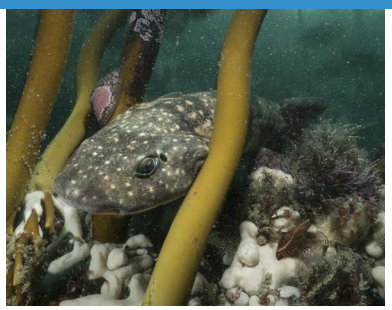
SPECIES PROFILES OF SOUTH AFRICAN
SHARKS, RAYS AND CHIMAERAS

VOLUME 2 : FISHERIES AND OTHER IMPORTANT SPECIES






WILDTRUST™

Shark Conservation Fund

Editors: Geremy Cliff and Jennifer M. Olbers

SPECIES PROFILES OF SOUTH AFRICAN SHARKS, RAYS AND CHIMAERAS.

Volume 2: Fisheries and other important species

Geremy Cliff and Jennifer M. Olbers (Editors)

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DEDICATION

This volume is dedicated to two great South African scientists who recently passed away. It is fitting to acknowledge their enormous contributions to the advancement of southern African and global elasmobranch research.

Leonard J. V. Compagno

4 December 1943 – 25 September 2024

Leonard, a native American, moved to South Africa in the prime of his career. He spent a decade at the JLB Smith Institute of Ichthyology, now the South African Institute for Aquatic Biodiversity (SAIAB), where he authored the two–volume series entitled *Sharks of the World*, published by the Fisheries and Agricultural Organization (FAO) of the United Nations. He spent the last two decades of his career at the South African Museum, where he published extensively on the taxonomy, biology, and ecology of the region's sharks and rays, and updated one of his earlier FAO volumes. He authored chapters on 18 shark, ray and chimaera families for *Smith's Sea Fishes*, several of which were co-authored with John Bass. Len, or Leonard as he was known to friends and colleagues, was living in Cape Town at the time of his passing.

A. John Bass

February 1944 – 25 May 2023

John, a South African by birth, joined the Oceanographic Research Institute (ORI), where he examined and collected shark specimens throughout the southwestern Indian Ocean. His findings, which covered the taxonomy, anatomy, life history and ecology of nearly 100 species of sharks, were published in a six-volume series of investigational reports. He moved to the JLB Smith Institute of Ichthyology, now the South African Institute for Aquatic Biodiversity (SAIAB), where he authored chapters on 16 shark families for *Smith's Sea Fishes*, several of which were co-authored with Leonard Compagno. Disturbed by the prevailing political situation in South Africa, John moved to Australia, where he worked in public health. He was living in Hobart at the time of his passing.

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ACKNOWLEDGEMENTS

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INTRODUCTION

Mainland South Africa has a coastline of over 3 600 km and more than a million square kilometres of ocean within its 200 nautical mile Exclusive Economic Zone. The continental shelf is narrow on the east coast, intermediate on the west coast and extends to over 260 km offshore to form the Agulhas Bank in the south, with the greatest depth recorded at 5 700 m. South Africa is well-known for its extraordinary biodiversity, with almost 13 000 known marine species, thus making it the third most biologically diverse country in the world. Approximately a third of South African marine species are endemic, with this high biodiversity and endemism being a by-product of marked changes in temperature and nutrient availability, which effectively form barriers around the coastline (Griffiths *et al.* 2010; Sink *et al.* 2012).

There are currently 194 species of chondrichthyans (sharks, batoids (rays and skates) and chimaeras) present in South African waters, comprising 50 families and 103 genera. There are 30 families, 64 genera, and 111 species of sharks; 17 families, 36 genera, and 72 species of batoids; and 3 families, 5 genera, and 8 species of chimaeras (Ebert *et al.* 2021a). South Africa has one of the most diverse and richest chondrichthyan faunas in the world. The country ranks among the top five nations in terms of species diversity, behind Australia (329 species), Indonesia (221), Japan (212), and Brazil (210). All five countries have two or more ocean current ecosystems bounding them. South Africa has the cold Benguela Current on the west coast and the warm Agulhas Current on the east coast. These two major currents have a profound influence on species diversity, with the east coast being more diverse than the west coast (Ebert and van Hees, 2015). Cape Point (18°42'E) is regarded as the approximate demarcation point between these two large marine ecosystem currents.

Chondrichthyans around the world are being affected both directly and indirectly by various human activities. As a result, several chondrichthyan populations are depleted and assessed as threatened with extinction. Chondrichthyans have life histories characterised by low fecundity, slow growth rates and late maturity. These life-history strategies make them vulnerable and susceptible to over-exploitation. The rapid economic growth in global fisheries has largely been unregulated and driven by unrestricted international trade in shark products. Also, the high levels of mortality from bycatch and the degradation of essential nursery grounds and other critical coastal, estuarine, and freshwater habitats because of anthropogenic disruptions, especially development and pollution are significant threats to chondrichthyans.

SOUTH AFRICAN LEGISLATION RELEVANT TO CHONDRICHTHYANS

In 1996, Section 24 of the South African Constitution preserved fundamental environmental rights with a strong emphasis on equitable access to resources. In 1998, NEMA, the National Environmental Management Act (No. 107 of 1998) was enacted, becoming the framework for all environmental legislation in South Africa. In the marine realm, and specifically related to sharks and rays, critical legislation (and related regulations) includes the Marine Living Resources Act No. 18 of 1998 (MLRA), National Environmental Management: Biodiversity Act No. 10 of 2004 (NEMBA) and the National Environmental Management: Protected Areas Act No. 57 of 2003 (NEMPAA). Also, South Africa is a signatory to the international Convention of Migratory Species (CMS), including the Sharks Memorandum of Understanding, and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

IUCN RED LIST AND CLASSIFICATION OF THREATENED SPECIES

A total of 14 species, comprising 7 shark and 7 batoid species, are regarded as South African endemics, with a further 14 species (7 sharks, 5 batoids and 2 chimaeras) described as southern African endemics (Ebert *et al.* 2021a).

Species are regarded as threatened according to their current IUCN Red List Assessment status. The IUCN Red List of Threatened Species is widely recognised as the most comprehensive source of information on the extinction risk of individual plant and animal species. The assessments are based on all available information on a species' taxonomy, distribution, population status, habitat and ecology, major threats, use and trade, and conservation measures. The IUCN Red List Categories and Criteria utilise a series of thresholds to evaluate extinction risk based on population size reduction, geographic range, population size, or the probability of extinction (IUCN, 2012; IUCN Standards and Petitions Subcommittee, 2019).

The IUCN Red List applies the following extinction risk categories (definitions from Mace *et al.* 2008; IUCN 2012):

Category	**Definition**
Extinct (EX)	There is no reasonable doubt that the last individual has died
Extinct in the Wild (EW)	Known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range
Critically Endangered (CR)	Facing an extremely high risk of extinction in the wild
Endangered (EN)	Facing a very high risk of extinction in the wild
Vulnerable (VU)	Facing a high risk of extinction in the wild
Near Threatened (NT)	Does not qualify for CR, EN or VU now, but is close to qualifying for or is likely to qualify for a threatened category in the near future
Least Concern (LC)	Does not qualify for CR, EN, VU, or NT
Data Deficient (DD)	Inadequate information to make a direct or indirect, assessment of its risk of extinction based on its distribution and/or population status
Not Evaluated (NE)	Species not yet assessed

Each species is assessed using five Red List criteria (Mace *et al.* 2008; IUCN, 2012; IUCN Standards and Petitions Subcommittee, 2019):

Criterion	**Consideration**
Criterion A	Population size reduction
Criterion B	Geographic range size
Criterion C	Small population size and decline
Criterion D	Very small or restricted population
Criterion E	Quantitative analysis (for example, population viability analysis)

To qualify for one of the three threatened categories (CR, EN, or VU), a species must meet a quantitative threshold for that category in any of the five criteria (A–E) listed above (IUCN, 2012). Only one of the five criteria needs to be met for a species to qualify. If species meet multiple criteria, it is assigned the highest category for which it qualifies. The Red List Categories provided here are the global assessments of each species. For endemic species, the category can be considered to represent their status at the global scale. For other species, the South African range comprises only part of their broader global range. Their Red List Category is therefore based on the entire global population and reflects status, threats, population trends, and management at the global level. This category may be very different to a species' status within South African waters, but in many cases a regional or local (southern or South African) assessment has not been undertaken.

In general, the assessment assigned to a particular species includes the year of publication. This can be misleading, as there are cases when the assessment is published several years after the

assessment was undertaken. For this reason, the year presented here is the year in which the assessment was undertaken.

HOW TO USE THIS BOOK

The species reports included here focus on the situation, state of knowledge and fishery-related activities in South African waters. The information presented is sometimes supplemented from populations which occur outside South/southern Africa, particularly where the species is poorly known in South Africa.

The arrangement of species is in taxonomic order by family, first the Selachii (sharks) are presented, followed by the Batoidea (skates and rays) and then Chimaeras.

To cite individual species profiles, references should include both the compiler and the reviewer, such as the example below:

> CLIFF, G and JORDAAN, GL. 2025. *Carcharhinus humani* . In: Cliff, G. and Olbers (Eds). Species profiles of South African sharks, rays and chimaeras. Volume 2: Fisheries and other important species. WILDTRUST Special Publication 3, Durban, South Africa, pp 167-172.

DETAIL AND ARRANGEMENT OF HEADINGS USED IN EACH REPORT

The sizes of all sharks, torpediniform rays, skates and chimaeras are expressed as Total Length (TL), being the body length from the tip of the snout to the extremity of the tail. All other rays are measured in terms of maximum disc width (DW), or where specified.

Information on each species is presented under the following headings:

SCIENTIFIC NAME	Genus and species according to the most recent literature, together with the authority and year described.
COMMON NAME	Vernacular name/s most commonly used in South Africa.
FAMILY	Taxonomic family in which it is designated.
ENDEMIC	Refers only to South African endemics; southern African endemics are noted as such.
SIZE RANGE	The known size range (total length or disc width).
DISTRIBUTION	A summary of distribution based on the following areas: East coast: from Mozambique border to Cape Recife; South coast: from west of Cape Recife to Cape Point; West coast: from west and/or north of Cape Point to the Orange River mouth.
HABITAT	Summary of habitat type the species frequents.
DEPTH RANGE	Range of known depth.
MAJOR FISHERIES	Main fisheries in which the species is caught.
IUCN STATUS	Category and year of Red List assessment, with a hyperlink to the report on IUCN Red List website.
CITES	Gives the Appendix in which the species is listed, where appropriate.
MLRA	Regulations within the Marine Living Resources Act (MLRA) applicable to that species.
COMPILER	Author/s who compiled the species profile.
REVIEWER	Author/s who reviewed and edited the species profile.

SPECIES SUMMARY and RECOMMENDATIONS
A summary of the species profile, together with recommendations for management and research.

TAXONOMIC and IDENTIFICATION ISSUES
Summary of taxonomic or identification changes and issues encountered or unresolved. This section also notes other very similar looking species with which it may be confused.

SOUTH AFRICAN DISTRIBUTION
Describes the distribution of the species according to the following table:

COAST	REGION
East coast	From Mozambique border to Cape Recife
South coast	From west of Cape Recife to Cape Point
West coast	From west and/or north of Cape Point to the Orange River mouth

REGIONAL DISTRIBUTION
Notes its presence in other countries in southern Africa.

SYNOPSIS OF RESEARCH
Summary of research on this species, primarily within South Africa, but includes regional work where none has been conducted locally.

ECOLOGY
Depth
Briefly describes the known depth range.

Habitat: Adults
Briefly describes the habitat of the adults.

Habitat: Juveniles/Nursery Grounds
Briefly describes the habitat of the juveniles and any information pertaining to known nursery areas.

Synopsis of tag deployments
Information on any tagging or tracking undertaken.

Movements
Brief summary of known movements and migrations.

Diet/feeding: Adults
Brief summary of known prey or diet in adults.

Diet/feeding: Juveniles
Brief summary of known prey or diet in juveniles.

South African toxicological studies
Known local information on toxicology.

REPRODUCTION

REPRODUCTIVE MODE	The method of nourishment of the embryos.
DURATION OF REPRO CYCLE	Time interval between pregnancies.
MATING SEASON	Time of the year when mating takes place.

GESTATION	Duration of pregnancy.
LITTER SIZE	The number of offspring produced in a pregnancy.
PUPPING/NURSERY GROUND	Region where the full-term pregnant females congregate to give birth/ where the new-borns occur.
LENGTH AT BIRTH	Size at birth expressed as length or disc width.
LENGTH AT MATURITY	Size at maturity expressed as total length or disc width. It may differ for males and females.
MAXIMUM LENGTH	The size of the largest individuals, expressed as total length or disc width. It may differ for males and females.
GENERATION LENGTH	Defined as age of maturity + 0.5*(length of reproductive period in life cycle).

Mode
The method of nourishment of the embryos.

Duration of reproductive cycle
This is the time interval between pregnancies.

Mating season and location
Where known, the mating season and location is described.

Gestation
Duration of the pregnancy.

Litter size
The number of offspring produced in a pregnancy.

Size at birth
The size at birth expressed in terms of length or disc width.

Pupping season and nursery ground
Region where the full-term pregnant females congregate to give birth and where the new-borns occur.

Length at maturity
The size, expressed as length or disc width, at maturity for males and females.

Maximum length
The size of the largest individuals, expressed as expressed as total length or disc width. It may differ for males and females. In the absence of local information, details from elsewhere may be included.

Age and growth
Details of any age and growth studies.

Generation length
Generation length is defined as *age of maturity + 0.5*(length of reproductive period in life cycle*).

FISHERIES MANAGEMENT
SA catch sources
Summary of catches within South Africa.

SA catch quantities and characteristics
Types of fisheries and where known, catch information.

Population trends
Information pertaining to known populations in the region, supplemented with information from elsewhere.

ECOTOURISM
Information pertaining to the ecotourism value or potential of this species.

CONSERVATION MEASURES
Information pertaining to nature and status of protection within the national legislation, including the**:**

- **Marine Living Resources Act (MLRA) Regulations**
- **National Environmental Management: Biodiversity (NEMBA) Act and associated Regulations, such as Threatened or Protected Species (TOPS)**
- **Marine Protected Areas (MPAs)**

IUCN Red List Status:
Current category and assessment details/criteria.

Previous IUCN assessments
Previous assessment information.

Types and status of protection within the national legislation, including the:

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
Type and status of protection within the national legislation.

Convention on Migratory Species (CMS)
Type and status of protection within the national legislation.

MANAGEMENT CONSIDERATIONS
Comments specific to the current and future management of the species.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Comments on current and future importance of research for this species.

ACRONYMS AND ABBREVIATIONS

BRUV	Baited Remote Underwater Video
CITES	Convention on International Trade in Endangered Species
cf.	Conforming to. A taxonomic term used where a species is similar to the listed species
CMS	Convention on Migratory Species
CR	Critically Endangered
DD	Data Deficient
DFFE	Department of Forestry, Fisheries and the Environment
DW	Disc Width
EN	Endangered
EW	Extinct in the Wild
EX	Extinct
FL	Fork Length
IUCN	International Union for Conservation of Nature
KZNSB	KwaZulu-Natal Sharks Board
LC	Least Concern
MLRA	Marine Living Resources Act
MMF	Marine Megafauna Foundation
MPA	Marine Protected Area
NE	Not Evaluated
NEMBA	National Environmental Management: Biodiversity Act
NMU	Nelson Mandela University
NT	Near Threatened
ORI	Oceanographic Research Institute
RASSPL	Rock-and-Surf-Super-Pro-League
SAAMBR	South African Association for Marine Biological Research
SAASA	South African Shore Angling Association
SAIAB	South African Institute for Aquatic Biodiversity
TAE	Total Allowable Effort
TL	Total Length
TOPS	Threatened or Protected Species
UKZN	University of KwaZulu-Natal
VU	Vulnerable
WCSAA	Western Cape Shore Angling Association

SOUTH AFRICAN FISHERIES AND OTHER IMPORTANT SPECIES REPORTS:

SHARKS

FAMILY CHLAMYDOSELACHIDAE

Chlamydoselachus africana - Southern African frilled shark

SCIENTIFIC NAME	*Chlamydoselachus africana* Ebert and Compagno, 2009
COMMON NAME	Southern African frilled shark
FAMILY	Chlamydoselachidae
ENDEMIC	No
SIZE RANGE	?–>115 cm TL
SA DISTRIBUTION	Poorly defined, possibly entire South African coast
HABITAT	Epibenthic on continental slope
DEPTH RANGE	300–1400 m
MAJOR FISHERIES	Suspected in offshore demersal trawl fishery
IUCN STATUS	Least Concern 2018
CITES	Not listed
MLRA	The current trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Chlamydoselachus africana is a medium-sized, epibenthic shark that is found on the continental slope at depths of 300–1400 m. It is known from only a handful of records from the west and east coasts, Namibia and Southern Angola, with no records from the south coast. Local average annual catch was estimated at <1 ton from DFFE records for two time periods: 2010–2012 and 2013–2019, and is likely to be restricted to the deep-water demersal trawl and longline fisheries. It is possible that much of the population inhabits waters that are deeper than the operating depths of these fisheries, so the species has refuge at depth. Individuals may spend time in the water column, thereby escaping bottom fishing gear. *C. africana* was assessed as Least Concern on the IUCN Red List in 2018. Very little is known about the distribution, habitat, life-history and movement of this species. Opportunistic sampling should be used to collect biological and ecological information on this poorly known species.

TAXONOMIC and IDENTIFICATION ISSUES

The family Chlamydoselachidae (frilled sharks) was long thought to contain a single wide-ranging species, *Chlamydoselachus anguineus.* Ebert and Compagno (2009) described a new species, *C. africana*, based on five specimens, one from Angola and four from Namibia. The new species, although extremely difficult to distinguish externally from *C. anguineus*, differs internally by the structural differences in the chondrocranium, lower total vertebral and spiral valve counts, and pectoral-fin radial counts. As there are no confirmed records of *C. anguineus* from southern Africa, all records in the literature of frilled sharks are assumed to be *C. africana* (Ebert et al. 2021a). Bass *et al.* (1975d) noted that local records of this species comprised a dubious one from the Eastern Cape and two from Namibia. Ebert and Compagno (2009) reported one record from southern Angola, nine from Namibia and one from the Eastern Cape. More recently, a single individual was captured off Hondeklip Bay on the west coast (DFFE unpublished records, Leslie 2021).

SOUTH AFRICAN DISTRIBUTION

The South African distribution is based on a handful of records from the east coast (KZN and Transkei waters) and one from the west coast, with no reports from the south coast (Ebert and Compagno 2009, DFFE unpublished records, Leslie 2021). Given its occurrence in Namibia, its truncated

distribution along the South African coast may be an artefact of the paucity of research trawls at the depths where *C. africana* occurs (Compagno *et al.* 1991).

REGIONAL DISTRIBUTION

Chlamydoselachus africana is present in southern Angola, based on a single record, and Namibia (Bass *et al.* 1975d, Ebert and Compagno 2009).

SYNOPSIS OF RESEARCH

This is a very poorly studied species in South African waters. Bass *et al.* (1975d) provided a very brief description of the two specimens, known at the time as *C. anguineus* and collected in Namibia, supplemented with information from findings elsewhere in the world. Ebert and Compagno (2009) described *C. africana* based on five specimens, four from Namibia and one from Southern Angola. No dedicated research has been conducted on this species. *Chlamydoselachus africana* was ranked sixth out the 60 South African demersal chondrichthyan species which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

Chlamydoselachus africana is found in waters of 300–1400 m depth (Ebert and Compagno 2009).

Habitat: Adults

Chlamydoselachus africana is usually caught on or near the bottom of the upper slope and rarely occurs on the surface or close inshore (Compagno *et al.* 1991). It is described as benthic, epibenthic, and pelagic on continental and insular shelves and upper slopes (Ebert *et al*. 2021b).

Habitat: Juveniles/Nursery Grounds

It is not known if the juveniles frequent a different habitat to the adults.

Synopsis of tag deployments

No tagging has taken place in South African waters.

Movements

Insufficient information exists to determine residency and movement patterns. Stomach contents of *C. anguineus* from Japan included epipelagic ommastrephid squids that are known to be fast-swimming and highly active, suggesting that it rises off the bottom (Ebert and Compagno 2009).

Diet/feeding: Adults

Chlamydoselachus africana feeds on teleosts, sharks from the family Pentanchidae and ommastrephid squids (Ebert and Compagno 2009).

Diet/feeding: Juveniles

It is not known whether there are any ontogenetic changes in the diet.

South African toxicological studies

No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Unknown
GESTATION	Unknown
LITTER SIZE	At least 3 (based on a single pregnant female)

PUPPING/NURSERY GROUND	Unknown
LENGTH AT BIRTH	Unknown
LENGTH AT MATURITY	Unknown
MAXIMUM LENGTH	> 115 cm TL
GENERATION LENGTH	Unknown

Mode
No adult females have been sampled but Ebert and Compagno (2009) noted that a pregnant female with three embryos was caught and discarded in Namibia. Everything else about the reproduction of *C. africana* is based on *C. anguineus*, which is viviparous, and likely matrotrophic (Smart *et al.* 2016). Lecithotrophy seems the more likely mode of embryo nourishment, given the large size of the eggs, which are 11–12 cm in diameter.

Duration of reproductive cycle
This is unknown.

Mating season and location
This is unknown.

Gestation
This is unknown, although *C. anguineus* has a gestation of 1–2 years (Smart *et al.* 2016).

Litter size
Litter size is at least three, based on an observation of a pregnant female caught off Namibia, but not retained (Ebert and Compagno 2009). Litter size of *C. anguineus* is 2–15 (Smart *et al.* 2016).

Size at birth
This is not known for *C. africana* but is 40–60 cm TL for *C. anguineus* (Smart *et al.* 2016).

Pupping season and nursery ground
This is unknown.

Length at maturity
This is unknown but female *C. anguineus* mature at 130–135 cm TL, males at 92–163 cm TL (Smart *et al.* 2016).

Maximum length
The largest known *C. africana* was an immature female of only 115 cm (Ebert and Compagno 2009). *C. anguineus* is far larger, attaining 196 cm (Smart *et al.* 2016).

Age and growth
No age and growth studies have been undertaken.

Generation length
This is unknown.

FISHERIES MANAGEMENT
SA catch sources
The local annual catch was estimated at <1 ton from DFFE records for two time periods: 2010–2012 ((da Silva *et al.* 2015) and 2013–2019 (DFFE 2022), with the offshore demersal trawl fishery and the hake longline fishery listed as the only suspected catch sources. No further details are available.

Fishing outside South Africa
Chlamydoselachus africana may be captured by deep-water demersal trawl and longline fisheries, particularly off northern Namibia (Leeney 2024).

Population trends
There are no population estimates for *C. africana*. The population trend is suspected to be stable, as it occurs largely outside fished areas and at depths greater than those fished. As a result, *C. africana* was assessed as Least Concern in terms of the IUCN Red List in 2018 (Pollom *et al.* 2019a).

ECOTOURISM
C. africana cannot be considered an ecotourism species as it primarily occurs in very deep waters.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
The current trawl footprint is ringfenced; there is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
This demersal species does not appear to be common in South African waters and due to its deep-water habitat, it is unlikely to benefit from South Africa's Marine Protected Areas.

Additional local comment
As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

Current IUCN Status
Least Concern 2018

Previous IUCN assessments
Data Deficient 2004 (as *Chlamydoselachus* sp. nov.)

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
No species-specific management or conservation measures are currently in place (Pollom *et al.* 2019a).

MANAGEMENT CONSIDERATIONS
Chlamydoselachus africana appears to be very uncommon in South African waters, based on the paucity of catch records. Alternatively, it occurs outside the operating depths of South African demersal fisheries, or in the water column where it is not available to bottom trawl gear. It should be regarded as being of very low management priority. The re-establishment of the scientific observer programme in the demersal trawl fishery, with observers that are trained in the

identification of chondrichthyans, will be an important step in facilitating the retention of specimens of this rarely caught species. It is important that the current trawl footprint remains in place and regulated.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

Chlamydoselachus africana is an extremely poorly studied species in South African waters. Almost nothing is known of its biology, life-history and ecology. This is unlikely to change as it appears to be extremely rare in any catches. In the unlikely event of any captures, the specimens should be used to collect such information and tissue samples for genetic studies. *Chlamydoselachus africana* was ranked sixth out the 60 South African demersal chondrichthyan species which were prioritised for further research.

FAMILY HEXANCHIDAE

Heptranchias perlo - Sharpnose sevengill shark

SCIENTIFIC NAME	*Heptranchias perlo* (Bonnaterre 1788)
COMMON NAME	Sharpnose sevengill shark
FAMILY	Hexanchidae
ENDEMIC	No, Mozambique and Namibia and beyond
SIZE RANGE	26–140 cm TL
SA DISTRIBUTION	East coast and part of the south coast to Cape Agulhas
HABITAT	Benthopelagic
DEPTH RANGE	100–450 m; elsewhere 0–1000 m
MAJOR FISHERIES	Suspected in hake longline and demersal trawl fishery
IUCN STATUS	Near Threatened 2019
CITES	Not listed
MLRA	Demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RGA Watson

SPECIES SUMMARY and RECOMMENDATIONS

Heptranchias perlo is a medium-sized shark found in deep water down to 1000 m on the entire east coast and on the south coast as far west as Cape Agulhas. It has a widespread global distribution, which includes Mozambique and Namibia. This little-studied species is easily distinguished from other regional members of the family Hexanchidae, which all feature 6–7 gill slits and a single dorsal fin. Local average annual catch was estimated at <1 ton from DFFE records for two time periods: 2010–2012 and 2013–2019, with the hake longline fishery and demersal trawl fisheries being the source of catches. The species was assessed globally as Near Threatened, verging on Vulnerable, on the IUCN Red List in 2019. In view of the low catches, it must be regarded as a very low management priority. Almost nothing is known locally about this species. It may benefit from protection in the deepest waters of the iSimangaliso Wetland Park. Any opportunistic sampling should be used to accumulate much-needed information on the biology and ecology of this species, as well as tissues for genetic studies.

TAXONOMIC and IDENTIFICATION ISSUES

There are no taxonomic or identification issues. *H. perlo* is very distinctive and is one of two species in the family Hexanchidae which has seven gill slits. Its large eyes pointed snout and lack of prominent spots easily distinguishes it from *Notorynchus cepedianus* (Bass *et al.* 1975d, Ebert *et al.* 2013). Historically, there were a number of nominal species of *Heptranchias,* but they have proved to be conspecifics of the wide-ranging *H. perlo,* despite wide differences in the number of vertebrae (Bass *et al.* 1975d).

SOUTH AFRICAN DISTRIBUTION

Heptranchias perlo is most common off the east coast, but individuals have been taken during survey cruises as far west as Cape Agulhas on the south coast (Ebert *et al*. 2021a).

REGIONAL DISTRIBUTION

Heptranchias perlo occurs in Mozambique and Namibia and is globally widespread but is absent from the NE Pacific (Ebert *et al.* 2021b).

SYNOPSIS OF RESEARCH

There is extremely little published information on the biology and ecology of this species in South Africa. Bass *et al.* (1975d) provided morphometric and biological data from eight females and eight males from KZN and southern Mozambique. Barnett *et al.* (2012) provided a global overview of the family Hexanchidae, with limited information on *H. perlo* from South Africa. *Heptranchias perlo* was ranked 48th out of the 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

Heptranchias perlo occurs at depths of 100–450 m (Compagno *et al.* 1989). It is feasible that shallow-water records of this species may have been a result of confusion with *N. cepedianus,* which is commonly found close to shore (Bass *et al.* 1975d). Elsewhere this species occurs at depths of 0–1000 m (Finucci *et al.* 2020a), but mainly in deep water (Ebert *et al.* 2013).

Habitat: Adults

They are benthopelagic and may also swim well off the bottom (Ebert *et al.* 2021b).

Habitat: Juveniles/Nursery Grounds

There is no evidence that juveniles occupy habitats which differ from those of the adults.

Synopsis of tag deployments

This species has not been tagged.

Movements

Nothing is known about the movement patterns of this species.

Diet/feeding: Adults

They feed on small teleosts, small sharks and rays, crustaceans and cephalopods (Compagno *et al.* 1989), although this could apply to both juveniles and adults. The presence of pelagic prey indicates that they feed well off the bottom (Ebert 2013). Of the deep-water hexanchids, *H. perlo* is the only species for which there are dietary studies from multiple regions, with a prominence of teleosts and cephalopods at all locations (Barnett *et al*. 2012 and references cited therein). There is evidence for regional variation; in South Africa, teleosts and cephalopods were of similar importance, whereas in Taiwan, the diet was almost exclusively teleosts (Barnett *et al*. 2012). It is likely that the 12 stomachs from South African specimens included both mature and immature individuals.

Diet/feeding: Juveniles

There was no distinction between adults and immature individuals in the limited stomach content data from local *H. perlo* (Bass *et al.* 1975d, Barnett *et al*. 2012). In eastern Australian waters there is an ontogenetic shift in diet, with differences in the proportional contribution of prey types to the diet rather than differences in the type of prey consumed (Braccini 2008).

South African toxicological studies

No local studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Year-round (outside South Africa)
GESTATION	Unknown

LITTER SIZE	6–20 (outside South Africa)
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	26–27 cm TL
LENGTH AT MATURITY	F: 90–105 cm; M: 75–85 cm TL
MAXIMUM LENGTH	140 cm TL
GENERATION LENGTH	13.5 years, inferred from *Hexanchus griseus*

Mode
Members of the family Hexanchidae exhibit lecithotrophic viviparity, in which the embryos are entirely dependent on the nourishment provided by the yolk-sac.

Duration of reproductive cycle
This is unknown locally or globally (Barnett *et al.* 2012).

Mating season and location
This is unknown locally. In the Mediterranean Sea and off Japan these sharks seem to be reproductively active throughout the entire year (Ebert 2013).

Pupping season and nursery grounds
This is unknown locally or globally (Barnett *et al.* 2012).

Gestation
This is unknown locally or globally (Barnett *et al.* 2012).

Litter size
No pregnant females have been sampled in South Africa. Elsewhere litter size is 6–20 (Ebert *et al.* 2021b).

Length at birth
This is 26–27 cm (Ebert *et al.* 2013). Bass *et al.* (1975d) reported that the smallest individual from the SW Indian Ocean was 27 cm TL.

Length at maturity
Females mature at 90–105 cm and males at 75–85 cm TL (Barnett *et al.* 2012). In southern Africa the largest female of 89 cm was immature; males of less than 69 cm were immature and those larger than 85 cm were mature (Bass *et al.* 1975d).

Maximum length
This species attains 140 cm (Ebert *et al.* 2021b).

Age and growth
Maximum age and age-at-maturity are unknown (Barnett *et al.* 2012, Finucci *et al.* 2020a).

Generation length
In the absence of information on the age-at-maturity and maximum age of this species, the generation length of the far-larger *Hexanchus griseus* (maximum of 550 cm) was scaled down from 53 years to 13.5 years for *H. perlo* (Finucci *et al.* 2020a).

FISHERIES MANAGEMENT

SA catch sources

The local average annual catch of *H. perlo* was estimated from DFFE records at <1 ton for two time periods: 2010–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022), with the hake longline and demersal trawl fisheries being the major source of these catches (da Silva *et al.* 2105, DFFE 2022).

SA catch quantities and characteristics

Hake longline fishery

Heptranchias perlo is a suspected catch in the offshore component of this fishery, which operates on the south coast at depths of 100–600 m (da Silva *et al.* 2015), but this species was not listed in an analysis of catches (Petersen *et al.* 2009).

Demersal trawl fishery

Heptranchias perlo is a suspected catch in the demersal trawl fishery but was not listed among catches in the inshore component of this fishery which operates on the south coast primarily at depths of 80–110 m (Attwood *et al.* 2011). It was not reported among catches in demersal trawl surveys on the south coast (Petersen *et al.* 2009).

Fishing outside South Africa

Published details on any catches of this species in Mozambique are scant, but deep-water demersal trawl fisheries for shrimp and teleosts have been operational in southern Mozambique over the past few decades and bycatch of *H. perlo* is likely (Ebert 2013). It is commonly encountered as bycatch in bottom trawl fisheries in Namibia (Leeney 2024). Globally, it is infrequently reported as incidental catch across its range from a wide variety of fisheries. The species is utilised for human consumption, although the meat has a low market value. It is retained for its liver oil, presumably used for fish meal, and has occasionally been kept in public aquaria (Finucci *et al.* 2020a and references cited therein).

Population trends

Nothing is known of the global or any regional population structure; *H. perlo* is wide-ranging but relatively uncommon in most places where it occurs (Ebert 2013). The wide differences in the number of vertebrae from various locations were construed as a strong indication that the different populations are isolated (Bass *et al.* 1975d). It is suspected to have undergone a population reduction of 20–29% over the past three generations (41 years), based on abundance data and actual levels of exploitation, and in 2019 it was assessed as Near Threatened and close to meeting the criteria of Vulnerable A2bd (Finucci *et al.* 2020a).

ECOTOURISM

As primarily a deep-water species, *H. perlo* is rarely seen by scuba divers in South Africa and therefore cannot be regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

Being primarily a deep-water species, *H. perlo* may derive some protection in the deeper waters of the iSimangaliso MPA.

Additional local comment
As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

Current IUCN Status
Near Threatened 2019 (considered close to meeting the criteria of Vulnerable A2bd).

Previous IUCN assessments
Near Threatened 2003

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

MANAGEMENT CONSIDERATIONS
As this species is not a confirmed catch in any South African fishery, it must be regarded as being of low management priority. Furthermore, it is unlikely that any management intervention in South Africa will improve the status of this species from one of Near Threatened. As it may be caught in the demersal trawl fishery, it is imperative that the footprint of this fishery remains ringfenced and regulated.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
It would appear that very little research on this species has been conducted anywhere, despite its widespread global distribution. Any opportunistic sampling should be used to provide essential biological and ecological information and to collect tissue samples for a global genetic study. *Heptranchias perlo* was ranked 48th out of the 60 South African demersal chondrichthyan species, which were prioritised for further research.

Hexanchus griseus - Bluntnose sixgill shark

SCIENTIFIC NAME	*Hexanchus griseus* (Bonnaterre, 1788)
COMMON NAME	Bluntnose sixgill shark
FAMILY	Hexanchidae
ENDEMIC	No, Mozambique and Namibia and beyond
SIZE RANGE	56–480 cm TL, possibly 550 cm
SA DISTRIBUTION	Entire South African coast
HABITAT	Benthopelagic
DEPTH RANGE	5–930 m; mostly > 200 m; elsewhere down to 2500 m
MAJOR FISHERIES	Hake longline fishery and possibly recreational and commercial line fisheries
IUCN STATUS	Near Threatened 2019
CITES	Nil
MLRA	Daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RGA Watson

SPECIES SUMMARY and RECOMMENDATIONS

Hexanchus griseus is a large shark found in deep water along the entire South African coast. Globally, it is one of most common and wide-ranging deep-water shark species, also occurring in Mozambique and Namibia. It is easily distinguished from other members of the family Hexanchidae in the region which all feature 6–7 gill slits and a single dorsal fin. The local average annual catch was estimated at <1 ton from DFFE records for two time periods: 2010–2012 and 2013–2019, with the hake longline fisheries indicated as the main source. It was assessed globally as Near Threatened, verging on Vulnerable, on the IUCN Red List in 2019. Little is known locally about *H. griseus*, making it very difficult to ascertain if any of the existing Marine Protected Areas will benefit this species. There is a known pupping area in Namibia. Any opportunistic sampling should be used to accumulate much-needed information on the biology and ecology of this species, as well as tissue samples for population genetic studies.

TAXONOMIC and IDENTIFICATION ISSUES

There are no taxonomic or identification issues. *H. griseus* is very distinctive and is one of two southern African species in the family Hexanchidae which has six gill slits. Its broad, blunt snout, light-coloured lateral line and large size easily distinguishes it from another locally occurring species *Hexanchus nakamuria* (Bass *et al.* 1975d), although *H. griseus* smaller than 120 cm may be confused with *H. nakamurai* (Ebert 2013).

SOUTH AFRICAN DISTRIBUTION

Hexanchus griseus occurs along the entire South African coast (Ebert *et al*. 2021a).

REGIONAL DISTRIBUTION

Hexanchus griseus occurs in Mozambique and Namibia and beyond. Globally, it is one of the most common and wide-ranging deep-water shark species (Ebert 2013).

SYNOPSIS OF RESEARCH

There is some published information on the biology and ecology of this species from southern Africa. Bass *et al.* (1975d) provided morphometric and biological data on eight individuals from South Africa, Mozambique and Namibia. Ebert (1990) investigated the taxonomy, biogeography and ecology of hexanchid sharks in southern African waters, which included specimens from Namibia, resulting in publications on diet (Ebert 1994) and reproduction (Ebert 2002). Compagno *et al.* (1991)

documented the distribution of this species along with other chondrichthyans on the west coast. Vella and Vella (2017) investigated genetic variation of individuals collected from different areas within and outside the Mediterranean region, including Namibia, to assess genetic connectivity. *Hexanchus griseus* was ranked 55th out of 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

Hexanchus griseus occurs in local waters near the bottom in deep water down to at least 930 m (Compagno *et al.* 1989) and down to 2500 m elsewhere (Ebert *et al.* 2021b), but mostly at depths of 200–1100 m (Finucci *et al.* 2020b). The specimens examined by Bass *et al.* (1975d) were taken in trawls at depths of 70–445 m on the east coast, while on the west coast, the five individuals were trawled at depths of 150–400 m (Compagno *et al.* 1991). It is most commonly deeper than 200 m, but it is also known from Langebaan Lagoon, Saldanha Bay and St. Helena Bay (Ebert *et al.* 2021a), which indicates that individuals may move into shallow coastal waters.

Habitat: Adults

They are benthopelagic in warm temperate and tropical waters on the shelf and upper slope. They usually swim close to the bottom but may approach the surface at night or in response to dense plankton blooms. They are often associated with areas of upwelling and high productivity (Ebert *et al.* 2021b). The diet indicates that *H. griseus* forages over a broad range of habitats, often well off the bottom (Ebert 1994).

Habitat: Juveniles/Nursery Grounds

There are shallow-water pupping areas in some locations including southern Namibia (Ebert *et al.* 2021b).

Synopsis of tag deployments

This species has not been tagged.

Movements

Very little is known of the horizontal movement patterns of this species. Pupping takes place in shallow water where the neonates remain. As they approach maturity, they move offshore into deeper water (Ebert 1994). The wide bathymetric and geographic range of the species, the large maximum size, its ability to prey on pelagic organisms, and its scattered occurrence off seamounts and oceanic islands and well away from the bottom suggest that it may be capable of long-distance movement in the open ocean (Ebert 2013). There is diel vertical movement, with individuals which usually swim close to the bottom approaching the surface at night. They are often associated with areas of upwelling and high productivity (Ebert *et al.* 2021b).

Diet/feeding: Adults

In individuals larger than 200 cm, marine mammals, comprising both seals and dolphins, were the most important prey, followed by teleosts. Cephalopods and chondrichthyans were of minor importance (Ebert 1994).

Diet/feeding: Juveniles

There is good evidence of an ontogenetic shift in diet. Individuals smaller than 120 cm feed almost exclusively on cephalopods and occasionally chondrichthyans, but no marine mammals. Individuals of 120–200 cm feed mainly on teleosts, followed by chondrichthyans and cephalopods, with a small marine mammal component (Ebert 1994).

South African toxicological studies
No local studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Possibly 2 years
MATING	Unknown
GESTATION	Possibly 12 months
LITTER SIZE	47–108 (outside South Africa)
PUPPING/NURSERY GROUND	Summer near Lüderitz, Namibia
SIZE AT BIRTH	56–74 cm TL (outside South Africa)
LENGTH AT MATURITY	F: <420 cm; M: ~310 cm TL
MAXIMUM LENGTH	480 cm, possibly 550 cm TL
GENERATION LENGTH	53 years

Mode
Members of the family Hexanchidae exhibit lecithotrophic viviparity, in which the embryos are entirely dependent on the nourishment provided by the yolk-sac.

Duration of reproductive cycle
The reproductive cycle is poorly defined, but may be biennial, with females having a 12-month gestation period, followed by a 12-month resting phase (Ebert 2013).

Mating season and location
This is unknown.

Pupping season and nursery grounds
There is a known summer pupping area off Lüderitz in Namibia, with parturition in late spring and summer (Ebert 2002).

Gestation
This is possibly 12 months (Ebert 2013).

Litter size
This species is characterised by large litters of 47–108 (Bass *et al.* 1975d, Ebert 2002), although no pregnant females have been sampled in southern Africa.

Length at birth
This is regarded as 61–74 cm (Ebert *et al.* 2021b), with the smallest individual from Namibia being 61 cm (Ebert 2002). In the Mediterranean, the smallest individual was 56 cm TL (Capapé *et al.* 2004).

Length at maturity
Ascertaining maturity in females was problematic, with the largest immature individual being 320 cm; most were fully mature by at least 420 cm. Males mature at about 310 cm (Ebert 2002).

Maximum length
This species attains at least 480 cm, possibly 550 cm (Ebert *et al.* 2021b).

Age and growth
Female age-at-maturity is estimated at 26.5 years, and maximum age is estimated at 80 years, but these statistics have not been validated, and estimates should be used with caution (Finucci *et al.* 2020b).

Generation length
The generation length was determined at 53 years, but with the caveat that this is based on unvalidated information (Finucci *et al.* 2020b).

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *H. griseus* was estimated from DFFE records at <1 ton for two time periods: 2010–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). In the first period, there were no confirmed catch sources; the recreational and commercial linefisheries and the hake longline fishery were listed as suspected catch sources (da Silva *et al*. 2015). In the second period, the hake longline fishery was listed as the main source of catches (DFFE 2022).

Fishing outside South Africa
Hexanchus griseus is a bycatch in the Namibian demersal trawl fishery (Leeney 2024). It is typically taken by line gear, gillnets, traps and pelagic and bottom trawls and utilised fresh, frozen, or dried and salted for human consumption, and for fishmeal and oil. These sharks are largely caught as a bycatch of other fisheries (Ebert 2013). The species is infrequently caught incidentally in deep-water industrial and artisanal fisheries across its range. There is high distribution overlap with intensive fishing pressure, with reported declines in part of its range and increases in others, together with a lack of species-specific management across its entire range (Finucci *et al.* 2020b).

Population trends
There is a strong regional population structure. Based on specimens collected from Namibia, there was a lack of genetic homogeneity between populations from the SE and NE Eastern Atlantic Ocean (Vella and Vella 2017). *H. griseus* is estimated to have undergone a population reduction of 20–29% over the past three generations (160 years) based on abundance data and actual levels of exploitation, and it is assessed as Near Threatened (close to meeting Vulnerable A2bd) (Finucci *et al.* 2020b).

ECOTOURISM
As primarily a deep-water species, it is rarely seen by scuba divers in South Africa and, therefore, cannot be regarded as an ecotourism species. On the NW Pacific coast *H. griseus* is the focus of a dive ecotourism industry (Ebert *et al.* 2021b). It is also a popular aquarium species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
Due to the insufficient information on the distribution of *H. griseus*, it is difficult to determine which established MPAs will be beneficial to this deep-water species.

Additional local comment
None

Current IUCN Status
Near Threatened 2019.

Previous IUCN assessments
Near Threatened 2009
Near Threatened 2009
Vulnerable 1996

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

MANAGEMENT CONSIDERATIONS
Very little is known about the catches in South African fisheries, particularly the hake longline fishery. This should be rectified but may require educating fishers to distinguish *H. griseus* from other members of the family Hexanchidae. It must be regarded as being of low management priority and it is unlikely that any intervention in South Africa will improve the status of this species from that of Near Threatened.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
It would appear that limited research on this species has been conducted anywhere, despite its widespread global distribution. Any opportunistic sampling should be used to build on the studies which have already provided essential biological and ecological information. Tissue samples should be collected to facilitate additional population genetic studies. *Hexanchus griseus* was ranked 55th out of 60 South African demersal chondrichthyan species, which were prioritised for further research.

Hexanchus nakamurai - Bigeye sixgill shark

SCIENTIFIC NAME	*Hexanchus nakamurai* Teng, 1964
COMMON NAME	Bigeye sixgill shark
FAMILY	Hexanchidae
ENDEMIC	No, Mozambique and Madagascar and elsewhere
SIZE RANGE	40–180 cm TL
SA DISTRIBUTION	Part of East coast: only KZN
HABITAT	Benthopelagic
DEPTH RANGE	10-600 m; elsewhere 0–700 m
MAJOR FISHERIES	None listed
IUCN STATUS	Near Threatened 2019
CITES	Not listed
MLRA	Daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RGA Watson

SPECIES SUMMARY and RECOMMENDATIONS

Hexanchus nakamurai is a small, benthopelagic shark found largely in deep water down to 600 m and is confined to the KZN coast. It has a patchy global distribution, which includes Mozambique, Tanzania and Madagascar. This little-studied species is easily distinguished from other regional members of the family Hexanchidae, which all feature 6–7 gill slits and a single dorsal fin. There were no local average annual catch estimates from DFFE records for this species, although it is an extremely rare catch in pelagic longlines. The species was assessed globally as Near Threatened, verging on Vulnerable, on the IUCN Red List in 2019. Almost nothing is known locally about this species, and it is unlikely that any management interventions will improve the status of this species in the region. It may benefit from protection in the deepest waters of the iSimangaliso Wetland Park. Any opportunistic sampling should be used to accumulate much-needed information on the biology and ecology of this species.

TAXONOMIC and IDENTIFICATION ISSUES

There are no current taxonomic or identification issues. *H. nakamurai* is one of two species in the family Hexanchidae which has six gill slits. Its small, slim body and narrow snout distinguishes it from another locally occurring species *Hexanchus griseus*, although *H. nakamurai* may be confused with smaller (<150 cm) individuals of *H. griseus* (Ebert *et al.* 2021a). The KZN specimens were originally referred to as *H. vitulus* (Bass *et al*., 1975d), but subsequent taxonomic research concluded they are *H. nakamurai* (Ebert, 1990). Recently, *H. vitulus* was resurrected as a valid species, but it appears to be restricted to the central North Atlantic (Daly-Engel *et al.* 2019, cited by Finucci *et al.* 2020c). Any new records of *H. nakamurai* from South Africa should checked to confirm their identity (Ebert *et al.* 2021a).

SOUTH AFRICAN DISTRIBUTION

The southern extent of the range of this species in the Western Indian Ocean appears to be KZN (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

Hexanchus nakamurai occurs in Mozambique and further north up to Somalia, as well as Madagascar (Finucci *et al.* 2020c).

SYNOPSIS OF RESEARCH

There is very little published information on the biology and ecology of this species in South Africa or elsewhere in the region. Bass *et al.* (1975d) provided morphometric and biological data on a single male specimen, described as *H. vitulus,* caught off Durban on the east coast and referred to 7 embryos from Kenya and the head of an individual caught in the KZN bather protection programme. Barnett *et al.* (2012) provided a global overview of the family Hexanchidae, with very limited information on *H. nakamurai* from South Africa.

ECOLOGY

Depth

Hexanchus nakamurai occurs in local waters from 90–600 m (Compagno *et al.* 1989). The capture of a single individual in the KZN bather protection nets, set in water of 10-15 m depth, indicates that this species may venture into shallow water close inshore on the KZN coast (Bass *et al.* 1975d). The global depth range is 0–700 m (Finucci *et al.* 2020c).

Habitat: Adults

They are benthopelagic, usually swimming close to the bottom but may make excursions towards the surface (Bass *et al*. 1975d).

Habitat: Juveniles/Nursery Grounds

There are no reports that juveniles occupy a different habitat.

Synopsis of tag deployments

This species has not been tagged.

Movements

Very little is known of the movement patterns of this species, other than the occasional incursion from depth to near the surface or to the inshore shallows.

Diet/feeding: Adults

They feed on teleosts (Barnett *et al.* 2012) and occasionally on crustaceans (Ebert *et al*. 2021b).

Diet/feeding: Juveniles

There is nothing published to indicate that the diet of the juveniles differs from that of the adults.

South African toxicological studies

No local studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Unknown
GESTATION	Unknown
LITTER SIZE	13–26 (outside South Africa)
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	40–43 cm TL
LENGTH AT MATURITY	F: ~142 cm; M: 123–157 cm TL (outside South Africa)
MAXIMUM LENGTH	~180 cm TL
GENERATION LENGTH	17 years, inferred from *Hexanchus griseus*

Mode
Members of the family Hexanchidae exhibit lecithotrophic viviparity, in which the embryos are entirely dependent on the nourishment provided by the yolk-sac.

Duration of reproductive cycle
This is unknown globally (Barnett *et al.* 2012).

Mating season and location
This is unknown globally (Barnett *et al.* 2012).

Pupping season and nursery grounds
This is unknown globally (Barnett *et al.* 2012).

Gestation
This is unknown globally (Barnett *et al.* 2012).

Litter size
This is 13–26 (Ebert *et al.* 2021b), which is represented by a litter from Madagascar of 13 and a female with 26 large ovarian eggs caught at an undisclosed location in the SW Indian Ocean (Bass *et al.* 1975d). No pregnant females have been sampled in southern Africa.

Length at birth
This is 40–43 cm (Ebert *et al.* 2021b). The litter of 13 from Madagascar were 39–42 cm in length and were regarded as close to birth as the yolk sacs were almost fully absorbed (Forster *et al.* 1970, cited by Bass *et al.* 1975d).

Length at maturity
Females mature at about 142 cm and males mature at 123–157 cm TL (Ebert *et al.* 2021b).

Maximum length
Hexanchus nakamurai attains about 180 cm (Ebert *et al.* 2021b).

Age and growth
Maximum age and age-at-maturity are unknown (Finucci *et al.* 2020c).

Generation length
In the absence of information on the age-at-maturity and maximum age of this species, the generation length of the far-larger *Hexanchus griseus* (maximum of 550 cm) was scaled down from 53 years to 17 years for *H. nakamurai* (Finucci *et al.* 2020c).

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Hexanchus nakamurai was not listed in annual catch estimates from DFFE records for the periods 2010–2012 (da Silva *et al.* 2015) or 2013–2019 (DFFE 2022), although it is an extremely rare catch in the pelagic longline fishery (Petersen *et al.* 2009).

Fishing outside South Africa
Hexanchus nakamurai is infrequently caught incidentally in demersal industrial and artisanal fisheries across its range and may be more common than currently reported and misidentified with other hexanchid species. There is distributional overlap with fishing pressure, some refuge at depth, and a lack of species-specific management across its entire range (Finucci *et al.* 2020c).

Population trends
Nothing is known of the global or any regional population structure. *H. nakamurai* is suspected to have undergone a population reduction of 20–29% over the past three generations (51 years), based on actual levels of exploitation. It was globally assessed as Near Threatened, close to meeting Vulnerable A2d (Finucci *et al.* 2020c).

ECOTOURISM
As it occurs primarily in deep water, *H. nakamurai* cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
There is insufficient information on the distribution of this deep-water species to determine which established MPAs in KZN will be beneficial to *H. nakamurai* but it could include the deepest waters of the iSimangaliso Wetland Park.

Additional local comment
Current IUCN Status
Near Threatened 2019

Previous IUCN assessments
None.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

MANAGEMENT CONSIDERATIONS
As this species is only an extremely rare catch in the pelagic longline fishery, it must be regarded as being of extremely low management priority. Furthermore, it is unlikely that any intervention in South Africa will improve the status of this species from that of Near Threatened.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
It would appear that extremely limited research on this species has been conducted anywhere, despite its fairly widespread global distribution. Any opportunistic sampling should be used to provide essential biological and ecological information and, in particular, tissue samples for population genetic studies.

FAMILY SQUALIDAE

Squalus acutipinnis - Bluntnose dogfish / spiny dogfish / spurdog

SCIENTIFIC NAME	*Squalus acutipinnis* Regan 1908
COMMON NAME	Bluntnose dogfish/spiny dogfish/spurdog
FAMILY	Squalidae
ENDEMIC	No, also in Namibia
SIZE RANGE	23–85 cm TL
SA DISTRIBUTION	Namibian border to central KZN
HABITAT	Demersal, but benthopelagic as juveniles
DEPTH RANGE	5–500 m; elsewhere to 1500 m
MAJOR FISHERIES	Demersal trawl
IUCN STATUS	Near Threatened 2019
CITES REGS	Nil
MLRA REGS	Production of squalene onboard vessels prohibited in offshore trawl fishery; current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Squalus acutipinnis is a small demersal dogfish, which occurs along much of the South African coast, except for northern KZN. Local average annual catch was estimated at 11–100 tons from DFFE records for two time periods: 2010–2012 and 2013–2019. It is largely caught in the demersal trawl fishery, but there was strong evidence that catches, which are discarded due to a lack of a local market, may be far higher. This species, which was assessed as Near Threatened on the IUCN Red List in 2019, has had a convoluted taxonomic history and improved identification within the genus is needed. It is well studied, with a low fecundity of 2-4 pups every two years in females which mature at 15 years. Historically the larger individuals were retained and exported to the United Kingdom and Australia, however these markets declined due to concerns over mercury content. There is no local market for similar reasons. The Agulhas Bank is an important habitat and the extent to which the Agulhas Bank Complex MPA benefits this species should be assessed. To this end, a better understanding of localised distribution and movement patterns would be beneficial.

TAXONOMIC and IDENTIFICATION ISSUES

The genus *Squalus* comprises a group of sharks with a very complex taxonomic history, primarily due to the high degree of morphological similarity and apparent widespread distribution of certain species (Viana and de Carvalho 2016). These authors state that four species were long recognised in the region, namely *S. acanthias*, *S. megalops*, *S. blainvillei* and *S. mitsukurii* (now *S. bassi*). A fifth species, *S. acutipinnis*, which was originally described from South Africa and Mauritius in 1908, was considered a junior synonym of *S. megalops,* a species first described from southern Australia. This was due to an overlap in external measurements and vertebral counts (Krefft 1968, cited by Bass et al., 1976). Compagno *et al.* (1991) supported this contention.

The relationship of *S. blainvillei* (Risso, 1827) to other *Squalus* species is uncertain because the original description is poor and the holotype has been lost. Compagno *et al*. (1991) state that, in the past, both *S. blainvillei* or *S. mitsikurii* have been used for the taxon now known as *S. bassi* and that the specimens listed as *S. blainvillei* by Bass *et al.* (1976) were in fact *S. mitsikurii* (= *S. bassi*), a view

supported by Ebert *et al*. (2002). In contrast, a molecular study of nominal *Squalus* taxa collected over a wide geographical range from South Africa to the Mediterranean (including the type locality of *S. blainvillei*) suggest that *S. megalops* from the South African west coast is a junior synonym of *S. blainvillei* (Veríssimo *et al.* 2017a).

Viana and de Carvalho (2016) found strong morphological evidence that the global taxon *S. megalops* is a species complex and they resurrected *S. acutipinnis* for the southern African taxon, sometimes referred to as *S. acutipinna,* e.g. da Silva *et al.* (2015), while *S. megalops* is recognised as an Australian endemic (Last and Stevens 1994). Subsequently, Viana et al (2017b) split *S. acutipinnis* into three taxa: *S. acutipinnis*, *S. margaretsmithae* and *S. mahia.* The first two taxa co-occur on the west and south coasts whereas *S. mahia* occurs from northern KZN up through the Mozambique Channel, with one record from Algoa Bay. Viana and de Carvalho (2018) resurrected *S. probatovi* off Angola and the Mozambique Channel, and possibly off South Africa and provided a key to the various southern African species of *Squalus*.

There is very little morphological difference between *S. acutipinnis* and *S. margaretsmithae*, and the recorded range of external morphological characters (Viana and de Carvalho 2016; Viana *et al.* 2017b) shows extensive overlap between the two nominal species. The only consistent external difference lies in the shape of the posterior margin of the first dorsal fin, which is straight in *S. acutipinnis* and concave in *S. margaretsmithae* (Viana and de Carvalho 2018). In addition, there is almost complete distributional overlap, in that the range for both species is given as Namibia to KZN (Viana *et al*. 2017b). On the other hand, Ebert *et al*. (2021a) regard the co-occurrence of five short-nosed species, *S. acutipinnis, S.* cf. *blainvillei*, *S. mahia*, *S. margaretsmithae*, and *S. probatovi*, as unlikely, given molecular (Veríssimo *et al*. 2017a) and ecological data (Ebert *et al*. 1992; unpublished data), and consider *S. margaretsmithae* and *S. probatovi* as junior synonyms of *S. acutipinnis*. Therefore, this species complex in the SE Atlantic and Western Indian Oceans needs extensive taxonomic revision with a combination of molecular and morphological methods to complement the classical taxonomic studies by Viana *et al*. cited above, to clarify and identify regional species.

When is *Squalus megalops* most likely *S. acutipinnis* in the historic literature?

- Studies on *S. megalops* from the South African west coast and southern Namibia can safely be assumed to refer to *S. acutipinnis.*

- Viana *et al*. (2017b) report of a single specimen of *S. mahia* south of KZN, being from Algoa Bay. Therefore, it is reasonable to assume that the studies on *S. megalops* from the south coast (Agulhas Bank) by Watson and Smale (1998, 1999) refer to *S. acutipinnis*.

- Studies on *S. megalops* from South Africa that include specimens from KZN are likely to include both *S. acutipinnis* and *S. mahia*.

- Studies that include *S. megalops* specimens from South Africa and elsewhere refer to a species complex.

SOUTH AFRICAN DISTRIBUTION

Squalus acutipinnis is reported as occurring along the entire South African coast (Ebert *et al*. 2021a), but it is absent from northern KZN waters, where it is replaced by *S. mahia* (Viana *et al.* 2017b).

REGIONAL DISTRIBUTION

Squalus acutipinnis also occurs along the entire coast of Namibia (Bass *et al.* 1976; Compagno *et al.* 1989; Compagno *et al.* 1991, Leeney 2024), but this is not reflected by Pollom *et al.* (2020). During research surveys on *R.V. Africana* this species was caught from south-west of Walvis Bay to the Orange River mouth in Namibia, but most of the records are from south-west of the Orange River

southwards along the outer shelf and upper slope of the west coast of South Africa (Compagno *et al.* 1991). Bass *et al.* (1976) reported the presence of *S. megalops* in southern Mozambique, but these records, as well as those from Reunion, require confirmation (Pollom *et al.* 2020a). Viana and de Carvalho (2016) report this species from Mauritius. It seems likely that most records of *S. megalops* and *S. acutipinnis* from southern Mozambique, Reunion and Mauritius should be referred to as *S. mahia*, but this is subject to confirmation.

SYNOPSIS OF RESEARCH

Prior to 2016 this taxon was regarded as *S. megalops*, with a global distribution. The *S. megalops*-complex has been extensively revised, with most regional forms raised to species status and *S. megalops* (*senso stricto*) now regarded as an Australian endemic. However, this means that much of the literature on *S. megalops* prior to 2016 included data from multiple species, unless restricted to specific local populations. Nonetheless, the local population of *S. megalops* has been well studied. Papers that present data from the west and south coasts only, can be regarded as referring to *S. acutipinnis*, but papers that include specimens from KZN may include both *S. acutipinnis* and *S. mahia*.

In a scientific assessment of the sharks of the east coast of southern Africa, Bass *et al.* (1976) provided taxonomic, morphological and biological information from over 100 individuals described as *S. megalops* collected between Namibia and southern Mozambique, thus his sample includes *S. mahia* which replaces *S. acutipinnis* in northern KZN. Dedicated research on this species, at the time still described as *S. megalops*, has documented spatial distribution (Watson 1996), reproductive biology (Watson and Smale 1998) and age and growth (Watson and Smale 1999), all on the Agulhas Bank, and is confidently assumed to refer to *S. acutipinnis*. Spatial distribution (Compagno *et al.* 1991) and diet (Ebert *et al.* 1992) have been documented on the west coast, including Namibia. Dippenaar (2017) and Dippenaar and Molefe (2015) described parasitic copepods found in the gills of *S. acutipinnis*. Viana and de Carvalho (2016) revisited the taxonomy of the species, following the confirmation that *S. megalops* is an Australian endemic. *S. acutipinnis* was ranked 47th out of 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

Squalus acutipinnis is reported as occurring over a very wide depth range of 0–1500 m (Pollom *et al.* 2020a), but in research trawl surveys, it has not been recorded deeper than 500 m (DFFE, unpublished data). On the west coast, it is most common at 150–250 m (range 5—450 m) (Compagno *et al.* 1991) and at 50–200 m on the Agulhas Bank (Watson and Smale 1998). Ebert *et al*. (1992) describe this species as possibly the most common squaloid shark in nearshore waters, because it is frequently caught by shore anglers.

Habitat: Adults

They usually occur near the bottom (Compagno *et al.* 1989). This species occurs in vast schools; segregation by size and sex is evident, and the patterns are complex. In some areas, mature males and females were trawled together. Mature females predominate in shallow water and to the east of the Agulhas Bank, while both immature and mature males, were more widespread on the Bank (Watson and Smale 1998).

Habitat: Juveniles/Nursery Grounds

On the outer Agulhas Bank, a possible pupping ground for the species, the young are pelagic and active from the surface to near the bottom (Compagno *et al.* 1991). They are often heavily infected by *Achtheinus pinguis*, a parasitic copepod that attaches to the fin edges (Rob Leslie, Cossypha

Consultants, formerly Department of Agriculture, Forestry and Fisheries, pers. obs.). The incidence of this parasitic infection is much lower in adults (Dippenaar and Molele 2015), although the presence of numerous scars attests to previous heavier infestation. It is assumed that, once individuals switch to a demersal lifestyle, they are able to remove most of these parasites by rubbing themselves on the seabed. In some parts of the Agulhas Bank, large numbers of neonates of both sexes were nearly always caught along with mature males (Watson and Smale 1998).

Synopsis of tag deployments

A total of 274 individuals were tagged (Jordaan and Mann 2023a) over the period 1984–2021 (inclusive). Nearly 200 of these tags were deployed by skiboat anglers, not shore anglers, off the Buffalo River, East London near the southern end of the east coast. As a result, they can be safely assumed to be *S. acutipinnis*, but the identity of the very small number (>10) of individuals caught and tagged in central and northern KZN are questionable. There were only four recaptures. The mean distance travelled was 189 km, with a maximum of 669 km. The mean time at liberty was 1.7 years, with a maximum of 4.0 years. Two individuals were recaptured very close to where they were tagged; one individual was recaptured 50-100 km away. The longest movement of 669 km was from offshore of East London/Buffalo River to Dana Bay, close to Mossel Bay on the south coast over a four-year period.

Movements

There is very limited information forthcoming from tag-recapture studies, with some indication of fairly long-distance movements. Nothing is known of the inshore-offshore movements patterns to explain why some individuals are caught by shore anglers.

Diet/feeding: Adults

In a dietary study incorporating neonates through to adults sampled on the west coast and Agulhas Bank, unidentified teleosts and myctophid fishes were the two main prey groups (Watson and Smale 1998). In another study several teleost species were identified; *Octopus vulgaris* was also an important prey item and some crustaceans were also eaten (Ebert *et al.* 1992). The observation of a large number of *S. acutipinnis* in the vicinity of an active chokka *Loligo reynaudii* spawning ground (Smale *et al.* 2001) suggests that scavenging of moribund post-spawning squid in late summer on the south coast may be an important seasonal food source.

Diet/feeding: Juveniles

There was no mention of any size-related differences in diet (Ebert *et al.* 1992).

South African toxicological studies

This species is reported to have high levels of mercury (da Silva and Bürgener 2007), which has resulted in closure of international markets, in particular the United Kingdom and Australia, and local markets.

REPRODUCTION

SCIENTIFIC NAME	*Squalus acutipinnis*
REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Two years
MATING	Aseasonal
GESTATION	Possibly 2 years
LITTER SIZE	2–4 pups
PUPPING/NURSERY GROUND	Include shallow waters off Algoa Bay and Agulhas Bank
SIZE AT BIRTH	23–28 cm TL

LENGTH AT MATURITY	F: 50 cm; M: 40 cm TL
MAXIMUM LENGTH	85 cm
GENERATION LENGTH	23.5 years

Mode
Like all members of the family Squalidae, this species displays lecithotrophic viviparity in which the developing embryo derives all its nourishment from the large egg.

Duration of reproductive cycle
Nearly all mature females were found to be pregnant and, therefore no resting or recovery stage occurs between pregnancies (Watson and Smale 1998). Given that gestation is close to two years (Bass *et al.* 1976), the reproductive cycle must also be regarded as being two years.

Mating season and location
There was no clear indication of seasonality in mating by the 590 pregnant females examined by Watson and Smale (1998), who found parturition could occur at any time in the year, with mating and ovulation probably occurring shortly afterwards.

Pupping season and nursery grounds
There was no clear indication of seasonality pupping. Term pregnant females have been found in Algoa Bay (Bass *et al.* 1976) and on the Agulhas Bank (Watson and Smale 1998) and therefore both locations may serve as nursery areas.

Gestation
Bass *et al.* (1976) examined over 100 *S. megalops* and concluded that gestation must be close to two years, but his sample, which was collected from localities ranging from Namibia to southern Mozambique would have contained both *S. acutipinnis* and *S. mahia*.

Litter size
Litter size is 2–4, with litter sizes of 2 and 3 being the most common (46% and 43% respectively); litters of 4 were uncommon and confined to the largest females (Watson and Smale 1998).

Length at birth
Size-at-birth is 23-28 cm TL (Watson and Smale 1998).

Length at maturity
Length at 50% maturity for females was 50 cm TL and males 40 cm TL; the smallest pregnant female was 49 cm TL (Watson and Smale 1998).

Maximum length
The largest recorded female measured 78 cm TL and the largest male 57 cm TL (Watson and Smale 1998). Viana and de Carvalho (2016) stated that the maximum size is 85 cm TL.

Age and growth
Female age-at-maturity is 15 years; male age-at-maturity is 9 years; maximum age is 32 years (Watson and Smale 1999).

Generation length
Generation length was calculated as 23.5 years (Pollom *et al.* 2020a), based on the female age parameters of Watson and Smale (1999).

FISHERIES MANAGEMENT

SA catch sources

In South Africa *S. acutipinnis* appears to be the most commonly caught member of the family Squalidae. Local average annual catch was estimated from DFFE records at 11–100 tons for the period 2010–2012 for *S. megalops* (da Silva *et al*. 2015) and similarly as *S. acutipinnis* for the period 2013–2019 (DFFE 2022). The bulk of the catches were in the demersal trawl fishery, with suspected catches in the recreational and commercial linefishery and the demersal longline fishery (da Silva *et al.* 2015). There is no targeted fishery for this species in South Africa.

SA catch quantities and characteristics

Demersal trawl fishery

S. acutipinnis is a bycatch in shallow water trawls on the south and west coasts. The average annual catch estimates for unidentified dogfish *Squalus* spp. on the south coast alone in the period 2003–2006 were reported as 409 tons. There are no offshore limits for the inshore fleet, but trawling is concentrated at depths of 80–110 m (Attwood *et al.* 2011). Most of the effort is focussed on the Agulhas Bank where *S. acutipinnis*, although discarded, represents a substantial component of the catch (Japp *et al.* 1994). As *S. acanthias* is confined to the west coast and *S. mitsikurii*, now *S. bassi*, generally occurs in water deeper than 150 m, it is conceivable that most of the 409 tons referred to above was *S. acutipinnis.*

In an assessment of catches on both the south and west coasts between 1995 and 2000, Walmsley *et al.* (2007) estimated that just over 500 tons of *S. megalops* is discarded annually from the south coast-based component of the trawl fishery and less than 50 tons on the west coast. On the west coast this species was caught in all trawls, from those shallower than 300 m to those deeper than 500 m, but the highest catches were at 401–500 m (Walmsley *et al.* 2007). In False Bay *S. megalops* was an uncommon catch in commercial and scientific trawls, prior to closure to trawling nearly a century ago (Best *et al.* 2013).

Demersal longline fishery

Members of the family Squalidae comprised the majority (58% by number) of the chondrichthyan bycatch in the demersal longline fishery. Of those identified to species, *S. acutipinnis* (as *S. megalops*) was the second most common, comprising 1% by number, after *S. bassi* (as *S. mitsukurii*, 12%), with unidentified *Squalus* comprising 38% by number (Petersen *et al.* 2008).

KZN prawn trawl fishery

This species was not recorded in the inshore prawn trawl fishery which historically operated on the uThukela Banks in depths of 20–45 m (Fennessy 1994) but it has been recorded in the deep-water, offshore crustacean fishery operating off the KZN central and south coast in depths of 100–600 m, but with no quantification of the bycatch in the fishery, other than that both *S. megalops* (probably both *S. acutipinnis* and *S. mahia*) and *S. bassi* (reported as *S. mitsukurii*) were common discards (Fennessy and Groeneveld 1997). The major decline in effort in the deep-water component of this fishery had greatly eased fishing pressure on locally occurring *Squalus,* which in northern KZN is likely to be *S. mahia* and not *S. acutipinnis*.

Recreational and commercial angling

A large quantity of unidentified *Squalus* species was caught in the commercial linefishery in False Bay (Best *et al*. 2013). Based on the tagging information (Jordaan and Mann 2023a), it appears that *S. acutipinnis* is not often caught by recreational shore anglers.

Fishing outside South Africa

It is caught at least occasionally as bycatch in the Namibian bottom trawl fishery for hake. The species is also caught occasionally by recreational anglers in Namibia but usually released alive (Leeney

2024). Compagno *et al.* (1991) reported that some individuals were encountered in research trawl surveys from south-west of Walvis Bay to the Orange River mouth in Namibia, but most of the catches were off the South African west coast.

Population trends

There are no estimates of population size for *S. acutipinnis*. Population trend data of annual density estimates were available from demersal research trawl surveys conducted over 27 years in commercially fished areas of South Africa (DFFE unpublished data, cited by Pollom *et al.* 2020a). The trend data revealed an annual rate of reduction of 0.6% over the trawl grounds, consistent with an estimated reduction of 33% over the past three generation lengths (70.5 years). Overall, due to estimated reductions in population size over most of its range and decreasing fishing pressure in some areas, especially on the east coast, this species appears to have undergone a population reduction of 20–29% over the past three generations and it was assessed in 2019 as Near Threatened, nearly meeting the criterion of Vulnerable A2bd (Pollom *et al.* 2020a).

ECOTOURISM

This species is unlikely to be seen by scuba divers and therefore cannot be regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is prohibited outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery. Permit conditions in the offshore hake trawl fishery prohibit the production of squalene on board vessels. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

Given its abundance on the Agulhas Bank, this species will benefit from protection provided by the Agulhas Bank Complex MPA.

Additional local comment

There are discrepancies in annual catch estimates, which are difficult to reconcile. They range from 11–100 tons for the period 2010–2012 (da Silva *et al.* 2015) and 2013–2019 (DFFE 2022) to 409 tons of unidentified dogfish *Squalus* spp. on the south coast alone in the period 2003–2006 (Attwood *et al.* 2011) to over 500 tons on the south coast and less than 50 tons on the west coast for the period 1995–2000 (Walmsley *et al.* 2007). *Squalus* species are no longer marketed in South Africa, despite their popularity elsewhere (Attwood *et al.* 2011), presumably due to concerns over mercury in the muscle, which is reported by da Silva and Bürgener (2007) to be high. Targeted fishing for deep-water squaloids for liver oil and squalene has had serious negative impacts on deep-water populations in some regions (Finucci *et al*. 2024). It is crucial that the local prohibition on squalene production remains in effect and is effectively enforced.

On the Agulhas Bank this species has shown evidence of a southward range shift over three decades (1981–2016) from the wide shelf area of the bank to waters approximately 30 m deeper to the south, possibly as a result of climate change (Currie *et al.* 2019).

Current IUCN Status
Near Threatened 2019

Previous IUCN assessments
Not assessed.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

MANAGEMENT CONSIDERATIONS
The lumping of squaliform sharks and other chondrichthyan bycatch in demersal fisheries remains a problem as it is not commercially viable for the industry to spend time sorting and identifying it. Distinguishing between *S. megalops* and *S. mitsukurii* has long been problematic, even for experienced observers, and this has been aggravated by the increased number of *Squalus* species currently recognised. Discard mortality is likely to be high, especially if catches are macerated to avoid deleterious interactions with seabirds. It would be beneficial to re-establish the scientific observer programme and to ensure that observers are trained in the identification of chondrichthyans. It is important to maintain the time series of bi-annual demersal trawl surveys to monitor population trends of this and other species. The trawl footprint must remain ringfenced and the ban on the onboard production of squalene must continue and be effectively enforced. Concerns over mercury accumulation, especially in larger individuals, remains an obstacle to the establishment of a local market for this high-catch species. Catches in Namibia should be quantified as they are likely to impact those in South Africa, assuming that it is a single stock.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
The taxonomy of *Squalus* in South Africa needs to be resolved. The distribution of pregnant females and neonates on the Agulhas Bank should be investigated in relation to the footprint of the Agulhas Bank Complex MPA. The recently documented shift in distribution on the Agulhas Bank should be monitored and its implication in terms of possible significant loss of habitat should be investigated. An improved understanding of movement patterns, including inshore-offshore movements, and levels of residency is required. *Squalus acutipinnis* was ranked 47th out of 60 South African demersal chondrichthyan species, which were prioritised for further research.

Squalus bassi - African longnose spurdog / long-snouted African dogfish

SCIENTIFIC NAME	*Squalus bassi* Viana, de Carvalho and Ebert 2017
COMMON NAME	African longnose spurdog/long-snouted African dogfish
FAMILY	Squalidae
ENDEMIC	No, also in Namibia and possibly southern Mozambique
SIZE RANGE	21–110 cm TL
SA DISTRIBUTION	Entire South African coast
HABITAT	Demersal
DEPTH RANGE	60–755 m
MAJOR FISHERIES	Demersal trawl and demersal longline
IUCN STATUS	Least Concern 2019
CITES REGS	Nil
MLRA REGS	Production of squalene onboard vessels prohibited in offshore trawl fishery; current footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Squalus bassi is a small demersal dogfish, occurring along the entire South African coast and over a very wide depth range. This regional endemic was originally regarded as a population of a widespread species, *S. mitsukurii*. The local average annual catch was estimated at 1–10 tons from DFFE records for two time periods: 2010–2012 and 2013–2019, mostly by the demersal trawl and hake longline fisheries. There was strong evidence that catches, which are discarded due to a lack of a local market, may be far higher. This species, which was assessed as Near Threatened on the IUCN Red List in 2019, has had a convoluted taxonomic history and improved identification within the genus is needed. It is poorly studied. Development of a local market would obviate its discard in the inshore demersal trawl fishery, but this is unlikely due to concerns over high mercury levels in the muscle.

TAXONOMIC and IDENTIFICATION ISSUES

The genus *Squalus* comprises a group of sharks with a very complex taxonomic history, primarily due to the high degree of morphological similarity and apparent widespread distribution of certain species (Viana and de Carvalho 2016). It has long been accepted that there are four *Squalus* taxa in the region, commonly referred to as *S. acanthias*, *S. blainvillei*, *S. megalops* and *S. mitsukurii* (e.g. Bass *et al.* 1976, Compagno *et al.* 1989, Ebert *et al.* 2002).

Squalus megalops and *S. mitsukurii* were treated as wide-ranging, short-snouted and long-snout dogfish, respectively, but their status in the region was questioned (Compagno *et al.* 1991, Ebert *et al.* 1992). Both taxa have now been shown to be global species complexes (Viana and de Carvalho 2016, 2018, Viana *et al*. 2017a). Viana *et al*. (2017a) described the southern African population of *S. mitsukurii* as a new regional endemic species, *S. bassi*. The status of *S. blainvillei* (*senso* Bass *et al.* 1976) and *S. blainvillei* (*senso* Ebert *et al.* 2002) and their relationship to other South African *Squalus* species is currently being investigated to clarify the taxonomic status of this species (Ebert *et al.* 2021a). The relationship of *S. blainvillei* (Risso, 1827) to other *Squalus* spp. is uncertain because the original description is poor, and the holotype has been lost. Compagno *et al*. (1991) state that, in the past, both *S. blainvillei* or *S. mitsukurii* have been used for the taxon, now known as *S. bassi*, and that the specimens listed as *S. blainvillei* by Bass *et al.* (1976) were, in fact, *S. mitsukurii* (= *S. bassi*), a view supported by Ebert *et al*. (2002). In contrast, Veríssimo *et al*. (2017b), based on *Squalus* specimens

collected from the type locality of *S. blainvillei*, argue that is a short-snouted dogfish and suggested that *S. megalops* from South Africa (now *S. acutipinnis*) is a junior synonym of *S. blainvillei*.

Separation of *S. megalops* and *S. mitsukurii* in the field has long been problematic because there is some overlap in the range of possible states of the two nominal taxa for most identification characters given in field guides (e.g. Compagno *et al.* 1989), presumably because the given ranges were based on species complexes. Viana and de Carvalho (2018) provide a key to the African *Squalus* species which will hopefully improve identification within this complex group of species, although the increase in the number of putative species in the region from four to seven increases the complexity of correct species identifications. *S. bassi* can be separated from other *Squalus* species in the region by a combination of: long snout; greyish dorsal colour; deep, robust body; position of dorsal fins; and possession of tricuspid dorsal denticles (Viana and de Carvalho 2018).

SOUTH AFRICAN DISTRIBUTION

Squalus bassi occurs along the entire South African coast but is most common on the south and west coasts (Ebert *et al*. 2021a).

REGIONAL DISTRIBUTION

Squalus bassi occurs in southern Mozambique (Compagno *et al.* 1989, Pollom *et al.* 2020b,) but there are conflicting reports about its presence in Namibia. It occurs there, at least as far north as Walvis Bay, according to Compagno *et al.* (1989) and Leeney (2024). Only a few specimens were caught in research trawls just north of the Orange River mouth, which is the South African border with Namibia, but not as far north as Walvis Bay (Compagno *et al.* 1991). These authors stated that it was impossible to ascertain its distribution north of southern Namibia because of the confusion with S. *megalops* (now *S. acutipinnis*), which also occurs in Namibia. On the other hand, its presence in Namibia was not corroborated by Viana *et al.* (2017a), or acknowledged by Pollom *et al.* (2020), who give the Orange River mouth as the northern limit of its distribution.

