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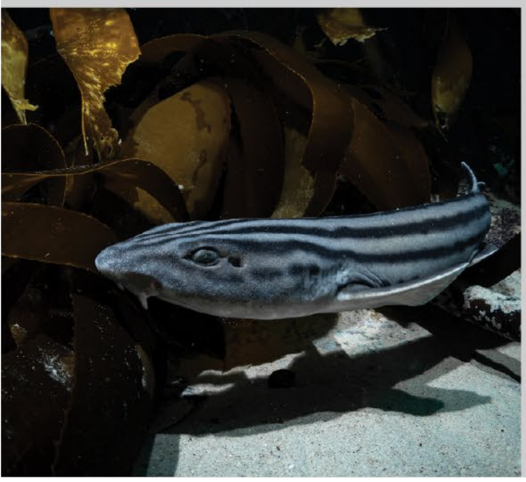
RECREATIONAL ELASMOBRANCH FISHERY:

Competitive Angling Catch-and-Effort and Recreational Post-Capture Survivorship Meta-analysis





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Elasmobranch Competitive Angling catch-and-effort and recreational Post-Capture Survivorship Meta-analysis

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Cite this report as:
Winkler AC, Farthing MW, Gush N and Potts WM. 2025. Competitive Angling catch-and-effort and Elasmobranch Recreational Post-Capture Survivorship Meta-analysis. Report compiled for WILDTRUST's Securing Shark and Ray Protection in South Africa, funded by the Shark Conservation Fund. WILDTRUST Unpublished Report Number 7. 36pp.

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Executive summary

In this report, we assessed the utilisation of competitive angling catch and effort data, to monitor angler effort and the associated elasmobranch catch along the South African coast. In this case study, we evaluated the efficacy of two separate competitive shore angling formats that overlap spatially and temporally and one format that is geographically and temporally isolated to better understand their efficacy at identifying areas of elasmobranch abundance along the South African coast. To this end, we have found that the different angling formats and their associated scoring systems influenced the species that are captured. Rock-and-Surf-Super-Pro-League (RASSPL) anglers focus on catching a diverse array of species to gain maximum competitive points. In contrast, South African Shore Angling Association (SASAA) anglers fish for any species that will cumulatively increase their overall catch weight, which equates to maximum competitive points. The result of this difference in scoring is clearly articulated in our findings. RASSPL anglers catch higher numbers of smaller endemic shark species, Scyliorhinidae family (three species in the top five ranked species) when compared to SASSA anglers who primarily capture two species of Rhinobatidae and three other large-bodied elasmobranch species. While the KwaZulu-Natal SASAA league data primarily captured *Carcharhinus obscurus* and *Acroteriobatus annulatus,* as well as a few other large-bodied elasmobranchs. The results of the comprehensive metanalysis on the effects of recreational fishing-induced post-capture mortality suggest an average mortality rate of 11% (95% CI: 1-55%) under standard shore-based recreational techniques, however, due to lack of data these results are not only within a South African context. This report has also highlighted the potential utility of gathering catch-and-effort data from the competitive angling fraternity which can be used in stock assessments to identify species of conservation concern. In conclusion, by engaging with the South African competitive angling community via i) an integrated management of competitive angling events, ii) through the establishment of recreational angling peak bodies[1], iii) via informed recreational fishing education programs with the assistance of recreational angling role models, targeting important locations where major competitive events are held (i.e. The Sunshine Coast, Mossel Bay, Arniston and False Bay) and in KwaZulu-Natal, south of Richards Bay.

Acknowledgements

Importantly, we would like to thank the Rock and Surf Super Pro-League (SASSA), the South African Shore Angling Association (SASSA) and the Oceanographic Research Institute (ORI) for submitting their competitive shore-based catch and effort data. Specifically, we would like to thank Kyle Hewett, Ryan Daly and Bruce Mann who acted as key communication channels between these organisations. Lastly, to the competitive recreational fishers who generated this dataset by participating in competitive recreational angling in South Africa, we would not have the data presented in this report without your participation. Jennifer Olbers is thanked for reviewing and editing this report. The Shark Conservation Fund is thanked for their funding support through WILDTRUST's Securing Protection for Sharks and Rays in South Africa Project. The WILDTRUST Shark Project Team, Nikki Chapman, Leigh de Necker, Lauren van Niekerk and Jean Harris are also thanked for their support and guidance.

[1] A 'peak body' is an Australian term for a non-government organisation whose membership consists of smaller organisations of allied interests

1. Introduction

The South African shore-based marine recreational fishery is the largest South African marine fishery based on a participation rate of ~ 400 000 anglers (Potts et al. 2021). Despite this high participation, there is virtually no state-run monitoring program to assess the impact this fishery is having on the multitude of species that are either targeted or incidentally captured (Potts et al 2019). Furthermore, recent angler fish handling assessments suggest that when fish are caught-and-released (C&R), handling practices are often sub-standard, reducing the chance of returned catch survival. The lack of government-issued handling guidelines should be a necessity, particularly given that C&R should be practised by all anglers when they encounter an undersized, prohibited or out-of-season catch. A further concern is the use of elasmobranchs as bait for larger shark species (J. Frachet per comm), a practice that is no longer practised in the competitive realm. To this end, it is critical to understand what species are targeted, where they are targeted and what the fate of the catch is.

Most of South Africa's shore-based competitive anglers fish in either the South African Shore Angling Association (SASAA) competitions or the Rock and Surf Super Pro League (RASSPL) competitions. In both angling formats, an angler competes in his/her home franchise league events throughout the year. In SASAA, their season score will be used to rank the angler amongst other anglers from a variety of franchises within a specific province. If the angler is ranked high enough, he will make a provincial team and be eligible to represent his/her province and fish in the annual national competition. If the angler is ranked high enough during the national competition, he/she will earn national colours and be able to fish in the annual international competition that is fished against Namibia. RASSPL follows a similar format with anglers fishing in their franchise leagues; the difference being that there are no provincial teams, and each franchise sends their highest ranked team to fish in the national competition. The highest-ranked anglers from the national competition are then eligible to represent South Africa at an international competition.

To acquire this much-needed information, we have developed a longstanding relationship with a prominent group of competitive recreational anglers (Rock and Surf Super Pro League (RASSPL)) for the past ten years. We provide a software tool to enable fast and efficient competition scoring, minimising their scoring time which in the past took hours or even days before data was captured. In return, we obtain access to the catch data in an easy-to-use georeferenced format that includes angler effort. This means that accurate estimates of catch per unit effort (CPUE) can be calculated, and therefore, individual species abundance estimates can be acquired. Furthermore, we have acquired ten years of the same type of data from the South African Shore Angling Association (SASSA) and are trialling the use of our software in their current competitions. The Oceanographic Research Institute in Durban, KwaZulu-Natal (KZN) has also collected SASAA KZN-KwaZulu-Natal league shore angling data (herein referred to as ORI data) since the 1970s, representing fishing from the northern Eastern Cape and KZN.

These data were also analysed and compared to the other two competitive data sets explained above, which are largely sourced in the Western and Eastern Cape. The greatest challenge in using these types of datasets is the species of the different competition format targets; for example, SASSA anglers exclusively fish for weight, where the species composition of their catch does not influence their scores. Meanwhile, RASSPL anglers fish for species diversity rather than weight, although weight does influence an angler's score, a diverse assemblage of species will provide maximum points. To this end, the first objective of this study was to assess the potential differences in both species assemblages and abundance estimates derived from either ten years of RASSPL data or ten years of SASSA data.

While these two competitive angling formats have evolved in terms of their conservation objectives, where all captured fish are measured and released during competitions, the fate of the released fish depends on a variety of factors but is primarily a consequence of how the fish is handled during the capture event (Brownscombe et al. 2017). In their extensive review of fish handling best practices, Brownscombe et al. (2017) suggest that anglers can mitigate their impacts on the welfare of released fish by mitigating against four factors controlled by the angler themselves, these being the amount of (1) exhaustive exercise and (2) air exposure, the fish is exposed to during the fight and upon landing, (3) hooking induced injuries and (4) angling/handling related trauma once the fish is landed. All four of these factors can be mitigated against if the angler is willing and understands his/her impact on the potential fate of the fish once released. Simple adjustments to angling behaviour, such as the use of circle hooks which can reduce hooking injury-related deaths, the use of a landing bucket for smaller fish and keeping larger animals in the water once landed is a simple technical approach that can reduce air exposure and reduce blunt handling trauma (Orth 2023). The use of the correct fishing gear to aid the angler in reeling in a fish quickly will reduce exhaustive exercise and activity, therefore decreasing the impact of the capture event.

Importantly, understanding the behaviour of fishers and their potential effect on their quarry is a critical factor on the path to managing a sustainable recreational elasmobranch fishery in South Africa. For example, Hilborn et al. (2007) suggests that “understanding the behaviour of fisherman is a key ingredient to successful fisheries management”. Unfortunately, a notion that has not been prioritised by the South African inshore management authority (Potts et al. 2020). Despite recreational fisheries being the largest fisheries sector by participation size (~ 1 300 000 recreational anglers) and contributing approximately ZAR 32.6 billion in economic activity (Potts et al 2022). Unfortunately, if the management of this sector is not prioritised it will be at the detriment of other inshore coastal resource users such as the marginalised small-scale fishing sector or the growing elasmobranch tourism economy (Topelko and Dearden 2005). Recreational fisheries are nested in the complex South African marine socio-ecological system and if ignored and left unmanaged will negatively affect a variety of other sectors (Potts et al. 2020).

While managing such a large user group may seem daunting to the management authority, which is a possible reason it has been largely ignored and therefore mismanaged, a targeted user group approach will require less effort and resources and may be a useful approach. Managing and educating top-tier recreational anglers that set recreational social norms amongst the angling fraternity is one such approach that has worked in other parts of the world (Diggles et al. 2011, Tracy 2019, Orth 2023) and in South Africa (Butler et al. 2017, Manneheim et al. 2018). Stakeholder engagement is, therefore, of utmost importance if sustainable recreational fisheries management in South Africa is envisioned.

The aim of this report is to understand the spatial distribution of competitive shore-based angling and their potential effects on coastal elasmobranch species in order to guide a proactive stakeholder management approach. The objectives of this report are to:

1. Map the effort and catch distribution of top-tier competitive shore-based elasmobranch recreational fisheries along the South African coast
2. Identify the most encountered elasmobranch species targeted within these angling competitions
3. Conduct a meta-analysis on existing peer-reviewed literature on the post-release mortality of recreationally caught elasmobranchs
4. Make suggestions on how to best engage and work with competitive recreational anglers to mitigate their effect on the elasmobranch species they target for catch-and-release purposes.

2. Materials and methods

2.1. Catch and effort data

Competitive catch and effort information was acquired for SASAA national tournaments, all RASSPL competitions (nationals and league), and the KwaZulu-Natal SASAA league, which is collected and stored in a database by the Oceanographic Research Institute (ORI), South African Association for Marine Biological Research (SAAMBR). While both SASSA national tournaments and RASSPL leagues are fished during daylight hours, the KwaZulu-Natal SASAA league (ORI data) is fished in 6-8-hour sessions and is fished during any time of the day and set by the host club. Due to diel effects being known to influence the catch composition of shore-based angling (Diogo and Pereira 2026), it was decided to split this dataset into both day and night components. Day competitions were categorised as any competition being fished between 06:00 and 18:00, while night competitions were categorised as being fished either throughout the night or if a portion of the competition was fished during the night. For example, if a competition started at 02:00 and ended at 08:00 it was considered a night competition. Furthermore, the ORI dataset has been collected from the 1970s until now, but a critical change in angler efficiency occurred in South Africa in 2001, when beach driving was effectively banned from the beginning of 2002. In response to this decree, many shore anglers had to adapt their angling behaviour and learn how to fish effectively on foot during 2002. It is therefore accepted that from 2003, anglers had effectively changed their behaviour. The allowance of beach driving (pre-2002) allowed anglers to fish further from access points and cover larger areas during competitions, following the ban, anglers had to adapt their fishing techniques by fishing closer to access points, limiting the habitat types they fished (Dunlop and Mann 2012). Given this drastic change in how anglers fished after the ban's implementation in early 2002, the dataset was only analysed post-2002 to allow for comparison between all three datasets.

Individual angling event records (per competition day) were calculated as CPUE and expressed as the number of elasmobranchs per angler^{-1} day^{-1} and calculated using the following equation:

$$CPUE_{l.i} = \frac{catch_{l.i}}{effort_{l.i}}$$

where catch *l.i* is the number of a specific species of elasmobranch captured on the ith fishing event, at locality (l) and where effortl (i) is the number of angler days recorded during the ith fishing event at locality l.

Following the calculation of the CPUE for each species per competition day, a running average per species was calculated and ranked by CPUE to obtain the top five ranked species per competition format. For each of these top five, heatmaps were produced based on georeferenced CPUE. The heatmaps are a way to visually identify an area of peak abundance, but it must however, be noted the offshore extent of the kernels is not an accurate depiction of offshore elasmobranch abundance.

2.2. Elasmobranch recreational fishing post-capture survivorship meta-analysis

An extensive literature review was performed using three of the most prominent peer-reviewed scientific publication repositories (Scopus, Proquest and the Web of Science). Given that this review was nested within a broader literature search conducted to acquire literature on all recreational angling facets and species globally, the following boolean search terms were utilised:

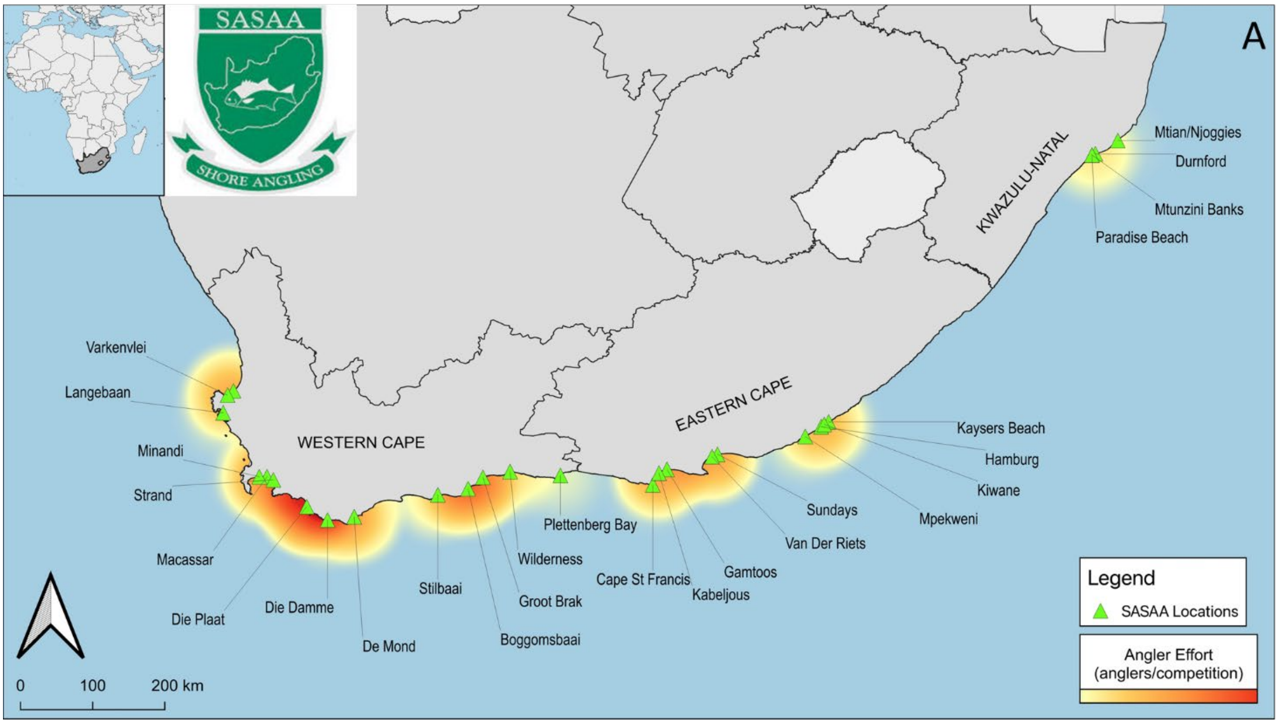
"**catch-and-release"** OR "**catch and release**" OR "**post-capture**" OR "**post capture**" OR "**post-release**" OR "**post release**" OR "**discard**" AND "**fishing**" OR "**angling**" OR "**fishery**" OR "**fisheries**" AND "**mortality**" OR "**survival**" OR "**impact**" OR "**stress**" OR "**effect**" OR "**predation".**

Once the results from the literature search were downloaded in .csv format from each repository, all three .csv files were merged and all duplicate records were consolidated. Following the merger of all the results, all titles and abstracts were screened for relevance to recreational fishing using the "Metagear" R Package. All studies found to investigate the post-capture morality of elasmobranchs were then extracted, and the relevant data was scraped into a spreadsheet. The primary factor investigated to understand post-capture mortality (PCM) patterns pertained to the platform from which an elasmobranch was captured (boat vs shore angling). To this end, the data was analysed using the "metaphor" R package, using a random effects model to identify any significant effect of the platform on the PCM results of the reviewed studies.