SYNOPSIS OF RESEARCH

Squalus bassi as a stand-alone species has been poorly studied, primarily a result of its very recent separation from the *S. mitsukurii* species complex. In an assessment of the sharks of the east coast of southern Africa, Bass *et al.* (1976) collected taxonomic, morphological and biological information from numerous specimens of *S. blainvillei* taken on the east coast of southern Africa between Algoa Bay and Beira (Mozambique), which may be *S. bassi*, but their identity remains uncertain. Compagno *et al.* (1991) reported on the horizontal and vertical distribution of *S. bassi* (as *S.* cf. *mitsukurii*) caught in 173 research trawl stations on the west and south coasts from around the Orange River mouth to Quoin Point. They found that three species, namely *S*. *acanthias*, *S. acutipinnis* (as *S. megalops*) and *S. bassi,* were common in the area, albeit with different distribution patterns, and two or three species could occur in the same trawl. Furthermore, catches of similar-sized young of the large *S. bassi* and adult and subadults of the smaller S. *acutipinnis* in the same haul necessitated careful sorting to distinguish the two. They state that this brings into question various literature records of spiny dogfish from the area unless sufficient evidence in the form of morphometrics, good illustrations of local material, or adequate descriptions are provided to differentiate these species (Compagno *et al.* 1991). Ebert *et al.* (1992) documented the stomach contents of 211 *S. bassi* (as *S. mitsukurii*) which contained food. The only other dedicated research on this species is the recent taxonomic assessment by Viana *et al.* (2017a), describing what was previously regarded as a local population of the widespread *S. mitsukurii* as a new species, *S. bassi*. This species was ranked 19th out of 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva *et al.* 2023).

ECOLOGY

Depth

Squalus bassi occurs on the outer shelf or upper continental slope between 150–550 m depth (Compagno *et al.* 1991). More recent research trawl catches extend the depth range to 60–755 m (DFFE unpublished data).

Habitat: Adults

Squalus bassi is a benthic species (Pollom *et al.* 2020b).

Habitat: Juveniles/Nursery Grounds

Nothing is known specifically about the juveniles or the whereabouts of possible nursery areas.

Synopsis of tag deployments

This species has not been tagged.

Movements

There was no evidence of any seasonal bathymetric and latitudinal movements on the west coast (Compagno *et al.* 1991).

Diet/feeding: Adults

They feed on a wide variety of teleosts, cephalopods and crustaceans (Compagno *et al.* 1989). On the west coast, hake *Merluccius* spp. was by far the most common prey (Ebert *et al.* 1992).

Diet/feeding: Juveniles

There was no mention of size-related differences in diet (Ebert *et al.* 1992).

South African toxicological studies

No local studies appear to have been undertaken on *S. bassi*, but *S. acutipinnis* is regarded as having high mercury levels in the muscle tissue (da Silva and Bürgener 2007).

REPRODUCTION

SCIENTIFIC NAME	*Squalus bassi*
REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Unknown
GESTATION	Unknown
LITTER SIZE	4–9
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	21–30 cm TL
LENGTH AT MATURITY	F: 73 cm; M: 65 cm
MAXIMUM LENGTH	110 cm
GENERATION LENGTH	23.5 years (based on *S. acutipinnis*)

Mode

Like all members of the family Squalidae, this species displays lecithotrophic viviparity in which the developing embryo derives all its nourishment from the large egg.

Duration of reproductive cycle

Nothing is known.

Mating season and location
Nothing is known.

Pupping season and nursery grounds
Nothing is known.

Gestation
Nothing is known.

Litter size
Litter size is 4–9 (Viana *et al.* 2017a).

Length at birth
Size-at-birth is 21–30 cm TL, with the smallest free-swimming neonates measuring 23 cm (Viana *et al.* 2017a).

Length at maturity
Minimum size at maturity is 73 cm TL for females and 65 cm TL for males (Viana *et al.* 2017a).

Maximum length
S. bassi attains 110 cm TL for females and 96 cm TL for males (Viana *et al.* 2017a).

Age and growth
Age-at-maturity is unknown (Pollom *et al.* 2020b).

Generation length
As age-at-maturity and maximum age are not known, they were inferred from a regional congener of similar depth range *S. acutipinnis* (formerly *S. megalops*) also from South Africa, with a female age-at-maturity of 15 years and maximum age of 32 years (Watson and Smale 1999), resulting in a generation length of 23.5 years (Pollom *et al.* 2020b).

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *S. bassi* (then described as *S. mitsukurii*) was estimated from DFFE records at 1–10 tons for the period 2010–2012 (da Silva *et al*. 2015) and as *S. bassi* for the period 2013–2019 (DFFE 2022), with suspected catches in the demersal/hake longline fishery (da Silva *et al.* 2015). These values appear to be very low, despite the difficulty in distinguishing the various local species of *Squalus* and based on the annual average catch estimate by Attwood *et al.* (2011) of 409 tons of unidentified dogfish *Squalus* spp. in the inshore trawl fishery. There is no targeted fishery for this species in South Africa.

SA catch quantities and characteristics
Demersal longline fishery
Members of the order Squaliformes comprised the majority (61% by number) of the chondrichthyan bycatch in the demersal longline fishery for the period 2005–2007. Of those identified to genus or species, *Squalus* was the most common by far (52% by number). This included 38% *Squalus* spp., 12% *S. bassi* (as *S. mitsukurii*), 1% *S. acutipinnis* (as *S. megalops*), and 1% *S. acanthias*. Catch rates were slightly higher on the west coast compared to the south coast, with the highest catch rates in the 100–200 m depth range on the west coast and in the 200–500 m depth range on the south coast. Females dominated the catches, and they were significantly larger than the males (Petersen *et al.* 2008).

Demersal trawl fishery

Squalus bassi is taken as bycatch in deep-water trawls on the south and west coasts. Over the period 2003–2006, the estimated annual average catch of unidentified dogfish *Squalus* spp. in the inshore trawl fishery was 409 tons (Attwood *et al.* 2011). Although there are no offshore limits for the inshore fleet, trawling is concentrated at depths of 80–110 m (Attwood *et al.* 2011), with only the larger inshore vessels fishing deeper than 200 m. Therefore, it is conceivable that most of the 409 tons were *S. acutipinnis.* The offshore trawl fleet is restricted to waters deeper than 100 m on the south coast, but there are no depth restrictions on the west coast, however offshore vessels generally do not fish in water shallower than 200 m and operate down to depths of 600 m (Japp 1999, da Silva *et al.* 2015), but more recently with some vessels operating down to 750 m (Deon Durholtz, DFFE, pers. comm.). In comparing the catches of *S. bassi* in the demersal longline and trawl fisheries, Petersen *et al.* (2008) reported that catch rates were higher closer inshore (100–200 m) for the longline fishery than for the trawl fishery (200–500 m on the west coast and 500–1000 m on the south coast). The distribution of *S. bassi* on the outer shelf or upper continental slope coincides with the trawl footprint, thus contributing to the *Squalus* spp. bycatch in the offshore fishery.

KZN prawn trawl fishery

This species has not been recorded in the inshore prawn trawl fishery which operates on the uThukela Banks in depths of 20–45 m (Fennessy 1994). It has been recorded in the deep-water, offshore crustacean fishery operating off the KZN central and south coast in depths of 100–600 m, but with no quantification of the bycatch in this fishery, other than that both *S. acutipinnis* and *S. bassi* (recorded as *S. megalops* and *S. mutsukurii*, respectively) were common discards (Fennessy and Groeneveld 1997).

Commercial linefishery

A large quantity of unidentified *Squalus* spp. was caught in the commercial linefishery in False Bay (Best *et al*. 2013).

Fishing outside South Africa

Compagno *et al.* (1991) reported that very few individuals were encountered in research trawl surveys from the southwest of Walvis Bay to the Orange River mouth in Namibia, but most of the catches were off the South African west coast. This species is described as frequently caught in Namibian demersal trawl and longline fisheries, as bycatch, but is usually discarded (Leeney 2024).

Population trends

There are no estimates of population size for *S. bassi.* The species is caught as bycatch in demersal trawl and longline fisheries, which have substantially decreased in effort in South Africa over the past decade. Trend analysis of research trawl data in South African commercially fished areas estimated a population increase of 136% over the past three generation lengths (70.5 years), with the highest probability of an increase over the past three generation lengths. Although fishing pressure may now be substantial in southern Mozambique, overall, it is suspected that this species was likely more heavily fished during the 1960–70s in South Africa and that the population is likely recovering across the region and it is stable across its distribution over the past three generation lengths (70.5 years). Therefore, *S. bassi* was not suspected to be close to reaching the population decline threshold and it was assessed as Least Concern in 2019 (Pollom *et al.* 2020b).

ECOTOURISM

This deep-water species is unlikely to be seen by scuba divers and is not regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is prohibited outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery. Permit conditions in the offshore hake trawl fishery prohibit the production of squalene on board vessels. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

Given its distribution on the outer shelf and upper slope, this species will benefit from the network of offshore MPAs, especially those in the Child's Bank area.

Additional local comment

There is little demand for shark meat in South Africa (da Silver and Bürgener 2007) and *Squalus* spp. are not marketed in South Africa, despite their popularity elsewhere (Attwood *et al.* 2011). Da Silva and Bürgener (2007) note that *S. acutipinnis* is regarded as having a high mercury level in the muscle. Mercury levels accumulate over time and thus increase with age and are therefore also likely to be high in *S. bassi*. Targeted fishing for deep-water squaloids for liver oil and squalene has had serious negative impacts on deep-water populations in some regions (Finucci *et al*. 2024). It is crucial that the local prohibition on squalene production remains in effect and is effectively enforced.

Current IUCN Status

Least Concern 2019

Previous IUCN assessments

Least Concern 2006

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

This species is not listed.

Convention on Migratory Species (CMS)

This species is not listed.

MANAGEMENT CONSIDERATIONS

The lumping of squaliform sharks and other chondrichthyan bycatch in demersal fisheries remains a problem as it is not commercially viable for the fishing industry to spend time sorting and identifying it. Distinguishing between *S. megalops* and *S. mitsukurii* has long been problematic, even for experienced observers and this has been aggravated by the increased number of *Squalus* species currently recognised. Discard mortality is likely to be high, especially if catches are macerated to avoid deleterious interactions with seabirds. It would be beneficial to re-establish the scientific observer programme and to ensure that observers are trained in the identification of chondrichthyans. It is important to maintain the time series of bi-annual demersal trawl surveys to monitor population trends of this and other species. The trawl footprint must remain ringfenced and the ban on the onboard production of squalene must continue and be enforced. Historically, *Squalus* products were exported to the United Kingdom and Australia, but exports have declined due to concerns of unacceptably high levels of mercury. As a result, it is highly unlikely that a local market

will be established for these species to obviate the tendency to discard this component of the demersal trawl catch.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

The taxonomy of *Squalus* in South Africa needs to be resolved. Very little is known about the biology and ecology of this species. An improved understanding of movement patterns, including inshore-offshore movements and levels of residency, is required in relation to the current trawl footprint. *Squalus bassi* was ranked 19th out of 60 South African demersal chondrichthyan species, which were prioritised for further research.

FAMILY CENTROPHORIDAE

Deania calceus - Birdbeak dogfish

SCIENTIFIC NAME	*Deania calceus* (Lowe 1839)
COMMON NAME	Birdbeak dogfish
FAMILY	Centrophoridae
ENDEMIC	No, Namibia and Angola
SIZE RANGE	28–162 cm TL
SA DISTRIBUTION	Small part of East coast and entire South and West coasts
HABITAT	Outer shelf and slope
DEPTH RANGE	450–900 m; elsewhere 70–1470 m
MAJOR FISHERIES	Demersal trawl fishery
IUCN STATUS	Near Threatened 2019
CITES REGS	Not listed
MLRA REGS	Production of squalene onboard vessels prohibited in offshore trawl fishery; the current trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

*Deania calceu*s is a small, widely distributed, demersal shark that is found on the continental shelf and slope, usually at depths of 450–900 m. It occurs in temperate waters from Algoa Bay westwards and into Namibia. Local annual catch is estimated at <1 ton from DFFE records for two time periods: 2010-2012 and 2013–2019 but is not identified to genus and is likely to be restricted to the deep-water demersal trawl fishery. Locally this species is regarded as the most common member of the genus. It was assessed globally as Near Threatened on the IUCN Red List in 2019, due to decreasing population trends in other regions. A local/regional Red List assessment should be undertaken, but very little is known about the distribution, habitat, life-history and movement of this species in South Africa. The outcome will be very dependent on the survival rates of individuals discarded or released from trawl catches. Specimens should be retained to improve identification and local knowledge of all *Deania* spp.

TAXONOMIC and IDENTIFICATION ISSUES

Historically there has been much confusion within the genus *Deania* due to sexual dimorphism in tooth shape, especially as this only arises in adults (Bass *et al.* 1976). A taxonomic review of the genus is required (Finucci *et al.* 2020d). Three species have long been recognised in South Africa and the validity of a fourth species is currently under investigation (Ebert *et al*. 2021a). The three species all have long snouts, large yellow eyes, strong dorsal fin spines and large pitchfork-shaped denticles which give them a bristly appearance (Compagno *et al.* 1989). *D. calceus* is also known as *D. calcea* (Bass *et al.* 1976, Compagno *et al.* 1989, Ebert 2013, Finucci *et al.* 2020d, Ebert *et al.* 2021b).

SOUTH AFRICAN DISTRIBUTION

The species occurs from Algoa Bay, situated at the very western end of the east coast, along the entire south and west coasts to the Orange River Mouth (Ebert *et al.* 2021a). It is to be expected to occur elsewhere on the east coast (Compagno *et al.* 1991, Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION
This species also occurs in Namibia and Angola. It is widely distributed in the NW Atlantic, East Pacific and West Pacific (Finucci *et al.* 2020d, Ebert *et al.* 2021b).

SYNOPSIS OF RESEARCH
There is very little published information on the biology and ecology of this species in South Africa. Bass *et al.* (1976) provided morphometric and biological data on three males and nine females, all from the Algoa Bay region. Compagno *et al.* (1991) reported on the distribution of individuals caught in research trawls on the west coast and in Namibia and Ebert *et al.* (1992) examined the stomach contents of 81 of these individuals. For details of research conducted on this species elsewhere, see Finucci *et al.* (2020d).

ECOLOGY
Depth
D. calceus were taken in research trawls on the west coast and in Namibia at depths of 475–900 m (Compagno *et al.* 1991, Ebert *et al.* 1992). Elsewhere it has been recorded on continental and insular shelves and slopes over a wide depth range of 70–1470 m (Ebert *et al.* 2021b).

Habitat: Adults
They are usually found on or near the bottom and, on occasion, well above it (Compagno *et al.* 1989).

Habitat: Juveniles/Nursery Grounds
There is no evidence that juveniles occupy habitats which differ from those of adults.

Synopsis of tag deployments
As this is a deep-water species, no tagging has taken place.

Movements
Nothing is known about the movement patterns of this species, which may occur in large aggregations (Ebert *et al.* 2021b).

Diet/feeding: Adults
They feed predominantly on small teleosts, predominantly myctophids; cephalopods which include octopus and cuttlefish, and penaeid prawns (Compagno *et al.* 1989, Ebert *et al.* 1992).

Diet/feeding: Juveniles
There is no evidence that the diet of juveniles differs from that of adults.

South African toxicological studies
No studies appear to have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown, likely 2 years (Australia)
MATING	Unknown, aseasonal in Australia
GESTATION	Unknown
LITTER SIZE	6–12 elsewhere
PUPPING/NURSERY GROUND	Unknown locally
SIZE AT BIRTH	28–33 cm TL (Australia)
LENGTH AT MATURITY	F: 94–106 cm TL; M: 73–94 cm TL (outside South Africa)
MAXIMUM LENGTH	162 cm TL

GENERATION LENGTH	29–30 years (outside South Africa)

Mode
Members of the family Centrophoridae exhibit lecithotrophic viviparity, in which the embryos are entirely dependent on the nourishment provided by the yolk-sac. Most family members have continuous oocyte development to enable ovulation soon after parturition (Irvine *et al.* 2012 and references cited therein). Nothing has been published on the reproductive biology of this species in South Africa; very little has been published elsewhere (see Irvine *et al.* 2012 and references cited therein).

Duration of reproductive cycle
In Australia the reproductive cycle was aseasonal, and consequently, the length of the reproductive cycle could not be determined. Unlike most other centrophorid sharks, there was evidence of a resting period between pregnancies, with a suggestion of a 2-year cycle, possibly longer (Irvine *et al.* 2012).

Mating season and location
Nothing is known in South African waters. In Australia the reproductive cycle was aseasonal (Irvine *et al.* 2012).

Pupping season and nursery grounds
Nothing is known in South African waters. In Australia the reproductive cycle was aseasonal, (Irvine *et al.* 2012).

Gestation
Nothing is known in South African waters. In Australia the reproductive cycle was aseasonal, making it difficult to determine the gestation (Irvine *et al.* 2012).

Litter size
Nothing is known in South African waters. Globally the litter size is 6–12 (Ebert *et al.* 2021b). In Australia, the mean was 6, with a maximum of 10 (Irvine *et al.* 2012).

Length at birth
Size-at-birth in Australia is 28–33 cm TL (Irvine *et al.* 2012).

Length at maturity
Females mature at 94–106 cm TL, males at 73–94 cm TL (Ebert *et al.* 2021b). The smallest of 18 pregnant females from Australia was 98 cm TL and the largest immature female was 108 cm TL (Irvine *et al.* 2012).

Maximum length
This species reaches a maximum length of 162 cm TL (Weigmann 2016, cited by Finucci *et al.* 2020d).

Age and growth
There are slight regional differences in age parameters. In the NE Atlantic, female age-at-maturity is 25 years, and maximum age is 35 years (Clarke et al. 2002, cited by Finucci *et al.* 2020d). In the SW Pacific, female age-at-maturity is 21.5 years, and maximum age is 37 years (Irvine et al. 2012).

Generation length
In the NE Atlantic generation length is 30 years, and, in the SW Pacific, it is 29 years (Finucci *et al.* 2020d).

FISHERIES MANAGEMENT

SA catch sources, quantities and characteristics

Estimated total catch was <1 ton for the two periods 2010–2012 (da Silva *et al.* 2015) and 2013–2019 (DFFE 2022for all three *Deania* species combined, due to an inability in the industry to separate the three species. The offshore demersal trawl fishery was the major source of data. It is a suspected catch in the hake longline fishery (da Silva *et al.* 2015). Based on catches in both research and commercial fishing gear, *D. calceus* is regarded as the most common member of the genus in South African waters (Rob Leslie, Cossypha Consultants, formerly DAFF, pers. comm.).

Demersal trawl fishery

Annual catches of unidentified longnose dogfish listed as *Deania* spp. in the inshore demersal trawl fishery were estimated at 3.6 tons for the period 2003–2006 (Attwood *et al.* 2011). This trawling is concentrated at depths of 80–110 m, while *D. calceus* is restricted to much deeper waters.

Fishing outside South Africa

D. calceus is caught as both targeted and incidental catch in the midwater and demersal trawl, demersal longline, and gillnet fisheries operating across most of its known range, which includes the NE Atlantic, SW Pacific and Australia and New Zealand. The species may find some refuge at depth. Taxonomic uncertainty and identification often result in catches being reported under a generic category of *Deania* spp. (Finucci *et al.* 2020d).

Population trends

Population size and trends for this species across its entire range are unknown. Population genetics have indicated some genetic variability between populations (Keggin 2017, cited by Finucci *et al.* 2020d). Globally, the various regional populations have shown very different responses to industrial fishing, with some increasing and others decreasing. To determine a single global population trend, weighting according to the relative size of each region was undertaken. Overall, a population reduction of 20–29% was estimated over the last three generations, based on abundance data and levels of exploitation. Therefore, the species was globally assessed as Near Threatened (close to meeting Vulnerable A2bd) on the IUCN Red List in 2019 (Finucci *et al.* 2020d).

ECOTOURISM

As primarily a deep-water species, it cannot be regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

Permit conditions in the offshore hake fishery prohibit the production of squalene on vessels. The current trawl footprint is ringfenced and regulated. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

It is unclear which deep-water MPAs might provide protection to this species.

Additional local comment

As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

Current IUCN Status
Near Threatened 2019

Previous IUCN assessments
Least Concern 2003

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
There have been a number of management measures implemented in recent years, both species-specific and more general, for deep-water sharks. Targeted deep-water shark fishing is not permitted in the SE Atlantic Fisheries Organization (SEAFO) Convention Area or under the Southern Indian Ocean Fisheries Agreement (SIOFA) (SIOFA 2019, SEAFO 2016). Conservation measures are generally lacking elsewhere in its patchy range (Finucci *et al*. 2020d).

MANAGEMENT CONSIDERATIONS
Deania spp. are slow-growing and not suitable for exploitation by fisheries. This species obtains refuge beyond the depth at which fisheries operate and provided the prohibition against squalene production in the demersal fishery remains in effect, there is little concern regarding the overexploitation of these species within South Africa. As catches of *Deania* spp. and all other squaliform sharks are discarded, their survival remains a concern. The priority on board is the processing of the targeted catches. In the larger, offshore trawlers the bycatch is macerated and discarded below the surface to reduce potentially deleterious interaction with seabirds. Chondrichthyan biodiversity associated with the continental slope remains largely unknown. The global status of *D. calceus* as Near Threatened is due to decreasing population trends in other regions and may not be appropriate for the southern African population. A local/regional Red List assessment should be undertaken, but this requires improved identification, which is needed to obviate the practice of lumping all Squaliform sharks by genus or as simply unidentified dogfish in the trawl industry. The prohibition of onboard production of squalene must remain and be effectively enforced. The trawl footprint must remain ringfenced and regulated.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
This is an extremely poorly studied species in South African waters. Almost nothing is known locally of its biology, life-history and ecology. This is unlikely to change as it appears to be extremely rare in any catches. Where the opportunity arises, specimens should be kept to accumulate such information.

Deania profundorum - Arrowhead dogfish

SCIENTIFIC NAME	*Deania profundorum* (Smith and Radcliffe 1912)
COMMON NAME	Arrowhead dogfish
FAMILY	Centrophoridae
ENDEMIC	No, Namibia
SIZE RANGE	>31–97 cm TL
SA DISTRIBUTION	Part of East and West coasts, possibly entire South Africa
HABITAT	Upper slope
DEPTH RANGE	385–1000 m; elsewhere 200–1800 m
MAJOR FISHERIES	Demersal trawl fishery
IUCN STATUS	Near Threatened 2019
CITES REGS	Not listed
MLRA REGS	Production of squalene onboard vessels prohibited in offshore trawl fishery; the demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Deania profundorum is a very small, widely distributed, demersal shark that is uncommon on the upper continental slope at depths of 385–1000 m. It has been recorded on both the east and west coasts, but not in between; it may prove to be present off the entire South African coast. Local average annual catch of *Deania* spp. was estimated at <1 ton from DFFE records for two time periods: 2010-2012 and 2013–2019 and was likely to be restricted to the deep-water demersal trawl fishery. Survival rates in this fishery are close to zero and the catch is discarded. This species was assessed globally as Near Threatened on the IUCN Red List in 2019, due to decreasing population trends in other regions. A local/regional Red List assessment should be undertaken, but very little is known about the distribution, habitat, life-history and movement of this species in South Africa. The outcome will be very dependent on the extent to which its core distribution lies within the demersal trawl footprint. Specimens should be retained to improve identification and local knowledge of all *Deania* spp.

TAXONOMIC and IDENTIFICATION ISSUES

Historically there has been much confusion within the genus *Deania* due to sexual dimorphism in tooth shape, especially as this only occurs in adults (Bass *et al.* 1976). A taxonomic review of the genus is required (Finucci *et al.* 2020e). Three species have long been recognised in South Africa and the validity of a fourth species is currently under investigation (Ebert *et al*. 2021a). The three species all have long snouts, large yellow eyes, strong dorsal fin spines and large pitchfork-shaped denticles which give them a bristly appearance (Compagno *et al.* 1989). Local synonymies for *D. profundorum* include *Acanthidium natalense* Gilchrist, 1922, *Deania eglantina* Smith, 1949 and *Deania natalensis* Penrith 1969 (Ebert *et al.* 2021a). Bass *et al.* (1976) proposed that the features distinguishing *D. natalensis* from specimens of *D. profundorum* from the Philippines were insufficient for the former to be regarded as a separate species. *Deania profundorum* can be distinguished from other local *Deania* species by the presence of a keel on the ventral midline of the caudal peduncle, which is absent in both *D. calceus* and *D. quadrispinosa*.

SOUTH AFRICAN DISTRIBUTION

Deania profundorum appears to have a disjunct local distribution. It has been recorded in KZN waters off the east coast (Compagno *et al.* 1989) and on the west and south coasts from the Orange River

to off Cape Agulhas, with one record from off Mossel Bay (Leslie 2021, DFFE unpublished data) but it is likely that it occurs along the entire South African coast (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

Deania profundorum also occurs in Namibia and other parts of the Western Atlantic (Ebert *et al.* 2021b, Finucci *et al.* 2020e).

SYNOPSIS OF RESEARCH

There is extremely little published information on the biology and ecology of this species in South Africa. Bass *et al.* (1976) provided morphometric and biological data on two males and two females, one from KZN and the other three from Namibia. Compagno *et al.* (1991) reported on numerous individuals caught in research trawls on the west coast and in Namibia between 1986 and 1990. Ebert *et al.* (1992) examined the stomach contents of 78 individuals caught in these research trawls. For details of research conducted on this species elsewhere, see Finucci *et al.* (2020e).

ECOLOGY

Depth

Deania profundorum was taken in research trawls on the west coast and in Namibia at depths of 385–1000 m (Compagno *et al.* 1991, Ebert *et al.* 1992, Leslie 2021, DFFE unpublished data). Elsewhere it has been recorded on continental and insular slopes over a depth range of 200–1800 m (Finucci *et al.* 2020e).

Habitat: Adults

They are usually found on or near the bottom (Ebert *et al.* 2021b).

Habitat: Juveniles/Nursery Grounds

There is no evidence that juveniles occupy habitats which differ from those of adults.

Synopsis of tag deployments

As this is a deep-water species, no tagging has been undertaken.

Movements

Nothing is known about the movement patterns of this species. Although individuals were infrequently encountered, they were sometimes caught in large numbers, suggesting that they form schools or aggregations (Compagno *et al.* 1991).

Diet/feeding: Adults

The only locally published study examined individuals of 53–76 cm, which comprised both immature and mature individuals. They feed predominantly on small teleosts, myctophids, squid and crustaceans. No size- or gender-related differences in diet were reported (Ebert *et al.* 1992). There is sexual dimorphism in the teeth among the adults (Bass *et al.* 1976) but it is unknown how this affects diet.

Diet/feeding: Juveniles

No size-related differences in diet were reported (Ebert *et al.* 1992).

South African toxicological studies

No studies appear to have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Possibly 1 year (NE Atlantic)

MATING	Unknown
GESTATION	Unknown
LITTER SIZE	5–7 elsewhere
PUPPING/NURSERY GROUND	Unknown locally
SIZE AT BIRTH	>31 cm TL
LENGTH AT MATURITY	F: 62–80 cm TL; M: 43–67 cm TL
MAXIMUM LENGTH	97 cm TL
GENERATION LENGTH	30 years, inferred from *Deania calceus*

Mode
Members of the family Centrophoridae exhibit lecithotrophic viviparity, in which the embryos are entirely dependent on the nourishment provided by the yolk-sac. Most family members have continuous oocyte development to enable ovulation soon after parturition (Irvine *et al.* 2012 and references cited therein). Nothing has been published on the reproductive biology of this species in South Africa, while very little has been published elsewhere (see Irvine *et al.* 2012 and Finucci *et al.* 2020e and references cited therein).

Duration of reproductive cycle
Deania profundorum from the NE Atlantic does not have a resting period between pregnancies (Irvine *et al.* 2012 and references cited therein). This implies that it is 1-year reproductive cycle.

Mating season and location
This is not known.

Pupping season and nursery grounds
This is not known.

Gestation
This is not known.

Litter size
Based on pregnant females sampled outside South Africa, the litter size is 5–7 (Ebert *et al.* 2021b). Both ovaries are functional in *D. profundorum* (Bass *et al.* 1976).

Length at birth
Length at birth is >31 cm TL (Finucci *et al.* 2020e). Locally, the smallest free-swimming individual of 33 cm TL was taken in KZN waters (Bass *et al.* 1976).

Length at maturity
Females mature at 62–80 cm TL, males at 43–67 cm TL (Ebert *et al.* 2021b).

Maximum length
This species reaches a maximum length of 97 cm TL (Finucci *et al.* 2020e).

Age and growth
Age parameters are unknown (Finucci *et al.* 2020e).

Generation length
As age parameters are not known, they were inferred from the closely related species, *Deania calceus*, which has a female age-at-maturity of 21.5 years and a maximum age of 37 years, resulting in a generation length of 30 years (Irvine et al. 2012). However, *D, calceus* is larger (120 cm TL) than

D. profundorum (97 cm TL), therefore this generation length is likely overestimated (Finucci *et al*. 2020e).

FISHERIES MANAGEMENT

SA catch sources, quantities and characteristics

Total annual South African catch was estimated from DFFE records at <1 ton for the two periods 2010–2012 (da Silva *et al.* 2015) and 2013–2019 (DFFE 2022). This was for all *Deania* species combined, due to the difficulty for the industry to separate the various species. The offshore demersal trawl fishery was the major component of the catch, and it is a suspected catch in the hake longline fishery (da Silva *et al.* 2015). *D. profundorum* is regarded as the second most common member of the genus, after *D. calceus,* in South African waters, with the latter recorded nearly four times more often than *D. profundorum* in research trawls (DFFE unpublished data).

Demersal trawl fishery

Annual catches of unidentified longnose dogfish listed as *Deania* spp. in the inshore demersal trawl fishery were estimated at 3.6 tons for the period 2003–2006 (Attwood *et al.* 2011). This trawling is concentrated at depths of 80–110 m, while *D. profundorum* is restricted to much deeper waters.

Fishing outside South Africa

This species is a common bycatch in the Namibian hake trawl fishery (Leeney 2024). It is caught as both targeted and incidental catch in midwater and demersal trawl, demersal longline, and gillnet fisheries operating across most of its known range, but the species is likely to find refuge at depth. Despite a number of management measures to reduce deep-water shark fishing mortality, the species is still captured in considerable quantities in demersal fisheries. Furthermore, at-vessel-mortality is high, and post-release mortality is also likely to be high (Finucci *et al.* 2020e and references cited therein). In some regions it is targeted along with other deep-water squaloids for liver oil and squalene (Finucci *et al.* 2024). Taxonomic uncertainty and identification often result in catches being reported under a generic category of *Deania* spp. (Finucci *et al.* 2020e).

Population trends

Population size and trends for this species across its entire range are unknown. Globally, the various regional populations of *D. profundorum* have shown very different responses to industrial fishing, with some regarded as stable and others decreasing. To determine a single global population trend, weighting according to the relative size of each region was undertaken. Overall, a population reduction of 20–29% was estimated over the last three generations (90 years) based on abundance data and levels of exploitation. Therefore, the species was globally assessed as Near Threatened (close to meeting Vulnerable A2bd) on the IUCN Red List in 2019 (Finucci *et al.* 2020e).

ECOTOURISM

As primarily a deep-water species, it cannot be regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

Permit conditions in the offshore hake fishery prohibit the production of squalene on vessels. The demersal trawl footprint is ringfenced. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas
It is unclear which deep-water MPAs might provide protection to this species.

Additional local comment
As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery. Targeted fishing of deep-water squaloids for liver oil and squalene has had serious negative impacts on deep-water populations in some regions (Finucci *et al*. 2024). It is crucial that the local prohibition on squalene production continues and is effectively enforced.

Current IUCN Status
Near Threatened 2019 A2d

Previous IUCN assessments
Least Concern 2009 as *D. profundora*

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
There have been several management measures implemented in recent years, both species-specific and more general, for deep-water sharks. Targeted deep-water shark fishing is not permitted in the SE Atlantic Fisheries Organization (SEAFO) Convention Area or under the Southern Indian Ocean Fisheries Agreement (SIOFA) (SIOFA 2019, SEAFO 2016). Conservation measures are generally lacking elsewhere in its patchy range (Finucci *et al*. 2020e).

MANAGEMENT CONSIDERATIONS
Deania spp. are slow-growing and not suitable for exploitation by fisheries. This species obtains refuge beyond the depth at which fisheries operate and provided the prohibition against squalene production in the demersal fishery remains in effect, there is little concern regarding the overexploitation of these species within South Africa. As catches of *Deania* spp. and all other squaliform sharks are discarded, their survival remains a concern. The priority on board is the processing of the targeted catches. In the larger, offshore trawlers the bycatch is macerated and discarded below the surface to reduce potentially deleterious interaction with seabirds. Chondrichthyan biodiversity associated with the continental slope remains largely unknown. The global status of *D. calceus* as Near Threatened is due to decreasing population trends in other regions and may not be appropriate for the southern African population. A local/regional Red List assessment should be undertaken, but this requires improved identification, which is needed to obviate the practice of lumping all Squaliform sharks by genus or as simply unidentified dogfish in the trawl industry. The prohibition of onboard production of squalene must remain and be effectively enforced. The trawl footprint must remain ringfenced and regulated.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
This is an extremely poorly studied species in South African waters. Almost nothing is known of its biology, life-history and ecology. This is unlikely to change as it appears to be extremely rare in any catches. Where the opportunity arises, specimens should be kept to accumulate such information.

FAMILY ETMOPTERIDAE

Etmopterus compagnoi - Brown lanternshark

SCIENTIFIC NAME	*Etmopterus compagnoi* Fricke and Koch, 1990
COMMON NAME	Brown lanternshark
FAMILY	Etmopteridae
ENDEMIC	No; southern African endemic: Mozambique and Namibia
SIZE RANGE	17–>68 cm TL
SA DISTRIBUTION	East, South and West coasts: Port Alfred to Lamberts Bay
HABITAT	Upper slope
DEPTH RANGE	310–1000 m, mostly below 600 m
MAJOR FISHERIES	Demersal trawl fishery
IUCN STATUS	Least Concern 2018
CITES REGS	Not listed
MLRA REGS	Production of squalene onboard vessels prohibited in offshore demersal trawl fishery; the demersal trawl footprint is ringfenced; move-on rule to limit the incidental catch of deep-water squaloids; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Etmopterus compagnoi is a very small, demersal southern African endemic shark that is found on the continental slope. It occurs along much of the entire South African coast, at depths of 310–1000 m. The local average annual catch of *Etmopterus* spp. was estimated at 1–10 tons and is likely to be restricted to the deep-water demersal trawl fishery. The bulk of the population inhabits waters that are primarily deeper than fisheries, so the species has refuge at depth. There are no other known threats, therefore it was assessed as Least Concern on the IUCN Red List in 2018. Very little is known about the distribution, habitat, life-history and movement of this species in South Africa. The lumping of catches could be addressed by the re-introduction of the onboard scientific observer programme, which could initiate opportunistic sampling to collect biological and ecological information on this little-known species, which is very difficult to distinguish from its sympatric congener *E. granulosus*.

TAXONOMIC and IDENTIFICATION

Etmopterus compagnoi is one of nine species in the genus *Etmopterus* found in South African waters; the eight listed by (Ebert *et al*. 2021a) and the newly described *E. brosei* (Ebert *et al*. 2021c). The taxonomic history of most etmopterids off southern Africa is convoluted, and *E. compagnoi* is no exception, with most early literature accounts referring to it as either *E. spinax,* a species that occurs off Angola, or *E. gracilispinis*, a SW Atlantic species (Compagno *et al*. 1989, Ebert 2015, Ebert *et al.* 2021b). Fricke and Koch (1990) described as a new species, *E. compagnoi*, but Compagno *et al*. (2005) regarded it as a junior synonym of *E. unicolor*. Straube *et al*. (2015) found this species to be genetically distinct from other lanternsharks and resurrected *E. compagnoi* as a southern African endemic.

Species of *Emopterus* found off southern Africa can be grouped into three distinct clades, based on the size, shape and arrangement of the dermal denticles. There is the Pusillus-clade with smooth skin; the Lucifer-clade with rough skin and dermal denticles arranged in linear rows and the Spinax-

clade with rough skin and dermal denticles not arranged in linear rows. Distinguishing between clades is relatively easy, but identification of species within clades can be difficult.

E. compagnoi and the closely related *E. granulosus* are both in the Spinax-clade and it is difficult to distinguish between them without comparative experience. *E. compagnoi* can be separated from *E. granulosus* by: base of the dorsal fins covered in dermal denticles (versus naked); absence of smooth naked areas around the base of the first dorsal fin, and behind the pectoral fins ("armpits"). It also tends to be browner than *E. granulosus*, hence the common name brown lanternshark.

SOUTH AFRICAN DISTRIBUTION

Etmopterus compagnoi occurs on the upper slope from about Lambert's Bay on the west coast to Port Alfred on the east coast but is more common on the south coast (Ebert *et al.* 2021a; Leslie 2021). Pollom *et al.* (2019) show this species as being present along the entire South African coast. This species is broadly sympatric with *E. granulosus* (Ebert 2015).

REGIONAL DISTRIBUTION

Etmopterus compagnoi also occurs in southern Mozambique, the northern Madagascar Plateau and southern Namibia, but specimens from outside South Africa should be closely examined to confirm their identity (Ebert *et al.* 2021a).

SYNOPSIS OF RESEARCH

There is extremely little published information on the biology and ecology of this species in South Africa. Compagno *et al.* (1991) reported on the horizontal and vertical distribution of individuals caught in research trawls on the west coast and in Namibia in the period 1986–1990. Ebert *et al.* (1992) examined the stomach contents of 26 individuals caught in these research trawls. Demersal trawl surveys on the west and south coasts have been conducted annually, or bi-annually by DFFE since 1984; however, initially, the chondrichthyan catch was not identified to species. Due to taxonomic uncertainty, the *Etmopterus* catch was not always reliably identified to species prior to 2016. Since 2016 the *E. compagnoi* catch at each research station is recorded by weight and by number per sex, and sex-disaggregated length frequency data are collected (DFFE unpublished data).

ECOLOGY

Depth

E. compagnoi occurs at depths of 310–1000 m, mostly below 600 m (Compagno *et al.* 1989, Pollom *et al.* 2019b, DFFE unpublished data) but has also been caught in the epipelagic zone in the open ocean at 120 m depth over very deep water (Ebert 2015).

Habitat: Adults

They are usually found on or near the bottom (Ebert *et al.* 2013), but individuals have also been caught in the epipelagic zone in the open ocean at 120 m depth over very deep water (Ebert 2015).

Habitat: Juveniles/Nursery Grounds

There is no evidence that juveniles occupy habitats which differ from those of the adults.

Synopsis of tag deployments

As this is a deep-water species, this species has not been tagged.

Movements

Nothing is known of the movement patterns of this species. In research trawls, catches ranged from a few individuals to hundreds of specimens (Compagno *et al.* 1991), suggesting that they may form schools or aggregations.

Diet/feeding: Adults
They feed predominantly on small teleosts, mostly myctophids; cephalopods, including squid; and crustaceans, including penaeid prawns (Compagno *et al.* 1989, Ebert *et al.* 1992).

Diet/feeding: Juveniles
There is no evidence that the diet of juveniles differs from that of adults.

South African toxicological studies
No studies appear to have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Unknown
GESTATION	Unknown
LITTER SIZE	7–21, mean of 12
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	17–22 cm
LENGTH AT MATURITY	F: ±62 cm; M: ±55 cm
MAXIMUM LENGTH	>=68 cm
GENERATION LENGTH	Unknown

Mode
Members of the family Etmopteridae exhibit lecithotrophic viviparity, in which the embryos are entirely dependent on the nourishment provided by the yolk-sac.

Duration of reproductive cycle
This is not known.

Mating season and location
This is not known.

Pupping season and nursery grounds
This is not known.

Gestation
This is not known.

Litter size
This is 7–21, with a mean of 12 (Ebert 2015).

Length at birth
Length at birth is 17–22 cm; the smallest free-swimming individuals measured 22–25 cm (Ebert 2015).

Length at maturity
Females mature at about 62 cm and males at about 55 cm (Ebert 2015).

Maximum length
This species reaches a maximum length of at least 68 cm (Ebert 2015).

Age and growth
Age and growth parameters are unknown.

Generation length
As age parameters are not known, no generation length was listed (Pollom *et al.* 2019b).

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Total annual South African catch was estimated from DFFE records at 1–10 tons for the two periods 2010–2012 (da Silva *et al.* 2015) and 2013–2019 (DFFE 2022). This was for all *Etmopterus* species combined, due to the difficulty and financial costs for the industry to separate the various species. The offshore demersal trawl fishery was the major component of the catch, and it is a suspected catch in the hake longline fishery (da Silva *et al.* 2015).

Fishing outside South Africa
Nothing is known of catches outside South Africa, but this species inhabits waters that are mostly deeper than where fisheries operate (Pollom *et al.* 2019b).

Population trends
There are no population estimates for *E. compagnoi* which inhabits waters that are mostly deeper than where fisheries operate. As there are no other known threats, the population trend is suspected to be stable, and this species was assessed as being of Least Concern in 2018 (Pollom *et al.* 2019b).

ECOTOURISM
As it only inhabits deep water, it cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
Permit conditions in the offshore hake fishery prohibit the production of squalene on vessels and there is a move-on rule to limit the incidental catch of deep-water squaloids. The demersal trawl footprint is ringfenced and regulated. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It is unclear which deep-water MPAs might provide protection to this species.

Additional local comment
As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery. Targeted fishing of deep-water squaloids for liver oil and squalene has had serious negative impacts on populations in some regions (Finucci *et al*. 2024). It is crucial that the local prohibition on squalene production remains and is effectively enforced.

Current IUCN Status
Least Concern 2018

Previous IUCN assessments
None

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
This species has very limited distribution outside South Africa. The international liver oil trade, and particularly the production of squalene, is the major driver of targeted fisheries for deep-water sharks globally. Liver oil fisheries are not sustainable and many of the species taken for liver oil are now threatened, with 7.5% critically endangered (Finucci *et al.* 2024).

MANAGEMENT CONSIDERATIONS
In South Africa there is little concern regarding the overexploitation of *Etmopterus* and other very deep-water squaliform species, as long as the prohibition against onboard squalene production in the demersal fishery, the move-on rule to limit incidental bycatch in the offshore fisheries and the prohibition on expanding the trawl footprint remain in effect. Squaliform sharks do not survive when discarded from this fishery due to post-release mortality). Chondrichthyan biodiversity associated with the continental slope remains largely unknown. The bulk of the population inhabits waters that are primarily deeper than fisheries, so the species has refuge at depth. Improved identification and observer coverage, particularly in the trawl industry, is needed to obviate the practice of lumping all squaliform sharks by genus or as simply unidentified dogfish.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
This is an extremely poorly studied species in South African waters. Almost nothing is known of its biology, life-history and ecology. This is unlikely to change unless a dedicated study is undertaken as species-specific catch data are not available from the commercial fishery. Scientific observers deployed on commercial trawlers must be trained to identify shark species, including methods for distinguishing it from its very similar, sympatric congener *E. granulosus*. Where the opportunity arises, specimens should be kept to accumulate such information.

Etmopterus granulosus - Southern lanternshark

SCIENTIFIC NAME	*Etmopterus granulosus* (Günther 1880)
COMMON NAME	Southern lanternshark
FAMILY	Etmopteridae
ENDEMIC	No; widely distributed in southern hemisphere
SIZE RANGE	17–>88 cm TL
SA DISTRIBUTION	South and West coasts: about Algoa Bay to Cape Columbine
HABITAT	Upper slope
DEPTH RANGE	460–1000 m; mostly >700 m
MAJOR FISHERIES	Demersal trawl fishery
IUCN STATUS	Least Concern 2017
CITES REGS	Not listed
MLRA REGS	Production of squalene onboard vessels prohibited in offshore trawl fishery; demersal trawl footprint is ringfenced; move-on rule to limit the incidental catch of deep-water squaloids; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Etmopterus granulosus is a very small, demersal shark that is found on the continental slope. It occurs along much of the South African coast, at depths of 460–1000 m and is widely distributed in the southern hemisphere. It is probably the most common lanternshark in South African waters. The local average annual catch of *Etmopterus* spp. was estimated at 1–10 tons from DFFE records for two time periods: 2010-2012 and 2013–2019 and was likely to be restricted to the deep-water demersal trawl fishery. As this species inhabits waters that are largely beyond current fishing pressure, and there are no other known threats, it was assessed globally as Least Concern on the IUCN Red List in 2017. The lumping of catches should be addressed by the re-introduction of the onboard scientific observer programme. Some research has been conducted on this species elsewhere in the southern hemisphere, but very little is known about its distribution, habitat, life-history and movement in South Africa. Opportunistic sampling should be used to collect biological and ecological information on this little-known species, which is very difficult to distinguish from its sympatric congener *E. compagnoi*.

TAXONOMIC and IDENTIFICATION ISSUES

Etmopterus granulosus is one of nine species in the genus found in South African waters; the eight listed by (Ebert *et al*. 2021a) and the newly described *E. brosei* (Ebert *et al*. 2021c). The taxonomic history of most etmopterids off southern Africa is convoluted, and *E. granulosus* is no exception. The southern African population has variously been assigned to *E. baxteri* (Australasia), *E. granulosus* (Patagonia) and *E. princeps* (North Atlantic) or even as an undescribed southern African endemic (see Ebert et al. 2021a for the full synonymy). A molecular genetic study by Straube *et al*. (2015) found that *E. baxteri*, *E. granulosus* and the southern African population are a single species widely distributed in the Southern Hemisphere.

Species of *Etmopterus* found off southern Africa can be grouped into three distinct clades, based on the size, shape and arrangement of the dermal denticles. There is the Pusillus-clade with smooth skin; the Lucifer-clade with rough skin and dermal denticles arranged in linear rows and the Spinax-clade with rough skin and dermal denticles not arranged in linear rows. Distinguishing between clades is relatively easy, but identification of species within clades can be difficult.

Etmopterus granulosus and the closely related *E. compagnoi* are in the Spinax-clade. They are very similar, and therefore difficult to distinguish without comparative experience. *E. granulosus* can be separated from *E. compagnoi* by: the base of the dorsal fins are naked (versus covered in dermal denticles); presence of smooth naked areas around the base of the first dorsal fin, and behind the pectoral fins ("armpits") (see Leslie 2021 for more detail). Trawl-caught specimens often have characteristic scuff marks, in the form of white patches, where the skin has rubbed off (Ebert 2015), a characteristic shared by another etmopterid, *Centrocyllium fabricii*.

SOUTH AFRICAN DISTRIBUTION

Etmopterus granulosus occurs on the upper slope on the entire west and south coasts from the Orange River to about Algoa Bay but is more common on the west coast (Ebert *et al.* 2021a; Leslie 2021). This species is broadly sympatric with *E. compagnoi* (Ebert 2015).

REGIONAL DISTRIBUTION

Etmopterus granulosus occurs in Angola and its presence in Namibia is described as uncertain (Finucci and Lamilla 2018), although Ebert (2015) states that it occurs in Namibia. It is found on the southern Madagascan Ridge and around Amsterdam Island and possibly the Tristan da Cunha Island group (Ebert 2015).

SYNOPSIS OF RESEARCH

There is extremely little published information on the biology and ecology of this species in South Africa. Compagno *et al.* (1991) reported on the horizontal and vertical distribution of individuals caught in research surveys on the west and south coasts between 1986 and 1990. Ebert *et al.* (1992) examined the stomach contents of 53 individuals caught in these research trawls. Demersal trawl surveys on the west and south coasts have been conducted annually, or bi-annually by DFFE since 1984. Due to taxonomic uncertainty, prior to 2016, the *Etmopterus* catch was not reliably identified to species. From 2016–2023 the *E. granulosus* catch at each research station was recorded by weight and by number per sex, and sex-disaggregated length frequency data collected (DFFE unpublished data). For a bibliography of research conducted elsewhere in the southern hemisphere, see Finucci and Lamilla (2018).

ECOLOGY

Depth

Etmopterus granulosus occurs at depths of 650–950 m (Compagno *et al.* 1989, Compagno *et al.* 1991) and more recently at 380–1300 m (Ebert 2015). Elsewhere it has been reported from 220–1500 m but is more common deeper than 700 m (Finucci and Lamilla 2018). It generally occurs on or close to the bottom, but in the SE Atlantic, neonates are not uncommon in midwater, often being several hundred metres off the bottom (Ebert 2015).

Habitat: Adults

They are found on or near the bottom.

Habitat: Juveniles/Nursery Grounds

In the SE Atlantic, neonates are not uncommon in midwater, often being several hundred metres off the bottom (Ebert 2015).

Synopsis of tag deployments

As this is a deep-water species, it has not been tagged.

Movements

Nothing is known of the movement patterns of this species. Compagno *et al.* (1989) describe it as apparently occurring in large schools. Similarly, in Australia, it is recorded in very large catches,

suggesting this species forms large aggregations (Daley et al. 2002, cited by Finucci and Lamilla 2018).

Diet/feeding: Adults
The stomach contents of 53 individuals, comprising both neonates and adults (17–85 cm), comprised predominantly small teleosts (mostly myctophids), cephalopods and crustaceans (all penaeid prawns) (Ebert *et al.* 1992).

Diet/feeding: Juveniles
It is not known if the diet differs from that of the adults.

South African toxicological studies
No studies appear to have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Unknown
GESTATION	Unknown
LITTER SIZE	2–16, mean of 8
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	17 cm
LENGTH AT MATURITY	F: 62 cm; M: 46 cm
MAXIMUM LENGTH	88 cm
GENERATION LENGTH	Unknown

Mode
Members of the family Etmopteridae exhibit lecithotrophic viviparity, in which the embryos are entirely dependent on the nourishment provided by the yolk-sac.

Duration of reproductive cycle
This is not known.

Mating season and location
This is not known but is presumed to be asynchronous (Finucci and Lamilla 2018).

Pupping season and nursery grounds
This is not known but is presumed to be asynchronous, based on studies elsewhere in the Southern Hemisphere (Finucci and Lamilla 2018).

Gestation
This is not known.

Litter size
This is 2–16, with a mean of 8 (Ebert *et al.* 2021b).

Length at birth
Length at birth is 17–20 cm TL (Ebert 2015).

Length at maturity
Females mature from 62 cm and males from 46 cm TL (Ebert 2015).

Maximum length
This species reaches a maximum length of at least 88 cm TL (Ebert 2015).

Age and growth
Age-at-maturity for the Australian population has been estimated as 30 years for females and 20 years for males (Irvine *et al.* 2006, cited by Finucci and Lamilla 2018).

Generation length
Although age parameters are known, no generation length was listed (Finucci and Lamilla 2018).

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Total annual South African catch was estimated from DFFE records at 1–10 tons for the two periods 2010–2012 (da Silva *et al.* 2015) and 2013–2019 (DFFE 2022). This was for all *Etmopterus* species combined, due to difficulty and financial costs for the industry to separate the various species. The offshore demersal trawl fishery was the major component, and it is a suspected catch in the hake longline fishery (da Silva *et al.* 2015).

Fishing outside South Africa
Leeney (2024) describe *E. granulosus* as a possible bycatch in the Namibian hake trawl fishery. It is taken as a bycatch in deep-water fisheries in Australia, New Zealand, Argentina and Chile (Finucci and Lamilla 2018).

Population trends
Etmopterus granulosus is probably the most common lanternshark in South African waters (Ebert *et al*. 2021a). Population size and trends for this species are unknown across most of its range, with information available only from New Zealand and Australia. An indicator analysis using trawl survey data, commercial catch-effort, and observer data between 1991 and 2014 found no trends in biomass indices, sex ratio, or size composition in New Zealand (Francis *et al.* 2016, cited by Finucci and Lamilla 2018). In Australia, it is the most abundant deep-water shark caught on seamounts near eastern and southern Tasmania (Daley et al. 2002, cited by Finucci and Lamilla 2018), in areas where fisheries have since closed. Therefore, as there was nothing to infer an overall population decline across its range, *E. granulosus* was assessed as Least Concern in 2017 (Finucci and Lamilla 2018).

ECOTOURISM
As it only inhabits deep water, *E. granulosus* cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
Permit conditions in the offshore hake fishery prohibit the production of squalene on vessels and there is a move-on rule to limit the incidental catch of deep-water squaloids. The demersal trawl footprint is ringfenced and regulated. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It is unclear which deep-water MPAs might provide protection to this species.

Additional local comment
As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery. Targeted fishing of deep-water squaloids for liver oil and squalene has had serious negative impacts on populations in some regions (Finucci *et al*. 2024). It is crucial that the local prohibition on squalene production continues and is effectively enforced.

Current IUCN Status
Least Concern 2017

Previous IUCN assessments
None

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
There are no species-specific management actions in place for *E. granulosus*, however, fisheries closures and restrictions in the Tasman Sea may indirectly offer this species some refuge, particularly in deeper waters (Finucci and Lamilla 2018). The international liver oil trade, and in particular the production of squalene, is the major driver of targeted fisheries for deep-water sharks globally, including this species. Liver oil fisheries are not sustainable and many of the species taken for liver oil are now threatened, with 7.5% critically endangered (Finucci *et al.* 2024).

MANAGEMENT CONSIDERATIONS
In South Africa there is little concern regarding the overexploitation of *Etmopterus* and other very deep-water squaliform species, as long as the prohibition against onboard squalene production in the demersal fishery, the move-on rule to limit incidental bycatch in offshore fisheries and the prohibition on expanding the trawl footprint remain in effect. Squaliform sharks do not survive post-release from this fishery. Chondrichthyan biodiversity associated with the continental slope remains largely unknown. Improved identification, particularly in the trawl industry, is needed to obviate the practice of lumping all Squaliform sharks by genus or as simply unidentified dogfish. This can be addressed by the re-introduction of the onboard scientific observer programme.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Etmopterus granulosus is an extremely poorly studied species in South African waters. Almost nothing is known of its biology, life-history and ecology. This is unlikely to change unless a dedicated study is undertaken as species-specific catch data are not available from the commercial fishery. Scientific observers deployed on commercial trawlers must be trained to identify shark species, including methods for distinguishing it from its very similar sympatric congener *E. compagnoi*. Where the opportunity arises, specimens should be kept to accumulate such information.

Etmopterus sculptus - Sculpted lanternshark

SCIENTIFIC NAME	*Etmopterus sculptus* Ebert, Compagno and DeVries 2011
COMMON NAME	Sculpted lanternshark
FAMILY	Etmopteridae
ENDEMIC	No; also found in Namibia and Mozambique
SIZE RANGE	15–>50 cm TL
SA DISTRIBUTION	Entire South African coast
HABITAT	Upper slope
DEPTH RANGE	240–1020 m; mostly >450 m
MAJOR FISHERIES	Demersal trawl fishery
IUCN STATUS	Least Concern 2018
CITES REGS	Not listed
MLRA REGS	Production of squalene onboard vessels prohibited in offshore demersal trawl fishery; the demersal trawl footprint is ringfenced; move-on rule to limit the incidental catch of deep-water squaloids; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Etmopterus sculptus is a very small, demersal shark that is found on the continental slope. It occurs along the entire South African coast at depths of 240–1020 m and is a southern African endemic. Local annual catch of *Etmopterus* spp. is estimated at 1–10 tons (DFFE records 2010–2012 and 2013–2019) and is likely to be restricted to the deep-water demersal trawl fishery. The bulk of the population inhabits waters that are primarily deeper than fisheries, so the species has refuge at depth. There are no other known threats, therefore it was assessed as Least Concern on the IUCN Red List in 2017. Very little is known about the distribution, habitat, life-history and movement of this species in South Africa. The situation is exacerbated by the discovery of a cryptic sympatric congener *E. brosei* that was only described in 2021, so data collected prior to that date are likely to include both species. Opportunistic sampling should be used to collect biological and ecological information on this little-known species.

TAXONOMIC and IDENTIFICATION ISSUES

Etmopterus sculptus is one of nine species in the genus *Etmopterus* found in South African waters; the eight listed by (Ebert *et al*. 2021a) and the newly described *E. brosei* (Ebert *et al*. 2021c). Species of *Etmopterus* found off southern Africa can be grouped into three distinct clades, based on the size, shape and arrangement of the dermal denticles. There is the Pusillus-clade with smooth skin; the Lucifer-clade with rough skin and dermal denticles arranged in linear rows, and the Spinax-clade with rough skin and dermal denticles not arranged in linear rows. Distinguishing between clades is relatively easy, but identification of species within clades can be difficult.

Etmopterus sculptus belongs to the Lucifer-clade and was long misidentified either as *E. lucifer* (Bass *et al.* 1976) or *E. brachyurus* (Compagno *et al.* 1989), but both of these species are confined to the Western Pacific. The large, prominent linear denticles over the entire body give it the appearance of a carving or sculpture, hence the name sculpted lanternshark (Ebert *et al*. 2011). Since 2011, *E. sculptus* has been thought to be the only lanternshark in the Lucifer-clade along most of the southern African coast, except for *E. alphus* found off northern KZN and Mozambique. However, in 2021, a cryptic species, *E. brosei,* that is very similar to, and sympatric with *E. sculptus* was discovered (Ebert *et al*. 2021c). *E. sculptus* can be distinguished from *E. brosei* by the strong contrast between the black belly and lighter upper parts (versus little or no contrast) and dorsal fin bases

naked or with few dermal denticles (versus densely covered with dermal denticles). Note that all references to *E. sculptus* prior to 2021 refer to *E. sculptus* and *E. brosei* combined and most known specimens of *E. brosei* were captured together with *E. sculptus* (Ebert *et al*. 2021c).

SOUTH AFRICAN DISTRIBUTION
Etmopterus sculptus occurs along the entire South African coast (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION
Etmopterus sculptus is a regional endemic and only occurs in Namibia and southern Mozambique (Ebert 2015).

SYNOPSIS OF RESEARCH
There is little published information on the biology and ecology of this species in South Africa. Bass *et al.* (1976) provided morphometric and biological information from 185 individuals, described as *E. lucifer*; there were no pregnant females. Compagno *et al.* (1991) reported on the horizontal and vertical distribution of individuals caught in research trawl surveys on the west and south coasts between 1986 and 1990. Ebert *et al.* (1992) examined the stomach contents of 62 individuals caught in these research trawls. It is important to note that all of the above studies probably sampled both *E. sculptus* and *E. brosei*. Very little is known of *E. brosei*, and in 2021 there were only 23 known specimens in museums, most captured together with *E. sculptus*. At that time, *E. brosei* was known only from the west coast of South Africa and from seamounts in the Western Indian Ocean. However, it has not been searched for on the south and east coasts and it is likely that careful examination of *Etmopterus* catches from those areas will yield further specimens.

ECOLOGY
Depth
Etmopterus sculptus occurs at depths of 240–1020 m, mostly below 450 m (Ebert 2015). Most of those sampled in KZN were in the range of 275–430 m, with adult males being far more common than females (Bass *et al*. 1976).

Habitat: Adults
They are found on or near the bottom (Ebert 2015); Pollom *et al.* (2019) describe *Etmopterus sculptus* as being a benthic or benthopelagic species.

Habitat: Juveniles/Nursery Grounds
There is no evidence that juveniles occupy habitats which differ from those of the adults.

Synopsis of tag deployments
As this is a deep-water species, it has not been tagged.

Movements
Nothing is known of the movement patterns of this wide-ranging species.

Diet/feeding: Adults
The stomach contents of 62 individuals, comprising both juveniles and adults (15–53 cm TL) from the South African west and south coasts and Namibia, comprised predominantly small teleosts (mostly myctophids), cephalopods and crustaceans (all penaeid prawns) (Ebert *et al.* 1992). Similarly, Bass *et al.* (1976) found mainly mytophids, *Loligo* squid and a variety of crustaceans in the stomachs of 90 individuals of 16–38 cm TL from the east coast. Both of these studies probably sampled both *E. sculptus* and *E. brosei*.

Diet/feeding: Juveniles
See above.

South African toxicological studies
No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Unknown
GESTATION	Unknown
LITTER SIZE	Unknown
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	15 cm TL
LENGTH AT MATURITY	F: 45 cm (West coast), 34 cm (East coast); M: 41 cm (West coast), 31 cm TL (East coast)
MAXIMUM LENGTH	53 cm (West coast), 38 cm TL (East coast)
GENERATION LENGTH	Unknown

Mode
Members of the family Etmopteridae exhibit lecithotrophic viviparity, in which the embryos are entirely dependent on the nourishment provided by the yolk-sac.

Duration of reproductive cycle
This is not known.

Mating season and location
This is not known.

Pupping season and nursery grounds
This is not known.

Gestation
This is not known.

Litter size
This is not known.

Length at birth
Length at birth is 15–17 cm TL (Ebert 2015), based on the smallest free-swimming individual of 15 cm (Ebert *et al.* 1992).

Length at maturity
Females from the west coast and Namibia mature from 45 cm and males from 41 cm TL (Ebert 2015). Bass *et al.* (1976) noted that specimens of *E. lucifer* from the east coast mature at 34 cm (females) and 31 cm (males), although there are three *Etmopterus* species from the Lucifer-clade in this region.

Maximum length
This species reaches a maximum length of at least 53 cm TL (Ebert 2015); this is based on individuals from Namibia and the west coast of South Africa. Bass *et al.* (1976) noted that *E. lucifer* specimens from the east coast only appear to attain 38 cm.

Age and growth
This is not known.

Generation length
This is not known.

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Total annual South African catch was estimated from DFFE records at 1–10 tons for the two periods 2010–2012 (da Silva *et al.* 2015) and 2013–2019 (DFFE 2022). This was for all *Etmopterus* species combined, due to the difficulty and financial costs for the industry to separate the various species. The offshore demersal trawl fishery was the major component of this catch, and it is a suspected catch in the hake longline fishery (da Silva *et al.* 2015).

Fishing outside South Africa
It is occasionally caught in Namibian hake trawls (Leeney 2024), otherwise nothing is known of any fishing outside South Africa.

Population trends
Population size and trends for *E. sculptus* are not known.

ECOTOURISM
As it only inhabits deep water, it cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
Permit conditions in the offshore hake fishery prohibit the production of squalene on vessels and there is a move-on rule to limit the incidental catch of deep-water squaloids. The demersal trawl footprint is ringfenced and regulated. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It is unclear which deep-water MPAs might provide protection to this species.

Additional local comment
As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery. Targeted fishing of deep-water squaloids for liver oil and squalene has had serious negative impacts on populations in some regions (Finucci *et al*. 2024). It is crucial that the local prohibition on squalene production continues and is effectively enforced.

Current IUCN Status
Least Concern 2018

Previous IUCN assessments
None

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
The international liver oil trade, and in particular the production of squalene, is the major driver of targeted fisheries for deep-water sharks globally. Liver oil fisheries are not sustainable and many of the species taken for liver oil are now threatened, with 7.5% critically endangered (Finucci *et al.* 2024).

MANAGEMENT CONSIDERATIONS
In South Africa there is little concern regarding the overexploitation of *Etmopterus* and other very deep-water squaliform species, as long as the prohibition against onboard squalene production in the demersal fishery, the move-on rule to limit incidental bycatch in offshore fisheries and the prohibition on expanding the trawl footprint remain in effect. Squaliform sharks do not survive post-release from the trawl fishery. The bulk of the *E. sculptus* population inhabits waters that are primarily deeper than where fisheries operate, so the species has refuge at depth. Chondrichthyan biodiversity associated with the continental slope remains largely unknown. Improved identification, particularly in the trawl industry, is needed to obviate the practice of lumping all Squaliform sharks by genus or as simply unidentified dogfish. This could be addressed by the re-introduction of the onboard scientific observer programme.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
This is an extremely poorly studied species in South African waters. Very little is known of its biology, life-history and ecology. This is exacerbated by the recent discovery of a cryptic sympatric congener *E. brosei* that was only described in 2021, so studies prior to that date are likely to include both species. The lack of knowledge about this species and *E. brosei* is likely to persist unless a dedicated study is undertaken. Scientific observers deployed on commercial trawlers must be trained to identify shark species, including methods for distinguishing *E. sculptus* from its very similar sympatric congener *E. brosei*. Where the opportunity arises, specimens should be kept to accumulate such information. The marked reported differences in length at maturity between the east and west coast individuals should also be investigated.

FAMILY SOMNIOSIDAE

Centroscymnus coelolepis - Portuguese dogfish / Portuguese shark

SCIENTIFIC NAME	*Centroscymnus coelolepis* Bocage and Capello 1864
COMMON NAME	Portuguese dogfish/ Portuguese shark
FAMILY	Somniosidae
ENDEMIC	No; widely distributed
SIZE RANGE	25–122 cm TL
SA DISTRIBUTION	Entire West and South coast and part of East coast: Orange River to Algoa Bay
HABITAT	Upper slope
DEPTH RANGE	550–1300 m, mostly below 700 m; elsewhere 130–3700 m
MAJOR FISHERIES	Demersal trawl fishery
IUCN STATUS	Near Threatened 2019
CITES REGS	Not listed
MLRA REGS	Production of squalene onboard vessels prohibited in offshore trawl fishery; current demersal trawl footprint ringfenced; move-on rule to limit the incidental catch of deep-water squaloids; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Centroscymnus coelolepis is a small, demersal shark that is found on the continental slope at depths of 550–1300 m. It occurs along the entire west and south coasts, as well as Namibia and Mozambique and is widely distributed globally. Local average annual catch of *Centroscymnus* spp. was estimated at <1 ton from DFFE records for the periods 2010-2012 and 2013–2019. Catch was restricted to the deep-water demersal trawl fishery. Globally there is high distribution overlap with intensive fishing pressure. As a result, it was globally assessed as Near Threatened on the IUCN Red List in 2017. Improved identification in the demersal fisheries is critically needed to obviate lumping of catches. This could be achieved with the re-introduction of the on-board scientific observer programme, which would also facilitate quantifying catches. Some research has been conducted on this species elsewhere in the southern hemisphere, but very little is known about its distribution, habitat, life-history and movement locally. Opportunistic sampling should be used to collect such information. The ban on squalene production must remain in force and the current trawl footprint must remain ringfenced.

TAXONOMIC and IDENTIFICATION ISSUES

There are five genera and six species in the family Somniosidae in South Africa (Ebert *et al*. 2021a). *Centroscymnus coelolepis* was originally recognised locally as *Centroscymnus fuscus* by Gilchrist and von Bonde (1924, cited by Compagno *et al.* 1991) until Hulley (1971) and Bass et at. (1976) tentatively synonymised it with *Centrophorus squamosus.* However, details of the original description by Gilchrist and von Bonde (1924) suggest that *C. fuscus* may be a synonym of *Centroscymnus coelolepis* rather than *Centrophorus squamosus* (Compagno *et al.* 1991). There are two species in the genus *Centroscymnus* and *C. coelolepis* can be distinguished from *C. owstoni* by a shorter snout, similar-sized dorsal fins (versus second dorsal fin higher than first) and the absence of

a thick ventrolateral skin fold from the pectoral to the pelvic fins (Ebert 2015). *C. coelolepis* is more common in demersal trawl catches off South Africa than other Somniosidae.

SOUTH AFRICAN DISTRIBUTION

Centroscymnus coelolepis occurs in deep waters along the west and south coasts from the Orange River to Algoa Bay. Ebert *et al*. (2021a) report it as common on the west coast and rare on the south coast, but it is uncommon in demersal research trawls (DFFE unpublished records, 1986-2024). It has not been found off the east coast (KZN) but is likely to occur there as it has been caught further north and east (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

Centroscymnus coelolepis occurs off southern Mozambique and is common on the Walters Shoal (Weigmann 2016). It is widespread in the Indo-Pacific and Atlantic Oceans (Finucci *et al.* 2021f).

SYNOPSIS OF RESEARCH

There is little published information on the biology and ecology of this species in South Africa. Bass *et al.* (1976) examined two males recorded as *Centrophorus squamosus.* Compagno *et al.* (1991) reported on the horizontal and vertical distribution of individuals infrequently caught in 29 research trawl stations on the west and south coasts from Walvis Bay to Quoin Point between 1986 and 1990. Ebert *et al.* (1992) reported on the stomach contents of 71 individuals caught in these research trawls.

ECOLOGY

Depth

Centroscymnus coelolepis occurs locally at depths of 550 m to at least 1300 m, with most records below 700 m (Compagno *et al.* 1991, DFFE unpublished data), but elsewhere at depths of 130–3700 m and mostly below 400 m (Ebert 2015), with peak abundance below 1,000 m (Neat *et al*. 2015, cited by Finucci *et al.* 2021f). There is depth segregation by size, sex, and reproductive stage (Ebert 2015). Locally it occurred together with *Centroselachus crepidater* at many deep-slope stations, but the two species have very different food habits and are not regarded as trophic competitors (Compagno *et al.* 1991).

Habitat: Adults

They are found on or near the bottom (Ebert 2015).

Habitat: Juveniles/Nursery Grounds

Although there is depth segregation by size, there is no evidence that juveniles occupy habitats which differ from those of the adults.

Synopsis of tag deployments

There are no known tagged individuals.

Movements

Nothing is known about the movement patterns of this species.

Diet/feeding: Adults

The stomach contents of 71 of the 93 individuals (31–110 cm) examined from the west coast contained mainly squid, with teleosts and cetacean meat being of secondary importance. This species may scavenge on dead whales, but it also appears to take scoop bites out of living cetaceans (Ebert *et al.* 1992).

Diet/feeding: Juveniles

See above.

South African toxicological studies
No studies have been undertaken, but in Australia it is not retained due to high levels of mercury (Last and Stevens 1994).

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Aseasonal
GESTATION	Unknown
LITTER SIZE	1–29, mostly 12–14 (elsewhere)
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	25–35 cm TL (elsewhere)
LENGTH AT MATURITY	F: 92–110 cm; M: 72–100 cm TL (elsewhere)
MAXIMUM LENGTH	122 cm TL (elsewhere)
GENERATION LENGTH	37 years, inferred from *Centroselachus crepidater*

Mode
Members of the family Somniosidae exhibit lecithotrophic viviparity, in which the embryos are entirely dependent on the nourishment provided by the yolk-sac.

Duration of reproductive cycle
This is not known.

Mating season and location
There does not appear to be a defined reproductive cycle as females give birth year-round (Ebert 2015). There is depth segregation by size, sex and reproductive stage (Ebert 2015).

Pupping season and nursery grounds
There does not appear to be a defined reproductive cycle as females give birth year-round (Ebert 2015).

Gestation
This is not known.

Litter size
Globally reported as 1–29, mostly 12–14, with fecundity increasing slightly with maternal length (Ebert 2015).

Length at birth
Globally length at birth is reported as 25–35 cm TL; the smallest free-swimming individual was 34 cm TL (Ebert 2015).

Length at maturity
Globally reported as 92–110 cm TL for females and 72–100 cm TL for males (Ebert 2015).

Maximum length
This species reaches a maximum length of 122 cm TL, based on data from outside southern Africa (Ebert 2015).

Age and growth
Age parameters are unknown but can be inferred from a related species, *Centroselachus crepidater* that has a female age-at-maturity of 20 years and a maximum age of 54 years (Irvine *et al*. 2006).

Generation length
Based on *Centroselachus crepidater*, this is 37 years (Irvine *et al*. 2006).

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Average annual catch estimates from DFFE records were reported as <1 ton for two periods, 2010–2012 (da Silva *et al.* 2015) and 2013–2019 (DFFE 2022) for *Centrosymnus owstonii, Centrosymnus coelolepis* and *Centroselachus crepidater* (formerly *Centrosymnus crepidater*) combined as *Centrosymnus* spp. This was all as bycatch in the offshore demersal trawl fishery (da Silva *et al.* 2015). Locally squalene production is banned and deep-water squaloids (including *Centrosymnus* spp.) are not targeted. They are taken as bycatch in the offshore trawl sector and there is a move-on rule to limit incidental bycatch. *Centrosymnus coelolepis* occurs in water deeper than that fished by the inshore trawl fishery and was not listed in catches by this fishery sector (Attwood *et al.* 2011).

Fishing outside South Africa
Centroscymnus coelolepis is taken as both targeted and incidental catch across parts of its range in demersal trawl, demersal longline, and gillnet fisheries (Finucci *et al.* 2021f). It is utilised for fishmeal, dried and salted for human consumption, and for its squalene-rich liver oil. It is taken as a bycatch in the Australian orange roughy fishery but discarded because of the high mercury content in its flesh (Last and Stevens 1994). Regionally it is not targeted but is taken as bycatch.

Population trends
Population genetic studies indicate low genetic variability and migration of individuals between East Atlantic and Pacific populations but recognise that there is a separate population in the Mediterranean (Catarino *et al*. 2015, cited by Finucci *et al.* 2021f).

To estimate a global population trend, the estimated trends for each of the regions for which species-specific population trend data were available were weighted according to the relative size of each region. The overall estimated median reduction was 5%, with the highest probability of no major reduction over three generation lengths (111 years). However, trends were unavailable for most of its known range. Overall, a population reduction of 20–29% was estimated over the last three generations, based on abundance data and levels of exploitation. Therefore, the species was assessed globally in 2019 as Near Threatened (close to meeting Vulnerable A2bd) (Finucci *et al.* 2021f).

ECOTOURISM
As it only inhabits deep water, it cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
Permit conditions in the offshore hake fisheries prohibit the production of squalene on vessels and there is a move-on rule to limit the incidental catch of deep-water squaloids. The current demersal trawl footprint is ringfenced. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It is unclear which deep-water MPAs might provide protection to this species.

Additional local comment
None

Current IUCN Status
Near Threatened 2019 A2bd

Previous IUCN assessments
Near Threatened 2003

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
The species does derive refuge at depth as most records are below 900 m and its peak distribution in the NE Atlantic is 1200–1500 m, where there is little to no known fishing effort (Neat et al. 2015, cited by Finucci *et al* 2021f).

There are some species-specific and general management arrangements of relevance in place in the NE Atlantic and the SW Pacific. Conservation measures are generally lacking elsewhere in its patchy range (Finucci *et al.* 2021f).

The international liver oil trade, and in particular the production of squalene, is the major driver of targeted fisheries for deep-water sharks globally, including this species. Liver oil fisheries are not sustainable and many of the species taken for liver oil are now threatened, with 7.5% critically endangered (Finucci *et al.* 2024).

MANAGEMENT CONSIDERATIONS
In South Africa there is little concern regarding the overexploitation of deep-water squaliform sharks as long as the regulations prohibiting the expansion of the trawl footprint remain. The prohibition against onboard squalene production and the move-on rule to limit incidental bycatch in the demersal fishery must remain in effect. As squalene production is the major threat to deep-water squaloids globally, it is imperative that the local ban on squalene production remains in place. Survival rates of squaliform sharks released in this fishery are close to zero. Much of the *C. coelolepis* population inhabits waters that are primarily deeper than where fisheries operate, so the species has refuge at depth. Chondrichthyan biodiversity associated with the continental slope remains largely unknown. The lumping of squaliform sharks and other chondrichthyan bycatch in demersal fisheries remains a problem as it is not commercially viable for the industry to spend time sorting and identifying it. The re-introduction of the on-board scientific observer programme, with observers trained in chondrichthyan identification, is needed to provide information on chondrichthyan biodiversity associated with the continental slope, and quantitative data on fishing mortality.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Centroscymnus coelolepis is an extremely poorly studied species in South African waters. Almost nothing is known of its biology, life-history and ecology. What little is known has been obtained from populations elsewhere. This is unlikely to change as it appears to be extremely rare in any local

commercial catches. Where the opportunity arises, specimens should be kept to accumulate such information.

Centroscymnus owstonii - Roughskin dogfish

SCIENTIFIC NAME	*Centroscymnus owstonii* Garman 1906
COMMON NAME	Roughskin dogfish
FAMILY	Somniosidae
ENDEMIC	No, found in Namibia and Walters Shoal
SIZE RANGE	27–120 cm TL
DISTRIBUTION	South and West coasts: Mossel Bay to Hondeklipbaai
HABITAT	Demersal on soft bottoms of outer shelf and upper slope
DEPTH RANGE	560–1000 m
MAJOR FISHERIES	Demersal trawl fishery
IUCN STATUS	Vulnerable 2017
CITES REGS	Not listed
MLRA REGS	Current demersal trawl footprint is ringfenced; production of squalene onboard vessels prohibited in offshore trawl fishery; move-on rule to limit the incidental catch of deep-water squaloids; daily bag limit of one individual in recreational fishery
COMPILER	C da Silva
REVIEWER	G Cliff and RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Centroscymnus owstonii is a small demersal shark species generally found on continental slopes, oceanic ridges and seamounts and is most common below 600 m. This species is suspected to be widespread globally and is often misidentified with other members of the family Somniosidae. Its occurrence in South African waters was first confirmed in 2006; prior to that, it was lumped with *C. coelolepis*. The local average annual catch of *Centroscymnus* spp. was estimated at <1 ton from DFFE records for the periods 2010-2012 and 2013–2019. Due to its depth distribution, catch is likely to be restricted largely to the offshore hake trawl fishery. This species was assessed globally as Vulnerable on the IUCN Red List in 2017, due to decreasing population trends in other regions. A local/regional Red List assessment should be undertaken. Improved identification of catches in the demersal fisheries is critically needed. This could be addressed by the re-introduction of the on-board scientific observer programme, which would also facilitate quantifying catches. Very little is known about the distribution, habitat, life-history and movement of this species. The ban on squalene production must remain in force.