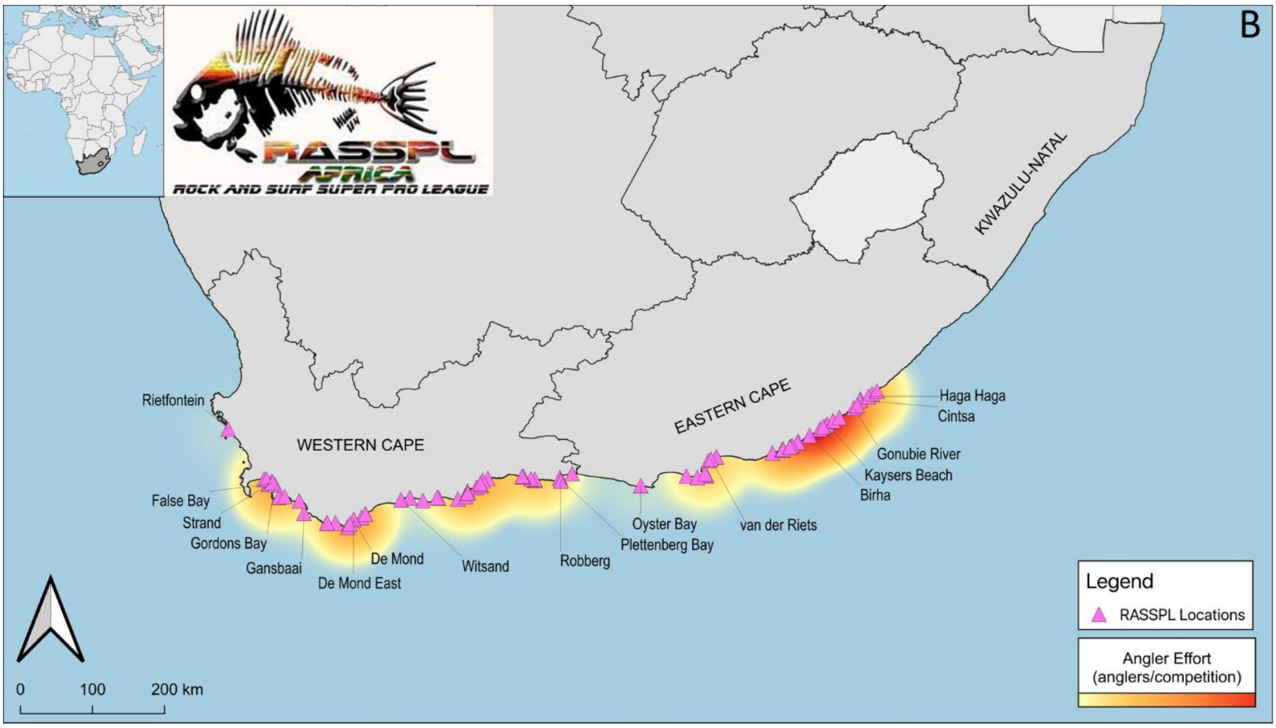
3. Results

3.1. Effort and spatial distribution

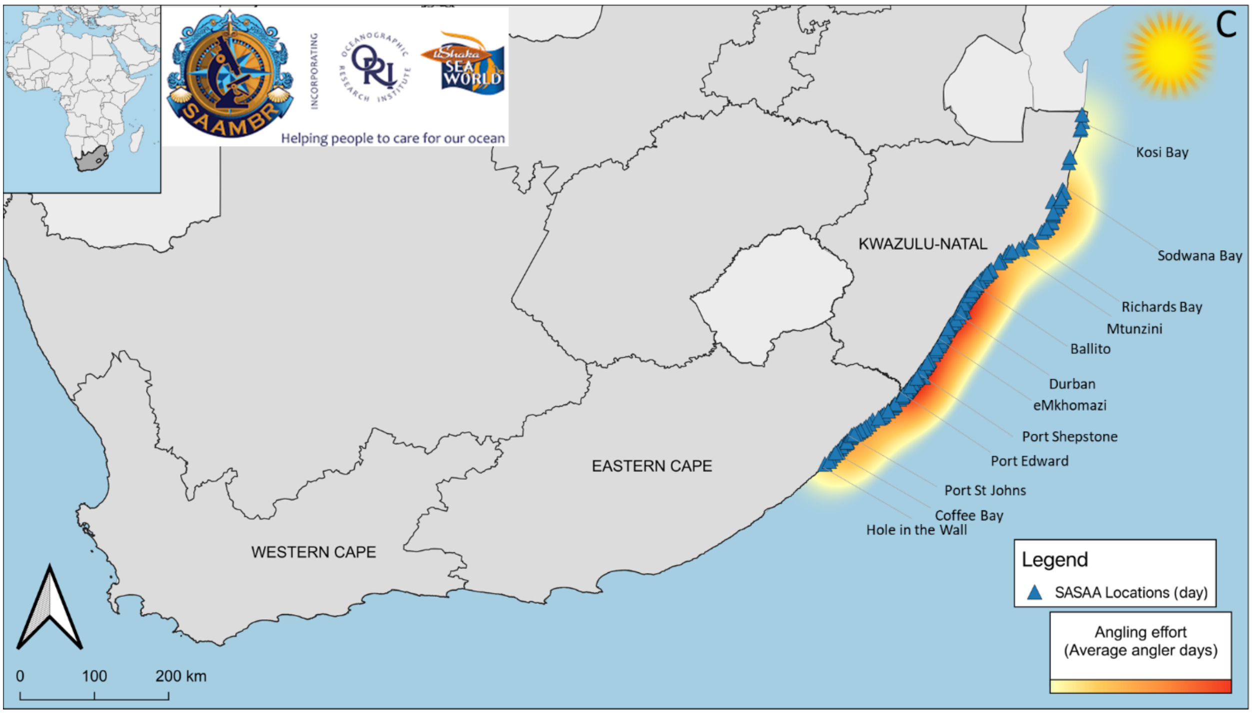
In total, data was acquired from 1061 individual competition days between 2011 and 2023, of which 744 and 317 individual competition days were SASSA National competitions and RASSPL league and National competitions, respectively. The total number of individual angler days for SASSA Nationals was 10 356, and 16 227 for RASSPL, where SASSA National competitions were fished between 2011 – 2020 and RASSPL between 2013 – 2023. The KwaZulu-Natal SASAA league datasets (ORI data) were largely geographically and partially temporally isolated (2003 – 2023) from the previous two and comprised 76 678 angler days of which 18 577 were during the day, and 58 101 were fished during night hours. The SASSA data represents 26 different localities between Varkenvlei on the West Coast and Noggies in Northern KwaZulu-Natal (Figure 1A), the RASSPL data represents 73 different fishing locations between Rietfontein on the West Coast and Haga Haga in the Eastern Cape (Figure 1B). The ORI dataset was only fished in KwaZulu-Natal and the northern Eastern Cape where 206 different locations were fished during the day (Figure 1C) and 225 at night between Kosi Bay and Xhora river mouth (Figure 1D). In total 27 194 individual elasmobranchs were captured, measured and released by SASSA anglers between 2011-2020, while RASSPL anglers captured 19 688 individuals between 2013-2023.



A
SASAA
SHORE ANGLING
Mtian/Njoggies
Durnford
Mtunzini Banks
Paradise Beach
KWAZULU-NATAL
Varkenvlei
Langebaan
Minandi
Strand
Macassar
Die Plaat
Die Damme
De Mond
Stilbaai
Boggomsbaai
Groot Brak
Wilderness
Plettenberg Bay
Cape St Francis
Kabeljous
Gamtoos
Van Der Riets
Sundays
Mpekweni
Kiwane
Hamburg
Kaysers Beach
WESTERN CAPE
EASTERN CAPE
Legend
SASAA Locations
Angler Effort
(anglers/competition)
0
100
200 km



B
RASSPL
AFRICA
ROCK AND SURF SUPER PRO LEAGUE
KWAZULU-NATAL
Rietfontein
WESTERN CAPE
EASTERN CAPE
False Bay
Strand
Gordons Bay
Gansbaai
De Mond East
De Mond
Witsand
Robberg
Plettenberg Bay
Oyster Bay
van der Riets
Birha
Kaysers Beach
Gonubie River
Cintsa
Haga Haga
Legend
RASSPL Locations
Angler Effort
(anglers/competition)
0
100
200 km



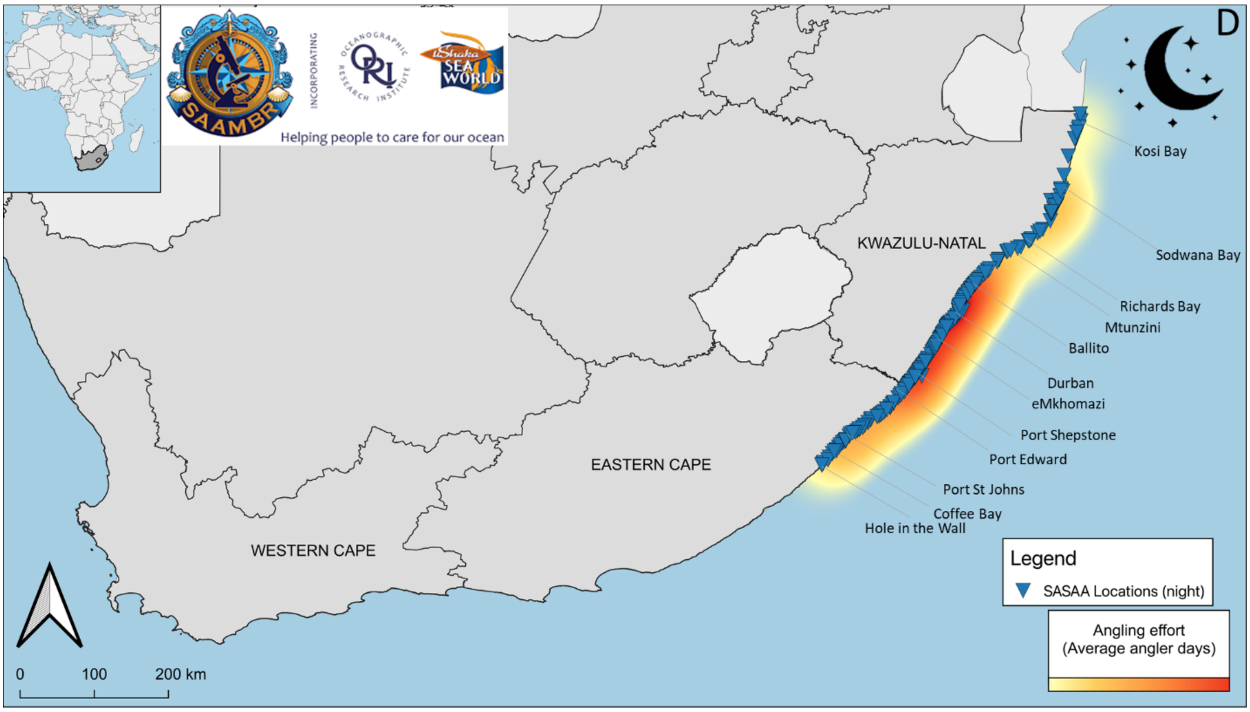


Figure 1. Angler effort distribution for A) SASSA national competitions held between 2011-2020, B) RASSPL national and league competitive angling competitions held between 2011 – 2023, C) SASSA KwaZulu-Natal league competitions fished during the day between 2003-2023, D) SASSA KwaZulu-Natal league competitions fished at night between 2003-2023.

3.2. CPUE ranking by species

3.2.1. SASSA Nationals 2011-2023

Of the 41 different elasmobranch species captured in the SASSA dataset, *Acroteriobatus annulatus* was by far the most commonly captured species with an average CPUE of 1.35, meaning that on any given competition day, every angler fishing in a competition would on average catch at least one. A close relative of this species, but confined to the west coast, *Acroteriobatus blochii* came in at second, but with a much lower overall average CPUE of 0.54. This was followed in descending order of ranking by *Dasyatis chrysonota, Gymnura natalensis, Mustelus palumbes, Carcharhinus brachyurus, Sphyrna zygaena, Myliobatis aquila, Triakis megalopterus and Carcharias taurus* (Figure 2). Of these top ten ranked species, *Myliobatis aquila* and *Carcharias taurus* are the only two species that are of severe conservation concern according to the IUCN Red List. For a full list of all captured species and their associated IUCN Red List status, see Appendix A1.

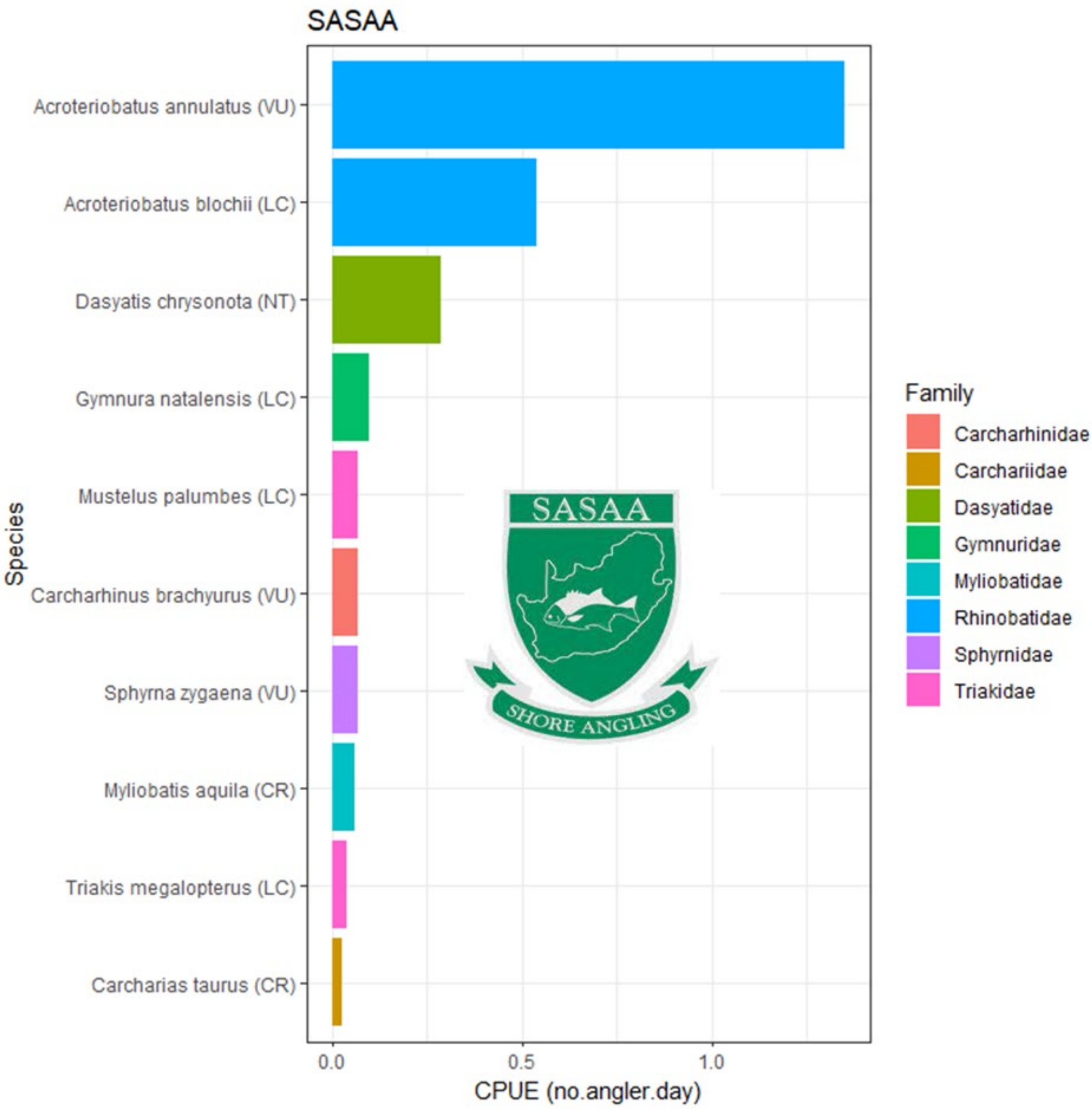


Figure 2. Average catch per unit effort for the top ten species ranked by CPUE caught during SASSA competitions held between 2011 and 2020. The coloured bar represents different elasmobranch taxonomic families and parentheses next to the species names, denote each species' current IUCN Red List status.

3.2.2. RASSPL Nationals and League 2011-2023

Of the 33 different elasmobranch species captured in the RASSPL dataset, *Haploblepharus fuscus* was the most commonly captured species with an average CPUE of 0.68. The next highest-ranked species was *Triakis megalopterus*, with a CPUE of 0.28, closely followed by *Acroteriobatus annulatus* with a CPUE of 0.27. This was followed in descending order of ranking by *Poroderma* spp*, Poroderma africanum, Dasyatis chrysonota, Mustelus mustelus, Myliobatis aquila, Carcharias taurus and Poroderma pantherinum* (Figure 3). Of these top ten ranked species, *Myliobatis aquila*, *Carcharias taurus* and *Mustelus mustelus* are the only three species that are of severe conservation concern according to the IUCN Red List. For a full list of all captured species and their associated IUCN Red List status, see Appendix A2.

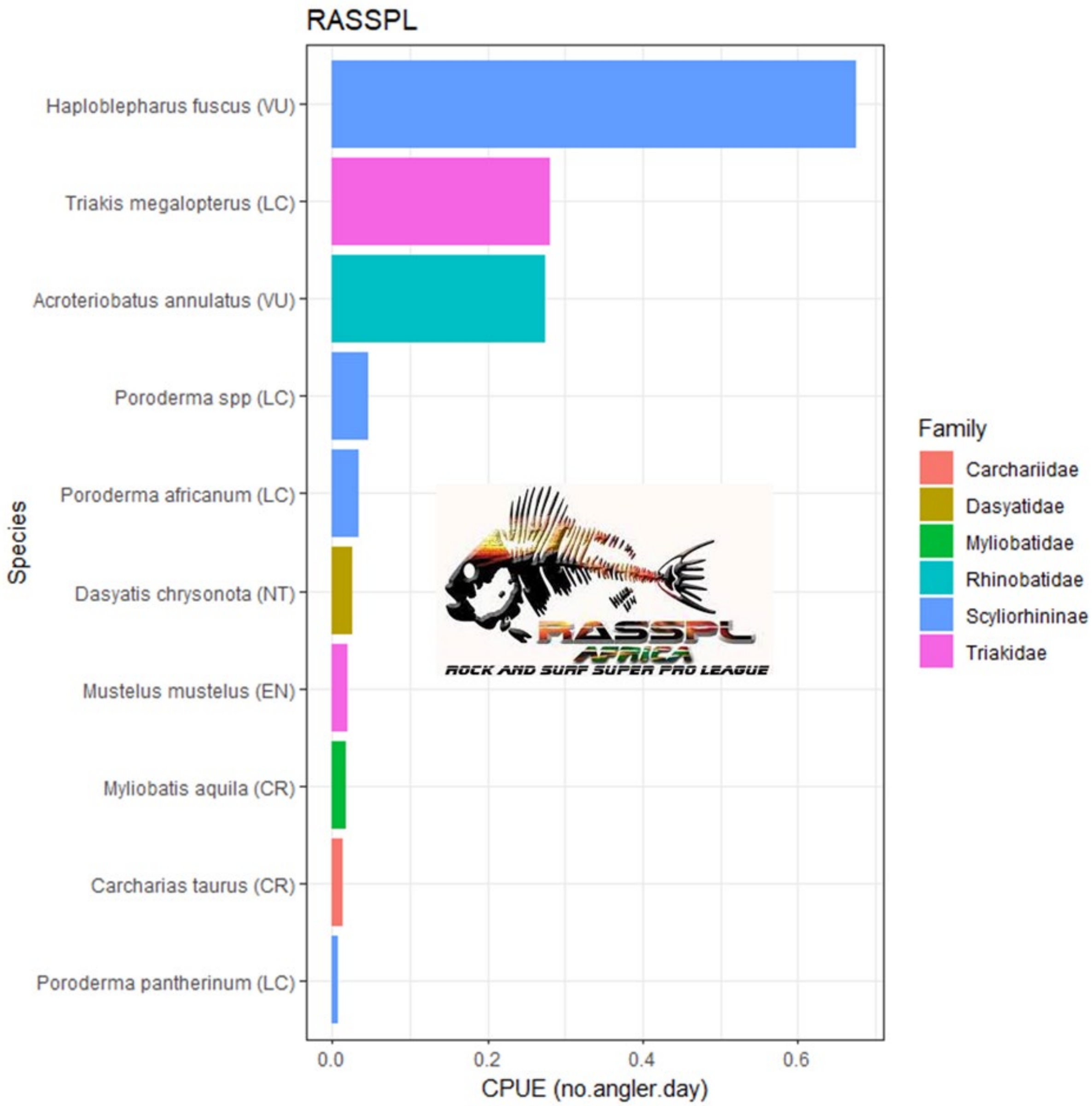


Figure 3. Average catch per unit effort for the top ten species ranked by CPUE caught during RASSPL competitions held between 2011 and 2023. The coloured bar represents different elasmobranch taxonomic families and parentheses next to the species names, denote each species' current IUCN Red List status.

3.2.3. ORI SASSA KwaZulu-Natal League competitions

In total 36 and 38 different elasmobranch species were captured between (2003 – 2023) during KwaZulu-Natal SASAA league competitions (ORI dataset) during daylight and night fishing competitions, respectively (see Appendix A3 & Appendix A4). Of these species, three were exclusively captured during the day (*Carcharhinus amblyrhynchos, Paragaleus leucolomatus, Prionace glauca*) while a further three were only captured during night fishing excursions (*Galeocerdo cuvier, Mustelus mosis, Notorynchus cepedianus*). Meaning that a total of 41 different species of elasmobranchs were encountered in the ORI dataset. In both day and night datasets *Carcharhinus obscurus* (dusky sharks) were the most commonly captured species where an angler on average will catch at least one of these sharks every three to four angling trips, this is closely followed by *Acroteriobatus annulatus* as the second-ranked species (Figure 4 & 5). After these two commonly caught species, the diel effect begins to reveal itself where *Carcharhinus brevipinna* is the 3rd ranked species during the day and *Rhizoprionodon acutus* at night (Figure 5). While *Gymnura natalensis* is ranked 4th during the day, *Carcharhinus brevipinna* is the 4th ranked at night corresponding to a CPUE of 0.15 compared to 0.18 during the day. The 5th most commonly captured species during the day was *Himantura gerrardi* and *Gymnura natalensis* at night. The next five ranked species captured during the day were: *Rhizoprionodon acutus, Rhynchobatus djiddensis, Dasyatis chrysonota, Mustelus* spp*, Sphyrna* spp with corresponding average CPUE values between 0.08-0.11 fish.angler.day^{-1}. At night the next five most commonly caught species were *Dasyatis chrysonota, Sphyrna* spp*, Himantura gerrardi, Carcharhinus limbatus,* and *Mustelus* spp with corresponding average CPUE values ranging between 0.1-0.14 fish.angler.day^{-1}. Of these ten species caught during the day, one is critically endangered (*Rhynchobatus djiddensis*), two endangered (*Carcharhinus obscurus, Himantura gerrardi*), three vulnerable (*Acroteriobatus annulatus, Carcharhinus brevipinna, Rhizoprionodon acutus*), one near threatened (*Dasyatis chrysonota*) and one least concern (*Gymnura natalensis*). At night, no critically endangered species featured but two were endangered (*Carcharhinus obscurus and Himantura gerrardi*), four vulnerable (*Acroteriobatus annulatus, Carcharhinus brevipinna, Rhizoprionodon acutus, Carcharhinus limbatus*), one near threatened (*Dasyatis chrysonota*) and one least concern (*Gymnura natalensis*).

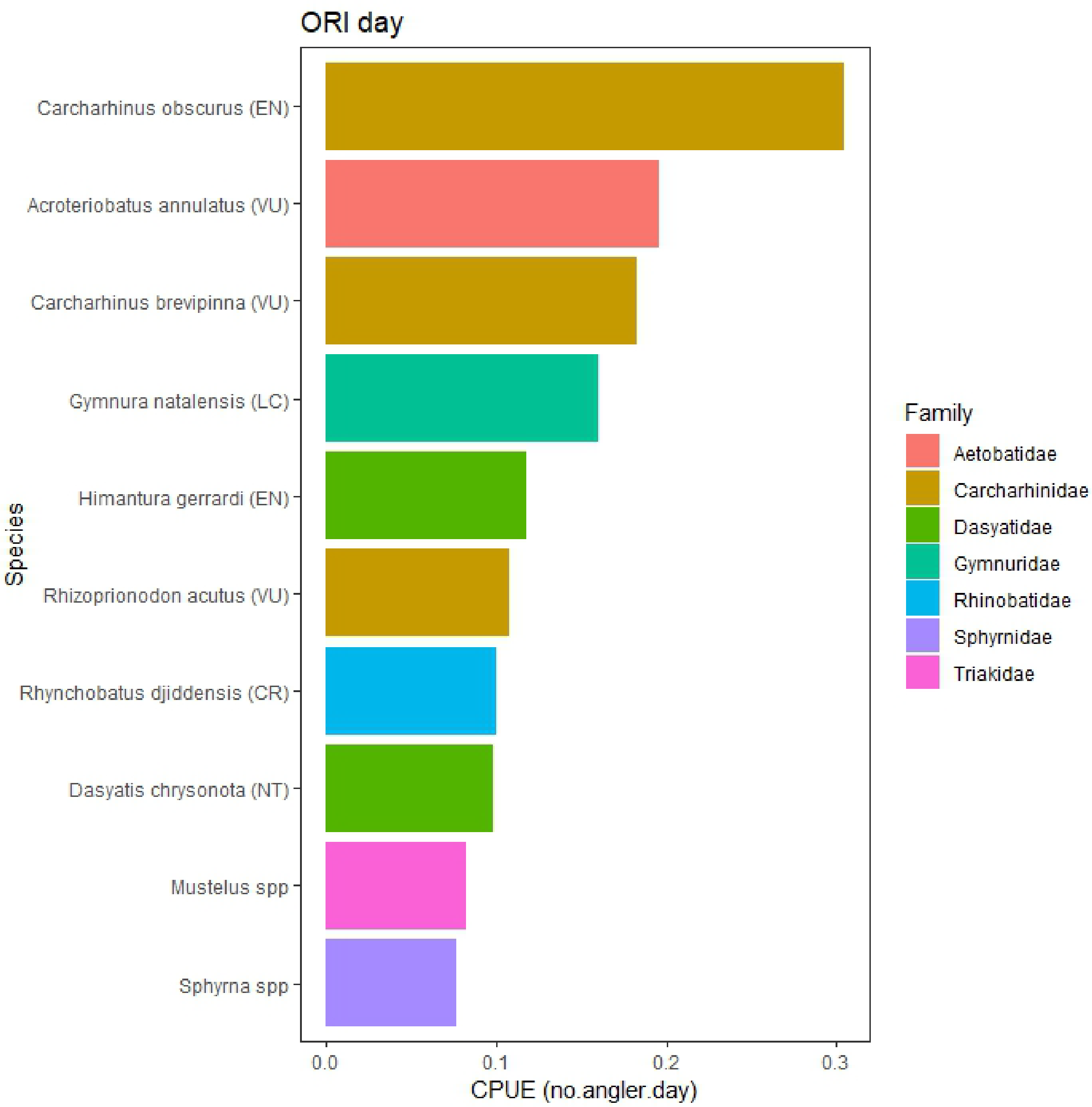


Figure 4. Average catch per unit effort for the top ten species ranked on average in the KwaZulu-Natal SASSA league CPUE, fished during the day between 2003-2023. The coloured bar represents different elasmobranch taxonomic families, and parentheses next to the species names, denote each species' current IUCN Red List status.

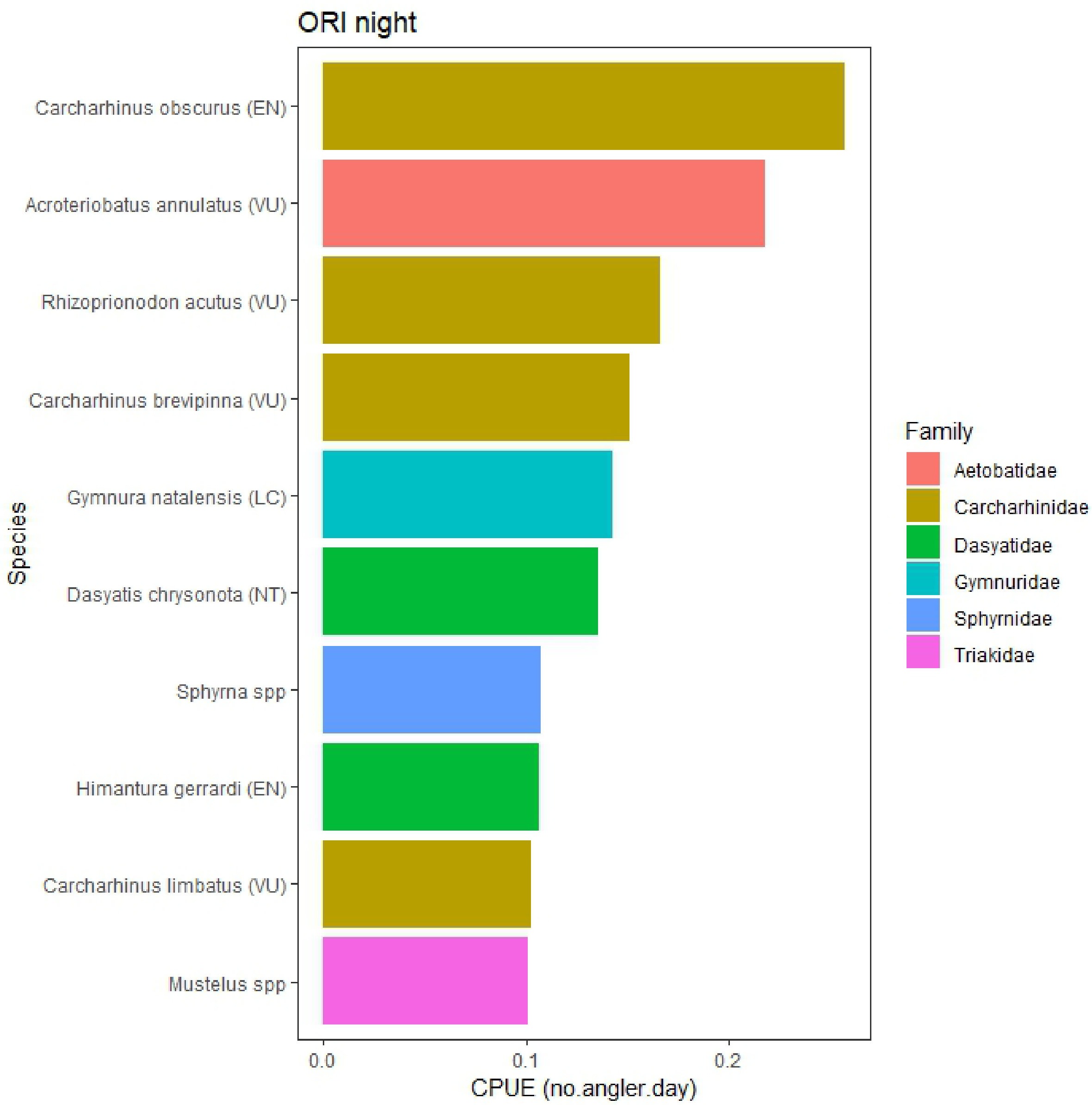
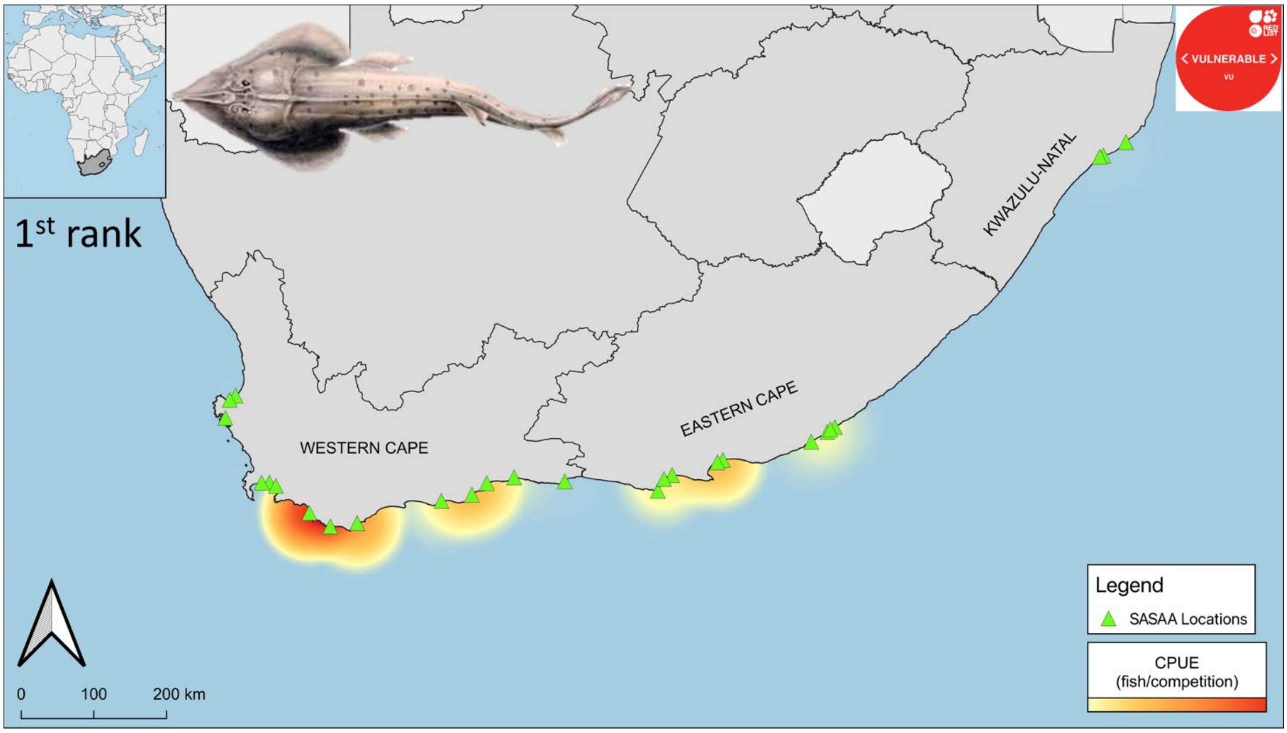