TAXONOMIC and IDENTIFICATION ISSUES

There are five genera and six species in the family Somniosidae in South Africa (Ebert *et al.* 2021a). There are two species in the genus *Centroscymnus*. *Centroscymnus owstonii* can be distinguished from *Centroscymnus coelolepis* by a longer snout, a second dorsal fin considerably taller than the first, and the presence of a diagnostic thick ventrolateral skin fold or ridge running from the pectoral to pelvic fins (Ebert 2015). Most of the previous records of this species from South Africa were misidentifications of either *Centroscymnus coelolepis* or *Centroselachus crepidater*, but a few specimens of *Centroscymnus owstonii* were caught in very deep water off Mossel Bay (Ebert *et al.* 2021a).

South African Distribution

Unpublished records from the tri-annual trawl surveys conducted by DFFE show that *C. owstonii* is uncommon in deep water on the south coast east of Cape Agulhas, with a few scattered records from the west coast. It was not reported in research trawl catches conducted from Walvis Bay to Quoin Point between 1986 and 1990 (Compagno *et al.* 1991).

Regional Distribution
This species also occurs in Namibia (Finucci and Kyne 2018). It has been recorded east of South Africa on the Walters Shoal and Madagascar Ridge, indicating a widespread distribution (Ebert *et al.* 2021a).

SYNOPSIS OF RESEARCH
This is a very poorly studied species in South Africa, with most known records from deep waters on the south coast between Mossel Bay and Algoa Bay (Leslie 2021). It was not reported in a demersal trawl survey on the west and south coasts from Walvis Bay to Quoin Point between 1986 and 1990 (Compagno *et al.* 1991). Elsewhere in its range, it is taken in deep-water fisheries, which have been a source of very limited study material, especially in Australia and New Zealand (Finucci and Kyne 2018 and references cited therein). These authors list recent publications on this species and the fisheries in which it is taken.

ECOLOGY
Depth
Locally this species has been recorded at depths of 560–1000 m. Globally, it is recorded on continental slopes, oceanic ridges, and seamounts at depths of 150–1500 m, but is most common in waters deeper than 600 m (Blackwell 2010).

Habitat: Adults
Little is known about the habitat of adults, except that they are found on upper continental shelves and on seamounts, on or near the bottom (Compagno 1984a; Blackwell 2010).

Habitat: Juveniles/Nursery Grounds
It is not known if juveniles utilise other habitats.

Synopsis of tag deployments
No tagging has taken place in South Africa.

Movements
Nothing is known.

Diet/feeding: Adults
This species feeds on fish and cephalopods (Last and Stevens 1994).

Diet/feeding: Juveniles
It is not known if the diet is different from the adults.

South African toxicological studies
No local studies have been undertaken but in Australia the flesh is high in mercury and is not fit for human consumption (Last and Stevens 1994).

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	5-34 pups (New Zealand)
PUPPING/NURSERY GROUND	Unknown
LENGTH AT BIRTH	27–30 cm TL (elsewhere)

LENGTH AT MATURITY	F 104; M 84 cm TL (elsewhere)
MAXIMUM SIZE	120 cm TL (elsewhere)
GENERATION LENGTH	30 years

Mode
This species exhibits lecithotrophic viviparity in which embryos are dependent entirely on the nourishment supplied by the yolk-sac.

Duration of reproductive cycle
This is unknown.

Mating season and location
This is unknown.

Gestation
This is unknown.

Litter size
This is 5–34 pups in New Zealand waters (Blackwell 2010).

Length at birth
This is 27–30 cm TL, based on data from outside southern African waters (Finucci and Kyne 2018).

Pupping season and nursery ground
This is unknown.

Length at maturity
Males mature at 67–84 cm TL; females mature at 95–104 cm TL, based on data from outside southern African waters (Finucci and Kyne 2018).

Maximum size
This is largely unknown but is around 120 cm TL outside of southern African waters (Finucci and Kyne 2018).

Age and growth
Age and growth have been assessed for Australian individuals (Irvine 2004, cited by Finucci and Kyne 2018).

Generation length
Generation length is estimated to be 30 years in Australian waters (Irvine 2004, cited by Finucci and Kyne 2018).

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Annual catches for *Centroscymnus* spp., which combines *Centrosymnus owstonii, Centrosymnus coelolepis* and *Centroselachus crepidater* (previously *Centrosymnus crepidater*) was estimated at <1 ton from DFFE records for the periods 2010–2012 (da Silva *et al.* 2015) and 2013–2019 (DFFE 2022). They are only taken as bycatch in the offshore trawl sector due to their occurrence at considerable depth and there is a move-on rule to limit incidental bycatch. Locally squalene production is banned and deep-water squaloids (including *Centrosymnus* spp.) are not targeted. *Centrosymnus owstonii* occurs in water deeper than that fished by the inshore trawl fishery and was not listed in catches by this fishery sector (Attwood *et al.* 2011).

Fishing outside South Africa
In Namibia *C. owstonii* is regularly taken as bycatch in the bottom trawl fishery for hake (Leeney 2024). It is taken incidentally in benthic trawl and longline (surface and benthic) fisheries across its range (Finucci and Kyne, 2018 and references therein; Compagno 2016). This species is strongly associated with seamounts (Tracey *et al*. 2004), potentially increasing its susceptibility to capture. It is utilised for its flesh and squalene oil, as well as for fishmeal (Compagno 2016). In Australia and New Zealand, >90% of catches have historically been retained (Finucci and Kyne, 2018 and references therein).

Population trends
Population size and trends for this species are unknown across most of its range. Some of its known range is confirmed only from a few reported specimens, and thus, any assessment of population trends from these areas is extremely difficult. There is some information from Australia and New Zealand in the SW Pacific and from the NE Atlantic (Finucci and Kyne, 2018). Nothing is known of any global population structure.

This is a low-productivity species, and based on current levels of exploitation, it is inferred that the global population has declined by at least 30% over the past three generations (90 years) because of the known levels of exploitation in core areas of its range, particularly the NE Atlantic, New Zealand and Australia. This species was globally assessed as Vulnerable on the IUCN Red List in 2017 (Finucci and Kyne, 2018).

ECOTOURISM
As it occurs in deep water, it cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
The current demersal trawl footprint is ringfenced. Permit conditions in the offshore hake trawl fishery prohibits the production of squalene on vessels, and there is a move-on rule to limit the incidental catch of deep-water squaloids. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
This species is not expected to receive any benefit from inshore and offshore MPAs.

Additional local comment
None

IUCN Red List Status
Vulnerable A2d: 2017

Previous IUCN assessments
Least Concern: 2003

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
The species does derive limited refuge at depth as most records are below 600 m. There are some species-specific and general management arrangements of relevance in place for *C. owstonii* in parts of its range (Finucci and Kyne 2018).

The international liver oil trade, and in particular the production of squalene, is the major driver of targeted fisheries for deep-water sharks globally, including this species. Liver oil fisheries are not sustainable, and many of the species taken for liver oil are now threatened, with 7.5% critically endangered (Finucci *et al.* 2024).

MANAGEMENT CONSIDERATIONS
This species is slow-growing and not suitable for exploitation by fisheries. In South Africa, there is little concern regarding the overexploitation of this species as long as the regulations prohibiting the expansion of the trawl footprint, the prohibition against squalene production, and the move-on rule to limit incidental bycatch in the offshore fisheries remain in effect. Squalene production is the major threat to deep-water squaloids globally, and it is imperative that the local ban on squalene production remains in place. Chondrichthyan biodiversity associated with continental slope remains largely unknown. Survival rates of squaliform sharks released in this fishery are close to zero. In view of the apparently low incidence of this species in local catches, it is unlikely that any South African management interventions would improve its global status from that of Vulnerable. A regional Red List assessment should be undertaken. Improved identification is needed in the trawl industry to obviate the practice of lumping squaliform sharks by genus or family or even as unidentified dogfish. It is, therefore, imperative that the scientific observer program be re-established. This will also enable the collection of quantitative estimates of all catches of chondrichthyans and all discarded species.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Very little is known about this species, with knowledge of life-history and diet being known from a few samples taken from a few regions. The chondrichthyans occurring on the slope edge of the continental shelves and seamounts need to be researched in more detail (life-history, distribution, occurrence, species composition). Furthermore, this is a largely unstudied region where what is known is mostly as a result of fisheries activities. Any opportunistic sampling should be used to collect individuals to provide some insight into the biology and ecology of this species.

Centroselachus crepidater – Longnose velvet dogfish

SCIENTIFIC NAME	*Centroselachus crepidater* (Bocage and Capello 1864)
COMMON NAME	Longnose velvet dogfish
FAMILY	Somniosidae
ENDEMIC	No, widely distributed
SIZE RANGE	28–105 cm TL
SA DISTRIBUTION	Entire West coast and part of South coast: Orange River to Cape Agulhas
HABITAT	Upper slope
DEPTH RANGE	460–1010 m, mostly below 600 m; elsewhere 240–1500 m
MAJOR FISHERIES	Demersal trawl fishery
IUCN STATUS	Near Threatened 2019
CITES REGS	Not listed
MLRA REGS	Production of squalene onboard vessels prohibited in offshore trawl fishery; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Centroselachus crepidater is a small, demersal shark that is found on the continental slope along part of the south coast and the entire west coast into Namibia and is widely distributed elsewhere. It was formerly included in the genus *Centroscymnus.* Local catches are included in *Centroscymnus* spp., with annual estimates from DFFE records of <1 ton for two periods: 2010–2012 and 2013–2019. Catches are likely to be restricted to the deep-water demersal trawl fishery. It will obtain some refuge at depth. Based on fishing pressure elsewhere in its global range, it was assessed as Near Threatened on the IUCN Red List in 2019. A local/regional Red List assessment should be undertaken. Some research has been conducted on this species elsewhere, but very little is known about its biology and ecology in South Africa. Opportunistic sampling should be used to collect biological and ecological information on this species. The ban on squalene production must remain in force.

TAXONOMIC and IDENTIFICATION ISSUES

There are five genera and six species in the family Somniosidae in South Africa (Ebert *et al*. 2021a). *Centroselachus crepidater* was previously assigned to the genus *Centroscymnus* (Bass *et al.* 1976, Compagno *et al.* 1989), but is now placed in its own monotypic genus. This species can be distinguished from other members of the family by the following features: its long snout, assessed as the distance from tip of snout to the front of the mouth similar to the distance from mouth to the pectoral fins; the presence of greatly elongated dorsal spines; and the arrangement of the labial furrows.

SOUTH AFRICAN DISTRIBUTION

Centroselachus crepidater occurs along entire west coast from the Orange River to Cape Agulhas (Ebert *et al.* 2021a) and is rare on the east coast.

REGIONAL DISTRIBUTION

Centroselachus crepidater occurs in Namibia and Madagascar and a range of sea mounts in the Madagascar Ridge (Ebert 2015).

SYNOPSIS OF RESEARCH

There is little very published information on the biology and ecology of this species in South Africa. Bass *et al.* (1976) refers to only two South African specimens. Compagno *et al.* (1991) reported on

the horizontal and vertical distribution of individuals infrequently caught in 13 research trawl stations on the west and south coasts from Walvis Bay to Quoin Point between 1986 and 1990. Ebert *et al.* (1992) reported on the stomach contents of four individuals caught in these research trawls.

ECOLOGY

Depth

Centroselachus crepidater is caught in local research trawls at depths of 460–1010 m, mostly deeper than 600 m (Bass *et al.* 1976, Compagno *et al.* 1991, Leslie 2021; DFFE unpublished data). It occurred together with *Centroscymnus coelolepis* at many deep-slope stations, but the two species have very different food habits and are not regarded as trophic competitors (Compagno *et al.* 1991). Globally it occurs on the upper slope at depths of 240–1500 m, mostly below 450 m (Ebert 2015). All those caught on the west coast and in Namibia were taken deeper than 600 m.

Habitat: Adults

They are found on or near the bottom (Ebert 2015).

Habitat: Juveniles/Nursery Grounds

Juveniles are rarely caught in research trawls.

Synopsis of tag deployments

No individuals are known to be tagged.

Movements

Nothing is known of the movement patterns of this species.

Diet/feeding: Adults

The diet consists of bony fishes, including lanternfishes (Myctophidae), crustaceans and cephalopods. The stomach contents of four of the six individuals (52–88 cm) examined from the west coast contained myctophids (Ebert *et al.* 1992). Elsewhere the diet is reported to include myctophids, other mesopelagic teleosts, squid and gadoids (Mauchline and Gordon 1983, cited by Ebert 1992).

Diet/feeding: Juveniles

See above.

South African toxicological studies

No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Unknown
GESTATION	Unknown
LITTER SIZE	1–9, mean of 6
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	28–35 cm
LENGTH AT MATURITY	F: 77–88 cm; M: 60–68 cm
MAXIMUM LENGTH	105 cm
GENERATION LENGTH	37 years (Australia)

Mode
Members of the family Somniosidae exhibit lecithotrophic viviparity, in which the embryos are entirely dependent on the nourishment provided by the yolk-sac.

Duration of reproductive cycle
This is not known.

Mating season and location
This is not known.

Pupping season and nursery grounds
This is not known.

Gestation
This is not known.

Litter size
Based on global data, this is 1–9, with a mean of 6 (Ebert 2015).

Length at birth
Based on global data, this is 28–35 cm TL (Ebert 2015).

Length at maturity
Based on global data, females mature at 60–68 cm TL and males at 77–88 cm TL (Ebert 2015).

Maximum length
Based on global data, this species reaches a maximum length of 105 cm TL (Ebert 2015).

Age and growth
Female age-at-maturity of Australian individuals is 20 years and maximum age is 54 years; males mature at 9 years, with a maximum of 34 years (Irvine et al. 2006, cited by Finucci *et al.* 2020f).

Generation length
Generation length is 37 years (Irvine et al. 2006, cited by Finucci *et al.* 2020f).

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Average annual catch estimates from DFFE records were reported as <1 ton for two periods, 2010–2012 (da Silva *et al.* 2015) and 2013–2019 (DFFE 2022) for *Centrosymnus owstonii, Centrosymnus coelolepis* and *Centroselachus crepidater* combined as *Centrosymnus* spp. This was all as bycatch in the offshore demersal trawl fishery (da Silva *et al.* 2015). Locally, squalene production is banned and deep-water squaloids (including *Centrosymnus* spp.) are not targeted. They are taken as bycatch in the offshore trawl sector, and there is a move-on rule to limit incidental bycatch. *Centrosymnus coelolepis* occurs in water deeper than that used by the inshore trawl fishery and was not listed in catches by this fishery sector (Attwood *et al.* 2011).

Centroselachus crepidater was an uncommon catch in the demersal longline fishery for the period 2005–2007 (Petersen *et al.* 2008).

Fishing outside South Africa
In Namibia *C. crepidater* has been recorded at least occasionally as a bycatch in the bottom trawl fishery for hake (Leeney 2024). Elsewhere it is caught as both targeted and incidental catch in midwater and demersal trawl, surface and demersal longlines, and gillnet fisheries operating

across most of its known range, but the species may find some refuge at depth (Finucci *et al.* 2020f). The species is utilised for its flesh and liver oil, although in India the liver is regarded as having a low oil content and the species is likely discarded (Akhilesh et al. 2011, cited by Finucci *et al.* 2020f).

Population trends
Population genetics have indicated separate populations in the Pacific and Atlantic (Keggin 2017, cited by Finucci *et al.* 2020f). *C. crepidater* is thought to have increased in the NE Atlantic and SW Pacific and to have declined off West Africa. The estimated population trends for the NE Atlantic and SW Pacific were weighted according to the relative size of each region in order to estimate a global population trend, although this only covered about 50% of its known range. Overall, a population reduction of 20–29% is estimated over the last three generation lengths (111 years), based on abundance data and levels of exploitation. Therefore, the species was assessed globally as Near Threatened (close to meeting Vulnerable A2bd) in 2019 (Finucci *et al.* 2020f).

ECOTOURISM
As it only inhabits deep water, *C. crepidater* cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
The current demersal trawl footprint is ringfenced. Permit conditions in the offshore hake fishery prohibit the production of squalene on vessels and there is a move-on rule to limit the incidental catch of deep-water squaloids, including *C. crepidater*. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It is unclear which deep-water MPAs might provide protection to this species.

Additional local comment
None

Current IUCN Status
Near Threatened 2019 A2bd

Previous IUCN assessments
Least Concern 2003 (*Centroscymnus crepidater*)

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
Centroselachus crepidater is likely to obtain refuge at depth as it has been found to be most abundant at depths below 900 m off New Zealand (Anderson et al. 1998, cited by Finucci *et al.* 2020f) and its peak distribution in the NE Atlantic was between 750–1050 m (Neat et al. 2015, cited by Finucci *et al.* 2020f). There are some species-specific and general management arrangements of

relevance in place in the NE Atlantic and the SW Pacific. Conservation measures are generally lacking elsewhere in the species' patchy range (Finucci *et al.* 2020f).

The international liver oil trade, and in particular the production of squalene, is the major driver of targeted fisheries for deep-water sharks globally, including this species. Liver oil fisheries are not sustainable, and half of the species taken for liver oil are now threatened, with 7.5% critically endangered (Finucci *et al.* 2024).

MANAGEMENT CONSIDERATIONS

In South Africa there is little concern regarding the overexploitation of deep-water squaliform sharks as long as the regulations prohibiting the expansion of the trawl footprint and the move-on rule to limit incidental bycatch in the demersal fishery remain in effect. Squalene production is the major threat to deep-water squaloids globally; therefore it is imperative that the local ban on squalene production remains in place. Survival rates of squaliform sharks released in this fishery are close to zero. Much of the *C. crepidater* population appears to inhabit waters that are primarily deeper than water at which fisheries operate within, so the species has refuge at depth. Chondrichthyan biodiversity associated with the continental slope remains largely unknown. Improved identification through the re-introduction of the on-board scientific observer programme, particularly in the trawl industry, is needed to obviate the practice of lumping all Squaliform sharks by genus or as simply unidentified dogfish.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

This is an extremely poorly studied species in South African waters. Almost nothing is known of its biology, life-history and ecology. What little is known has been obtained from populations elsewhere This is unlikely to change as it appears to be extremely rare in any local commercial catches. Where the opportunity arises, specimens of *C. crepidater* should be kept to accumulate such information.

FAMILY PRISTIOPHORIDAE

Pliotrema warreni - Sixgill sawshark

SCIENTIFIC NAME	*Pliotrema warreni* Regan, 1906
COMMON NAME	Sixgill sawshark
FAMILY	Pristiophoridae
ENDEMIC	No, also Mozambique and Namibia
SIZE RANGE	35–136 cm TL, possibly 170 cm
SA DISTRIBUTION	East, South and West coasts: Mozambique border to Table Bay
HABITAT	Largely demersal
DEPTH RANGE	10–430 m, exceptionally to 915 m
MAJOR FISHERIES	Bycatch in demersal trawl and longline fisheries
IUCN STATUS	Least Concern 2019
CITES	Not listed
MLRA	Demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Pliotrema warreni is a small, demersal shark found over a wide depth range along the entire east and south coasts of South Africa and appears to be a southern African endemic. The local average annual catch was estimated at <1 ton from DFFE records for two time periods: 2010–2012 and 2013–2019, largely in the demersal trawl, demersal longline and KZN offshore crustacean trawl fisheries. *P. warreni* was assessed as Least Concern on the IUCN Red List in 2018. This species is listed as *Protected* in TOPS and has been regarded as an ETP species in the demersal trawl industry since 2017. Nothing is known of its movement patterns, but the core of its distribution is the Agulhas Bank, so this species will derive some benefit from this MPA. It is not a well-studied species with very little known of its reproductive biology.

TAXONOMIC and IDENTIFICATION ISSUES

Sawsharks of the family Pristiophoridae are superficially similar to sawfish, family Pristidae, but differ by the presence of lateral versus ventral gill slits. There are two genera in this highly distinctive family, Pristiophoridae. Both feature a snout elongated into a flattened blade, with a row of lateral teeth on each side and a pair of long barbels on the underside. The genus *Pliotrema* has six pairs of gill slits and *Pristiophorus* has five. *Pliotrema* was considered to be monotypic, but a recent study revealed two new species in the genus, *P. annae* and *P. kajae*, both of which occur in the Western Indian Ocean. This necessitated a redescription of *P. warreni* (Weigmann *et al.* 2020), which is the only species that occurs in South Africa.

SOUTH AFRICAN DISTRIBUTION

Pliotrema warreni occurs along the entire east and south coasts from the Mozambique border to False Bay in the Western Cape (Pollom *et al.* 2019d; 2020c). Ebert *et al.* (2021a) extended its distribution to include Table Bay on the west coast but stated that the core of its distribution lies on the Agulhas Bank. Based on at least one record from Namibia (Leeney 2024), it is conceivable that this species also occurs along the west coast of South Africa, although no specimens were collected there during several research trawl surveys conducted between 1986 and 2023 (Compagno *et al.* 1991, Leslie 2021).

REGIONAL DISTRIBUTION

Pliotrema warreni is present in southern Mozambique (Weigmann *et al.* 2020, Pollom *et al.* 2020c). It is rare in Namibia and is the only member of the family to occur there (Leeney 2024).

SYNOPSIS OF RESEARCH

Pliotrema warreni is not a well-studied species. In southern Africa, published information on the life-history, taxonomy and morphometrics of this species was initially based on approximately 26 individuals collected between KZN and False Bay (Bass *et al.* 1975d). An additional 77 individuals were collected between False Bay and Port Elizabeth to assess reproductive biology, diet composition, and distribution (Bizzarro *et al*. 2007). A total of 32 specimens from Algoa Bay were examined for morphometrics, reproductive biology, diet and macro-parasites (Foor 2017). No other dedicated research has been conducted on this species. *Pliotrema warreni* was ranked 29th out of 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva *et al.* 2023).

ECOLOGY

Depth

This benthic and epibenthic species inhabits shelf and slope waters from 10 m to 430 m, and exceptionally to 915 m; adults usually occur in deeper water than juveniles (Ebert *et al.* 2021b). Three individuals were observed swimming close to the surface at night off Plettenberg Bay (Rob Leslie, Cossypha Consultants, formerly DAFF, pers. obs.). They use their large pectoral fins for propulsion, similar to wings, giving the illusion that they were flying through the water.

Habitat: Adults

They are benthic or epibenthic (Ebert *et al.* 2021b).

Habitat: Juveniles/Nursery Grounds

In the absence of any information, it is assumed that the juveniles occupy the same habitat as the adults, but in shallower water.

Synopsis of tag deployments

Pliotrema warreni has not been tagged.

Movements

Nothing is known about the movement patterns of this species.

Diet/feeding: Adults

There was a predominance of teleost prey, followed by crustaceans and squid (Bass *et al.* 1975d). The stomach contents of a sample comprising largely adults from Algoa Bay were dominated by redeye round herring *Etrumeus whiteheadi*, indicating that *P. warreni* does move off the bottom to feed (Foor 2017).

Diet/feeding: Juveniles

There is no evidence that juveniles have a different diet.

South African toxicological studies

No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Possibly biennial
MATING	Unknown

GESTATION	Unknown
LITTER SIZE	5–>7, possibly up to 17
PUPPING/NURSERY GROUND	Possibly Algoa Bay and KZN
LENGTH AT BIRTH	35 cm TL
LENGTH AT MATURITY	F: 100 cm; M: 83–85 cm TL
MAXIMUM LENGTH	F: 136 cm; M 112 cm TL; possibly 170 cm
GENERATION LENGTH	11 years (inferred from *Pristiophorus cirratus*)

Mode
Pliotrema warreni exhibits lecithotrophic viviparity, in which the embryos rely solely on the nourishment provided by the yolk sac.

Duration of reproductive cycle
The periodicity of the reproductive cycle is possibly biennial, based on findings from two other members of the family, *Pristophorus cirratus* and *Pristiophorus nudipinnis* (Ebert *et al.* 2021b).

Mating season and location
This is unknown.

Gestation
This is unknown.

Litter size
Litter size ranged from 5–7 in the two pregnant females reported but could be larger as a result of observed abortion. The number of developing ova in 13 mature females was 7–17 (Bass *et al.* 1975d), suggesting litters of up to 17.

Size at birth
Size at birth is 35–38 cm TL, based on the largest embryo of 38 cm and the smallest free-swimming individual of 35 cm (Bass *et al.* 1975d).

Pupping season and nursery ground
Nothing is known of any seasonality in pupping or the exact location of a nursery area. Females with term embryos, as well as neonates and other small juveniles, have been collected in the vicinity of Algoa Bay and off KZN, suggesting the presence of pupping grounds there (Ebert 2015).

Length at maturity
The size at maturity is about 100 cm TL for females and 83–85 cm TL for males (Bass *et al.* 1975d, Foor 2017). The largest immature female examined by Bizzarro *et al.* (2007) was 124 cm TL and the largest immature male was 104 cm TL.

Maximum length
The largest female was 136 cm, while the largest male was 112 cm TL (Bass *et al.* 1975d). This species may attain 170 cm TL (Compagno *et al.* 1989).

Age and growth
Attempts to conduct a conventional age and growth study based on vertebral growth rings proved unsuccessful (Foor 2017).

Generation length
Maximum age was inferred from congener *Pristiophorus cirratus*, which is of similar size and inhabits a similar depth range and has a maximum age of 15 years (Walker 2016). Age-at-maturity is inferred

as 7 years, after considering values for other unrelated shark species. This results in an inferred generation length for *P. warreni* of 11 years (Pollom *et al.* 2020c).

FISHERIES MANAGEMENT

SA catch sources

Local average annual catch of *P. warreni* was estimated from DFFE records at <1 ton for two time periods: 2010–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022), with catches in the demersal trawl, demersal longline and KZN offshore crustacean trawl fishery (da Silva *et al*. 2015).

SA catch quantities and characteristics

Demersal trawl fishery

The inshore trawl fishery targets shallow-water Cape hake *Merluccius capensis* and Agulhas sole *Austroglossus pectoralis* between Cape Agulhas and the Great Kei River, with an estimated annual bycatch of 1.6 tons of *P. warreni* over the period 2003–2006, all of which was discarded (Attwood *et al.* 2011). Based on an average individual mass of 2 kg, this catch would equate to about 800 individuals. This species was not listed in the mean annual landings of chondrichthyan species (59 in total) caught on the Agulhas Bank in trawls and on lines for the period 1986-1991 (Japp *et al.* 1994). It was described as a rare catch in the inshore sector of the fishery operating out of Port Elizabeth (Booth and Hecht 1998). *P. warreni* was a rare catch in trawls in False Bay prior to closure of the entire bay to this form of fishing in 1928 (Best *et al.* 2013).

Given its occurrence at depth, *P. warreni* is also likely to be caught in the offshore sector of the demersal trawl fishery, targeting shallow- and deep-water Cape hakes *M. capensis* and *M. paradoxus*.

KZN offshore crustacean trawl fishery

This species is a likely catch in the offshore component of the KZN crustacean trawl fishery which operates at depths of 100–600 m, with most fishing effort concentrated at depths of 300–600 m (Fennessy and Groeneveld 1997).

Fishing outside South Africa

Little information is available. *P. warreni* is inherently susceptible to capture in trawl fisheries as the saw is easily entangled in any net. This species may be rare in Namibian waters but at least one specimen has been recorded as bycatch on a bottom trawl vessel (Leeney 2024). Small-scale trawling occurs in parts of southern Mozambique (Pollom *et al.* 2020c and references cited therein), with deep-water trawling occurring mostly north of Maputo, which is outside the known range of this species (Sean Fennessy Oceanographic Research Institute, unpublished data). At-vessel-mortality (AVM) is variable, depending on the trawl duration and depth; in Australian gillnets, AVM was 7–42% for congeners *Pristiophorus cirratus* and *P. nudipinnis* (Ellis *et al*. 2017).

Population trends

There are no estimates of population size for this species. Trend analysis of research trawl surveys in fished areas over 26 years from 1991–2016 indicate a population increase over the past three generation lengths (33 years). The fisheries in South Africa, which account for the majority of the species' range, have decreased in effort over the last decade. As a result, *P. warreni* was assessed as Least Concern in terms of the IUCN Red List in 2019 (Pollom *et al.* 2020c).

ECOTOURISM

Pliotrema warreni generally occurs in deep water. Although it has been found in the shallows around 10 m, there are no regular sightings by divers for it to constitute an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

The demersal trawl footprint is ringfenced. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is listed as *Protected* in TOPS.

Marine Protected Areas

As the core of its distribution is considered to be the Agulhas Bank, *P. warreni* will benefit from protection provided by the Agulhas Bank Complex MPA. This species also occurs in the iSimangaliso MPA, the largest on the east coast, but insufficient is known of its distribution in this region to assess the extent of the protection derived. The same applies to the uThukela Banks MPA to the south.

Additional local comment

As part of the Marine Stewardship Council (MSC) certification, the demersal trawl industry has regarded this species as an ETP (Endangered, Threatened and Protected) for almost a decade, and although it appears that there is an increase in the population over 3 generation lengths (Winker 2019), the status quo should remain as it is a southern African endemic and is susceptible to capture in net fisheries. Further to this, the trawl footprint has been defined as 'Hake Trawl Ringfence' for industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

IUCN Red List Status

Least Concern 2019

Previous IUCN assessments

None

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

Pliotrema warreni is not listed.

Convention on Migratory Species (CMS)

This species is not listed.

International comments

None

MANAGEMENT CONSIDERATIONS

Pliotrema warreni appears to be an uncommon catch in the demersal trawl fishery, hence its assessment as Least Concern. This could be confirmed by the reintroduction of a scientific observer programme, with those involved trained in the identification of all chondrichthyans. More information is needed on possible catches in the KZN deep-water crustacean trawl fishery. Its presence on the west coast north of Table Bay has not been confirmed. As a result of its scarcity in catches, it must be regarded as being of very low management priority. It is imperative that the trawl footprint, which has been ringfenced, remains in place and is not expanded.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

A limited amount of information has been accumulated on the biology of this species. Very little is known of its reproductive biology. Other gaps include a validated age-and-growth study, which will be difficult given the failure of conventional methods of counting growth rings. More information is

needed on its distribution and relative abundance in the region. Opportunistic sampling should be used to collect tissue samples to investigate any regional population structure. *Pliotrema warreni* was ranked 29th out of 60 South African demersal chondrichthyan species, which were prioritised for further research.

FAMILY SQUATINIDAE

Squatina africana - African angelshark

SCIENTIFIC NAME	*Squatina africana* (Regan 1908)
COMMON NAME	African angelshark
FAMILY	Squatinidae
ENDEMIC	No, Mozambique and beyond
SIZE RANGE	30–125 cm TL
SA DISTRIBUTION	Entire East coast and occasionally to Mossel Bay on South coast
HABITAT	Outer shelf and slope
DEPTH RANGE	0–500 m; mostly 60–300 m
MAJOR FISHERIES	KZN bather protection programme, KZN inshore prawn trawl fishery
IUCN STATUS	Near Threatened 2017
CITES REGS	Nil
MLRA REGS	Daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	ST Fennessy

SPECIES SUMMARY and RECOMMENDATIONS

Squatina africana is a small, benthic shark found over a wide depth range on the entire east coast and on the south coast as far west as Mossel Bay. It also occurs along the entire East African coast and Madagascar. There are no taxonomic issues, but this little-studied species is often mistaken for a ray because of its flattened body shape. It is the only locally occurring member of the family Squatinidae. The local average annual catch was estimated at <1 ton from DFFE records for two time periods: 2010–2012 and 2013–2019, with the KZN bather protection programme and the erstwhile inshore KZN prawn trawl fishery being the main sources. The species was assessed globally as Near Threatened, verging on Vulnerable, on the IUCN Red List in 2017. It will benefit from protection in the uThukela MPA, where neonates and other juveniles are known to occur. The closure of the KZN inshore prawn trawl fishery over a decade ago and the extensive replacement of shark nets with drumlines in the KZN bather protection programme has greatly reduced fishing mortalities. Nothing is known of growth rates which are slow in other members of the genus. As *Squatina* are not regarded as good swimmers, there is likely to be strong population structure on the East African coast. This should be investigated, and therefore, tissue samples from various locations over its range should be collected. Inshore-offshore movements should also be investigated.

TAXONOMIC and IDENTIFICATION ISSUES

There are no taxonomic or identification issues locally, although *S. africana,* with its distinctive, flattened body, may be mistaken for a ray. It does, however, have lateral gill slits and the pectoral fins are not fused to the head. It is the only angelshark in South African waters (Bass *et al.* 1975d). There are currently 20 species listed globally, but there are others which have not yet been described (Ebert *et al.* 2021b).

SOUTH AFRICAN DISTRIBUTION

Squatina africana occurs on the entire east coast and occasionally on the south coast as far west as Mossel Bay (Ebert *et al.* 2021a). Bass *et al.* (1975d) regard the KZN coast as the centre of its South African distribution.

REGIONAL DISTRIBUTION

Squatina africana also occurs in Mozambique and the entire East African coast as well as Madagascar (Cliff *et al.* 2019). It was long recognised as the only member of the genus in the Western Indian Ocean, until the recent discovery of a new species *S. lea* from the Mascarene Plateau and SW India (Weigmann *et al.* 2023).

SYNOPSIS OF RESEARCH

There is little published information on the biology and ecology of this species in South Africa. Bass *et al.* (1975d) provided morphometric and biological data on 18 females and eight males, all from KZN waters. Shelmerdine and Cliff (2006) conducted an analysis of catch statistics and documented aspects of the general biology of 661 individuals caught in the KZN bather protection programme. Stelbrink *et al.* (2010) investigated the molecular systematics and global phylogeography of the genus, which included specimens of *S. africana.* This species was ranked 40th out of 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva *et al*. 2023).

ECOLOGY

Depth

Squatina africana occurs from 0–500 m (Cliff *et al.* 2019), but most of the individuals examined by Bass *et al.* (1975d) were taken in bottom trawls at 60–300 m.

Habitat: Adults

They are benthic, found on sandy bottoms close to reefs where they lie buried to ambush prey (Ebert *et al.* 2021b).

Habitat: Juveniles/Nursery Grounds

There is no evidence that juveniles occupy habitats which differ from those of the adults.

Synopsis of tag deployments

This species has not been tagged by members of the ORI Cooperative Fish Tagging Project. A total of 13 individuals caught in the KZN bather protection nets were tagged by KZN Sharks Board staff between 1988 and 2017, with no recaptures reported.

Movements

Nothing is known of both longshore or inshore-offshore movements. Capture in the KZN shark nets, which are deployed in water of 10-14 m depth, indicates that individuals do occasionally move into shallow water. Members of the genus are not regarded as good swimmers (Ebert *et al.* 2021b).

Diet/feeding: Adults

They feed predominantly on small teleosts, as well as cephalopods which include octopus, cuttlefish and squid (Bass *et al.* 1975d, Shelmerdine and Cliff 2006).

Diet/feeding: Juveniles

There is no evidence that the diet of juveniles differs from that of adults.

South African toxicological studies

Total mercury in white muscle of a single adult *S. africana* was determined (Erasmus *et al.* 2022).

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Biennial
MATING	Weakly seasonal, mainly February and March

GESTATION	Approximately 12 months
LITTER SIZE	1–12
PUPPING/NURSERY GROUND	Include uThukela Banks
SIZE AT BIRTH	About 30 cm TL
LENGTH AT MATURITY	F: 80 cm; M: 75 cm
MAXIMUM LENGTH	125 cm TL
GENERATION LENGTH	23 years, based on *Squatina californica*

Mode
Members of the family Squatinidae exhibit lecithotrophic viviparity, in which the embryos are entirely dependent on the nourishment provided by the yolk-sac.

Duration of reproductive cycle
This is good evidence that it is biennial, a feature of several other members of the genus (Shelmerdine and Cliff 2006).

Mating season and location
Uterine ova were found between January and September, with a peak in February and March. Mating is, therefore, likely to occur just before ovulation. Many of these females and those with very small embryos were caught at the southern end of the KZN coast (Shelmerdine and Cliff 2006).

Pupping season and nursery grounds
The largest embryos were caught in October and January, but they all had small yolk sacs, indicating that birth was not immediate. The nursery area appears to include the uThukela Banks region (Fennessy 1994).

Gestation
This is about 12 months.

Litter size
The litter size of 20 pregnant females was 1–12 (mean: 6, mode: 2 and median 6.5), but there was evidence of abortion (Shelmerdine and Cliff 2006).

Length at birth
This is just over 30 cm, based on the largest embryos of 28 cm which still had 15–20 mm yolk sacs and the smallest free-swimming individual of 34 cm (Bass *et al*. 1975d).

Length at maturity
Females mature at about 80 cm and males at 75cm TL (Shelmerdine and Cliff 2006).

Maximum length
This species attains 125 cm TL (Shelmerdine and Cliff 2006).

Age and growth
Maximum age and age-at-maturity are unknown (Cliff *et al.* 2019).

Generation length
The generation length is unknown, but it is suspected to be similar to congener *Squatina californica*, which has a generation length of 23 years (Cliff *et al.* 2019 and references cited therein).

FISHERIES MANAGEMENT

SA catch sources

Local average annual catch of *S. africana* was estimated from DFFE records at <1 ton for two time periods: 2010–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022), with the KZN bather protection programme being by far the largest contributor, followed by the now-closed KZN inshore prawn trawl fishery (da Silva *et al*. 2015).

SA catch quantities and characteristics

KZN bather protection programme

The mean annual catch in the KZN bather protection programme between 1980 and 2001 was 30 (range 11–69), with 43% of the catch found alive and released. Survival rate on release is unknown, but expected to be high, given that this species is benthic and is able to pump water over the gills while stationary. The mean catch rate was 0.7 sharks km-net–1 year–1, with no significant trend over time (r^2 = 0.02, p > 0.05) (Shelmerdine and Cliff 2006). Catches have declined with the widespread replacement of nets with baited hooks in this programme, and in the period 2000–2017, the average annual catch was 15, with a similar release rate. Catches are also likely to be further reduced by efforts to keep the nets off the bottom to prevent catches of various benthic species (KZN Sharks Board, unpublished data).

KZN crustacean trawl fisheries

Squatina africana was an infrequent catch in the KZN inshore (<50 m) prawn trawl fishery on the uThukela Banks. The size range was 0.2–0.5 m, with a mean of 0.3 m, which encompassed neonates and larger juveniles. Based on observer-recorded catches, the extrapolated annual average catch between 1989 and 1992 was 120 (range 91–172). Survival of this bycatch species was assumed to be high, given that 4 of 6 individuals examined were found alive in catches. This fishery has been dormant for nearly two decades due to the extended closure of the mouth of Lake St Lucia, resulting in poor prawn recruitment and diminishing prawn catches on the uThukela Banks. The fishing grounds were formally closed to trawling following the declaration of the uThukela MPA in August 2019.

It is also caught in the deep (200–500 m) crustacean trawl grounds on the east coast from Durban to southern and central Mozambique. Between 2003 to 2012, 94 individuals were recorded in 42 of 749 observed trawls in KZN, with an extrapolated annual catch of 700 individuals in 2004. Although its range overlaps widely with the deep-water trawl fishery, trawling effort on the KZN coast has varied substantially over the last few decades, peaking in 2021 (Oceanographic Research Institute, unpublished data).

Recreational linefishery

In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore angling league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential effects on coastal elasmobranch species (Winkler *et al.* 2025). In the SASSA -KZN dataset, where locations are fished in KZN and the northern Eastern Cape, at 206 different locations between Kosi Bay and Xhora river mouth, *Squatina africana* was ranked the 42nd most common elasmobranch caught, during the day (CPUE: 0.00061) and at night (CPUE: 0.00056) (Winkler *et al.* 2025).

Fishing outside South Africa

Squatina africana is caught and retained as bycatch in several fisheries including industrial crustacean trawl and small-scale gillnet fisheries throughout most of its range. It does derive some refuge at depth. Published details on any catches of this species in Mozambique are not available. It

was frequently recorded from research trawl surveys in the Western Indian Ocean 2007-2018 (ORI, unpublished data).

Population trends
Nothing is known of any population structure along the East African coast. This is likely to exist as members of the genus are known to be weak swimmers, and therefore, are incapable of moving long distances. Furthermore, they are vulnerable to overexploitation due to their slow growth (generation length of 23 years) and declines in several other *Squatina* species are evident in areas with similar trawl and gillnet fisheries. *S. africana* appears to have experienced a population reduction in mature individuals of 20-30% over the past three generations (69 years). It was globally assessed as Near Threatened (close to meeting the criteria of Vulnerable A2d) in 2017 (Cliff *et al.* 2019).

ECOTOURISM
As primarily a deep-water species, *S. africana* is rarely seen by scuba divers in South Africa and, therefore, cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
Neonates and other juveniles were historically caught in the KZN inshore prawn trawl fishery on the uThukela Banks. This location is now largely a declared marine protected area, the uThukela MPA.

Additional local comment
None

Current IUCN Status
Near Threatened 2017 (considered close to meeting the criteria of Vulnerable A2bd).

Previous IUCN assessments
Data Deficient 2004

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
Squatina africana is not listed.

Convention on Migratory Species (CMS)
Squatina africana is not listed.

Additional international comment
None.

MANAGEMENT CONSIDERATIONS
Several major initiatives have greatly improved the outlook for *S. africana* in South Africa. These include the closure of the KZN inshore prawn trawl fishery in 2009 and the widespread replacement of nets with drumlines or baited hooks in the KZN bather protection programme. Furthermore, effort in the KZN deep-water crustacean trawl fishery has also varied in the last few decades. All these

initiatives have greatly reduced fishing mortalities. In addition, the establishment of the uThukela MPA has protected a pupping and nursery area.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

Any opportunistic sampling should be used to confirm or improve our understanding of the life-history traits of this species. The extent to which individuals might move north into Mozambique waters where they are vulnerable to fishing pressure is unknown. There is no information on age and growth of this species, although in other *Squatina* vertebral growth band deposition is related to somatic growth rather than time, which indicates that the traditional approach of counting growth rings is inappropriate for these species. Tissue samples should be collected to investigate population structure along the East African coast. Inshore-offshore movements should also be investigated. *S. africana* was ranked 40th of 60 South African demersal chondrichthyan species, which were prioritised for further research.

FAMILY PENTANCHIDAE

Apristurus microps - Smalleye catshark

SCIENTIFIC NAME	*Apristurus microps* (Gilchrist 1922)
COMMON NAME	Smalleye catshark
FAMILY	Pentanchidae
ENDEMIC	No; NW and NE Atlantic
SIZE RANGE	>32–61 cm TL
SA DISTRIBUTION	Entire West and South coast: Orange River to Algoa Bay (East coast)
HABITAT	Upper slope
DEPTH RANGE	400–1200 m
MAJOR FISHERIES	Demersal trawl fishery
IUCN STATUS	Least Concern 2018
CITES REGS	Nil
MLRA REGS	The current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Apristurus microps is a very small demersal shark that is found on the continental slope along the entire west and south coasts, and into Algoa Bay on the east coast. It is not found elsewhere in southern Africa but does occur in the North Atlantic. Local annual catch, which is lumped as *Apristurus* spp., is estimated at <1 ton from DFFE records for two time periods: 2010-2012 and 2013–2019. This catch is restricted to the deep-water demersal trawl fishery, in which it is a discarded bycatch. Much of the population inhabits waters that are deeper than these fisheries, so the species has refuge at depth. There are no other known threats, therefore it was assessed globally as Least Concern on the IUCN Red List in 2018. Very little is known about the distribution, habitat, life-history and movement of this species in South Africa or in the North Atlantic. Opportunistic sampling should be used to collect biological and ecological information on this little-known species. The re-establishment of the scientific observer programme will address this shortcoming, and the continuation of research trawl surveys will also provide material and related catch information.

TAXONOMIC and IDENTIFICATION ISSUES

At least 39 species of *Apristurus* are recognised globally, comprising three clades. Several species are very difficult to tell apart, even for experts (Ebert *et al.* 2021b). The genus has a complicated taxonomic history in South Africa, with at least two locally described species, namely *A. microps* and *A. saldanha*, but at least one (possibly as many as three) unidentified species have been recorded, including *A.* cf. *manis*. A taxonomic revision of southern African *Apristurus* species is currently in progress. *A. microps* was first described from South Africa in 1922 but is also known from the North Atlantic (Ebert *et al*. 2021a). A careful comparison of North Atlantic and South African forms is needed (Pollom *et al.* 2019e).

SOUTH AFRICAN DISTRIBUTION

Apristurus microps occurs on the upper slope along the entire west coast and south coasts and a small part of the east coast from the Orange River to Algoa Bay (Ebert *et al.* 2021a, Leslie 2021).

REGIONAL DISTRIBUTION

There are disjunct populations in the NE and NW Atlantic. Ebert *et al.* (2021a) noted that there were no confirmed records from Namibia and northwards in the SE Atlantic, but Leeney (2024) includes this species in an updated list of chondrichthyans with "*at least one reliable record*" from Namibian waters.

SYNOPSIS OF RESEARCH

There is very little published information on the biology and ecology of this species in South Africa. Compagno *et al.* (1991) reported on the horizontal and vertical distribution of individuals caught in research trawl surveys for the period 1986-1990 on the west and south coasts from Orange River to Quoin Point. Ebert *et al.* (2006) reported on the reproductive biology of 113 individuals caught in these research trawls. A molecular taxonomic assessment of southern African catsharks included members of the genus *Apristurus* and confirmed the presence of unidentified species (van Staden *et al.* 2023).

ECOLOGY

Depth

This demersal species inhabits the continental slope at depths of 400–1200 m locally (Ebert 2013, Leslie 2021) and 700–2200 m elsewhere (Ebert *et al.* 2021b).

Habitat: Adults

South African specimens have been collected on soft substrates (Ebert 2013). They are found on or near the bottom but may move up to feed on midwater prey items (Pollom *et al*. 2019e).

Habitat: Juveniles/Nursery Grounds

Neonates, as with other *Apristurus* species, may inhabit midwater and assume a more demersal lifestyle with the onset of maturity (Pollom *et al*. 2019e).

Synopsis of tag deployments

There are no known tagged individuals.

Movements

Nothing is known about the movement patterns of this species. *Apristurus microps* were caught at 19 out of 869 research trawl stations and were widely distributed both geographically and in terms of depth on the west and south coasts. It was the most commonly caught *Apristurus,* sometimes in considerable numbers (Compagno *et al.* 1991).

Diet/feeding: Adults

They feed on small teleosts, crustaceans, cephalopods and small sharks (Compagno *et al.* 1989). The presence of midwater prey suggests these sharks may forage far off the bottom (Ebert 2013).

Diet/feeding: Juveniles

It is not known if the diet differs from that of the adults.

South African toxicological studies

No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Aseasonal

GESTATION	Unknown
LITTER SIZE	2; 1 egg case in each uterus
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	<32 cm
LENGTH AT MATURITY	F: 47 cm; M: 49 cm TL
MAXIMUM LENGTH	61 cm
GENERATION LENGTH	Unknown

Mode
Members of the family Pentanchidae exhibit oviparity. Only the right ovary is functional (Ebert *et al.* 2006).

Duration of reproductive cycle
This is not known.

Mating season and location
The occurrence of egg cases in both summer and winter indicates that *A. microps* may not have a defined breeding season or at least a protracted breeding season (Ebert *et al.* 2006). The frequency of egg-laying is not known.

Pupping season and nursery grounds
The occurrence egg cases in both summer and winter indicates that *A. microps* may not have a defined breeding season or at least a protracted breeding season (Ebert *et al.* 2006).

Gestation
This is not known.

Litter size
The total number of mature oocytes present was 7–8 but this species exhibits single oviparity, with only a single egg case released into each uterus at a time, a mode consistent for all known species of *Apristurus* (Ebert *et al.* 2006). These authors provided a detailed description of the egg cases. The frequency of egg-laying is unknown.

Length at birth
This is not known, but the smallest free-swimming individual was 32 cm TL (Ebert *et al.* 2006).

Length at maturity
Females mature at 47 cm and males at 49 cm TL (Ebert *et al.* 2006).

Maximum length
This species reaches a maximum length of 61 cm TL (Ebert *et al.* 2013).

Age and growth
Age parameters are unknown.

Generation length
This is not listed (Pollom *et al.* 2019e).

FISHERIES MANAGEMENT

SA catch sources, quantities and characteristics

Local average annual catch was estimated from DFFE records at <1 ton for two time periods, 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022) for all *Apristurus* species combined, due to an inability in the industry to separate the species. This was all as bycatch in the demersal trawl fishery, with the hake longline fishery being a possible additional source of catches (da Silva *et al.* 2015). As members of the genus are soft-bodied, they are invariably dead when bought on board in the trawl fishery and are discarded. The same applies to any catches in the hake longline fishery.

Fishing outside South Africa

Apristurus microps may be caught and discarded as bycatch by deep-water trawl fisheries in the North Atlantic, but most of its depth range is outside the reach of fisheries. It is not known to be utilised or traded (Pollom *et al.* 2019e).

Population trends

There are currently no population size or trend estimates for this species, but the trend is suspected to be stable as this species primarily inhabits waters deeper than current fishing activity, therefore, *A. microps* was assessed globally as Least Concern in 2018 (Pollom *et al.* 2019e).

ECOTOURISM

As it only inhabits deep water, it cannot be regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

The current demersal trawl footprint is ringfenced. This species is not listed. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

It is unclear which deep-water MPAs might provide protection to this species.

Additional local comment

As part of the MSC certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

Current IUCN Status

Least Concern 2018

Previous IUCN assessments

Least Concern 2004

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

This species is not listed.

Convention on Migratory Species (CMS)

This species is not listed.

International comments

There are no species-specific protection or conservation measures in place, but *A. microps* does derive refuge at depth (Pollom *et al.* 2019e).

MANAGEMENT CONSIDERATIONS

In South Africa there is little concern for this species as much of the *A. microps* population inhabits waters that are primarily deeper than fisheries, so the species has refuge at depth. It is important that regulations prohibiting the expansion of the trawl footprint remain in effect. Chondrichthyan biodiversity associated with the continental slope remains largely unknown. Improved identification, particularly in the trawl industry, is needed to obviate the practice of lumping all catsharks by genus or as simply unidentified catsharks. An important step would be to re-establish the scientific observer programme and to ensure that observers are trained in the identification of chondrichthyans. It is also imperative to maintain the time series of DFFE-led bi-annual demersal trawl surveys to monitor population trends of this and other deep-water species.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

Apristurus is an extremely poorly studied genus in South African waters, with the number of local species being unknown. Almost nothing is known of the biology, life-history and ecology of *A. microps*. Where the opportunity arises, specimens should be kept to accumulate such information. Tissue samples for genetic analysis should also be collected.

Apristurus saldanha - Saldanha catshark

SCIENTIFIC NAME	*Apristurus saldanha* (Barnard 1925)
COMMON NAME	Saldanha catshark
FAMILY	Pentanchidae
ENDEMIC	No, also Namibia
SIZE RANGE	<33–89 cm TL
SA DISTRIBUTION	Entire West and South coast: Orange River to Algoa Bay (East coast)
HABITAT	Upper slope
DEPTH RANGE	340–1200 m
MAJOR FISHERIES	Demersal trawl fishery
IUCN STATUS	Least Concern 2018
CITES REGS	Not listed
MLRA REGS	The current demersal trawl footprint is ringfenced by DFFE; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Apristurus saldanha is a very small demersal shark that is found on the continental slope along the entire west and south coasts, and into Algoa Bay on the east coast. It is a southern African endemic, also found in southern Namibia. Local annual catch, which is lumped as *Apristurus* spp., is estimated at <1 ton from DFFE records for two time periods: 2010-2012 and 2013–2019. This catch is restricted to the deep-water demersal trawl fishery, in which it is a discarded bycatch, but much of the population inhabits waters that are deeper than these fisheries, so the species has refuge at depth. There are no other known threats, therefore it was assessed regionally as Least Concern on the IUCN Red List in 2018. Very little is known about the distribution, habitat, life-history and movement of this species. Opportunistic sampling should be used to collect biological and ecological information on this little-known species. The re-establishment of the scientific observer programme will address this shortcoming, and the continuation of research trawl surveys will also provide material and related catch information.

TAXONOMIC and IDENTIFICATION ISSUES

At least 39 species of *Apristurus* are recognised globally, comprising three clades. Several species are very difficult to tell apart, even for experts (Ebert *et al.* 2021b). The genus has a complicated taxonomic history in South Africa, with two locally described species, namely *A. saldanha* and *A. microps*, but another two or three unidentified species have been recorded, including *A.* cf. *manis*. A taxonomic revision of southern African *Apristurus* species is currently in progress (Ebert *et al.* 2021a). *A. saldanha* was first described from Saldanha Bay in 1925, hence the name.

SOUTH AFRICAN DISTRIBUTION

Apristurus saldanha occurs on the upper slope along the entire west and south coasts and a very small part of the east coast from the Orange River to about Algoa Bay (Ebert *et al.* 2021a, Leslie 2021).

REGIONAL DISTRIBUTION

Apristurus saldanha is a southern African endemic which also occurs in Namibia (Ebert 2015; Pollom *et al.* 2019f). More recently, Ebert *et al.* (2021a) stated that it may be endemic to South Africa as the records from southern Namibia require confirmation, however Leeney (2024) records it from Namibia.

SYNOPSIS OF RESEARCH

There is little very published information on the biology and ecology of this species. Compagno *et al.* (1991) reported on the horizontal and vertical distribution of individuals caught in research trawl surveys on the west and south coasts from Orange River to Quoin Point from 1986–1990. Ebert *et al.* (2006) reported on the reproductive biology of 95 individuals taken in these research trawls. A molecular taxonomic assessment of southern African catsharks included members of the genus *Apristurus* and confirmed the presence of unidentified species (van Staden *et al.* 2023).

ECOLOGY

Depth

This demersal species inhabits the continental slope at depths of 340–1200 m (Ebert 2015, Leslie 2021).

Habitat: Adults

They are found on or near the bottom (Pollom *et al*. 2019f). The presence of midwater prey species indicates that they move up into midwater to feed (Ebert 2015).

Habitat: Juveniles/Nursery Grounds

Neonates, as with other *Apristurus* species, may inhabit midwater, assuming a more demersal lifestyle with the onset of maturity (Pollom *et al*. 2019f).

Synopsis of tag deployments

There are no known tagged individuals.

Movements

Nothing is known of the movement patterns of *A. saldanha*. It was caught at 7 out of 869 research trawl stations that were widely distributed both geographically and in terms of depth on the west and south coasts; only single individuals were usually collected during these surveys (Compagno *et al.* 1991).

Diet/feeding: Adults

They feed on teleosts and cephalopods (Compagno *et al.* 1989).

Diet/feeding: Juveniles

It is not known if the diet differs from that of the adults.

South African toxicological studies

No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Aseasonal
GESTATION	Unknown
LITTER SIZE	Possibly 2
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	<33 cm
LENGTH AT MATURITY	F: 70 cm; M: 74 cm TL
MAXIMUM LENGTH	89 cm
GENERATION LENGTH	Unknown

Mode
Members of the family Pentanchidae exhibit oviparity. Only the right ovary is functional (Ebert *et al.* 2006).

Duration of reproductive cycle
This is not known.

Mating season and location
This is not known.

Pupping season and nursery grounds
This is not known.

Gestation
This is not known.

Litter size
The total number of mature oocytes present was 16–20 but no pregnant females have been sampled. It is suspected that this species exhibits single oviparity, with only a single egg case released into each uterus at a time, a mode consistent for all known species of *Apristurus* (Ebert *et al.* 2006). Five very distinctive egg cases were found off Cape Point close to where *A. saldanha* was caught at other trawl stations. They were very large and strikingly different from those of *A. microps* or *Scylliorhinus capensis* (Ebert *et al.* 2006). The frequency of egg-laying is not known.

Length at birth
This is not known, but the smallest free-swimming individual was 33 cm TL (Ebert *et al.* 2006).

Length at maturity
Females mature at 70 cm and males at 74 cm TL (Ebert *et al.* 2006).

Maximum length
Apristurus saldanha reaches a maximum length of 89 cm TL (Ebert *et al.* 2013).

Age and growth
Age parameters are unknown.

Generation length
This is not listed (Pollom *et al.* 2019f).

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Local average annual catch was estimated from DFFE records at <1 ton for two time periods, 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022) for all *Apristurus* species combined, due to an inability in the industry to separate the species. This was all as bycatch in the demersal trawl fishery, with the hake longline fishery listed as a possible additional source of catches (da Silva *et al.* 2015), although highly unlikely (Rob Leslie, Cossypha Consultants, formerly DAFF, pers. observation). As members of the genus are soft-bodied, they are invariably dead when bought on board in the trawl fishery and are discarded. The same applies to any catches in the hake longline fishery.

Fishing outside South Africa
Apristurus saldanha may be caught and discarded as bycatch by the deep-water trawl fishery, but most of its depth range is outside the reach of fisheries. It is not known to be utilised or traded (Pollom *et al.* 2019f).

Population trends
There are currently no population size or trend estimates for this species, but the trend is suspected to be stable as this species primarily inhabits waters deeper than current fishing activity, therefore, *A. saldanha* was assessed regionally as Least Concern in 2018 (Pollom *et al.* 2019f).

ECOTOURISM
As it only inhabits deep water, it cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
The current demersal trawl footprint is ringfenced and regulated. This species is not listed. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It is unclear which deep-water MPAs might provide protection to this species.

Additional local comment
As part of the MSC certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

Current IUCN Status
Least Concern 2018

Previous IUCN assessments
Least Concern 2004

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
There are no species-specific protection or conservation measures in place, but this species does derive refuge at depth (Pollom *et al.* 2019f).

MANAGEMENT CONSIDERATIONS
In South Africa there is little concern as much of the *A. saldanha* population inhabits waters that are primarily deeper than fisheries, so the species has refuge at depth. It is important that regulations prohibiting the expansion of the trawl footprint remain in effect. Chondrichthyan biodiversity associated with the continental slope remains largely unknown. Improved identification, particularly in the trawl industry, is needed to obviate the practice of lumping all catsharks sharks by genus or as

simply unidentified catsharks. An important step would be to re-establish the scientific observer programme and to ensure that observers are trained in the identification of chondrichthyans. It is also imperative to maintain the time series of the DFFE-led bi-annual demersal trawl surveys to monitor population trends of this and other deep-water species.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

Apristurus is an extremely poorly studied genus in South African waters, with the number of local species being unknown. Almost nothing is known about the biology, life-history and ecology of *A. saldanha*. Where the opportunity arises, specimens should be kept to accumulate such information. Tissue samples for genetic analysis should also be collected.

Halaelurus lineatus - Banded catshark / Lined catshark

SCIENTIFIC NAME	*Halaelurus lineatus* Bass, D'Aubrey and Kistnasamy 1975
COMMON NAME	Banded catshark/Lined catshark
FAMILY	Pentanchidae
ENDEMIC	Yes
SIZE RANGE	8–50 cm TL
SA DISTRIBUTION	Most of East coast, Mozambique border to East London
HABITAT	Demersal on sand/mud bottoms in coastal, shelf and slope waters
DEPTH RANGE	0–290 m
MAJOR FISHERIES	KZN inshore prawn trawl fishery and recreational linefishery
IUCN STATUS	Least Concern 2018
CITES	Not listed
MLRA	Daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	ST Fennessy

SPECIES SUMMARY and RECOMMENDATIONS

Halaelurus lineatus is a very small, demersal southern African endemic, which is restricted to most of the east coast of South Africa and part of Mozambique. The local average annual catch was estimated at 1–10 tons from DFFE records for two time periods: 2010–2012 and 2013–2019, largely from the now-closed KZN inshore prawn trawl fishery. Given its very small size, most catches are unlikely to be retained. It was assessed as Least Concern on the IUCN Red List in 2018. Limited tagging studies have shown this species to be highly resident; hence it will receive considerable protection from coastal MPAs within its range. Very little is known of its life-history and ecology.

TAXONOMIC and IDENTIFICATION ISSUES

The family Scyliorhinidae was recently split, with a large number of genera, including *Halaelurus*, placed in the family of deep-water catsharks Pentanchidae. There are at least seven species in the genus worldwide (Ebert et al. 2021b). *H. natalensis* was long recognised as the only member of the genus on the South African coast until *H. lineatus* was described by Bass *et al.* (1975b). These two species are the only members of this genus on the South African coast, with no overlap in their distribution. Both have a distinctive upturned knob on the tip of the snout. *H. lineatus* has numerous dark spots and narrow, dark bands which form obscure saddles (Bass *et al.* 1975b; Compagno *et al.* 1989).

SOUTH AFRICAN DISTRIBUTION

Halaelurus lineatus only occurs on the east coast from East London to the Mozambique border and beyond (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

Halaelurus lineatus only occurs in southern and central Mozambique (Pollom *et al*. 2019g).

SYNOPSIS OF RESEARCH

Halaelurus lineatus was described by Bass *et al.* (1975b), who also provided life-history information from numerous specimens, the great majority of which were adult females. Only a single small individual of 13 cm was encountered. This species, unlike *H. natalensis*, was not included in an examination of phylogenetic relationships between various members of the catsharks (Human *et al.* 2006). No dedicated research has subsequently been undertaken on this species. *Halaelurus lineatus* was ranked 16th of the 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

This demersal species is associated with sandy/muddy areas from the shoreline out to depths of 290 m. Pregnant females are caught by shore anglers, while juveniles smaller than 25 cm are not often found and possibly live in deep water over the edge of the continental shelf (Bass *et al.* 1975b).

Habitat: Adults

As they are taken in trawls (Fennessy 1994), they clearly inhabit soft substrates.

Habitat: Juveniles/Nursery Grounds

Juveniles smaller than 25 cm are not often found and possibly inhabit much deeper water close to or over the shelf edge (Bass *et al.* 1975b).

Synopsis of tag deployments

A total of 68 individuals were tagged (ORI Cooperative Fish Tagging Project 1984-2021 inclusive) with 12% recaptured. The mean distance travelled was 16 km, and mean time at liberty was 1.2 years (max: 55 km and 3.2 years) (Jordaan *et al.* 2020a).

Movements

The tagging results listed above are indicative of a moderately mobile species, with a fairly high recapture rate.

Diet/feeding: Adults

H. lineatus feeds primarily on crustaceans, supplemented by small teleosts and cephalopods (Bass *et al.* 1975b).

Diet/feeding: Juveniles

It is not known if the diet of juveniles differs from that of the adults.

South African toxicological studies

No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Unknown
GESTATION	Unknown
LITTER SIZE	Up to 16
PUPPING/NURSERY GROUND	Unknown
LENGTH AT BIRTH	8 cm
LENGTH AT MATURITY	F: 40–52 cm; M: 32–38 cm TL
MAXIMUM LENGTH	56 cm TL
GENERATION LENGTH	15 years (inferred from *Galeus sauteri*)

Mode

Halaelurus lineatus exhibits oviparity, with the female retaining the egg cases until the embryos are 3–4 cm. The egg cases have a coating of short sticky hairs to enhance adherence to the substrate (Bass *et al.* 1975b).

Duration of reproductive cycle
This is unknown.

Mating season and location
This is unknown.

Gestation
This is unknown.

Litter size
This is up to 16; females carry up to eight egg cases in each uterus simultaneously (Bass *et al.* 1975b).

Size at birth
This is about 8 cm, based on captive individuals (Bass *et al.* 1975b).

Pupping season and nursery ground
This is unknown, but pregnant females are caught by shore anglers during late winter (July–September). In captivity, hatching took place 23–36 days after deposition in a water temperature of 19–20°C (Bass *et al.* 1975b).

Length at maturity
Females mature at 40–52 cm and males at 32–38 cm (Bass *et al.* 1975b).

Maximum length
This is 56 cm (Ebert *et al.* 2021b).

Age and growth
No age and growth studies have been undertaken. The longest time at liberty of a tagged individual was 3.2 years (Jordaan *et al.* 2020a).

Generation length
No generation length is listed (Pollom *et al*. 2019g).

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *H. lineatus* was estimated from DFFE records at 1–10 tons for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022), with only the inshore KZN prawn trawl fishery listed as a known catch source for the first period (da Silva *et al.* 2015). Major catch sources for the period 2013–2019 were listed as the commercial linefishery, demersal trawl fisheries and rock lobster fishery (DFFE 2022). The last mentioned, abbreviated as RL, is clearly an error and should read Recreational linefishery (RecL), as this species is caught by recreational shore anglers (van der Elst 1988, Pradervand *et al*. 2007).

SA catch quantities and characteristics
Inshore KZN prawn trawl fishery
Halaelurus lineatus was present as bycatch in 18% of trawls conducted on the uThukela Banks between 1989 and 1992. Based on the observer-recorded catches, the extrapolated average annual catch between 1989 and 1992 was 1414 (range 1071–2021). Catches were significantly higher in the cooler months (June–November). Survival in the trawl net was around 19%, based on a subsample of 47 individuals. The 91 sharks examined ranged from 0.2–0.6 m, with a mean of 0.4 m (Fennessy 1994). Given that females mature from 40 cm and males from 32 cm (Bass *et al.* 1975b), a large portion of the catch was mature. This inshore fishery was formally closed with the declaration of the uThukela Banks MPA in 2019. No individuals were observed in 367 deep-water (200–500 m)

commercial crustacean trawl catches from 2003-2006 (Sean Fennessy, Oceanographic Research Institute, unpublished data).

Recreational linefishery
H. lineatus was infrequently caught by competitive shore anglers along the KZN coast for the period 1977–2000, with a mean annual catch of 11 and a mean weight of 0.6 kg (Pradervand *et al.* 2007). Dunlop and Mann (2012) did not record any individuals during 406 roving-creel surveys of recreational anglers catches from 1 February 2009 to 31 January 2010.

Fishing outside South Africa
Only a single individual was recorded in 244 research trawls in deep water (200-700m) off Mozambique from 2007-2009, and five individuals were recorded in 278 research trawls at depths of 17–300 m in 2007, 2014 and 2018 (Sean Fennessy, Oceanographic Research Institute, unpublished data), suggesting that the species is not abundant there. Monitoring of bycatch should be undertaken at a species level in Mozambican trawl fisheries (Pollom *et al.* 2019g).

Population trends
There are no population size or trend estimates for this species. Historically individuals were captured relatively frequently in the KZN inshore prawn trawl fishery at levels similar to those in research trawls a century ago, which is long before the inception of the fishery, but this fishery virtually ceased in 2007 (Oceanographic Research Institute, unpublished data, 2018, cited by Pollom *et al.* 2019g). There are no trends in recreational catches of this species (Oceanographic Research Institute, unpublished data, 2018, cited by Pollom *et al.* 2019g). In the absence of any information to indicate a decline, the population trend was suspected to be stable and *H. lineatus* was assessed as Least Concern in 2018 (Pollom *et al.* 2019g).

ECOTOURISM
Although this species is found inshore and is caught by shore anglers it is rarely encountered by scuba divers. In the absence of further information, it is not regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
This species will derive protection from all the inshore MPAs within its range on the east coast, in particular the uThukela Banks MPA, where the inshore KZN prawn trawl fishery previously operated.

Additional local comment
None.

IUCN Red List Status
Least Concern 2018

Previous IUCN assessments
Data Deficient 2004

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
Halaelurus lineatus is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
None

MANAGEMENT CONSIDERATIONS
This species is predominantly taken as a bycatch in the trawl and line fisheries, with little known of its survival. This should be investigated. When discarded without undue harm, post-release mortality is likely to be low, based on generally very low at-vessel and post-release mortality for catsharks (Ellis *et al.* 2017). Another management intervention would be an education campaign among line fishers who regard this and other small elasmobranch species as a nuisance and, therefore, do not release their catches. Careful handling and prompt return to the water must be promoted. Accurate identification to species level of all catsharks caught in the various fishing sectors is needed.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Very little is known of the life-history, reproductive biology and ecology of this regional endemic species. Any opportunistic sampling in the region should be used to collect tissue samples for genetic studies to detect any population structure. *Halaelurus lineatus* was ranked 16th out of the 60 South African demersal chondrichthyan species, which were prioritised for further research.

Haploblepharus pictus - Dark shyshark

SCIENTIFIC NAME	*Haploblepharus pictus* (Müller and Henle, 1838)
COMMON NAME	Dark shyshark
FAMILY	Pentanchidae
ENDEMIC	No
SIZE RANGE	10–70 TL
SA DISTRIBUTION	East, South and West coasts: East London to Orange River Mouth
HABITAT	Demersal on sand bottoms, rocky reefs and kelp forests
DEPTH RANGE	0–35 m
MAJOR FISHERIES	Demersal trawl fishery and possibly demersal longline, beach-seine and gillnet, and commercial and recreational line fisheries
IUCN STATUS	Least Concern 2018
CITES	Not listed
MLRA	Current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RGA Watson and AE Bester-van der Merwe

SPECIES SUMMARY and RECOMMENDATIONS

Haploblepharus pictus is a very small, demersal southern African endemic, which is restricted to extremely shallow waters, largely on the south and west coasts and Namibia. The local average annual catch was estimated at <1 ton from DFFE records for two time periods: 2010–2012 and 2013–2019, with the demersal trawl and beach seine and gill net fisheries listed as the major source of catches. Given its very small size, most catches will be discarded. As it is piscivorous, it is likely to feature in linefish catches. There are no population estimates for this species, which was determined to be stable in 2022. It was assessed as Least Concern on the IUCN Red List in 2018. This species currently has no specific legislated protection. Tagging studies have shown it to be highly resident, hence it will receive considerable protection from coastal MPAs within its range. Accurate identification of all catsharks caught, especially in commercial fisheries, is needed. *H. pictus* is a reasonably well-studied species, but sample sizes used in studies of age and growth and diet have been limited. Estimates of gestation length need to be refined. Additional investigations of movement patterns to determine the effectiveness of MPAs would be beneficial to the conservation of this species.

TAXONOMIC and IDENTIFICATION ISSUES

Species identification of the genus *Haploblepharus* has been historically problematic and stems from the use of colour patterns that have proven to be variable, and the poor choice of morphological characters in identification keys. Juvenile specimens that are difficult to identify with confidence further complicate the problem. Many authors chose to synonymise *H. pictus* with *H. edwardsii,* until Bass *et al.* (1975b) resurrected the former as a valid species, which has been subsequently accepted. Not surprisingly, *H. pictus* is most often misidentified with *H. edwardsii* where the two species overlap (Ebert *et al.* 2021a). The former has a highly variable colour pattern that can superficially resemble both *H. edwardsii* or *H. fuscus*, although *H. pictus* more commonly has 6–8 distinct, dark saddles and additional dark markings on a yellow-brown body and on the fins (Compagno *et al.* 1989, Human 2007a). Recent genetic studies suggest very low levels of divergence between *H. pictus, H. edwardsii* and *H. fuscus* (van Staden *et al*. 2023), and a strong potential for hybridisation between the species (van Staden *et al.* 2020).

SOUTH AFRICAN DISTRIBUTION

Haploblepharus pictus occurs along the entire west and south coasts and part of the east coast to East London (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

This species is a regional endemic, occurring from Lüderitz in central Namibia southwards (Compagno *et al*. 1989).

SYNOPSIS OF RESEARCH

Haploblepharus pictus is a very well-studied species. Bass *et al.* (1975b) provided morphometrics and some life-history information from 17 specimens, with very few mature individuals. Smith and Griffiths (1997) and Schmöle *et al*. (2020) investigated all egg cases, including those of *H. pictus*, found washed ashore on the south coast. Studies were undertaken on the diet, age and growth and reproductive biology of members of the genus *Haploblepharus* (Bertolini 1993, Dainty 2002). The diet of several suprabenthic predators in False Bay, including *H. pictus*, was investigated by Lechanteur and Griffiths (2003). Human (2007a) undertook a taxonomic revision of the genus, followed by an assessment of the use of morphological measurements to separate the various species (Human 2007b). The parasitic fauna of *H. pictus* has been well studied (Yeld and Smit 2006, Yeld 2009, McLachlan 2011, Pretorius 2021, Pretorius *et al.* 2021). Factors influencing egg deposition and development and the mortality of the embryos was investigated by Pretorius (2012) and Pretorius and Griffiths (2013).

The presence of *H. pictus* was reported using baited remote underwater video systems (BRUVs) at several locations: False Bay (Watson 2013, De Vos *et al.* 2015); Plettenberg Bay (Cortelezzi et al. 2022); the Betty's Bay MPA (Roberson *et al*. 2015); Walker Bay (Osgood *et al.* 2020) and Gansbaai (Rooth 2019, Nyborg 2023). An overview of the use of molecular genetics for species identification, including species of catsharks, was presented by Bester-van der Merwe and Gledhill (2015). Molecular studies have examined phylogenetic relationships between members of both catshark families (Human *et al.* 2006, van Staden *et al*. 2023). Molecular markers were developed and applied in assessing genetic variation and species divergence in the genus (van Staden 2018), with significant population differentiation in *H. pictus* seen over 100 km (van Staden *et al*. 2020). Van Staden *et al.* (2023) utilised species delimitation and specimen assignment methods to investigate the molecular taxonomy of the South African catsharks, including *H. pictus.* Sebastian (2020) assessed tonic immobility. Scarponi *et al.* (2021) investigated capture stress in catsharks*. H. pictus* was included in a study of total mercury concentrations in selected South African elasmobranchs (Erasmus *et al.* 2022). Site fidelity of *H. pictus* based on mark-recapture was investigated by Johnson *et al*. (2024). *Haploblepharus pictus* was ranked 30th out of the 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

This demersal species occurs from the shoreline out to depths of 35 m (Compagno *et al*. 1989. Lechanteur and Griffiths (2002) did not find this species deeper than 20 m in False Bay, where the mean depth of individuals observed in BRUV studies was 10–20 m (De Vos *et al*. 2007).

Habitat: Adults

Adults are associated with rocky reefs, particularly those inundated with sand and supporting kelp forests (Dainty 2002, De Vos *et al.* 2007, De Vos *et al*. 2015, Osgood *et al.* 2020).

Habitat: Juveniles/Nursery Grounds
Juveniles possibly occupy a similar habitat but in shallower water. In False Bay all detections of egg cases were shallower than 25 m, with the majority (94%) found between 0 and 5 m (Pretorius and Griffiths 2013).

Synopsis of tag deployments
A total of 1213 individuals were tagged (ORI Cooperative Fish Tagging Project 1984-2022 inclusive) with 288 (12%) recaptures. Mean distance travelled was 3 km; mean time at liberty was 0.4 years (max: 86 km and 5.5 years) (Jordaan *et al.* 2023). In a mark-recapture study in Walker Bay, 1023 individuals were tagged, comprising similar numbers of males and females. There was high site fidelity with limited movement; the mean distance moved was 5 km (maximum of 33 km) for males and 3 km (maximum of 13 km) for females (Johnson *et al*. 2024).

Movements
The results of the two tagging studies described above are indicative of a highly sedentary species, which is not unexpected, given its small size.

Diet/feeding: Adults
They are generalist feeders, preying upon a variety of food sources, which include teleosts (mainly sardines *Sardinops sagax*), molluscs (mainly cephalopods) and crustaceans (mostly decapods, especially the crab, *Plagusia chabrus*, and ostracods). The importance of crustaceans increased in the larger individuals, while the importance of teleosts decreased (Dainty 2002). The high occurrence of sardines is likely to be an artefact of scavenging on bait discarded by linefishers, as these teleosts are pelagic and do not naturally occur in the benthic ecosystem inhabited by *H. pictus* (Ralph Watson, University of Cape Town, pers. comm.). Lechanteur and Griffiths (2003) reported similar findings for individuals from False Bay, with crustaceans, teleosts, molluscs and polychaetes in decreasing frequency of occurrence. The majority of these teleosts were described as “chunks”, again highlighting the high likelihood of scavenging.

Diet/feeding: Juveniles
The diet of smaller individuals differed slightly from that of larger sharks, with a higher importance of teleosts and a lower importance of crustaceans (Dainty 2002).

South African toxicological studies
Total mercury levels were determined in the white muscle of 10 individuals; they were the lowest among 21 other elasmobranchs included in the study (Erasmus *et al.* 2022).

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Year-round
GESTATION	6–8 months (based on captive studies)
LITTER SIZE	Only 2 egg cases
PUPPING/NURSERY GROUND	No specific location
LENGTH AT BIRTH	10–12 cm TL
LENGTH AT MATURITY	F: 49 cm; M: 50 cm TL
MAXIMUM LENGTH	70 cm TL
GENERATION LENGTH	20 years

Mode
Haploblepharus pictus exhibits oviparity, as is typical of members of this family (Bass *et al.* 1975b).

Duration of reproductive cycle
This is unknown.

Mating season and location
This is year-round. Egg cases were found in False Bay throughout the year, with a summer peak (December–February) and a winter low (June–August). Almost all were attached to a single species of seaweed *Bifurcariopsis capensis* (Pretorius and Griffiths 2013). Given the sedentary nature of this species, it is likely to mate wherever it occurs. Schmöle *et al*. (2020) found no seasonal variation in the number of *H. pictus* egg cases washed up around Plettenberg Bay, though there was a significantly higher abundance in the Tsitsikamma MPA, compared to Keurboomstrand or Robberg MPA.

Gestation
In captivity, the length-age relationship was linear, and total development time to hatching was on average 8 months at 14°C and 6 months at 17°C (Pretorius and Griffiths 2013). Dainty (2002) had previously speculated a 12-month gestation period at 14°C.

Litter size
This is only two, with one egg case in each uterus (Dainty 2002).

Size at birth
This is 10–12 cm TL (Dainty 2002).

Pupping season and nursery ground
This appears to be aseasonal, based on the year-round presence of deposited egg cases (Pretorius and Griffiths 2013) and those washed ashore (Schmöle *et al.* 2020). Given the sedentary nature of this species, it is likely to reproduce wherever it occurs.

Length at maturity
Females attain 50% maturity at 49 cm TL and males at 50 cm (Dainty 2002).

Maximum length
This is 70 cm (Ebert *et al.* 2021b). The largest individual examined by Dainty was 65 cm (2002).