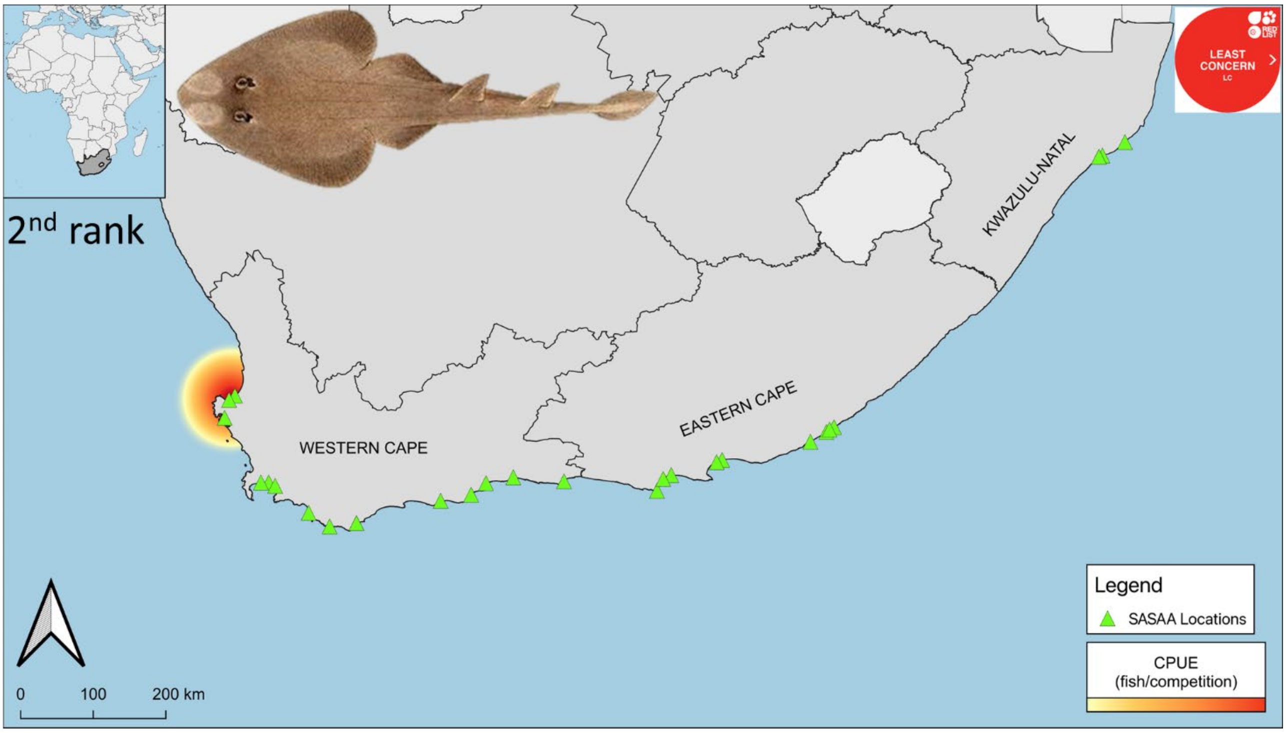
Figure 5. Average catch per unit effort for the top ten species ranked on average in the KwaZulu-Natal SASSA league CPUE, fished at night between 2003-2023. The coloured bar represents different elasmobranch taxonomic families and parentheses next to the species names, denote each species' current IUCN Red List status.

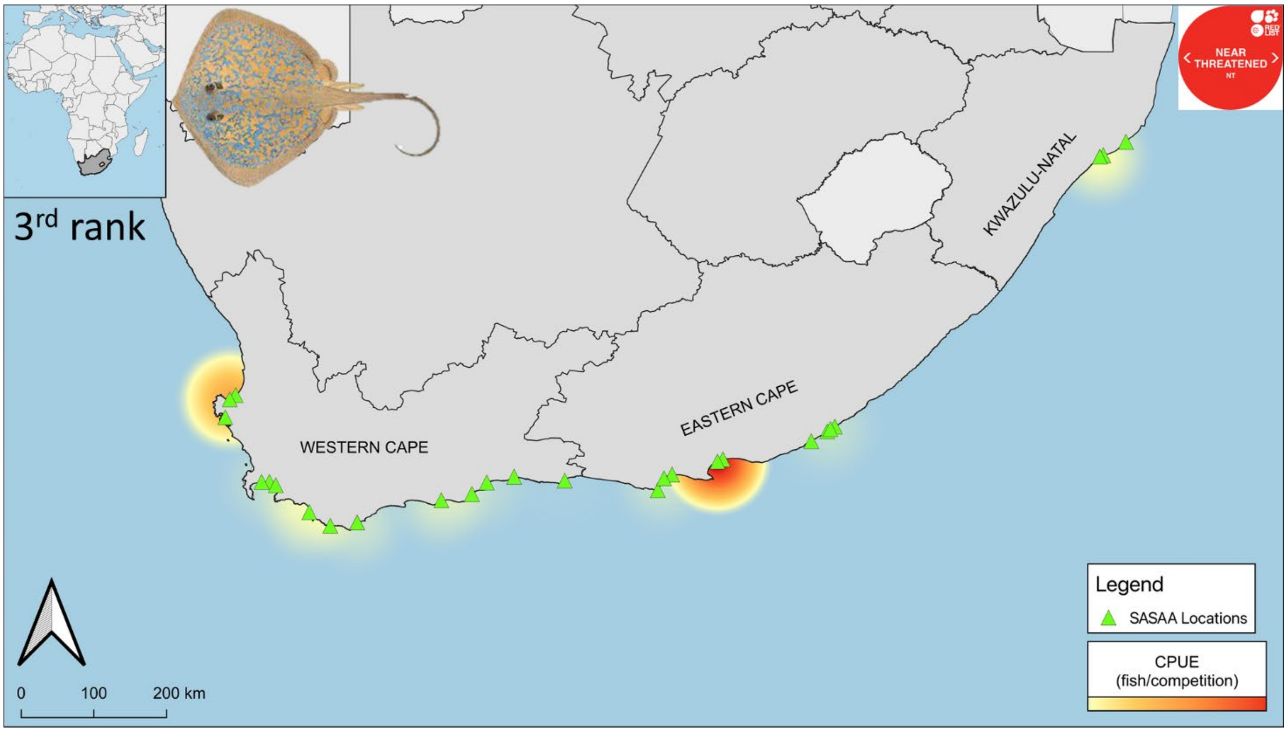
3.3. Spatial distribution of abundance

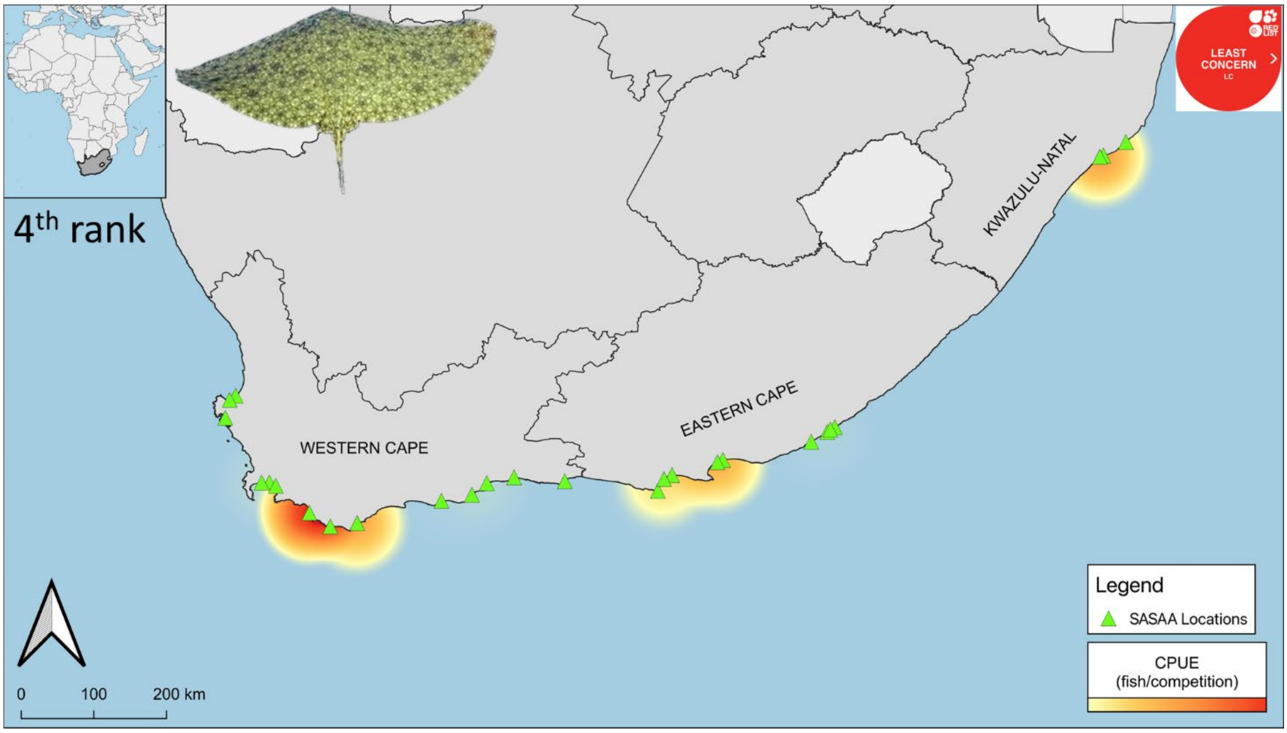
3.3.1. SASSA Nationals 2011-2023

Of the five highest-ranked species by average CPUE, spatial abundance estimates vary between species (Figure 6). The highest-ranked species, *Acroteriobatus annulatus* ($\bar{x}$ CPUE = 1.35 fish.angler.day^{-1}) is primarily captured east of Cape Agulhas, with peaks in their abundance being centred around the southern Cape coast (Figure 6). The second-ranked species, *Acroteriobatus blochii* ($\bar{x}$ CPUE = 0.54 fish.angler.day^{-1}), is only captured on the west coast, with a peak in their abundance centred around Saldanha Bay and Varkenvlei. The third-ranked species, *Dasyatis chrysonota* ($\bar{x}$ CPUE = 0.29 fish.angler.day^{-1}), has peaks of abundance around Algoa Bay but high catches are also made off the west coast and Varkenvlei in particular. Both the 4th and 5th ranked species, *Gymnura natalensis* (x̄ CPUE = 0.10 fish.angler.day^{-1}) and *Mustelus palumbes* (x̄ CPUE = 0.07 fish.angler.day^{-1}), respectively, are more likely to be captured, and therefore in higher abundance along the Overberg coastal area in the Western Cape.






3rd rank
NEAR THREATENED
NT
KWAZULU-NATAL
EASTERN CAPE
WESTERN CAPE
Legend
SASAA Locations
CPUE
(fish/competition)
0
100
200 km


4th rank
LEAST CONCERN
LC
KWAZULU-NATAL
EASTERN CAPE
WESTERN CAPE
Legend
SASAA Locations
CPUE
(fish/competition)
0
100
200 km

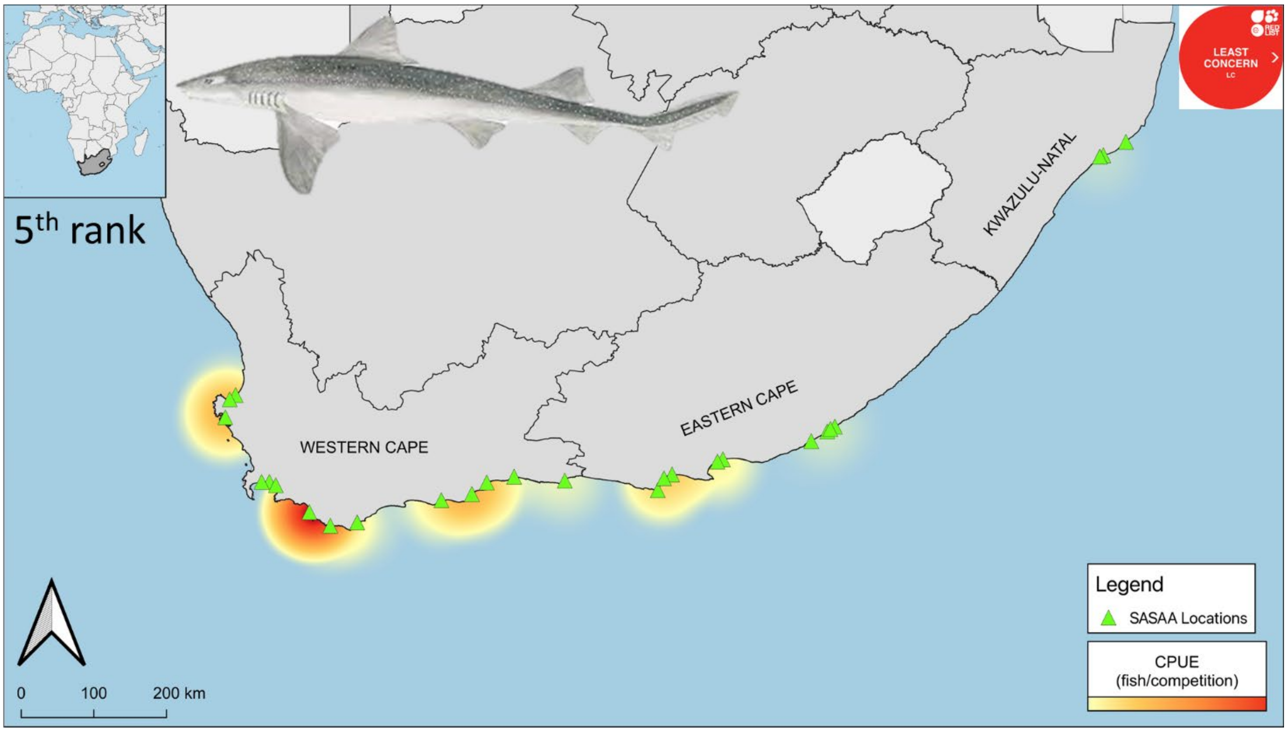
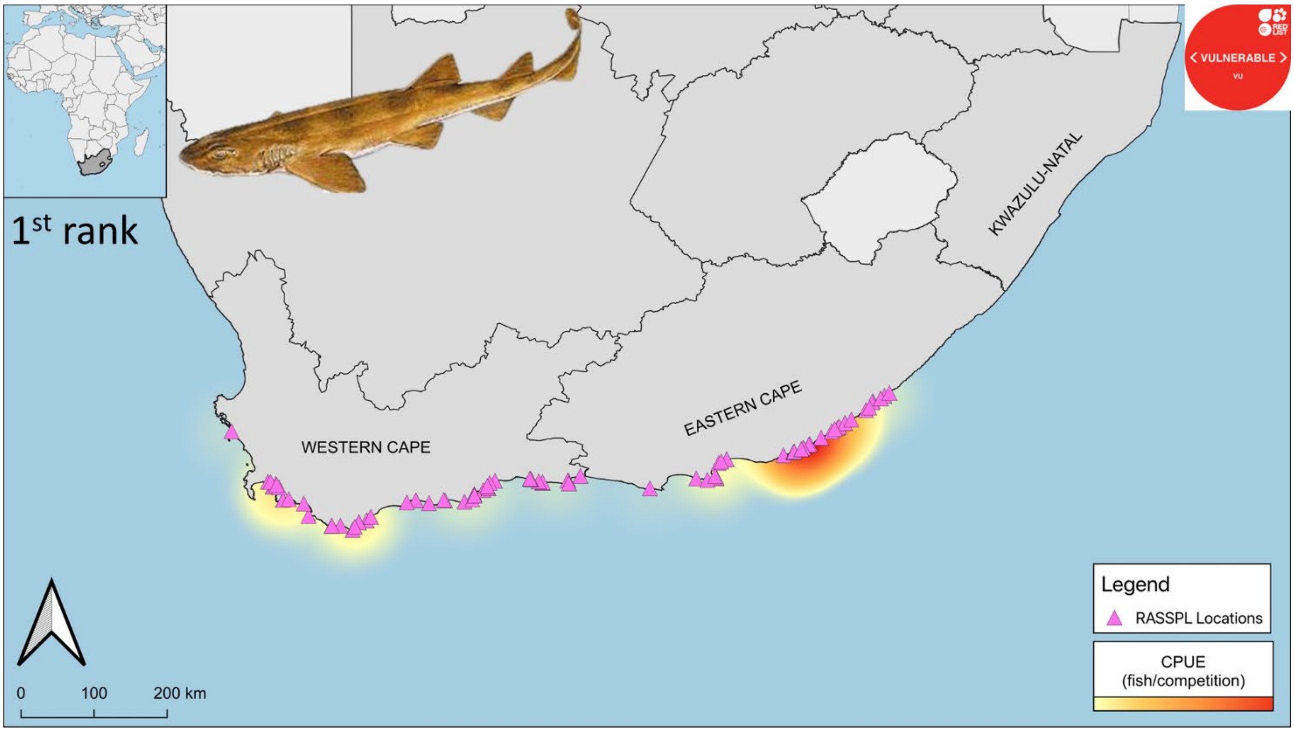
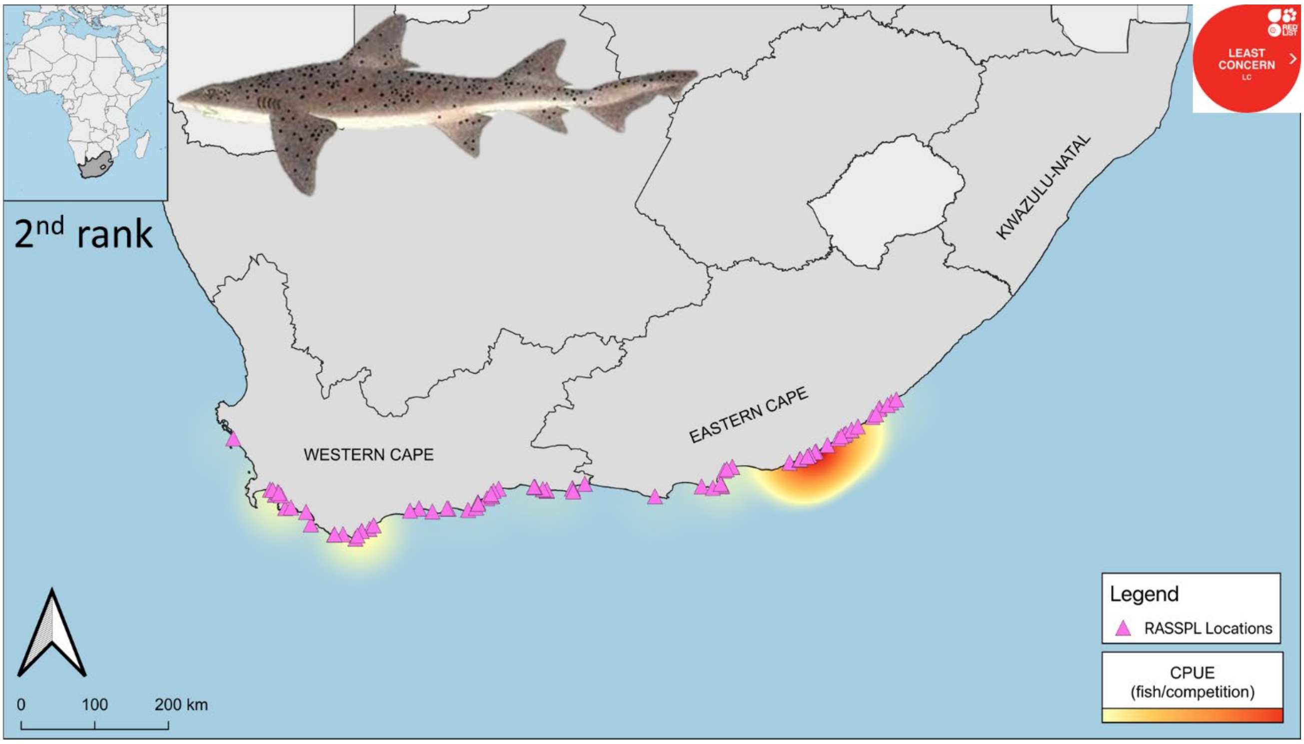