Age and growth
Haploblepharus pictus attains 50% maturity after 15 years, with the oldest individual, based on vertebral growth rings of 25 years (Dainty 2002).

Generation length
No generation length was listed (Pollom *et al*. 2019h), but from the values provided above (Dainty 2002), this would be 20 years, based on age-at-maturity plus half of the length of the reproductive phase.

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *H. pictus* was estimated from DFFE records at <1 ton for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022), with the demersal trawl fishery listed as the only known catch source. In the first period, the recreational and commercial linefishery and the demersal longline fishery were listed as possible catch sources (da Silva *et al.* 2015). In the second period, the beach seine fishery and the demersal trawl fishery are listed as the primary catch sources (DFFE 2022).

SA catch quantities and characteristics

Demersal trawl fishery

Haploblepharus pictus was not specified in an observer-based assessment of catches in the inshore demersal trawl fishery, although annual catches of unidentified catsharks (Scyliorhinidae) were estimated at 10.2 tons for the period 2003–2006 (Attwood *et al.* 2011). This trawling is concentrated at depths of 80–110 m, which far exceeds the maximum reported depth of this species of 35 m. Therefore, the demersal trawl fishery is likely to be a very minor source of catches.

Recreational linefishery

Haploblepharus pictus was not included in the list of recreational linefish species caught in False Bay (Best *et al*. 2013) or the De Hoop MPA (Bennett and Attwood 1993). Because of its piscivorous diet, it is likely to feature in angler catches. *H. pictus* is among the species that are sometimes deliberately killed or left to die by anglers because individuals are regarded as a nuisance (Ralph Watson, pers. comm.).

Beach seine and gillnet fisheries

This species was a rare catch in the gillnet fishery of the Western Cape (Hutchings and Lamberth 2002a). The beach seine fishery was listed as the only source of catches in False Bay (Best *et al.* 2013), but no catches were reported in an in-depth assessment of this fishery (Lamberth *et al.* 1994, Lamberth 2006).

Fishing outside South Africa

Little information is available on catches in Namibia but much of the western portion of its range is in remote areas where fishing pressure is low (Pollom *et al.* 2019h). Leeney (2024) notes that this species is largely only caught by Namibian recreational anglers and released.

Population trends

There are no population size estimates for this species. *H. pictus* was one of the most abundant species in baited remote underwater video (BRUV) surveys in False Bay, making up 12–20% of sightings depending on season (De Vos *et al.* 2015). It was also the most common elasmobranch in the Betty's Bay MPA and Walker Bay Whale Sanctuary (Osgood *et al.* 2020). The population trend is suspected to be stable (DFFE 2022), given the continued abundance of this common species. Hence *H. pictus* was assessed as Least Concern in 2018 (Pollom *et al.* 2019h). Nuclear DNA markers revealed significant population differentiation in the species, with a genetic cline present across the sampling region (van Staden *et al*. 2020).

ECOTOURISM

As a very shallow-water species, it is often encountered by scuba divers and must be regarded as having ecotourism value.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

Given its sedentary nature, this species will derive some protection from all the inshore MPAs within its range on the south and west coasts, although the home ranges may exceed the size of the protected areas in smaller MPAs. Roberson *et al.* (2015) reported that although habitat did affect

the diversity and species composition in the Betty's Bay MPA, protection had no effect. By contrast, in an expanded analysis of chondrichthyan abundance and richness, the protected status of Betty's Bay was found to have a limited positive effect (Osgood *et al.* 2020). *H. pictus* showed no difference in frequency of occurrence within and outside Robberg MPA; this was likely due to insufficient preferred habitat within the study area (Cortelezzi *et al.* 2022). *H. pictus* was the third most common chondrichthyan observed in False Bay, which is closed to trawling (De Vos *et al.* 2015). Examination of the abundance of egg cases washed up on beaches around Plettenberg Bay showed an increased number next to the Tsitsikamma MPA (Schmöle *et al*. 2020).

Additional local comment
None

IUCN Red List Status
Least Concern 2018

Previous IUCN assessments
Least Concern 2009

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
Haploblepharus pictus is not listed.

Convention on Migratory Species (CMS)
It is not listed.

International comments
None

MANAGEMENT CONSIDERATIONS
Haploblepharus pictus does not appear to be caught in high numbers in any fishery. Major catch sources are listed as the trawl and beach seine and gillnet fisheries but there is no published evidence to support this, especially as *H. pictus* is not known to occur deeper than 35 m and the inshore benthic trawl fishery is concentrated at depths of 80–100 m. This should be scrutinised and monitored. Given its piscivorous diet and shallow-water habitat, it will be caught by recreational shore anglers and other linefishers, some of whom regard this species as a nuisance and therefore do not release their catches. This requires an education campaign to ensure careful handling and prompt return to the water. Accurate identification to species level of all catsharks caught in the various fisheries sectors is needed.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Aspects of the life-history requiring attention include the duration of gestation and embryonic development, age and growth, and mating behaviour. Further ecological research should include more detailed dietary studies, examining spatial variation in stomach content, and incorporating stable isotope analyses. More details of movement behaviour and population trends are required. *Haploblepharus pictus* was ranked 30th out of the 60 South African demersal chondrichthyan species, which were prioritised for further research.

Holohalaelurus regani - Izak catshark

SCIENTIFIC NAME	*Holohalaelurus regani* (Gilchrist 1922)
COMMON NAME	Izak catshark
FAMILY	Pentanchidae
ENDEMIC	No, also occurs in Namibia
SIZE RANGE	11–69 cm TL
SA DISTRIBUTION	East, South and West coasts: Central KZN to Orange River Mouth
HABITAT	Demersal on soft and rocky substrates on shelf and slope
DEPTH RANGE	15–1075 m, mostly 100–300 m
MAJOR FISHERIES	Demersal trawl and demersal longline fishery, possibly commercial linefishery
IUCN STATUS	Least Concern 2019
CITES	Not listed
MLRA	Current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Holohalaelurus regani is a very small, demersal southern African endemic, which occurs along most of the South African coast and part of Namibia. Local average annual catch was estimated at 11–100 tons from DFFE records for two time periods: 2010-2012 and 2013–2019, but these catches appear to be a gross underestimate. The demersal trawl fishery was the major source, followed by the demersal longline fishery. All these catches are discarded, with a likely low survival rate. Research surveys to monitor hake biomass indicated that this species is increasing, so it was assessed as Least Concern on the IUCN Red List in 2019. It currently has no legislated protection, but will gain refuge from trawling outside the trawl footprint. Better species-specific catch data are needed from the demersal trawl and longline fisheries. There are still large gaps in our understanding of the life-history and ecology of what appears to be a very fecund species, in particular age and growth, and the location of neonates and other juveniles, which are rarely caught in demersal gear.

TAXONOMIC and IDENTIFICATION ISSUES

Previously all catsharks were placed in the family Scyliorhinidae, however that family has now been split into Pentanchidae and Scyliorhinidae based on internal anatomy and molecular genetics. *Holohalaelurus regani* was moved to the deep-water catshark family Pentanchidae. Two forms of *H. regani* were recognised by Bass *et al*. (1975b): a larger *Cape* or *typical* form, and a smaller *Natal* or northeastern form. The latter form was later separated from *H. regani* by Human (2006) as a new species, *H. favus*. A third species in this genus, *H. punctatus* occurs off the south and east coasts. A source of taxonomic confusion in this genus is the marked ontogenetic allometry and patterning found in these species (Human 2006). Morphometrics given by Bass et al. (1975b) are a combination of *H. favus* and *H. regani* (Human 2006).

SOUTH AFRICAN DISTRIBUTION

Holohalaelurus regani is common on the west and south coasts from the Orange River Mouth to Algoa Bay on the east coast (Leslie 2021, DFFE unpublished data), but also occurs infrequently along the east coast to central KZN (Human 2006). It is a faunal associate with the less common and larger *Scyliorhinus capensis* (Compagno *et al*. 1991).

REGIONAL DISTRIBUTION

Holohalaelurus regani is a regional endemic found as far north as Lüderitz, Namibia (Compagno *et al*. 1991). Records reported by Bass *et al*. (1975b) from the east coast, north of South Africa are *H. grennian* and *H*. *melanostigma* (Human 2006).

SYNOPSIS OF RESEARCH

Holohalaelurus regani is a fairly well-studied species. Bass *et al.* (1975b) provided morphometrics and some life-history information from 32 specimens collected from a number of localities ranging from the SW Cape to southern Mozambique but it was subsequently established that they represent two species, *H. regani* and *H. favus*. Compagno *et al.* (1991) reported on the distribution on the west coast and in Namibia of over 500 individuals caught in research trawl surveys, where *H. regani* was by far the most commonly caught chondrichthyan. Ebert *et al.* (1996) examined the stomach contents of 383 of these individuals. Richardson *et al.* (2000) also used the research trawl catches to investigate abundance, distribution, morphometrics, reproduction and diet. Human (2006) revised the genus *Holohalaelurus* and described two new species, including *H.* favus, which had previously been regarded as a subspecies of *H. regani*. Human *et al.* (2006) described the phylogenetic relationships among members of the previous family Scyliorhinidae (now the families Scyliorhinidae and Pentanchidae), including *H. regani.* Van der Heever *et al.* (2020) documented spatial and ontogenetic variability in the diet and trophic ecology in this species and the larger faunal associate *Scyliorhinus capensis.* Van der Heever *et al.* (2023) also investigated the distributions and associations of these two species. *Holohalaelurus regani* was ranked seventh out of 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

Holohalaelurus regani occurs on the continental shelf and upper slope over a depth range of 15–1075 m. It appears to be most common at depths of 200–300 m on the west coast and 100–200 m on the south coast (Compagno *et al*. 1991, Richardson *et al.* 2000). There was sexual segregation with depth, in that juveniles and females were generally found in water shallower than 300 m, while males were progressively more dominant with increasing depth (Richardson *et al.* 2000).

Habitat: Adults

Adult *H. regani* are caught in trawls on both soft and rocky substrates (DFFE unpublished data). The long tendrils on *H. regani* egg cases suggest that they are attached to a rocky substrate (Richardson *et al.* 2000).

Habitat: Juveniles/Nursery Grounds

The noticeable absence of neonates from research trawls suggests that they occupy other areas, possibly moving up in the water column, thereby avoiding capture, and are thus under-sampled (Richardson *et al.* 2000). Although there is substantial overlap in the distribution of immature and adult *H. regani*, immature individuals are more abundant in the shallower parts of the distribution and absent in the deeper areas (van der Heever et al. 2023)

Synopsis of tag deployments

This species has not been tagged.

Movements

Nothing is known about the movements of this species. Although it was by far the most common chondrichthyan caught in research trawl surveys on the west coast and in Namibia, it seldom occurred in large numbers or formed massive catches (Compagno *et al*. 1991). There was no clear seasonal change in the distribution on the south coast, but there was an indication of a seasonal migration to the southern tip of the Agulhas Bank during autumn (Richardson *et al.* 2000).

Diet/feeding: Adults
Holohalaelurus regani consume a wide range of prey items, suggesting that it is a generalist feeder. Overall, teleosts were the most important prey item, followed by crustaceans and then cephalopods. There was a change in the diet of *H. regani* with increasing size, with crustaceans becoming more important and teleosts less important (Richardson *et al.* 2006). The main teleost prey were myctophids, unidentified teleosts and anchovy *Engraulis capensis.* Crustacean prey included hermit crabs, crabs, stomatopods and penaeid prawns. *Sepia australis* was the only cephalopod recorded in the diet (Ebert *et al.* 1996). A more recent study by van der Heever *et al.* (2020) confirmed that crustaceans, cephalopods and teleosts are the predominant prey types. The importance of crustaceans and cephalopods contrasts with the results of the two previous studies (Ebert *et al*. 1996, Richardson *et al*. 2000), which indicated that teleosts, largely myctophids, were the most important prey items.

Diet/feeding: Juveniles
There was an ontogenetic change in the diet with teleosts being more important and crustaceans less important in smaller individuals (Richardson *et al.* 2006).

South African toxicological studies
No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Possibly year-round
GESTATION	Unknown
LITTER SIZE	2
PUPPING/NURSERY GROUND	Unknown
LENGTH AT BIRTH	11 cm
LENGTH AT MATURITY	F: 40–45 cm TL; M: 45–50 cm
MAXIMUM LENGTH	69 cm TL
GENERATION LENGTH	Unknown, inferred at 21 years from *Galeus sauteri*

Mode
This species exhibits single oviparity, with one egg case found in each uterus (Richardson *et al.* 2000).

Duration of reproductive cycle
This is unknown.

Mating season and location
This is unknown. There was no significant seasonal difference in the proportion of mature females that had cased eggs, indicating that this species reproduces throughout the year (Richardson *et al.* 2000). It is assumed that this species mates where it occurs and that there is no specific mating location.

Gestation
This is unknown.

Litter size
Pairs of eggs are laid year-round; the long tendrils on the egg cases suggest that they are attached to a rocky substrate (Richardson *et al*. 2000). The frequency of egg deposition is unknown.

Size at birth
This is 11 cm TL (Ebert *et al.* 2021b).

Pupping season and nursery ground
Based on the inference that this species reproduces throughout the year (Richardson *et al.* 2000), hatching is also likely to take place throughout the year. The noticeable absence of neonates from research trawls suggests that they occupy other areas, possibly moving up in the water column, thereby avoiding capture (Richardson *et al.* 2000).

Length at maturity
Females mature at 40–45 cm TL, and males at 45–50 cm (Richardson *et. al.* 2000).

Maximum length
This is 69 cm (Compagno *et al* 1989).

Age and growth
No age and growth studies have been undertaken.

Generation length
This is unknown as age-at-maturity and maximum age are unknown. Catsharks are difficult to age, and the most reliable age estimates are from the blacktip sawtail catshark *Galeus sauteri*, which has an age-at-maturity of 9 years and a maximum age of 21 years, resulting in a generation length of 15 years (Liu *et al*. 2011, cited by Pollom *et al.* 2020g). *G. sauteri* is smaller than *H. regani* (48 cm vs 69 cm TL) and based on scaled size, the generation length for *H. regani* is inferred as 21 years (Pollom *et al.* 2020g).

FISHERIES MANAGEMENT
SA catch sources
Total annual South African catch was estimated from DFFE records at 11–100 tons for the two periods 2010–2012 (da Silva *et al.* 2015) and 2013–2019 (DFFE 2022). The demersal trawl fishery was listed as a known catch source, and the demersal longline and commercial line fisheries were possible catch sources (da Silva *et al.* 2015).

SA catch quantities and characteristics
Demersal trawl fishery
The total catch of *H. regani* in 2006 was estimated to be 390 tons, with all catsharks discarded (Petersen *et al.* 2008). This species is relatively robust and individuals caught in research demersal trawls were often seen swimming away when returned to the sea (Richardson *et al.* 2000) and may survive. Some individuals discarded from commercial demersal trawls may survive, particularly those discarded quickly. However, on the larger offshore trawlers, the discards are macerated prior to discarding to minimise interaction with, and potential mortality of seabirds.

Demersal longline fishery
Holohalaelurus regani was the second most common elasmobranch caught in the demersal longline fishery, with an estimated catch of 38 tons in 2006; all catches of Scyliorhinidae and Pentanchidae are discarded (Petersen *et al.* 2008).

Fishing outside South Africa
This species is caught as bycatch in substantial numbers in demersal hake trawl fisheries off Namibia (Leeney 2024), but it will derive protection from fishing at depth.

Population trends
There was no evidence of a decline in the biomass index of *H. regani*, calculated during annual hake biomass surveys from 1986 to 2007 (Petersen *et al.* 2008). Trend analysis of research trawl data in South African commercially fished areas estimated a population increase of 84% over the previous three generation lengths (63 years), with the highest probability of an increase over the past three generation lengths. Other research and commercial fisheries data also indicate increases in population, and this species remains among the most frequently captured elasmobranchs in the southern African hake fisheries (Pollom *et al.* 2020g). As *H. regani* may be able to tolerate moderate levels of fishing pressure due to its high fecundity and some refuge outside of the trawl footprint, and the population was estimated to be increasing, it was assessed as Least Concern in 2019 (Pollom *et al.* 2020g).

ECOTOURISM
As it occurs only in deep water, it is not regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
The current demersal trawl footprint is ringfenced. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It is uncertain as to the level of protection this species will derive from the offshore MPAs within its range.

Additional local comment
As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery. There are no species-specific protections or conservation measures in place.

It is difficult to reconcile the 2006 *H. regani* catch estimates of 390 tons in the demersal trawl fishery and 38 tons in the demersal longline fishery (Petersen *et al.* 2008) with the total estimated annual catch of 11–100 tons in all local fisheries for the period 2010–2012 (da Silva *et al.* 2015) and 2013–2019 (DFFE 2022). In both cases, the total catch is the result of extrapolation from a relatively small base.

IUCN Red List Status
Least Concern 2019

Previous IUCN assessments
Least Concern 2009

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
None

MANAGEMENT CONSIDERATIONS
Holohalaelurus regani is predominantly taken as a bycatch in the demersal trawl and longline fisheries, with all catches discarded. It appears to be a robust species capable of surviving capture, provided it is handled with care and released rapidly. While efforts to ensure the survival of at least some individuals should be encouraged, the emphasis in any commercial operation is to first process the targeted catch. There is also the MSC requirement to minimise any deleterious interactions with seabirds. This is achieved by macerating all discarded bycatch and discharging it below the waterline. As a result, there is likely to be zero survival of bycatch. Accurate identification of all catsharks caught in the various fisheries sectors is required to species-level, but it is not commercially viable for the industry to spend time sorting and identifying it. The onboard scientific observer program should be re-established in order to collect quantitative estimates of catches of chondrichthyans and all discarded species. The discrepancies in relatively recent catch estimates, as stated above, should be reconciled.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
There are still large gaps in our knowledge of the life-history, reproductive biology and ecology of this regional endemic species. In particular, nothing is known about age, growth longevity, or the whereabouts of the neonates. *Holohalaelurus regani* was ranked seventh out of 60 South African demersal chondrichthyan species, which were prioritised for further research.

FAMILY SCYLIORHINIDAE

Cephaloscyllium sufflans - Balloon shark

SCIENTIFIC NAME	*Cephaloscyllium sufflans* (Regan, 1921)
COMMON NAME	Balloon shark
FAMILY	Scyliorhinidae
ENDEMIC	No, regional endemic. Occurs in Mozambique and Madagascar
SIZE RANGE	20–110 cm TL
SA DISTRIBUTION	East coast: Mozambique border to Durban
HABITAT	Demersal on sand and mud bottoms
DEPTH RANGE	40–600 m
MAJOR FISHERIES	KZN offshore crustacean trawl fishery
IUCN STATUS	Near Threatened 2019
CITES	Not listed
MLRA	Daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	ST Fennessy

SPECIES SUMMARY and RECOMMENDATIONS

Cephaloscyllium sufflans is a small, demersal catshark inhabiting shelf and upper slope waters along the northern part of the east coast. Its range extends northwards into Mozambique and possibly Tanzania. It is one of several deep-water catsharks found on the east coast but it is relatively easy to identify, based largely on its dorsal colour pattern. It was not reported in annual catch estimates of any South African fisheries, based on DFFE records for the two periods 2010–2012 and 2013–2019. Given its preference for waters deeper than 40 m, it is taken in the deep-water crustacean trawl fishery off the central KZN coast, but it may derive protection from trawling as a result of the adult preference for rocky habitats. It was assessed as Near Threatened on the IUCN Red List in 2019. Accurate species identification is needed and any opportunistic sampling should be used to improve the knowledge of the life-history and ecology of this very poorly-known species.

TAXONOMIC and IDENTIFICATION ISSUES

Cephaloscyllium sufflans is the only species in the genus in the SW Indian Ocean. It is one of several deep-water catsharks found on the east coast, but it is identified largely by the absence of lip grooves and its distinctive colouration, which comprises seven light grey-brown saddles on a lighter, pale-grey brown background. The most notable feature of all members of the genus is the ability to inflate the body by swallowing water when caught or otherwise disturbed (Ebert *et al.* 2021b).

SOUTH AFRICAN DISTRIBUTION

Cephaloscyllium sufflans is confined to the east coast from the Mozambique border to Durban (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

Cephaloscyllium sufflans occurs in Comoros, Mozambique and Madagascar, possibly Tanzania (Pollom *et al.* 2020e); several individuals were recorded in research trawls by the *Dr Fridjtof Nansen* off Tanzania in 2023 (Bernadine Everett, Oceanographic Research Institute, pers. comm.). Records from Kenya and the Gulf of Aden may be a separate species (Heemstra *et al*. 2022).

SYNOPSIS OF RESEARCH

Cephaloscyllium sufflans has been poorly studied in South Africa. Bass *et al.* (1975b) provided morphometrics, supplemented with some biological information, from over 100 specimens trawled off the KZN and southern Mozambique coasts. No dedicated research has since been conducted on this species.

ECOLOGY

Depth

Apart from a few specimens caught at about 370 m in southern Mozambique, most of those examined were caught at 40–440 m off KZN. As these catches contained very few adults, the whereabouts of this component of the population is unknown (Bass *et al.* 1975b). The maximum depth has been extended to 600 m (Pollom *et al.* 2020e).

Habitat: Adults

As adults were rarely sampled in the trawls (Bass *et al.* 1975b), it appears that they prefer more rocky habitats, which are not suitable for trawl gear (Sean Fennessy, Oceanographic Research Institute, unpublished data).

Habitat: Juveniles/Nursery Grounds

They occur on sand and mud bottoms, based on catches in trawl nets (Bass *et al.* 1975b), but may also be found on rocky bottoms.

Synopsis of tag deployments

Individuals of this species have not been tagged.

Movements

Nothing is known.

Diet/feeding: Adults

Crustaceans and cephalopods formed the major component of the diet, followed by small teleosts and elasmobranchs, although few adults were sampled (Bass *et al.* 1975b).

Diet/feeding: Juveniles

Crustaceans and cephalopods formed the major component of the diet, followed by small teleosts and elasmobranchs (Bass *et al.* 1975b).

South African toxicological studies

No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Single oviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	Two
PUPPING/NURSERY GROUND	Unknown
LENGTH AT BIRTH	20 cm TL
LENGTH AT MATURITY	70–90 cm TL
MAXIMUM LENGTH	110 cm TL
GENERATION LENGTH	Unknown, inferred as 25 years from *Galeus sauteri*

Mode
Cephaloscyllium sufflans exhibits single oviparity in that only one egg case is found in each uterus (Bass *et al.* 1975b).

Duration of reproductive cycle
This is unknown, as nothing is known of the frequency of egg-laying.

Mating season and location
This is unknown. No egg cases were found in KZN trawls, suggesting that they are laid in much deeper water or further north of the KZN trawling grounds (Bass *et al.* 1975b).

Gestation
This is unknown.

Litter size
This is two, based on one female with egg cases *in utero* and another with an egg case forming in each shell gland (Bass *et al.* 1975b), but the frequency of egg-laying is unknown (Pollom *et al.* 2020e).

Size at birth
This is about 20 cm TL; specimens of 20–22 cm TL had fresh umbilical scars (Bass *et al.* 1975b).

Pupping season and nursery ground
This is unknown, but recently hatched specimens were occasionally taken in the trawls (Bass *et al.* 1975b), suggesting that there are nursery areas along the KZN coast. It is possible that this species gives birth wherever it occurs.

Length at maturity
This is approximately 70–90 cm TL. Bass *et al.* (1975b) reported immature females of 71 cm and less and an adult of 82 cm TL; males of 71 and 75 cm TL were immature while one of 89 cm was mature.

Maximum size
Maximum size is 110 cm TL (Compagno *et al.* 1989).

Age and growth
This is unknown.

Generation length
This is unknown, as age-at-maturity and maximum age are unknown. Catsharks are difficult to age, and the most reliable age estimates are from the blacktip sawtail catshark *Galeus sauteri* that has an age-at-maturity of 9 years and maximum age of 21 years, resulting in a generation length of 15 years (Liu *et al*. 2011, cited by Pollom *et al.* 2020e). *G. sauteri* is much smaller than *C. sufflans* (48 cm vs 110 cm TL) and, based on scaled-size, the generation length for *C. sufflans* is inferred as 25 years (Pollom *et al.* 2020e).

FISHERIES MANAGEMENT
SA catch sources
Cephaloscyllium sufflans was not listed in the annual catch estimates based on DFFE records for the periods 2010–2012 (da Silva *et al.* 2015) and 2013–2019 (DFFE 2022).

SA catch quantities and characteristics
KZN crustacean trawl fishery
Almost all 101 individuals sampled by Bass *et al.* (1975b) were from trawls on the KZN coast at depths of 40–440 m. The inshore fishery operated at depths of 12–45 m on the uThukela Bank until it was

formally closed after a large portion of the fishing ground was declared an MPA in 2019, but there were no catches observed in this component of fishery in 1989–1992 (Fennessy 1994), nor from 2003-2005 (S. Fennessy, Oceanographic Research Institute, unpublished data).

Cephaloscyllium sufflans is caught in the offshore component of the fishery, as described by Fennessy and Groeneveld (1997), which is still operational, albeit at reduced capacity. The trawling grounds range from 200–600 m, with most of the effort concentrated at 300–600 m.

Fishing outside South Africa
Cephaloscyllium sufflans may be caught as bycatch in deep-water trawl, longline, and artisanal fisheries across much of its range (Pollom *et al.* 2020).

Population trends
There are no population size estimates for this species. In the period 1920–1932 during research trawl surveys in deep water off Durban, 13 individuals were recorded in 6 of 98 trawls. From 2007–2009, 22 specimens were recorded from 149 trawls on the deep-water commercial crustacean trawlers off KZN. Steep declines of about 80% were observed in trawl catch rates of *C. sufflans* made over the period 2004–2007 to 2009–2011 in water depths of 300–500 m. Subsequently, there has been no onboard observer sampling (Sean Fennessy, Oceanographic Research Institute, unpublished data). This species will gain refuge from trawling at depth and through its preference for rocky habitats. *C. sufflans* is suspected to have undergone a population reduction of 20–29% over the past three generation lengths (75 years) and was therefore assessed as Near Threatened, nearly meeting the Criterion of Vulnerable A2d in 2019 (Pollom *et al.* 2020e).

ECOTOURISM
This species is not regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
Cephaloscyllium sufflans is not listed.

Marine Protected Areas
Cephaloscyllium sufflans is afforded some protection in the deeper waters of the uThukela MPA and iSimangaliso MPA, as well as the Ponta do Ouro Partial MPA in southern Mozambique. There are no species-specific protections or conservation measures in place.

Additional local comment
None

IUCN Red List Status
Near Threatened 2019 A2d

Previous IUCN assessments
Least Concern 2004

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
None

MANAGEMENT CONSIDERATIONS
Monitoring of catches in the KZN offshore crustacean trawl fishery is needed. Given that local catches appear to be small, they are unlikely to pose a major threat to this species in South African waters and *C. sufflans* can be considered to be of low management priority.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
As very little is known about the biology and ecology of this species, further information is needed on its distribution, life-history, population size and trends and threats. Any opportunistic sampling in the region should be used to collect tissue samples for a genetic study to detect any population structure.

Scyliorhinus capensis - Yellowspotted catshark

SCIENTIFIC NAME	*Scyliorhinus capensis* (Müller and Henle, 1838)
COMMON NAME	Yellowspotted catshark
FAMILY	Scyliorhinidae
ENDEMIC	No, also occurs in Namibia
SIZE RANGE	25–122 cm TL
SA DISTRIBUTION	East, South and West coasts: Central KZN to Orange River Mouth
HABITAT	Demersal on soft and rocky substrates on outer shelf and upper slope
DEPTH RANGE	25–700 m; mostly 200–400 m
MAJOR FISHERIES	Demersal trawl fishery, demersal longline and possibly commercial linefishery
IUCN STATUS	Near Threatened 2019
CITES	Not listed
MLRA	Current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Scyliorhinus capensis is a small, demersal southern African endemic catshark, which occurs along most of the South African coast and part of Namibia. The local average annual catch was estimated at 1–10 tons from DFFE records for two time periods: 2010-2012 and 2013–2019, but this appears to be a gross underestimate. Catches were highest in the demersal trawl fishery and demersal longline fishery. All these catches are discarded, with survival likely to be low. This species was assessed as Near Threatened on the IUCN Red List in 2018. It currently has no legislated protection but will gain refuge from trawling outside of the trawl footprint. Better species-specific catch data are needed from the demersal trawl and longline fisheries. This could be achieved with the re-introduction of the on-board scientific observer programme, which would also facilitate quantifying catches. There are still large gaps in our understanding of the life-history and ecology of this species, in particular age and growth and the location of neonates and other juveniles.

TAXONOMIC and IDENTIFICATION ISSUES

Previously all catsharks belonged to the family Scyliorhinidae, however this family was recently split into Pentanchidae and Scyliorhinidae, based on internal anatomy and molecular genetics. Only four of the 17 species of catsharks occurring in South African waters remain in the family Scyliorhinidae, one of which is *Scyliorhinus capensis*, the only member of the genus which occurs in South Africa. Its colour pattern of bright yellow-gold spots on a dark grey body with irregular blotches and saddles distinguishes it from all other local catsharks in both families (Bass *et al.* 1975b).

SOUTH AFRICAN DISTRIBUTION

Scyliorhinus capensis is common on the west and south coasts from the Orange River Mouth to Algoa Bay, but more so on the south coast east of Cape Agulhas (van der Heever *et al.* 2023). It also occurs infrequently further north along the east coast, with a single record from KZN (Bass *et al*. 1975b; Ebert *et al*. 2021a). It is a faunal associate with the more common and smaller *Holohalaelurus regani* (Compagno *et al*. 1991).

REGIONAL DISTRIBUTION

Scyliorhinus capensis is a regional endemic with records from southern Namibia (Compagno *et al*. 1991).

SYNOPSIS OF RESEARCH

Scyliorhinus capensis is a fairly well-studied species. Bass *et al.* (1975b) provided morphometrics and some life-history information from some 15 specimens, with few mature individuals. Compagno *et al.* (1991) reported on the distribution of individuals caught in research trawl surveys between 1986 and 1990 on the west coast and in Namibia; Ebert *et al.* (1996) examined the stomach contents of 81 of these individuals. Ebert *et al.* (2006) documented aspects of the reproductive biology. Human *et al.* (2006) described the phylogenetic relationships among members of the families Scyliorhinidae and Pentanchidae, including *S. capensis.* Soares and De Carvalho (2019) provided a global overview of the taxonomy and morphology of members of the genus *Scyliorhinus,* with some additional information on life-history. Van der Heever *et al.* (2020) documented spatial and ontogenetic variability in the diet and trophic ecology of this species and the smaller faunal associate *Holohalaelurus regani.* Van der Heever *et al.* (2023) investigated the distributions and associations of these two species. *S. capensis* was ranked eighth out of 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

This species occurs at depths of 25–500 m (Compagno *et al.* 1989), but this has been increased to 25–700 m (Pollom *et al.* 2020h). It has been recorded in shallow water in Table Bay and False Bay, but during research trawl surveys conducted between Cape Agulhas and Walvis Bay, Namibia it was collected on the outer shelf and uppermost slope at 155-500 m, with most records at 200–400 m (Compagno 1991).

Habitat: Adults

Adults occur on soft and rocky substrates, although they are most typically found on rocky reefs (Pollom *et al.* 2020h)

Habitat: Juveniles/Nursery Grounds

The noticeable absence of neonates from research trawls suggests that they occupy other areas, possibly moving up in the water column (Ebert *et al.* 2006).

Synopsis of tag deployments

This species has not been tagged.

Movements

Nothing is known about the movements of this species.

Diet/feeding: Adults

Scyliorhinus capensis is a generalist feeder, ingesting a wide variety of prey. On the south and west coasts, teleosts were the most important prey category, followed by crustaceans, with cephalopods and polychaetes occurring infrequently. There was an ontogenetic shift in diet. Larger individuals (>50 cm) consumed larger fish such as pilchard *Sardinops sagax,* horse mackerel *Trachurus capensis,* dragonet *Paracallionymus costatus* and round herring *Etrumeus whiteheadi* (Ebert *et al.* 1996). Bass *et al.* (1975b) reported that *Scyliorhinus capensis* consumed teleosts and crustaceans in nearly equal proportions, but with no comment on any size-related change in diet other than an ontogenetic change in dentition; most of their sample was from the Algoa Bay area. A recent study combined stomach content analysis with stable isotope analysis (van der Heever *et al.* 2020) and found that cephalopods and crustaceans were the most important prey items, with the occasional teleost. There were no significant size-related differences in the diet.

Diet/feeding: Juveniles
Bass *et al.* (1975b) reported an ontogenetic change in dentition. On the south and west coasts, smaller individuals (< 50 cm) fed primarily on anchovy *Engraulis capensis* and cuttlefish *Sepia australis* (Ebert *et al.* 1996). Van der Heever *et al.* (2020) reported no significant size-related differences in the diet.

South African toxicological studies
No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Unknown
GESTATION	Unknown
LITTER SIZE	2
PUPPING/NURSERY GROUND	Unknown
LENGTH AT BIRTH	25–27 cm
LENGTH AT MATURITY	F: 76 cm; M: 83 cm TL
MAXIMUM LENGTH	122 cm TL
GENERATION LENGTH	Unknown, inferred at 25 years from *Galeus sauteri*

Mode
Scyliorhinus capensis exhibits single oviparity, with one egg case found in each uterus (Ebert *et al.* 2006).

Duration of reproductive cycle
This is unknown.

Mating season and location
This is unknown. Bass *et al.* (1975b) reported the presence of one egg case in each uterus of three females. Another three females with a single egg case present in each uterus were all sampled in winter (Ebert *et al.* 2006).

Gestation
This is unknown.

Litter size
This is two, based on the presence of a single egg case in each uterus (Bass *et al.* 1975b, Ebert *et al.* 2006), but the frequency of egg deposition is unknown.

Size at birth
This is 25–27 cm TL. Bass *et al.* (1975b) found specimens of 30–31 cm had visible umbilical scars.

Pupping season and nursery ground
This is unknown. Neonates were noticeably absent in research trawl surveys on the south and west coasts (Ebert *et al.* 2006).

Length at maturity
Length at 50% maturity for females is 76 cm TL and for males 83 cm TL (Ebert *et al.* 2006).

Maximum length
This is 122 cm (Compagno *et al.* 1989).

Age and growth
No age and growth studies have been undertaken.

Generation length
This is unknown as age-at-maturity and maximum age are unknown. Catsharks are difficult to age, and the most reliable age estimates are from the blacktip sawtail catshark Galeus sauteri, which has an age-at-maturity of 9 years and a maximum age of 21 years, resulting in a generation length of 15 years (Liu *et al*. 2011, cited by Pollom *et al.* 2020h). *G. sauteri* is smaller than *S. capensis* (48 cm vs 112 cm TL) and, based on scaled-size, the generation length for *S. capensis* is inferred as 25 years (Pollom *et al.* 2020h).

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *S. capensis* was estimated from DFFE records at 1–10 tons for two time periods, 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). In the first period only the demersal trawl fishery was listed as a known catch source; the demersal longline and commercial line fisheries were listed as possible catch sources (da Silva *et al.* 2015). In the second period the demersal trawl, commercial and recreational linefisheries and rock lobster fishery were listed as the major sources of catches (DFFE 2022).

SA catch quantities and characteristics
Demersal trawl fishery
In 2006 the total catch of *S. capensis* was estimated to be 92 t in the trawl fishery, all of which is discarded (Petersen *et al.* 2008). The species has a likely low post-release mortality (Pollom *et al.* 2020h) but this is only if released quickly, which is unlikely, given the time taken to sort the catches. Also, the larger offshore vessels macerate all of the unwanted bycatch before discarding to minimise interaction with, and possible mortality of sea birds.

Demersal longline fishery
Scyliorhinus capensis was the third most common elasmobranch caught in the demersal longline fishery, with a total estimated catch of 25 t in 2006. Most individuals were alive when hauled on board, but discarded dead, due to fatal injury in the line rollers and the long time spent on deck or in the hauling basin (Petersen *et al.* 2008).

Fishing outside South Africa
Scyliorhinus capensis was reported as a minor bycatch of hake trawl research surveys in 2010 in Namibia (Kainge *et al*. 2010, cited by Pollom *et al.* 2020h). Some parts of southern Namibia are remote and may offer refuge from fishing pressure (Belhabib *et al.* 2015, cited by Pollom *et al.* 2020h).

Population trends
There are no estimates of population size for this species. Relative biomass indices, based on catches in both the demersal trawl and demersal longline fisheries, increased from 1986 until 2000, but declined between 2000 and 2007 (Petersen *et al.* 2008). Trends in research trawl surveys in fished areas over 27 years (1991–2017) indicate a population reduction of 58% over the past three generation lengths (75 years), although there was a high level of uncertainty in this estimate. Analyses of additional trawl and longline surveys in South Africa revealed a reduction in biomass of 44–50% from 2000–2007, although gear changes during that period reduce the certainty that these estimates reflect a change in actual abundance. Some of the estimated population reduction in both

of the surveys is possibly a result of an increase in the depth range of *S. capensis* associated with climate change that may have moved some of the species' distribution away from the fishing grounds. Based on all the above, it is estimated that *S. capensis* has undergone a population reduction of 20–29% over the past three generations (75 years) due to actual levels of exploitation (bycatch), and it was assessed as Near Threatened, nearly meeting Vulnerable A2bd in 2019 (Pollom *et al.* 2020h).

ECOTOURISM
As it occurs only in deep water, it is not regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It is uncertain as to the level of protection this species will derive from the offshore MPAs within its range.

Additional local comment
Its habitat preference for rocky reefs may provide this species with some refuge from trawling. As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is prohibited outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

It is difficult to reconcile the 2006 catch estimates for *S. capensis* of 92 tons in the demersal trawl fishery and 26 tons in the demersal longline fishery (Petersen *et al.* 2008) with the total estimated annual catch of 1–10 tons for the periods 2010–2012 and 2013–2019 from DFFE records (da Silva *et al.* 2015 and DFFE 2022). In both cases the total catch is the result of extrapolation from a relatively small base.

IUCN Red List Status
Near Threatened 2019

Previous IUCN assessments
Near Threatened 2004
Near Threatened 2000

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
None.

MANAGEMENT CONSIDERATIONS

Catches of *S. capensis* in both the demersal trawl and demersal longline fisheries are discarded. While efforts to ensure the survival of at least some individuals should be encouraged, the emphasis in any commercial operation is to first process the targeted catch. There is also the MSC requirement to minimise any deleterious interactions with seabirds. This is achieved by macerating all discarded bycatch and discharging it below the waterline. As a result, there is likely to be zero survival of bycatch. Accurate identification to species level of all catsharks caught in the various fisheries sectors is needed. It is therefore essential that the at-sea scientific observer program be re-established. This will also enable the collection of quantitative estimates of all catches of chondrichthyans and all discarded species. It is imperative that the current trawl footprint, which is ringfenced, continues to be regulated and is not expanded. The discrepancies in relatively recent catch estimates, as stated above, should be reconciled.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

There are still major gaps in the current state of knowledge of the life-history, reproductive biology and ecology of this regional endemic. In particular, nothing is known of the age, growth and longevity, or the whereabouts of the neonates. *S. capensis* was ranked eighth out of 60 South African demersal chondrichthyan species, which were prioritised for further research.

FAMILY TRIAKIDAE

Mustelus mosis - Hardnose smoothhound / Arabian smoothhound

SCIENTIFIC NAME	*Mustelus mosis* Hemprich and Ehrenberg, 1899
COMMON NAME	Hardnose smoothhound/Arabian smoothhound
FAMILY	Triakidae
ENDEMIC	No, widespread in Indian Ocean
SIZE RANGE	23–150 cm TL
SA DISTRIBUTION	East coast: Mozambique border to about Durban
HABITAT	Demersal on sand bottoms, occasionally associated with coral reefs
DEPTH RANGE	0–250 m
MAJOR FISHERIES	KZN inshore crustacean trawl, recreational linefishery
IUCN STATUS	Near Threatened 2018
CITES	Not listed
MLRA	Slot limit of 70–130 cm TL in demersal longline and commercial line fisheries; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	BQ Mann

SPECIES SUMMARY and RECOMMENDATIONS

Mustelus mosis is a medium-sized, demersal shark found close inshore and out to the upper slope along the northern part of the east coast. Local average annual catch was estimated at 1–10 tons from DFFE records for two time periods: 2010–2012 and 2013–2019, largely from the now-closed KZN inshore prawn trawl fishery. It is also caught by the recreational and commercial linefishery, but in relatively small numbers. Catch records are generally reported as houndsharks *Mustelus* spp., which include *M. mustelus* and *M. palumbes*; both species are more common in cooler waters of the south and west coasts. *M. mosis* was globally assessed as Near Threatened on the IUCN Red List in 2018. The historically high catches of primarily juveniles, including neonates, in the KZN inshore prawn trawl fishery indicates that the uThukela Banks is an important location for this species. Large parts of these trawling grounds have been incorporated into the uThukela MPA. Improved identification of catches of *Mustelus* spp. to species level is needed in all fisheries. There are large gaps in the current knowledge of the life-history and ecology of this species. This includes age and growth and several aspects of the reproductive cycle.

TAXONOMIC and IDENTIFICATION ISSUES

The taxonomy and identification of members of the genus *Mustelus* in South African waters, like many other regions, is very convoluted and confused. This is due to poorly chosen characteristics separating species, the misidentification of local species, and the discovery of new or previously unknown species. This problem was recognised by Bass *et al*. (1975c) who excluded *Mustelus* from their comprehensive survey of the sharks of the east coast of southern Africa because of the confused taxonomic situation in the genus. This situation persists, and Ebert *et al.* (2021a) recommended that local synonymy for each of the species occurring in South Africa should be treated with caution until a more thorough study has been undertaken. Three members of this genus are currently recognised as occurring in South Africa, *M. mosis, M. mustelus* and *M. palumbes.* They are morphologically very similar and catches are aggregated as *Mustelus* spp. in most fisheries. *M. mosis* has a tropical distribution which has little overlap with the other two species. It lacks spots and sometimes has pale tips to some fins. Adults have a hard, bone-like projection in the snout, which is easily felt and is absent in the other two species (Compagno *et al.* 1989). Van der Elst (1981)

tentatively identified this species as *Mustelus canis*, a NW Atlantic species, but subsequently corrected this to *M. mosis* (van der Elst 1988).

SOUTH AFRICAN DISTRIBUTION
Mustelus mosis occurs along the northern part of the east coast from the Mozambique border to about Durban (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION
Mustelus mosis also occurs from Mozambique through to Kenya (Ebert *et al.* 2021b). There is also a northern population from Djibouti into the Red Sea and eastwards to India and Sri Lanka (Pollom *et al.* 2018). It is the only *Mustelus* in much of its range (Ebert *et al.* 2021b).

SYNOPSIS OF RESEARCH
The local population has been poorly studied with no dedicated research conducted locally. Most of what is known about *M. mosis* is from the northern population, see Moore *et al.* (2016). It was reported as a common bycatch species in the inshore KZN prawn trawl fishery (Fennessy 1994). McKinney *et al.* (2016) investigated the trophic ecology and muscle mercury content of this species and several other large pelagic sharks from KZN coastal waters. *Mustelus mosis* was ranked 12th out of the 22 South African coastal chondrichthyan species which were prioritised for further research (da Silva *et al.* 2023).

ECOLOGY
Depth
This demersal species occurs over a wide depth range of 20–250 m (Pollom *et al.* 2019i). This depth range must be expanded to 0–250 m, as it is occasionally caught in the surf zone by shore anglers along the KZN north coast (van der Elst 1981, 1988).

Habitat: Adults
Adults are generally found on sand and other soft substrates, but they may occur in association with coral reefs (Ebert *et al*. 2021b).

Habitat: Juveniles/Nursery Grounds
A high percentage of juveniles, including neonates, were caught in the KZN inshore prawn trawl fishery on the uThukela Banks (Fennessy 1994). There were no neonates tagged by KZN shore anglers (ORI Cooperative Fish Tagging Project, unpublished data).

Synopsis of tag deployments
A total of 609 individuals have been tagged in the ORI Cooperative Fish Tagging Project, but there is much confusion with *M. mustelus*, a species commonly caught by shore anglers on the lower KZN south coast. By restricting the tagging data to all catches north of Durban, where the species tagged is most likely to be *M. mosis*, there have only been 60 individuals tagged, with a single recapture. This particular shark was recaptured 40 km south of its original tagging location after eight months at liberty. Catches of tagged individuals were highest in the Mtunzini and Port Durnford area (ORI Cooperative Fish Tagging Project, unpublished data).

Movements
There is insufficient information from tag-recaptures to determine movement patterns. Tagged sharks were caught throughout the year, with a peak in the cooler months, suggesting possible offshore movement into deeper water in summer.

Diet/feeding: Adults
The diet comprises crustaceans, molluscs and small teleosts (van der Elst 1981).

Diet/feeding: Juveniles
It is not known if the diet differs from that of adults.

South African toxicological studies
One toxicological study has been conducted on this species in South Africa, using specimens caught in the KZN bather protection nets. Levels of total mercury in the muscle tissue of five individuals (120–125 cm TL) were by far the lowest of the 17 species sampled and fell well below the regulatory guidelines for the protection of human health. Almost all the other species sampled were larger, pelagic species, with very different diets (McKinney *et al.* 2016).

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown; 1 year (Arabian Gulf)
MATING	Summer
GESTATION	1 year; about 6 months (Arabian Gulf)
LITTER SIZE	About 13; 2–16 (Arabian Gulf)
PUPPING/NURSERY GROUND	Summer
LENGTH AT BIRTH	23-30 cm TL
LENGTH AT MATURITY	F: ~73 cm TL; M: 65–78 cm TL (Arabian Gulf)
MAXIMUM LENGTH	150 cm TL
GENERATION LENGTH	11 years, inferred from *M. canis*

Mode
Mustelus mosis exhibits lecithotrophic viviparity in which embryos are dependent on the nourishment supplied by the yolk-sac.

Duration of reproductive cycle
Nothing is known locally about the reproductive cycle. In the Arabian Gulf, available data suggested an annual reproductive cycle, with a gestation of approximately 6 months, allowing the females a recovery period of about 6 months (Moore *et al.* 2016).

Mating season and location
Mating is thought to occur in summer (van der Elst 1988). As there is no known mating location, it is assumed that adult's mate where they occur. In the Arabian Gulf mating is in autumn (Moore *et al.* 2016).

Pupping season and nursery grounds
Young are born in summer after a 1-year gestation (van der Elst 1988). Juveniles, including neonates, have been caught in the now-closed inshore prawn trawl fishery on the uThukela Banks (Fennessy 1994), suggesting that this may be an important nursery area. In the Arabian Gulf, pupping occurs in spring after mating the previous autumn (Moore *et al.* 2016).

Gestation
Locally gestation is thought to be approximately 1 year (van der Elst 1988). In the Arabian Gulf, it is about 6 months, based on mating in autumn and pupping the following spring (Moore *et al.* 2016).

Litter size
Locally the litter size is about 13 (van der Elst 1988). In the Arabian Gulf, it is 2–16, based on five pregnant females (Moore *et al.* 2016).

Size at birth
Size-at-birth is 23–30 cm TL (van der Elst 1988).

Length at maturity
No local information is available, but in the Arabian Gulf females mature from ~73 cm TL and males at 65–78 cm TL (Moore *et al.* 2016).

Maximum length
Mustelus mosis reaches a maximum size of 150 cm TL (van der Elst 1988, Compagno *et al.* 1989). In the Arabian Gulf no individuals larger than 100 cm TL were sampled (Moore *et al*. 2016).

Age and growth
No age and growth studies have been successfully undertaken. Vertebral ring counts of individuals from the Arabian Gulf population failed due to the lack of clarity of the band pairs (Moore *et al*. 2016).

Generation length
As no age or growth data are available for this species, generation length was inferred as 11 years, based on *Mustelus canis* from the NW Atlantic, which has a similar latitudinal distribution and maximum size (Conrath *et al*. 2002, cited by Pollom *et al.* 2019i).

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *M. mosis* was estimated from DFFE records at 1–10 tons for two time periods: 2010–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022), with suspected catches in the commercial and recreational linefisheries (da Silva *et al*. 2015).

SA catch quantities and characteristics
KZN inshore prawn trawl fishery
Mustelus mosis was present in 17% of trawls in the period 1989–1992, with estimated annual catches ranging from 727–1371 individuals. Catches were significantly higher in shallow water (20–33 m), compared to deep water (33–45 m), with no difference between summer (December-May) and winter (June–November). The survival rate of the discarded catch was found to be 71%, based on a sample of 14 individuals. The size range, based on a sample of 77 individuals, was 30–120 cm, with a mean of 50 cm; there were very few adults but a large number of juveniles, including neonates (Fennessy 1994). This fishery was dormant for nearly two decades due to the extended closure of the mouth of Lake St Lucia, resulting in poor prawn recruitment and diminishing prawn catches on the uThukela Banks. The inshore fishing grounds were subsequently formally closed to trawling following the declaration of the uThukela MPA in August 2019.

Recreational linefishery
Mustelus mosis is caught by both shore and boat anglers throughout the year, especially in autumn (van der Elst 1988). Catches in the competitive shore angling sector comprised nearly 3500 individuals (145 per annum) with a total weight of 18 500 kg (mean 5 kg) in the period 1977–2000. However, catches were expressed as unidentified houndsharks *Mustelus* spp. (Pradervand *et al.* 2007) and may well have included *M. mustelus*, which is primarily caught on the KZN lower south coast.

In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential effects on coastal elasmobranch species (Winkler *et al.* 2025). In the SASSA National data (2011-2023), which represents 26 different localities between Varkenvlei on the West Coast and Noggies in Northern KwaZulu-Natal, it was found that *Mustelus mosis* was the 17th most commonly captured species with an average CPUE of 0.005, while in the SAASA-KZN dataset, where locations are fished in KZN and the northern Eastern Cape, at 206 different locations between Kosi Bay and Xhora river mouth, this species was ranked 41st as the most common elasmobranch caught, at night (CPUE: 0.0006), respectively (Winkler *et al.* 2025).

Commercial linefishery

Catches in the KZN commercial linefishery are too low (Bryan Potgieter, commercial fisherman, Zinkwazi, pers. comm.) to make it viable to include *M. mosis* in exports of small demersal shark species, which include other *Mustelus* species and *Galeorhinus galeus* (da Silva and Bürgener 2007).

KZN bather protection programme

This species was an extremely rare catch in the KZN bather protection programme due to its small size, with a mean annual catch of 1 individual for the period 1981–1990 (Dudley and Cliff 1993).

Fishing outside South Africa

This species is captured in multiple gears (bottom trawls, gillnets, and line gear) and is retained for human consumption in most of its range. Inshore fishing pressure is generally intense within its range. It remains one of the dominant species in landings in parts of the North Indian Ocean (Pollom *et al.* 2019i).

Population trends

There are no estimates of population size for this species. Although it is regarded as a relatively productive species, it is suspected to have undergone a population reduction of 20–29% over the past three generations (33 years), based on levels of exploitation in largely unmanaged fisheries. Therefore, *M. mosis* was globally assessed as Near Threatened, nearly meeting the threshold for threatened under A2d, in terms of the IUCN Red List in 2018 (Pollom *et al.* 2019i). Much of the information used in this assessment was from the northern hemisphere.

ECOTOURISM

Although associated with coral reefs in other parts of its range, *M. mosis* is rarely, if ever, sighted by local scuba divers. It was not seen during a BRUV survey conducted within the iSimangaliso MPA between 2016 and 2017 (Martinez *et al*. 2024).

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

There is currently a bag limit of 1 per person per day for recreational anglers, with no bag limits for commercial fisheries. There are no closed seasons. A slot limit of 70–130 cm was recently introduced for all *Mustelus* spp. and *G. galeus,* in the demersal longline and the commercial linefishery. This is aimed at protecting the juveniles (born at about 30 cm) and the larger, more fecund adult females, although *M. mosis* rarely exceeds 120 cm and is not caught in sufficient numbers in the KZN commercial linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas (MPAs)
Two protected areas occur within its South African range, namely the iSimangaliso and uThukela MPAs. Given the high historical catches of juveniles, including neonates, in the now-closed inshore prawn trawl fishery on the uThukela Banks, this MPA appears to be important for this species.

Additional local comment
None.

IUCN RED List Status
Near Threatened 2018 A2d

Previous IUCN assessments
Data Deficient 2009

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
Mustelus mosis is not listed.

International comments
There are no specific management measures in place for *M. mosis* anywhere in its range (Pollom *et al.* 2019i).

Management considerations
Accurate identification of *Mustelus* species caught in all fisheries is imperative to improve the management of the three species present in South African waters. Any possible exploitation by commercial linefishers in the future must comply with the slot limits introduced to protect the other commercially exploited species of the family Triakidae.

Research requirements and opportunities
The biology and life-history of *M. mosis* has not been well-studied. Nothing is known of movement patterns, age and growth and several aspects of its reproduction, including the length of the gestation period and generation length and the whereabouts of any mating or pupping areas. *Mustelus mosis* was ranked 12th out 22 South African coastal chondrichthyan species which were prioritised for further research.

Mustelus palumbes – Whitespotted / Whitespot smoothhound

SCIENTIFIC NAME	*Mustelus palumbes* Smith, 1957
COMMON NAME	Whitespotted/Whitespot smoothhound
FAMILY	Triakidae
ENDEMIC	No, southern African endemic
SIZE RANGE	27–113 cm TL
SA DISTRIBUTION	East, South and West coasts: central KZN to Orange River mouth
HABITAT	Demersal on sand bottoms and rocky reefs
DEPTH RANGE	0-480 m, mostly deeper than 70 m
MAJOR FISHERIES	Demersal shark longline, demersal trawl
IUCN STATUS	Least Concern 2019
CITES	Not listed
MLRA	Current demersal trawl footprint is ringfenced; slot limits of 70–130 cm TL introduced into target fisheries
COMPILER	G Cliff
REVIEWER	RW Leslie and AE Bester-van der Merwe

SPECIES SUMMARY and RECOMMENDATIONS

Mustelus palumbes is a medium-sized, demersal shark found on the shelf and upper slope along almost the entire South African coast. It is a regional endemic which also occurs in Namibia and possibly southern Mozambique. Local average annual catch was estimated at 1–100 tons from DFFE records for the periods 2010-2012 and 2013–2019, largely from the demersal shark longline fishery and the offshore and inshore demersal trawl fishery. Catch records in these fisheries are generally reported as *Mustelus* spp., which include *M. mustelus*, a species that is far more common in shallower waters. Due to the different fishing depths of these fisheries, the bycatch is mainly *M. palumbes* in the trawl fisheries, and mainly *M. mustelus* in the longline fishery. *M. palumbes* was assessed as Least Concern on the IUCN Red List in 2018. The meat of *Mustelus* spp. is prized and South African catches are largely exported as fillets to Australia. The movement patterns of this species are unknown, so it is difficult to ascertain the degree of protection offered by any MPAs in its range. Slot limits of 70–130 cm, introduced for management of other Triakidae in the demersal shark longline and commercial linefishery, will benefit *M. palumbes.* Improved identification of catches in the demersal fisheries is critically needed, this could be addressed by the re-introduction of the on-board scientific observer programme, which would also facilitate quantifying catches. There are large gaps in the current knowledge of the life-history and ecology of this species. These include age and growth and several aspects of the reproductive cycle. The impact of some genetic structure found in the population needs to be investigated.

TAXONOMIC and IDENTIFICATION ISSUES

Taxonomy and identification of members of the genus *Mustelus* in South African waters and in many other regions is very convoluted and confused. This is due to poorly chosen characteristics separating species, misidentification of local species, and the presence of new or previously unknown species. This problem was recognised by Bass *et al*. (1975c), who excluded *Mustelus* from their comprehensive survey of the sharks of the east coast of southern Africa, because of the confused taxonomic situation in the genus at that time. According to Ebert *et al.* (2021a), this situation still persists, and they recommended that local synonymy for each South African species should be treated with caution until a more thorough study has been undertaken. Three species are currently recognised as occurring in South Africa, namely *M. mustelus*, *M. palumbes* and *M. mosis*. They are morphologically very similar and catches are aggregated as *Mustelus* spp. in most fisheries. Generally, *M. palumbes* can be easily separated from the other two species by its conspicuous white

spots, but in some individuals the spots are small and inconspicuous or absent. Its distribution along the South African coast overlaps extensively with that of *M. mustelus*, but *M. palumbes* tends to occur in water deeper than 70 m, whereas *M. mustelus* is more common shallower than 50 m (Compagno *et al*. 1991). The third South African species, *M. mosis,* only occurs on the east coast from Durban northwards.

SOUTH AFRICAN DISTRIBUTION

Mustelus palumbes occurs along most of the South African coast from central KZN on the east coast to the Orange River mouth (Ebert *et al.* 2021a)**.**

REGIONAL DISTRIBUTION

Mustelus palumbes also occurs in Namibia (Leeney 2024), where it was listed as frequent in research trawls between Lüderitz and the Orange River, but absent north of 27°S (Compagno *et al.* 1991). It is reported to occur in southern Mozambique (Compagno *et al.* 1991, Pollom *et al.* 2020d), but if its distribution on the South African east coast is restricted to central KZN southwards (Ebert *et al.* 2021a), its occurrence in Mozambique seems doubtful.

SYNOPSIS OF RESEARCH

Unlike its congener *M. mustelus*, *M. palumbes* has not been well studied. Smale and Compagno (1997) examined its life-history and diet. A dermal denticle identification guide and two molecular assays for species identification and comparative population genetics of southern African *Mustelus* and other members of the family Triakidae have been developed (Maduna 2017, Maduna *et al.* 2017). A recent study confirmed the species' phylogenetic placement within the aplacental white-spotted clade of the *Mustelus* genus (Maduna et al. 2020). The study also supports the recent diversification of the species, indicating a separate dispersal event from that of the sympatric *M. mustelus*. No other dedicated research has been conducted on this species. *Mustelus palumbes* was ranked 25th out of 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

Mustelus palumbes is a demersal species occurring over a wide depth range from the intertidal to the upper slope, 0–480 m (Pollom *et al.* 2020d, DFFE unpublished data). It is usually found in water deeper than 70 m and is most common at 100–300 m. On the west coast between St Helena Bay and the Orange River, this species is concentrated on the outer shelf and upper slope, but it ranges closer inshore during summer (Compagno *et al.* 1991). Although both sexes were found over the same depth range, the majority of males were taken between 100 and 180 m deep, whereas females were taken more often at 60–140 m (Smale and Compagno 1997).

Habitat: Adults

Mustelus spp. are active, strong swimming, epibenthic sharks, usually found over soft bottoms (Smale and Compagno 1997). Adults are generally found on sand and other soft substrates but may occur in association with rocky reefs.

Habitat: Juveniles/Nursery Grounds

Nothing is reported on the location of the neonates, although they were sampled by Smale and Compagno (1997).

Synopsis of tag deployments

There are no known tags on *Mustelus palumbes,* including within the ORI Cooperative Fish Tagging Project.

Movements
Nothing is known of its movements, however *M. palumbes* may range closer inshore during summer (Smale and Compagno 1997). Trawl catches often comprised individuals of similar size of one or both sexes in the same net. Aggregations of individuals were observed, which suggested schooling behaviour (Smale and Compagno 1997).

Diet/feeding: Adults
Smale and Compagno (1997) found that the diet of all size classes was dominated by a wide variety of crustaceans, with polychaetes, cephalopods and small teleosts being minor contributors. The size of some prey species increased with predator size. The teleost component of the diet increased in quantity and diversity with predator size, although Smale and Compagno (1997) noted that often only the heads were present and suggested that these teleosts may have been scavenged. The molariform dentition of this and other *Mustelus* spp. is suited to invertebrate prey and scavenged cephalopods and fish, not the capture of fast-swimming, slippery organisms. The composition of the diet was strongly influenced by the prey available in different habitats; prey diversity on the west coast was lower than on the south coast (Smale and Compagno 1997).

Diet/feeding: Juveniles
The diet is similar to the adults, eating small crustaceans and other benthic invertebrates, with a low incidence of teleost fishes and ommastrephid squids (Smale and Compagno 1997).

South African toxicological studies
No studies have been undertaken on *M*. *palumbes*, but high levels of methylmercury and arsenic were found in *M. mustelus* (Bosch *et al.* 2013, 2016).

REPRODUCTION

REPRODUCTIVE MODE	Aplacental but possibly matrotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Aseasonal
GESTATION	Unknown
LITTER SIZE	3-15, mean of 7
PUPPING/NURSERY GROUND	Aseasonal where they occur
LENGTH AT BIRTH	27-34 cm
LENGTH AT MATURITY	F: 80 cm TL; M: 75 cm TL
MAXIMUM LENGTH	F: 113 cm TL; M: 100 cm TL
GENERATION LENGTH	14 years, inferred from *M. walkeri*

Mode
The embryos are initially dependent on the nourishment supplied by the yolk-sac. Unlike *M. Mustelus, M. palumbes* is an aplacental species. Smale and Compagno (1997) reported that the yolk supply was exhausted when the embryos attained about 8 cm and the yolk sac was gradually absorbed. Thereafter there was no visible source of nutrition for the embryo until parturition at 27–34 cm. As a result, these authors suggested that there may be an alternative source of nutrients, possibly in the uterine fluid, that contributes to embryonic growth after yolk depletion.

Duration of reproductive cycle
Reproduction is highly aseasonal, with small and term embryos found in most months of the year thus the timing of reproductive cycles could not be established. The high proportion of non-pregnant adult females indicates that there may be a resting period between pregnancies (Smale and Compagno 1997).

Mating season and location
Mating is aseasonal, with very small embryos found in many months of the year (Smale and Compagno 1997). As there is no known mating location, it is assumed that adult's mate where they occur.

Pupping season and nursery grounds
Pupping is year-round (Smale and Compagno 1997), with no known nursery areas.

Gestation
The duration of the gestation period is unknown, due to the aseasonal pattern of embryo development (Smale and Compagno 1997).

Litter size
The litter size is 3–15, with a mean of 7. There was a positive relationship between female size and litter size (Smale and Compagno 1997).

Size at birth
Size at birth is 27–34 cm TL, based on the smallest free-swimming individuals of 27 cm TL and the largest embryos of 34 cm TL (Smale and Compagno 1997).

Length at maturity
Females mature from 80 cm TL and all were mature by 100 cm TL. The smallest pregnant female was 84 cm TL. Males mature from 75 cm TL and were all mature by 85 cm TL (Smale and Compagno 1997).

Maximum length
This is 113 cm TL for females and 100 cm TL for males (Smale and Compagno 1997).

Age and growth
No age and growth studies have been undertaken.

Generation length
As age-at-maturity and maximum age are unknown, these parameters are inferred from the congener Eastern spotted gummy shark *M. walkeri* which is of similar maximum size and depth range. This species has an age-at-maturity of 12 years and maximum age of 16 years, resulting in a generation length of 14 years (Rigby *et al*. 2016).

FISHERIES MANAGEMENT
SA catch sources
Local annual catch estimates from DFFE records were 1–100 tons for two periods: 2010-2012 (da Silva *et al*. 2015) and 2013-2019 (DFFE 2022). The bulk of the catch was taken in the demersal trawl fishery, followed by the demersal shark longline fishery and beach seine and gillnet fishery. It is a suspected catch in the commercial and recreational linefisheries (da Silva *et al*. 2015). The demersal shark trade in southern Africa is primarily concentrated on five species. They are, in order of commercial importance: *Mustelus mustelus*, *Galeorhinus galeus*, *Carcharhinus brachyurus*, *Carcharhinus obscurus* and *M. palumbes.* Most of these catches are exported to Australia (da Silva and Bürgener 2007). Post-release mortality for *Mustelus* species tends to be low (<2%) in line fisheries and moderate (25–60%) in trawl and gillnet fisheries (Ellis *et al*. 2017).

SA catch quantities and characteristics
Demersal shark longline fishery
The demersal shark longline fishery is the only fishery that directly targets sharks. *Mustelus* spp. were a common catch (da Silva *et al*. 2015), ranging from zero up to 4 tons dressed weight per annum

for the period 2000–2005 (da Silva and Bürgener 2007). This catch is probably mainly *M. mustelus*, because this fishery is active in shallow inshore waters where this species is far more common than *M. palumbes*.

Demersal trawl fishery
The inshore and offshore trawl fisheries target largely shallow-water *Merluccius capensis* and deep-water Cape hakes *Merluccius paradoxus*, respectively. Together they land over 1 500 tons of chondrichthyans, with dogfish (Squalidae), *G. galeus*, *M. palumbes*, *Callorhinchus capensis* and skates (Rajiformes) comprising the majority of the cartilaginous bycatch (da Silva *et al*. 2015).

The inshore trawl fishery is based at Mossel Bay and Gqeberha and operates between Cape Agulhas and Port Alfred. Booth and Hecht (1998) list both *M. mustelus* and *M. palumbes as* common in the catch of inshore trawlers based at Gqeberha.

The offshore component operates from the Orange River to Port Alfred, fishing deeper than 200 m west or deeper than 110 m east of Cape Agulhas (Durholtz *et al.* 2015 and references therein). Given their fishing depth, most or all of the *Mustelus* bycatch will be *M. palumbes*.

Beach seine and gillnet fisheries
The beach seine fishery which is distributed primarily on the west coast from Port Nolloth to False Bay, catches *Mustelus* spp., but is prohibited from retaining them in most regions. It is highly likely that almost all this catch is *M. mustelus*, given its shallow water habitat.

Recreational linefishery
In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential effects on coastal elasmobranch species (Winkler *et al.* 2025). In the SASSA National data (2011-2023), which represents 26 different localities between Varkenvlei on the West Coast and Noggies in Northern KwaZulu-Natal, it was found that *Mustelus palumbes* was the fifth most commonly captured species with an average CPUE of 0.1, while in the RASSPL dataset, which represents 73 different fishing locations between Rietfontein on the West Coast and Haga Haga in the Eastern Cape, *M. palumbes* was the 19th most commonly caught elasmobranch with a CPUE of 0.001 (Winkler *et al.* 2025).

Fishing outside South Africa
In Namibia, *M. palumbes* is taken as bycatch in the demersal trawl, line and gillnet fisheries. It is also caught by recreational anglers and has been used as live bait for larger sharks, a practice which is strongly discouraged (Leeney 2024). Fishing pressure is suspected to be lower in Namibia, and although fishing pressure is likely to be intense in Mozambique, this only represents a small portion of its range (Pollom *et al.* 2020d).

Population trends
There are no estimates of population size for this species. A population genetic study indicated possible inter-oceanic genetic structure across the Atlantic/Indian Ocean boundary (Maduna *et al.* 2017). Population trend data from research trawl surveys in fished areas off South Africa over 27 years (1991–2017) indicate a population increase over the past three generation lengths (42 years). Overall, due to the estimated increase in population in South Africa, which represents most of its range, but acknowledging some possible intense fishing pressure in a small part of the range, the population trend appears to be stable over the past three generation lengths (42 years). As a result,

M. palumbes was not suspected to be close to reaching the population decline threshold, and it was assessed as Least Concern in terms of the IUCN Red List in 2019 (Pollom *et al.* 2020d).

ECOTOURISM
Given that it is primarily found in deep water, *M. palumbes* is not regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
There is currently a bag limit of 1 per person per day among recreational anglers, with no bag limits for commercial fisheries. There are no closed seasons. A slot limit of 70–130 cm was recently introduced for *M. mustelus* and *G. galeus* in the demersal longline and the commercial linefishery, but the legislation also applies to *M. palumbes*. This is aimed at protecting the juveniles, which are born at about 30 cm, and the larger, more fecund adult females, although *M. palumbes* does not exceed 115 cm. Larger individuals of *Mustelus mustelus*, especially the males, have mercury levels which exceed the maximum limit for human consumption (Bosch *et al.* 2013), but no local toxicological studies have been undertaken on *M. palumbes*. As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint in South African waters has been ringfenced. This has been formalised and is implemented in the trawl permit regulations. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas (MPAs)
A number of protected areas occur across its range. The coastal MPAs are probably of limited value to this species, which is more common in waters deeper than 70 m. The network of offshore MPAs will cover more suitable habitat, but these sharks are probably wide-roaming so may not remain within the MPA network.

Additional local comment
An increase in the offshore MPA network is planned, including an enlargement of the Agulhas Bank MPA (Kerry Sink, South African National Biodiversity Institute, pers. comm.).

IUCN RED List Status
Least Concern 2019

Previous IUCN assessments
Data Deficient 2006

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
Mustelus palumbes is not listed.

Convention on Migratory Species (CMS)
Mustelus palumbes is not listed.

International comments
There are no specific management measures in place for this species elsewhere in southern Africa. Fishing pressure is suspected to be minimal in the Namibian portion of its range (Pollom *et al.* 2020d).

Management considerations

Accurate identification of *Mustelus* species caught in the demersal fisheries is imperative to improve management of both *M. palumbes* and *M. mustelus.* The decline in the more valuable teleost stocks, has forced linefishers to target this and other shark species. Slot limits have been introduced for all members in the family Triakidae, including *M. palumbes,* to decrease catches in the demersal shark longline and commercial linefishery, which account for more 75% of landings. These limits of 70–130 cm were chosen to protect the newborns, and, more importantly, the fecund adult females, while also avoiding the largest individuals which have the highest mercury loads. However, the upper slot limit will be of no benefit for *M. palumbes* as the maximum size is 113 cm. It is imperative that the current footprint of the trawl fishery, which is ringfenced, remains so.

Research requirements and opportunities

The biology and life-history of this species has not been well-studied. Nothing is known of movement patterns, age and growth and several aspects of reproduction, including the length of the gestation period and generation length and the whereabouts of any mating or nursery areas. *Mustelus palumbes* was ranked 25th out of 60 South African demersal chondrichthyan species, which were prioritised for further research.

Triakis megalopterus - Spotted gully shark

SCIENTIFIC NAME	*Triakis megalopterus* (Smith, 1839)
COMMON NAME	Spotted gully shark
FAMILY	*Triakidae*
ENDEMIC	No, also found in Namibia and southern Angola
SIZE RANGE	42–208 cm TL
SA DISTRIBUTION	East, South and West coasts: Coffee Bay to Orange River mouth
HABITAT	Demersal on sand bottoms and rocky reef areas in coastal waters
DEPTH RANGE	0-30 m; often in the surf zone
MAJOR FISHERIES	Recreational linefisheries
IUCN STATUS	Least Concern 2019
CITES	Not listed
MLRA	No retention permitted in commercial or small-scale linefisheries, demersal shark longline or beach seine fisheries; daily bag limit of one individual per person in recreational fishery
COMPILER	G Cliff
REVIEWERS	BQ Mann, TS Murray and AE Bester-van der Merwe

SPECIES SUMMARY and RECOMMENDATIONS

Triakis megalopterus is a medium-sized, demersal shark found in cooler coastal waters along much of the South African coast. It is a regional endemic, also found in Namibia and southern Angola. The local average annual catch was estimated at 1–10 tons from DFFE records for two time periods: 2010–2012 and 2013–2019, largely from the recreational and commercial linefisheries, with a very small component taken in the demersal trawl fishery. This species was decommercialised in 2005, which legislated against any retention in commercial catches. Despite this, it is occasionally mistaken for one of the members of the genus *Mustelus*, which are heavily fished by the demersal longline and commercial linefishery sectors. It was assessed globally as Least Concern in 2019, largely as a result of the low retention rate and likely high survival rates in the recreational linefishery. A late age-at-maturity and low reproductive output necessitates close monitoring of catch trends. This largely resident species appears to derive good protection from the network of coastal MPAs in its range. More information is needed on mating and nursery areas. Monitoring of catches by competitive shore anglers must continue and further analysis of these catch records must be undertaken to improve our knowledge of this important angling species.

TAXONOMIC and IDENTIFICATION ISSUES

Triakis and *Mustelus* were previously combined, as the two genera proved difficult to separate using external morphological features. Compagno (1973, cited by Bass *et al.* 1975c) redefined the family Triakidae, and provided a key to differentiate the genera. Bass *et al.* (1975c) listed two species of *Triakis* in southern Africa, but acknowledged the possibility that *T. natalensis*, known only from two immature specimens taken on the east coast, may be young *T. megalopterus*. The two species were separated by tooth shape, with *T. megalopterus* having a single prominent cusp, while those of *T. natalensis* are tricuspid. Compagno (1984b) confirmed that the latter represent the juvenile form of *T. megalopterus* and stated that this species is the only representative of the genus in the region. It may be confused with the three local members of the genus *Mustelus*, although *T. megalopterus* has a larger body and fins. In addition, most individuals are grey-bronze with small, but prominent black spots; small juveniles and some adults may lack spots, which is the primary reason for confusion with *Mustelus* species (Compagno *et al.* 1989). A recent phylogenomic study of the Triakidae family has shown that the *Mustelus* genus should be expanded to incorporate *Triakis megalopterus*, where it falls within the aplacental clade (Winn *et al*. 2024).

SOUTH AFRICAN DISTRIBUTION

Triakis megalopterus occurs along much of the South African coast but is extremely rare in KZN waters. It is most common on the west and south coast and the southern part of the east coast as far north as Coffee Bay (Bass *et al.* 1975c, Compagno *et al*. 1989).

REGIONAL DISTRIBUTION

Triakis megalopterus also occurs in Namibia and southern Angola (Compagno *et al.* 1989; Penrith 1978, cited by Smale and da Silva (2013)).

SYNOPSIS OF RESEARCH

Triakis megalopterus is well studied in South Africa, as it is frequently caught by recreational shore anglers, thereby providing a very accessible source of study material. Goosen (1997) investigated age, growth and reproduction. Smale and Goosen (1999) investigated reproduction and feeding. Smale and da Silva (2013) provided an overview of its life-history and fisheries details. Soekoe (2016) documented regional population structure using genetics, while Maduna *et al.* (2017) investigated genetic differentiation across the Indian/Atlantic Ocean boundary. *T. megalopterus* was included in a DNA barcoding study of South African chondrichthyans (Kuguru *et al*. 2018). Soekoe *et al*. (2022) examined tooth morphology in relation to regional differences in diet. Cottrant *et al.* (2023) investigated spatial and social networks using acoustic telemetry. Tag-recapture data was used to determine movement and growth (Mann *et al*. 2024). The species' mitogenome was assembled and included in a comprehensive phylogenetic study of the family Triakidae (Winn *et al*. 2024). A study investigating residency, site affinity and coastal movements using acoustic telemetry is currently underway (Cottrant *et al*. in prep). *T. megalopterus* was ranked 16th out 22 South African coastal chondrichthyan species prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

This demersal species inhabits shallow coastal sandy areas and rocky reefs down to a depth of 30 m, but usually occurs in water shallower than 10 m, most often in the surf zone (Smale and Goosen 1999).

Habitat: Adults

Adults prefer rocky reefs in and just beyond the surf zone and may penetrate estuaries and other marine inlets (Smale and da Silva 2013).

Habitat: Juveniles/Nursery Grounds

Juveniles are also found on shallow, rocky reefs (Smale and da Silva 2013).

Synopsis of tag deployments

A total of 7211 individuals were tagged (ORI Cooperative Fish Tagging Project 1984-2021 inclusive) with 657 (9%) recaptures. Mean distance travelled was 31 km; mean time at liberty 1.5 years (max: 911 km and 17.3 years) (Mann *et al.* 2024). Acoustic telemetry tags were surgically inserted into 25 individuals (76–176 cm TL) caught on the south coast (Cottrant *et al.* 2023). A further nine (104–167 cm TL) have been acoustically tagged: five in False Bay and four in Algoa Bay (ATAP, unpublished data).

Movements

This species is regarded as mostly resident, with 67% of recaptures displaying philopatric behaviour; adults did move significantly further than juveniles (Mann *et al*. 2024). A recent acoustic telemetry study revealed that individuals exhibited non-random movements, with patterns of spatial segregation by sex, along with co-occurrence between individuals (Cottrant *et al.* 2023). There were seasonal shifts in residency along the south coast, with higher residency in False Bay during late

summer/early autumn (February-April), in the Overberg region in autumn/early winter (April-June), and in Mossel Bay during autumn (March-April) and spring (August-October) (ATAP, unpublished data).

Diet/feeding: Adults
In individuals from the south coast, the diet was dominated by reef-associated species, largely in the form of brachyuran crustaceans, cephalopods and teleosts. Prey changed with increasing size in that larger sharks ate more vertebrates, especially teleosts (Smale and Goosen 1999). Soekoe *et al.* (2022) investigated the role of ontogenetic changes in dentition in shaping feeding patterns and regional variation in diet. Teleosts, crustaceans and molluscs constituted the major prey, but in Angola, teleosts were the dominant prey in all size classes, while individuals in the Western Cape feed almost exclusively (98%) on west coast rock lobster *Jasus lalandi.*

Diet/feeding: Juveniles
On the south coast, juveniles fed mainly on rock crabs *Plagusia chabrus* (Smale and Goosen 1999). Soekoe (2016) also documented ontogenetic changes in diet, with juveniles feeding largely on hard-shelled crustaceans, rather than the softer-bodied cephalopods and teleosts ingested by larger individuals.

South African toxicological studies
No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	2–3 years
MATING	Spring and early summer (October–December)
GESTATION	19–21 months
LITTER SIZE	5–15, average 10
PUPPING/NURSERY GROUND	Autumn–winter (May–August); inshore waters
LENGTH AT BIRTH	42–45 cm TL
LENGTH AT MATURITY	F: 145 cm; M: 132 cm TL
MAXIMUM LENGTH	F: 208 cm; M: 152 cm TL
GENERATION LENGTH	20 years

Mode
Triakis megalopterus exhibits lecithotrophic viviparity, in which embryos are dependent entirely on the nourishment supplied by the yolk-sac.

Duration of reproductive cycle
Reproduction is seasonal, with either a two- or three-year cycle. The wide range of embryo sizes throughout the year was taken as evidence of a 19–21-month gestation. Some females with term embryos showed no sign of egg enlargement, indicating that they have an extended rest period between pregnancies, hence the three-year cycle; others were found with large ovarian eggs and, therefore, appeared capable of mating soon after giving birth (Smale and Goosen 1999).