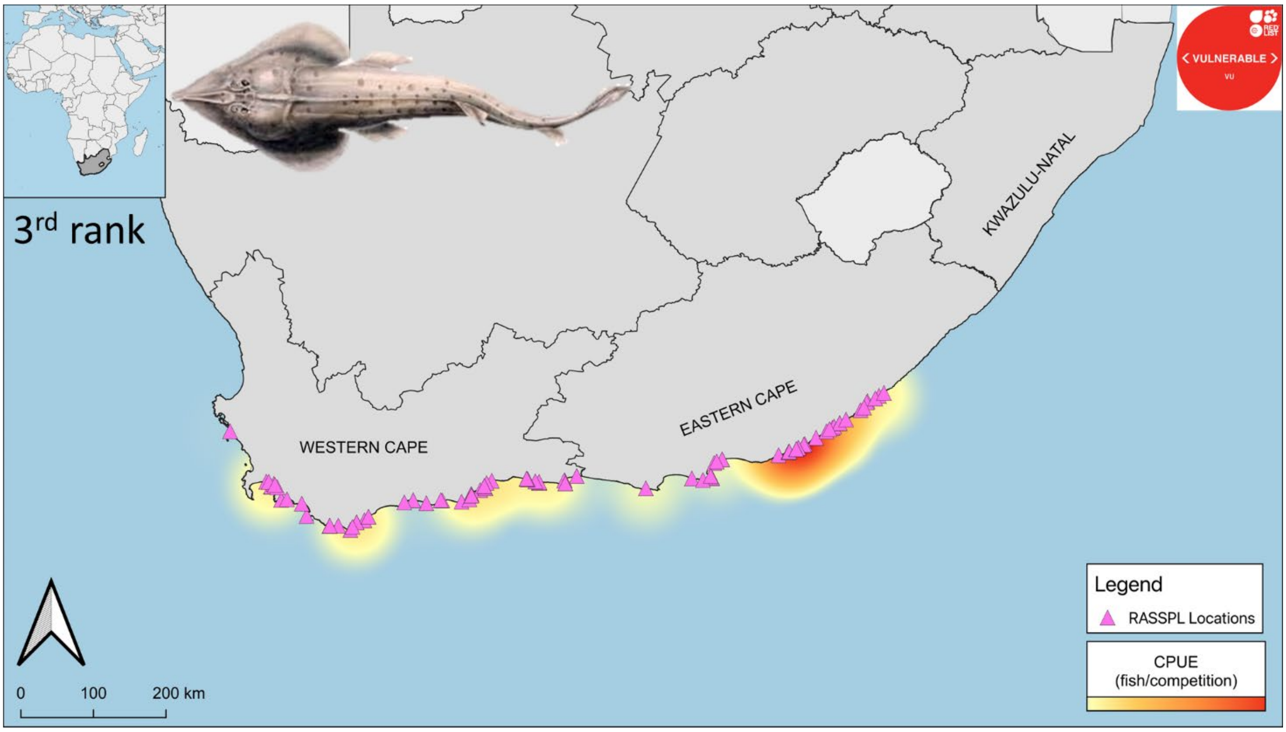
Figure 6. Spatial abundance estimates of the top five ranked species based on average SASSA CPUE between 2011 and 2020, inserted heat maps are listed by ranking from highest to lowest average CPUE being: *Acroteriobatus annulatus, Acroteriobatus blochii*, *Dasyatis chrysonota, Gymnura natalensis* and *Mustelus palumbes*

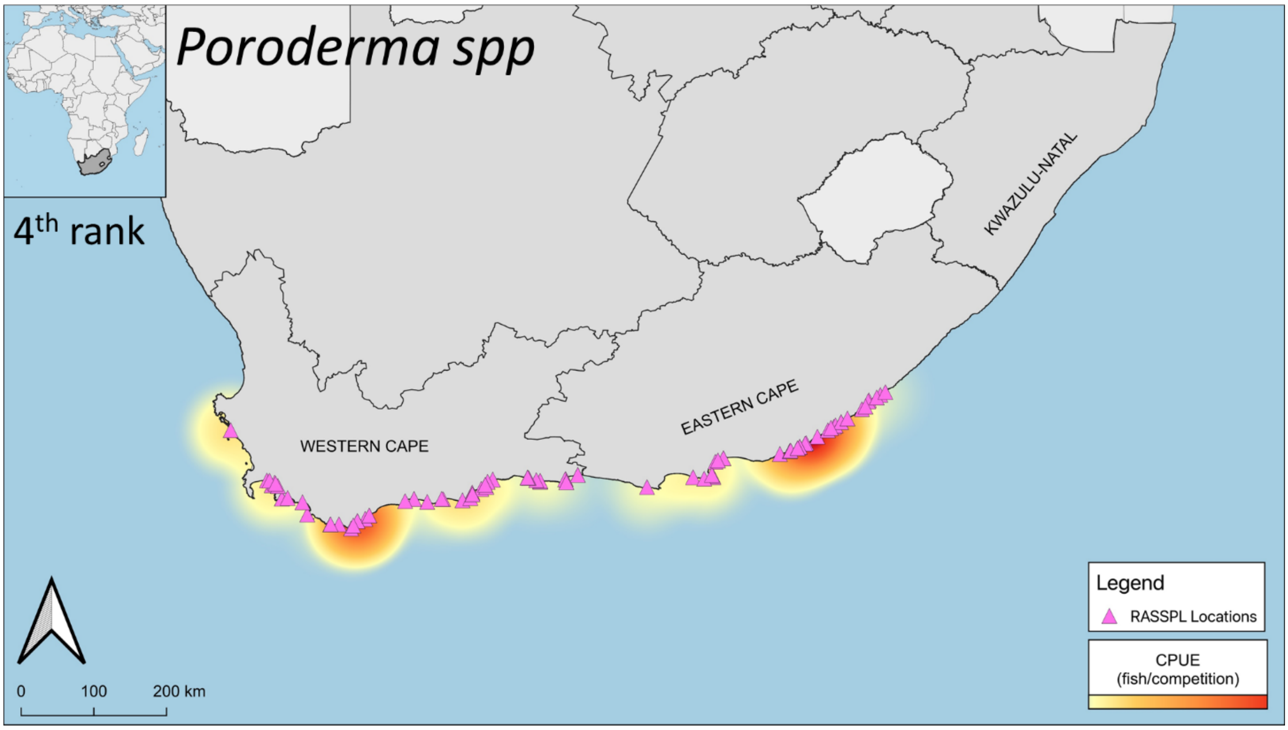
3.3.2. RASSPL Nationals and League 2011-2023

Of the five highest-ranked species by average CPUE, spatial abundance estimates vary between species (Figure 7). The highest-ranked species *Haploblepharus fuscus* ($\bar{x}$ CPUE = 0.68 fish.angler.day^{-1}) is primarily captured east of Algoa Bay, with a peak abundance being centred around Port Alfred (Figure 7). The second-ranked species, *Triakis megalopterus* ($\bar{x}$ CPUE = 0.28 fish.angler.day^{-1}), follows a similar spatial pattern to *Haploblepharus fuscus* with a centre of abundance being around Port Alfred. The third-ranked species, *Acroteriobatus annulatus* ($\bar{x}$ CPUE = 0.27 fish.angler.day), also has peaks of abundance around Port Alfred. Both the 4th and 5th ranked species, *Poroderma* spp ($\bar{x}$ CPUE = 0.05 fish.angler.day^{-1}) and *Poroderma africanum* ($\bar{x}$ CPUE = 0.03 fish.angler.day^{-1}), deviate from the above-mentioned pattern, with peaks in their abundance being found off the Southern Cape as well as East of Algoa Bay in the vicinity of Port Alfred.


1st rank
VULNERABLE
WESTERN CAPE
EASTERN CAPE
KWAZULU-NATAL
Legend
RASSPL Locations
CPUE
(fish/competition)
0
100
200 km


2nd rank
LEAST CONCERN
WESTERN CAPE
EASTERN CAPE
KWAZULU-NATAL
Legend
RASSPL Locations
CPUE
(fish/competition)
0
100
200 km


VULNERABLE
VU
3rd rank
KWAZULU-NATAL
EASTERN CAPE
WESTERN CAPE
0
100
200 km
Legend
RASSPL Locations
CPUE
(fish/competition)


Poroderma spp
4th rank
KWAZULU-NATAL
EASTERN CAPE
WESTERN CAPE
0
100
200 km
Legend
RASSPL Locations
CPUE
(fish/competition)

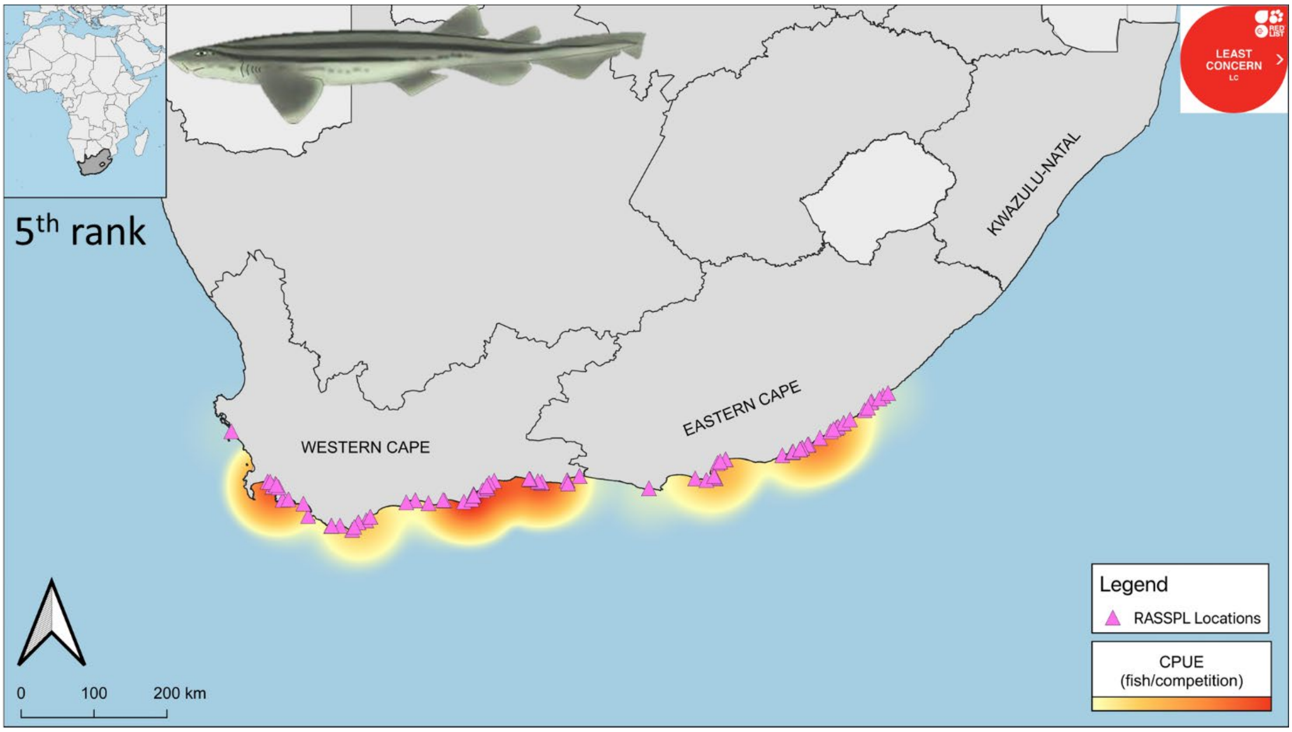
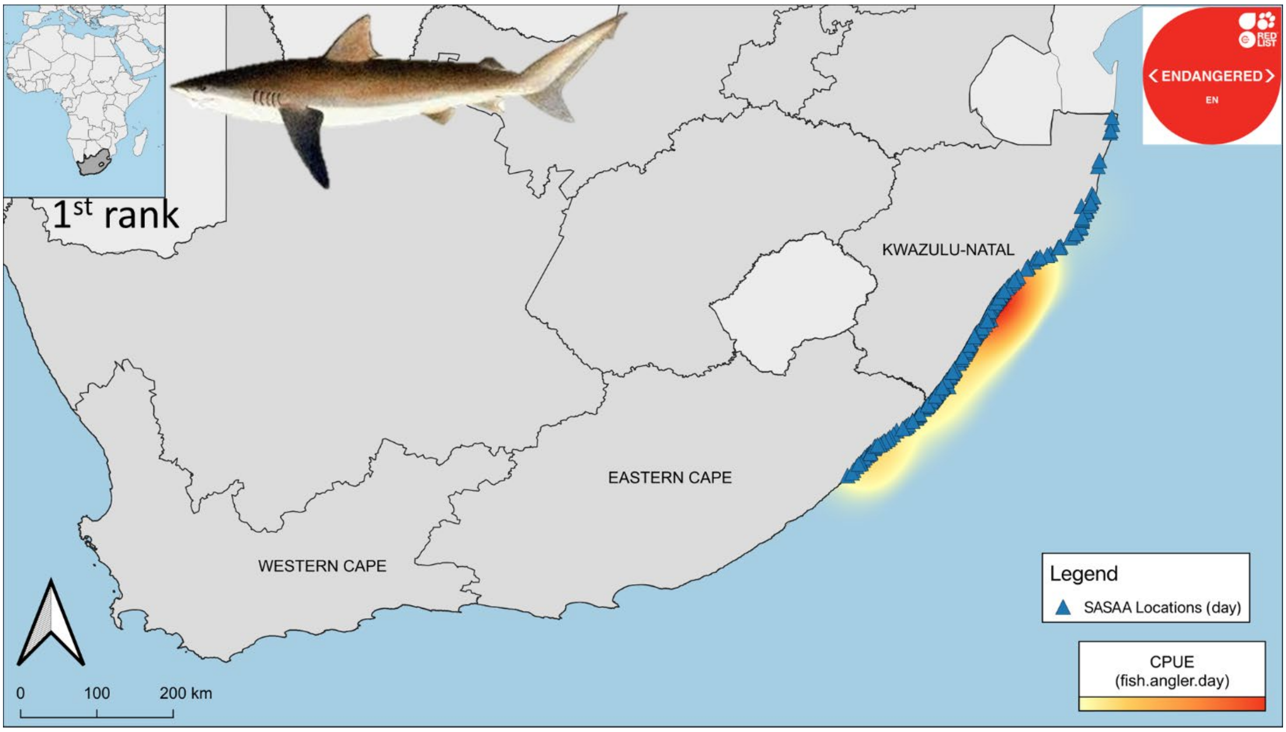
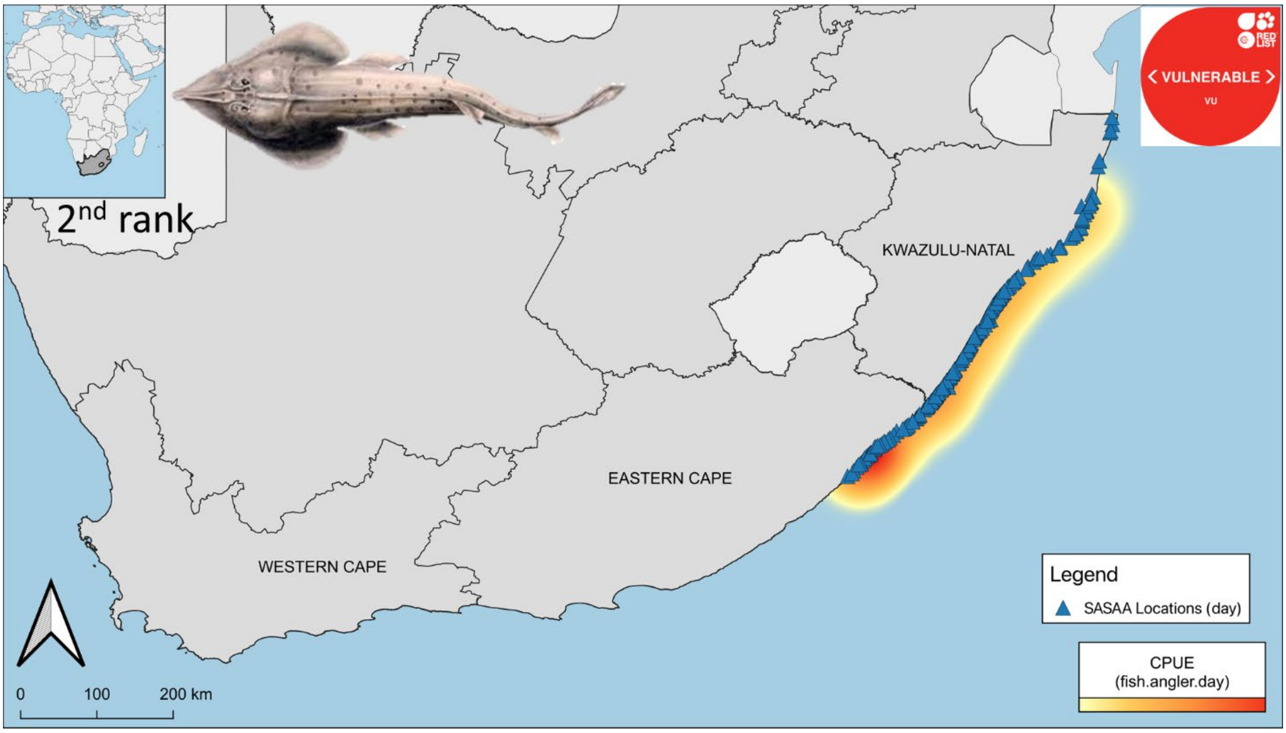


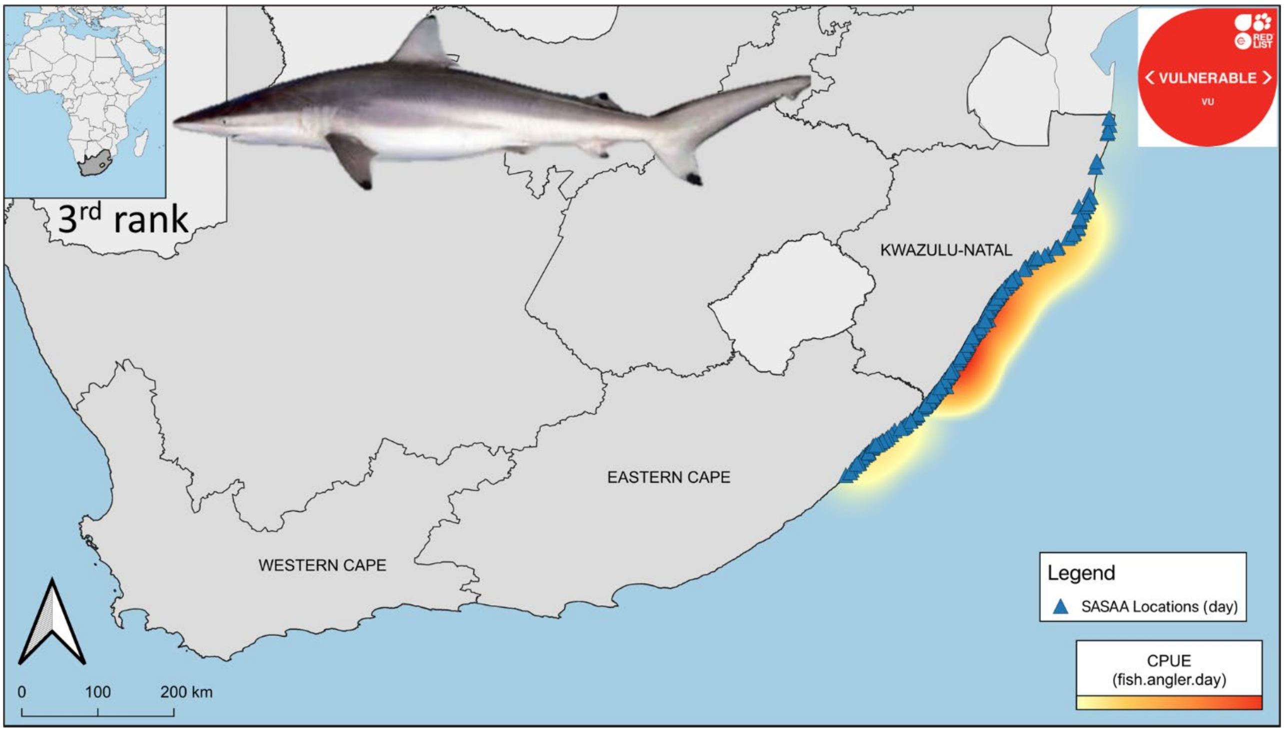
Figure 7. Spatial abundance estimates of the top five ranked species based on average RASSPL CPUE between 2011 and 2023, inserted heat maps are listed by ranking from highest to lowest average CPUE being: *Haploblepharus fuscus, Triakis megalopterus*, *Acroteriobatus annulatus, Poroderma spp* and *Poroderma africanum.*

3.3.3. KZN SASAA League daylight competitions 2003-2023

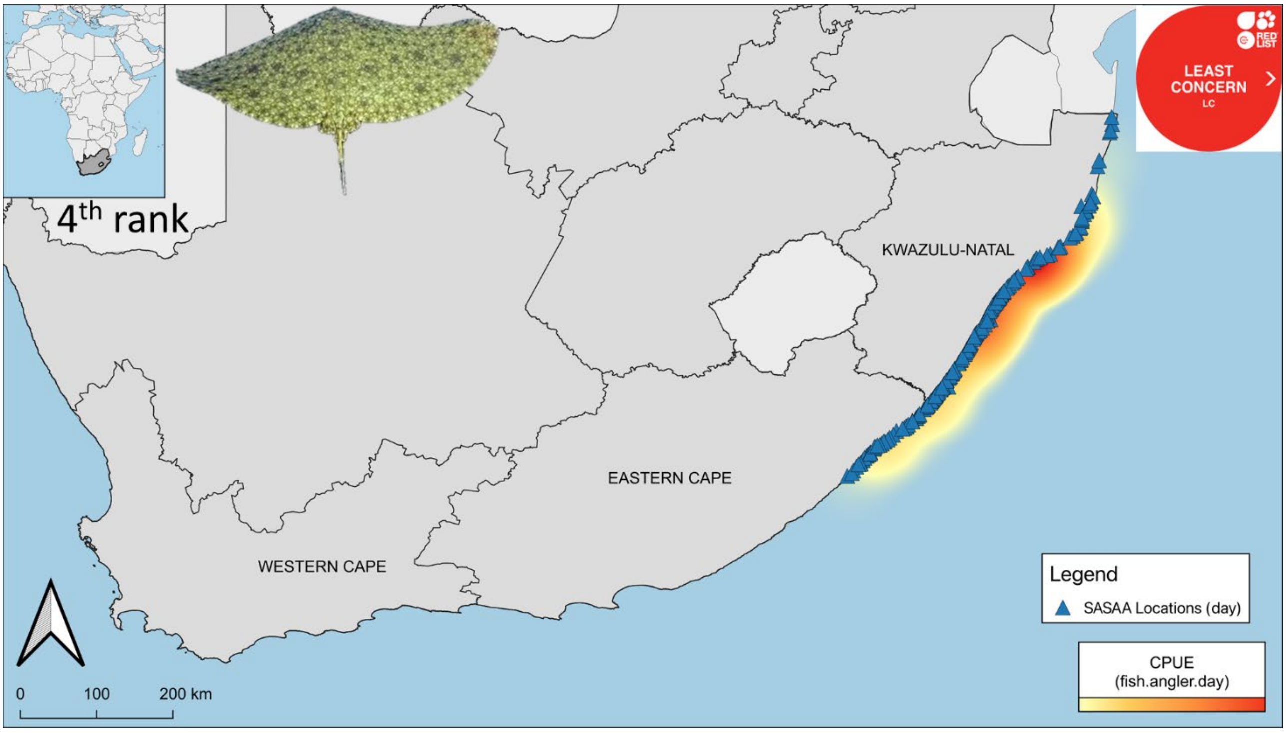
Of the five highest-ranked species by average CPUE, spatial abundance estimates vary between species (Figure 8). The highest-ranked species, *Carcharhinus obscurus* ($\bar{x}$ CPUE = 0.30 fish.angler.day^{-1}) is primarily captured north of Durban, with a peak abundance centred between Durban and Richards Bay (Figure 8). The second-ranked species, *Acroteriobatus annulatus* ($\bar{x}$ CPUE = 0.20 fish.angler.day^{-1}), has a peak in abundance in the southern section of this competitive fishing area, with peaks occurring within the northern Eastern Cape around Port St Johns, Coffee Bay and Hole in the Wall. The third-ranked species, *Carcharhinus brevipinna* ($\bar{x}$ CPUE = 0.18 fish.angler.day^{-1}), has peaks of abundance sandwiched between the two species mentioned above, with abundance hotspots found in southern KwaZulu-Natal between Port Edward and Durban. The 4th ranked species, *Gymnura natalensis* ($\bar{x}$ CPUE = 0.16 fish.angler.day^{-1}) deviates from the above-mentioned pattern, with peaks in their abundance being found north of Durban but south of Richards Bay. The 5th ranked species, *Himantura gerrardi* ($\bar{x}$ CPUE = 0.12 fish.angler.day^{-1}), is primarily captured around Durban and Port Shepstone.


1st rank
ENDANGERED
EN
KWAZULU-NATAL
EASTERN CAPE
WESTERN CAPE
Legend
SASAA Locations (day)
CPUE
(fish.angler.day)
0
100
200 km


2nd rank
VULNERABLE
VU
KWAZULU-NATAL
EASTERN CAPE
WESTERN CAPE
Legend
SASAA Locations (day)
CPUE
(fish.angler.day)
0
100
200 km



3rd rank
VULNERABLE
VU
RED LIST
KWAZULU-NATAL
EASTERN CAPE
WESTERN CAPE
Legend
SASAA Locations (day)
CPUE
(fish.angler.day)
0
100
200 km



4th rank
LEAST CONCERN
LC
RED LIST
KWAZULU-NATAL
EASTERN CAPE
WESTERN CAPE
Legend
SASAA Locations (day)
CPUE
(fish.angler.day)
0
100
200 km

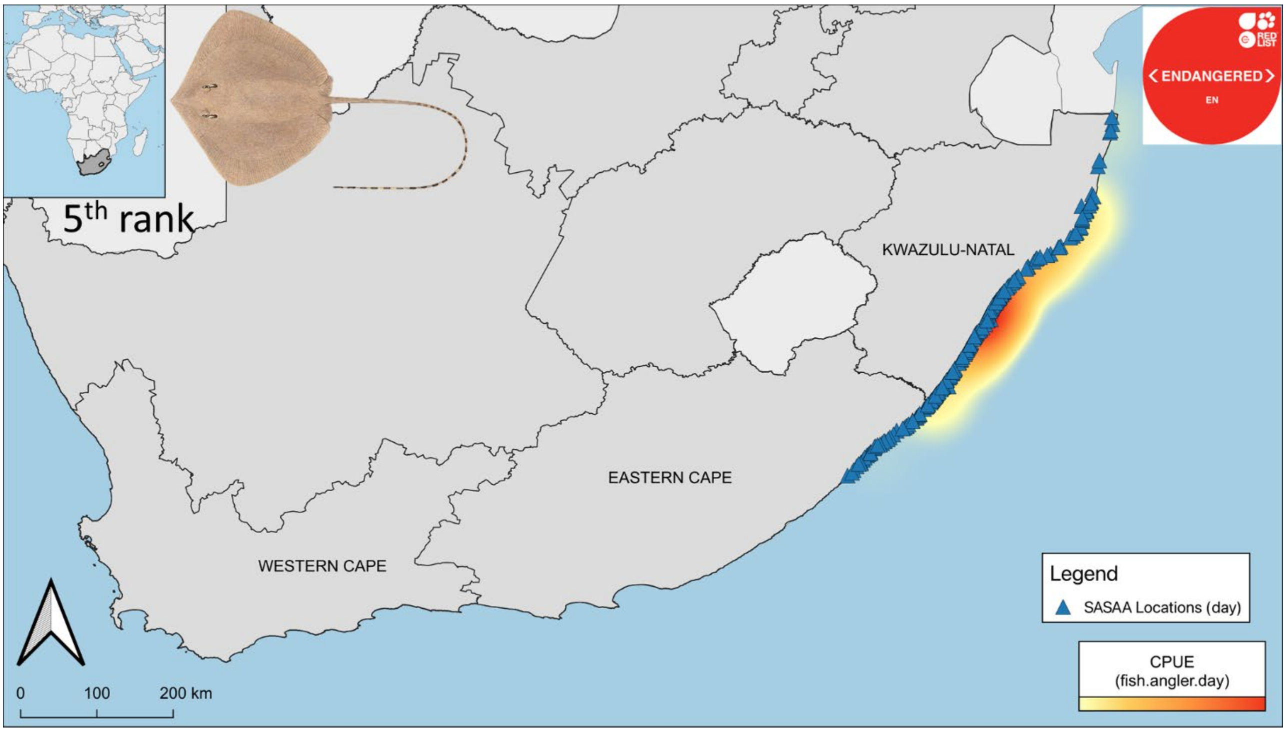
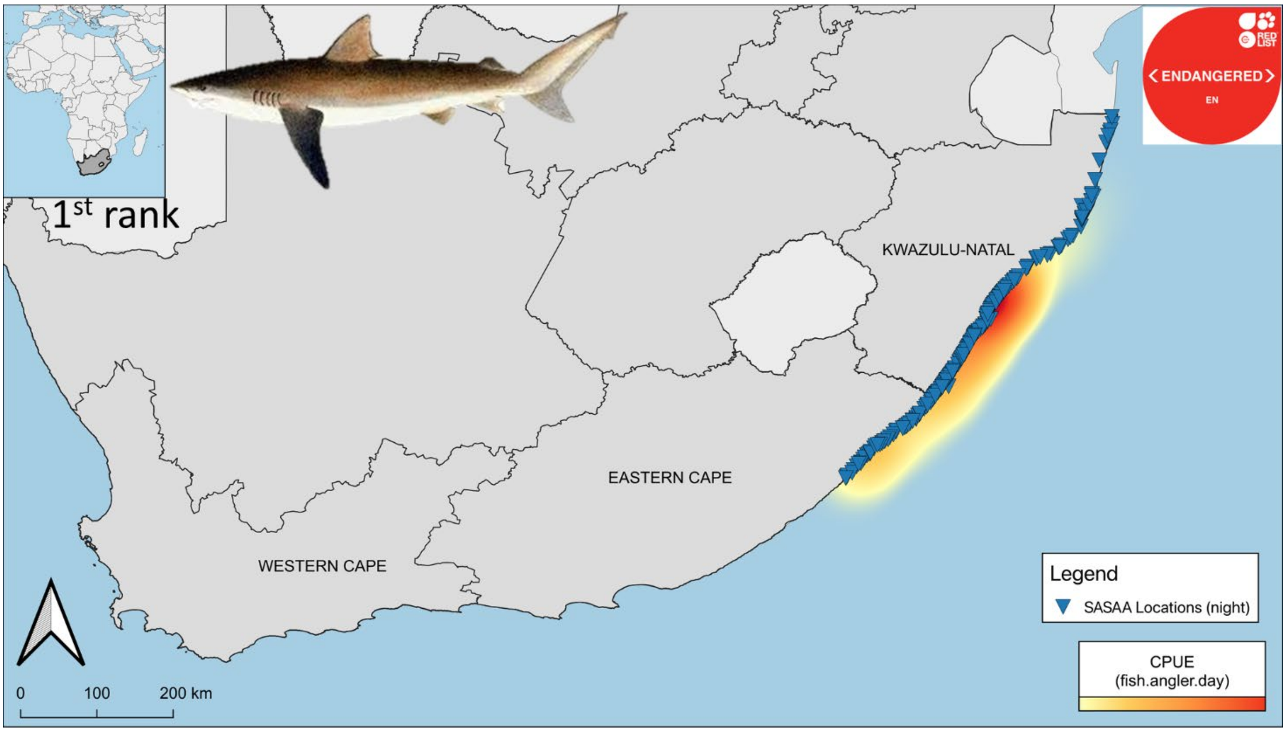
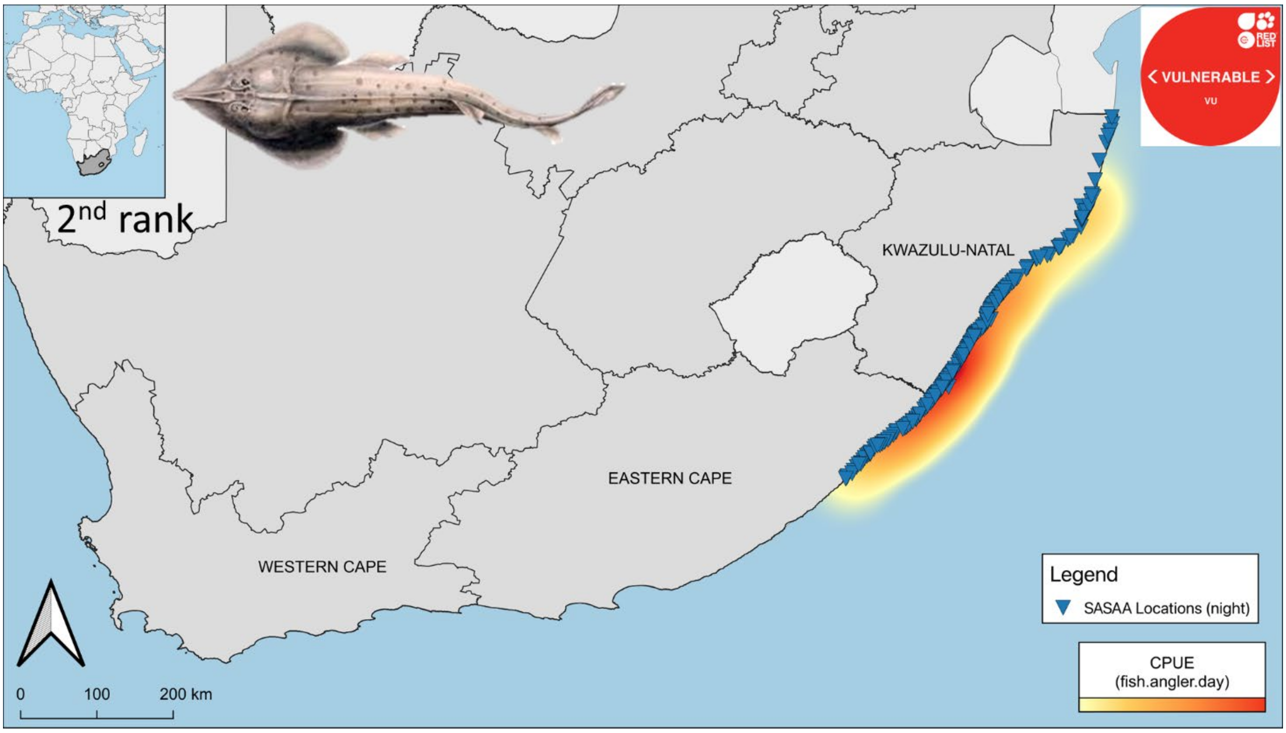