Mating season and location
On the basis of embryo growth rates, mating and fertilisation probably occur from about October to early December (Smale and Goosen 1999). No specific mating locations have been identified.

Pupping season and nursery grounds
Pupping is probably in late autumn through to winter (late May-August) (Smale and Goosen 1999). Concentrations of small juveniles have been observed in the East London area (Goosen 1997), although pupping is likely to take place throughout their range (Mann *et al*. 2024).

Gestation
The gestation period is 19–21 months (Smale and Goosen 1999).

Litter size
There are 5–15 pups per litter with a mean of 10. The embryos within a uterus often differed in size, with the largest up to 30% larger than the smallest. Larger females tended to have more embryos (Smale and Goosen 1999).

Size at birth
Size at birth is estimated at 42–45 cm TL, with the largest embryo examined at 44 cm TL (Smale and Goosen 1999).

Length at maturity
Female *T. megalopterus* mature at 145 cm and males at 132 cm TL (Smale and Goosen 1999).

Maximum length
This is 208 cm TL for females and 152 cm TL for males (Smale and Goosen 1999).

Age and growth
Age-at-maturity is 15 years for females and 11 years for males, with a maximum validated age of 26 years, based on counts of vertebral growth rings (Booth *et al.* 2011). Similarly, Soekoe (2016) determined a maximum validated age of 30 years. Based on growth rates derived from tag-recapture data, Mann *et al*. (2024) estimated that *T. megalopterus* could reach a theoretical maximum age of 41 years.

Generation length
Based on female age-at-maturity of 15 years and a maximum validated age of 26 years (Booth *et al*. 2011), generation length was calculated as 20 years (Pollom *et al.* 2020i).

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *T. megalopterus* was estimated from DFFE records at 1–10 tons for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022), with catches largely in the recreational and commercial linefisheries and, to a lesser extent, in the inshore demersal longline fishery (da Silva *et al*. 2015) and beach seine and gillnet fishery (DFFE 2022). Confusion between this non-commercial species and *Mustelus* spp., which are harvested commercially, may explain its occurrence in some commercial catch records (Smale and da Silva 2013).

SA catch quantities and characteristics
Recreational linefishery
Triakis megalopterus is often caught by recreational shore anglers, especially in competitions, but is generally released (Smale and da Silva 2013). All the data presented here are from competitive shore angling. A total of 914 individuals were caught in the 18-year period between 1982-1998 in the Border region of the Eastern Cape (Fish River to Kei River), constituting 5% by number and 6% by mass of the total catch in these competitions. The mean weight of these individuals was 5 kg (Pradervand and Govender 2003). Catches were rare in the coastal zone to the immediate north of the Kei River mouth (Pradervand 2004). To the south, this species was a common catch in Angling

Week, fished annually between Port Alfred and Robberg, but catches were lumped with those of *Mustelus* species due to an inability to separate them (Dicken *et al*. 2012). *T. megalopterus* was caught in small numbers in the Goukamma MPA (Pradervand and Hiseman 2006) but is commonly caught in the De Hoop Marine Reserve (Wagstaff 2023). It was not an uncommon catch in the linefishery in False Bay but there was a significant decline in the proportional representation in catches in this fishery, which historically targeted this species, pointing to possible over-exploitation (Best *et al*. 2013). In addition to the high release rates, some houndsharks have been shown to have low post-release mortality (Ellis *et al.* 2017).

In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential effects on coastal elasmobranch species (Winkler *et al.* 2025). In the SASSA National data (2011-2023), which represents 26 different localities between Varkenvlei on the West Coast and Noggies in Northern KwaZulu-Natal, it was found that *Triakis megalopterus* was the ninth most commonly captured species with an average CPUE of 0.04. Despite Pradervand (2004) finding catches to be rare in the coastal zone to the immediate north of the Kei River mouth, in the RASSPL dataset, which represents 73 different fishing locations between Rietfontein on the West Coast and Haga Haga in the Eastern Cape, *T. megalopterus* was the second most commonly caught elasmobranch with a CPUE of 0.28 (Winkler *et al.* 2025). In the SAASA-KZN dataset, where locations are fished in KZN and the northern Eastern Cape, at 206 different locations between Kosi Bay and Xhora river mouth, this species was ranked 31st most common elasmobranch caught, during the day (CPUE: 0.002).

Commercial linefishery

In an analysis of over a century of catch records, *T. megalopterus* was the fifth most common chondrichthyan caught in False Bay. There was a decline after a peak in catches in 1990. Catches in the commercial linefishery remained low through the remainder of the time series, pointing to possible over-exploitation (Best *et al*. 2013). However, these authors noted that *T. megalopterus* is often listed as *Mustelus mustelus,* either in error or intentionally, to receive a better price or to sell it illegally, especially following the decommercialisation of *T. megalopterus* in 2005. This species featured in the sales of demersal sharks prior to the introduction of this protective legislation (da Silva and Bürgener 2007).

Demersal shark longline fishery

Although decommercialised, *T. megalopterus* is sometimes taken as bycatch by demersal longliners, especially when fishing in shallow (< 30 m), inshore waters. Similar to the linefishery, they are often listed as *M. mustelus*, either in error or intentionally (da Silva, DFFE, pers. comm.).

Inshore demersal trawl fishery

Triakis megalopterus was not reported in the inshore trawl fishery, which targets shallow-water Cape hake *Merluccius capensis* and Agulhas sole *Austroglossus pectoralis* between Cape Agulhas and the Kei River. This fishery operates primarily at depths of 80–100 m (Attwood *et al.* 2011) which falls well beyond the depth range of *T. megalopterus.*

Beach seine and gillnet fisheries

This species was a rare catch in the beach seine fishery in False Bay (Lamberth 1997; Best *et al*. 2013).

Fishing outside South Africa

This species is targeted in the competitive shore fishery in Namibia, but most are released. There may be some intense fishing pressure in a few locations in southern Angola, but there are large unfished areas in other parts of its Angolan range (Pollom *et al.* 2020i).

Population trends
Soekoe (2016) found a clear differentiation in mitochondrial DNA between the Angolan/Namibian population and the South African population. Nuclear DNA showed a distinct transoceanic, Atlantic versus Indian Ocean arrangement, indicating a shallow population structure within South Africa. On the other hand, Maduna *et al.* (2017) found no significant genetic differentiation between individuals collected west and east of the Indian/Atlantic Ocean boundary.

There are no range-wide population size or trend estimates for this species. However, there are localised population trend data in the form of standardized catch-per-unit-effort from ongoing shore-based, research angling surveys conducted in the De Hoop MPA over the 21-year period 1997–2017 (DFFE, unpublished data, 2018). The trend analysis indicated a population increase over the past three generation lengths (60 years), coupled with the catch and release of this species in the recreational fishery, together with an expected low post-release mortality. In addition, a mostly low fishing pressure elsewhere, it is suspected that the population trend is stable. Therefore, it was assessed as Least Concern in 2019 (Pollom *et al.* 2020i).

Marine Living Resources Act (MLRA) Regulations
This species was decommercialised in 2005. There is currently a bag limit of 1 per person per day for recreational anglers.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
A Baited Remote Underwater Video (BRUV) survey conducted in and adjacent to the De Hoop MPA showed a greater abundance of *T. megalopterus* inside the MPA (Albano *et al.* 2022). Similarly, Wagstaff (2023) found a high level of residency within the De Hoop MPA, with individuals making repeated use of small home ranges of the order of 1 km of coastline. However, while individuals fitted with acoustic tags displayed high use of protected areas on the Cape south coast, the differences between the use of protected and exploited areas were not significant (Cottrant *et al.* 2023). Females showed a high use of the De Hoop area but most of the detections were outside the MPA (Cottrant *et al.* 2023). Both juvenile and adult *T. megalopterus* display some degree of residency to the De Hoop MPA (ATAP, unpublished data).

Additional local comment
None.

IUCN RED List Status
Least Concern 2019

Previous IUCN assessments
Near Threatened 2009
Near Threatened 2000

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
None.

Management considerations
This regional endemic occurs close inshore where it is often caught by recreational anglers. The release of any catches of this species must be encouraged, using best-practice handling guidelines, which minimise the risk of post-release mortality. On the other hand, late age-at-maturity, low reproductive capacity and high residency make this species potentially vulnerable to overfishing. While large no-take MPAs with suitable inshore habitats provide important refuges for this species, much smaller MPAs with suitable inshore habitats will also be beneficial, given the very small home ranges (1 km) of some individuals. Such areas, regardless of their size, need to be well managed. It is essential to ensure that this species is not mistaken for a *Mustelus* spp. and, therefore, retained in commercial catches, in violation of its decommercialised status. The lobster, *Jasus lalandi* is overexploited on the south and west coasts, and the extremely high dependence of *T. megalopterus* on this prey species should be considered when managing stocks of both predator and prey. The South African stock of *T. megalopterus* may need to be managed as two separate populations with the split at Cape Agulhas, but this aspect requires further research. The Namibian/Angolan population should be managed as a separate stock. The growing dataset from competitive recreational and research anglers will provide the necessary long-term data for accurate stock assessments.

Research requirements and opportunities
The biology and life-history of this species have been relatively well studied in South Africa. More information is needed on mating and pupping areas and how these overlap with existing MPAs, as well as sex-specific movement patterns. Monitoring of catches by competitive recreational anglers along the coastline must continue, thereby providing data which can contribute to future stock assessments. *Triakis megalopterus* was ranked 16th out of 22 South African coastal chondrichthyan species prioritised for further research.

FAMILY CARCHARHINIDAE

Carcharhinus altimus - Bignose shark

SCIENTIFIC NAME	*Carcharhinus altimus* (Springer, 1950)
COMMON NAME	Bignose shark
FAMILY	Carcharhinidae
ENDEMIC	No, patchy distribution worldwide
SIZE RANGE	60–300 cm TL
SA DISTRIBUTION	East coast: Mozambique border to Port Alfred
HABITAT	Benthopelagic
DEPTH RANGE	0–1000 m
MAJOR FISHERIES	Bycatch in KZN offshore crustacean trawl fishery
IUCN STATUS	Near Threatened 2020
CITES	Appendix II (2022)
MLRA	Daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	D van Beuningen

SPECIES SUMMARY and RECOMMENDATIONS

Carcharhinus altimus is a large, little-known shark found in waters of the continental shelf and upper slope along much of the east coast of South Africa. There are no annual catch estimates based on DFFE records for the periods 2010–2012 and 2013–2019, although this species was historically taken in the KZN offshore crustacean trawl fishery. It was assessed globally as Near Threatened on the IUCN Red List in 2020, based on declines in catches elsewhere in its patchy global distribution. Local catches are unlikely to pose a threat to this species, but nothing is known of any movements into Mozambican waters where fishing pressure is likely to be much higher. Little is known about the biology and ecology of this species, both locally and globally. Any opportunistic sampling should be used to collect information on basic life-history parameters, and to collect genetic samples for any regional population assessment.

TAXONOMIC and IDENTIFICATION ISSUES

Despite its widespread distribution, *C. altimus* was only recently recognised as a distinct species, probably because of its lack of distinctive markings and its deep-water habitat. It was described from the Indian Ocean by Fourmanoir in 1961, under its junior synonym of *Carcharhinus radamae* (Bass *et al.* 1973). Due to its large size, presence of an interdorsal ridge, lack of distinct fin markings and rounded snout it may be mistaken for several other more common members of the genus, including dusky *C. obscurus*, silky *C. falciformis* and sandbar *C. plumbeus*, as well as Galapagos shark *C. galapagensis.* These species are largely separated by the height of the first dorsal fin and its position relative to the pectoral fins, as well as tooth and vertebral counts (Bass *et al.* 1973).

SOUTH AFRICAN DISTRIBUTION

Carcharhinus altimus is confined to the northern part of the east coast from the Mozambique border along the entire KZN coast to Port Alfred in East Cape waters (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

It is present in Mozambique and Madagascar in the SW Indian Ocean (Rigby *et al.* 2020). It has also been captured in Kenya and Tanzania (Wildlife Conservation Society, unpublished data). This species has a widespread albeit patchy distribution in the Atlantic, Indian and Pacific Oceans (Ebert *et al.* 2021b).

SYNOPSIS OF RESEARCH

This species is not well-studied locally. In southern Africa published information on the life-history, taxonomy and morphometrics of this species has been confined to a study based on 31 individuals from KZN and one from Maputo Bay, Mozambique (Bass *et al.* 1973). No local dedicated research has subsequently been conducted on this species.

ECOLOGY

Depth

Carcharhinus altimus inhabits continental shelves and upper slopes at depths of 0–1000 m, with juveniles mostly inshore in shallower waters of ~25 m and adults offshore close to the seafloor during the day and near the surface at night (Anderson and Stevens 1996, Rigby *et al.* 2020). Historically, this species has been taken locally by trawlers operating at depths of 150–430 m (Bass *et al.* 1973).

Habitat: Adults

Adults are regarded as benthopelagic, found close to the seabed during the day and moving up into the water column at night (Rigby *et al.* 2020).

Habitat: Juveniles/Nursery Grounds

The juveniles may occur inshore in shallower waters up to 25 m depth (Compagno 1984b), although there is no local evidence of this, as neonates and juveniles have previously been caught in trawls at depths of 150–430 m off the KZN coast (Bass *et al.* 1973).

Synopsis of tag deployments

This deep-water species has not been tagged in the ORI Cooperative Fish Tagging Project.

Movements

This species exhibits diurnal, vertical movements in the water column (Anderson and Stevens 1996). Nothing is known of the movement patterns of this species, although it is classified as "possibly migratory" by Fowler (2014).

Diet/feeding: Adults

There was a predominance of bottom-dwelling prey in the diet, comprising largely teleosts, small sharks and cephalopods (Bass *et al.* 1973).

Diet/feeding: Juveniles

Unknown, but likely similar to adults.

South African toxicological studies

No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Placental viviparity
DURATION OF REPRO CYCLE	2 years (Indonesia)
MATING	Unknown
GESTATION	Unknown
LITTER SIZE	3–15
PUPPING/NURSERY GROUND	Possibly offshore in KZN waters
LENGTH AT BIRTH	60–90 cm TL
LENGTH AT MATURITY	F: >205 cm; M: >190 cm TL (Pacific)
MAXIMUM LENGTH	300 cm
GENERATION LENGTH	20 years (NW Atlantic)

Mode
This species exhibits placental viviparity.

Duration of reproductive cycle
The duration of the reproductive cycle is not known locally. In Indonesia this species gives birth every second year (White *et al.* 2006).

Mating season and location
Nothing is known.

Gestation
Nothing is known.

Litter size
Litter size is 3–15 (Compagno 1984b).

Size at birth
The smallest individuals of 71 and 90 cm TL in the SW Indian Ocean both had umbilical scars (Bass *et al.* 1973). Size at birth is probably 60–90 cm TL (Ebert *et al.* 2021b).

Pupping season and nursery ground
Trawl catches in KZN waters at depths of 150–430 m included newborns, which Bass *et al.* (1973) concluded was scant evidence of the KZN coast serving as a nursery or juvenile area, while the adults possibly live further to the north.

Length at maturity
In the Pacific Ocean, females mature from 205 cm and males from 190 cm TL (Rigby *et al.* 2020). None of the sharks sampled on the KZN coast were mature (Bass *et al.* 1973).

Maximum length
Maximum length is possibly 300 cm TL (Compagno 1984b).

Age and growth
Preliminary verified age parameters from females caught in the NW Atlantic indicate female age-at-maturity of 17 years and maximum age of 23 years (Jensen *et al.* 1996, cited by Rigby *et al.* 2020).

Generation length
The generation length is 20 years, based on the age parameters presented above (Rigby *et al.* 2020).

FISHERIES MANAGEMENT
SA catch sources
Carcharhinus altimus was not listed in annual catch estimates based on DFFE records for the periods 2010–2012 (da Silva *et al.* 2015) or 2013–2019 (DFFE 2022).

SA catch quantities and characteristics
KZN deep-water crustacean trawl fishery
The offshore component of the KZN crustacean trawl fishery operates in depths of 100–600 m from Durban, northwards into southern Mozambique, with most fishing concentrated at depths of 300–600 m (Fennessy and Groeneveld 1997). The entire range of *C. altimus* overlaps with this fishery in South Africa, and historically it was caught in this fishery (Bass *et al.* 1973). Trawling effort on the KZN coast has varied considerably over the last few decades and was the highest on record in 2021.

Despite this, there have been no records of this species from the KZN crustacean trawls or Nansen research surveys in Mozambique in recent decades (Sean Fennessy, Oceanographic Research Institute, unpublished data).

KZN bather protection programme
It is an extremely rare catch in the KZN bather protection programme, although some individuals may have been mistaken for *C. obscurus* which is the most common species caught (Cliff and Dudley 2011, KZN Sharks Board, unpublished data).

Fishing outside South Africa
The species is taken as bycatch by industrial and small-scale fisheries with pelagic longlines and purse seine, trawls, and gillnets, and is retained for the meat and fins (Rigby *et al.* 2020). In East Africa, specifically Kenya and Tanzania, this species has been caught and landed in artisanal fisheries with handlines and longlines, albeit in very low numbers (Wildlife Conservation Society, unpublished data).

Population trends
There are no estimates of population size or trend for this species in South Africa. Elsewhere, the population declined significantly over 30 years in the Maldives, where it was targeted prior to closure of the fishery in 2010. The population is suspected to have declined by 20–29% in the NW Atlantic and by >30% in the Arabian Seas over three generation lengths (60 years) due to fishing pressure. There are no species-specific data, where it is subject to intense and unregulated fishing pressure in some parts and far less pressure in others, where there are managed fisheries across approximately half of its range. It has a low biological productivity and inferred high susceptibility to fisheries. It is suspected that globally *C. altimus* has undergone a population reduction of 20–29% over the past three generation lengths (60 years) due to high levels of exploitation, and it was assessed as Near Threatened, close to meeting Vulnerable A2d, on the IUCN Red List in 2020 (Rigby *et al.* 2020).

ECOTOURISM
As it occurs largely in deep water, *C. altimus* is not an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
There are several Marine Protected Areas (MPA) in its range where this species could derive some benefit. The largest and deepest of these is the iSimangaliso MPA, followed by the uThukela Banks MPA. The other MPAs on the east coast are likely to be too shallow to benefit this species.

Additional local comment

None.

IUCN Red List Status
Near Threatened 2020 A2d

Previous IUCN assessments
Data Deficient 2009

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
Carcharhinus altimus was listed on CITES Appendix II in 2022, along with other members of the family Carcharhinidae.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
None.

MANAGEMENT CONSIDERATIONS
Fishing pressure on this species is likely to continue to be low in KZN waters, as it is confined to the offshore crustacean trawl fishery. The extent of any transboundary movements between South Africa and Mozambique, where fishing pressure is likely to be high, should be investigated.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Very little is known about the biology and ecology of this species locally and, to a lesser extent, internationally. This includes the location of mating, pupping and nursery areas. Any opportunistic sampling, which is likely to be confined to the KZN deep-water crustacean trawl fishery, should be used to collect basic life-history information. More information is needed on coastwise movement patterns, including any transboundary crossings into Mozambique. Tissue samples should be collected to investigate any regional population structure.

Carcharhinus humani - African blackspot shark

SCIENTIFIC NAME	*Carcharhinus humani* (White and Weigmann 2014)
COMMON NAME	African blackspot shark
FAMILY	Carcharhinidae
ENDEMIC	No, Western Indian Ocean
SIZE RANGE	35–100 cm TL
SA DISTRIBUTION	East coast: KZN and into East Cape
HABITAT	Sandy beaches
DEPTH RANGE	1–45 m
MAJOR FISHERIES	Bycatch in KZN prawn trawl fishery; recreational linefishery
IUCN STATUS	Data Deficient 2018
CITES	Appendix II (2022)
MLRA	Daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	GL Jordaan

SPECIES SUMMARY and RECOMMENDATIONS

Carcharhinus humani is a small, little-known shark found in shallow coastal waters along the entire African east coast. This includes KZN where it occurs year-round, with a peak in summer. There are no annual catch estimates based on DFFE records for the periods 2010–2012 and 2013–2019, although this species was taken in the now-closed KZN inshore prawn trawl fishery and is also caught in the KZN recreational shore-based linefishery and the KZN bather protection programme. It was assessed globally as Data Deficient on the IUCN Red List in 2018, but a recent analysis of South African catches shows that this population meets the criteria for Least Concern. It was one of the most common elasmobranchs detected on Baited Remove Underwater Videos (BRUVs) deployed in the iSimangaliso MPA. There is evidence of a nursery area within the uThukela MPA. This fairly mobile species will also derive some protection from the other MPAs in its range. The existence of any regional population structure and the extent of any transboundary movements into Mozambique should be investigated. Its life-history characteristics suggest that it can withstand a high level of exploitation, but the frequency of the reproductive cycle requires confirmation, together with a validated age-and-growth study.

TAXONOMIC and IDENTIFICATION ISSUES

This species has experienced a convoluted taxonomic history. Southern African specimens of *C. humani* were originally assigned to *C. tjutjot* (D'Aubrey 1964) and subsequently to *C. sealei* (Bass *et al.* 1973), but both species only occur in the Eastern Indian Ocean (EIO) and Western Pacific Ocean (WPO). In a taxonomic revision of the genus *Carcharhinus*, Garrick (1982) noted that Western Indian Ocean specimens of *C. sealei* differed in several morphological characteristics from those in the EIO and WPO but was reluctant to consider this population as a distinct species, due to a lack of specimens. Later, White and Weigmann (2014) confirmed that it was another species and named it the Human's whaler shark, *C. humani*, in honour of an Australian shark researcher, the late Brett Human, who studied sharks in South Africa and Oman, another location in which this species occurs. Regionally it can easily be distinguished by its distinctive colour pattern, with a prominent black blotch confined to the second dorsal fin; the remaining fins are plain, often with translucent-white edges. In a review of the biology and ecology of this species, Cliff *et al.* (2024) proposed that the common name be changed to African blackspot shark to distinguish it from *C. sealei*, which is known globally as the blackspot shark and *C. coatesi,* the Australian blackspot shark.

SOUTH AFRICAN DISTRIBUTION
This species is confined to the northern part of the east coast from the Mozambique border along the entire KZN coast and approximately 45 km into Eastern Cape waters (Cliff *et al.* 2024).

REGIONAL DISTRIBUTION
It is present in Mozambique, northwards along the entire East African coast, as well as Yemen, Oman and Kuwait in the Persian Gulf (White and Weigmann 2014). It has been recorded as *C. sealei* in Madagascar and Seychelles (Bass *et al.* 1973).

SYNOPSIS OF RESEARCH
This species is not well-studied. In southern Africa, published information on the life-history, taxonomy and morphometrics of this species was initially based on approximately 40 individuals from KZN, three individuals from Mozambique and a single individual from Madagascar (Bass *et al.* 1973). It was one of the most common elasmobranchs detected on BRUVs deployed in the iSimangaliso Wetland Park (Ferreira *et al.* 2023). Cliff *et al.* (2024) documented aspects of the biology and ecology of this species, together with an analysis of catch trends in the competitive recreational shore-based linefishery in KZN. The only other regional study of this species was undertaken by Darracott (1977) who examined 108 individuals caught in a multi-species, 16-month-long fishery survey in Tanzania, using bottomset gillnets.

ECOLOGY
Depth
This species inhabits coastal waters from the shoreline, where it is often caught by shore anglers, to maximum depths of about 45 m, where it was caught in the now-closed KZN inshore prawn trawl fishery (Bass *et al.* 1973, Fennessy 1994). In a BRUV study in the iSimangaliso MPA, this species was more commonly detected in the deeper deployments at 26-33 m, compared to those in water of 25 m and shallower (Ferreira *et al.* 2023, Cliff *et al.* 2024). In Tanzania it was caught in bottomset gillnets, mainly deployed at 12–24 m, suggesting that it occurs close to the sea bottom (Darracott 1977).

Habitat: Adults
Adults are more common on sandy bottoms as opposed to reef environments (Ferreira *et al.* 2023). Although anglers' catches are often made in turbid water (van der Elst 1993), there is no evidence that this species enters estuaries or river mouths and may be intolerant of reduced salinities (Compagno 1984b).

Habitat: Juveniles/Nursery Grounds
In the absence of any information, it is assumed that the juveniles occupy the same habitat as the adults.

Synopsis of tag deployments
A total of 294 individuals were tagged in the ORI Cooperative Fish Tagging Project in the period 1984-2022, all along the KZN coast and almost all by shore-based anglers. There were 8 (3%) recaptures, also all along the KZN coast. The mean distance travelled was 33 km (range 0–192 km), with mean time at liberty being 11 months (max: 363 km and 2.1 years) (Cliff *et al.* 2024).

Movements
It is difficult to categorise the movement patterns based on only 8 recaptures, but it appears to be a relatively mobile species, with some evidence of site affinity. Four individuals showed resident behaviour and were recaptured within 5 km of where they were tagged. Two individuals moved 6–10 km; another moved 48 km. The furthest distance recorded was 192 km by a 40 cm shark tagged at Mtunzini, KZN, and recaptured 1.3 years later north of Sodwana Bay, KZN (Cliff *et al.* 2024).

Diet/feeding: Adults
There was a predominance of teleost prey, followed by cephalopods and crustaceans (Bass *et al.* 1973, Cliff *et al.* 2024). In Tanzania, *C. humani* fed mainly on teleosts, comprising both reef dwellers and small, pelagic, shoaling species (Darracott 1977).

Diet/feeding: Juveniles
The dietary study by Bass *et al.* (1973) comprised both juveniles and adults. These authors did not comment on any ontogenetic shift in diet, so it must be assumed that the juveniles feed on similar prey to adults.

South African toxicological studies
No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Placental viviparity
DURATION OF REPRO CYCLE	Unconfirmed, likely to be 2 years
MATING	Summer (December–March)
GESTATION	9–10 months
LITTER SIZE	1–3, usually 2
PUPPING/NURSERY GROUND	Spring (September–November)
LENGTH AT BIRTH	35–45 cm TL
LENGTH AT MATURITY	F: 75 cm; M: 75 cm TL
MAXIMUM LENGTH	F: 100 cm; M 90 cm TL
GENERATION LENGTH	Unknown

Mode
This species exhibits placental viviparity.

Duration of reproductive cycle
The duration of the reproductive cycle in southern African waters has not been confirmed. The very high incidence of pregnant females (30 out of 34 mature individuals examined from the bather protection programme) is suggestive of an annual reproductive cycle. Gestation is 9–10 months, which may not give the females enough time to replenish their energy reserves, thereby necessitating a 2-year cycle (Cliff *et al.* 2024). *Carcharhinus melanopterus*, a similarly small, tropical, coastal species has an 8–9-month gestation and a 2-year reproductive cycle (Last and Stevens 1994).

Mating season and location
Mating takes place in summer (December to March), based on the presence of ova *in utero* in this period (Bass *et al.* 1973, Cliff *et al.* 2024). It is not known if there is a specific mating location on the KZN coast.

Gestation
This is 9–10 months (Cliff *et al.* 2024).

Litter size
Litter size ranges from 1–3, but in 24 of the 30 females examined it was two (Cliff *et al.* 2024). In Tanzania the litter sizes of eight pregnant *C. sealei* was 2–6 (Darracott 1977).

Size at birth
Size at birth is about 35–45 cm TL, based on the smallest free-swimming individual of 35 cm (Bass *et al.* 1973) and the largest embryos of 45 cm (Cliff *et al.* 2024).

Pupping season and nursery ground
Pupping takes place in spring between September and November, based on the size of the largest embryos. Several newborn *C. humani,* with prominent umbilical scars, were caught by shore anglers at Mtunzini on the KZN north coast in November 2021, suggesting that this location could be a nursery area (Cliff *et al.* 2024).

Length at maturity
The size at maturity is about 75 cm TL for both sexes (Cliff *et al.* 2024).

Maximum length
The largest female was 100 cm and the largest male 90 cm TL (Cliff *et al.* 2024).

Age and growth
It is a fast-growing shark, maturing at about 1 year and reaching a maximum age of at least 5 years (van der Elst 1993).

Generation length
The generation length for *C. humani* is not known. In the absence of reliable life-history information, a very conservative generation length of 11 years was adopted. This value was chosen to take full advantage of the data available in that three generation lengths spanned almost the entire time series of catch data from 1985 to 2019 (Cliff *et al.* 2024). The IUCN Red List assessments for closely related species, namely *C. coatesi* and *C. sealei,* applied generation lengths of 4.25 and 8 years, respectively (Baje 2019, Dulvy *et al.* 2021). These alternative values were tested in an assessment of the KZN population, but they resulted in inconsequential changes to the outcome (Cliff *et al.* 2024).

FISHERIES MANAGEMENT
SA catch sources
This species was not listed in annual catch estimates based on DFFE records for the periods 2010–2012 (da Silva *et al.* 2015) and 2013–2019 (DFFE 2022).

SA catch quantities and characteristics
KZN prawn trawl industry
This species was a bycatch in the now-closed inshore KZN prawn trawl industry on the uThukela Banks, with an extrapolated annual catch of ~158 individuals (range 101–190) for the period 1989–1992 (Fennessy 1994). The three specimens examined were about 1.0 m TL (Fennessy 1994) and, therefore, all adults. This fishery was dormant for nearly two decades due to the extended closure of the mouth of Lake St Lucia, resulting in poor prawn recruitment and diminishing prawn catches on the uThukela Banks. The inshore fishing grounds have been closed to trawling since the declaration of the uThukela MPA in August 2019.

Recreational shore angling
Shore anglers catch this species. In most cases, the catch is released, especially by anglers belonging to angling clubs. In some cases, small sharks and guitarfish catches may be discarded on the shore because they pose a nuisance. Competitive shore anglers caught an annual average of 39 sharks along the entire KZN coast in the period 1985–2019, with no marked trend in catch rate over time. Catches were highest in the central and southern zones of KZN and were dominated by adults, with few sharks smaller than 60 cm recorded. The probability of catching *C. humani* peaked in summer

and autumn (December to May) and was lowest during winter and spring (June to November) (Cliff *et al.* 2024).

In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential effects on coastal elasmobranch species (Winkler *et al.* 2025). In the SASSA National data (2011-2023), which represents 26 different localities between Varkenvlei on the West Coast and Noggies in Northern KwaZulu-Natal, it was found that *Carcharhinus sealei* was the 37th most commonly captured species with an average CPUE of 0.00003, while in the SAASA-KZN dataset, where locations are fished in KZN and the northern Eastern Cape, at 206 different locations between Kosi Bay and Xhora river mouth, this species was ranked 14th and twelfth most common elasmobranch caught, during the day (CPUE: 0.05) and at night (CPUE: 0.06), respectively (Winkler *et al.* 2025). It is assumed *C. humani* was misidentified as *C. sealei,* in these catches.

Fishing outside South Africa

No information is available, apart from the catches made in the 16-month-long research survey undertaken by Darracott (1977) in shallow coastal waters of Tanzania, using bottomset gillnets.

Population trends

No regional study has been undertaken to determine if there is any genetic structure between the individuals from South Africa and those from either Tanzania or Mozambique. This species was assessed as Data Deficient in terms of the criteria of the IUCN Red List (Pollom *et al.* 2019j). The data from the catches by competitive recreational shore anglers in KZN indicate that this sector of the population meets the IUCN Red List criteria of Least Concern. This is based on a 65% population increase over the 34 year-long study period (Cliff *et al.* 2024). *C. humani* appears to be a highly productive species that matures early.

ECOTOURISM

Carcharhinus humani is not recognised as an ecotourism species. It is rarely seen by divers as it seems to be more common on sandy bottoms. It is also possible that many divers are not aware of the identity of this small species. There are diver reports of this species from Protea Banks on the KZN south coast (Roland Mauz, African Dive Adventures, unpublished data).

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

This species will benefit from most of the coastal Marine Protected Areas in KZN, especially the iSimangaliso MPA, where it was one of the most common elasmobranchs detected on BRUVs deployed there (Ferreira *et al.* 2023, Cliff *et al.* 2024). It was historically caught in the now-closed KZN inshore prawn trawl fishery which took place in what is now largely the uThukela MPA (Fennessy 1994). Mtunzini, which appears to be a nursery area, occurs in this MPA. It is caught by shore anglers at several locations within the Aliwal MPA (Cliff *et al.* 2024) and has been seen by divers on Protea Banks, also an MPA, (Roland Mauz, African Dive Adventures, unpublished data).

Additional local comment
None.

IUCN Red List Status
Data Deficient 2018

Previous IUCN assessments
None.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species was listed on CITES Appendix II in 2022, along with other members of the family Carcharhinidae.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
None.

MANAGEMENT CONSIDERATIONS
This species is well distributed along the KZN coast and appears to be well protected in the network of coastal MPAs in the province, including a possible nursery area in the uThukela MPA. The formal closure of the inshore KZN prawn trawl fishery has removed a major source of fishery-related mortality. Careful handling by shore anglers and a commitment by them to release all catches will ensure that this species continues to meet the criteria of Least Concern in terms of the IUCN Red List in the local context. The extent of any transboundary movements between South Africa and Mozambique, where fishing pressure is likely to be high, could influence the stability of the population.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Limited information has been accumulated on the biology of this species. Gaps include the frequency of the reproductive cycle and a validated age-and-growth study. The importance of Mtunzini, KZN, and surrounds as a nursery area should be investigated. More information is needed on movement patterns, including any transboundary crossings into Mozambique. Tissue samples should be collected to investigate any regional population structure.

Prionace glauca - Blue shark

SCIENTIFIC NAME	*Prionace glauca* (Linnaeus 1758)
COMMON NAME	Blue shark
FAMILY	Carcharhinidae
ENDEMIC	No, circumglobal in oceanic tropical and temperate waters
SIZE RANGE	35–380 cm TL
SA DISTRIBUTION	East, South, West coasts: entire South African coast
HABITAT	Pelagic in oceanic waters, occasionally coastal
DEPTH RANGE	0–1000 m
MAJOR FISHERIES	Pelagic and demersal longlines, commercial and recreational linefisheries and small pelagic fishery
IUCN STATUS	Near Threatened 2018
CITES	Appendix II (2022)
MLRA	Targeting in pelagic longline fishery is prohibited, but landing of bycatch is still permitted provided that shark bycatch does not exceed catch of target species; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	C da Silva

SPECIES SUMMARY and RECOMMENDATIONS

Prionace glauca is a large, epipelagic species and is generally found offshore in the open ocean. It has a circumglobal distribution in tropical and temperate waters. The local average annual catch was estimated from DFFE records for two time periods. In 2010–2012, 301–600 tons were caught and in 2013–2019 400–500 tons, largely in the pelagic longline fishery. With catches peaking at 648 tons in 2014, the introduction of progressively more stringent permit conditions has reduced 2023 catches to below 100 tons. The species has the highest known population growth rates among pelagic sharks; it matures young and has large litters. Steep population declines have been documented in the Atlantic, with lesser declines in the Indian Ocean, and increases in the Pacific Ocean. With high levels of unregulated exploitation and international trade in meat and fins, experts estimated a global population reduction of 20–29% over three generations and this species was assessed globally as Near Threatened, nearly meeting the Criterion of Vulnerable, on the IUCN Red List. This highly mobile species will derive little or no benefit from any offshore MPAs. Post-release survival in the longline fishery remains a concern but appears to be high. Age and growth estimates require validation and the very high methyl-mercury concentrations in the muscle tissue should be investigated further.

TAXONOMIC and IDENTIFICATION ISSUES

Prionace has long been recognised as a monotypic genus. *P. glauca* is easily distinguished from all other sharks, including other members of the family Carcharhinidae, by a combination of a long, pointed snout, a long, slender body which is a brilliant dark blue on its dorsal surface and extremely long pectoral fins.

SOUTH AFRICAN DISTRIBUTION

Prionace glauca occurs along the entire South African coast, where it is a common pelagic offshore species (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

Prionace glauca has one of the widest known ranges of any shark and occurs in all temperate and most subtropical seas. It is found in offshore waters of both Namibia and Mozambique and countries to the north (Compagno 1984b).

SYNOPSIS OF REGIONAL RESEARCH

This is a relatively well-studied species locally. Bass *et al.* (1975c) documented morphometric and biological information from about 14 individuals from various offshore locations in the SW Indian Ocean. Jolly *et al.* (2011) described catch patterns in the pelagic longline fishery. Jolly *et al.* (2013) investigated age and growth and aspects of reproductive biology. Jolly and da Silva (2013) provided a concise overview of life-history and fishery-related information on this species in southern Africa. The Indian Ocean Tuna Commission funded regional research into age and growth (Farley *et al.* 2021) and reproduction (Murua *et al.* 2021). *Prionace glauca* was ranked twelfth out of 14 South African pelagic chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

This epipelagic species occurs in the open ocean and may be found close to the coast in areas with narrow continental shelves and oceanic islands. It occurs from the surface down to depths of 1,000 m (Compagno 1984b, Ebert *et al.* 2021a). It is tolerant of a wide range of water temperatures but in the tropics, it is most common at depths of 80–220 m, where the water is cooler than at the surface (Compagno 1984b).

Habitat: Adults

They are epipelagic in the open ocean (Compagno 1984b).

Habitat: Juveniles/Nursery Grounds

The juveniles are also pelagic, with offshore nursery areas (Ebert *et al.* 2021a). The presence of neonate blue sharks with umbilical scars and females with uterine scars, as well as the high frequency of small juveniles in research longline catches, confirm the existence of a pupping and nursery area within the Benguela/Agulhas Current transition area on the south coast off South Africa. Other such areas in the Atlantic appear to be associated with oceanic fronts, featuring large horizontal temperature gradients and high productivity, such as at subtropical and polar convergences (da Silva *et al.* 2010).

Synopsis of tag deployments

A total of 38 individuals were tagged with conventional dart tags, mainly by deep-sea recreational and charter vessels, in the ORI Cooperative Fish Tagging Project 1984-2021, inclusive. There have been no recaptures from this programme (ORI Tagging News #35, Jordaan *et al.* 2022). On three research cruises undertaken by DAFF (now DFFE) in 2008–2009, 441 individuals were tagged with dart tags, with five recaptures. Nine individuals were tagged with archival satellite tags, and one juvenile was recaptured in Uruguay after being tagged off Cape Point (da Silva *et al*. 2010).

Movements

This is a highly mobile species with seasonal migrations influenced by factors such as water temperature, prey abundance and reproductive status (Jolly and da Silva 2013). Long-distance, trans-Atlantic movement is well documented in the northern hemisphere, with the sharks taking advantage of various major current systems (Compagno 1984b). The first documented recapture of a South African-tagged juvenile off Uruguay and the final positions of three satellite-tagged sharks suggest that large-scale movement patterns in the South Atlantic mirror those in the North Atlantic, with sharks using the north-westerly Benguela Drift to migrate into the tropics and ultimately across into South American waters (da Silva *et al.* 2010).

Diet/feeding: Adults
The diet comprises largely relatively small prey, especially teleosts and squid, although other invertebrates, small sharks and mammalian carrion are readily taken (Compagno 1984b). Like other pelagic sharks, this species appears to feed on anything it finds (Bass *et al.* 1975).

Diet/feeding: Juveniles
There is no evidence to suggest that the diet of juveniles differs from that of adults.

South African toxicological studies
Limited toxicological studies have been conducted on sharks in South Africa. One study sampled 10 *P. glauca* individuals and found that close to 100% of the mercury present in muscle tissue was methyl-mercury, with negligible concentrations of naturally occurring inorganic mercury. Total arsenic (As) concentrations of 7 mg/kg greatly exceeded the maximum allowable limit (MAL) of 3.0 mg/kg. Concentrations of several other heavy metals were documented but found to be below MAL (Bosch 2015); additional research is required.

REPRODUCTION

REPRODUCTIVE MODE	Placental viviparity
DURATION OF REPRO CYCLE	1–2 years
MATING	Summer in North and South Atlantic
GESTATION	9–12 months
LITTER SIZE	4–135, usually 25–35
PUPPING/NURSERY GROUND	Spring and summer
LENGTH AT BIRTH	35–60 cm TL
LENGTH AT MATURITY	F: 195 cm; M: 200 cm TL
MAXIMUM LENGTH	380 cm TL
GENERATION LENGTH	24–25 years

Mode
Prionace glauca, like other members of the family Carcharhinidae, exhibits placental viviparity.

Duration of reproductive cycle
This species exhibits an annual or biennial reproductive cycle (Rigby *et al.* 2019 and references cited therein).

Mating season and location
Mating in the North and South Atlantic takes place in summer (Jolly and da Silva 2013 and references cited therein). In the Western Indian Ocean, the area near the equator appears to be a mating area from October to March (Zhu *et al.* 2023).

Gestation
This is 9–12 months (Rigby *et al.* 2019 and references cited therein).

Litter size
This species has extremely large litters, ranging from 4–135, usually 25–35 (Rigby *et al.* 2019 and references cited therein). In the SW Indian Ocean, Bass et al (1975) reported three litters of 6, 17 and 58 embryos. Jolly *et al.* (2013) examined a single pregnant female carrying 43 embryos; another which had recently given birth had 55 uterine scars.

Size at birth
This is 35–60 cm (Rigby *et al.* 2019 and references cited therein).

Pupping season and nursery ground
Pupping occurs in spring and summer (Ebert *et al.* 2021b). The presence of neonate blue sharks with umbilical scars and females with post-parturition scars, as well as the high frequency of small juveniles in research longline catches, confirm the existence of a pupping and nursery area off the south coast (da Silva *et al*. 2010). In the Western Indian Ocean, temperate waters are the pupping and nursery area, based on the presence of pregnant females and juveniles throughout the year (Zhu *et al.* 2023).

Length at maturity
Females caught in South African waters mature at about 195 cm and males 200 cm (Jolly *et al.* 2013). In a regional study in the Western Indian Ocean females mature at 214 cm and males 192 cm (Zhu *et al.* 2023). Globally females mature at 183–221 cm and males at 183–218 cm (Rigby *et al.* 2019 and references cited therein).

Maximum length
Maximum length is about 380 cm, with larger records unconfirmed (Rigby *et al.* 2019).

Age and growth
Sex-specific growth curves were not significantly different, with female age-at-maturity of 6 years, 7 years for males and a maximum age of 16 years (Jolly *et al.* 2013). This species has the highest known population growth rates of pelagic sharks. Globally, there is minor regional variation in female age-at-maturity; it is 5–6 years in the Atlantic and 5–8 years in the Pacific, with a maximum age of 15.5–16 years in both regions (Rigby *et al*. 2019 and references cited therein).

Generation length
Due to slight regional variation in growth rates, generation length is 10 years in the Atlantic and 10.5 years in the Pacific (Rigby *et al*. 2019 and references cited therein).

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *P. glauca* was estimated from DFFE records at 301–600 tons for the time period 2011–2012 (da Silva *et al*. 2015) and revised to 400–500 tons for 2013–2019 (DFFE 2022). Catches were from a number of fisheries, with the pelagic longline fishery listed as the biggest contributor, followed by the commercial and recreational linefishery and small pelagic and mid-water trawl fishery and bather protection programme; it is a suspected catch in the hake longline fishery (da Silva *et al*. 2015). Catches peaked at 648 tons in 2014, but progressively more stringent permit conditions aimed at reducing shark catches in the pelagic longline fishery have subsequently reduced this to below 100 tons (DFFE unpublished records, 2023).

SA catch quantities and characteristics
Pelagic longline fishery
P. glauca was the most common large pelagic shark caught in the southern African tuna and swordfish longline fishery for the period 1998–2005, comprising 69% of shark landings (by number) (Petersen *et al.* 2009). Between 2000 and 2015 a total of 681,456 sharks (10,070 t) were reported by local and foreign fleets combined. *P. glauca* dominated shark landings by number (58%), with local vessels contributing the bulk of the catch (91% by number and 88% by weight) (Jordaan *et al.* 2020b). The 2015 large pelagic longline policy prohibited any directed targeting of sharks, with a number of permit conditions, including prohibitions on the discard of any dead sharks; prohibition on the retention of thresher (*Alopias* spp.), hammerhead (*Sphyrna* spp.), oceanic whitetip (*Carcharhinus longimanus*), porbeagle (*Lamna nasus*), dusky (*Carcharhinus obscurus*) and silky (*C. falciformis*) sharks, and the use of stainless-steel hooks and wire traces was also prohibited. Another stipulation was that all sharks must be landed with fins attached, and there should be a minimum

observer coverage threshold. Despite this, targeting of sharks persisted, with catches of *P. glauca* and shortfin mako *Isurus oxyrinchus,* totalling ~1 400 tons, or 52% of the total landings by the large pelagic longline fishery (2 650 tons), in 2016. In response, the DFFE reviewed and updated the National Plan of Action (NPOA) for sharks, consulted with stakeholders and implemented new permit conditions to reduce pelagic shark catches. In 2020, South Africa's total pelagic shark catch was 204 tons; an 85% reduction in 4 years (Parker *et al.* 2021). This has been further reduced to 149 tons in 2023.

KZN bather protection nets
The documented catch in the KZN bather protection nets was confined to a single individual in 2007.

Recreational linefishery
This species is rarely caught by shore anglers. It is very occasionally caught by deep-sea anglers, as evident in the ORI-CFTP tagging data. Catches were year-round, with greater numbers in the Western Cape around Cape Point and Hout Bay, with a size range of 80–250 cm (Jolly and da Silva 2013).

Fishing outside South Africa
In Namibia, *P. glauca* is a target catch of the longline fishery for swordfish and tuna and is one of its major exports. Globally, it is caught as a target and bycatch in commercial and small-scale pelagic longline, purse seine, and gillnet fisheries, although most of the take is bycatch of industrial pelagic fleets in offshore and the high-seas waters. It is the most prevalent species in the shark fin trade, where *P. glauca* comprises the majority of shark fins imported into Hong Kong, 17.3% in 1991–2001 and 49% in 2014. Generally, individuals are retained for the fins, although the demand for meat is likely increasing. The species is highly valued by big-game recreational fishers, and although many practice catch and release, post-release mortality is a concern if handling and release procedures are poor (Rigby *et al.* 2019 and references cited therein).

Population trends
There are no data available on the absolute global population size of *P. glauca*. Genetic results suggest one global population, with weak or no differentiation within and between ocean basins (Rigby *et al.* 2019). South African individuals are part of a single stock that straddles the South Atlantic and the Indian Ocean, and possibly the entire Southern Hemisphere (da Silva *et al.* 2010). More recent research explored the genetic population structure of juveniles from three Atlantic nursery areas and found genetic similarity across regions and even between the Atlantic and Indo-Pacific Oceans. This suggests that this species is interconnected globally, with significant gene flow, which has important implications for their management in fisheries (Veríssimo *et al.* 2017). The weighted global population trend estimated a median decline of 7.3%, with the highest probability of <20% reduction over three generation lengths (30–31.5 years). However, due to uncertainty in some of the regional estimated trends, inferred steep historic declines in the Mediterranean Sea, high levels of unregulated exploitation, and high levels of international trade in meat and fins, experts estimated a global population reduction of 20–29% over three generations and therefore the species was globally assessed as Near Threatened, but nearly meeting the criteria of Vulnerable A2bd in 2018 by the IUCN Red List (Rigby *et al.* 2019).

ECOTOURISM
Historically, this species was not known as an ecotourism species, but in the last two decades, dive companies have offered shark diving with blue *P. glauca* and mako *Isurus oxyrinchus* sharks some 50–70 km off Cape Point.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

The Department of Forestry, Fisheries and the Environment (DFFE) reviewed and updated the National Plan of Action (NPOA) for sharks, consulted with stakeholders and implemented new permit conditions to reduce pelagic shark catches (DFFE 2022). In 2020, South Africa's total pelagic shark catch was just 204 tons; an 85% reduction in just 4 years (Parker *et al.* 2021) and has been further reduced to below 100 tons in 2023.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

None of the current MPAs are likely to be effective for this highly mobile, offshore species.

Additional local comment

None.

IUCN Red List Status

Near Threatened 2018

Previous IUCN assessments

Near Threatened 2009
Near Threatened 2005
Near Threatened 2000

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

In 2022 *P. glauca* was listed under Appendix II, along with 18 other species from the family Carcharhinidae. Non-detrimental Findings (NDFs) are currently being prepared by South Africa.

Convention on Migratory Species (CMS)

In 2017, *P. glauca* was listed under Appendix II of the Convention on Migratory Species (CMS) which indicates *unfavourable conservation status*. Such a listing obligates CMS Parties to work toward regional conservation, specifically through the CMS Memorandum of Understanding for Conservation of Migratory Sharks (Sharks MoU). A proposal to add *P. glauca* to the Sharks MoU Annexure 1 was rejected in 2018, on the basis that the species did not have an unfavourable conservation status and therefore did not meet the listing criteria (Rigby *et al.* 2019).

International comments

Globally, there are very few national and no international catch limits in place for *P. glauca.* In 2016, scientists associated with the International Commission for the Conservation of Atlantic Tunas (ICCAT) recommended capping catches from both the North and South Atlantic at recent levels. ICCAT instead agreed to a threshold for landings (from the North Atlantic only) that is meant to trigger reconsideration if exceeded on average over two consecutive years. To prevent overfishing, it is recommended that *P. glauca* be subject to regional and national catch limits, based on scientific advice and/or the precautionary approach, as well as improved reporting of catch and discard data, efforts to minimize bycatch mortality, and full implementation of all commitments agreed to through international treaties (Rigby *et al.* 2019).

MANAGEMENT CONSIDERATIONS

Recent permit conditions in the large pelagic longline fishery that prohibit the targeting of sharks have been effective and resulted in a substantial decrease in targeting and landing of this species.

The survival rate of live individuals released remains a concern, however, post-release mortality for this species is known to be very low based on DFFE research utilising hook timers during national large pelagic surveys (Charlene Da Silva, Department of Forestry Fisheries and the Environment, unpublished data).

RESEARCH REQUIREMENTS AND OPPORTUNITIES

This is a relatively well-studied species, with extensive knowledge of its life-history, reproductive biology and ecology. Validation of age and growth estimates is required, together with more information on local pupping and nursery areas. The high methyl-mercury concentrations, albeit in only 10 individuals, is of considerable concern and more sampling should be undertaken. *Prionace glauca* was ranked twelfth out of 14 South African pelagic chondrichthyan species, which were prioritised for further research.

FAMILY GALEOCERDIDAE

Galeocerdo cuvier - Tiger shark

SCIENTIFIC NAME	*Galeocerdo cuvier* (Péron and Lesueur 1822 *in* Lesueur, 1822)
COMMON NAME	Tiger shark
FAMILY	Galeocerdidae
ENDEMIC	No
SIZE RANGE	51–>550 cm TL
SA DISTRIBUTION	East and South coasts; Mozambique border to Cape St Francis
HABITAT	Pelagic in coastal and occasionally in offshore waters
DEPTH RANGE	0–>1275 m
MAJOR FISHERIES	KZN bather protection nets and possibly recreational linefishery
IUCN STATUS	Near Threatened 2018
CITES	Not listed
MLRA	Daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	R Daly

SPECIES SUMMARY and RECOMMENDATIONS

Galeocerdo cuvier is a large, pelagic shark commonly found in tropical coastal waters across the globe. It is a highly nomadic species and although most movements have been coastwise, some individuals are known to move long distances offshore into the SW Indian Ocean and beyond, as far north as Somalia. There is considerable localised coastal movement of individuals between South Africa and Mozambique and in-and-out of Marine Protected Areas (MPAs) in the region. The iSimangaliso Wetland Park and neighbouring Maputo National Park in Southern Mozambique are important habitats. Local average annual catch was estimated at 1–10 tons from DFFE records for two time periods: 2010–2012 and 2013–2019 and confined largely to the KZN bather protection programme. Although catch rates in this fishery showed no decline, in part due to the high rates of survival and release, it was assessed globally as Near Threatened on the IUCN Red List in 2018. Given its mobility and lack of population structure in the Indo-Pacific, management of this species should be conducted at a regional level. The location of any local nursery areas remains unknown.

TAXONOMIC and IDENTIFICATION ISSUES

Galeocerdo cuvier is very distinctive with its vertical stripes, cockscomb-shaped teeth, broad snout and large eyes. It was long regarded as a member of the family Carcharhinidae, despite several features that separate it from that family (Bass *et al.* 1975c, Compagno 1984b). These external morphological characteristics include very long upper labial furrows reaching to eye level, low keels on the caudal peduncle and distinct spiracles. Unlike all carcharhinids, this species exhibits aplacental viviparity. It is now regarded as the only member of the family Galeocerdidae. Molecular research supports its assignment into its own family (Ebert *et al*. 2021a and references cited therein).

SOUTH AFRICAN DISTRIBUTION

Galeocerdo cuvier occurs along the entire east coast and a small part of the south coast from the Mozambique border to Cape St Francis (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

Galeocerdo cuvier is common in tropical, coastal waters of all three major oceans. It is present in Madagascar and Mozambique, northwards along the entire East African coast. On the African west

coast, it is absent from Namibia but occurs from Angola northwards (Ferriera and Simpfendorfer 2019).

SYNOPSIS OF RESEARCH

Galeocerdo cuvier has been relatively well-studied locally. In southern Africa, published information on the life-history, taxonomy and morphometrics of this species was initially based on approximately 50 individuals, most of which were from KZN (Bass *et al.* 1975c). Wintner and Dudley (2000) assessed the age and growth, based on deposition of growth rings in the vertebrae. Davidson and Cliff (2002) investigated liver lipid content and Davidson *et al.* (2011) analysed heart and muscle lipids. Dippenaar *et al.* (2009) described copepod gill parasites. McKinney *et al.* (2016) examined the trophic ecology and muscle mercury content of this species and several other large sharks from KZN coastal waters. It is an important eco-tourism species in the Aliwal Shoal MPA (Dicken and Hosking 2009, Du Preez *et al.* 2012). An analysis of catch statistics and general biology of 1760 individuals caught in the KZN bather protection programme was undertaken by Dicken *et al.* (2016), followed by an investigation of the diet and trophic ecology of these sharks (Dicken *et al.* 2017). Daly *et al.* (2018) utilised satellite tags to investigate movements in relation to the existing regional MPA network. South African individuals were included in a global assessment of the genetic structure and demography of this species (Pirog *et al*. 2019). Daly *et al.* (2023) monitored transboundary movements between Mozambique and South Africa of four pelagic shark species, including *C. cuvier*, using internal acoustic tags. *Galeocerdo cuvier* was ranked 20th out of 22 South African coastal chondrichthyan species which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

This solitary species inhabits coastal waters and is sometimes associated with coral reefs. It occasionally makes longer-distance excursions into the pelagic zone far offshore (Daly *et al.* 2018; Ferreira and Simpfendorfer 2019, and references cited therein). The vertical distribution of this nocturnal species is characterised by high surface use with occasional excursions into deeper waters to a maximum of 1275 m (Andrzejaczek *et al.* 2022).

Habitat: Adults

They occur in a variety of inshore habitats, including coral reefs. They may be found in the vicinity of large flooding rivers (van der Elst 1993), possibly due to their scavenging habits.

Habitat: Juveniles/Nursery Grounds

There is a dearth of information on the local whereabouts of the neonates and their nursery areas. Although, on occasion small (~100 cm TL) individuals are caught in iSimangaliso MPA by boat-based fishermen (Grant Smith, Sharklife, pers. comm.).

Synopsis of tag deployments

From 1978 to 2014, 486 *G. cuvier* were tagged and released after capture in the KZN bather protection programme, with an overall recapture rate of 5% (*n* = 23). More than 70% of these sharks were females. The time at liberty for recaptured sharks ranged from 2 days to 5 years, with a mean of 1 year. Almost all of the recaptured sharks were within 150 km of their original tagging locality. There were three noteworthy long-distance recaptures. One was recorded off Port Elizabeth, 800 km from the tagging location. Another was caught in the Mozambique Channel 250 km offshore of Inharrime (Mozambique), 1200 km from its tagging location. The third shark was recorded after 1.1 years, 1530 km away, near Anakao in southern Madagascar. All three of these long-distance movements were by larger juveniles of about 250 cm (Dicken *et al.* 2016).

A total of 610 individuals were tagged in the ORI Cooperative Fish Tagging Project in the period 1984-2021, with a recapture rate of 5%, an average distance travelled of 267 km (maximum 1400 km) and a mean time of liberty of 1.1 years (maximum 5 years) (Jordaan *et al.* 2023). These statistics include most of the 486 individuals tagged by the KZN Sharks Board, as described above. The individual that travelled the furthest was released from the KZN bather protection programme (see above) and recaptured off the SW coast of Madagascar (Gareth Jordaan, Oceanographic Research Institute, unpublished data).

Satellite tags were fitted to 26 individuals, which included several adults, caught in Ponta do Ouro Partial Marine Reserve in Mozambique, the iSimangaliso Marine Protected Area (MPA), and Aliwal Shoal MPA. The sharks remained largely coastal, and only three undertook open ocean migrations (Daly *et al.* 2018). Additional monitoring confirmed that some sharks are capable of wide-ranging open ocean movements in the Indian Ocean, with one adult female travelling 22500 km in 668 days (Ryan Daly, Oceanographic Research Institute, unpublished data).

A total of 21 individuals, which included 9 adults, were fitted with internal acoustic tags in southern Mozambique and in the iSimangaliso MPA. Most of the individuals crossed between the two countries, with an annual mean of 7.5 border crossings per shark. Individuals tagged in one country often spent over 50% of their time detected in the neighbouring country (Daly *et al.* 2023).

Movements

The results from all the tagging and tracking studies described above indicate that *G. cuvier* is a highly mobile species which may move long distances coastwise and, on occasion, offshore. Many of the individuals which made large offshore movements were immature, but they included some adults. Such movements cannot, therefore, be solely attributed to reproductive needs. There is southward movement of individuals in summer and the reverse in winter. Tagging studies from outside the region suggest that individuals occupy large home ranges of hundreds of kilometres within which they make long-distance movements across the open ocean before returning to specific areas (Dicken *et al.* 2016 and references cited therein). An individual tagged in La Reunion swam to South Africa and southern Mozambique before being captured and killed in southern Madagascar (Lennox *et al*. 2023). Another individual tagged off the west coast of Australia, was detected off the south coast of South Africa, 8000 km away (Heithaus *et al.* 2007).

Diet/feeding: Adults

The indiscriminate feeding habits of this species are well known, and it has been described as somewhat of a “garbage-can with fins”, ingesting carrion and a wide variety of inedible objects. Large individuals take more sea turtles than any other shark species (Compagno 1984b). In a study of 628 non-empty stomachs that comprised very few mature individuals, there was a size-based shift in diet in that sea turtles, birds, whales and large shark species increased in importance with shark size. Larger individuals also fed on teleosts and cephalopods (Dicken *et al.* 2017). Scavenging on whale carcasses is thought to play an important role as their unique-shaped teeth allow them to access this energy-rich food source. As such, they may play an important ecological role, enabling other species access to whale carcasses (Lea et al. 2018).

Diet/feeding: Juveniles

Juveniles feed mainly on a wide variety of teleosts, small rays, dolphins and cephalopods. The teleosts included inshore, soft-bottom demersal species, reef-associated species and more offshore epipelagic species (Dicken *et al.* 2017).

South African toxicological studies

Two toxicological studies have been conducted on this species in South Africa, both assessing mercury levels in muscle tissue of specimens caught in the KZN bather protection nets. McKinney *et*

al. (2016) found that there was a poor correlation with body length in 18 largely immature individuals (185–315 cm TL), Furthermore, values for a number of local pelagic shark species, including *G. cuvier*, were higher than those from other regions and, in many cases, they were far higher than international regulatory guidelines for human and fish health. In a second study, only four juveniles (190–235 cm TL) were sampled (Erasmus *et al.* 2022).

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	3 years (Hawaii and Australia)
MATING	Unknown locally
GESTATION	15–16 months outside South Africa
LITTER SIZE	26–33 on average; maximum 82
PUPPING/NURSERY GROUND	Unknown locally
LENGTH AT BIRTH	51–90 cm TL
LENGTH AT MATURITY	F: 370 cm; M: 325 cm TL
MAXIMUM LENGTH	At least 550 cm, possibly 740 cm TL
GENERATION LENGTH	Unknown locally, 17.5–22.5 years elsewhere

Mode
Galeocerdo cuvier exhibits lecithotrophic viviparity.

Duration of reproductive cycle
The duration of the reproductive cycle in southern African waters is unknown but is triennial in Hawaii and Australia (Ferreira and Simpfendorfer 2019 and references cited therein).

Mating season and location
Nothing is known of any local or regional mating activities.

Gestation
The duration of gestation in southern African waters is unknown, but from studies conducted elsewhere, it is 15–16 months (Ferreira and Simpfendorfer 2019).

Litter size
Litter sizes are large, with a maximum of 82 and an average of 26-33 pups, based on several studies across the globe (Ferreira and Simpfendorfer 2019 and references cited therein). In the SW Indian Ocean, the litter size of five pregnant females ranged from 30–46 (Bass *et al.* 1975c). A single pregnant female caught in the KZN bather protection programme, carried 17 pups, with a mean size of 86 cm TL (Dicken *et al.* 2016).

Size at birth
Size at birth is 51–90 cm TL (Ferreira and Simpfendorfer 2019 and references cited therein). The smallest free-swimming individual from the SW Indian Ocean was 106 cm (Bass *et al.* 1975c).

Pupping season and nursery ground
Nothing is known of any local or regional pupping activities and no known nursery areas have been identified in the Indo-Pacific (Pirog *et al.* 2019).

Length at maturity
Length at 50% maturity for South African females was 370 cm and 325 cm TL for males (Dudley and Simpfendorfer 2006). There is regional variability, with females found elsewhere maturing at 274–345 cm and males at 250–305 cm (Ferreira and Simpfendorfer 2019 and references cited therein).

Maximum length
Maximum reported size is 740 cm total length (TL) but individuals larger than 500 cm TL are rarely seen (Ebert et al. 2013). Meyer *et al.* (2014) provide an overview of maximum size for this species. The largest individual caught in the KZN bather protection programme and examined in the laboratory was 415 cm (Dicken *et al.* 2016). The largest individual fitted with an internal acoustic tag off the east coast of southern Africa was 416 cm (Daly *et al.* 2023).

Age and growth
Based on counts of growth rings in the vertebrae, females matured at 11 years and males at 8 years (Wintner and Dudley 2000). Elsewhere, age-at-maturity was estimated at 4–13 years and maximum age at 27–37 years (Ferreira and Simpfendorfer 2019 and references cited therein).

Generation length
Based on data from the Western North Atlantic and Australia, the generation length was estimated at 17.5–22.5 years (Ferreira and Simpfendorfer 2019 and references cited therein).

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *G. cuvier* was estimated from DFFE records at 1–10 tons for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022), with the KZN bather protection programme listed as the only known catch source for the first period (da Silva *et al.* 2015), but the recreational linefishery was added as another source of catches for the second (DFFE 2022).

SA catch quantities and characteristics
KZN bather protection programme
The mean annual catch in the KZN bather protection programme was 48 (range 26–76) for the period 1978–2014. The percentage of sharks released alive increased significantly from 3% to 57% over this time period, reflecting a change in the policy of releasing potentially dangerous sharks found alive (Cliff and Dudley 1992). Standardised catch rates increased significantly over time. The nets caught significantly larger sharks (mean 230 cm) than drumlines (mean 175 cm). Very few young-of-the-year or adults were caught (Dicken *et al.* 2016).

Recreational shore angling
This species is an extremely uncommon catch by shore anglers in KZN. In KZN, competitive shore anglers only caught 3 individuals over a 24-year period (1977–2000), with a mean individual mass of 10 kg (Pradervand *et al.* 2007).

Fishing outside South Africa
Globally, this species is caught in target shark fisheries and as bycatch in commercial, artisanal and recreational fisheries. It has been increasingly exploited by fisheries since the 1950s, due to the increasing demand from the shark fin trade (Ferreira and Simpfendorfer 2019 and references cited therein).

Population trends
A regional study of individuals from several locations in the Western Indian Ocean revealed weak genetic differentiation between this region and the West Pacific Ocean, suggesting high genetic connectivity (Pirog *et al*. 2019). Despite an increasing local population trend in catches in the KZN bather protection programme (Dicken *et al.* 2016), this species has shown both increases and declines in catch rates and abundance elsewhere in its range. Globally, it is suspected to have declined by close to 30% over the past three generations (53-68 years), due to exploitation from commercial, recreational, and unregulated fisheries, as well as shark control programs. As such, this

species was assessed as Near Threatened and close to meeting Vulnerable A2bd+3d) in 2018 (Ferreira and Simpfendorfer 2019 and references cited therein).

ECOTOURISM

It is an important ecotourism species on the Aliwal Shoal, where bait is used to attract individuals as well as adult blacktip sharks *Carcharhinus limbatus* for freedivers and caged-divers to view. The best period for viewing *G. cuvier* is between December and April, with up to 14 individuals (mean of 4), largely adolescents, seen on an outing (Dicken and Hosking 2009, Du Preez *et al.* 2012). These authors undertook an economic assessment of the industry. This species is also often observed by divers on Protea Banks on the KZN south coast (Roland Mauz, African Dive Adventures, unpublished data) and, less frequently, in the Sodwana Bay area.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

This species occurs in most of the coastal Marine Protected Areas in KZN. It was occasionally detected on BRUVs in the iSimangaliso MPA (Ferreira *et al.* 2023, Martinez *et al.* 2024). It is the focus of a diver-viewing experience in the Aliwal Shoal MPA (Dicken and Hosking 2009) and is often seen by divers on Protea Banks, also an MPA (Roland Mauz, African Dive Adventures, unpublished data). The protective benefits of these MPAs are likely to be very limited, given the highly nomadic habits of this species (Daly *et al.* 2018, Daly *et al.* 2023).

There was a 6% spatial overlap between *G. cuvier* hotspots and marine protected areas, which will increase significantly to 24% with the planned expansion of protected areas in South Africa, rising as high as 41% with the offshore expansion of the Maputo National Park in southern Mozambique (Daly *et al.* 2023).

Additional local comment

None.

IUCN Red List Status

Near Threatened 2018

Previous IUCN assessments

Near Threatened 2009
Near Threatened 2000

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

This species is not listed.

Convention on Migratory Species (CMS)

This species is not listed.

International comments

None.

MANAGEMENT CONSIDERATIONS

This highly nomadic species does not appear to be under local threat based on catch trends in the KZN bather protection programme. It has a high survival rate in this programme, which is the primary local source of mortalities. It has a high fecundity, as a result of its fast growth and large litter sizes, but this must be tempered by the 3-year-long reproductive cycle. The time spent in local MPAs is very limited. The high level of transboundary movements between South Africa and Mozambique and beyond, where fishing pressure is likely to be high, could influence the stability of the population. Based on the absence of a notable regional population structure, any management considerations must entertain such threats from outside South African waters. A first step would be to align conservation priorities in South Africa and Mozambique, given the largely contrasting current priorities of the two countries.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

A considerable amount of information has been accumulated on the biology and ecology of *G. cuvier*. Gaps include the location of local mating and nursery areas and more information on the whereabouts and movements of the adults. Further research on regional population genetics may be useful to confirm local population structure and connectivity within the Indian Ocean. In addition, research into the possible impacts of climate change on seasonal migrations and local habitat use should be undertaken. *Galeocerdo cuvier* was ranked 20th out of the 22 South African coastal chondrichthyan species which were prioritised for further research.

SOUTH AFRICAN FISHERIES AND OTHER IMPORTANT SPECIES REPORTS:

BATOIDS

FAMILY TORPEDINIDAE

Tetronarce cowleyi - South African torpedo ray

SCIENTIFIC NAME	*Tetronarce cowleyi* Ebert, Haas and de Carvalho, 2015
COMMON NAME	South African torpedo ray
FAMILY	Torpedinidae
ENDEMIC	No, regional endemic from Namibia
SIZE RANGE	<19–113 cm TL
DISTRIBUTION	West, south and east coasts: Orange River Mouth to Algoa Bay
HABITAT	Benthopelagic
DEPTH RANGE	110–455 m
MAJOR FISHERIES	Demersal trawl fishery and recreational linefishery
IUCN STATUS	Least Concern 2018
CITES REGS	Not listed
MLRA REGS	Current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Tetronarce cowleyi is a small electric ray which occurs inshore along the entire west and south coasts into Algoa Bay on the east coast. It is a regional endemic which also occurs in Namibia. It was globally assessed as Least Concern in 2018. The local average annual catch was estimated at 1–10 tons from DFFE records for two time periods: 2010–2012 and 2013–2019, primarily from the demersal trawl fishery. Its benthopelagic habit may help it avoid catches in demersal trawls. Improved identification to species level of large catches of unidentified electric rays in the demersal trawl fishery is needed. This can be overcome by the re-introduction of a scientific observer programme to enable at-sea sampling of commercial landings. Catches of *T. cowleyi* are discarded at sea, hence this species has not been well studied, with little known of its reproductive biology, life-history, ecology and population trends. The re-establishment of the scientific observer programme will address this shortcoming, and the continuation of research trawl surveys will also provide material and related catch information. Tissue samples should be collected to help resolve several taxonomic issues.

TAXONOMIC and IDENTIFICATION ISSUES

There are now three species of torpedo/electric rays in the family Torpedinidae recognised in South Africa. Initially, the family was considered to consist of a single genus, but the subgenus *Tetronarce* was elevated to full genus status (Ebert *et al.* 2015) based on the absence of spiracular papillae which are present in *Torpedo* species. Originally considered as a southern population of *Tetronarce nobiliana* (previously known as *Torpedo nobiliana*), a species widely distributed in the Eastern Atlantic (Compagno *et al.* 1989), it was recently recognised as a separate species *Tetronarce cowleyi.* This decision was supported by the use of molecular markers to reliably distinguish closely related species (Naylor *et al*. 2012). Ebert *et al*. (2015) regard *Tetronarce cowleyi* as the only member of the genus in South Africa, assigning all historical South African records of *Tetronarce nobiliana* to this species. Last *et al*. (2016a) still consider the distribution of the North Atlantic *Tetronarce nobiliana* to extend along the entire west and south coasts of South Africa.

SOUTH AFRICAN DISTRIBUTION
Tetronarce cowleyi occurs on the entire west and south coasts and a very small part of the east coast from the Orange River Mouth to Algoa Bay (Ebert *et al.* 2015), but it is far more common on the west coast (DFFE, unpublished records).

REGIONAL DISTRIBUTION
Tetronarce cowleyi occurs along the Namibian coast as far north as Walvis Bay (Ebert *et al.* 2015).

SYNOPSIS OF RESEARCH
Tetronarce cowleyi is a very poorly studied species. No dedicated local research has been conducted apart from its description as a new species (Ebert *et al.* 2015). Compagno *et al.* (1991) reported on the distribution on the west coast and in Namibia of only 15 individuals, then known as *Torpedo nobiliana*, caught in research trawl surveys for the period 1986-1990.

ECOLOGY
Depth
This species, reported as *Torpedo nobiliana,* occurs at depths of 110–455 m (Compagno *et al.* 1989).

Habitat: Adults
A benthopelagic species, it is found near the bottom, and also well off it (Ebert *et al.* 2015).

Habitat: Juveniles/Nursery Grounds
Neonates have been collected during pelagic plankton tows on the edge of the outer continental shelf southwest of Cape Town (Compagno *et al.* 1991), suggesting that they may have a pelagic lifestyle.

Synopsis of tag deployments
No individuals have been tagged.

Movements
Nothing is known about the movement patterns of *T. cowleyi*.

Diet/feeding: Adults
The diet comprises mainly large bottom and pelagic teleosts (Ebert *et al.* 2015).

Diet/feeding: Juveniles
The diet is possibly the same as that of adults.

South African toxicological studies
No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Histotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	Unknown
PUPPING/NURSERY GROUND	Unknown
LENGTH AT BIRTH	<19 cm TL
LENGTH AT MATURITY	F: >100 cm TL; M: ~58 cm
MAXIMUM LENGTH	113 cm TL

GENERATION LENGTH	Unknown

Mode
This species exhibits histotrophic viviparity, in which maternal uterine secretions supplement the initial nourishment provided by the yolk-sac.

Duration of reproductive cycle
The length of the reproductive cycle is unknown.

Gestation
Gestation duration is unknown.

Mating season and location
This is unknown.

Litter size
This is unknown.

Pupping season and nursery ground
This is unknown.

Length at birth
This is unknown, with the smallest free-swimming neonate recorded at 19 cm TL (Ebert *et al.* 2015).

Length at maturity
Female *T. cowleyi* mature by at least 100 cm TL and males at about 58 cm TL (Ebert *et al.* 2015).

Maximum length
This species attains 113 cm TL (Ebert *et al.* 2015).

Age and growth
This unknown.

Generation length
This is unknown.

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Local average annual catch of *T. cowleyi* was estimated from DFFE records at 1–10 tons for the period 2011–2012, with the demersal trawl fishery the only listed source of catches (da Silva *et al*. 2015). For the period 2013–2019, catches remained at 1–10 tons but were listed as *Tetronarce* cf. *nobiliana,* with no catches assigned to *T. cowleyi*; the demersal longline fishery and beach-seine and gillnet fisheries were listed as possible additional sources (DFFE 2022).

Demersal trawl fishery
The annual catch of unidentified electric rays in the inshore trawl fishery was estimated at 26 tons for the period 2003–2006, based on observer records (Attwood *et al.* 2011). Demersal research surveys on the south coast have recorded three species of electric rays and numbfish, *Narce capensis*, *Torpedo fuscomaculata* and *Tetronarce cowleyi*, with each contributing 19%, 65% and 16% to the catch by weight, respectively (DFFE unpublished data). However, the geographic distribution of research survey trawls is substantially different to that of commercial trawls, so it is not valid to directly extrapolate from research to commercial catches.

In False Bay *Torpedo* spp. (including *Tetronarce* spp.) was one of several chondrichthyans which revealed a significant decline in trawls spread over 35 years in the period 1897–1932. Although commercial trawling was banned in 1928 in False Bay, scientific trawl surveys continued until 1947. Chondrichthyans, however, were not recorded after 1932 (Best *et al.* 2013). The identity of these individuals is uncertain as *Tetronarce cowleyi* is only known from water deeper than 110 m and the maximum depth in False Bay is about 90 m. Furthermore, the only other species of electric ray found in the region is *Torpedo fuscomaculata*, which Ebert *et al.* (2021a) state is confined to waters east of Cape Agulhas.

Demersal longline fishery
No electric rays (family Torpedinidae) were listed in the chondrichthyan bycatch of the demersal longline fishery (Petersen *et al.* 2008).

Fishing outside South Africa
Leeney (2024) reported that this species has been frequently recorded as a bycatch of the Namibian demersal trawl fishery for hake.

Population trends
There are no estimates of population size or trend. Although this species may be caught in demersal trawl fisheries, its semi-pelagic behaviour possibly limits catches. Electric rays are generally discarded when caught. There are no other known threats. The population is suspected to be stable and *T. cowleyi* was assessed as Least Concern in 2018 (Pollom and Ebert 2019).

ECOTOURISM
This species is confined to very deep water, therefore cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
The current demersal trawl footprint is ringfenced. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
Not enough is known of the distribution and movements of *T. cowleyi* to ascertain which MPAs will benefit this species.

Additional local comment
As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is prohibited outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

IUCN Status
Least Concern 2018

Previous IUCN assessments
Not evaluated.

MANAGEMENT CONSIDERATIONS

Members of this family are slow swimmers, found close to the seabed, where they are highly vulnerable to trawl fisheries. The benthopelagic habit of *T. cowleyi* may enable some individuals to avoid capture in demersal trawls. It is important to identify to species level in demersal trawl catches as accurately as possible, even though they are discarded. An important step would be the re-introduction of a scientific observer programme, with those involved trained in the identification of all chondrichthyans. An indication of post-release survival would be beneficial. It is also imperative to continue the time series of bi-annual demersal trawl surveys to monitor population trends of this and other species. The current trawl footprint must remain ringfenced and regulated.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

Almost nothing is known about the biology and ecology of this species. As any catches in the demersal trawl fishery are discarded, the re-introduction of the scientific observer programme would be a valuable source of information on *Tetronarce cowleyi.* Tissue samples should be collected to help resolve various taxonomic issues within the family, including the presence of *Tetronarce nobiliana* in South African waters.

Torpedo fuscomaculata - Blackspotted electric ray / Torpedo

SCIENTIFIC NAME	*Torpedo fuscomaculata* Peters, 1855
COMMON NAME	Blackspotted electric ray/torpedo
FAMILY	Torpedinidae
ENDEMIC	No, much of SW Indian Ocean
SIZE RANGE	?–65 cm TL
DISTRIBUTION	East and south coasts: Kosi Bay to False Bay
HABITAT	Demersal on sand-inundated rocky reefs, sometimes in estuaries
DEPTH RANGE	0–440 m; mostly < 50 m
MAJOR FISHERIES	Demersal trawl fishery and recreational linefishery
IUCN STATUS	Data Deficient 2018
CITES REGS	Not listed
MLRA REGS	Current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	JM Olbers

SPECIES SUMMARY and RECOMMENDATIONS

Torpedo fuscomaculata is a small electric ray which occurs inshore along the east coast and much of the south coast. It is also found in coastal waters of much of the SW Indian Ocean, but it is possible that it is a species complex, comprising several regional endemics. Annual local catches were estimated at 1–10 tons (DFFE records: 2010-2012 and 2013–2019), primarily from the demersal trawl fishery and possibly in the demersal longline fishery. It was globally assessed as Data Deficient in 2018. The identification of individuals to species of large catches of unidentified electric rays in the inshore demersal trawl fishery is needed. This can be achieved by the re-introduction of a scientific observer programme to enable at-sea sampling of commercial landings. As catches are discarded at sea, *T. fuscomaculata* has been very poorly studied in South African waters, with nothing known of its life-history and ecology. The scientific observer programme will address this shortcoming, and the continuation of research trawl surveys will also provide material and related catch information. Tissue samples must be collected to help resolve the taxonomic issues.