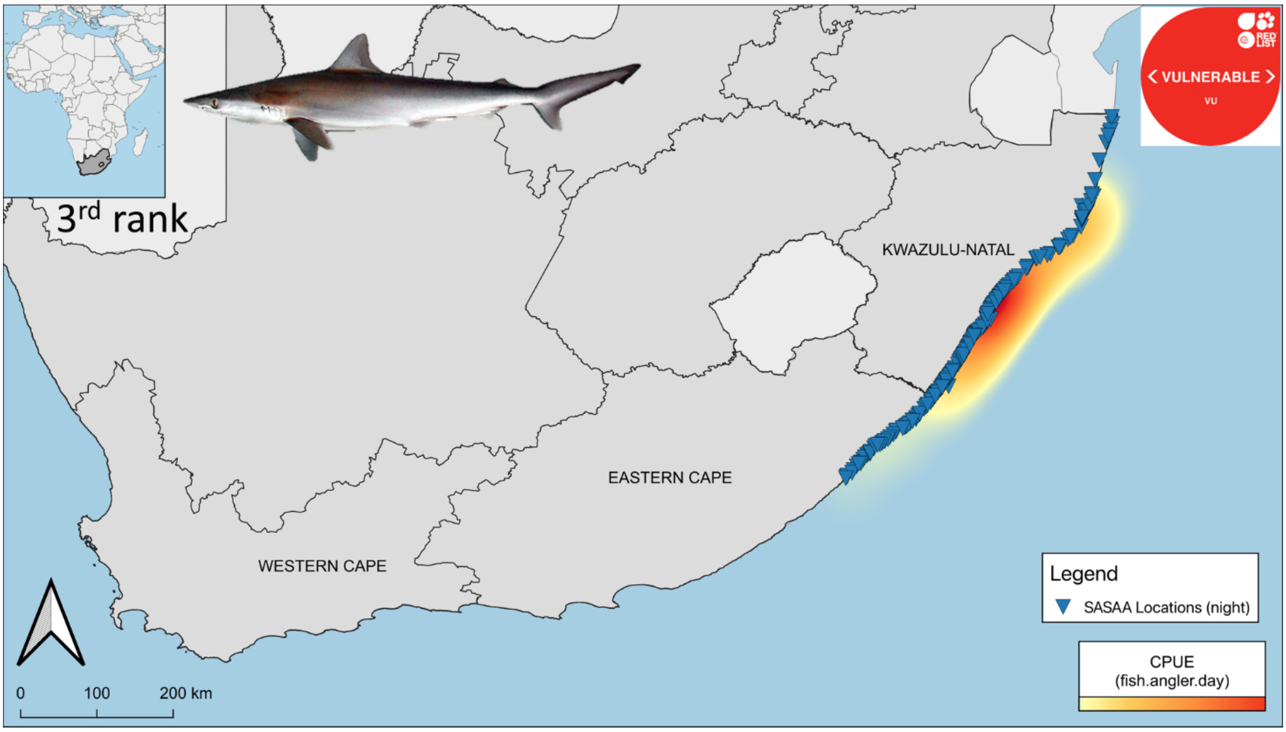
Figure 8. Spatial abundance estimates of the top five ranked species based on average KwaZulu-Natal SASSA league CPUE fished during the day between 2003-2023, inserted heat maps are listed by ranking from highest to lowest average CPUE being: *Carcharhinus obscurus, Acroteriobatus annulatus, Carcharhinus brevipinna, Gymnura natalensis, Himantura gerrardi*

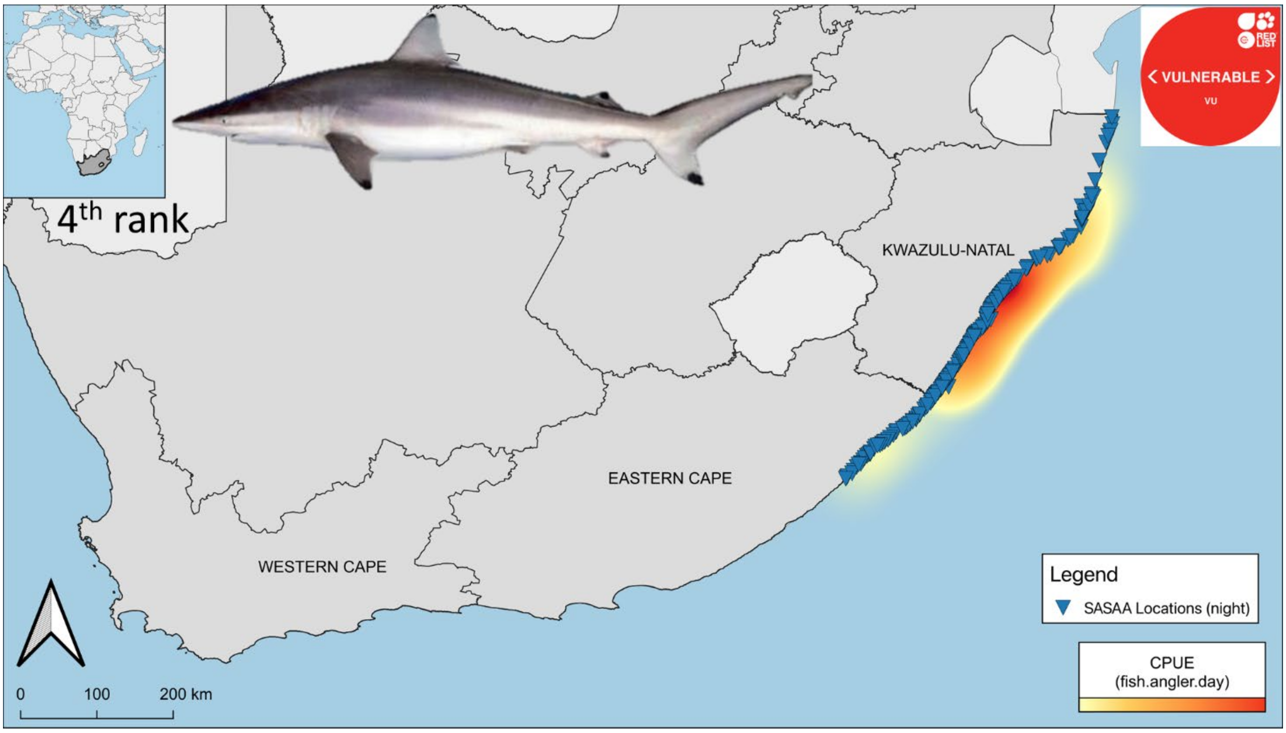
3.3.4. ORI night competitions 2003-2023

Of the five highest-ranked species by average CPUE, spatial abundance estimates vary between species (Figure 9). The highest-ranked species, *Carcharhinus obscurus* ($\bar{x}$ CPUE = 0.26 fish.angler.day^{-1}) is primarily captured north of Durban, with a peak abundance being centred between Durban and Richards Bay (Figure 9). The second-ranked species, *Acroteriobatus annulatus* ($\bar{x}$ CPUE = 0.22 fish.angler.day^{-1}), has a peak in abundance in the southern section of this competitive fishing area, peaks in abundance at night are however found further north than during daylight hour fishing and centred around the KZN south coast (Figure 9). The third-ranked species, *Rhizoprionodon acutus* ($\bar{x}$ CPUE = 0.17 fish.angler.day^{-1}), is primarily captured between Ballito and Port Shepstone. The 4th ranked species, *Carcharhinus brevipinna* ($\bar{x}$ CPUE = 0.15 fish.angler.day^{-1}) follows a similar pattern to *Rhizoprionodon acutus* with their abundance extending further south. The 5th ranked species, *Gymnura natalensis* ($\bar{x}$ CPUE = 0.14 fish.angler.day^{-1}), interestingly is primarily captured around Durban and Port Shepstone but deviates from the patterns for the same species caught during the day with higher catches occurring further south at night, including in the northern Eastern Cape area, which is not found in the daylight fishing dataset.


1st rank
ENDANGERED
EN
KWAZULU-NATAL
EASTERN CAPE
WESTERN CAPE
0
100
200 km
Legend
SASAA Locations (night)
CPUE
(fish.angler.day)


2nd rank
VULNERABLE
VU
KWAZULU-NATAL
EASTERN CAPE
WESTERN CAPE
0
100
200 km
Legend
SASAA Locations (night)
CPUE
(fish.angler.day)


3rd rank
VULNERABLE
VU
KWAZULU-NATAL
EASTERN CAPE
WESTERN CAPE
0 100 200 km
Legend
SASAA Locations (night)
CPUE
(fish.angler.day)


4th rank
VULNERABLE
VU
KWAZULU-NATAL
EASTERN CAPE
WESTERN CAPE
0 100 200 km
Legend
SASAA Locations (night)
CPUE
(fish.angler.day)

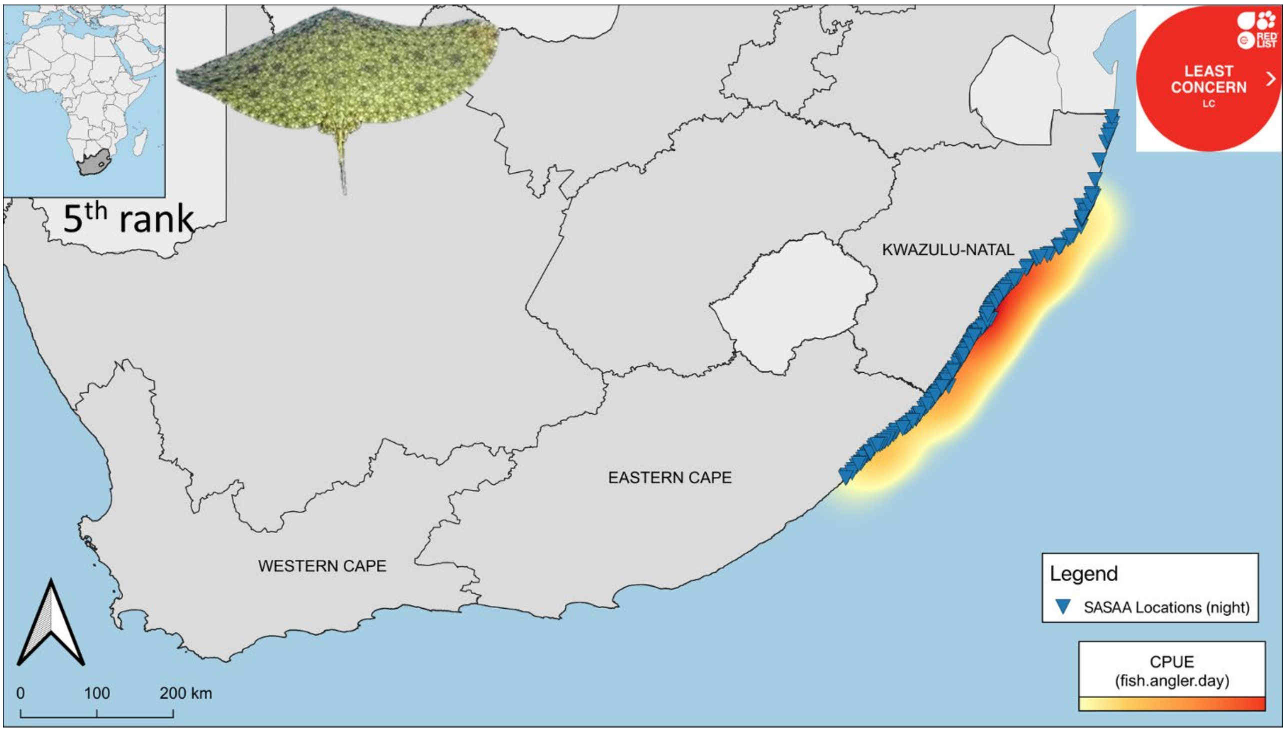


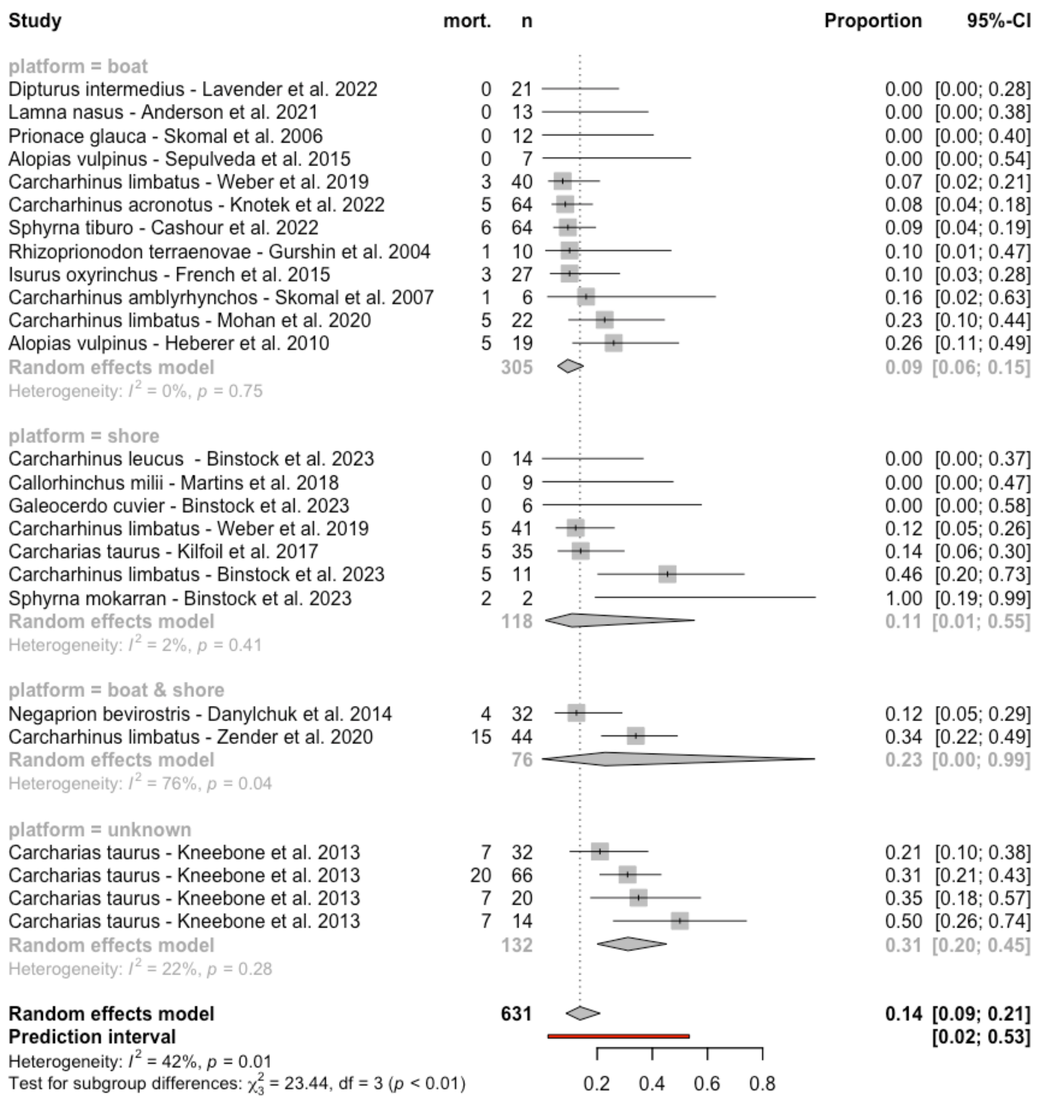
Figure 9. Spatial abundance estimates of the top five ranked species based on average KwaZulu-Natal SASSA league CPUE fished during at night between 2003-2023, inserted heat maps are listed by ranking from highest to lowest average CPUE being: *Carcharhinus obscurus, Acroteriobatus annulatus, Rhizoprionodon acutus, Carcharhinus brevipinna, Gymnura natalensis*

3.4. Elasmobranch recreational fishing post-capture survivorship meta-analysis

From the literature review, a total of 18 scientific manuscripts (25 different experiment types), evaluating 16 different shark species were found to assess the proportion of post-capture mortality in recreationally caught-and-released elasmobranchs. Of the 25 different experimental types that were performed to evaluate post-release mortality, 48% (12 trials) utilised acoustic telemetry, 44% (11 trials) utilised Pop-up Satellite Archival Tags (PSAT) or Data Storage Tags (DST), one study observed the individual survivorship in the field through the use or trailed balloons and one study re-enacted recreational fishing in a laboratory environment and observed mortality outcomes via captive observation.