TAXONOMIC and IDENTIFICATION ISSUES

There are three species in the family of torpedo/electric rays Torpedinidae recognised in South Africa (Ebert *et al.* 2021a). Two of those are in the genus *Torpedo*, both of which are widespread in the Western Indian Ocean. *T. fuscomaculata* has a highly variable dorsal colouration, which is distinct from that of *T. sinuspersici*; regional forms of the former may form part of a species complex (Last *et al.* 2016a). Locally there are two distinctive colour forms of *T. fuscomaculata*: the spotted form has dark brown spots on a grey dorsal surface, while the speckled form has much smaller dark dots on grey (Compagno *et al.* 1989). *T. marmorata*, which also has a highly varied, mottled patterning, is listed as occurring on the entire west coast of Africa, including the west coast of South Africa (Last *et al.* 2016a). Its presence in South African waters is not recognised (Compagno *et al.* 1989, Ebert *et al.* 2021a).

SOUTH AFRICAN DISTRIBUTION

Torpedo fuscomaculata occurs along the entire east coast to Cape Agulhas on the south coast (Ebert *et al.* 2021a). Best *et al.* (2013) reported the presence of both this species and *Torpedo marmorata* in historical catches in False Bay, which lies west of Cape Agulhas. There is contention as to the presence of *T. marmorata* in South African waters. It is therefore likely that any records from False Bay are *T. fuscomaculata*, as the only other member of the family Torpedinidae present in the area

is *Tetronarce cowleyi*, which lacks any colour patterning. As a result, the local range of *T. fuscomaculata* should be extended west to include False Bay.

REGIONAL DISTRIBUTION
This species occurs in coastal waters of the SW Indian Ocean as far north as Kenya. Fricke (1999) and Fricke *et al* (2009) reported this species to occur in La Réunion, originally reported as *T. marmorata.* Its presence in Madagascar, Mauritius and Seychelles is uncertain and may represent other closely related and possibly yet-to-be described species (Pollom *et al.* 2019j).

SYNOPSIS OF RESEARCH
This is a poorly studied species. In a study of batoid fishes of the east coast of southern Africa, Wallace (1967a) examined 13 individuals of this species, all caught in Algoa Bay or central Mozambique. This sample comprised juveniles and adults (18–66 cm TL). Very little additional dedicated research has been conducted on this species. Protein characterisation was undertaken by Carstens *et al.* (1982). Its presence on the Agulhas Bank was noted (Japp *et al.* 1994). An isopod ectoparasite of this species was identified by Smit and Basson (2002). *Torpedo fuscomaculata* was ranked as the eighth highest research priority among all South African chondrichthyan species (da Silva *et al.* 2023).

ECOLOGY
Depth
This species occurs from intertidal depths to 440 m, but it is commonly shallower than 50 m (Pollom *et al.* 2019j).

Habitat: Adults
They inhabit estuaries during periods of high salinity, the intertidal zone, and sandy areas near deep rocky reefs (Pollom *et al.* 2019j). There are anecdotal reports of this species up to 2 km inland in the Kariega estuary, where water salinity is ~35 ppt (Pollom *et al.* 2019j). It may enter other large estuarine systems during periods of high salinity.

Habitat: Juveniles/Nursery Grounds
It is not known if the juveniles occupy areas different from the adults.

Synopsis of tag deployments
This species has not been tagged.

Movements
Nothing is known about the movement patterns of this species.

Diet/feeding: Adults
The diet comprises small teleosts and cuttlefish (Last *et al.* 2016).

Diet/feeding: Juveniles
The diet is possibly the same as that of adults.

South African toxicological studies
No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Histotrophic viviparity
DURATION OF REPRO CYCLE	Unknown

MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	Unknown
PUPPING/NURSERY GROUND	Unknown
LENGTH AT BIRTH	Unknown
LENGTH AT MATURITY	Unknown
MAXIMUM LENGTH	65 cm TL
GENERATION LENGTH	Unknown

Mode
This species exhibits histotrophic viviparity, in which maternal uterine secretions supplement the initial nourishment provided by the yolk-sac.

Duration of reproductive cycle
The length of the reproductive cycle is unknown.

Gestation
Gestation duration is unknown.

Mating season and location
This is unknown.

Litter size
This is unknown.

Pupping season and nursery ground
This is unknown.

Length at birth
This is unknown.

Length at maturity
This is unknown.

Maximum length
This species attains 65 cm TL (Compagno *et al.* 1989).

Age and growth
This unknown.

Generation length
This is unknown.

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Annual catches in South African fisheries were estimated at 1–10 tons for the periods 2010–2012 (DFFE unpublished records) and 2013–2019 (DFFE 2022). The demersal trawl fishery was the only listed source of catches. The demersal longline fishery, beach-seine fishery and gillnet fisheries were listed as possible additional sources (da Silva *et al.* 2015).

Demersal trawl fishery
The annual catch of unidentified electric rays in the inshore trawl fishery was estimated at 26 tons, for the period 2003–2006, based on observer records (Attwood *et al.* 2011). It is highly likely that these were both *T. fuscomaculata* and *Tetronarce cowleyi.* The former being rare in Eastern Cape inshore trawls (Booth and Hecht 1998) and on the Agulhas Bank (Japp *et al.* 1994).

In False Bay, Torpedo spp. was one of several chondrichthyans, which revealed a significant decline in trawl catches spread over 35 years in the period 1897–1932. Although commercial trawling was banned in 1928 in False Bay, scientific trawl surveys continued until 1947. Chondrichthyans, however, were not recorded after 1932 (Best *et al.* 2013).

Demersal longline fishery
No electric rays (family Torpedinidae) were listed in the chondrichthyan bycatch of the demersal longline fishery (Petersen *et al*. 2008).

Recreational linefishery
Torpedo fuscomaculata is a rare catch in Angling Week, an annual competition for competitive recreational anglers between Port Alfred and Robberg, with nine individuals, weighing 36 kg, recorded in catches between 1999 and 2010 (Dicken *et al.* 2012).

In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential effects on coastal elasmobranch species (Winkler *et al.* 2025). In the SASSA National data (2011-2023), which represents 26 different localities between Varkenvlei on the West Coast and Noggies in Northern KwaZulu-Natal, it was found that *Torpedo fuscomaculata* was the 35th most commonly captured species with an average CPUE of 0.0001, while in the RASSPL dataset, which represents 73 different fishing locations between Rietfontein on the West Coast and Haga Haga in the Eastern Cape, *T. fuscomaculata* was the 24th most commonly caught elasmobranch with a CPUE of 0.0002 (Winkler *et al.* 2025).

Beach-seine and gillnet fisheries
A single *T. fuscomaculata* of 40 cm DW was reported in the False Bay beach-seine fishery over several decades of data collection (Lamberth 2006).

Fishing outside South Africa
Nothing is known of catches outside South Africa, but *T. fuscomaculata* is caught frequently as bycatch by inshore trawlers. As a piscivore, this species is vulnerable to capture in any linefishery. This species may also be susceptible to coastal development that affects estuarine habitat (Fricke *et al* 2009; Pollom *et al.* 2019k). Although torpedo rays are typically discarded at sea, post-release mortality is unknown and potentially high.

Population trends
There are no estimates of population size or trend. This species is likely to be declining due to the level of fisheries exploitation occurring across its range, but was assessed globally as Data Deficient in 2018, due to a lack of information (Pollom *et al.* 2019k).

ECOTOURISM
As *T. fuscomaculata* does not appear to be often seen by scuba divers, despite being found close inshore, this species cannot be regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

The current demersal trawl footprint is ringfenced. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

Not enough is known of the distribution and movements of *T. fuscomaculata* to ascertain which MPAs will benefit this species.

Additional local comment

As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is prohibited outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

IUCN Status

Data Deficient 2018

Previous IUCN assessments

Data Deficient 2004

MANAGEMENT CONSIDERATIONS

The historic catches in the inshore trawl fishery were high, with an estimated annual catch of 26 tons between 2003–2006, which was all lumped as unidentified electric rays. Members of this family are slow swimmers, found close to the seabed where they are highly vulnerable to trawl fisheries. It is important to identify catches as accurately as possible, even if they are all discarded. A significant step would be the re-introduction of a scientific observer programme, with those involved trained in the identification of all chondrichthyans. An indication of post-release survival would be beneficial. It is imperative that the current trawl footprint remains ringfenced.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

Very little is known about the biology and ecology of *T. fuscomaculata*, both locally and internationally, as commercial catches are discarded at sea. An understanding of the genetic structure in the Western Indian Ocean is needed to establish if separate stocks occur regionally. Tissue samples should be collected for this purpose and to establish any genetic basis for the two local colour variants, described as spotted and speckled. This will also resolve confusion about the possible presence of *T. marmorata* in South African waters. The westernmost distribution of *T. fuscomaculata* needs to be confirmed, either as Cape Agulhas or False Bay. *T. fuscomaculata* was ranked as the eighth highest research priority among all South African chondrichthyan species.

Torpedo sinuspersici - Marbled electric ray / Persian Gulf torpedo

SCIENTIFIC NAME	*Torpedo sinuspersici* Olfers, 1831
COMMON NAME	Marbled electric ray, Persian Gulf torpedo
FAMILY	Torpedinidae
ENDEMIC	No, entire Western Indian Ocean
SIZE RANGE	15–80 cm TL, possibly 130 cm
DISTRIBUTION	East coast only: Kosi Bay to Port Alfred
HABITAT	Demersal on sand-inundated rocky reefs
DEPTH RANGE	0–200 m; very common in surf zone
MAJOR FISHERIES	KZN prawn trawl fishery and recreational linefishery
IUCN STATUS	Data Deficient 2017
CITES REGS	Not listed
MLRA REGS	Daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	JM Olbers

SPECIES SUMMARY and RECOMMENDATIONS

Torpedo sinuspersici is a small electric ray which occurs inshore along much of the east coast. It is found in coastal waters throughout the tropical Western Indian Ocean, but it is likely to be a species complex, comprising several regional endemics. The local average annual catch was estimated at 1–10 tons from DFFE records for two time periods: 2010–2012 and 2013–2019, primarily from the demersal trawl fishery. It was a regular catch in the now-closed KZN inshore prawn trawl fishery and is occasionally caught by recreational shore anglers in KZN. It was globally assessed as Data Deficient in 2017. Recreational anglers should be encouraged to release all catches. This species has been poorly studied in South African waters and opportunistic sampling opportunities should be used to improve knowledge of its biology and ecology. Tissue samples should be collected to help resolve the taxonomic issues.

TAXONOMIC and IDENTIFICATION ISSUES

There are three species of torpedo/electric rays in the family Torpedinidae in South Africa. Two of those are in the genus *Torpedo*, both of which are widespread in the Western Indian Ocean. *T. sinuspersici* has a very distinctive dorsal colouration, with a cream reticulated/vermiculate pattern formed by fused spots on a red/brown background extending onto all the fins. There are unlikely to be any local identification issues, but with its widespread distribution in most coastal waters of the Western Indian Ocean, it may be a species complex (Last *et al.* 2016a).

SOUTH AFRICAN DISTRIBUTION

Torpedo sinuspersici is confined to the east coast from the Mozambique border to Port Alfred (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

Torpedo sinuspersici occurs in coastal waters throughout the Western Indian Ocean, including the Red Sea and the Persian/Arabian Gulf (Kyne 2019).

SYNOPSIS OF RESEARCH

Torpedo sinuspersici is a poorly-studied species. In a study of batoid fishes of the east coast of southern Africa, Wallace (1967a) examined 14 individuals, all taken in the vicinity of Durban on the KZN coast. This sample comprised juveniles and adults (13–66 cm TL) and included three pregnant females. No additional dedicated research has been conducted on this species. Catches were quantified in the now-closed KZN inshore prawn trawl fishery (Fennessy 1994) and competition

shore angling on the east coast (Pradervand and Govender 2003, Pradervand 2004, Pradervand *et al.* 2007). *T. sinuspersici* was ranked 18th out of 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva *et al*. 2023).

ECOLOGY

Depth

This species occurs in the shallows, where it is caught by shore anglers, down to a depth of 200 m (Compagno *et al*. 1989).

Habitat: Adults

They inhabit coral reefs and sandy and rocky areas. They are often partially covered by sand, presumably as concealment from potential prey.

Habitat: Juveniles/Nursery Grounds

Juveniles also inhabit coral reefs and sandy and rocky areas. It is not known if the neonates occupy a different habitat.

Synopsis of tag deployments

A total of 49 individuals have been tagged by recreational and research shore anglers as part of the Oceanographic Research Institute Cooperative Fish Tagging Project. There have not been any recaptures (Gareth Jordaan, Oceanographic Research Institute, unpublished data).

Movements

Torpedo sinuspersici appears to be a weak swimmer and, therefore, unable to undertake long-distance movements. In the absence of any tag-recaptures, it must be regarded as a sedentary species.

Diet/feeding: Adults

The diet comprises small teleosts and various invertebrates. Swimming slowly just above the bottom at night, the prey is enveloped with the broad pectoral fins before an electric shock is administered to stun it. They also act as ambush predators while buried in sand during the day (Ketabi and Jamili 2016).

Diet/feeding: Juveniles

The diet is possibly the same as that of adults.

South African toxicological studies

No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Histotrophic viviparity
DURATION OF REPRO CYCLE	1 year (India)
MATING SEASON	Unknown
GESTATION	6-8 months (India)
LITTER SIZE	9–22
PUPPING/NURSERY GROUND	Summer, unknown location
LENGTH AT BIRTH	10 cm TL (India)
LENGTH AT MATURITY	F: 32 cm and M: 30 cm TL (India)
MAXIMUM LENGTH	80 cm, possibly 130 cm TL
GENERATION LENGTH	Unknown

Mode
Torpedo sinuspersici exhibits histotrophic viviparity, in which maternal uterine secretions supplement the initial nourishment provided by the yolk-sac.

Duration of reproductive cycle
The reproductive cycle is unknown locally but based on a gestation of 6–8 months in India, it does not exceed one year (Shrikanya and Sujatha 2014).

Gestation
Gestation duration is unknown locally, but it is 6–8 months in India (Shrikanya and Sujatha 2014).

Mating season and location
This is unknown.

Litter size
The litter sizes of three females, 62–66 cm TL, were 9, 15 and 22 pups (Wallace 1967a).

Pupping season and nursery ground
This is in summer (van der Elst 1988) but the location is unknown. It is possibly in the same locatin where the pregnant females occur.

Length at birth
This is unknown locally but is 10–12 cm TL in India (Shrikanya and Sujatha 2014).

Length at maturity
This is unknown locally, but length at maturity of *T. sinuspersici* in India is 32 cm TL for females and 30 cm TL for males (Shrikanya and Sujatha 2014). In the Persian Gulf, females mature at 45 cm and males at 39 cm TL (Ketabi and Jamili 2016).

Maximum length
Torpedo sinuspersici attains 80 cm TL and may reach 130 cm TL (Last *et al.* 2016).

Age and growth
This is unknown locally.

Generation length
This is unknown.

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Local average annual catch of *T. sinuspersici* was estimated from DFFE records at 1–10 tons for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). The demersal trawl fishery was listed as the main source of catches, followed by the now-closed inshore KZN prawn trawl fishery. The hake longline fishery was noted as a possible additional source, but the recreational linefishery was not included (da Silva *et al*. 2015).

Demersal trawl fishery
This species was not listed specifically in the annual catch estimates in the South African inshore trawl fishery for the period 2003–2006, although there was a category of unidentified electric rays which constituted 26 tons (Attwood *et al.* 2011). Given that no demersal trawling is permitted east of the Kei River Mouth, which is only 200 km from the southernmost limit of the distribution of *Torpedo sinuspersici*, it is likely that the high catches in this fishery are other species, either *Torpedo*

fuscomaculata or *Tetronarce cowleyi*, or members of the other families within the order Torpediniformes.

KZN inshore prawn trawl fishery
This species was a bycatch in the now-closed KZN inshore prawn trawl industry on the uThukela Banks. The extrapolated average annual catch between 1989 and 1992 was 109 individuals (range 82-156). The size range was 0.1–0.4 m, with a mean of 0.3 m, which encompassed both neonates and adults (Fennessy 1994). Survival of this bycatch species was around 60%, based on a subsample of five individuals (Fennessy 1994). This fishery was dormant for nearly two decades due to the extended closure of the mouth of Lake St Lucia, resulting in poor prawn recruitment and diminishing prawn catches on the uThukela Banks. The fishing grounds were formally closed to trawling following the declaration of the uThukela MPA in August 2019.

Recreational linefishery
T. sinuspersici is not an uncommon catch of recreational shore anglers along the east coast. In KZN 283 individuals with a total weight of 1350 kg were caught in the period 1977–2000 (Pradervand *et al.* 2007). In the same period, only 13 individuals weighing 53 kg were caught immediately to the south on the Transkei coast (Pradervand 2004). Moving further south, 15 individuals weighing 63 kg were caught on the Border coast in the period 1982–1998 (Pradervand and Govender 2003).

In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential effects on coastal elasmobranch species (Winkler *et al.* 2025). In the SAASA-KZN dataset, where locations are fished in KZN and the northern Eastern Cape, at 206 different locations between Kosi Bay and Xhora river mouth, this species was ranked 19th and 20th most common elasmobranch caught, during the day (CPUE: 0.03) and at night (CPUE: 0.02), respectively (Winkler *et al.* 2025).

Fishing outside South Africa
Trawl fisheries operate across many parts of its range and, as a slow-moving species, *T. sinuspersici* is vulnerable to capture; post-capture survival is thought to be low (Kyne 2019). As a piscivore, this species is vulnerable to capture in any linefishery.

Population trends
If this species turns out to represent a species-complex of range-restricted endemics, taxonomic resolution is required to understand population structure and size (Kyne 2019).

ECOTOURISM
This species is often seen by scuba divers, particularly in the iSimangaliso and Aliwal Shoal MPAs, albeit partially covered in sand and usually in caves and under rock overhangs. As a result, it must be recognised as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It does occur in several protected areas along the South African coast. The uThukela MPA appears to be an important area for this species, based on historical catches in the now-closed inshore prawn trawl fishery. It is also seen regularly by divers in the iSimangaliso and Aliwal Shoal MPAs. Given its apparent low mobility, it is likely that these three MPAs provide considerable protection to *T. sinuspersici.*

Additional local comment
As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is prohibited outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

IUCN Status
Data Deficient 2017

Previous IUCN assessments
Data Deficient 2006

MANAGEMENT CONSIDERATIONS
The closure of the inshore KZN prawn trawl fishery on the uThukela Banks has removed a significant portion of the historical catch. It is important to identify trawl catches as accurately as possible, even though they are discarded. An important step would be the re-introduction of a scientific observer programme, with those involved being trained in the identification of all chondrichthyans. An indication of post-release survival would be beneficial. It is also imperative to continue the time series of bi-annual demersal trawl surveys to monitor population trends of this and other species of electric rays. The current trawl footprint must remain ringfenced. Recreational shore anglers should be encouraged to continue to release any catches, despite the possibility of being shocked during handling.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Torpedo sinuspersici has been poorly studied locally. As any catches in the demersal trawl fishery are discarded, the re-introduction of the scientific observer programme would be a valuable source of biological material and catch statistics. Any other opportunistic sampling should be used to collect much-needed biological and ecological information. An understanding of the genetic structure in the Western Indian Ocean is needed to establish if separate stocks occur regionally. Genetic samples should be collected for this purpose. *Torpedo sinuspersici* was ranked 18th out of 60 South African demersal chondrichthyan species, which were prioritised for further research.

FAMILY RHINOBATIDAE

Acroteriobatus blochii - Bluntnose guitarfish

SCIENTIFIC NAME	*Acroteriobatus blochii* (Müller and Henle, 1841)
COMMON NAME	Bluntnose guitarfish
FAMILY	Rhinobatidae
ENDEMIC	No, regional endemic: occurs in Namibia and possibly Angola
SIZE RANGE	At least 12–102 cm TL
SA DISTRIBUTION	West coast: Orange River Mouth to Langebaan, possibly Cape Point
HABITAT	Demersal on sand bottoms, including estuaries
DEPTH RANGE	0-30 m, possibly 50 m
MAJOR FISHERIES	Beach seine and gillnet fishery and recreational shore angling
IUCN STATUS	Least Concern 2018
CITES	Appendix II
MLRA	Daily bag limit of one individual in recreational fishery; no-sale species
COMPILER	G Cliff
REVIEWER	M van Staden

SPECIES SUMMARY and RECOMMENDATIONS

Acroteriobatus blochii is a small, demersal guitarfish species inhabiting shallow inshore waters along the west coast. Its range extends into Namibia and possibly Angola. Misidentification with the far more common *A. annulatus* has greatly limited the state of knowledge of this species, which appears to be an important predator in the Langebaan Lagoon. Local average annual catch was estimated at <1 ton from DFFE records for two time periods: 2010–2012 and 2013–2019, which was largely in the beach-seine and gillnet fishery. It is caught by recreational shore anglers. Despite so little being known about this species, it was assessed as Least Concern on the IUCN Red List in 2018. Its congener *A. annulatus* is fast growing and matures within three years, so it is conceivable that the same applies to *A. blochii*. It is important to distinguish between the two species in all fisheries. As *A. blochii* is a poorly-known species, any sampling opportunity should be used to improve the knowledge of its life-history and ecology.

TAXONOMIC and IDENTIFICATION ISSUES

Acroteriobatus blochii was once considered very rare and known from only a few specimens along the west coast of South Africa and Namibia, but this was because it was frequently misidentified as *A. annulatus*. A coastal survey conducted along the west coast of South Africa and Namibia revealed it to be the most common guitarfish along the west coast, mostly replacing *A. annulatus* north of Langebaan Lagoon and extending into central Namibia (Ebert *et al.* 2021a). On the South African coast *A. blochii* is the only guitarfish with a short and bluntly rounded snout, as well as a single spiracle fold (Last *et al.* 2016a). A comparative mitogenomics study provided molecular evidence for the continued treatment of *A*. *annulatus* and *A*. *blochii* as taxonomically distinct species (van Staden *et al*. 2022). Furthermore, sequences from specimens that were caught in Namibia and reported as *A*. *annulatus* (van der Bank 2019) were found to match the newly generated sequence for *A*. *blochii.*

SOUTH AFRICAN DISTRIBUTION

Acroteriobatus blochii is confined to the west coast from the Orange River Mouth to Langebaan; it may extend southwards to Cape Point but if so, it is rare south of Langebaan (Ebert *et al.* 2021a). It is listed as occurring along the entire west coast (Compagno *et al.* 1989, Pollom *et al.* 2019l). This uncertainty over its range can be attributed to confusion with the better-known and more common *A. annulatus*, which occurs along much of the South African coast, including the west coast from

Cape Point to at least Langebaan (Ebert *et al.* 2021a). With increasing awareness of *A. blochii*, it is conceivable that *A. annulatus* may not occur on the west coast at all. This is supported by observations based on careful attention to snout shape (blunt: *A. blochii*; pointed: *A. annulatus*), in which no *A. annulatus* have been caught in annual sampling of the Saldanha-Langebaan system in the past decade (Ken Hutchings, Anchor Environmental Consultants (Pty) Ltd. unpublished data).

REGIONAL DISTRIBUTION

Acroteriobatus blochii occurs in Namibia (Compagno *et al*. 1989, Leeney 2024). It is present in Angola (Pollom *et al.* 2019l) but this, together with records from Senegal and Mauritania, is described as doubtful (Last *et al.* 2016a). Its congener *A. annulatus* is present in Angola, but it may be *A. blochii*, given the misidentification issues already noted above.

SYNOPSIS OF RESEARCH

Acroteriobatus blochii has been very poorly studied in South Africa, largely as a result of its confusion with the better-known *A. annulatus.* A study of the role of *A. annulatus* as a predator in the Langebaan Lagoon (Harris 1984, Harris *et al*. 1988) was most likely *A. blochii* (Colin Attwood, University of Cape Town, unpublished). This error was confirmed by the photograph of two blunt-snouted guitarfish, clearly *A. blochii,* on the front page of the thesis by Harris (1984). Schultz (2010) used quantitative multivariate morphometrics to differentiate between *A. blochii* and *A. annulatus*. Morris *et al*. (2016) determined heavy metal concentrations in various body tissues, as well as in endoparasites of *A. blochii* and *A. annulatus* from Saldanha Bay. Van Staden *et al.* (2022) and van Staden (2023) undertook comparative analyses of the complete mitochondrial genomes of these two guitarfish species. Given the scant knowledge of *A. blochii*, this species was ranked as the highest research priority among all South African chondrichthyan species (da Silva *et al.* 2023).

ECOLOGY

Depth

This demersal species occurs in coastal waters from close inshore, including the surf zone, estuaries and embayments, with no reference to a maximum depth in the published literature. It is absent in commercial, and research demersal trawl catches on the west coast, as well as catches of commercial linefishers targeting snoek *Thyrsites atun* in St Helena Bay, where it is common close inshore (Hutchings pers. obs.). In view of these observations and based on various unpublished records and observations, *A. blochii* appears to occur from 0–30 m, possibly as deep as 50 m.

Habitat: Adults

The adults inhabit sandy habitats in shallow coastal waters, including the Saldanha Bay-Langebaan Lagoon system, as well as the lower reaches of larger estuaries. These include the Berg Estuary (Clark *et al.* 2009) and Olifants Estuary (Lamberth *et al.* 2008), when the salinities approach that of sea water. There were far fewer records from the Orange River (Stephen Lamberth, DFFE, unpublished data), although at the time the estuarine individuals were recorded as *A. annulatus.*

Habitat: Juveniles/Nursery Grounds

It is assumed that juveniles also inhabit similar shallow sandy areas. Catch records of 291 individuals made during research surveys in the Saldanha Bay-Langebaan Lagoon system were dominated by larger individuals of 50–89 cm but included a very small number of individuals smaller than 30 cm, as well as other larger juveniles (Hutchings pers. obs.). The implication of this finding is that the juveniles inhabit the deeper waters of the system to avoid competition with the larger individuals and thereby escape capture in research nets.

Synopsis of tag deployments

Individuals of this species have not been tagged, unless misidentified as *A. annulatus.* Should any analysis of tagging data be undertaken, there is merit in assuming that all those tagged in the

Saldanha-Langebaan system, as well as other locations on the west coast, are *A. blochii* and not *A. annulatus.*

Movements
Nothing is known.

Diet/feeding: Adults
In Langebaan Lagoon the diet of *A. annulatus*, although most likely *A. blochii*, comprised nearly 90% crustaceans, which included sandprawns, mudprawns, swimming crabs, mole crabs, amphipods, and isopods; small teleosts and polychaete annelid worms were also eaten. Calculations suggest that 26–77% of the annual invertebrate production in the intertidal flats of the lagoon is consumed by this species, so it has a substantial impact on the macrofauna and thereby plays an important role as a predator in the system (Harris *et al.* 1988). The ichthyofauna of this system is dominated by benthic feeders which include *A. blochii* (Lamberth unpublished data). Individuals aggregate in the swash-zone, where they feed on sand welks *Bullia* sp. which are themselves feeding on dead jellyfish.

Diet/feeding: Juveniles
The diet is possibly similar to that of adults.

South African toxicological studies
Morris *et al.* (2016) investigated concentrations of 17 heavy metals, including manganese, arsenic, titanium, lead and zinc in *A. blochii* and *A*. *annulatus* and their associated gastro-intestinal parasites. In this symbiotic (possibly mutualistic) relationship, the parasites act as sinks, removing these heavy metals from the host tissues.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	7
PUPPING/NURSERY GROUND	Unknown
LENGTH AT BIRTH	At least 12 cm TL
LENGTH AT MATURITY	Unknown
MAXIMUM LENGTH	106 cm TL
GENERATION LENGTH	Unknown

Mode
Acroteriobatus blochii, like other members of the family Rhinobatidae, exhibits lecithotrophic viviparity, in which the embryos are dependent entirely on nourishment provided by the yolk-sac. Nothing is known about the reproduction of this species. Its congener, *A. annulatus*, has been well studied; it is significantly bigger (140 cm) than *A. blochii*, and has a high fecundity, an annual reproductive cycle, a litter size of 2–10, age-at-maturity of 2-3 years and a generation length of 5 years (Pollom *et al.* 2019, and references cited therein). It is reasonable to assume that *A. blochii* may have similar life-history traits.

Duration of reproductive cycle
This is unknown.

Mating season and location
This is unknown.

Gestation
In April, many females were found with well-developed embryos, which suggests that they migrate into Langebaan Lagoon in late summer to give birth (Harris *et al.* 1988).

Litter size
Acroteriobatus blochii has a litter size of seven, based on an anecdotal report of a stranded female in Namibia. Harris (1984) and Harris *et al.* (1988) note the capture of several pregnant females in Langebaan Lagoon, but with no information on litter size.

Size at birth
Anecdotal evidence suggests a size of birth of at least 12 cm TL, based on the single record of a pregnant female with seven embryos.

Pupping season and nursery ground
This is unknown and includes the Saldanha Bay-Langebaan Lagoon system. Only a single individual smaller than 20 cm TL was recorded among 291 *A. blochii* sampled in research surveys in this system. These small individuals are rarely seen in the shallows where the adults aggregate and appear to inhabit water deeper than that sampled (Hutchings unpublished data).

Length at maturity
This is unknown.

Maximum size
The maximum size of *A. blochii* was reported at 96 cm TL (Compagno *et al.* 1989, Last *et al.* 2016a), but there was a recent angling record of 106 cm (Andre de Villiers, Western Cape Shore Angling Association: WCSAA), with individuals over 100 cm caught by these anglers in the Berg River, Saldanha-Langebaan and St Helena Bay.

Age and growth
This is unknown.

Generation length
This is unknown.

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *A. blochii* was estimated from DFFE records at <1 ton for two time periods: 2010–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022), which comprised almost exclusively bycatch in the beach-seine and gillnet fisheries, followed by the recreational linefishery. The commercial linefishery was listed as a suspected source of further catches (da Silva *et al*. 2015). Pollom *et al.* (2019), erroneously cited da Silva *et al.* (2015), listing the annual catch estimate at 11–100 tons for the period 2010–2012.

SA catch quantities and characteristics
Beach seine and gill net fisheries
Bycatch in the gillnet fishery targeting *Callorhinchus capensis* on the west coast around St Helena Bay comprised 98% chondrichthyans, including *A. annulatus* which were all released alive (Freer and Griffiths 1993a). As a result, these catches were not quantified. Some beach-seine permit-holders on the west coast admitted to substantial landings of bycatch species, with up to 10 tons of *A. annulatus* per year, however such large catches were rare (Hutchings and Lamberth 2002b). In both these fisheries it is likely that *A. blochii* was one or possibly the only species of *Acroteriobatus* caught.

There was an exploratory bottom-set gillnet fishery for *A. blochii* in St Helena Bay, with the centre of operations off Varkenvlei, from the late 1980s into the early 1990s. It evidently failed, with fishers complaining that bycatch limitations were too restrictive (Stephen Lamberth, unpublished data).

Recreational shore angling

No details of catches have been published, but records kept by the WCSAA indicate that *A. blochii* is not an uncommon catch. A total of 2,105 individuals were caught, measured and released in five competitions, all fished in St Helena Bay in October and November of 2022 and 2023 and October 2024 (de Villiers, WCSAA records). In terms of the competition rules, only catches heavier than 1 kg are eligible, thereby creating a marked bias in the length-frequency distribution of the catch records, with very few *A. blochii* smaller than 60 cm TL documented. Females constituted 94% of this catch.

In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential effects on coastal elasmobranch species (Winkler *et al.* 2025). According to the SASSA National data (2011-2023), *Acroteriobatus blochii* was the second most commonly captured species, with an average catch per unit effort (CPUE) of 0.54. The most commonly caught was *A. annulatus* with an average CPUE of 1.35. Therefore an angler would catch one *A. blochii* every second outing.

Fishing outside South Africa

Acroteriobatus blochii is caught by recreational anglers and occasionally in bottom trawls in Namibia. Most are released alive by anglers in which post-release mortality rates are unknown but should be low with careful handling. The restricted range of this species and its preference for shallow, coastal habitats makes it susceptible to fishing activities. Potential habitat degradation from diamond mining and coastal development activities on the Namibian coast may also pose a threat (Leeney 2024).

Population trends

There are no population size or trend estimates for this species. Much of its range is remote and not subjected to fishing pressure. Despite very little being known about its distribution, life-history, population size and trends, and threats, the population trend is suspected to be stable; therefore, it was assessed as Least Concern in terms of the IUCN Red List in 2018 (Pollom *et al.* 2019l).

ECOTOURISM

Acroteriobatus blochii is not regarded as an ecotourism species, but occasionally snorkellers have been seen following them in the Langebaan Lagoon as they are highly visible and easy to watch (Lamberth, pers. obs.).

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

There is a daily bag limit of one individual in the recreational linefishery and it may not be sold.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

Acroteriobatus blochii is afforded some protection in the small West Coast National Park, which encompasses Langebaan Lagoon. Fishing is prohibited in two management zones of the park. However, the commercial gillnet TAE for Langebaan is oversubscribed and previously there have

been concessions granted to fish in the restricted areas. Both the Berg and Olifants Estuaries have effective protection in the regions where most *A. blochii* occurs in these systems, through closure to fishing.

IUCN Red List Status
Least Concern 2018

Previous IUCN assessments
Least Concern 2016
Least Concern 2006 (*Rhinobatos blochii*)

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
All members of the family Rhinobatidae were included in Appendix II in 2023.

Convention on Migratory Species (CMS)
Acroteriobatus blochii is not listed.

International comments
There are no known species-specific conservation measures in place for this species.

MANAGEMENT CONSIDERATIONS
It is important to resolve the identity of specimens of *Acroteriobatus* encountered on the west coast, in particular whether *A. annulatus* occurs there at all. *A. blochii* favours shallow, inshore soft-bottom habitats, which are extremely vulnerable to either loss or degradation, through activities such as harbour development and coastal land reclamation.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Clarification is required in terms of spatial delineation between *A. blochii* and *A. annulatus.* In the case of *A. blochii* very little is known about the distribution, life-history, ecology, population size and trends and threats. The marked dominance of female *A. blochii* in the catches of shore anglers in St Helena Bay suggests sexual segregation; the whereabouts of the males also requires investigation. The possibility of sexual dimorphism in snout shape, which has led to confusion between the two species, should be investigated. As a result of this dearth of information, DFFE has ranked *A. blochii* as being the highest research priority of all South African chondrichthyan species.

ACKNOWLEDGEMENTS
In view of the dearth of published information on *A. blochii,* the authors are grateful to Dr Stephen Lamberth of DFFE and Dr Ken Hutchings of Anchor Environmental Consultants (Pty) Ltd. for contributing considerable unpublished information on this species.

Rhinobatos holcorhynchus - Slender guitarfish

SCIENTIFIC NAME	*Rhinobatos holcorhynchus* Norman, 1922
COMMON NAME	Slender guitarfish
FAMILY	Rhinobatidae
ENDEMIC	No, regional endemic: occurs in Mozambique
SIZE RANGE	?–127 cm TL
SA DISTRIBUTION	East coast: Mozambique border to Port Shepstone
HABITAT	Demersal on sand bottoms
DEPTH RANGE	75–350 m
MAJOR FISHERIES	Demersal trawl fishery and demersal longline fishery
IUCN STATUS	Data Deficient 2018
CITES	Appendix II (2023) with all members of the family Rhinobatidae
MLRA	Daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RH Bennett

SPECIES SUMMARY and RECOMMENDATIONS

Rhinobatos holcorhynchus is a small, demersal guitarfish species inhabiting shelf and upper slope waters along the northern part of the east coast. Its range extends northwards to Kenya. Misidentification of this species with other guitarfish has meant that this is one of the most poorly known chondrichthyans in South African waters. The local average annual catch was estimated at <1 ton from DFFE records for two time periods: 2010–2012 and 2013–2019. Given its preference for waters deeper than 75 m, it is possible that it is taken in the deep-water crustacean trawl fishery off the central KZN coast. It was assessed as Data Deficient on the IUCN Red List in 2018. Accurate species identification is needed, and any sampling opportunity should be used to improve the knowledge of the life-history and ecology of this very poorly known species.

TAXONOMIC and IDENTIFICATION ISSUES

Rhinobatos holcorhynchus was, until the description of *R. austini* (Ebert and Gon 2017), the only recognised species in this genus found in the SW Indian Ocean, as most guitarfishes of the region have been reassigned to the genus *Acroteriobatus* (Last *et al.* 2016a). The name *Rhinobatos schlegelii* appears in some earlier South African literature, but more recent accounts do not recognize it as occurring in the region (Ebert *et al.* 2021a). The two species, *R. holcorhynchus* and *R. austini*, are easily confused as both have a black teardrop-shaped blotch on the ventral surface of the snout (Ebert *et al.* 2021a), but *R. holcorhynchus* has a plain, dark, olive-green dorsal surface, with no distinctive markings (Ebert and Gon 2017). Geographically, these two species broadly overlap, although *R. holcorhynchus* appears to occur in deeper water 75–350 m, while *R. austini* inhabits a mostly coastal habitat shallower than 75 m (Last *et al*. 2016a, Ebert and Gon 2017). The illustration (fig. 10.20) in the species account of *R. holcorhynchus* in Last *et al.* (2016a) is *R. austini* (Ebert *et al.* 2021a).

SOUTH AFRICAN DISTRIBUTION

Rhinobatos holcorhynchus is confined to the east coast from the Mozambique border to Port Shepstone on the KZN south coast (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

This species occurs in Mozambique up to Kenya (Last *et al.* 2016a). Its presence in Madagascar is uncertain (Pollom *et al.* 2019m).

SYNOPSIS OF RESEARCH

Rhinobatos holcorhynchus has been very poorly studied in South Africa. Wallace (1967b) provided morphometrics from six immature specimens trawled off the KZN coast. The only more recent research was the taxonomic reassessment of the three species of *Rhinobatos* found in the SW Indian Ocean, the third species being *R. nudidorsalis,* which is currently only known from the Mascarene Ridge where it may be endemic (Aitchison *et al.* 2024). *Rhinobatos holcorhynchus* was ranked 42nd of 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

Rhinobatos holcorhynchus is a demersal species which occurs on the continental shelf and upper slope at depths of 75–350 m (Last *et al.* 2016a).

Habitat: Adults

The adults inhabit sandy habitats.

Habitat: Juveniles/Nursery Grounds

It is assumed that juveniles also inhabit sandy areas.

Synopsis of tag deployments

Individuals of this species have not been tagged.

Movements

Nothing is known.

Diet/feeding: Adults

It is assumed that the diet is similar to that of other guitarfish and comprises infaunal crustaceans such as swimming crabs, mole crabs, amphipods and isopods, as well as polychaetes and small teleosts.

Diet/feeding: Juveniles

The diet is possibly similar to that of adults.

South African toxicological studies

No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Lecithotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	Unknown
PUPPING/NURSERY GROUND	Unknown
LENGTH AT BIRTH	Unknown
LENGTH AT MATURITY	Unknown
MAXIMUM LENGTH	127 cm TL
GENERATION LENGTH	Unknown

Mode
Members of the family Rhinobatidae exhibit lecithotrophic viviparity in which the embryos are dependent entirely on nourishment provided by the yolk-sac. Nothing is known about the reproduction of *R. holcorhynchus*, but *Acroteriobatus annulatus* has been well-studied. This species is slightly bigger (140 cm) than *R. holcorhynchus* and has a high fecundity. It has an annual reproductive cycle, with a litter size of 2–10, age-at-maturity of 2-3 years and a generation length of 5 years (Pollom *et al.* 2019m and references cited therein). It is possible that *R. holcorhynchus* has similar life-history traits.

Duration of reproductive cycle
This is unknown.

Mating season and location
This is unknown.

Gestation
This is unknown.

Litter size
This is unknown.

Size at birth
This is unknown.

Pupping season and nursery ground
This is unknown.

Length at maturity
This is unknown.

Maximum size
Maximum size is 127 cm TL (Compagno 1986a).

Age and growth
This is unknown.

Generation length
This is unknown.

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *R. holcorhynchus* was estimated from DFFE records at <1 ton for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). In the first period, the demersal trawl fishery and the demersal longline fishery were listed as possible catch sources (da Silva *et al*. 2015). In the period 2013–2019, the hake longline fishery and the demersal trawl fishery were listed as major contributors (DFFE 2022).

SA catch quantities and characteristics
Demersal trawl fishery
Rhinobatos holcorhynchus only occurs well north and outside of the footprint of this fishery, which is not permitted to operate east of the Kei River Mouth. The same restriction applies to the demersal longline fishery (da Silva *et al.* 2015).

KZN crustacean trawl fishery
The four specimens examined by Wallace (1967b) were taken in trawls on the KZN north coast in the vicinity of the uThukela Banks at depths of 75–140 m. This is far deeper than the operating limits of the inshore prawn fishery (Fennessy 1994). The deep-water crustacean trawling grounds range from 100–600 m, with most of the effort concentrated at 300–600 m (Fennessy and Groeneveld 1997). The depth distribution of *R. holcorhynchus* is 75–350 m, which means that it is a likely bycatch in this fishery.

Fishing outside South Africa
Rhinobatos holcorhynchus is landed and retained as bycatch in trawl and gillnet fisheries throughout its range. Guitarfishes are often targeted for their meat and valuable fins in various artisanal fisheries and are susceptible to being caught due to their nearshore and shelf habitat (Pollom *et al.* 2019m).

Population trends
There are no population size estimates for this species. It was recorded in most (>70%) of the shallowest research stations (100–200 m depth) surveyed during scientific demersal trawl surveys (March–April 2007) in waters off Mozambique (Baro et al. 2007, cited by Pollom *et al.* 2019m). This species is suspected to be declining due to the levels of exploitation, but trend data are unavailable. The level of fisheries mortality is unclear in parts of its range, and it may have refuge at depth in some areas. In the absence of further information on levels of fishing mortality, *R. holcorhynchus* was assessed as Data Deficient in terms of the IUCN Red List in 2018 (Pollom *et al.* 2019m).

ECOTOURISM
Rhinobatos holcorhynchus is not regarded as an ecotourism species because of its deep-water habit.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
Rhinobatos holcorhynchus may be afforded some protection in the deeper waters of the uThukela MPA and the iSimangaliso MPA.

Additional local comment
None.

IUCN Red List Status
Data Deficient 2018

Previous IUCN assessments
Data Deficient 2009

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
Rhinobatos holcorhynchus was placed on Appendix II in 2023, along with all members of the family Rhinobatidae.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
None.

MANAGEMENT CONSIDERATIONS
It is important to resolve the identity of specimens of guitarfish encountered on the east coast, given the close similarity in appearance of this species and of *R. austini* and *A. annulatus.* The two latter species occur in shallower water, while *R. holcorhynchus* favours much deeper water.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Rhinobatos holcorhynchus is one of the most poorly studied South African elasmobranchs. Almost nothing is known about its life-history and ecology, population size and trends, and threats. Any opportunistic sampling should be used to collected information as well as tissue samples to assess any regional population structure. *R. holcorhynchus* was ranked 42nd out of 60 South African demersal chondrichthyan species, which were prioritised for further research.

FAMILY ARHYNCHOBATIDAE

Bathyraja smithii - African softnose skate

SCIENTIFIC NAME	*Bathyraja smithii* (Müller and Henle 1841)
COMMON NAME	African softnose skate
FAMILY	Arhynchobatidae
ENDEMIC	No, also found in Namibia
SIZE RANGE	13–120 cm TL
DISTRIBUTION	South, West coasts: Orange River mouth to Cape Agulhas, with 1 record in the vicinity of Algoa Bay
HABITAT	Demersal on upper slope
DEPTH RANGE	160–1020 m, mostly below 600 m
MAJOR FISHERIES	Demersal trawl fishery and possibly demersal longline fishery
IUCN STATUS	Least Concern 2018
CITES	Not listed
MLRA	The current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Bathyraja smithii is a regional endemic skate that also only occurs in southern Namibia. It is found on the deep slope along the entire south and west coasts. Local average annual catch was estimated at 11–100 tons from DFFE records for two time periods: 2010-2012 and 2013–2019, which seems very high given that it occurs mostly deeper than 600 m on the west coast. This catch was predominantly from the demersal trawl fishery, but species-specific records of catches are either poor or almost non-existent. This species was assessed as Near Threatened on the IUCN Red List in 2020, and close to meeting the criteria of Vulnerable. Catches of *B. smithii* are discarded at sea, hence this species has not been well studied, with little known of its reproductive biology, life-history, ecology and population trends. The re-establishment of the scientific observer programme will address this shortcoming, and the continuation of research trawl surveys will also provide material and related catch information.

TAXONOMIC and IDENTIFICATION ISSUES

Bathyraja smithii is a member of the family of softnose skates Arhynchobatidae, which are characterised by a soft, flexible snout with the rostral cartilage reduced to a slender rod (Compagno *et al*. 1989). *B. smithii* was originally known as *Raja smithii* in the family Rajidae (Ebert *et al.* 2021a, and references cited therein). It is the only member of the Arhynchobatidae that occurs in South Africa, which facilitates its identification.

SOUTH AFRICAN DISTRIBUTION

This species occurs along the entire west and south coasts, with a single record from the east coast near Algoa Bay (Ebert *et al.* 2021a). The area on the west coast between Saldanha Bay and Cape Point appears to be the epicentre of the regional population (Compagno *et al*. 1991). The species was uncommon in DFFE demersal research surveys conducted between 1986 and 2023 (DFFE unpublished data), with the majority of records from the West coast from Cape Point north to the Namibian border. Only 2% of demersal trawl survey records were east of Cape Agulhas.

REGIONAL DISTRIBUTION

Bathyraja smithii only occurs in the southern part of Namibia (Compagno *et al*. 1989), as far north as Walvis Bay (Leeney 2024), and possibly elsewhere in the SW Indian Ocean (Last *et al.* 2016a).

SYNOPSIS OF RESEARCH

Bathyraja smithii is not well studied. The distribution of several skate species, including *B. smithii,* was described by Compagno *et al.* (1991), based on catches in research trawls for the period 1986-1990. A study of the feeding ecology was undertaken on the west coast (Ebert *et al.* 1991). Compagno and Ebert (2007) reviewed the biodiversity and distribution of southern African skates. Reproductive biology was investigated by Ebert *et al.* (2008). *B. smithii* was ranked 17th out of the 60 South African demersal chondrichthyan species which were prioritised for further research (da Silva et al. 2023) in South Africa.

ECOLOGY

Depth

It occurs over a wide depth range from 300–1040 m, with most records deeper than 600 m (Compagno and Ebert 2007). More recent trawl surveys reported only a handful of records shallower than 300 m, the shallowest being 160 m (DFFE unpublished data). It appears that *B. smithii* is a deep-water species that occasionally ventures inshore.

Habitat: Adults

Bathyraja smithii is a benthic species on the deep slope (Last *et al.* 2016), with adults and adolescents occurring over a wide depth range (Ebert *et al.* 1991).

Habitat: Juveniles/Nursery Grounds

All juveniles were only caught in water deeper than 700 m (Ebert *et al.* 1991).

Synopsis of tag deployments

This species occurs in extremely deep water and has not been tagged.

Movements

Nothing known.

Diet/feeding: Adults

Bathyraja smithii has a large mouth, strong jaws and sharp teeth. The stomach contents of 32 individuals sampled on the south and west coasts, comprising both juveniles and adults, contained mainly crustaceans and teleosts, with the occasional cephalopod from individuals sampled in very deep-water Ebert *et al.* (1991).

Diet/feeding: Juveniles

Ebert *et al.* (1991) did not highlight any size-related difference in diet.

South African toxicological studies

No study has been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	2

PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	13 cm TL
SIZE AT MATURITY	F: 87 TL; M: 96 cm TL
MAXIMUM SIZE	120 cm
GENERATION LENGTH	Unknown

Mode
Oviparity is the known reproductive mode of all skates. Ebert *et al.* (2008) reported the presence of a single egg case in each uterus in a single individual.

Duration of reproductive cycle
The duration of the reproductive cycle is unknown.

Mating season and location
This is not known.

Gestation
Gestation length is not known.

Litter size
This is two, based on the presence of a single egg case in each uterus (Ebert *et al.* 2008), but the frequency of egg-laying is not known.

Size at birth
This is about 13 cm TL, based on the smallest *B. smithii* caught (Ebert *et al.* 2008).

Pupping season and nursery ground
Nothing is known.

Size at maturity
Size at 50% maturity was 87 cm TL for females and 96 cm TL for males (Ebert *et al.* 2008).

Maximum size
The maximum size of *B. smithii* is 120 cm (Compagno *et al.* 1989).

Age and growth
This species has not been aged.

Generation length
This is unknown.

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *B. smithii* was estimated from DFFE records at 11–100 tons for two time periods, 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). It is caught in the demersal trawl fishery and is a suspected catch in the demersal longline fishery.

SA catch quantities and characteristics
Trawl fishery
Annual average catch estimates of unidentified skates in the inshore trawl fleet, based on unsorted samples by observers, was 833 tons for the period 2003-2006. This excluded catches of 4.8 tons for *B. smithii*, which was one of only two identified skate species, the other being *Cruriraja*

parcomaculata now known as *C. hulleyi* at 12.8 tons (Attwood *et al.* 2011). This catch seems far too high, as this fishery is confined to the south coast east of Cape Agulhas, with trawling concentrated at depths of 80–110 m, which is far shallower than the depth range and epicentre of distribution of *B. smithii* reported above. Catches in the offshore component of this fishery are poorly documented, but *B. smithii* is considered extremely rare on the south coast east of Cape Agulhas, with only four records from demersal surveys (DFFE unpublished data). These surveys are conducted in April and September, while those west of Cape Agulhas are undertaken in January. If the catch estimates reported by Attwood *et al.* (2011) are correct, it suggests that *B. smithii* makes a seasonal migration into shallow waters on the south coast outside of the summer, when research trawl surveys are undertaken.

Fishing outside South Africa
Nothing is known of catches in Namibia, other than it is noted as bycatch in the Namibian bottom trawl fishery for hake (Leeney 2024).

Population trends
There are no population estimates for *B. smithii*. Although data collected during demersal research trawl surveys along the west coast in summer (1991–2017) and along the south coast in autumn and spring (1991–2016) by the Department of Agriculture, Forestry and Fisheries (DAFF, now DFFE) are used to monitor population trends for several commercial and bycatch species, the catches of this species during these research surveys were too low for trend analysis. The population is suspected to be stable, based on it having some refuge in waters deeper than current fishing activities. It was assessed as Near Threatened on the IUCN Red List in 2018 (Pollom *et al.* 2019n).

ECOTOURISM
As *Bathyraja smithii* occurs in largely deep water, it cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
The current demersal trawl footprint is ringfenced and regulated. This species is not listed.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It is unknown if *B. smithii* will derive any benefit from the offshore MPAs.

Additional local comment
As part of the MSC certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

IUCN Red List Status
Least Concern 2018

Previous IUCN assessments
Data Deficient 2009

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
There are no known conservation measures in place for *B. smithii* in Namibia.

MANAGEMENT CONSIDERATIONS
Bathyraja smithii occurs along the entire south and west coasts, where most of the demersal trawling takes place, but it will derive considerable protection from this fishery at depth. Better identification of all skates caught in this fishery is needed. An important step would be to re-establish the scientific observer programme and to ensure that observers are trained in the identification of chondrichthyans. Only *Raja straeleni* is regularly retained and processed. All other skates including *B. smithii*, are discarded at sea. It is also imperative to maintain the time series of the DFFE-led bi-annual demersal trawl surveys to monitor population trends of this and other species. The trawling footprint should continue to be regulated.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Bathyraja smithii is poorly studied, with little known of its reproductive biology and life-history. Collection of specimens is greatly hampered by the fact that it is uncommon and confined to deep water, despite the surprisingly high annual catch estimates of 11–100 tons. Furthermore, any sampling is hampered by the fact that this species has little commercial value and is discarded at sea. The demersal trawl surveys are the primary source of any research material to improve our knowledge of *B. smithii*. This species was ranked 17th out of the 60 South African demersal chondrichthyan species, which were prioritised for further research in South Africa.

FAMILY RAJIDAE

Dipturus pullopunctatus - Slime skate

SCIENTIFIC NAME	*Dipturus pullopunctatus* (Smith, 1964)
COMMON NAME	Slime skate
FAMILY	Rajidae
ENDEMIC	No, also found in Namibia
SIZE RANGE	19–130 cm TL
DISTRIBUTION	East, South, West coasts: Orange River mouth to Port Edward
HABITAT	Demersal on outer shelf and upper slope
DEPTH RANGE	30–566 m, mostly <200 m
MAJOR FISHERIES	Demersal trawl fishery and possibly demersal shark longline fishery
IUCN STATUS	Least Concern 2019
CITES	Not listed
MLRA	Current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Dipturus pullopunctatus is a regional endemic skate, found over a wide range of depths along the entire south and west coasts and part of the east coast. It also occurs in southern Namibia and possibly Mozambique. It is the most common and widespread of the seven local species of *Dipturus.* The local average annual catch was estimated at 11–100 tons from DFFE records for two time periods: 2010–2012 and 2013–2019. This was predominantly from the demersal trawl fishery, but species-specific records of commercial catches are either poor or almost non-existent. Population trends based on local research trawl surveys suggest that this species is increasing and, given the low fishing pressure in Namibia, it was assessed as Least Concern on the IUCN Red List in 2019. More species-specific catch records are essential for all skate species, and this can be achieved by the re-introduction of a scientific observer programme to enable at-sea sampling of commercial landings. This species is one of the few skates that has been aged, using vertebral ring counts. Catches of *D. pullopunctatus* are discarded at sea. Hence this species has not been well studied, with little known of its reproductive biology, life-history, ecology and population trends. The re-establishment of the scientific observer programme will address this shortcoming, and the continuation of research trawl surveys will also provide material and related catch information.

TAXONOMIC and IDENTIFICATION ISSUES

Dipturus species are characterised by an elongate to very elongated, stiff, pointed snout and dark, pigmented pores on the underside of the disc (Compagno *et al.* 1989; Last *et al.* 2016a). There are seven species in South African waters, five of them are uncommon, large, black deep-water species with a very elongated snout. *Dipturus pullopunctatus* and *D. campbelli* (from KZN), differ in occurring in shallower waters and having a shorter snout. *D. pullopunctatus* has a large, irregular dark brown "liver" spot on each wing; *D. campbelli* has a brown dorsal disc with black spots. *D. pullopunctatus* was often confused by earlier researchers as *Raja batis*, a European species, or with *D. campbelli*, which was once considered a junior synonym of *D. pullopunctatus* (Ebert *et al.* 2021a). The common name, slime skate, is because it is slippery when handled. It has also been called the greybelly skate because of its ventral colouration (Compagno and Ebert 2007).

SOUTH AFRICAN DISTRIBUTION
This species occurs along the entire west and south coasts and a very small part of the east coast from the Orange River mouth to at least Algoa Bay. Early records from off Durban (KZN) may be *D. campbelli* (Ebert *et al.* 2021a). This eastern range has recently been extended to at least Port Edward (DFFE unpublished data).

REGIONAL DISTRIBUTION
It occurs in southern Namibia (Compagno *et al.* 1989, Last *et al.* 2016a, Leeney 2024). It may occur off Mozambique, up to Bazaruto (Heemstra *et al.* 2022).

SYNOPSIS OF RESEARCH
This species is one of the better-studied skates. Wallace (1967a) provided morphometrics from three individuals obtained during a three-year survey of batoid fishes off the east coast of southern Africa. The distribution of various skate species, based on catches in research trawls undertaken between Cape Agulhas and Walvis Bay for the period 1986–1990, was described by Compagno *et al.* (1991). A study of the feeding ecology west of Cape Agulhas was undertaken by Ebert *et al.* (1991) and east of Cape Agulhas by Smale and Cowley (1992). Aspects of the biology, including age and growth, were investigated by Walmsley-Hart *et al.* (1999) on the south coast. Compagno and Ebert (2007) undertook a review of the biodiversity and distribution of southern African skates. Reproductive biology was investigated by Ebert *et al.* (2008). *Dipturus pullopunctatus* was ranked 14th out of the 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY
Depth
In South Africa this species occurs over a wide depth range on the outer shelf and upper slope from 30–566 m (Compagno and Ebert 2007, DFFE unpublished data). The majority (77%) of catch records in demersal trawl surveys (DFFE unpublished data) were shallower than the 200 m.

Habitat: Adults
It is a benthic species found on soft substrates (Compagno *et al.* 1989).

Habitat: Juveniles/Nursery Grounds
It is not known if juveniles utilise other habitats.

Synopsis of tag deployments
This predominantly deep-water species has not been tagged by anglers.

Movements
Nothing is known.

Diet/feeding: Adults
Dipturus pullopunctatus has a mouth of moderate size and relatively strong jaws. The teeth exhibit sexual dimorphism in adults, males having sharp, pointed teeth and females rounded teeth (Ebert *et al*. 1991). There was an ontogenetic shift in diet with larger individuals (>70 cm) feeding mainly on teleosts and crustaceans of the suborder Macrura east of Cape Agulhas (Smale and Cowley 1992). West of Cape Agulhas the stomach contents of both juveniles and adults contained mainly crustaceans and benthic teleosts; larger individuals (>70 cm) were found to have consumed larger, more mobile fish species (Ebert *et al.* 1991).

Diet/feeding: Juveniles
There was an ontogenetic shift in diet with juveniles (<70 cm) eating mainly small crustaceans, comprising mysids and crustaceans of the suborder Macrura. Prey size increased with predator size (Smale and Cowley 1992).

South African toxicological studies
No study has been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	Unknown
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	19 cm TL
SIZE AT MATURITY	F: 81–104 TL; M: 86–91 cm TL
MAXIMUM SIZE	130 cm
GENERATION LENGTH	11.5 years

Mode
Oviparity is the known reproductive mode of all skates. Ebert *et al.* (2008) reported the presence of a single egg case in each uterus of three adult females examined.

Duration of reproductive cycle
The duration of the reproductive cycle is unknown.

Mating season and location
Reproductive seasonality could not be determined, with egg cases found in three female *D. pullopunctatus*, two caught on the west coast in summer and one on the south coast in autumn (Ebert *et al.* 2008).

Gestation
Gestation length is not known.

Litter size
Assumed to be two, based on the presence of a single egg case in each uterus of three mature females (Ebert *et al.* 2008). The frequency of egg-laying is not known.

Size at birth
Assumed to be about 19 cm TL, based on the smallest *D. pullopunctatus* caught on the south coast (Ebert *et al.* 2008).

Pupping season and nursery ground
Very little is known. Female *D. pullopunctatus* carrying egg cases *in utero* were caught on both the south and west coasts (Ebert *et al.* 2008).

Size at maturity
Ebert *et al*. (2008) reported that size at 50% maturity for female *D. pullopunctatus* was 81 cm TL on south coast and 104 cm TL on the west coast; for males it was 86 cm TL on the south coast and 91

cm TL on the west coast. The reasons for the larger size at maturity on the west coast are uncertain: it might be that there are discrete populations (Ebert *et al.* 2008). Walmsley-Hart *et al*. (1999) reported that females matured at about 100 cm and males at about 90 cm on the south coast. It is uncertain why the two studies obtained marked differences in size at maturity for females on the south coast.

Maximum size
In South Africa the largest female examined was 124 cm and the largest male 113 cm TL (Ebert *et al.* 2008). Compagno *et al.* (1989) report that the maximum size is 130 cm.

Age and growth
von Bertalanffy growth parameters were determined for *D. pullopunctatus*, based on vertebral growth bands, with growth significantly different between sexes. The oldest aged individuals were a female of 14 years and a male of 18 years. The length at first maturity was approximately 85 cm or 9 years of age (Walmsley-Hart *et al.* 1999).

Generation length
Female *D. pullopunctatus* age-at-maturity is 9 years, and maximum age is 14 years (Walmsley-Hart et al. 1999); generation length is, therefore, 11.5 years (Pollom *et al.* 2020l).

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *D. pullopunctatus* was estimated from DFFE records at 11–100 tons for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). This species is caught in the demersal trawl fishery and is a suspected catch in the demersal longline fishery.

SA catch quantities and characteristics
Trawl fishery
Annual average catch estimates of unidentified skates in the inshore trawl fleet, based on unsorted samples by observers, was 833 tons for the period 2003-2006. This excluded catches of *Cruriraja parcomaculata,* now *C. hulleyi,* of 12.8 tons and *Bathyraja smithii* of 4.8 tons. These were the only two identified skate species (Attwood *et al.* 2011). The majority (77%) of catch records in demersal trawl surveys (DFFE unpublished data) were shallower than the 200 m. Therefore, this species will have some protection in the offshore component of the trawl fishery which does not operate in waters shallower than 200 m on the west coast and 110 m on the south coast. It is susceptible to fishing mortality from the inshore component on the south coast.

Walmsley *et al*. (2007) analysed the catch composition data from 180, 140 and 294 observed trawls from the hake-directed offshore, hake-directed inshore and sole-directed fisheries respectively, collected during a pilot study to assess the feasibility of introducing a scientific observer scheme conducted between June 1995 and September 2000. They estimated that catch of *D. pullopunctatus* comprised 0.11%, 0.02% and 0.11% of the hake catch taken by the offshore, inshore and sole sectors of the demersal fishery, respectively.

Demersal longline fishery
Petersen *et al*. (2008) reported that *D. pullopunctatus* accounted for 0.7% of the chondrichthyan bycatch taken by the demersal hake longline fishery in the period 2005-2007.

Fishing outside South Africa
In Namibia, the only other country in which it occurs, D. *pullopunctatus* was a minor bycatch in hake trawl research surveys. Demersal trawling is not allowed shallower than the 200 m isobath and given that the core depth distribution of this species is under 200 m, it will enjoy a measure of protection.

Furthermore, some sections of the coastline are remote, which also offers refuge from fishing pressure (Pollom *et al.* 2020l and references cited therein).

Population trends
There are no estimates of population size for *D. pullopunctatus*. Trend analysis of research trawl data in South African commercially fished areas obtained over nearly three decades estimated a population increase of 100% over the past three generation lengths (34.5 years). Overall, due to an estimated increase in population size in South Africa and a suspected stable population in Namibia, *D. pullopunctatus* was assessed as Least Concern in 2019 (Pollom *et al.* 2020l).

ECOTOURISM
As it occurs in deep water, *D. pullopunctatus* cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
The current demersal trawl footprint is ringfenced. This species is not listed.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It is not known if *D. pullopunctatus* will derive any benefit from offshore MPAs.

Additional local comment
This species will benefit from a ban on trawling outside the current footprint. *D. pullopunctatus* is the most common of the seven species of *Dipturus* found in South African waters (Rob Leslie, Cossypha Consultants, formerly DAFF, unpublished data). It has shown evidence of a southwest range shift and a loss of habitat area over three decades from 1981–2016, possibly as a result of climate change (Currie *et al.* 2019). This may represent a significant loss of habitat to this species that has a restricted southern African distribution (Pollom *et al.* 2020l).

IUCN Red List Status
Least Concern 2019

Previous IUCN assessments
Least Concern 2004

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
There are no known conservation measures in place for *D. pullopunctatus* (Pollom *et al.* 2020l).

MANAGEMENT CONSIDERATIONS
Dipturus pullopunctatus occurs along the entire south and west coasts, where most of the demersal trawling takes place. It enjoys some protection in shallow waters (less than 200 m) on the west coast. Despite its large size and high annual catch, this species is not retained by the trawl fishery, possibly due to the presence of the black slime pores on the ventral surface, which gives this species its common name, and makes them unappealing to the market. The lumping of skates and other

chondrichthyan bycatch in demersal fisheries remains a problem as it is not commercially viable for the industry to spend time sorting and identifying it. An important step would be to re-establish the scientific observer programme and to ensure that observers are trained in the identification of chondrichthyans. It is imperative to maintain the time series of the DFFE-led bi-annual demersal trawl surveys to monitor population trends of this and other species. The trawl footprint must remain ringfenced and regulated.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

Although *D. pullopunctatus* has been better studied than other skates and is one of the few that has been aged, there are still gaps in aspects of its reproductive biology and life-history. As this species is not retained in the trawl fishery, the re-introduction of the scientific observer programme and the continuation of the demersal trawl surveys are the only likely sources of this research material to improve our knowledge of this species. *Dipturus pullopunctatus* was ranked 14th out of the 60 South African demersal chondrichthyan species which were prioritised for further research.

Dipturus springeri - Roughbelly skate

SCIENTIFIC NAME	*Dipturus springeri* (Wallace 1967)
COMMON NAME	Roughbelly skate
FAMILY	Rajidae
ENDEMIC	No, also found in Namibia and Mozambique
SIZE RANGE	<27–192 cm TL
DISTRIBUTION	East, South, West coasts: Orange River mouth to Mozambique border
HABITAT	Demersal on outer shelf and upper slope
DEPTH RANGE	50–970 m, mostly deer than 400 m
MAJOR FISHERIES	Demersal trawl fishery and possibly demersal shark longline fishery
IUCN STATUS	Least Concern 2018
CITES	Not listed
MLRA	Current trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Dipturus springeri is a skate found over a wide range of depths along the entire south and west coasts. It also occurs in Namibia and Mozambique and further north in the Indian Ocean. The local average annual catch was estimated at 11–100 tons from DFFE records for two time periods: 2010–2012 and 2013–2019. This was predominantly from the demersal trawl fishery, but species-specific records of skate catches are either poor or almost non-existent. Despite the high estimates, catches are rare, possibly due to this species obtaining refuge at depth and suggestions that it may inhabit rocky substrates which cannot be trawled. Population trends remain unknown. Due to the low catches, this species was assessed as Least Concern on the IUCN Red List in 2019. More species-specific catch records are essential for all skate species, but this can be achieved only by at-sea sampling. This highlights the importance of re-establishing a scientific observer programme, with observers trained in chondrichthyan identification to enable at-sea sampling of commercial landings. Any catches of *D. springeri* are discarded at sea. Hence, this species has been poorly studied, with little known of its reproductive biology, life-history, ecology and population trends. The re-establishment of the scientific observer programme will address this shortcoming, and the continuation of research trawl surveys will also provide material and related catch information.

TAXONOMIC and IDENTIFICATION ISSUES

This species was described as *Raja springeri* by Wallace (1967a), after examining benthic collections made in the Mozambique Channel and adjacent continental shelves, but has subsequently been moved to the genus *Dipturus.* There are seven species of *Dipturus* found in South African waters. They are mostly large, offshore species with markedly elongated, stiff, pointed snouts. They also differ from other local skates by having dark, pigmented pores on the underside of the disc (Compagno *et al.* 1989). A rough ventral surface distinguishes *D. springeri* from other South African members of the genus, except *D. nidarosiensis*, a similar-looking species which was only recently recorded from the South African west coast (Last *et al.* 2016a). As a result, a re-evaluation of these two large *Dipturus* species is required to determine the extent of their range in the region (Ebert *et al.* 2021a).

SOUTH AFRICAN DISTRIBUTION

This species is thought to occur along the entire South African coast, but the recent discovery of *D. nidarosiensis* in South African waters calls this distribution into question (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

It occurs in southern Namibia, Mozambique (Last *et al.* 2016a) and north to Kenya as well as Madagascar (Ebert *et al.* 2021a). Leeney (2024) does not list this species as occurring in Namibia but does state that *D. nidarosiensis* occurs there and that it may have been called *D. springeri* in the past.

SYNOPSIS OF RESEARCH

This is a little-studied species which is not often caught. Wallace (1967a) described this species from among nine individuals trawled in a 1964 Indian Ocean research survey. The distribution of various skate species was described by Compagno *et al.* (1991), based on catches in research trawls undertaken between Cape Agulhas and Walvis Bay for the period 1986-1990. A study of the feeding ecology was undertaken on the west coast by Ebert *et al.* (1991). Compagno and Ebert (2007) undertook a review of the biodiversity and distribution of southern African skates. Reproductive biology was investigated by Ebert *et al.* (2008). *Dipturus springeri* was ranked twelfth out of the 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

In southern Africa this species occurs over a wide depth range on the outer shelf and upper slope from 50–970 m, with most on the upper slope between 200 and 600 m but with a few on the shelf at 50–194 m (Compagno and Ebert 2007). Less than 10% of the *D. springeri* recorded during demersal research surveys between 1986 and 2023 were caught shallower than 400 m (DFFE, unpublished records).

Habitat: Adults

Dipturus springeri is a benthic species, which is rarely caught, so it may inhabit hard substrates (Last *et al.* 2016a).

Habitat: Juveniles/Nursery Grounds

It is not known if juveniles utilise other habitats.

Synopsis of tag deployments

This deep-water species has not been tagged by anglers.

Movements

Nothing is known.

Diet/feeding: Adults

This species has strong jaws. Based on only five stomachs with food from individuals sampled on the west coast, the diet comprises teleosts and crustaceans (Ebert *et al.* 1991).

Diet/feeding: Juveniles

It is not known if the diet of the juveniles differs from that of the adults.

South African toxicological studies

No study has been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown

GESTATION	Unknown
LITTER SIZE	Unknown
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	<27 cm TL
SIZE AT MATURITY	F: ~190 TL; M: ~130 cm TL
MAXIMUM SIZE	192 cm
GENERATION LENGTH	unknown

Mode
Oviparity is the known reproductive mode of all skates. Egg cases are unknown for this species, and none were found by Ebert *et al.* (2008).

Duration of reproductive cycle
The duration of the reproductive cycle is unknown.

Mating season and location
Reproductive seasonality could not be determined (Ebert *et al.* 2008).

Gestation
Gestation length is not known.

Litter size
This is unknown as no female *D. springeri* with egg cases *in utero* were found (Ebert *et al.* 2008).

Size at birth
This is less than 27 cm TL, which is the size of the smallest individual examined by Ebert *et al.* (2008) which still had an internal yolk sac.

Pupping season and nursery ground
Nothing is known.

Size at maturity
Female *D. springeri* mature at about 190 cm and males at about 130 cm TL (Ebert *et al.* 2008).

Maximum size
The largest individual examined was a female of 192 cm (Ebert *et al.* 2008).

Age and growth
This is not known.

Generation length
This is not known.

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *D. springeri* was estimated from DFFE records at 11–100 tons for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). This species is caught in the demersal trawl fishery and is a suspected catch in the demersal longline fishery. Skates are rarely identified to species or even genus level in these fisheries. The catch estimates listed above appear to be unrealistically high, given the comments by Pollom *et al.* (2019) that this species is rarely caught. Therefore, it possibly inhabits rocky, untrawlable substrates and obtains refuge at depth.

SA catch quantities and characteristics

Trawl fishery

Annual average catch estimates of unidentified skates in the inshore trawl fleet, based on unsorted samples by observers, was 833 tons for the period 2003-2006. This excluded catches of roughnose skate reported as *Cruriraja parcomaculata* but now known to be *C. hulleyi* of 12.8 tons and African softnose skate *Bathyraja smithii* of 4.8 tons. These were the only two identified skate species (Attwood *et al.* 2011). However, catch of *D. springeri* by the inshore trawl fleet is expected to be very low because there are no records of this species from shallower than 400 m on the south coast from demersal research surveys between 1986 and 2023 (DFFE unpublished data). Catches in the offshore component of this fishery are poorly documented.

Fishing outside South Africa

This species is captured by demersal trawls and longlines. Heavy trawling occurs off southwest India, and there have been significant declines in chondrichthyans there (Jabado et al. 2017 cited by Pollom *et al.* 2019o). However, this species is caught rarely in trawl fisheries, indicating that it may have refuge over rocky, untrawlable substrates (Pollom *et al.* 2019o).

Population trends

There are no population size or trend estimates available. This species is caught rarely in trawl fisheries, indicating that it may have refuge over rocky, untrawlable substrates. There is a large refuge in deeper waters beyond current fishing activities and fisheries are thus not suspected to be causing substantial reductions in population size. As a result, *D. springeri* was assessed as Least Concern in 2018 (Pollom *et al.* 2019o).

ECOTOURISM

As *D. springeri* occurs in deep water, it cannot be regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

The current trawl footprint is ringfenced. This species is not listed.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

It is not known if this species will derive any benefit from offshore MPAs.

Additional local comment

As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

IUCN Red List Status

Least Concern 2018

Previous IUCN assessments

Data Deficient 2009

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
There are no known conservation measures in place for this species (Pollom *et al.* 2019o).

MANAGEMENT CONSIDERATIONS
This species reportedly occurs along the entire South African coast but is rarely caught and therefore is of very low management priority. Improved identification of all skates caught in the trawl fishery is needed to provide accurate catch statistics, but it is not commercially viable for the industry to spend time sorting and identifying all the components of the bycatch. In this case, the situation is complicated by the fact that *D. springeri* may be easily confused with *D. nidarosiensis.* An important step would be to re-establish the scientific observer programme and to ensure that observers are trained in the identification of chondrichthyans. It is also imperative to maintain the time series of bi-annual demersal trawl surveys to monitor population trends of this and other species. The trawl footprint must remain ringfenced and regulated.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
This is an extremely poorly studied species, largely due to the rarity of catches, which are discarded at sea. Further research is required on distribution, life-history, and population size and trends. Individuals retained by observers on commercial vessels and the demersal trawl surveys are the only likely sources of the necessary research material. *Dipturus springeri* was ranked twelfth out of the 60 South African demersal chondrichthyan species, which were prioritised for further research.

Malacoraja spinacidermis - Roughskin skate / Prickle skate

SCIENTIFIC NAME	*Malacoraja spinacidermis* (Barnard 1923)
COMMON NAME	Roughskin skate, prickle skate
FAMILY	Rajidae
ENDEMIC	No
SIZE RANGE	10–70 cm TL
DISTRIBUTION	West and South coasts: Orange River mouth to Algoa Bay
HABITAT	Demersal on upper slope
DEPTH RANGE	670–1,350 m with most records deeper than 800 m
MAJOR FISHERIES	Demersal trawl fishery and possibly demersal longline fishery
IUCN STATUS	Least Concern 2019
CITES	Not listed
MLRA	Current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Malacoraja spinacidermis is a small skate that occurs on the deep slope along the entire west coast, with sparse records from the south coast. It is also found in southern Namibia and elsewhere in the North Atlantic. Local average annual catch was estimated at 1–10 tons from DFFE records for two time periods: 2010–2012 and 2013–2019. This catch was predominantly from the demersal trawl fishery, but species-specific records of catches are either poor or almost non-existent. This species was globally assessed as Least Concern on the IUCN Red List in 2019. More species-specific catch records are essential for all skate species, and this can be achieved by the re-introduction of a scientific observer programme to enable at-sea sampling of commercial landings. *M. spinacidermis* has been poorly studied, with gaps in the reproductive biology, life-history, ecology and population trends. This is largely due to it occurring in water deeper than the range of the offshore trawl fishery and the fact that any commercial catches are discarded at sea. The continuation of research trawl surveys will provide material and related catch information.

TAXONOMIC and IDENTIFICATION ISSUES

Malacoraja spinacidermis is a member of the family of hardnose skates Rajidae. It was first described as *Raia spinacidermis* Barnard 1923. The global distribution comprises three disjunct populations: NW, NE and SE Atlantic (Last *et al*. 2016a). Morphological and molecular comparisons are required to confirm if they are the same species (Ebert *et al.* 2021a). The uniform dark colouration and rough skin on the upper surface make this species relatively easy to identify.

SOUTH AFRICAN DISTRIBUTION

Malacoraja spinacidermis occurs along the entire West coast from the Orange River mouth to Cape Point (Ebert *et al.* 2021a), with sparse records from the south coast as far east as Algoa Bay (DFFE unpublished data).

REGIONAL DISTRIBUTION

Malacoraja spinacidermis only occurs in southern Namibia (Compagno and Ebert 2007).

SYNOPSIS OF RESEARCH

Malacoraja spinacidermis is not well studied. Compagno *et al.* (1991) described the distribution of several skate species based on catches in research trawls for the period 1986–1990. A study of the feeding ecology was undertaken (Ebert *et al.* 1991). Compagno and Ebert (2007) reviewed the

biodiversity and distribution of southern African skates. Reproductive biology was investigated by Ebert *et al.* (2008).

ECOLOGY

Depth

This species occurs over a wide depth. Locally, it occurs in depths of 670–1 350 m, with most records deeper than 800 m (Compagno and Ebert 2007). Globally, it ranges from 450 to 1 570 m (Last *et al.* 2016a).

Habitat: Adults

It a benthic species on the deep slope (Last *et al.* 2016a).

Habitat: Juveniles/Nursery Grounds

There were no reports in the South African literature to indicate that the juveniles are segregated from the adults.

Synopsis of tag deployments

This species occurs in extremely deep water and has not been tagged.

Movements

Nothing is known.

Diet/feeding: Adults

Malacoraja spinacidermis has a moderately large mouth and strong jaws; the adult males have sharp teeth, while females have low, rounded teeth. The stomach contents of three of only four individuals sampled on the west coast contained crustaceans (shrimps) and teleosts (Ebert *et al.* 1991). Elsewhere it also feeds on crustaceans (mainly shrimps) and small benthic teleosts (Last *et al.* 2016a).

Diet/feeding: Juveniles

Ebert *et al.* (1991) did not highlight any size-related difference in diet.

South African toxicological studies

No study has been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	2
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	10 cm TL
SIZE AT MATURITY	F: 45 TL; M: 48 cm TL
MAXIMUM SIZE	70 cm
GENERATION LENGTH	Unknown

Mode

Oviparity is the known reproductive mode of all skates. Ebert *et al.* (2008) reported the presence of a single egg case in each uterus in a single female.

Duration of reproductive cycle
The duration of the reproductive cycle is unknown.

Mating season and location
This is not known.

Gestation
Gestation length is not known.

Litter size
This is assumed to be two, based on the presence of a single egg case in each uterus in one adult female (Ebert *et al.* 2008). The frequency of egg-laying is unknown.

Size at birth
This is about 10 cm TL (Last *et al.* 2016a). Locally, the smallest individual caught was 13 cm TL (Ebert *et al.* 2008).

Pupping season and nursery ground
Nothing is known.

Size at maturity
Size at 50% maturity was 45 cm TL for females and 48 cm TL for males (Ebert *et al.* 2008).

Maximum size
The largest female examined was 64 cm TL and male 70 cm TL. (Ebert *et al.* 2008).

Age and growth
Malacoraja spinacidermis has not been aged.

Generation length
This unknown.

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *M. spinacidermis* was estimated from DFFE records at 1–10 tons for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). This species is caught in the demersal trawl fishery and is a suspected catch in the demersal longline fishery.

SA catch quantities and characteristics
Trawl fishery
Annual average catch estimates of unidentified skates in the inshore trawl fleet, based on unsorted samples by observers, was 833 tons for the period 2003-2006 (Attwood *et al.* 2011). This species is unlikely to contribute to these catches because the inshore fleet operates only on the south coast, where *M. spinacidermis* is very rare, and generally fish in waters shallower than its preferred habitat. It was rare in offshore research trawls and was only recorded at 41 out of 10605 (0.4%) stations (DFFE unpublished data)**.**

Fishing outside South Africa
Nothing is known of catches in Namibia.

Population trends
There are no population estimates for *M. spinacidermis*. The population is suspected to be stable, as it enjoys considerable refuge in waters deeper than current fishing activities. It was globally assessed as Least Concern on the IUCN Red List in 2019 (Kulka *et al.* 2020).

ECOTOURISM
As *M. spinacidermis* occurs in largely deep water, it cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
This species is not listed.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It is not known if this species will derive any benefit from the offshore MPAs.

Additional local comment
As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

IUCN Red List Status
Least Concern 2019.

Previous IUCN assessments
Least Concern 2007.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
There are no species-specific protections or conservation measures in place for *M. spinacidermis* (Kulka *et al.* 2020).

MANAGEMENT CONSIDERATIONS
Malacoraja spinacidermis occurs along the entire west coast, where most of the demersal trawling takes place, but its distribution is generally deeper than the trawl grounds. It will, therefore, derive considerable protection from this fishery at depth. Improved identification of all skates caught in this fishery is needed, but they are generally discarded at sea. An important step would be to re-establish the scientific observer programme and to ensure that observers are trained in the identification of chondrichthyans. It is also imperative to maintain the time series of bi-annual demersal trawl surveys to monitor population trends of this and other species. The trawling footprint should remain regulated.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

This species is poorly studied, with little known of its reproductive biology and life-history. As it occurs at great depths, few specimens are likely to be obtained from catches in the demersal trawl fishery. The continuation of the demersal trawl surveys is the only likely source of research material to improve our knowledge of *M. spinacidermis*.

Raja straeleni - Biscuit skate

SCIENTIFIC NAME	*Raja straeleni* Poll 1951
COMMON NAME	Biscuit skate, false thornback skate
FAMILY	Rajidae
ENDEMIC	No, also found in Namibia and northwards
SIZE RANGE	17–91 cm TL
DISTRIBUTION	East, South, West coasts: Orange River mouth to Port Edward
HABITAT	Demersal on upper slope and sometimes in shallow bays
DEPTH RANGE	1–750 m, mainly < 300 m
MAJOR FISHERIES	Demersal trawl fishery, recreational linefishery and possibly demersal shark longline fishery
IUCN STATUS	Near Threatened 2020
CITES	Not listed
MLRA	Demersal trawl footprint is ring fenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Raja straeleni is found over a wide range of depths along the entire south and west coasts and part of the east coast. The local average annual catch was estimated at 201–300 tons from DFFE records for the period 2010-2012, which is the highest for any skate species, but was reduced to 100–200 tons for the period 2013–2019. This catch was predominantly in the demersal trawl fishery. It is also a suspected catch in the demersal shark longline fishery and is occasionally caught by shore anglers in the recreational linefishery. Population trends based on local research trawls are the only indicator of the status of this species which occurs along much of the West African coast, but there is confusion with *R. clavata*, a very similar-looking sibling species. *R. straeleni* was assessed globally as Near Threatened on the IUCN Red List in 2020, and close to meeting the criteria of Vulnerable. More species-specific catch records are essential for all skate species. This can be achieved by the re-introduction of a scientific observer programme to enable at-sea sampling of commercial landings. *R. straeleni* has not been well studied, despite being the most common skate marketed commercially. Very little is known of its reproductive biology and life-history. The re-establishment of the scientific observer programme will address this shortcoming, and the continuation of research trawl surveys will also provide material and related catch information.

TAXONOMIC and IDENTIFICATION ISSUES

Members of the family Rajidae are very difficult to characterise using external features. Skeletal structures, particularly claspers, are more important and distributional ranges should be used in identifying species (Hulley 1972). *R. straeleni* resembles several other members of the genus in the East Atlantic but can be distinguished by its characteristic variegated dorsal colour pattern (Last *et al.* 2016a). Despite this, it has had a convoluted taxonomic history in South Africa. Some earlier literature regarded it as a population of the European thornback skate *R. clavata*, a species that is widespread in the NE Atlantic and Mediterranean. Others considered it a separate species, either *R. rhizacanthus* or *R. capensis* (Compagno and Ebert 2007, and references cited therein). Molecular comparison of both nuclear and mitochondrial DNA between *R. clavata* from the NE Atlantic and Mediterranean with *R. straeleni* from the west and south coasts of South Africa confirmed that these two taxa are closely related sibling species (Pasolini *et al*. 2011). There is still some contention as to the status of *R. clavata* in South African waters. Last *et al.* (2016a) acknowledged its presence, while Compagno and Ebert (2007) and Ebert *et al.* (2021a) did not. Compagno *et al.* (1991) made reference to some individuals they described as "*stravata"*, thereby highlighting the difficulty in distinguishing

R. straeleni from *R. clavata.* Pasolini *et al*. (2011) analysed 58 specimens collected off the west and south coasts of South Africa and found no genetic evidence to suggest the occurrence of *R. clavata* off South Africa. They also found evidence of genetic subpopulation structure between west and south coast populations of *R. straeleni*. The dorsal colour pattern is quite variable, ranging from a strikingly ornate pattern to rather plain brown. It is uncertain whether this variation represents discrete subpopulations (Ebert *et al.* 2021a), but there are indications that inshore forms caught by anglers have the most striking pattern.

SOUTH AFRICAN DISTRIBUTION
Raja straeleni occurs along the entire west and south coasts and part of the east coast from the Orange River mouth to Algoa Bay, possibly to Port Edward in southern KZN (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION
Raja straeleni occurs in Namibia northwards up the west coast of Africa to Morocco (Jabado *et al.* 2021a). It possibly occurs off Madagascar and Mauritius (Last *et al.* 2016a).

SYNOPSIS OF RESEARCH
Despite being the most abundant and common skate species in South Africa, *R. straeleni* is not well studied. Wallace (1967a) reported on the morphometrics of 46 individuals identified as *R. clavata.* The distribution of various skate species, including those described as *R.* cf*. clavata* on the south and west coasts, based on catches in research trawls for the period 1986-1990, was documented by Compagno *et al.* (1991). A study of the feeding ecology was undertaken on individuals caught west of Cape Agulhas by Ebert *et al.* (1991) and those caught east of Cape Agulhas by Smale and Cowley (1992). Compagno and Ebert (2007) undertook a review of the biodiversity and distribution of southern African skates. Reproductive biology was investigated by Ebert *et al.* (2008). Pasolini *et al*. (2011) investigated molecular genetic variation in *R. straeleni*, used as an outgroup to a study of population structure study in *R. clavata* from the NE Atlantic and Mediterranean. *Raja straeleni* was ranked 15th out of 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY
Depth
In South Africa *R. straeleni* occurs over a wide depth range, from close inshore in shallow, enclosed bays, over the continental shelf and on the upper slope down to 750 m (Compagno *et al.* 1989; DFFE unpublished data), but mainly shallower than 300 m. Elsewhere, it occurs down to 690 m (Last *et al.* 2016a). On the south coast it was most common in inshore research trawl records at depths of 9–95 m (Buxton *et al.* 1984).

Habitat: Adults
Raja straeleni is a benthic species (Last *et al.* 2016a).

Habitat: Juveniles/Nursery Grounds
It is not known if juveniles utilise other habitats.

Synopsis of tag deployments
Raja straeleni is occasionally caught by shore anglers and 47 individuals were tagged (ORI Cooperative Fish Tagging Project 1984–2018 inclusive). Nearly half of these individuals were caught in the Port of Ngqura/Coega Harbour in Algoa Bay. The remainder were caught on the south and west coasts from Groot Brak River/Mossel Bay to north of Saldanha Bay. There were only two 2 (4%) recaptures; both individuals were tagged and recaptured in the Port of Ngqura Harbour after 1.5 and 11 months at liberty (ORI Cooperative Tagging Programme, unpublished data).

Movements
The very limited tagging data presented above suggests that *R. straeleni* may be sedentary.

Diet/feeding: Adults
The stomach contents of both juveniles and adults from west of Cape Agulhas contained mainly crustaceans and teleosts. The crustaceans were dominated by members of the suborder Macrura (Ebert *et al.* 1991). Large individuals (> 57 cm TL) sampled east of Cape Agulhas ate mainly crustaceans of the suborder Brachyura and more mobile teleosts and cephalopods. In general, larger individuals fed on larger prey (Smale and Cowley 1992).

Diet/feeding: Juveniles
In their study, Ebert *et al.* (1991) did not highlight any size-related difference in diet. Small individuals (< 57 cm TL) sampled east of Cape Agulhas preferred small crustaceans (Smale and Cowley 1992).

South African toxicological studies
Total mercury in the white muscle of eight individuals (65–74 cm TL) was among the lowest of the 22 species of elasmobranchs sampled (Erasmus *et al.* 2022).

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	2
PUPPING/NURSERY GROUND	Unknown, no seasonal pattern
SIZE AT BIRTH	17 cm TL
SIZE AT MATURITY	F: 65–66 TL; M: 62–63 cm TL
MAXIMUM SIZE	91 cm
GENERATION LENGTH	7 years, based on *Raja montagui*

Mode
Oviparity is the known reproductive mode of all skates. Ebert *et al.* (2008) reported the presence of a single egg case in each uterus in 13 of the 198 adult females examined.

Duration of reproductive cycle
The duration of the reproductive cycle is unknown.

Mating season and location
Reproductive seasonality was difficult to determine, with egg cases found in 13 females in six different months, encompassing winter and summer on the west coast and spring and autumn on the south coast. A lack of reproductive seasonality has been reported in studies from elsewhere (Ebert *et al.* 2008).

Gestation
Gestation length is not known.

Litter size
This is two based on the presence of only a single egg case in each uterus (Ebert *et al.* 2008). The frequency of egg-laying is not known.

Size at birth
This is about 17 cm TL, based on the smallest individuals caught on both the south and west coasts (Ebert et al 2008).

Pupping season and nursery ground
Nothing is known. Pregnant females were caught on both the south and west coasts (Ebert *et al.* 2008).

Size at maturity
In South Africa, size at 50% maturity was 65–66 cm TL for females and 62–63 cm TL for males (Ebert *et al.* 2008). Elsewhere in the Atlantic, females mature at 55–71 cm and males 56–68 cm (Last *et al.* 2016a).

Maximum size
In South Africa female *Raja straeleni* attain at least 86 cm and males 81 cm TL (Ebert *et al.* 2008). Compagno *et al.* (1989) report that the maximum size is 91 cm.

Age and growth
Raja straeleni has not been aged.

Generation length
This is inferred at 7 years, based on the findings for the spotted skate *Raja montagui* (Jabado *et al.* 2021a).

FISHERIES MANAGEMENT
SA catch sources
Local annual catch estimates from DFFE records were 201–300 tons for the period 2010-2012 (da Silva *et al*. 2015), which is by far the highest of any skate species. This estimate was revised to 100–200 tons for the period 2013-2019 (DFFE 2022). This species is caught in the demersal trawl fishery and is a suspected catch in the demersal shark longline fishery, both the recreational and commercial linefisheries, and the beach seine and gillnet fisheries (da Silva *et al*. 2015).

SA catch quantities and characteristics
Inshore trawl fishery
This fishery lands *R. straeleni* and, possibly, large individuals of *R. ocellifera* as skate wings. Annual average catch estimates of unidentified skates in the inshore trawl fishery, based on unsorted samples by observers, was 833 tons for the period 2003-2006. This excluded catches of roughnose skate *Cruriraja parcomaculata* of 12.8 tons and African softnose skate *Bathyraja smithii* of 4.8 tons. These were the only two identified skate species (Attwood *et al.* 2011). Walmsley *et al*. (2007) analysed the catch composition data collected from observed trawls in the hake-directed and sole-directed components of the inshore trawl fishery during a pilot study to assess the feasibility of introducing a scientific observer scheme conducted between June 1995 and September 2000. They recorded a total of 5.0 t (2% of the total catch) of *R. straeleni* in 140 hake-directed trawls and 7.6 t (5% of the total catch) from 294 sole-directed trawls.

Offshore trawl fishery
Raja straeleni is the only skate species that is retained by the offshore trawl sector and marketed as skate wings; it is also the only skate species reported in offshore landings (Cliff Hart, pers. comm. formerly DFFE). Walmsley *et al*. (2007) recorded a total of 6.8 t (2.26% of the catch) of *R. straeleni* caught in 180 hake-directed offshore trawls observed between January 1996 and September 2000 as part of a pilot study to assess the feasibility of introducing a scientific observer scheme.

Demersal hake longline fishery
Petersen *et al*. (2008) report that *R. straeleni* accounted for 1.9% of the chondrichthyan bycatch taken by the demersal hake longline fishery, 2005–2007.

Recreational shore angling
Raja straeleni is occasionally caught by shore anglers on the south and west coasts. A single individual was reported in recreational anglers' catches in False Bay (Best *et al*. 2013) and there were very low catch rates in the Tsitsikamma MPA (Hanekom *et al.* 1997) on the south coast.

In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential effects on coastal elasmobranch species(Winkler *et al.* 2025). In the SASSA National data (2011-2023), which represents 26 different localities between Varkenvlei on the West Coast and Noggies in Northern KwaZulu-Natal, it was found that *R. straeleni* was the 14th most commonly captured species with an average CPUE of 0.014, while in the RASSPL dataset, which represents 73 different fishing locations between Rietfontein on the West Coast and Haga Haga in the Eastern Cape, *R. straeleni* was the 27th most commonly caught elasmobranch with a CPUE of 0.0002 (Winkler *et al.* 2025).

Beach seine and gill net fisheries
This species was an occasional bycatch in the beach seine fishery in False Bay, occurring in 7% of hauls (1991–1992) (Lamberth *et al.* 1994).

Fishing outside South Africa
In Namibia, it has been recorded as bycatch in the bottom trawl fishery for hake and has been used by some shore-based anglers as bait for large sharks, a practice which is strongly discouraged (Leeney 2024). Elsewhere, *R. straeleni*, being a widely-distributed species, is a bycatch in industrial and artisanal fisheries. Most catches are in trawl fisheries, but include gillnets, set nets, tangle nets, and trammel nets; it is retained for human consumption. Information on discards and associated mortality is not available (Jabado *et al.* 2021a).

Population trends
Population trend data of annual density estimates were obtained from demersal research trawl surveys conducted along the South African south coast over 29 years (1991–2019) in commercially fished areas (DFFE unpublished data). The trend analysis of standardized catch-per-unit-effort (CPUE) estimates revealed annual rates of reduction of 0.7%, consistent with a median reduction of 18.3% decrease over the past three generation lengths (21 years), with the highest probability (54%) of no major reductions in population over three generation lengths (20 years) (Jabado *et al.* 2021a).

Given the level of intense and largely unmanaged fisheries that operate throughout its northern range, and the noted declines in landings across its range, it is suspected that *R. straeleni* has undergone a global population reduction of 20–29% over the past three generation lengths (21 years) and it was assessed globally in 2020 as Near Threatened on the IUCN Red List (close to meeting Vulnerable A2bd) (Jabado *et al.* 2021a).

In South Africa, there is evidence of separate west and south coast populations (Pasolini *et al*.2011). It is uncertain whether individuals with the most striking dorsal pattern and caught by shore anglers represent an inshore form which is discrete from those caught offshore, which tends to be far less patterned.

ECOTOURISM
As *R. straeleni* largely occurs in deep water, it cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
This species is not listed.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It is not known if *R. straeleni* will derive much benefit from the offshore MPAs. Based on occasional catches by recreational shore anglers on the south and west coasts and in beach seines in False Bay, it will derive limited protection from the Tsitsikamma MPA and Table Mountain National Park MPA.

Additional local comment
The long-standing ban on trawling in False Bay will benefit *R. straeleni*. As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

Raja straeleni occurs along the entire south and west coasts, where almost all demersal trawling takes place. It may derive some protection from this fishery in shallow waters on the west coast, where trawling seldom takes place shallower than 200 m, and a third of all west coast catch records in the DFFE demersal research trawl database were from waters shallower than 200 m (DFFE unpublished data).

IUCN Red List Status
Near Threatened 2020: A2bd

Previous IUCN assessments
Data Deficient 2009

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
There are no known conservation measures in place for *R. straeleni*. Although countries across its range have legislations concerning fisheries activities (including gear restrictions and no-trawling zones in coastal waters), fisheries taking *R. straeleni* are generally unmanaged, and it is unlikely that pressure will decrease in the near future (Jabado *et al.* 2021a).

MANAGEMENT CONSIDERATIONS
Skates caught in the demersal trawl fisheries are seldom identified to species level, which makes it difficult to formulate any management considerations. An important step to improve the identification of skates caught in this fishery would be to re-establish the scientific observer programme and to ensure that observers are trained in the identification of chondrichthyans.

Because *R. straeleni* is the only skate with considerable commercial value, catch records of this species are far better than those of other skates. It is imperative to maintain the time series of bi-annual demersal trawl surveys to monitor population trends of this and other species. The ringfenced trawl footprint must remain within the permit conditions.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

This species has not been well studied, despite its considerable commercial value, with little known of its movements, reproductive biology and life-history. Tissue samples should be collected to finalise the debate as to whether *R. clavata* occurs in South African waters, and to investigate the indications of local genetic population structure in *R. straeleni.* Any such study should examine the implications of the marked differences in colouration between inshore and offshore forms. *Raja straeleni* was ranked 15th out of 60 South African demersal chondrichthyan species, which were prioritised for further research.

Rajella barnardi - Bigthorn skate

SCIENTIFIC NAME	*Rajella barnardi* (Norman 1935)
COMMON NAME	Bigthorn skate
FAMILY	Rajidae
ENDEMIC	No, also found in Namibia northwards
SIZE RANGE	11–75 cm TL
DISTRIBUTION	East, South and West coasts: Algoa Bay to Orange River
HABITAT	Demersal on soft bottoms of shelf and slope
DEPTH RANGE	130–920 m, mostly 400–700 m
MAJOR FISHERIES	Demersal trawl fishery and possibly hake longline fishery
IUCN STATUS	Least Concern 2020
CITES	Not listed
MLRA	Current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Rajella barnardi is a small skate which is found on the continental shelf and slope at depths of 130–920 m, but mostly 400–700 m. It occurs along the entire south and west coasts into Namibia and beyond. The local average annual catch was estimated at 1–10 tons from DFFE records for two time periods: 2010–2012 and 2013–2019, although skates are seldom identified to species. This catch was predominantly from the demersal trawl fishery. As there was no trend in catches, the population was suspected to be stable, therefore, it was assessed globally as Least Concern in 2020 on the IUCN Red List. This species is poorly studied as commercial catches of *R. barnardi* are discarded at sea and even experienced researchers find it difficult to distinguish from the closely-related *R. leoparda*. More species-specific catch records are essential for all skate species, and this can be achieved by the re-introduction of a scientific observer programme to enable at-sea sampling of commercial landings. Little is known of its reproductive biology, life-history, ecology and population trends. The re-establishment of the scientific observer programme will address this shortcoming, and the continuation of research trawl surveys will also provide material and related catch information.

TAXONOMIC and IDENTIFICATION ISSUES

This species was first described as *Raja barnardi* Norman 1935 and subsequently moved to the genus *Rajella.* Hulley (1970) designated *Rajella barnardi* a junior synonym of *Raja leoparda,* and described *Raja confundens* as a new species. Stehmann (1995) examined the holotypes and revived *Rajella barnardi* as a valid species, with *Rajella confundens* as a junior synonym. Globally the family Rajidae comprises at least 154 valid species from 17 genera, which are very difficult to characterise based solely on external features (Last *et al.* 2016a). *Rajella leoparda* and *Rajella barnardi* are genetically closely related and very difficult to distinguish from each other, even for experienced researchers, and they are often misidentified (Crobe *et al*. 2021). *Rajella barnardi* can be distinguished from *Rajella leoparda* by its thicker disc, plain dorsal colouration and strong, pale thorns. The dorsal disc of juvenile *Rajella leoparda* is covered with small blackish spots, making them easy to distinguish from the plain *Rajella barnardi*. However, the spots in *Rajella leoparda* fade with age and some adults loose them entirely.

SOUTH AFRICAN DISTRIBUTION

Wallace (1967a) examined individuals trawled off the Limpopo River mouth in southern Mozambique, off Durban and off the Chalumna River near East London. He designated them as *Raja barnardi*, but they were *Leucoraja wallacei* (Ebert *et al.* 2021a), as neither *Rajella barnardi* nor the

similar-looking *Rajella leoparda* occur east of Algoa Bay. Compagno *et al.* (1989) and Ebert *et al.* (2021a) describe the local distribution of *Rajella barnardi* as being from the Orange River mouth to Algoa Bay.

REGIONAL DISTRIBUTION
Rajella barnardi occurs from Namibia northwards up the West African coast (Last *et al.* 2016a).

SYNOPSIS OF RESEARCH
This is a very poorly studied species. Ebert *et al.* (1991) documented stomach contents from individuals caught on the west coast and part of the south coast. The distribution of skates on the south and west coasts and Namibia was described by Compagno *et al.* (1991), based on catches in research trawls for the period 1986-1990. Compagno and Ebert (2007) undertook a review of the biodiversity and distribution of southern African skates. A total of 158 *R. barnardi*, including 19 mature females and 18 mature males, caught in various research trawls conducted along much of the South African coast, were used to generate length-weight and length-disc width relationships and to provide life-history and reproductive information (Ebert *et al.* 2008). *R. barnardi* was ranked 31st out of 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY
Depth
Off the southern African west coast individuals were taken at 130–920 m and appear to be most common at 400–700 m (Ebert *et al.* 1991, Compagno and Ebert 2007). Elsewhere in its range it occurs at depths of 100–1700 m (Last *et al*. 2016a).

Habitat: Adults
It is a benthic species (Last *et al.* 2016a).

Habitat: Juveniles/Nursery Grounds
It is not known if juveniles utilise other habitats.

Synopsis of tag deployments
No tagging has taken place in South Africa.

Movements
Nothing is known.

Diet/feeding: Adults
This species has a small mouth, weak jaws and blunt teeth. The stomach contents of 80 individuals, comprising both juveniles and adults and which contained food, consisted mainly of crustaceans, largely mysids. Polychaetes and teleosts were of minor dietary importance (Ebert *et al.* 1991).

Diet/feeding: Juveniles
It is not known if the diet is different from the adults.

South African toxicological studies
No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown

MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	Unknown
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	11 cm TL
SIZE AT MATURITY	F: 63 cm, M: 63 cm TL
MAXIMUM SIZE	75 cm TL
GENERATION LENGTH	Unknown

Mode
All skates exhibit oviparity.

Duration of reproductive cycle
The duration of the reproductive cycle is unknown.

Mating season and location
Little is known; egg cases were found in four of 19 adult female *R. barnardi*, two caught in summer and two in winter (Ebert *et al.* 2008).

Gestation
This is unknown.

Litter size
Although egg cases were found in four females, Ebert *et al.* (2008) did not give the number of individuals. The frequency of egg-laying is unknown.

Size at birth
This is at least 11 cm TL, based on the smallest individual examined (Ebert *et al.* 2008).

Pupping season and nursery ground
This is unknown.

Size at maturity
Females and males attain 50% maturity at 63 cm TL. The smallest mature female examined was 59 cm and the largest immature individual was 65 cm TL. The smallest mature male examined was 60 cm and the largest immature individual was 62 cm TL (Ebert *et al.* 2008).

Maximum size
The largest female and male examined were both 65 cm TL, respectively (Ebert *et al.* 2008). The maximum length is 75 cm TL (Last *et al.* 2016a).

Age and growth
This is unknown.

Generation length
This is unknown.

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Local average annual catch was estimated from DFFE records at 1–10 tons for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). This species is caught largely in the demersal trawl fishery (da Silva *et al.* 2015). As it is generally found in deep water, *R. barnardi* species

is only likely to be caught in the offshore component of the fishery, where there are very few species-specific catch records for skates.

Fishing outside South Africa
In Namibia, *Rajella* skates, possibly including *R. barnardi,* are a frequent bycatch of the bottom trawl fishery for hake. This species may have some refuge at depth from the impact of fishing activities (Leeney 2024). Elsewhere off the NW African coast there are a number of European distant-water vessels using demersal trawl and longline gear to target demersal deep-water fish and shrimp species that may interact with this species (Finnuci and Derrick 2021a).

Population trends
The global population trend of *R. barnardi* is suspected to be stable, because its overlap with the fishery footprint is insufficient to pose a significant threat, and the species enjoys refuge at depth. As a result, this species was assessed globally as Least Concern in 2020 (Finnuci and Derrick 2021a).

ECOTOURISM
As it occurs in deep waters, it is not regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
This species is not listed.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It is not known if this species derives any protection in the deep-water MPAs on the south and west coasts.

Additional local comment
As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is prohibited outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

IUCN Red List Status
Least Concern 2020

Previous IUCN Red List assessments
Least Concern 2004

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
None.

MANAGEMENT CONSIDERATIONS

This species is not well known and appears to be most common outside of the trawl footprint, which diminishes the need for close management. Most skate species caught in this fishery are seldom identified to species level, which makes it difficult to formulate any management considerations. It is not commercially viable for the industry to sort and identify the various components of its bycatch. This can be addressed by the reintroduction of a scientific observer programme but this is hampered by the difficulty of distinguishing *R. barnardi* from the closely related *R. leoparda*, even by experienced researchers. It is also imperative to maintain the time series of bi-annual demersal trawl surveys to monitor population trends of this and other species. The trawl footprint must remain in the permit conditions.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

Very little is known about the biology of *R. barnardi*. Further research is needed on population size and trends, life-history, and catch rates. As this small species has no commercial value and is discarded at sea, research trawls or the reintroduction of scientific observers on commercial vessels are the only two sources of research material. *R. barnardi* was ranked 31st out of 60 South African demersal chondrichthyan species, which were prioritised for further research.

Rajella caudaspinosa - Munchkin skate

SCIENTIFIC NAME	*Rajella caudaspinosa* (von Bonde and Swart 1923)
COMMON NAME	Munchkin skate
FAMILY	Rajidae
ENDEMIC	No, also found in Namibia
SIZE RANGE	10–65 cm TL
DISTRIBUTION	East, South and West coasts: one record from KZN; Algoa Bay to Orange River
HABITAT	Demersal on soft bottoms of shelf and slope
DEPTH RANGE	100–1100 m, mostly 400-600 m
MAJOR FISHERIES	Demersal trawl fishery and possibly hake longline fishery
IUCN STATUS	Least Concern 2018
CITES	Not listed
MLRA	Current trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Rajella caudaspinosa is a very small regional endemic skate which also occurs in Namibia. It inhabits the continental shelf and slope at depths of 100–1100 m, mostly at 400–600 m. The local average annual catch was estimated at 11–100 tons from DFFE records for two time periods: 2010–2012 and 2013–2019, although skates are seldom identified to species. This catch was predominantly from the demersal trawl fishery, with its core distribution falling within the hake trawl fishery footprint. As there was no trend in catches, the population was suspected to be stable, therefore, it was assessed as Least Concern in 2018 on the IUCN Red List. Accurate identification of all skates caught in the trawl and other fisheries is lacking. The re-establishment of the scientific observer programme will enable at-sea sampling of commercial catches. Catches of *R. caudaspinosa* are discarded at sea, hence this species has not been well studied, with little known of its reproductive biology, life-history, ecology and population trends. The scientific observer programme will address this shortcoming, and the continuation of research trawl surveys will also provide material and related catch information.

TAXONOMIC and IDENTIFICATION ISSUES

This species was first described as *Raia caudaspinosa* in 1923 by von Bonde and Swart from a specimen trawled off KZN, although it is far more common on the west and south coasts of South Africa. *Raia albalinea* and, in part, *Raja plutonia*, which were also named by von Bonde and Swart in 1923, have been synonymised with *Rajella caudaspinosa. Rajella* was long regarded as a subgenus of *Raja*. Globally, the family Rajidae comprises at least 154 valid species from 17 genera, which are very difficult to characterise, based solely on external features (Last *et al.* 2016a), although *Rajella caudaspinosa* is one of the easier species to identify. It is the smallest local member of the genus. It can be distinguished from other South African *Rajella* skates by its heart-shaped disc, very short snout, relatively long tail and a very spiny band of both strong and delicate thorns on the midline of the trunk and the entire tail (Last *et al.* 2016a). It is light grey to brownish above, with or without darker spots and white below. The young have a distinctive, white-barred reticulated pattern (Compagno *et al.* 1989).

SOUTH AFRICAN DISTRIBUTION

Rajella caudaspinosa is near endemic to South Africa. Although the holotype was recorded from KZN waters around 100 years ago, this species was not listed in the three-year survey of batoid fishes

undertaken on the east coast of southern Africa in the period 1964–1966 (Wallace 1967a). Most records are from south of the Orange River to Quion Point on the south coast, with a few scattered records between Quion Point and KZN (Compagno *et al*. 1991, Ebert *et al.* 2021a, DFFE unpublished data).

REGIONAL DISTRIBUTION

Rajella caudaspinosa reportedly occurs in southern Namibia (Last *et al.* 2016, Leeney 2024), but during a series of research surveys into Namibia, no specimens were caught north of the Orange River (Compagno *et al*. 1991; Compagno and Ebert 2007).

SYNOPSIS OF RESEARCH

This is not a well-studied species. Compagno *et al.* (1991) described the distribution of skate species on the south and west coasts, from Cape Agulhas to Namibia, based on catches in research trawls for the period 1986-1990. Ebert *et al.* (1991) documented stomach contents. Compagno and Ebert (2007) undertook a review of the biodiversity and distribution of southern African skates. A total of 94 individuals, including 14 mature females and 29 mature males, were caught in various research trawls conducted along much of the South African coast. Ebert *et al.* (2008) reported length-weight and length-disc width relationships and life-history, and reproductive information based on 54 male (29 mature) and 40 female (14 mature) *R. caudaspinosa* caught in various research trawls conducted along much of the South African coast. It was also ranked as the seventh highest research priority among all South African chondrichthyan species (da Silva *et al.* 2023).

ECOLOGY

Depth

This species occurs on the shelf and upper slope at water depths of 100–1100 m, mostly between 400 and 600 m (Compagno and Ebert 2007, DFFE unpublished data).

Habitat: Adults

It is a benthic species (Last *et al.* 2016a).

Habitat: Juveniles/Nursery Grounds

Juveniles are occasionally caught with adults in research trawls (DFFE unpublished data).

Synopsis of tag deployments

No tagging has taken place in South Africa.

Movements

Nothing is known.

Diet/feeding: Adults

This is a small-mouthed, weak-jawed skate with blunt teeth and distensible jaws. The stomach contents of 48 individuals, comprising both juveniles and adults, which contained food, consisted mainly of crustaceans. Polychaetes, fish and mysids were of minor dietary importance (Ebert *et al.* 1991).

Diet/feeding: Juveniles

It is not known if the diet is different from the adults.

South African toxicological studies

No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	Unknown
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	10 cm TL
SIZE AT MATURITY	F: 55 cm, M: 51 cm TL
MAXIMUM SIZE	65 cm TL
GENERATION LENGTH	Unknown

Mode
All skates exhibit oviparity.

Duration of reproductive cycle
The duration of the reproductive cycle is unknown.

Mating season and location
This is unknown. A single individual of the 14 adult females examined contained an egg case passing through each oviducal gland. It was caught in winter on the west coast (Ebert *et al.* 2008).

Gestation
This is unknown.

Litter size
This is unknown. The frequency of egg-laying is unknown.

Size at birth
This is at least 10 cm TL, based on the smallest individual examined (Ebert *et al.* 2008).

Pupping season and nursery ground
This is unknown.

Size at maturity
Females attain 50% maturity at 55 cm and males 51 cm TL. The smallest mature female examined was 50 cm and the largest immature individual was 57 cm TL. The smallest mature male examined was 53 cm and the largest immature individual was 59 cm TL (Ebert *et al.* 2008).

Maximum size
The largest female and male *R. caudaspinosa* examined were 65 cm TL (Ebert *et al.* 2008).

Age and growth
This is unknown.

Generation length
This is unknown.

FISHERIES MANAGEMENT

SA catch sources, quantities and characteristics

Local average annual catch for *R. caudaspinosa* was estimated from DFFE records at 11–100 tons for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). As it is generally found in deep water, *R. caudaspinosa* is primarily caught in the offshore component of the demersal trawl fishery (da Silva *et al.* 2015, DFFE 2022).

Fishing outside South Africa

Leeney (2024) states that large numbers of *Rajella* are caught in the Namibian demersal trawl fishery, but gives no indication of the species.

Population trends

There are no estimates of population size for *R. caudaspinosa.* There is substantial overlap between this species distribution and the hake trawl fishery footprint. The population is suspected to be stable, and, as a result, this species was assessed as Least Concern in 2018 (Pollom *et al.* 2019p).

ECOTOURISM

As it occurs in deep waters, it is not regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

This species is not listed.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

It is not known if this species will derive any protection in the deep-water MPAs on the south and west coasts.

Additional local comment

As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is prohibited outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery. The statement in the IUCN Red List assessment (Pollom *et al.* 2019p) that *R. caudaspinosa* occurs mainly outside of the trawl footprint is an error (Rob Leslie, Cossypha Consultants, formerly DAFF, pers. comm.).

IUCN Red List Status

Least Concern 2018

Previous IUCN Red List assessments

Near Threatened 2004

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

This species is not listed.

Convention on Migratory Species (CMS)

This species is not listed.

International comments

This species is possibly a South African endemic, given the lack of specimens from Namibia.

MANAGEMENT CONSIDERATIONS

This species is not well known, which is concerning given that there is substantial overlap between its distribution and the hake trawl fishery footprint. Few skate species caught in this fishery are identified to species level, which makes it difficult to formulate any management considerations. This problem is exacerbated because most species are discarded at sea, and it is not commercially viable for the industry to sort and identify the various components of the bycatch. An important step would be to re-establish the scientific observer programme and to ensure that observers are trained in the identification of chondrichthyans. It is also imperative to maintain the time series of bi-annual demersal trawl surveys to monitor population trends of this and other species. The trawl footprint must remain ringfenced and enforced.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

Very little is known about the biology of *R. caudaspinosa*. Further research is needed on population size and trends, life-history and ecology. This will be difficult to achieve as there is no commercial market for *R. caudaspinosa*, because of its small size, and all catches are discarded at sea. Research trawl surveys or the reintroduction of scientific observers on commercial vessels are the only two sources of research material. *R. caudaspinosa* was ranked as the seventh highest research priority among all South African chondrichthyan species.

Rajella leoparda - Leopard skate

SCIENTIFIC NAME	*Rajella leoparda* (von Bonde and Swart 1923)
COMMON NAME	Leopard skate
FAMILY	Rajidae
ENDEMIC	No, also found in Namibia northwards
SIZE RANGE	15–95 cm TL
DISTRIBUTION	East, South and West coasts: Algoa Bay to Orange River
HABITAT	Demersal on soft bottoms of shelf and slope
DEPTH RANGE	40–1025 m, mostly 300–700 m
MAJOR FISHERIES	Demersal trawl fishery and possibly hake longline fishery
IUCN STATUS	Least Concern 2020
CITES	Not listed
MLRA	Current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Rajella leoparda is a small skate which is found on the continental shelf and slope at depths of 40–1025 m, but most commonly at 300–700 m. It occurs along part of the east coast and the entire south and west coasts into Namibia and beyond. This species is very difficult to distinguish from the closely related *R. barnardi*, and the two species are often confused with each other. The local average annual catch was estimated at 11–100 tons from DFFE records for two time periods: 2010–2012 and 2013–2019, although skates are seldom identified to species. This catch was predominantly from the demersal trawl fishery, but this species largely inhabits waters outside of the hake trawl fishery footprint. As there was no trend in catches, the population was suspected to be stable, therefore, it was assessed globally as Least Concern in 2018 on the IUCN Red List. Accurate identification of all skates caught in the trawl and other fisheries is lacking. This can be overcome by the re-introduction of a scientific observer programme to enable at-sea sampling of commercial landings. Catches of *R. leoparda* are discarded at sea, hence this species is poorly studied, despite being the most common deep-water skate on the west coast. Further research is needed on the life-history, ecology and population size and trends. The re-establishment of the scientific observer programme will address this shortcoming, and the continuation of research trawl surveys will also provide material and related catch information.

TAXONOMIC and IDENTIFICATION ISSUES

This species was first described as *Raia leopardus* and subsequently moved to the subgenus *Rajella*, as *Rajella leoparda* in line with the gender rules of nomenclature. Globally, the family Rajidae comprises at least 154 valid species from 17 genera, which are very difficult to characterise based solely on external features (Last *et al.* 2016a). Crobe *et al*. (2021) found that *Rajella leoparda* is genetically closely related to the very similar *Rajella barnardi*. *Rajella leoparda* is mid-grey to brown above with small, inconspicuous thorns and often with blackish spots (Compagno *et al.* 1989) and can be distinguished from other *Rajella* species of the East Atlantic by its larger size, subtly more flattened disc and darker upper surface (Last *et al.* 2016a). The upper disc of juveniles is covered with small blackish spots which fade with age; some adults lose them entirely. Typical *Rajella leoparda* can be easily distinguished from *Rajella barnardi* by the presence of the diagnostic small black spots on the dorsal disc, but unspotted individuals are extremely difficult to differentiate. Crobe *et al* (2021) found that adult *Rajella leoparda* were misidentified as *Rajella barnardi* and

juveniles as *Cruriraja hulleyi*. Juvenile *C. hulleyi* are also spotted, but the spots are browner, and 50% larger than those of juvenile *Rajella leoparda*.

SOUTH AFRICAN DISTRIBUTION
The type locality is listed as KZN, but there are no further records of this species from KZN, and it was not listed in the three-year survey of batoid fishes undertaken on the east coast of southern Africa in the period 1964–1966 (Wallace 1967a). *R. leoparda* occurs on the east, south and west coasts from Algoa Bay to the Orange River mouth and is the most common deep-water skate of the upper continental slopes of the west coast (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION
R. leoparda occurs from Namibia up to Mauritania on the West African coast (Last *et al.* 2016a).

SYNOPSIS OF RESEARCH
This is not a well-studied species. Ebert *et al.* (1991) documented stomach contents. The distribution of skates on the south and west coasts and Namibia was described by Compagno *et al.* (1991), based on catches in research trawls for the period 1986-1990. Compagno and Ebert (2007) expanded this to cover the entire South African coast, by including other historical research trawl records. A total of 220 individuals, including 33 mature females and 27 mature males, caught in various research trawls conducted along much of the South African coast, were used to generate length-weight and length-disc width relationships and to provide life-history and reproductive information (Ebert *et al.* 2008). *Rajella leoparda* was ranked thirteenth out of 60 South African demersal chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY
Depth
The majority of records were 300–700 m, but there were a few records on the shelf from as shallow as 40 m and a scattering of deep slope records down to 1025 m (Compagno and Ebert 2007, DFFE unpublished data). Adults were typically found deeper than 700 m; adolescents and juveniles were more common in depths of 400–600 m (Ebert *et al.* 1991). Elsewhere in its range, it occurs at depths of 130–1900 m (Last *et al*. 2016).

Habitat: Adults
It is a benthic species (Last *et al.* 2016a).

Habitat: Juveniles/Nursery Grounds
It is not known if juvenile *R. leoparda* utilise other habitats.

Synopsis of tag deployments
No tagging has taken place in South Africa.

Movements
Nothing is known.

Diet/feeding: Adults
This species has large jaws and blunt teeth. The stomach contents of 137 individuals, comprising both juveniles and adults and which contained food, consisted mainly of demersal teleosts and crustaceans. Polychaetes and cephalopods were of minor dietary importance (Ebert *et al.* 1991).

Diet/feeding: Juveniles
It is not known if the diet of the juveniles is different from the adults.

South African toxicological studies
No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	Unknown
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	15 cm TL
SIZE AT MATURITY	F: 65 cm, M: 72 cm TL
MAXIMUM SIZE	95 cm TL
GENERATION LENGTH	Unknown

Mode
All skates exhibit oviparity.

Duration of reproductive cycle
The duration of the reproductive cycle is unknown.

Mating season and location
Little is known; egg cases were found in four of 33 adult females; all caught during summer (Ebert *et al.* 2008).

Gestation
This is unknown.

Litter size
This is unknown. The frequency of egg-laying is not known.

Size at birth
This is at least 15 cm TL, based on the smallest individual examined (Ebert *et al.* 2008).

Pupping season and nursery ground
This is unknown.

Size at maturity
Females attain 50% maturity at 65 cm and males 72 cm TL. The smallest mature female examined was 61 cm and the largest immature individual was 69 cm TL. The smallest mature male examined was 62 cm and the largest immature individual was 73 cm TL (Ebert *et al.* 2008).

Maximum size
The largest female and male examined were 93 cm and 87 cm TL, respectively (Ebert *et al.* 2008). The maximum length is 95 cm TL (Compagno *et al.* 1989).

Age and growth
This is unknown.

Generation length
This is unknown.

FISHERIES MANAGEMENT

SA catch sources, quantities and characteristics

Local average annual catch for *R. leoparda* was estimated from DFFE records at 11–100 tons for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). This species is caught predominantly in the demersal trawl fishery (da Silva *et al.* 2015). As it is generally found in deep water, this species is only likely to be caught in the offshore component of the fishery, where there are very few species-specific catch records for skates.

Fishing outside South Africa

This species is a bycatch of the demersal trawl fishery for hake in Namibia (Leeney 2024). There are an estimated 518 Chinese distant-water vessels registered in Africa. Most fly flags from West Africa between Morocco and Gabon and most are trawlers, with widespread fishing effort, often in deep offshore areas. Virtually nothing is known about these fishing activities (Finnuci and Derrick 2021b).

Population trends

The global population trend is suspected to be stable, based on refuge in deep water outside of current fishing activities. As a result, this species was assessed globally as Least Concern in 2020 (Finnuci and Derrick 2021b).

ECOTOURISM

As it occurs in deep waters, it is not regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

This species is not listed.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

It is not known if this species derives any protection in the deep-water MPAs on the south and west coasts.

Additional local comment

As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is prohibited outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

IUCN Red List Status

Least Concern 2020

Previous IUCN Red List assessments

Least Concern 2018
Least Concern 2004

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

This species is not listed.

Convention on Migratory Species (CMS)

This species is not listed.

International comments
None.

MANAGEMENT CONSIDERATIONS
This species is not well known and appears to be most common outside of the trawl footprint, which diminishes the need for close management. Few skate species caught in this fishery are identified to species level, which makes it difficult to formulate any management considerations. In addition, even experienced researchers find it very difficult to distinguish *R. leoparda* from the closely related *R. barnardi*. This problem is exacerbated because most species are discarded at sea, as it is not commercially viable for the industry to sort and identify the various components of the bycatch. An important step would be to re-establish the scientific observer programme and to ensure that observers are trained in the identification of chondrichthyans. It is also imperative to maintain the time series of bi-annual demersal trawl surveys to monitor population trends of this and other species. The trawl footprint must remain ringfenced and enforced.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Very little is known about the biology of this species. Further research is needed on population size and trends, life-history, and catch rates. As this small species has no commercial value and is discarded at sea, research trawl surveys or the reintroduction of scientific observers on commercial vessels are the only two sources of research material. *Rajella leoparda* was ranked thirteenth out of 60 South African demersal chondrichthyan species, which were prioritised for further research.

FAMILY ANACANTHOBATIDAE

Anacanthobatis marmorata - Spotted legskate

SCIENTIFIC NAME	*Anacanthobatis marmorata* (von Bonde and Swart 1923)
COMMON NAME	Spotted legskate
FAMILY	Anacanthobatidae
ENDEMIC	No, also found in Mozambique
SIZE RANGE	?–29 cm TL
DISTRIBUTION	East coast: only KZN
HABITAT	Demersal on upper slope
DEPTH RANGE	200–435 m
MAJOR FISHERIES	None listed; possibly deep-water East coast crustacean trawl fishery
IUCN STATUS	Near Threatened 2019
CITES	Not listed
MLRA	Daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	ST Fennessy

SPECIES SUMMARY and RECOMMENDATIONS

Anacanthobatis marmorata is one of the smallest skates found in South Africa. This regional endemic is confined to deep water off the coasts of KZN and southern Mozambique and is known from only a handful of records. There were no reported local catches, based on DFFE records for the periods 2010–2012 and 2013–2019. This species is a suspected catch in the deep-water crustacean trawl fishery operating in depths of 100–600 m from Durban northwards into southern and central Mozambique, but there are no local records in the period 2004–2012. Due to the absence of any recent documented catches, population trends remain unknown, and almost nothing is known about its distribution, reproductive biology and life-history. It is difficult to ascertain the significance of the paucity of catch records.

TAXONOMIC and IDENTIFICATION ISSUES

Anacanthobatis marmorata is the only member of the legskate family (Anacanthobatidae) which occurs in South Africa. These bottom dwellers use their "legs" to move over the seabed (Last *et al.* 2016a). This species, which was long known as *A. marmoratus* (Wallace 1967a, Compagno *et al.* 1989), has a very distinct mottling pattern on the dorsal surface (Last *et al.* 2016a).

SOUTH AFRICAN DISTRIBUTION

Anacanthobatis marmorata is confined to KZN waters on the east coast. Two records from Mossel Bay on the south coast taken during a research trawl nearly a century ago require confirmation as their capture location has subsequently been intensively surveyed, without a single record of this species (Compagno and Ebert 2007). It was not recorded from approximately 700 deep-water KZN crustacean trawl catches in the period 2004–2012 (Sean Fennessy, Oceanographic Research Institute, unpublished data).

REGIONAL DISTRIBUTION

Anacanthobatis marmorata occurs in southern Mozambique (Last *et al.* 2016a). It was recorded in 20 trawls conducted during research surveys off southern and central Mozambique from 2007-2014 (S Fennessy, ORI unpublished data).

SYNOPSIS OF RESEARCH

This is a very poorly known species. Wallace (1967a) provided morphometrics based on five specimens. Compagno and Ebert (2007) reviewed the biodiversity and distribution of all southern African skates.

ECOLOGY

Depth

This species occurs at depths of 200–430 m off KZN and Mozambique. The two Mossel Bay records reported from the RV *Africana* nearly a century ago were from water only 64–66 m deep. Both the shallow depth and extremely southern location bring their identity into question. Their capture location has been intensively surveyed by RV *Africana III* without a single specimen being caught (Compagno and Ebert 2007).

Habitat: Adults

It is probably a benthic species but may also be benthopelagic, as some legskates have been observed swimming off the bottom (Last *et al.* 2016a).

Habitat: Juveniles/Nursery Grounds

It is not known if juveniles utilise other habitats.

Synopsis of tag deployments

This deep-water species has not been tagged by anglers.

Movements

Nothing is known.

Diet/feeding: Adults

It is assumed that this species feeds mainly on small benthic invertebrates and small teleosts (Last *et al.* 2016a).

Diet/feeding: Juveniles

It is not known if the diet of the juveniles differs from that of the adults.

South African toxicological studies

No study has been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	2
PUPPING/NURSERY GROUND	Unknown
SIZE AT BIRTH	Unknown
SIZE AT MATURITY	F: 23 cm TL; M: 23 cm TL
MAXIMUM SIZE	29 cm
GENERATION LENGTH	12 years, based on *Bathyraja kincaidii*

Mode

Oviparity is the known reproductive mode of all skates. A single female was found with one egg case in each uterus (Wallace 1967a).

Duration of reproductive cycle
The duration of the reproductive cycle is unknown.

Mating season and location
Nothing is known.

Gestation
Gestation length is not known.

Litter size
This is two, based on a single female found with one egg case in each uterus (Wallace 1967a), frequency of egg-laying is not known.

Size at birth
This is unknown.

Pupping season and nursery ground
This is unknown.

Size at maturity
A female of 24 cm was found with two egg cases (Wallace 1967a). Both sexes mature at about 23 cm (Last *et al.* 2016a).

Maximum size
This species attains at least 29 cm (Last *et al.* 2016a).

Age and growth
Age-at-maturity and maximum age of this species are unknown and are poorly known among members of the legskate family Anacanthobatidae (Pollom and Fernando 2020).

Generation length
Age-at-maturity is inferred from the smallest deep-water skate with known ages and similar depth range, the sandpaper skate *Bathyraja kincaidii* from the family Rajidae. This species has a female age-at-maturity of 6 years and a maximum age of 17 years. As a result, a generation length of 12 years is inferred for *A. marmorata* (Pollom and Fernando 2020, and reference cited therein).

FISHERIES MANAGEMENT
SA catch sources
This species was not listed in estimated catches based on DFFE records for the periods 2010–2012 (da Silva *et al.* 2015) or 2013–2019 (DFFE 2022). Skates are rarely identified to species or even genus level in the fisheries in which they are caught.

SA catch quantities and characteristics
KZN crustacean trawl industry
Anacanthobatis marmorata is a likely bycatch of the deep-water crustacean trawl fishery operating in depths of 100–600 m in the region from Durban, northwards into southern Mozambique (Fennessy and Groenveld 1997), although there were no records from approximately 700 trawls observed in the period 2004–2012. The footprint of this fishery overlaps entirely with the geographic and depth ranges of *A. marmorata* (Pollom and Fernando 2020).

Fishing outside South Africa
Anacanthobatis marmorata may be caught in trawl fishing in southern Mozambique (Pollom and Fernando 2020, and references cited therein), and has been reported from trawl surveys in southern and central Mozambique (Oceanographic Research Institute, unpublished data).

Population trends
There are no estimates of population size or trend for this species. Although its entire range overlaps with the deep-water crustacean trawl fishery, trawling effort on the KZN coast has varied considerably over the last few decades and was the highest on record in 2021 (Sean Fennessy Oceanographic Research Institute, unpublished data). Due to historically high levels of fishing pressure across its entire range, it is suspected that *A. marmorata* has undergone a population reduction of 20–29% over the past three generation lengths (36 years) and it was assessed as Near Threatened on the IUCN Red List in 2019, nearly meeting the criteria of Vulnerable A2d (Pollom and Fernando 2020).

ECOTOURISM
As it occurs in deep water, *A. marmorata* cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
Anacanthobatis marmorata is not listed.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
Anacanthobatis marmorata may obtain some refuge in the iSimangaliso MPA, which extends offshore to a depth of 400 m.

Additional local comment
None.

IUCN Red List Status
Near Threatened 2019 A2d

Previous IUCN assessments
Data Deficient 2004

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
There are no known species-specific conservation measures in place (Pollom and Fernando 2020).

MANAGEMENT CONSIDERATIONS
It is difficult to ascertain the significance of the fact that *A. marmorata* was not observed in approximately 700 trawls undertaken in in the KZN deep-water crustacean trawl fishery in the period 2004–2012. It seems unlikely that the species has been overfished, and therefore it appears to be of very low management priority. Better identification of all skates caught in the trawl fisheries is

needed to improve the quality of catch statistics. Given its small size, it is likely that any catches are discarded.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

Anacanthobatis marmorata is an extremely poorly studied species, largely due to the rarity of catches. Further research is required on distribution, life-history and population size and trends. Opportunitistic sampling should be used to collect such information as well as tissue studies for regional genetic structure.

FAMILY GURGESIELLIDAE

Cruriraja hulleyi - Roughnose legskate / Hulley's pygmy skate

SCIENTIFIC NAME	*Cruriraja hulleyi* Aschilman, Ebert and Compagno 2010
COMMON NAME	Roughnose legskate, Hulley's pygmy skate
FAMILY	Gurgesiellidae
ENDEMIC	No, also found in Namibia
SIZE RANGE	9–59 cm TL
DISTRIBUTION	East, South and West coasts: Orange River mouth to Port Edward
HABITAT	Demersal on soft bottoms of shelf and upper slope
DEPTH RANGE	40–1000 m, mostly 200–500 m
MAJOR FISHERIES	Demersal trawl fishery
IUCN STATUS	Least Concern 2018
CITES	Not listed
MLRA	Current demersal trawl footprint is ringfenced
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Cruriraja hulleyi is a small regional endemic skate, also found in Namibia. It occurs along most of the South African coast on the continental shelf and slope at depths of 40–1000 m, primarily at 200–500 m. The local average annual catch was estimated at 11–100 tons from DFFE records for two time periods: 2010–2012 and 2013–2019, but as *Cruriraja* spp. This catch was predominantly from the demersal trawl fishery. This species may obtain partial protection in shallow waters on the west coast where the bottom trawl fleet fishes in waters greater than 200 m depth. The portion of the population which was assessed in research trawl surveys was either stable or increasing, and therefore, this species was assessed as Least Concern on the IUCN Red List in 2018. Accurate identification of all skates caught in the trawl and other fisheries is lacking. This can be overcome by the re-introduction of a scientific observer programme to enable at-sea sampling of commercial landings. Catches of *C. hulleyi* are discarded at sea, hence this species has not been well studied. Little is known about its reproductive biology, life-history, ecology and population trends. The continuation of research trawl surveys will provide material and related catch information.

TAXONOMIC and IDENTIFICATION ISSUES

Three *Cruriraja* species are found off southern Africa. *C. durbanensis* is known only from the type material which was collected off Hondeklipbaai but was lost. The other two species share an entangled taxonomic history, even though their geographic distributions don't overlap. Although the roughnose legskate, the most common of the three South African *Cruriraja* species, had long been known as *C. parcomaculata,* Compagno and Ebert (2007) proposed that the name had been applied in error and should belong to the triangular legskate, then known as *C. triangularis*. Aschliman *et al*. (2010), who reviewed the issue, concurred and designated *C. triangularis* (Smith 1964) as a junior synonym of *C. parcomaculata* (von Bonde and Swart 1923). They then described the roughnose legskate as a new species, *C. hulleyi*, in recognition of the contribution made to local skate taxonomy by P.A. (Butch) Hulley. Thus, the previous *C. parcomaculata* became *C. hulleyi*, while the previous *C. triangularis* became *C. parcomaculata,* but fortunately, the common (vernacular) names remained unchanged. When consulting field guides or the literature, care must be taken to determine whether the name *C. parcomaculata* refers to the current (ex *C. triangularis*) or previous (*C. hulleyi*) taxon. *C. hulleyi* differs from *C. parcomaculata* in having a shorter snout, smaller eyes, more spatulate anterior pelvic fin lobes and the presence of thorns on the central disc (Last *et al.* 2016a). The dorsal

surface of the juveniles is covered with large dark dots and must not be confused with the superficially similar juvenile *Rajella leoparda*, which has much smaller dark spots.

SOUTH AFRICAN DISTRIBUTION

Cruriraja hulleyi occurs on the entire west and south coasts of South Africa from the Orange River mouth to Algoa Bay on the east coast, possibly to East London (Compagno and Ebert 2007). This eastern range has been extended to at least Port Edward (DFFE unpublished data).

REGIONAL DISTRIBUTION

The distribution of *C. hulleyi* extends into Namibia (Compagno and Ebert 2007, Last *et al.* 2016a, Leeney 2024).

SYNOPSIS OF RESEARCH

Cruriraja hulleyi is not a well-studied species. All research conducted prior to the last decade (2010's) referred to this species as *C. parcomaculata* and included two dietary studies (Ebert *et al.* 1991, Smale and Cowley 1992). The distribution of skate species on the south and west coasts, based on catches in research trawls for the period 1986-1990, was described by Compagno *et al.* (1991). Compagno and Ebert (2007) reviewed the biodiversity and distribution of southern African skates, stating that the species known as *C. parcomaculata* found on the south and west coasts and part of the east coast required a replacement name. Reproductive biology was investigated by Ebert *et al.* (2008).

ECOLOGY

Depth

Individuals were caught at depths of 40–1000 m (DFFE unpublished data), mostly at 200–500 m (Compagno and Ebert 2007).

Habitat: Adults

Cruriraja hulleyi is benthic (Last *et al*. 2016a).

Habitat: Juveniles/Nursery Grounds

There are no known nursery grounds. Research trawl catches included neonates through to adults, although the majority of individuals were adults (Compagno and Ebert 2007), suggesting that there are born where they occur.

Synopsis of tag deployments

No tagging has taken place in South Africa.

Movements

Nothing is known.

Diet/feeding: Adults

Cruriraja hulleyi is a small-mouthed, weak-jawed skate with small granular teeth. The stomach contents of both juveniles and adults from west of Cape Agulhas consisted mainly of mysid crustaceans. Other crustaceans and teleosts were of minor dietary importance (Ebert *et al.* 1991). In waters east of Cape Agulhas crustaceans, amphipods and mysids dominated the prey; dragonets were the principal teleost prey and were recovered from larger specimens only (Smale and Cowley 1992).

Diet/feeding: Juveniles

It is not known if the diet is different from the adults.

South African toxicological studies
No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown
GESTATION	Unknown
LITTER SIZE	Unknown
PUPPING/NURSERY GROUND	Possibly born where they occur
SIZE AT BIRTH	9 cm TL
SIZE AT MATURITY	F: 46–48 cm; M: ~45 cm TL
MAXIMUM SIZE	59 cm TL
GENERATION LENGTH	Unknown

Mode
All skates exhibit oviparity (Last *et al*. 2016a).

Duration of reproductive cycle
This is not known.

Mating season and location
This is not known. No egg cases were found in the mature females examined (Ebert *et al.* 2008).

Gestation
Gestation length is not known.

Litter size
This is not known. The frequency of egg-laying is unknown.

Size at birth
The smallest free-swimming *C. hulleyi* was 9 cm (Ebert *et al.* 2008).

Pupping season and nursery ground
There are no known nursery grounds. Trawl catch research suggest that they are born where they occur.

Size at maturity
Female *C. hulleyi* mature at 46–48 cm TL and males at ~45 cm TL (Ebert *et al.* 2008).

Maximum size
This is 59 cm TL (Ebert *et al.* 2008).

Age and growth
This is unknown.

Generation length
This is unknown.

FISHERIES MANAGEMENT

SA catch sources

Local average annual catch for *Cruriraja* spp. was estimated from DFFE records at 11–100 tons for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). Individuals from this genus are caught in the demersal trawl fishery (DFFE 2022) and possibly the demersal longline fishery as well (da Silva *et al.* 2015).

SA catch quantities and characteristics

Trawl fishery

Annual average catch estimates of unidentified skates in the inshore trawl fleet, based on unsorted samples by observers, was 833 tons for the period 2003-2006. This excluded catches of 12.8 tons for *Cruriraja parcomaculata*, which was one of only two identified skate species (Attwood *et al.* 2011). As stated above, this catch is undoubtedly *C. hulleyi.*

Demersal shark longline fishery

Petersen *et al*. (2008) reported that this species accounted for 0.03% by number of the chondrichthyan bycatch taken by the demersal hake longline fishery for the period 2005-2007.

Fishing outside South Africa

This species is caught in demersal trawls in Namibia (Leeney 2024), the only other country in which it occurs.

Population trends

There are no population size estimates for *C. hulleyi*. Data collected during demersal research trawl surveys conducted along the west coast (1991–2017, in summer) and along the south coast (1991–2016, in autumn and spring) by Department of Agriculture, Forestry and Fisheries (DAFF, now DFFE,) are used to calculate survey density estimates for this and other species to monitor population trends of bycatch and commercial species in the survey area. The survey density trend for *C. hulleyi* indicated that the portion of the population in the surveyed area was stable or increasing and the global population was assessed as Least Concern on the IUCN Red List in 2018 (Pollom *et al.* 2019q).

ECOTOURISM

As *C. hulleyi* occurs in deep water, it cannot be regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

The current demersal trawl footprint is ringfenced, and there is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

It is not known if *C. hulleyi* will derive any protection in the deep-water MPAs off the South African coast.

Additional local comment

As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

IUCN Red List Status
Least Concern 2018

Previous IUCN assessments
Least Concern (as *C. parcomaculata*) 2009

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

MANAGEMENT CONSIDERATIONS
In general, skates caught in demersal trawl fisheries are seldom identified to species level, which makes it difficult to formulate any management considerations. *C. hulleyi* was one of only two skates identified to species in this fishery, even though this very small species is discarded, along with almost all the others. Only *Raja straeleni* and some larger individuals of *R. ocellifera* are regularly retained. An important step to improve the identification of all skates caught in this fishery would be to re-establish the scientific observer programme and to ensure that observers are trained in the identification of chondrichthyans. It is also imperative to maintain the DFFE-led time series of bi-annual demersal trawl surveys to monitor population trends of this and other species. The trawl footprint must remain in place and regulated.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Very little is known about the biology of this species. Further research is needed on population size and trends, life-history, and catch rates. This can be achieved only through dedicated research sampling as there is no commercial market for *C. hulleyi*, because of its small size, and all catches are discarded at sea. The re-introduction of the scientific observer programme and the continuation of the demersal trawl surveys are the only likely sources of this research material which is required to improve our knowledge of this species.

FAMILY DASYATIDAE

Bathytoshia brevicaudata - Shorttail stingray

SCIENTIFIC NAME	*Bathytoshia brevicaudata* (Hutton, 1875)
COMMON NAME	Shorttail stingray
FAMILY	Dasyatidae
ENDEMIC	No, Indo-West Pacific
SIZE RANGE	35–210 cm DW
DISTRIBUTION	East, South and part of West coast: Mozambique border to St. Helena Bay
HABITAT	Demersal and epipelagic
DEPTH RANGE	0–480 m
MAJOR FISHERIES	Recreational linefishery; possibly commercial linefishery, demersal trawl fishery and beach-seine and gillnet fisheries
IUCN STATUS	Least Concern 2020
CITES REGS	Not listed
MLRA REGS	Demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	C Elston

SPECIES SUMMARY and RECOMMENDATIONS

Bathytoshia brevicaudata is a medium-sized, demersal and epipelagic ray with an anti-tropical distribution. In South Africa it occurs over a wide depth range along the entire east and south coasts and part of the west coast. Local average annual catch was estimated at <1 ton from DFFE records for two time periods: 2010–2012 and 2013–2019, with the recreational linefishery, beach-seine and gillnet fisheries listed as the major contributors. It was globally assessed as Least Concern in 2020, which is appropriate for the South African population, given the low local catches and stable population. There is considerable regional genetic structure in the southern hemisphere. Nothing is known of its life-history and ecology locally. Any opportunistic sampling should be used to collect biological information.

TAXONOMIC and IDENTIFICATION ISSUES

Bathytoshia brevicaudata was first described in South Africa as a new species *Trygon schreineri* by Gilchrist (1913, cited by Ebert *et al.* 2021a) but Wallace (1967c) ascertained that it was synonymous with New Zealand specimens of *Dasyatis brevicaudata.* Subsequently, Last *et al.* (2016b) resurrected the genus *Bathytoshia* and renamed the species *B. brevicaudata.* There are unlikely to be any identification issues, given its large size, and the characteristic diagonal row of white or pale blue dots along each pectoral fin base. This species is known as the smooth stingray in Australia (Last and Stevens 1994), due to its smooth skin which lacks any dermal denticles, apart from a row of thorns and tubercles on the midline of the tail (Last *et al.* 2016a).

SOUTH AFRICAN DISTRIBUTION

Bathytoshia brevicaudata was long regarded as only occurring from the Mozambique border to False Bay (Compagno *et al.* 1989), but this range was extended up the west coast to St. Helena Bay (van der Westhuizen and van der Westhuizen 2016), based on records of shore anglers' catches (Jordaan and Mann 2023b). This species is most common in the cooler waters of the South coast.

REGIONAL DISTRIBUTION

Bathytoshia brevicaudata occurs in Mozambique (Pierce *et al.* 2008) but not further north (World Conservation Society, unpublished data). It also occurs in Namibia (Leeney 2024). It is largely confined to the anti-tropical Indo-Pacific and is also found off Australia, New Zealand, Japan and Russia (Last *et al.* 2016a).

SYNOPSIS OF RESEARCH

In a study of batoid fishes of the east coast of southern Africa, Wallace (1967c) examined only two individuals of this species, then referred to as *Dasyatis brevicaudata.* Vaughan and Chisholm (2010) identified a new species of monogenean parasite from the gills of captive *B. brevicaudata* at the Two Oceans Aquarium. Population genetic studies have been undertaken comparing South African individuals with those from Australia and New Zealand (Le Port and Lavery 2012, Roycroft *et al.* 2019). *B. brevicaudata* has been detected infrequently in Baited Remote Underwater Videos (BRUVS) deployed in False Bay (de Vos *et al*. 2015), Bettys Bay (Roberson *et al.* 2015) Walker Bay (Osgood *et al.* 2019) and Plettenberg Bay (Cortelezzi *et al.* 2022). In a current, long-term study in Plettenberg Bay this species is frequently detected on BRUVS and has also been observed year-round from cliff-top monitoring sites (Melissa Nel, Chantel Elston, South African Institute for Aquatic Biodiversity, unpublished data). Nothing has been published on the life-history of this species in South Africa. *Bathytoshia brevicaudata* was ranked ninth out of 22 South African coastal chondrichthyan species which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

Bathytoshia brevicaudata occurs on the outer shelf and upper slope from 180–480 m and sometimes close inshore (Compagno *et al.* 1989), where it is caught by shore anglers, as well as being observed by tourists in specific locations. It usually occurs in water shallower than 150 m in Australia (Last *et al.* 2016a) and at 200–250 m in New Zealand (Rigby *et al.* 2021). It has been found on the surface in deep water of 3000 m in Japan (Rigby *et al.* 2021).

Habitat: Adults

Bathytoshia brevicaudata is demersal and epi-pelagic on the continental shelf and slope in a wide variety of habitats including shallow coastal bays, estuaries, large inlets, coastal rocky reefs, offshore islands, the open sea floor, and occasionally near the surface over the outer shelf (Rigby *et al.* 2021).

Habitat: Juveniles/Nursery Grounds

It is not known if juveniles utilise other habitats, but a potential nursery area has been identified at an offshore island in New Zealand (Le Port *et al*. 2012).

Synopsis of tag deployments

A total of 180 individuals have been tagged by recreational shore anglers along much of the South African coast, from Sodwana in the far north of the east coast up to St Helena Bay on the west coast. The provincial breakdown of these data is 80% in the Western Cape, 15% in the Eastern Cape and 5% in KZN, with only three recaptures (Jordaan and Mann 2023b).

Movements

The recaptures of two individuals within 10 km of where they were tagged and after two months or less at liberty is suggestive of some degree of site fidelity. One individual was recaptured 230 km from where it was tagged after an interval of over 6 years (Jordaan and Mann 2023b). The year-round presence of the species in Plettenberg Bay (Melissa Nel, Chantel Elston, unpublished data) suggests site fidelity to this area. Individuals attracted to feed on discards from fishing boats

returning to Struisbaai harbour demonstrate strong site fidelity, facilitated by provisioning. This activity is often reported on social media but has not been documented in the scientific literature.

Outside of South Africa, both site fidelity, through provisioning similar to that observed at Struisbaai (Pini-Fitzsimmons *et al*. 2023), and seasonal aggregations (Le Port *et al*. 2012) have been observed.

Diet/feeding: Adults
The diet comprises invertebrates and small teleosts (Last *et al*. 2016a).

Diet/feeding: Juveniles
There is no evidence that it is different from that of the adults.

South African toxicological studies
No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Histotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Unknown locally; summer and autumn in New Zealand
GESTATION	Unknown
LITTER SIZE	6–10 (outside South Africa)
PUPPING/NURSERY GROUND	Unknown locally; offshore island in New Zealand
DISC WIDTH AT BIRTH	32–36 cm (outside South Africa)
DISC WIDTH AT MATURITY	Unknown
MAXIMUM DISC WIDTH	210 cm
GENERATION LENGTH	Unknown

Mode
Bathytoshia brevicaudata exhibits histotrophic viviparity in which maternal uterine secretions supplement the nourishment provided by the yolk-sac.

Duration of reproductive cycle
This is unknown.

Gestation
This is not listed (Rigby *et al.* 2021).

Mating season and location
This is unknown locally, although it occurs in summer and autumn in the vicinity of an offshore island in New Zealand (Le Port *et al.* 2012).

Litter size
Litter size is 6–10 outside South Africa (Last *et al.* 2016a).

Pupping season and nursery ground
This is unknown locally, but a potential nursery area has been identified in the vicinity of an offshore island in New Zealand (Le Port *et al*. 2012).

Disc width at birth
This is unknown locally but is 32–36 cm outside South Africa (Last *et al.* 2016). The smallest individual in South Africa was tagged by a researcher at 38 cm (Jordaan and Mann 2023b).

Disc width at maturity
Size at maturity is unknown for both females and males (Rigby *et al.* 2021).

Maximum disc width
This species attains at least 210 cm (Last *et al.* 2016).

Age and growth
Age-at-maturity is unknown. A tagged individual of 107 cm grew 38 cm in 6.6 years at liberty (Jordaan and Mann 2023b).

Generation length
Generation length was not listed (Rigby *et al.* 2021), but for its congener *B. lata,* which attains 260 cm, this is estimated at 21.5 years, based on age-at-maturity of 15 years and maximum female longevity of 28 years in Hawaii (Jabado *et al.* 2021b).

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Local average annual catch of *B. brevicaudata* was estimated from DFFE records at <1 ton for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). In the first period, the recreational linefishery was listed as the only confirmed source of catches, with the commercial linefishery, demersal trawl fishery and beach-seine and gillnet fisheries noted as possible additions (da Silva *et al*. 2015). In the second period, the recreational linefishery and the beach-seine and gillnet fisheries were listed as the major contributors (DFFE 2022).

Recreational linefishery
The tagging of *B. brevicaudata* by recreational shore anglers provides insight into the longshore distribution of the species. A total of 180 individuals have been tagged from Sodwana in the far north of the east coast up to St Helena Bay on the west coast, with a provincial breakdown of 80% in the Western Cape, 15% in the Eastern Cape and 5% in KZN. Nearly 15% of the individuals tagged were caught in the Simonstown area of False Bay (Jordaan and Mann 2023b). This species was not reported in competition shore angling catches on the east coast (Pradervand 2004, Pradervand and Govender 2003, Pradervand *et al.* 2007). Only a single individual was reported in recreational anglers' catches in both False Bay (Best *et al.* 2013) and in Angling Week (Dicken 2012).

In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential effects on coastal elasmobranch species (Winkler *et al.* 2025). In the SASSA National data (2011-2023), which represents 26 different localities between Varkenvlei on the West Coast and Noggies in Northern KwaZulu-Natal, it was found that *B. brevicaudata* was the 23rd most commonly captured species with an average CPUE of 0.0001, while in the RASSPL dataset, which represents 73 different fishing locations between Rietfontein on the West Coast and Haga Haga in the Eastern Cape, *B. brevicaudata* was the 29th most commonly caught elasmobranch with a CPUE of 0.002 (Winkler *et al.* 2025).

Beach seine net and gillnet fisheries
Three individuals, ranging in size from 46-210 cm, were caught in February and March in beach seine nets in False Bay (Lamberth *et al.* 1994, Lamberth 2006).

Fishing outside South Africa
The species is taken as bycatch in a wide variety of fisheries elsewhere including trawl, Danish seine, longline, and purse seine fisheries, and is most often discarded. It is commonly taken by recreational anglers and sometimes speared or harpooned for sport. It is often released but sometimes retained for meat. Commercial and recreational anglers regularly amputate the tail before release to reduce the risk of injury. The relatively large number of individuals seen by divers without tails suggests they survive capture and release well (Rigby *et al.* 2021, and references cited therein).

Population trends
There is significant genetic structure between South Africa, Australia, and New Zealand populations (Le Port and Lavery 2012), with evidence for male-biased dispersal (Roycroft *et al.* 2019). There is no evidence of a population decline in both Australia, as well as New Zealand, where it has been locally assessed at Least Concern. The species is apparently common in Japan. Globally, the species is not suspected to be close to reaching the population reduction threshold and was therefore assessed as Least Concern in 2020 (Rigby *et al.* 2021).

ECOTOURISM
Bathytoshia brevicaudata is generally not seen by scuba divers, other than in the Struisbaai harbour and, more recently, during summer in False Bay in the vicinity of the Miller's Point public slipway. At Struis Bay the rays have become conditioned to feed on offal from the fishing boats and are a well-publicised tourist attraction; the same appears to be developing at Miller's Point. There is similar provisioning in Hamelin Bay, Western Australia (Newsome *et al.* 2004) and Jervis Bay, New South Wales (Pini-Fitzsimmons *et al*. 2023). Therefore *B. brevicaudata* should be recognised as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
The demersal trawl footprint is ringfenced. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
Nearly 15% of the individuals tagged were caught in the Simonstown area of False Bay, which falls into the Table Mountain National Park MPA. Individuals were observed at an equal rate both inside and outside the Robberg MPA, Plettenberg Bay (Cortelezzi *et al.* 2022). Due to insufficient information on the distribution of *B. brevicaudata,* it is difficult to ascertain which other, if any, MPAs would provide significant protection to this species.

Additional local comment
None.

IUCN Status
Least Concern 2020

Previous IUCN assessments
Not evaluated.

MANAGEMENT CONSIDERATIONS
Bathytoshia brevicaudata is an uncommon local catch, thus the global assessment of Least Concern appears to be appropriate for the South African population. This species must, therefore, be regarded as being of being of relatively low management priority. Recreational shore anglers should be encouraged to continue to release any catches. Some guidelines should be formulated to ensure the well-being of individuals which have been conditioned by provisioning in the Struisbaai harbour and Miller's Point. The demersal trawl footprint must remain in place.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Very little is known locally about the life-history and ecology of this species in South Africa. Opportunistic sampling to obtain life-history information should be undertaken. The Struisbaai aggregation provides an excellent research opportunity, albeit in the unnatural context of provisioning; individuals can be marked and behaviours observed in shallow waters. *Bathytoshia brevicaudata* was ranked ninth out of 22 South African coastal chondrichthyan species which were prioritised for further research.

Dasyatis chrysonota - Blue stingray

SCIENTIFIC NAME	*Dasyatis chrysonota* (Smith, 1828)
COMMON NAME	Blue stingray
FAMILY	Dasyatidae
ENDEMIC	No, present in Namibia and Angola
SIZE RANGE	17–75 cm DW
DISTRIBUTION	Entire South African coast
HABITAT	Demersal
DEPTH RANGE	0–110 cm; very common in surf zone
MAJOR FISHERIES	Demersal and midwater trawl fisheries; beach-seine and gillnet fisheries; recreational linefishery; possibly commercial linefishery
IUCN STATUS	Near Threatened 2019
CITES REGS	Not listed
MLRA REGS	Current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	C Elston

SPECIES SUMMARY and RECOMMENDATIONS

Dasyatis chrysonota is a small demersal ray which occurs inshore along the entire South African coast and into Namibia and southern Angola. Local average annual catch was estimated at <1 ton from DFFE records for two time periods, 2010–2012 and 2013–2019, from a wide variety of fisheries. It was globally assessed as Near Threatened in 2019 but is regarded as Endangered based on recent DFFE records. This species has been comparatively well studied in South African waters. Tracking studies have identified site fidelity in conjunction with wide-ranging movements in winter, but no spatial overlap between individuals tagged in the western and eastern sections of the south coast may indicate sub-populations; this needs to be confirmed through genetic studies. This species is protected by MPAs in some parts of its range. Pregnant females in Algoa Bay are poorly protected. Future spatial planning should take this into consideration, particularly at sensitive times during the reproductive cycle.

TAXONOMIC and IDENTIFICATION ISSUES

Dasyatis chrysonota was first described in South Africa as *Trigon chrysonotus* by Smith in 1828 (Cowley and Compagno 1993), but this was largely overlooked, and it was long known as *D. pastinacus* (Wallace 1967c, van der Elst 1993), a species widespread in the Mediterranean and East Atlantic, including Angola but not Namibia. Compagno *et al*. (1989) subsequently listed it as the southern African blue stingray *D. marmorata*, a species found in the central East Atlantic and stated that *D. pastinaca* does not occur in the region. Cowley and Compagno (1993) revived the name *chrysonotus* and assigned it the southern African specimens. Molecular data supports the non-conspecificity of the two similar, blue-marbled forms, *D. chrysonota* and *D. marmorata* (Last *et al.* 2016b). There are unlikely to be any local identification issues as this species has a characteristic dorsal colour pattern of conspicuous bright blue blotches and branching lines on a golden-brown disc.

SOUTH AFRICAN DISTRIBUTION

Dasyatis chrysonota occurs on the entire South African coast (Ebert *et al.* 2021a). Previously Cowley and Compagno (1993) and Götz and Cowley (2013) gave the eastern boundary as St Lucia, approximately 175 km south of the Mozambique border.

REGIONAL DISTRIBUTION

Dasyatis chrysonota occurs in Namibia and southern Angola and possibly Mozambique (Götz and Cowley 2013).

SYNOPSIS OF RESEARCH

In a study of batoid fishes of the east coast of southern Africa Wallace (1967c) examined 23 individuals of this species, then referred to as *D. pastinacus*; all taken on the KZN coast. This sample comprised juveniles and adults and included a pregnant female. Cowley and Compagno (1993) revisited the taxonomy of this species. Cowley (1997) conducted an age-and-growth study, Ebert and Cowley (2003) investigated diet and Ebert and Cowley (2009) investigated reproduction. As it is an important recreational angling species, Götz and Cowley (2013) provided an overview of the life-history and fisheries details. This was one of 44 species investigated by Currie *et al*. (2019) for evidence of a shift in the range, either due to climatic change or the impact of trawl fishery on the Agulhas Bank. Elston *et al.* (2023) investigated its spatial ecology, including movement patterns, using acoustic telemetry. *Dasyatis chrysonota* was ranked 22nd of the 22 South African coastal chondrichthyan species which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

Dasyatis chrysonota occurs in very shallow water in the surf zone, out to depths of 110 m (Götz and Cowley 2013).

Habitat: Adults

In spring and summer, they occur in shallow waters of sandy beaches, estuary mouths, lagoons and sand and mud flats, moving offshore in winter (Ebert and Cowley 2003, Götz and Cowley 2013, Elston *et al.* 2023).

Habitat: Juveniles/Nursery Grounds

Juveniles are born inshore and then move offshore for the first 1–2 years (Cowley 1990, cited by Götz and Cowley 2013). This offshore presence of the juveniles now appears to be an artefact of different sampling techniques. Catches by shore anglers rarely included young-of-the-year and slightly larger juveniles, while these small individuals were often caught by trawlers operating in deeper water. Larger juveniles of 30–45 cm DW are present in both zones. A current study shows that Knysna Estuary is a pupping ground. This finding, in conjunction with all the most recent studies, indicates nursery habitats to be in shallow, sheltered environments (Chantel Elston, South African Institute for Aquatic Biodiversity, unpublished data).

Synopsis of tag deployments

A total of 3562 individuals have been tagged by recreational and research shore anglers along much of the South African coast. There have only been 13 recaptures (Jordaan *et al.* 2023). The mean distance travelled was 30 km, with a maximum of 234 km. Mean time at liberty was 1.0 year with a maximum of 3.3 years (Jordaan *et al*. 2023). An acoustic telemetry study of 27 individuals was undertaken in Algoa Bay and on the south coast (Elston *et al.* 2023). Another acoustic telemetry study of 30 individuals is currently underway in Knysna Estuary, Western Cape (C. Elston, pers. comm.).

Movements

This species moves offshore in winter, leaving the shallow inshore waters it frequents in summer (Götz and Cowley 2013). Individuals fitted with acoustic tags displayed a high degree of site affinity to particular coastal areas, based on the majority of their detections occurring within 50 km of the tagging locality. However, winter migrations to offshore habitats or neighbouring coastal habitats were also identified, with individuals travelling up to 200 km. There was no overlap in movements

between individuals tagged on the western and eastern sections of the south coast, which may suggest sub-populations, with the exception of one individual which travelled approximately 500 km from the eastern to the western section, representing the furthest known distance travelled by a benthic undulatory ray (Elston *et al.* 2023).

Diet/feeding: Adults
The diet varies with size and habitat (Götz and Cowley 2013). In the surf zone the main prey items were mud prawns, bivalves and polychaetes. In slightly deeper water the main prey were acorn worms and mud prawns (Ebert and Cowley 2003).

Diet/feeding: Juveniles
The diet of newborn individuals was dominated by amphipods and polychaetes (Ebert and Cowley 2003). All these individuals were sampled in deeper water.

South African toxicological studies
No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Histotrophic viviparity
DURATION OF REPRO CYCLE	1 year
MATING SEASON	Summer (January–March)
GESTATION	9 months
LITTER SIZE	1–7, mean of 3
PUPPING/NURSERY GROUND	Early summer in Eastern Cape and Western Cape waters, in particular Knysna Estuary
DISC WIDTH AT BIRTH	17 cm
DISC WIDTH AT MATURITY	F: 50 cm and M: 40 cm
MAXIMUM DISC WIDTH	75 cm
GENERATION LENGTH	10.5 years

Mode
Dasyatis chrysonota exhibits histotrophic viviparity, in which maternal uterine secretions supplement the nourishment provided by the yolk-sac.

Duration of reproductive cycle
This is one year (Ebert and Cowley 2009).

Gestation
This is 9 months (Ebert and Cowley 2009).

Mating season and location
This takes place in summer (January to March) with no evidence of any specific locations (Ebert and Cowley 2009).

Litter size
Litter size is 1-7, with a mean of 3. There was no correlation between the number of embryos and maternal size (Ebert and Cowley 2009).

Pupping season and nursery ground
Pupping occurs in early summer (October to December) in sheltered bays and estuary mouths (Ebert and Cowley 2009). A current study has revealed that pregnant females aggregate in shallow waters

of the Knysna Estuary during October and November, with acoustically-tagged individuals remaining in the estuary for subsequent months, suggesting this estuary is a pupping and nursery area (C Elston, unpublished data).

Disc width at birth
This is about 17 cm (Ebert and Cowley 2009).

Disc width at maturity
Size at maturity is 50 cm DW for females and 40 cm DW for males (Ebert and Cowley 2009).

Maximum disc width
This species attains at 75 cm DW (Last *et al.* 2016a).

Age and growth
Female age-at-maturity is 7 years, and maximum age is 14 years (Cowley 1997).

Generation length
Generation length is 10.5 years, based on the female age details from Cowley (1997) (Pollom *et al.* 2020k).

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Local average annual catch of *D. chrysonota* was estimated from DFFE records at <1 ton for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). The beach-seine, demersal and midwater trawl fisheries were listed as the main source of catches, followed by the recreational linefishery and the KZN prawn trawl fishery. The commercial linefishery and the hake longline fishery are noted as possible additions (da Silva *et al*. 2015).

Demersal trawl fishery
This species was not listed in the catch estimates in the South African inshore trawl fishery, 2003–2006, although there was a category of *unidentified stingrays* which comprised <1% of the discarded catch (Attwood *et al.* 2011).

Beach seine net and gillnet fisheries
Over a period of two years (January 1991 to December 1992) a total of 1073 individuals, ranging in size from 50–80 cm, were caught in beach seine nets in False Bay, with 92% considered immature (Lamberth *et al.* 1994). In an updated study of this same fishery and location, this species was found in 30% of hauls (Lamberth 2006).

Recreational linefishery
Dasyatis chrysonota is not an uncommon catch of recreational shore anglers along the east coast (Pradervand 2004, Pradervand and Govender 2003, Pradervand *et al.* 2007), and in Angling Week fished annually between Port Alfred on the east coast and Plettenberg Bay on the south coast (Dicken 2012). This species is targeted in shore angling competitions around Algoa Bay during the spring and summer. Most of the catches are large, pregnant females with well-developed embryos, consequently abortion is a problem (C Elston, unpublished data). It is also caught by recreational anglers in False Bay (Best *et al.* 2013).

In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential

effects on coastal elasmobranch species (Winkler *et al.* 2025). In the SASSA National data (2011-2023), which represents 26 different localities between Varkenvlei on the West Coast and Noggies in Northern KwaZulu-Natal, it was found that *Dasyatis chrysonata* was the third most commonly captured species with an average CPUE of 0.29, while in the RASSPL dataset, which represents 73 different fishing locations between Rietfontein on the West Coast and Haga Haga in the Eastern Cape, D. *chrysonata* was the sixth most commonly caught elasmobranch with a CPUE of 0.03 (Winkler *et al.* 2025). In the SAASA-KZN dataset, where locations are fished in KZN and the northern Eastern Cape, at 206 different locations between Kosi Bay and Xhora river mouth, this species was ranked sixth and eighth most common elasmobranch caught, during the day (0.10) and at night (0.14), respectively (Winkler *et al.* 2025).

KZN prawn trawl fishery

Dasyatis chrysonota was a regular bycatch in the KZN prawn trawl industry on the uThukela Banks. Based on the observer-recorded catches, the extrapolated average annual catch between 1989 and 1992 was 897 (range 678-1280). The size range was 0.2–0.7 m DW, with a mean of 0.5 m, which encompassed both juveniles and adults. Survival of this bycatch species was around 82%, based on a subsample of 34 individuals. Catches were significantly higher in the warm season (December–May) and in deeper water (>32 m) (Fennessy 1994). This fishery was dormant for nearly two decades due to the extended closure of the mouth of Lake St Lucia, resulting in poor prawn recruitment and diminishing prawn catches on the uThukela Banks. The inshore fishing grounds were closed to trawling following the declaration of the uThukela MPA in August 2019.

Fishing outside South Africa

No information is provided by Pollom *et al.* (2020) on catches outside South Africa, but they note that parts of Namibia are remote and offer refuge from fishing pressure. Furthermore, since 2002, artisanal and recreational fishing pressure in a few parts of southern Angola has increased while other areas remain unfished. Individuals are regularly caught by recreational anglers in Namibia (Leeney 2024).

Population trends

There are no estimates of population size for this species. Trend analysis of research trawl data undertaken by DFFE, (DFFE, unpublished data, 2018) in South African commercially fished areas estimated a population reduction of 62% over the past three generation lengths (31.5 years). The estimated reduction is driven partly by a steep decline in catch rates during the early 1990s when local fishing pressure was substantially higher. Over the last two decades, the population reduction has been less dramatic (Pollom *et al.* 2020k). These authors attribute some of this reduction to a northeast range shift in abundance away from the trawl grounds, due to climate change (Currie *et al*. 2019), however the latter study makes no mention of any significant shift. It is suspected that this species has undergone a population reduction of 20–29% over the past three generation lengths (31.5 years) due to levels of exploitation, and it was assessed as Near Threatened (nearly meeting Vulnerable A2bd) in 2019 (Pollom *et al.* 2020k). In a more recent assessment, *D. chrysonota* was rated as Endangered, based on a decline in stocks (DFFE 2022).

A large genetic study involving several stingray species is in the planning stages. One of the objectives will be to ascertain if there is significant structure within the southern African population of *D. chrysonota* to indicate different stocks. There was no overlap in movements between individuals tagged on the western and eastern sections of the south coast, which may suggest sub-populations, with the exception of one individual which travelled approximately 500 km from the eastern to the western section, as reported above.

ECOTOURISM

Individuals are not often spotted by divers, possibly because they spend a lot of time cryptically buried in the sand. Sightings in the Keurbooms Estuary are extremely rare. On the other hand, adults aggregate in shallow waters next to the harbour wall in the Knysna Estuary in late spring and early summer, providing an opportunity to view individuals easily in the wild. This has become a popular attraction, which has garnered media attention (C Elston unpublished data), therefore, *D. chrysonota* should be regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

The current demersal trawl footprint is ringfenced. There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

Dasyatis chrysonota does occur in several protected areas along the South African coast. The uThukela MPA appears to be an important area, based on catches in the now-closed inshore prawn trawl fishery. Tagged individuals displayed site fidelity to the De Hoop MPA (Elston et al. 2023). However, the Addo Elephant MPA is unlikely to be sufficient to protect blue stingrays from further population declines in Algoa Bay, given that tagged individuals were most often detected just outside the MPA boundary (Elston *et al.* 2023).

Additional local comment

None.

IUCN Status

Near Threatened 2019 (A2bd) but assessed as Endangered (DFFE 2022).

Previous IUCN assessments

Least Concern 2009

MANAGEMENT CONSIDERATIONS

The closure of the inshore KZN prawn trawl fishery on the uThukela Banks has removed a significant portion of the catch. Some quantification of the catch in the inshore hake trawl fishery is needed, although it appears to be low. The current demersal trawl footprint must remain ringfenced and regulated. Recreational shore anglers should be encouraged to continue to handle any catches with care while releasing them. Given that tagged individuals were most often detected close to or just outside the western boundary of the Addo Elephant MPA in Algoa Bay, this MPA should be extended to include the area frequented by *D. chrysonota*. Recreational angling for elasmobranchs should be prohibited in this extended area, at the very least on a seasonal basis, to protect pregnant females who aggregate in shallow coastal areas during spring and summer.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

This species has been well studied in comparison to other South African rays. A planned genetic study is important to determine if there is any local or regional structure in the southern African population. The importance of estuaries, in particular the larger ones, as suitable habitat for *D. chrysonota* must be investigated. Currently only the Knysna Estuary is known to have year-round residents. The planned study will investigate possible genetic differences between the Knysna Estuary individuals and those found in the marine environment. *Dasyatis chrysonota* was ranked

22nd out the 22 South African coastal chondrichthyan species which were prioritised for further research.

Maculabatis cf. *ambigua* - Sharpnose stingray / Brown stingray

SCIENTIFIC NAME	*Maculabatis* cf. *ambigua* Last, Bogorodsky and Alpermann, 2016
COMMON NAME	Sharpnose stingray; brown stingray
FAMILY	Dasyatidae
ENDEMIC	No, also found in Mozambique and possibly entire East African coast
SIZE RANGE	18–90 cm DW
DISTRIBUTION	East coast: Mozambique border to East London
HABITAT	Demersal
DEPTH RANGE	0–50 m
MAJOR FISHERIES	The now-closed KZN inshore prawn trawl fishery and shore-based recreational linefishery
IUCN STATUS	Near Threatened 2018
CITES REGS	Not listed
MLRA REGS	Daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	BQ Mann

SPECIES SUMMARY and RECOMMENDATIONS

Maculabatis cf. *ambigua* is a medium-sized demersal ray which occurs inshore along much of the east coast. Its identity remains unresolved, but it was formerly known as *Himantura gerrardi*. The South African and Mozambican forms closely resemble *M. ambigua*, which is reported to occur from Tanzania northwards to the Red Sea. Local average annual catch was estimated at <1 ton from DFFE records for the period 2010–2012), primarily from the now-closed KZN inshore prawn trawl fishery. It is also caught by recreational shore anglers. It was not included in more recent DFFE catch estimates for the period 2013–2019. It was globally assessed as Near Threatened in 2018, but the local population, irrespective of its identity, is likely to meet the criteria of Least Concern, given the formal closure of the KZN inshore prawn trawl fishery and the establishment of the uThukela MPA in 2019. This species has been very poorly studied. Shore anglers must be encouraged to continue to release any catches. Tagging studies suggest that the species is resident although very few have been recaptured. More information is required on aspects of its life-history and ecology, and its identity needs to be confirmed.

TAXONOMIC and IDENTIFICATION ISSUES

Maculabatis cf. *ambigua* was previously referred to as *Himantura gerrardi* (van der Elst 1988, Compagno *et al.* 1989), a species which is now recognised as only present in the Eastern Indian Ocean (Last *et al.* 2016a), and which has been assigned to the newly-created genus *Maculabatis* (Last *et al.* 2016b). South African individuals are similar to *M. ambigua*, a species known presently from the Red Sea to Tanzania, but their identity is currently under investigation (Ebert *et al.* 2021a). The species description and accompanying illustration of *Dasyatis jenkinsii* provided by Wallace (1967c) does not fit with what is now known as *Pateobatis jenkinsii*. It closely resembles *M.* cf. *ambigua*, in that it has a clearly defined, narrow band of enlarged, flattened denticles along the midline of the back and a very long tail which is banded in smaller individuals. The description by Wallace makes no mention of the presence of thorny denticles down the midline or a relatively short, plain-coloured tail, both characteristic features of *P. jenkinsii. M.* cf. *ambigua* may be mistaken for other uniformly brown stingrays which occur along the east coast. In addition to *P. jenkinsii*, they include *P. fai*, *Bathytoshia lata* and *Pastinachus ater,* which all have a similar body shape.

SOUTH AFRICAN DISTRIBUTION

This species occurs on much of the South African east coast, from the Mozambique border to Port Alfred (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

Maculabatis cf. *ambigua* occurs from Tanzania northwards to the Red Sea. It is abundant in Mozambique (Rhett Bennett, World Conservation Society, pers. comm.) but was not historically recorded there (Pollom *et al.* 2019r), hence the reservation that the South African individuals may be another species and not *M. ambigua* (Ebert *et al.* 2021a).

SYNOPSIS OF RESEARCH

In a study of batoid fishes of the east coast of southern Africa, Wallace (1967c) examined 50 individuals incorrectly described as *Dasyatis jenkinsii,* most of which were taken on the KZN coast. This sample comprised juveniles and at least two adult males and a pregnant female. No other dedicated research has been conducted on this species. Catches were recorded in the KZN inshore prawn trawl fishery (Fennessy 1994) and the east coast recreational shore fishery (Pradervand *et al.* 2007). Dunlop and Mann (2013a) provided an overview of the life-history and fisheries details of this species.

ECOLOGY

Depth

Maculabatis cf. *ambigua* occurs in very shallow water, predominantly in the surf zone, but it may also enter larger estuaries, such as St Lucia, Richards Bay, and Durban Harbour. It is also found on offshore sand and mud banks to depths of 50 m (van der Elst 1988, Dunlop and Mann 2013a and references cited therein).

Habitat: Adults

They inhabit sandy and muddy bottoms in the surf zone, larger estuaries and offshore to deeper sand and mud banks.

Habitat: Juveniles/Nursery Grounds

It is likely that juveniles occupy a similar habitat to that of the adults, based on the abundance of juveniles in shore anglers' catches (Pradervand *et al*. 2007).

Synopsis of tag deployments

A total of 1973 individuals have been tagged by recreational and research shore anglers along the east coast. There have only been 6 recaptures. The mean distance travelled was 6 km, with a maximum of 24 km. The mean time at liberty was 0.7 months, with a maximum of 1.3 years (Jordaan *et al*. 2023). These statistics may include other mistakenly identified brown stingray species (Bruce Mann, Oceanographic Research Institute, pers. obs.).

Movements

From the limited number of tag-recaptures, this species appears to be fairly resident. It is present on the KZN coast throughout the year, with a peak in abundance in summer (van der Elst 1988; Pradervand *et al*. 2007).

Diet/feeding: Adults

The diet comprises benthic invertebrates, including bivalve molluscs, polychaete worms, crabs and prawns (van der Elst 1988).

Diet/feeding: Juveniles

It is likely to be similar to that of adults.

South African toxicological studies

No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Histotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING SEASON	Summer (January–March)
GESTATION	1 year
LITTER SIZE	At least 2
PUPPING/NURSERY GROUND	Summer, close inshore, including uThukela Banks
DISC WIDTH AT BIRTH	18–21 cm (*Himantura gerrardi*)
DISC WIDTH AT MATURITY	60–70 cm
MAXIMUM DISC WIDTH	90 cm
GENERATION LENGTH	Unknown

Mode
This species exhibits histotrophic viviparity, in which maternal uterine secretions supplement the nourishment provided by the yolk-sac.

Duration of reproductive cycle
This is unknown.

Gestation
This is assumed to be 1 year (van der Elst 1988).

Mating season and location
This takes place in summer (van der Elst 1988), with no evidence of any specific locations.

Litter size
Litter size is at least two (van der Elst 1988).

Pupping season and nursery ground
This occurs in summer, with pupping in shallow waters off sandy beaches and bays through much of its range (van der Elst 1988), including the uThukela Banks (Fennessy 1994). It is not known whether this species uses large estuaries such as St Lucia and Richards Bay and Durban Harbours as pupping areas.

Disc width at birth
This is unknown but is 18–21 cm for *H. gerrardi* from the Eastern Indian Ocean (Dunlop and Mann 2013a and reference cited therein).

Disc width at maturity
Size at maturity is 60–70 cm (van der Elst 1988). In Indonesia, females matured at 54 cm DW and males 48 cm (Dunlop and Mann 2013a and reference cited therein).

Maximum disc width
This species attains 90 cm (van der Elst 1988).

Age and growth
This is unknown.

Generation length
This is unknown.

FISHERIES MANAGEMENT

SA catch sources, quantities and characteristics

Annual catch estimates based on DFFE records in South African fisheries were <1 ton for the period 2010–2012 (da Silva *et al*. 2015) and listed as *Himantura gerrardi*. The now-closed KZN inshore prawn trawl fishery was the only known source of catches. The recreational linefishery, commercial linefishery, demersal trawl fishery and the demersal longline fishery were noted as possible other sources. This species was not included in an update of catches for the period 2013–2019 (DFFE 2022).

KZN Inshore prawn trawl fishery

This species was present in 25% of trawls during the period 1989–1992, with estimated annual catches ranging from 764–1441 individuals (Fennessy 1994). Catches were significantly higher in the warm season (December–May) and in shallow water (20–33 m). The survival rate of the catch was found to be 57%, based on a sample of 47 individuals. The size range, expressed as disc width and based on a sample of 64 individuals, was 20–80 cm, with a mean of 30 cm, comprising a large percentage of juveniles, including neonates. There were very few adults (> 60 cm) (Fennessy 1994). This fishery was dormant for nearly two decades due to the extended closure of the mouth of Lake St Lucia, resulting in poor prawn recruitment and diminishing prawn catches on the uThukela Banks. The fishing grounds were formally closed to trawling following the declaration of the uThukela MPA in August 2019.

Demersal trawl fishery

This fishery is only permitted to operate west of the Kei River mouth which is only 200 km north of Port Alfred, the southern limit of *M.* cf *ambigua.* Therefore, catches in this fishery are likely to be extremely low.

Recreational linefishery

M. cf *ambigua* is a common catch taken by competitive recreational shore anglers along the east coast, but most are released. In the KZN competitive shore angling fishery, 4211 individuals (175 per annum) with a total weight of 39 520 kg (mean 9 kg) were caught over the period 1977–2000 (Pradervand *et al*. 2007). Catch rates, by number of individuals and by weight, increased significantly over this period (Pradervand *et al.* 2007). In the same period only 21 individuals (296 kg) were caught immediately to the south along the Transkei coast (Pradervand 2004). Further south in the Border region of the Eastern Cape no individuals were caught during the period 1982–1998 (Pradervand and Govender 2003); this region is at the very southern limit of its distribution. More recent statistics from the KZN shore fishery (2000–2011) did not show an increase in the mean size of individuals caught (Dunlop and Mann 2013a).

In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential effects on coastal elasmobranch species. In the SAASA-KZN dataset, where locations are fished in KZN and the northern Eastern Cape, at 206 different locations between Kosi Bay and Xhora river mouth, *M.* cf *ambigua*, but listed as *Himantura gerrardi*, was ranked fifth and eighth most common elasmobranch caught, during the day (0.12) and at night (0.11), respectively. It is primarily captured around Durban and Port Shepstone (Winkler *et al.* 2025).

KZN bather protection programme

This species was an extremely rare catch in the KZN bather protection programme, with a mean annual catch of 1 for the period 1981–1990 (Dudley and Cliff 1993).

Fishing outside South Africa
This species is taken as both targeted and incidental catch of inshore trawl fisheries, bottom-set gillnets, hook and line fisheries, and artisanal beach seines. In Mozambique *M.* cf *ambigua* is the most common ray landed in the artisanal beach seine fishery (R. Bennett, WCS, pers. comm.). In Tanzania, all whiprays are consumed fresh locally or salted and dried and traded domestically. This species is generally not utilised and is discarded in the Red Sea (Pollom *et al.* 2019r).

Population trends
There are no estimates of population size for this species. Competitive shore angler catches in KZN revealed an increase in catch rates by number and by weight between 1977 and 2000 (Pradervand *et al.* 2007). Elsewhere, unmanaged bycatch and increasing fishing effort in parts of its range are suspected to have led to a global population decline of 20–29%. Therefore, *M.* cf *ambigua* was assessed globally as Near Threatened in 2018, nearly meeting the threshold for Vulnerable A2d (Pollom *et al.* 2019r).

ECOTOURISM
Maculabatis cf. *ambigua* are occasionally seen by scuba divers, particularly in the iSimangaliso and Aliwal Shoal MPAs and therefore should be regarded as an ecotourism species. They are also attractive display animals in marine aquaria.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
There is a daily bag limit of one individual per person in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
It occurs in several protected areas along the east coast. The uThukela MPA appears to be a particularly important area for this species, based on historic high catches in the now-closed inshore prawn trawl fishery, in which catches included largely neonates and larger juveniles. Many of the beaches inside this MPA, such as Mtunzini and Nonoti, are favoured by competitive shore anglers targeting this species during summer. It is also seen by divers in the iSimangaliso and Aliwal Shoal MPAs. Given their apparently resident behaviour, it is likely that these three KZN MPAs will provide some protection for this species.

Additional local comment
None.

IUCN Status
Near Threatened 2018 (A2d).

Previous IUCN assessments
Not assessed.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
None.

MANAGEMENT CONSIDERATIONS
The formal closure of the inshore KZN prawn trawl fishery on the uThukela Banks has removed by far the highest portion of the catch. It is often caught by recreational shore anglers in KZN, but most individuals are released. There are several similar-looking brown stingrays in this region, making the identification of catches problematic. This is the most common ray caught in the inshore artisanal fishery in Mozambique, which may have implications for the status of the regional population. A guide to assist anglers and managers in identifying different species of brown rays should be produced. Recreational shore anglers should be encouraged to handle any ray catches with great care while releasing them.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
This species has been poorly studied. Its identity needs to be confirmed, especially if it proves to be a new species and not *M.* cf *ambigua.* Several life-history parameters need to be determined, including length at birth, fecundity and age and growth. Greater insight into movement patterns is needed, particularly in view of the high catches in Mozambique. Opportunistic sampling should be used to collect tissue samples for a genetic assessment of any regional population structure.

Pteroplatytrygon violacea - Pelagic stingray

SCIENTIFIC NAME	*Pteroplatytrygon violacea* (Bonaparte, 1832)
COMMON NAME	Pelagic stingray
FAMILY	Dasyatidae
ENDEMIC	No, patchy global distribution
SIZE RANGE	14–80 cm DW
DISTRIBUTION	East and South coasts: Algoa Bay to False Bay, but likely to be wider
HABITAT	Pelagic in open ocean, sometimes littoral
DEPTH RANGE	0–380 m
MAJOR FISHERIES	Recreational linefishery; possibly commercial linefishery, demersal trawl fishery and beach-seine and gillnet fisheries
IUCN STATUS	Least Concern 2018
CITES REGS	Not listed
MLRA REGS	Current demersal trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	RW Leslie

SPECIES SUMMARY and RECOMMENDATIONS

Pteroplatytrygon violacea is a small epipelagic ray with a widespread, albeit patchy global distribution. It is the only truly pelagic stingray. Its local occurrence is largely confined to the south coast but is likely to be far wider. The local average annual catch was estimated at 1–10 tons from DFFE records for two time periods: 2010–2012 and 2013–2019. The demersal trawl fishery is listed as the only known contributor, but it has also been recorded as bycatch in the midwater trawl fishery. It was globally assessed as Least Concern in 2018 on the IUCN Red List, which is appropriate for the South African population, given the low local catches. Nothing is known of its life-history and ecology locally. Any opportunistic sampling should be used to collect biological information and tissue samples for a global genetic study.

TAXONOMIC and IDENTIFICATION ISSUES

Pteroplatytrygon violacea has had a convoluted taxonomic history in South Africa. It was originally known as *Trygon purpurea* and then *Dasyatis purpurea* or *D. purpureus*, before being recognised as synonymous with the widely-distributed *D. violacea* (Ebert *et al*. 2021a). It was placed in a newly created subgenus *Pteroplatytrygon*, which was elevated to full genus status. *P. violacea* is the only member of the genus and is unique among the family Dasyatidae as being the only pelagic species. More recent research has revealed that the morphologically divergent groups, *Bathytoshia* and *Pteroplatytrygon*, possibly form a single monophyletic group, so further investigation is needed to confirm the validity of *Pteroplatytrygon* (Last *et al.* 2016b). *P. violacea* is easily recognised by its angular or cone-shaped disc and as the only stingray with an entirely dark ventral surface.

SOUTH AFRICAN DISTRIBUTION

As an open ocean species, *P. violacea* occurs off the south coast from False Bay to Algoa Bay on the east coast but is likely to be wider-ranging (Ebert *et al.* 2021a).

REGIONAL DISTRIBUTION

This species has a patchy global distribution; *P. violacea* occurs off Mozambique and Madagascar but not Tanzania; it also occurs off Namibia (Leeney 2024) and Angola (Kyne *et al*. 2019).

SYNOPSIS OF RESEARCH

In a study of batoid fishes of the east coast of southern Africa Wallace (1967c) erroneously referred to six specimens he examined as *D. pupureus* when they were another species, mostly likely *Pateobatis fai* (Ebert *et al*. 2021a). Nothing has been published on the life-history and ecology of this species in South Africa. *P. violacea* has been extensively studied elsewhere in the world, as is evident from the extensive biography listed by Kyne *et al*. (2019). *Pteroplatytrygon violacea* was ranked thirteenth out of 14 South African pelagic chondrichthyan species, which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

Pteroplatytrygon violacea generally occurs in the epipelagic zone, mostly to depths of 100 m, although it has been recorded to 380 m (Kyne *et al*. 2019).

Habitat: Adults

Previously thought to be exclusively pelagic, the recent collections at a depth of 330–380 m suggests that *P. violacea* may be a benthopelagic species, utilising both benthic and pelagic habitats (Nakaya, 1982, cited by Neer 2008).

Habitat: Juveniles/Nursery Grounds

It is not known if juveniles utilise other habitats.

Synopsis of tag deployments

No tagging has been undertaken for this species.

Movements

Nothing is known of local movement patterns of *P. violacea*.

Diet/feeding: Adults

The diet of *P. violacea* comprises oceanic squid, crustaceans, jellyfish and small teleosts (Compagno *et al.* 1989).

Diet/feeding: Juveniles

There is no evidence that it is different from that of the adults.

South African toxicological studies

No studies have been undertaken on *P. violacea*.

REPRODUCTION

REPRODUCTIVE MODE	Histotrophic viviparity
DURATION OF REPRO CYCLE	Annual (outside South Africa)
MATING SEASON	Unknown locally
GESTATION	2-3 months (outside South Africa)
LITTER SIZE	2–13, mean 6 (outside South Africa)
PUPPING/NURSERY GROUND	Unknown locally
DISC WIDTH AT BIRTH	14–24 cm (outside South Africa)
DISC WIDTH AT MATURITY	F: 40–50 cm; M: 35–40 cm (outside South Africa)
MAXIMUM DISC WIDTH	80 cm (outside South Africa)
GENERATION LENGTH	6.5 years (outside South Africa)

Mode
Pteroplatytrygon violacea exhibits histotrophic viviparity, in which maternal uterine secretions supplement the nourishment provided by the yolk-sac. These secretions are thought to be very rich in nutrients to enable the extremely short gestion of 2–3 months (Snelson *et al.* 2008). No pregnant females have been reported in South Africa, so everything known about the reproductive biology of *P. violacea* is from outside the southern African region.

Duration of reproductive cycle
There is no evidence that females reproduce more than once a year, and therefore an annual reproductive cycle is assumed (Snelson *et al.* 2008).

Gestation
This is 2–3 months (Snelson *et al.* 2008).

Mating season and location
This is unknown.

Litter size
Litter size of *P. violacea* is 2–13, with a mean of 6 (Snelson *et al.* 2008).

Pupping season and nursery ground
This is unknown locally.

Disc width at birth
This is 14–24 cm (Snelson *et al.* 2008). One anomaly that is not found in other stingrays is the wide range of sizes and developmental stages among the young in a single brood (Mollet *et al*. 2002, cited by Snelson *et al.* 2008). As most of these observations are based on captive individuals, they may be anomalies associated with stress, nutritional deficiencies or other artefacts of captivity (Snelson *et al.* 2008).

Disc width at maturity
Size at maturity for females is 40–50 cm and for males 35–40 cm (Snelson *et al.* 2008).

Maximum disc width
This species attains 80 cm (Kyne *et al*. 2019).

Age and growth
Females mature at 3 years; males mature at 2 years; the maximum age determined from vertebral growth rings was 10 years (Neer 2008).

Generation length
Generation length of *P. violacea* is 6.5 years, based on female age-at-maturity of 3 years and a maximum age of 10 years (Kyne *et al*. 2019).

FISHERIES MANAGEMENT
SA catch sources, quantities and characteristics
Average annual catches of *P. violacea* in South African fisheries were estimated from DFFE records at 1–10 tons for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022). The demersal trawl fishery was listed as the only confirmed source of catches, with several other fisheries, including the pelagic longline and midwater trawl, noted as possible catch sources (da Silva *et al*. 2015, DFFE 2022).

Demersal trawl fishery
Pteroplatytrygon violacea was not listed in the catch estimates in the South African inshore trawl fishery, 2003–2006, although there was a category of unidentified stingrays which comprised <1% of the discarded catch (Attwood *et al.* 2011).

Demersal longline fishery
Pteroplatytrygon violacea was not listed in the catch estimates in the South African demersal longline fishery, 2005–2007, although there was a category of unidentified stingrays which comprised 2% of the discarded catch (Petersen *et al.* 2008).

Small-pelagic and midwater trawl fisheries
Pteroplatytrygon violacea was a rare catch in the South African midwater trawl fishery for horse mackerel *Trachurus capensis* (Reed 2015).

Fishing outside South Africa
Rates of capture of *P. violacea i*n Namibia's longline fisheries are unknown (Leeney 2024). This species is caught frequently in pelagic longline fisheries and, to a lesser extent, other gear, including pelagic gillnets and trawls. It is of low commercial value and mostly discarded, although it is retained and utilised in some areas. Post-discard survival rates are thought to be low in some regions, where individuals are often discarded with jaw damage (Kyne *et al*. 2019). In the West Indian Ocean, this species is a common bycatch in tuna longline fisheries, with evidence of a period of decline until the late 1980s. More recently, the species appears to have become more abundant, possibly due to mesopredator release as a result of declines in sharks and billfishes (E. Romanov unpublished data, cited by Kyne *et al.* 2019).

Population trends
The population status of *P. violacea* is unknown (Neer 2008). No investigation for significant genetic structure between different populations appears to have been undertaken. Relative abundance trends across its distribution appear to fluctuate over time, with no consistent significant increase or decrease and with variability between datasets. Given its widespread occurrence and apparent resilience to fisheries, *P. violacea* was assessed as Least Concern in the IUCN Red List in 2018, with the caveat that catches should continue to be monitored (Kyne *et al.* 2019).

ECOTOURISM
Being a pelagic species found offshore, *P. violacea* is rarely seen by scuba divers and cannot be regarded as an ecotourism species.

CONSERVATION MEASURES
Marine Living Resources Act (MLRA) Regulations
The current demersal trawl footprint is ringfenced; there is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)
This species is not listed.

Marine Protected Areas
Given its pelagic habit, *P. violacea* is unlikely to derive much protection in the Marine Protected Areas across its range.

Additional local comment
None.

IUCN Status
Least Concern 2018

Previous IUCN assessments
Least Concern 2009

MANAGEMENT CONSIDERATIONS
P. violacea appears to be rarely encountered in South African fisheries, and therefore the global assessment of Least Concern appears to be appropriate for the South African population. This species was ranked thirteenth out of 14 South African pelagic chondrichthyan species, which were prioritised for further research.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Virtually nothing is known locally of the life-history and ecology of *P. violacea* in South Africa. Opportunistic sampling should be undertaken to obtain life-history information and to collect tissue samples for a study of any regional or global population structure.

FAMILY GYMNURIDAE

Gymnura natalensis - Diamond ray / Backwater butterfly

SCIENTIFIC NAME	*Gymnura natalensis* (Gilchrist and Thompson, 1911)
COMMON NAME	Diamond ray, backwater butterfly ray
FAMILY	Gymnuridae
ENDEMIC	No, also Namibia and southern Mozambique
SIZE RANGE	35–250 cm DW
SA DISTRIBUTION	Entire East, South and West coasts
HABITAT	Demersal on sand bottoms and rocky reef areas in coastal waters
DEPTH RANGE	0–75 m
MAJOR FISHERIES	Demersal and prawn trawl, KZN bather protection nets, beach seine and gillnet, recreational linefishery; suspected in commercial linefishery
IUCN STATUS	Least Concern 2018
CITES	Not listed
MLRA	Current demersal prawn trawl footprint is ringfenced; daily bag limit of one individual in recreational fishery
COMPILER	G Cliff
REVIEWER	R Daly

SPECIES SUMMARY and RECOMMENDATIONS

Gymnura natalensis is a large demersal ray which occurs in the shallow coastal waters along the entire South African coast. Shore angling catches suggest that adults are most common in KZN. It is a regional endemic, also found in Mozambique and Namibia. This little-studied but highly mobile species is the only member of the family Gymnuridae which occurs in the region. The local average annual catch was estimated at 1–10 tons from DFFE records for two time periods: 2010–2012 and 2013–2019, largely from the now-closed KZN inshore prawn trawl fishery, with a small component caught in the KZN bather protection nets and other fisheries. The species was assessed as Least Concern on the IUCN Red List in 2018, a decision which was justified by a more recent analysis of available catch data. Based on current and historical catches, this species, which has very little protective legislation, is common in the uThukela MPA, particularly in summer. There are still extensive gaps in our knowledge of the life-history and movement patterns of this species.

TAXONOMIC and IDENTIFICATION ISSUES

There are no major taxonomic issues associated with this highly distinctive species. Some authors (van der Elst 1988, Fennessy 1994, Dunlop and Mann 2013b, Daly *et al.* 2022) placed this species in the stingray family Dasyatidae, presumably because it has a serrated spine or sting at the base of its very short tail. Others regard it as the only southern African representative in the family Gymnuridae, which comprises at least 10 species which are characterised by a disc which is at least 1.5 times broader than long (Compagno *et al.* 1989, Last *et al.* 2016a, Ebert *et al.* 2021a). Compagno *et al*. (1989) noted unconfirmed reports of the Japanese butterfly ray *G. japonica* from the Agulhas Bank. Ebert *et al*. (2021a) stated that these reports are unsubstantiated and that *G. natalensi*s is the only member of the genus in South African waters. Based on molecular data, *G. natalensis* is a distinct species from the very similar-looking *G. altavela* which is widespread in the West and East Atlantic and is found as far south as Angola (Last *et al.* 2016a).

SOUTH AFRICAN DISTRIBUTION

Gymnura natalensis occurs along the entire South African coast (Ebert *et al*. 2021a) and was previously described as an endemic (Wallace 1967c).

REGIONAL DISTRIBUTION

Gymnura natalensis ranges from southern Mozambique to central Namibia (Last *et al.* 2016a).

SYNOPSIS OF RESEARCH

There is very little published information on the life-history of this species in South Africa. In a study of batoid fishes of the east coast of southern Africa, Wallace (1967c) examined 28 specimens of both sexes, including a number of pregnant females. Dippenaar e*t al.* (2004) described a new species of parasitic copepod found on the gill filaments. Dunlop and Mann (2013b) provided a concise overview of life-history and fishery-related information on this species. In the only dedicated research on this species, Daly *et al.* (2022) used three independent long-term (3–4 decades) datasets, comprising tagging by recreational anglers, catches in competition shore angling and in the KZN bather protection programme, to investigate movements, catch composition and population status. A total of 33 individuals were fitted with internal acoustic tags, with their movements monitored along the South African coast for up to seven years (Elston *et al.* 2024). *Gymnura natalensis* was ranked as the second highest research priority among all South African chondrichthyan species (da Silva *et al.* 2023).

ECOLOGY

Depth

This demersal species occurs in shallow estuarine waters down to depths of 75 m (Wallace 1967c).

Habitat: Adults

They inhabit lagoons, sandy beaches, estuaries, and offshore banks. Based on shore anglers' catches, they may be present in large numbers close inshore on sandy beaches between the uThukela River mouth and Richards Bay in late summer to autumn (January to April) (Daly *et al*. 2022).

Habitat: Juveniles/Nursery Grounds

The juveniles appear to occupy similar habitats to those of the adults, with some evidence that the shallow sheltered waters inside the Port of Durban function as a nursery area. Another location where very small individuals (<50 cm DW) are caught by anglers is St Francis Bay in the Eastern Cape (Daly *et al.* 2022), suggesting that such sheltered bays are important nurseries for this species.

Synopsis of tag deployments

A total of 3739 individuals were tagged (ORI Cooperative Fish Tagging Project 1984–2018 inclusive), with only 30 (1%) recaptures. Mean time at liberty was 1.3 years, with a maximum of 6.0 years. The majority (60%) of the recaptures occurred within 10 km of the release site, while 7% had moved more than 1000 km along the coast. The mean distance covered was 395 km (SD=604 km), with the longest recorded movements (1577 and 1756 km) undertaken by adult rays tagged in False Bay at the western extremity of the south coast moving to KZN (Daly *et al.* 2022).

Movements

The high recapture of individuals within 10 km of the tagging location suggests some level of site fidelity. Of the animals which moved more than 10 km, eight individuals moved northwards along the coast and four in the opposite direction. All four long-distance movements (>500 km) were made by adults, swimming in a northward direction, ending up on the KZN coast. This species is, therefore, capable of covering long distances and appears to be the most mobile of several ray species for which considerable local tag-recapture data exists (Daly et al. 2022). These authors speculate that the movement of these adults could be associated with reproduction. More recent research using

acoustic telemetry confirmed that the species undertakes substantial coastal migrations. Individuals were more likely to exhibit site fidelity in summer and undertake migrations eastward or northward in winter, returning to specific locations across multiple years. While there was some variation found in the migration patterns between individuals, the study confirmed that *G. natalensis* is capable of undertaking movements of over 1000 km along the coast (Elston *et al*. 2024).

Diet/feeding: Adults
They feed mainly on benthic or small shoaling teleosts, supplemented by crustaceans (benthic copepods, crabs, shrimps and prawns), molluscs (bivalves, cephalopods and gastropods) and polychaetes (van der Elst 1988, Dunlop and Mann 2013b).

Diet/feeding: Juveniles
There is no evidence that the diet of juveniles differs from that of adults.

South African toxicological studies
No studies have been undertaken.

REPRODUCTION

REPRODUCTIVE MODE	Histotrophic viviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Unknown
GESTATION	1 year
LITTER SIZE	2–9
PUPPING/NURSERY GROUND	Possibly includes Port of Durban
DISC WIDTH AT BIRTH	In the region of 35 cm
DISC WIDTH AT MATURITY	F:150 cm; M: 100 cm
MAXIMUM DISC WIDTH	250 cm
GENERATION LENGTH	13 years

Mode
Based on the presence of several glandular villi on the maternal uterine walls and the observation that these villi are always found inserted into the spiracular openings of the embryos (Wallace 1967c), this species exhibits histotrophic viviparity.

Duration of reproductive cycle
This is unknown.

Mating season and location
This is unknown, but large catches by shore anglers between Richards Bay and the uThukela River during summer could represent mating aggregations, as the majority of individuals were large and thought to be mature, based on their size. No pregnant or reproductively active females were found among the 109 individuals examined from the KZN bather protection nets (Daly *et. al.* 2022). Pregnant females were caught in the Port of Durban between January and August, but no details of any seasonal variation in the size of the embryos were provided, and were listed as 9–38 cm DW, (Wallace 1967c).

Pupping season and nursery grounds
The Port of Durban is a known pupping location (Wallace 1967c) and possibly serves as a nursery area (Daly *et al*. 2022). St Francis Bay in the Eastern Cape is another location where very small individuals (<50 cm DW) are caught by anglers (Daly *et al*. 2022), therefore, this and other sheltered bays along the east and south coasts may be nursery areas.

Gestation
This is listed by van der Elst (1988) as being one year, presumably based on the records of Wallace (1967c).

Litter size
This is listed as 5–9 (Wallace 1967c) but expanded to 2–9 (van der Elst 1988).

Disc width at birth
The largest recorded embryo was 38 cm (Wallace 1967c) and size at birth was listed as 35 cm (van der Elst 1988).

Disc width at maturity
The smallest mature female was 146 cm, and the smallest mature male was 101 cm (Wallace 1967c). Dunlop and Mann (2013b) give length at 50% maturity for males of 100 cm and females 150 cm.

Maximum disc width
Gymnura natalensis attains 250 cm (van der Elst 1988) but individuals of both sexes over 200 cm are rare (Daly *et al.* 2022). The South African angling record is 224 cm (Dunlop and Mann 2013b).

Age and growth
Females mature at 6 years and males at 2 years (Dunlop and Mann 2013b and references cited therein). The longest time at liberty of a tagged individual was 6 years (Daly *et al.* 2022, Elston *et al.* 2024) and the maximum recorded age was 24 years (van der Elst 1988).

Generation length
In the absence of reliable life-history information, a conservative generation length of 13 years was assumed, identical to that applied to *G. japonicus* and within the 5–15-year range used in other IUCN assessments of members of the genus *Gymnura* (Daly *et al.* 2022 and references cited therein).

FISHERIES MANAGEMENT
SA catch sources
Local average annual catch of *G. natalensis* was estimated from DFFE records at 1–10 tons for two time periods: 2011–2012 (da Silva *et al*. 2015) and 2013–2019 (DFFE 2022), with catches in the demersal and now-closed KZN inshore prawn trawl fishery, beach seine and gillnet fishery, the recreational linefishery and a suspected catch in the commercial linefishery (da Silva *et al*. 2015). It is also caught in the KZN bather protection nets (Cliff and Dudley 2011).

SA catch quantities and characteristics
KZN inshore prawn trawl fishery
Gymnura natalensis was the second most commonly caught elasmobranch as bycatch in the inshore KZN prawn trawl fishery on the uThukela Banks (Fennessy 1994), as well as the landings being the highest documented in any South African fishery. Based on the observer-recorded catches, the extrapolated average annual catch between 1989 and 1992 was 1315 (range 994–1876). The size range was 0.3–1.5 m DW, with a mean of 0.5 m, which encompassed mainly neonates and other immature individuals. Catches were higher in the warm season between December and May. Survival of this species in the trawls was around 46%, based on a subsample of 84 individuals (Fennessy 1994). This fishery was dormant for nearly two decades due to the extended closure of the mouth of Lake St Lucia, resulting in poor prawn recruitment and diminishing prawn catches on the uThukela Banks. The inshore fishing grounds were formally closed to trawling following the declaration of the uThukela MPA in August 2019.

Recreational shore angling
Competition shore anglers captured 9150 individuals annually between the Mbashe River and the Mozambique border, with the highest catches on the central KZN coast between 1977 and 2018. The ratio of mature to immature individuals varied along the coast. Probability of encounter showed a stable to increasing trend (Daly *et al.* 2022). Anglers have become increasingly aware of the presence, sometimes in extremely large numbers, of individuals in the surf-zone between the uThukela River mouth and Richards Bay in late summer to autumn (January to April). This often follows a few days of strong NE wind, and it is thought that movement of cooler, low-oxygen, upwelled water onto the uThukela Bank forces these rays to move inshore into the warmer, highly oxygenated surf zone where they feed aggressively and readily take bait. As an example, in 2015 a total of 158 individuals (8300 kg total weight; mean weight 52 kg and mean disc width of ~180 cm) were caught by a team of eight competitive shore anglers within 8 hours on the same day within a 3 km stretch of coast north of the uThukela River mouth (Daly *et al.* 2022).

Gymnura natalensis was also recorded in the catches of competitive shore anglers from both the Wild Coast (Umtamvuna River to Kei River) and the Border region (Kei River to Fish River), but in far smaller numbers. In these two regions, the mean annual catches were 5 (Pradervand 2004) and 8 (Pradervand and Govender 2003) individuals, respectively.

In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential effects on coastal elasmobranch species (Winkler *et al.* 2025). In the SASSA National data (2011-2023), which represents 26 different localities between Varkenvlei on the West Coast and Noggies in Northern KwaZulu-Natal, it was found that *Gymnura natalensis* was the fourth most commonly captured species with an average CPUE of 0.1, while in the RASSPL dataset, which represents 73 different fishing locations between Rietfontein on the West Coast and Haga Haga in the Eastern Cape, *G. natalensis* was the 18th most commonly caught elasmobranch with a CPUE of 0.001 (Winkler *et al.* 2025). In the SAASA-KZN dataset, where locations are fished in KZN and the northern Eastern Cape, at 206 different locations between Kosi Bay and Xhora river mouth, this species was ranked fourth and fifth most common elasmobranch caught, during the day (CPUE: 0.16) and at night (CPUE: 0.14), respectively (Winkler *et al.* 2025).

Inshore demersal trawl fishery
In the inshore demersal trawl fishery, the catches of unidentified stingrays, which presumably included *G. natalensis,* were estimated at 3.4 tons per annum for the period 2003–2006. It is difficult to quantify the catches of this species, but *G. natalensis* comprised 0.12% of the discarded species in the fishery (Attwood *et al.* 2011). A total of 30 individuals were caught in research trawls conducted over the year on the south coast and Algoa Bay in 1980 (Wallace *et al.* 1984 and Buxton *et al.* 1984). Depth range was 5–49 m.

KZN bather protection nets
There was an annual catch of 33 individuals in the KZN bather protection nets between 1978 and 2017, of which 75% were found alive and released. The standardised Probability of Encounter of these catches showed a relatively stable trend over time. Catches peaked in the summer months and were dominated by juvenile rays (76%) between 90 and 120 cm DW, with a 1:1 sex ratio (Daly *et al*. 2022).

Beach seine and gill net fisheries
A small number of individuals were caught in beach seines in False Bay; all were 106–180 cm DW (Lamberth *et al*. 1994, Lamberth 2006).

Fishing outside South Africa

Published details on catches of this species in Mozambique are not available. In Namibia, it is occasionally caught and usually released alive by recreational anglers (Leeney 2024). Because it occurs close inshore and has a piscivorous diet, it is likely to be caught in artisanal linefishing and gillnetting operations wherever it occurs.

Population trends

Gymnura natalensis species was assessed as Least Concern on the IUCN Red List in 2018 (Pollom *et al*. 2019s). A more recent risk assessment indicated a 104% increase in the population on the east coast over a period of 39 years (three generation lengths: 1979–2018) (Daly *et al*. 2022), which would support the IUCN assessment. Although no population genetic studies have been undertaken, the long-distance movements made by two adults between False Bay at the western extremity of the south coast and KZN (Daly *et al*. 2022) would suggest that there is no population structure along the South African coast.

ECOTOURISM

This species is seen on occasion by scuba divers in the Aliwal Shoal MPA and the iSimangaliso MPA. It is occasionally observed following shoals of sardines on the lower KZN coast in winter.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act
Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

This species will benefit considerably from protection in the uThukela MPA where it is known to be seasonally abundant, based on both anglers' and inshore trawl catches. It will obtain limited benefit from other coastal MPAs in its range, due to its relative mobility.

Additional local comment

As this species was caught in large numbers in the KZN inshore prawn trawl fishery, it will benefit from the ban on any bottom trawling and demersal shark longlining east of the Kei mouth (this excludes the entire KZN and Wild Coast), which usually occurs at depths of 50–100 m.

Current IUCN Status

Least Concern 201**8**

Previous IUCN assessments

Data deficient 2006

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

This species is not listed.

Convention on Migratory Species (CMS)

This species is not listed.

MANAGEMENT CONSIDERATIONS

Gymnura natalensis was caught in large numbers as a bycatch in the uThukela Banks prawn trawl industry. The closure of this fishery has eliminated a major source of mortality. It is still caught by

recreational shore anglers, especially in KZN and sometimes in large numbers, and occasionally in the KZN bather protection programme. Anglers must be encouraged to follow best practice handling protocols and continue releasing catches. The current demersal trawl footprint must remain ringfenced. A very recent risk assessment confirmed a stable to increasing population trend over four generations and concluded that the population sampled along the east coast of South Africa has been correctly assessed as Least Concern. As a result, this species should be regarded as of low priority and minimal management considerations are required.

RESEARCH REQUIREMENTS AND OPPORTUNITIES

Little is known of the reproductive biology, apart from the knowledge that the Port of Durban and possibly St Francis Bay are pupping locations. The aggregations targetted by shore anglers in summer in the Richards Bay to Uthukela River mouth should be investigated as they may be mating-related. There are still large gaps in our understanding of the movements of this highly mobile species. No validated ageing studies have been undertaken to confirm growth rates and longevity. *Gymnura natalensis* was ranked as the second highest research priority among all South African chondrichthyan species.

FAMILY RHINOPTERIDAE

Rhinoptera jayakari - Oman cownose ray / Flapnose ray

SCIENTIFIC NAME	*Rhinoptera jayakari* Boulenger, 1895
COMMON NAME	Oman cownose ray/flapnose ray
FAMILY	Rhinopteridae
ENDEMIC	No, occurs in Indo-West Pacific
SIZE RANGE	?–90 cm DW
SA DISTRIBUTION	Northern half of East coast
HABITAT	Benthopelagic in coastal waters; usually over sand but feeds on rocky reefs
DEPTH RANGE	0–50 m
MAJOR FISHERIES	KZN bather protection nets, beach seine, recreational linefishery
IUCN STATUS	Endangered 2020
CITES	Nil
MLRA	Nil
COMPILER	G Cliff
REVIEWER	RH Bennett

SPECIES SUMMARY and RECOMMENDATIONS

Rhinoptera jayakari is a small, benthopelagic ray which occurs close inshore on the northern part of the east coast. It is widespread in the tropical and subtropical waters of the Indo-West Pacific. This little-studied species is the only member of the family Rhinopteridae in the region. It is an active swimmer found over sand bottoms and rocky reefs. It was not listed in the annual catch estimates from DFFE records for the periods 2010–2012 and 2013–2019 but is caught in low numbers in the KZN bather protection nets and by recreational shore anglers. The species was assessed globally as Endangered on the IUCN Red List in 2020. This assessment failed to acknowledge its occurrence in South African waters, stating that its distribution in the Western Indian Ocean occurs only from Mozambique northwards. Almost nothing is known locally about this species, and it is unlikely that any management interventions will improve the status of this species in the region. Potentially it will benefit from all coastal marine protected areas north of Durban. Any opportunistic sampling should be used to accumulate much-needed information on the biology and ecology of this species, including tissue samples for genetic studies.

TAXONOMIC and IDENTIFICATION ISSUES

This highly distinctive species, which is easily recognised by its strongly indented snout, may comprise two species based on recent genetic findings and differences in the shape of the head and tail and robustness of the body (Last *et al.* 2016a). Its presence in South Africa has long been recognised but it was initially listed as *R. javanica,* either in the family Rhinopteridae (Wallace 1967c, Compagno *et al.* 1989), or Myliobatidae (van der Elst 1988, Compagno 1986b). More recently it was listed as *R. jayakari* (Ebert *et al.* 2021a). Both species co-occur in much of their Indo-Pacific ranges, but Last *et al.* (2016a) state that *R. javanica* is absent from the entire east African coast, a view shared by Ebert *et al.* (2021a). Human (2022) disagrees and states that both species occur in the Western Indian Ocean, including South African waters. Some exploratory genetic work suggests that both species may be present in Tanzania (Wildlife Conservation Society, unpublished data). The two species are separated based on tail length relative to body length and tooth width relative to tooth length in the middle row of the upper jaw. Further research is needed to confirm the distribution of *R. jayakari* and its overlap, if any, with *R. javanica*.

SOUTH AFRICAN DISTRIBUTION

Rhinoptera jayakari occurs on the northern part of the east coast from the Mozambique border to Amanzimtoti, which is 20 km south of Durban (Wallace 1967c, Ebert *et al*. 2021a). In the IUCN Red List assessment, this species is not listed as occurring in South Africa (Sherman *et al.* 2021).

REGIONAL DISTRIBUTION

Rhinoptera jayakari occurs widely in coastal tropical and subtropical waters of the Indo-West Pacific, including the entire African east coast (Last *et al.* 2016a).

SYNOPSIS OF RESEARCH

There is extremely little published information on the biology and ecology of *R. jayakari* in South Africa. In a study of batoid fishes on the east coast of southern Africa, Wallace (1967c) examined only five specimens, all caught in the KZN bather protection nets. This species, then referred to as *R. javanica,* is caught in small numbers in the KZN bather protection programme (Cliff and Dudley 1992). Information has been accumulated on catches in this fishery, including seasonal and geographical distribution of both females and males, together with a small amount of biological detail, but this information has never been published. Oosthuizen *et al.* (2022) described a new species of parasitic cestode found in the intestine of *R. jayakari.*

ECOLOGY

Depth

It occurs in coastal waters down to 50 m (Sherman *et al.* 2021).

Habitat: Adults

They are benthopelagic in coastal waters (Sherman *et al.* 2021), including muddy areas and shallow estuaries (Compagno *et al*. 1989), and sandy subtidal habitats (Wildlife Conservation Society, unpublished data).

Habitat: Juveniles/Nursery Grounds

There is no evidence that juveniles occupy habitats which are different to those of the adults.

Synopsis of tag deployments

This species has not been tagged.

Movements

Nothing is known about the movement patterns of this species. It is known to aggregate in large shoals, a feature documented in other members of the genus. In some species these aggregations migrate over vast distances for reproductive purposes (Last *et al.* 2016a).

Diet/feeding: Adults

They feed mainly on bivalves which are crushed with their plate-like teeth (van der Elst 1988), but are also generalist feeders, capable of using suction to ingest small prey (Last *et al.* 2016a).

Diet/feeding: Juveniles

There is no evidence that the diet of juveniles differs from that of adults.

South African toxicological studies

Total mercury was determined in white muscle of three individuals (Erasmus *et al.* 2022).

REPRODUCTION

REPRODUCTIVE MODE	Histotrophic viviparity
DURATION OF REPRO CYCLE	Unknown

MATING	Unknown
GESTATION	Unknown
LITTER SIZE	1
PUPPING/NURSERY GROUND	Unknown
DISC WIDTH AT BIRTH	Unknown
DISC WIDTH AT MATURITY	F: unknown; M: 78 cm (outside South Africa)
MAXIMUM DISC WIDTH	90 cm
GENERATION LENGTH	10 years, based on *Rhinoptera bonasus*

Mode
Members of the family Rhinopteridae exhibit histotrophic viviparity, in which secretions from glandular villi on the maternal uterine walls nourish the developing embryos, after the yolk sac has been depleted (Last *et al.* 2016a).

Duration of reproductive cycle
This is unknown.

Mating season and location
This is unknown.

Pupping season and nursery grounds
This is unknown.

Gestation
This is unknown.

Litter size
This comprises a single embryo (Sherman *et al.* 2021).

Disc width at birth
This is unknown.

Disc width at maturity
The only published information is for males which mature at 78 cm (Last *et al.* 2016a).

Maximum disc width size
This species attains 90 cm (Last *et al.* 2016a).

Age and growth
No information was presented (Sherman *et al.* 2021).

Generation length
In the absence of information on the age-at-maturity and maximum age of this species, generation length was estimated to be 10 years, based on the slightly larger (110 cm DW) American cownose ray, *R. bonasus* (Sherman *et al.* 2021).

FISHERIES MANAGEMENT
SA catch sources
Rhinoptera jayakari was not listed in annual catch estimates made from DFFE records for the periods 2010–2012 (da Silva *et al.* 2015) or 2013–2019 (DFFE 2022). It is caught in the KZN bather protection nets (Cliff and Dudley 1992) and occasionally by shore anglers (van der Elst 1988).

SA catch quantities and characteristics

KZN bather protection nets

There was an annual catch of 41 individuals in the KZN shark nets between 1981 and 1990, of which 58% were found alive and released (Cliff and Dudley 1992). Over a 40-year period (1978–2017) catches dropped to 20 per annum, with a 56% release rate (KZN Sharks Board, unpublished data). It is tempting to interpret the decline in catch as a shrinking local population, but there has been a marked drop in netting effort over the last three decades, from 44 km to 13 km.

Recreational angling

Although this species is occasionally caught by recreational shore anglers (van der Elst 1988), there were no reported catches in the competition component of this fishery (Pradervand *et al.* 2007, Winkler *et al.* 2025).

Fishing outside South Africa

Published details on catches of this species in Mozambique are not available, although it is recorded in coastal fisheries of Mozambique, Tanzania and Kenya (Temple *et al.* 2019; Wildlife Conservation Society, unpublished data). Globally, it is taken as target and bycatch in a wide range of fishing gear deployed in industrial and artisanal fisheries. Its meat is consumed locally and traded internationally; in some countries, it is used for fish meal production (Sherman *et al.* 2021).

Population trends

Nothing is known of any regional population structure. There are no species-specific time series, but there is a long history of overfishing in a number of inshore populations. Fishing pressure remains high and may be rising across the species' range. *R. jayakari* has minimal refuge from fishing pressure and its coastal habitat has also been degraded by urban development and agriculture. Its shoaling behaviour makes the species particularly vulnerable to gillnets. It is thought to be locally extinct in certain parts of its range. It is suspected that this species has undergone a population reduction of 50–79% over the past three generation lengths (30 years), due to actual levels of exploitation and a decline in habitat quality, and it was globally assessed as Endangered in 2020 (Sherman *et al.* 2021).

ECOTOURISM

This species is rarely seen by scuba divers in South Africa and, therefore, cannot be regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

There is a daily bag limit of one individual in the recreational linefishery.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

Based on its coastal distribution, this species will potentially benefit from the protection provided by two shallow-water MPA's in its South African range. They are the iSimangaliso MPA and the uThukela MPA, but there is no information on the extent to which *R. jayakari* utilises these two areas. Being mobile, it is possible that individuals move in and out of these MPAs. The species also likely benefits from protection within the Ponta do Ouro Partial Marine Reserve in southern Mozambique.

Additional local comment
The conservation status of *R. jayakari* was erroneously recorded as NE (Not Evaluated) instead of EN (Endangered) by Ebert *et al.* (2021a).

Current IUCN Status
Endangered 2020 A2cd

Previous IUCN assessments
Not assessed.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

International comments
None.

MANAGEMENT CONSIDERATIONS
This species is confined to the northern part of the South African east coast, where catches appear to be largely confined to the KZN bather protection programme. These catches are low, with a high release rate. As a result, *R. jayakari* must be regarded as a very low priority species. Furthermore, it is unlikely that any management intervention in South Africa will improve the status of this species from one of Endangered. Resolving the identity of *Rhinoptera* in the Western Indian Ocean is imperative. A local/regional Red List assessment should be undertaken.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
Of all the coastal chondrichthyan species found on the South African coast, *R. jayakari* is possibly the least known. It would appear that very little research has been conducted anywhere, despite a very widespread Indo-West Pacific distribution and a high incidence as both a target and a bycatch in numerous coastal fisheries. Any opportunistic sampling should be used to provide much-needed biological and ecological information, as well as tissue samples for regional population genetic studies.

SOUTH AFRICAN FISHERIES AND OTHER IMPORTANT SPECIES REPORTS:

CHIMAERAS

FAMILY CALLORHINCHIDAE

Callorhinchus capensis - St Joseph

SCIENTIFIC NAME	*Callorhinchus capensis* Duméril 1865
COMMON NAME	St Joseph/elephant fish
FAMILY	Callorhinchidae
ENDEMIC	No, also Namibia
SIZE RANGE	13–120 cm TL
SA DISTRIBUTION	Much of East and entire South and West coasts
HABITAT	Demersal on sand and other soft substrates
DEPTH RANGE	5–600 m; most common < 100 m
MAJOR FISHERIES	Demersal trawl, directed gillnet fishery, beach seine, recreational and commercial linefishery
IUCN STATUS	Least Concern 2019
CITES	Not listed
MLRA	The current demersal trawl footprint is ringfenced.
COMPILER	G Cliff
REVIEWER	C da Silva

SPECIES SUMMARY and RECOMMENDATIONS

Callorhinchus capensis is a small demersal chimaera found over a wide depth range. This regional endemic, which also occurs in Namibia, is one of the most common inshore chondrichthyans on the south and west coasts. Annual catch estimates from DFFE records for the period 2010–2012 were 801–900 tons but were downscaled to 300-400 tons for the period 2013–2019, largely in the demersal trawl fishery, supplemented by catches in a very localised, dedicated gillnet fishery on the west coast and by recreational anglers. The species was assessed as Least Concern on the IUCN Red List in 2019, based on its relatively fast growth, early sexual maturity and reasonably high fecundity. Nevertheless, careful monitoring of catch trends must continue to prevent overexploitation. There are still extensive gaps in our knowledge of the life-history and movement patterns of this species.

TAXONOMIC and IDENTIFICATION ISSUES

There are no taxonomic or identification issues associated with this highly distinctive species, which is easily recognised by its bizarre-looking, hoe-shaped snout. There is only one genus, *Callorhinchus*, in the family Callorhinchidae with three species, which are all found in subtropical and temperate waters of the southern hemisphere. Only *C. capensis* occurs in southern Africa (Compagno *et al.* 1989).

SOUTH AFRICAN DISTRIBUTION

Callorhinchus capensis occurs along almost the entire South African coast from Durban to the Orange River mouth but is most common on the south and west coasts (Ebert *et al*. 2021a).

REGIONAL DISTRIBUTION

Callorhinchus capensis also occurs along much of the Namibian coast (Ebert *et al.* 2021a).

SYNOPSIS OF RESEARCH

There is limited dedicated research on this species. Freer and Griffiths (1993a) documented aspects of catches in the trawl and dedicated gillnet fisheries, where they investigated reproduction and diet. Freer and Griffiths (1993b) estimated age and growth from counts of serially deposited cones

of dentine in the dorsal spine. Nibam (2011) investigated reproductive biology and diet. Da Silva and Lamberth (2013) provided a concise overview of life-history and fishery-related information on this species. Morris (2015) and Morris *et al.* (2016) investigated heavy metal concentrations in various body tissues and in associated endoparasites. Morris *et al.* (2019) documented aspects of its parasite community. *Callorhinchus capensis* was ranked 38th out of the 60 South African demersal chondrichthyan species which were prioritised for further research (da Silva et al. 2023).

ECOLOGY

Depth

Callorhinchus capensis has been found in coastal waters down to depths of 600 m but is most abundant in waters shallower than 100 m (Finucci and Pacoureau 2020). Only mature females were found deeper than 250 m and catches were uncommon deeper than 300 m (Freer and Griffiths 1993a). This species was one of the three most common chondrichthyans taken in research trawls on the west coast, with most individuals caught between 100 and 250 m water depth. Catches comprised mainly larger individuals, both adolescents and adults, with no marked seasonal pattern (Compagno *et al.* 1991).

Habitat: Adults

They are found close to the bottom over sand and other soft substrates; males and females appear to occur in largely discrete aggregations (Freer and Griffiths 1993a).

Habitat: Juveniles/Nursery Grounds

Neonates appear to be confined to inshore waters shallower than 50 m (Freer and Griffiths 1993a).

Synopsis of tag deployments

A total of 287 individuals were tagged (ORI Cooperative Fish Tagging Project 1984–2018), with only a single recapture. This individual was tagged in Namibia in February 1993 and was recaptured at St Helena Bay, Western Cape, having moved 1342 km in 0.6 years at liberty (Jordaan and Mann 2023c).

Movements

There is insufficient information forthcoming from tag-recapture studies but da Silva and Lamberth (2013) describe this species as nomadic. Adults, which show sexual segregation, move inshore to mate and females lay eggs in shallow, sheltered bays (Freer and Griffiths 1993a).

Diet/feeding: Adults

They feed mainly on benthic invertebrates from soft substrata, comprising bivalves, gastropods, polychaetes and crustaceans, as well as small teleosts (Freer and Griffiths 1993a). Nibam (2011) reported a high incidence of black mussels, either *Choromytilus meridionalis* or *Mytilus galloprovincialis.*

Diet/feeding: Juveniles

There is no evidence that the diet of juveniles differs from that of adults. The most common prey of small individuals was black mussels, either *C. meridionalis* or *M. galloprovincialis* (Nibam 2011).

South African toxicological studies

Morris (2015) and Morris *et al.* (2016) documented elevated heavy metal concentrations in this species and associated intestinal parasites, highlighting the usefulness of marine endoparasites as early warning indicators of heavy metal pollution.

REPRODUCTION

REPRODUCTIVE MODE	Oviparity
DURATION OF REPRO CYCLE	Unknown
MATING	Year-round, peaking in summer
GESTATION	Assumed to be 9–12 months
LITTER SIZE	Two egg cases laid at a time
PUPPING/NURSERY GROUND	Shallow, sheltered bays
SIZE AT BIRTH	13 cm TL
LENGTH AT MATURITY	F: 75 cm; M: 59 cm TL
MAXIMUM LENGTH	120 cm TL
GENERATION LENGTH	7.3 years

Mode
Like all chimaeras, this species displays oviparity, laying very characteristic-shaped egg cases, which are deposited on sand with no means of attachment to the substrate. The male first deposits a semen plug into the female. Sexually mature males in reproductively active condition occur inshore along with the adult females, and therefore semen storage would appear redundant (Freer and Griffiths 1993a).

Duration of reproductive cycle
This is unknown. A study by Nibam (2011) indicated that reproduction may not be annual and regarded mature females carrying small ovarian ova as being in a resting phase.

Mating season and location
Callorhinchus capensis displays spatial sexual segregation and moves inshore to mate and lay eggs. The mating season is protracted, with a peak in summer, and there is the possibility of more than one mating in a season. Adult females move offshore into deeper water during winter, where they disperse to feed and to build up body reserves (Freer and Griffiths 1993a).

Pupping season and nursery grounds
The nursery grounds are close inshore in sheltered bays. There is no published information on the peak pupping season, but, given the peak in mating in summer and the assumed incubation of 9–12 months (Freer and Griffiths 1993a), there is likely to be a peak in pupping in spring.

Gestation
The timespan of egg development was impossible to determine because of the protracted mating season and not all females are fertilised simultaneously. Gestation is thought to be the order of 9–12 months, based on findings in other species of chimaera (Freer and Griffiths 1993a).

Litter size
The egg cases are laid in pairs, but, given the likelihood of more than one mating in a season, litter size in a season may be far higher than two. The maximum number of eggs produced by females increases rapidly with size, peaking at about 22, but not all are fertilised, with evidence of egg resorption in winter (Freer and Griffiths 1993a).

Size at birth
Size-at-birth is 13 cm TL (Freer and Griffiths 1993a).

Length at maturity
Females mature at 50 cm fork length (FL) and males at 43 cm FL (Freer and Griffiths 1993a). These authors used FL, as the tips of the tails were frequently lost in larger fish. Using a far smaller sample, Nibam (2013) found that size at 50% maturity for females was 75 cm TL and 59 cm TL for males.

Maximum length
Callorhinchus capensis reaches a maximum size of 90 cm FL, which is approximately 120 cm TL (Freer and Griffiths 1993a).

Age and growth
Females mature at 4.2 years and males 3.3 years. Lifespan is estimated at 10 and 7 years for females and males, respectively (Freer and Griffiths 1993b).

Generation length
Generation length is estimated at 7.3 years (Finucci and Pacoureau 2020).

FISHERIES MANAGEMENT
SA catch sources
Callorhinchus capensis was long considered a 'trash' fish, and the large quantities accidentally caught in seine nets set for the more lucrative mullet (harder) *Liza richardsonii* were either dumped or given away. Initially catches were accepted for drying and, to a limited extent, for production of frozen fillets from larger fish (Freer and Griffiths 1993a). The market has grown, and the species is utilised for its high-quality flesh, with an estimated 801–900 tons taken annually between 2010 and 2012, mainly as bycatch in the demersal trawl fishery. It is also taken in a very localised, directed gillnet fishery, as well as in the beach seine and recreational linefishery; it is caught in the demersal longline fishery. The species is one of the top five chondrichthyans taken in South African fisheries (da Silva *et al.* 2015). Annual catch estimates for the period 2013–2019 have been revised at 300–400 tons (DFFE 2022).

SA catch quantities and characteristics
Demersal trawl fishery
Callorhinchus capensis is a bycatch in shallow water trawls on both south and west coasts. The average annual catch estimates for the south coast alone from 2003-2006 were 504 tons and was one of the few chondrichthyans which was preferentially retained (Attwood *et al.* 2011). Given the trawl fishery is so large, *C. capensis* landings in this fishery dwarf those in the gillnet fishery and hence they may well have an impact on this gillnet fishery (Freer and Griffiths 1993a). This species was caught in low numbers at depths of 5–49 m in research trawls conducted over a year on the south coast and Algoa Bay (Wallace *et al.* 1984 and Buxton *et al.* 1984).

Beach seine and gillnet fisheries
The commercial beach seine catches of chondrichthyans in False Bay were dominated by *C. capensis* which were found in 40% of monitored landings but comprised <1% of the total catch. There was a high incidence of mature individuals, although neonates were also taken (Lamberth *et al*. 1994). There was considerable seasonal variation in numbers taken per haul, peaking in February and November (Lamberth 2006). Neonates, in which the yolk slit was still visible, were only caught in beach-seines, indicating that newly hatched *C. capensis* are confined to very shallow water (Freer and Griffiths 1993a).

The first gillnet catches of *C. capensis* of 263 tons were recorded in 1981 as a bycatch. In the following year all gillnet permits were either cancelled or exchanged for "shark net permits", which were gillnets of 178 mm stretched mesh, intended for the catching of St Joseph only (Freer and Griffiths 1993a). Deployment of these bottom-set nets is now confined to St Helena Bay, with very little

bycatch. Mostly mature females are caught in this fishery as they move inshore to deposit their eggs in soft sediment. Mature females are also larger and easier to remove from the gillnets than males as they lack the tenaculum and paired retractable prepelvic graspers (Freer and Griffiths 1993a). *C. capensis* is caught in small numbers in the other gillnets deployed on the west coast to target *L. richardsonii* (Hutchings and Lamberth 2002a). The combined catch of *C. capensis* in the directed gillnet and beach seine fisheries was <10 tons in 2010 (da Silva and Lamberth 2013).

Recreational angling

This species is occasionally caught inshore by recreational boat and shore anglers and subsistence shore fishers during and following upwelling events (da Silva and Lamberth 2013). The number of individuals tagged by recreational anglers provides some indication of relative abundance close inshore along the southern African coast. Of the 291 individuals, 29 were tagged on the east coast, all from Kei River Mouth westwards. A total of 124 were tagged on the south coast, of which 65 were tagged in False Bay. Only 25 were tagged on the west coast and 93 in Namibia, although tagging by South African anglers in Namibia has ceased in response to a request from the Namibian government, as the Namibian fisheries authorities have introduced have their own tagging programme (Jordaan and Mann 2023c).

In a report on the elasmobranchs caught by the competitive angling fraternity, catch-and-effort datasets from the South African Shore Angling Association (SASSA), the Rock and Surf Super Pro League (RASSPL) and the SASAA KwaZulu-Natal shore league, were elucidated to understand the spatial distribution and catch per unit effort of competitive shore-based angling and the potential effects on coastal elasmobranch species (Winkler *et al.* 2025). In the RASSPL dataset, which represents 73 different fishing locations between Rietfontein on the West Coast and Haga Haga in the Eastern Cape, *C. capensis* was the 14th most commonly caught elasmobranch with a CPUE of 0.002 (Winkler *et al.* 2025).

Fishing outside South Africa

In Namibia *C. capensis* is caught by shore-based recreational anglers, who usually release them alive (Leeney 2024).

Population trends

The population size and structure of *C. capensis* is unknown. Despite high fishing pressure, research surveys from the west coast of South Africa showed no significant trends in abundance indices, and the population trend was estimated to be stable or increasing over the last three generations (22 years). As a result, this species was assessed as Least Concern in 2019 (Finucci and Pacoureau 2020).

ECOTOURISM

This species is not often seen by scuba divers and therefore cannot be regarded as an ecotourism species.

CONSERVATION MEASURES

Marine Living Resources Act (MLRA) Regulations

The current trawl footprint is ringfenced.

National Environmental Management: Biodiversity (NEMBA) Act

Threatened or Protected Species (TOPS)

This species is not listed.

Marine Protected Areas

This species may seasonally benefit from protection provided by MPAs within sheltered coastal waters of the south and west coasts, as this is where the mature females deposit their egg cases and

the neonates are most common. These MPAs include Table Mountain National Park, De Hoop and Stilbaai on the south coast and Langebaan and adjacent MPAs on the west coast.

Additional local comment
This species will benefit from the long-standing ban on trawling in False Bay. As part of the Marine Stewardship Council (MSC) certification of the demersal trawl industry, the trawl footprint has been defined as 'Hake Trawl Ringfence' for the industry, where fishing is not permitted outside of this area. This means that all areas outside the current trawl footprint are *de facto* protected from fishing by this fishery.

Current IUCN Status
Least Concern 2019

Previous IUCN assessments
Least Concern 2006

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
This species is not listed.

Convention on Migratory Species (CMS)
This species is not listed.

MANAGEMENT CONSIDERATIONS
This species is one of the most heavily fished chondrichthyan in South African waters. Despite the high fishing pressure, research surveys from the west coast show no significant trends in abundance indices, and the population trend was recently estimated as stable or possibly increasing over the last three generations. As there is segregation by sex and maturity stage, the gillnet fishery has been shown to target larger females which move inshore for egg-laying and therefore constitute breeding aggregations. There is an urgent need to monitor these and ensure that these are not targeted.

Despite the healthy stocks of *C. capensis,* the markets for catches in the seine and gillnet fishery have all but collapsed, largely due to the loss of the Central and West African market for the dried product (Stephen Lamberth, DFFE, unpublished data). In addition, these artisanal fisheries have historically lacked the economic resources to provide high-value products (through the use of ice to preserve flesh quality) and to research new markets.

There is always concern over bycatch in any gillnet fishery, but in this case the soak time is in the region of only 20–30 minutes to avoid infestations of isopods spoiling the catch. Furthermore, permit conditions dictate that the nets must be tethered to the fishing vessel. Da Silva and Lamberth (2013) recommended that St Helena Bay be closed to inshore trawling to avoid the capture of large numbers of egg-laying females. Opportunities for market development need to be explored. The current demersal trawl footprint must remain ringfenced.

As the bulk of the catches of *C. capensis* are made as bycatch in the demersal trawl industry, it is difficult to modify the *modus operandi* of the fishery, should a reduction in catches of this species be desirable.

RESEARCH REQUIREMENTS AND OPPORTUNITIES
There are still gaps in our undestanding of the life-history of this species, including fecundity and the length of the reproductive cycle, as well as movement patterns and levels of residency. Tests for trace metals such as methylmercury should be undertaken. *Callorhinchus capensis* was ranked 38th

out of the 60 South African demersal chondrichthyan species which were prioritised for further research.

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