Observed post-capture mortality (PCM) estimates ranged between 0% to 100% post-release, (see Table 1). Modelled (Random effects model) PCM estimates suggested an average PCM of 14% (Table 1) under all recreational fishing situations within a 95% confidence interval of 9% - 21% (Table 1), while the prediction interval for PCM ranged between 2% - 53% (Table 1). Modelled differences between the platform from which fish was captured (boat vs shore) were negligible, where the boat-based average PCM was 9% (95% CI: 6% - 15%) vs a shore-based average of 11% (95% CI: 1%-55%) (Table 1).

Table 1. Elasmobranch recreational post-capture survivability meta-analysis and random effects model results split by angling platform (boat vs shore). Overall post-capture release mortality is estimated at 14% based on the fate of 631 individual sharks captured from the shore or from a boat ; and within a 95% confidence interval of 9-21% .



4. Discussion

The findings of this report highlight geographical areas along South Africa's coastline that are of high importance to the majority of the country's competitive shore angling fraternity. It also identifies the primary elasmobranch species that are targeted by these anglers, their conservation status and strategies that may aid in reducing the impact of these competitions going into the future. Furthermore, the metanalysis of elasmobranch marine recreational post-capture mortality estimates, suggest that on average 11% (95% CI: 1-55%) of shore-based recreational catch is likely to succumb to the stress of capture upon release back into the wild. This estimate must, however, be used with caution as it is derived from only 7 studies evaluating the fate of 118 individuals from a global suite of studies using a variety of techniques to infer post-capture mortality.

The utilisation of competitive angling catch-and-effort data is a cost-effective monitoring method to gain an understanding of coastal marine resource users. In this study, we evaluated the efficacy of three separate competitive shore angling formats, to better understand their efficacy at identifying areas of elasmobranch abundance along the South African coast. To this end, we have found that the different angling formats, their associated scoring systems and geographic locations influenced the species that are captured. RASSPL anglers focus on catching a diverse array of species to gain maximum competitive points, while SASSA anglers fish for any species that will cumulatively increase their overall catch weight, which equates to maximum competitive points. The result of this difference in scoring is clearly articulated in our findings where RASSPL anglers catch higher numbers of smaller endemic shark species within the Scyliorhinidae family (three species in the top five ranked species) when compared to SASSA national anglers, who primarily capture two species of Rhinobatidae and three other larger bodies species. Importantly, the most commonly caught species of elasmobranch captured along the KZN coastline is the Endangered *Carcharhinus obscurus*. While this report did not assess the size-frequency distributions of the captured elasmobranchs, previous studies have shown that the majority of *Carcharhinus obscurus* captured along the KZN coastline are juveniles (Pradervand et al. 2007).

While we know these datasets have both spatial and temporal gaps, this study only allowed access to ~10 years of recent data, while the historical SASSA data is potentially available for future studies. This is highlighted by the rich dataset that the Oceanographic Research Institute (ORI) has been collecting and maintaining along the KwaZulu-Natal / northern Eastern Cape coastlines, which has been analysed in this report. Unfortunately, we were only able to acquire this league data for this area due to the dedicated efforts of ORI, but it is expected that these data should exist for the remainder of the coastline, as all SASSA franchises fish at least eight leagues a year. These data would also hold better spatial resolution and are expected to provide information on catch and effort along the southern Wild Coast in the Eastern Cape, where data is currently absent /unattained. Regarding the RASSPL dataset, we are confident that the entire dataset has been analysed, including all historical data as well as additional novel information from its commencement when the competitive format emerged in 2011.

While both competitive formats release their catch, RASSPL has a strict fish and shark handling strategy, while SASSA is dependent on each franchise's conservation ethics. While catch-and-release angling is better than killing catch (which was mandatory ~20 years ago; B. Wareham pers. comm.), it cannot be assumed that 100% of these captured elasmobranchs survive. The elasmobranch recreational post-capture mortality meta-analysis suggests an average shore-based post-capture release mortality rate of ~ 11%. In this dataset, SASAA anglers captured 27 194 individual elasmobranchs, while RASSPL anglers encountered 19 688 individuals. Together with 11% likely to succumb to angling-induced injuries, approximately 2 991 and 2 166 elasmobranch individuals would have perished, respectively. While this estimate must be taken cautiously, as the reviewed literature was not collected in a South African context, it is the current best-estimate. Furthermore, RASSPL proactively engages with researchers to continually update their handling rules to minimise their impact (Manneheim et al. 2018).

The easiest way to reduce the effect of recreational fishing-related post-capture mortality is through effective stakeholder engagement and angler education drives (Granek et al. 2008, Danylchuk et al. 2011, Sawchuk et al. 2015). This report has geographically highlighted areas along the South African coastline where management efforts through education and awareness should be prioritised based on competitive recreational angling effort distribution patterns. This includes the following areas and surrounds for SASSA national anglers: Mtinzini, Hamburg, Jeffery's Bay, Mossel Bay, Arniston, False Bay and Varkenvlei. For RASSPL anglers: the Sunshine Coast (Boknes – East London), Gqerberha, Mossel Bay, Arniston and False Bay. Areas of commonality between the effort distribution of both fishing formats where management effort should be prioritised should be: **The Sunshine Coast, Mossel Bay, Arniston and False Bay**. As for the KwaZulu-Natal coast, the most heavily fished areas based on angler effort are found south of Ballito, which corresponds with where the majority of the elasmobranch catches are made except for *Gymnura natalensis,* which are primarily captured on the north Coast between Ballito and Richards Bay.

To this end, a variety of stakeholder management strategies should be implemented to achieve sound conservation agendas that are also supported by the anglers themselves. Firstly, recreational anglers should be better included in the management decisions, and while it may be hard to include the opinions of hundreds of thousands of anglers, the Department of Forestry, Fisheries and the Environment (DFFE) needs to regulate the establishment of marine recreational fisheries peak bodies which represent the interests of recreational anglers, through which the DFFE can formally engage with stakeholders. For example, Fowler et al. (2023) suggested that without government-assisted independent peak bodies, there is little chance that the recreational sector will have an influence on fisheries policy or management. Another example in the South African context was the recent publicised ban on drone fishing, which, although misinterpreted by the recreational fishing sector, was only formally communicated to anglers by the DFFE in 2022, after the increase of drone use, despite the practice being commonplace since at least 2016 (Winkler et al. 2022). If the peak bodies were already established, concerns around the use of drones for fishing could have been communicated to the DFFE earlier and visa versa, enabling communication well before the industry had been established.

In terms of communication and educational strategies directed at recreational fishers, there is a dire need for improved accessibility to information to both young and old anglers entering the fishery, which can easily be done through the use of the Internet given that recreational angling licences have been sold online since October 2023[2].

Furthermore, best practice guidelines on how to correctly handle elasmobranchs to reduce post-capture mortality are required and can be communicated on the DFFE's website. Furthermore, educational signage should also be erected in coastal areas, such as in those identified in this report to achieve maximum influence.

More importantly, the regulation of the competitive angling fraternity should be of utmost importance (Diggles et al. 2011). Currently, unless a competition is held within a South African National Parks controlled area (Smith pers comm), or iSimangaliso MPA, there are no specific regulations or catch reporting required. While this report does not identify critically important shark and ray conservation areas in South Africa, the potential of an 11 % post-capture mortality rate in biologically important areas (i.e. pupping or feeding areas)

[2] https://www.dffe.gov.za/mediareleases/onlineapplication_recreationalfishingpermits

needs to be mitigated. This can be done via both scientific literature (Cliff and Olbers, 2022) and expert opinion, based on competition rules when fishing competitions are undertaken in areas where there are critical habitats and important areas for sharks and rays. Mitigation could include handling rules such as the use of buckets to reduce air exposure in small endemic sharks, the mandatory use of barbless circle hooks which will greatly reduce the potential for post-capture mortality during these fishing events (Brownscombe et al. 2017, Manneheim et al. 2018), as well as seasonal closures.

Furthermore, by targeting and influencing the competitive angling fraternity, pro-environmental sentiments and social fish-handling norms will be established and transferred to the general angling community who see competitive anglers as role models or champions on whom they can base their recreational fishing behaviour on (Farthing et al. 2022). Many of the top competitive recreational anglers are also angling guides, and often have a presence on social media platforms. It is expected that if the pro-environmental sentiments are broadcast by these guides to the general public, fewer fish are likely to succumb (Farthing et al. 2022). However, recreational fishermen who do not compete or follow angling groups on social media would require a different education and awareness avenue or tactic to be sufficiently reached on best handling practices.

Various hard regulatory changes that may help curb the decline of elasmobranchs along the South African coastline can be explored. However, up to 80% of interviewed recreational anglers in the South African marine shore-based fishery admitted to breaking the law and not abiding by government regulations when fishing (Bova et al. 2018). Simply prohibiting a specific species, such as a critically endangered species, will not stop anglers from catching them. A better approach may be to regulate specific actions that may increase the chance of elasmobranch survival when released, or decrease the chance of being caught. One such action might be to prohibit the use of J- and treble hooks when fishers are passively fishing, as these are known to increase hooking-induced mortality (Brownscombe et al. 2018). A legislative change that may reduce the use of elasmobranchs as bait, and follow similar teleost legislation, is to adopt a minimum size limit for all elasmobranch species based on length-at-50%-maturity. This is currently in place for all teleost species but not shark species. While elasmobranchs are generally not consumed by recreational anglers, there is a large fraternity of recreational anglers that fish for subsistence, and they may be consuming elasmobranchs in small numbers. Therefore, an outright elasmobranch retaining moratorium might affect this portion of the fraternity the most.

This report has also highlighted the potential utility of gathering catch and effort data from the competitive angling fraternity which can be used in stock assessments to identify species of conservation concern. The use of competitive angling catch data can be extremely reliable as it is self-regulated by the anglers themselves. Checks and balances are incorporated in competitive rules to reduce the chance of cheating and are policed by fellow anglers during competitions, meaning that the quality of the data being collected is reasonably high and potentially without the need for fisheries observers. In conclusion, engaging with the South African competitive angling community via the integrated management of competitive angling events, establishing recreational angling peak bodies, and undertaking informed recreational educational programs through angling role models, influencers and prominent competitive anglers, would improve the management of this fishing sector.

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6. Appendices

Appendix A1 - All elasmobranch species captured in SASSA National competitions 2011-2023 ranked by average CPUE over the entire period and locations. Parentheses after species name denote the current global IUCN status of each species.

Rank	Species	Common name	Family	CPUE (no.angler.day)
1st	Acroteriobatus annulatus (VU)	Lesser guitarfish	Rhinobatidae	1.35194
2nd	Acroteriobatus blochii (LC)	Bluntnosed guitarfish	Rhinobatidae	0.53754
3rd	Dasyatis chrysonota (NT)	Blue stingray	Dasyatidae	0.28565
4th	Gymnura natalensis (LC)	Backwater butterflyray	Gymnuridae	0.09626
5th	Mustelus palumbes (LC)	Whitespotted smoothhound	Triakidae	0.06704
6th	Carcharhinus brachyurus (VU)	Copper shark	Carcharhinidae	0.06671
7th	Sphyrna zygaena (VU)	Smooth hammerhead	Sphyrnidae	0.06640
8th	Myliobatis aquila (CR)	Eagleray	Myliobatidae	0.05962
9th	Triakis megalopterus (LC)	Spotted gullyshark	Triakidae	0.03756
10th	Carcharias taurus (CR)	Raggedtooth shark	Carchariidae	0.02676
11th	Pteromylaeus bovinus (CR)	Duckbill ray	Myliobatidae	0.02473
12th	Haploblepharus fuscus (VU)	Brown shyshark	Scyliorhininae	0.01688
13th	Carcharhinus obscurus (EN)	Dusky shark	Carcharhinidae	0.01447
14th	Raja straeleni (NT)	Biscuit skate	Rajidae	0.01381
15th	Poroderma pantherinum (LC)	Leopard catshark	Scyliorhininae	0.01214
16th	Carcharhinus brevipinna (VU)	Spinner shark	Carcharhinidae	0.00735
17th	Mustelus mosis (NT)	Hardnosed smooth-hound	Triakidae	0.00524
18th	Galeorhinus galeus (CR)	Soupfin shark	Triakidae	0.00513
19th	Poroderma africanum (LC)	Striped catshark	Scyliorhininae	0.00506
20th	Rhynchobatus djiddensis (CR)	Giant guitarfish	Rhinobatidae	0.00271
21st	Mustelus mustelus (EN)	Smoothhound	Triakidae	0.00208
22nd	Bathytoshia lata (VU)	Brown stingray	Dasyatidae	0.00201
23rd	Dasyatis brevicaudata (LC)	Short-tail stingray	Dasyatidae	0.00196
24th	Sphyrna lewini (CR)	Scalloped hammerhead	Sphyrnidae	0.00178
25th	Notorynchus cepedianus (VU)	Broadnose sevengill	Hexanchidae	0.00167
26th	Torpedo marmorata (VU)	Marbled electric ray	Torpedinidae	0.00149
27th	Rhizoprionodon acutus (VU)	Milkshark	Carcharhinidae	0.00105
28th	Dasyatis thetidis (VU)	Thorntail stingray	Dasyatidae	0.00090
29th	Carcharhinus melanopterus (VU)	Blacktip reef shark	Carcharhinidae	0.00062
30th	Himantura uarnak (VU)	Honeycomb stingray	Dasyatidae	0.00062
31st	Carcharhinus limbatus (VU)	Blacktip shark	Carcharhinidae	0.00059
32nd	Rostroraja alba (EN)	Spearnose skate	Rajidae	0.00054
33rd	Acroteriobatus leucospilus (EN)	Greyspot guitarfish	Rhinobatidae	0.00054
34th	Aetobatus narinari (EN)	Spotted eagleray	Aetobatidae	0.00019
35th	Torpedo fuscomaculata (DD)	black-spotted torpedo ray	Torpedinidae	0.00011
36th	Prionace glauca (NT)	Blue shark	Carcharhinidae	0.00006
37th	Carcharhinus sealei (VU)	Blackspot shark	Carcharhinidae	0.00003
38th	Raja clavata (NT)	Thornbay skate	Rajidae	0.00003

Appendix A2. All elasmobranch species captured in RASSPL league and National competitions 2011-2023 ranked by average CPUE over the entire period and locations. Parentheses after species name denote the current global IUCN status of each species.

Rank	Species		Family	CPUE (no.angler.day)
1st	Haploblepharus fuscus (VU)	Brown shyshark	Scyliorhininae	0.67598
2nd	Triakis megalopterus (LC)	Spotted gullyshark	Triakidae	0.28173
3rd	Acroteriobatus annulatus (VU)	Lesser guitarfish	Rhinobatidae	0.27438
4th	Poroderma spp (LC)	Catshark spp	Scyliorhininae	0.04696
5th	Poroderma africanum (LC)	Striped catshark	Scyliorhininae	0.03492
6th	Dasyatis chrysonota (NT)	Blue stingray	Dasyatidae	0.02630
7th	Mustelus mustelus (EN)	Smoothhound	Triakidae	0.01983
8th	Myliobatis aquila (CR)	Eagleray	Myliobatidae	0.01763
9th	Carcharias taurus (CR)	Raggedtooth shark	Carchariidae	0.01464
10th	Poroderma pantherinum (LC)	Leopard catshark	Scyliorhininae	0.00809
11th	Carcharhinus brachyurus (VU)	Copper shark	Carcharhinidae	0.00748
12th	Pteromylaeus bovinus (CR)	Duckbill ray	Myliobatidae	0.00308
13th	Carcharhinus obscurus (EN)	Dusky shark	Carcharhinidae	0.00273
14th	Callorhinchus capensis (LC)	Elephant fish	Callorhinchus	0.00216
15th	Sphyrna lewini (CR)	Scalloped hammerhead	Sphyrnidae	0.00186
16th	Galeorhinus galeus (CR)	Soupfin shark	Triakidae	0.00165
17th	Taeniura lymma (LC)	blue-spotted stingray	Dasyatidae	0.00096
18th	Gymnura natalensis (LC)	Backwater butterflyray	Gymnuridae	0.00095
19th	Mustelus palumbes (LC)	whitespotted smooth-hound	Triakidae	0.00059
20th	Taeniurops meyeni (VU)	Black-blotched stingray	Dasyatidae	0.00033
21st	Carcharhinus melanopterus (VU)	Blacktip reef shark	Carcharhinidae	0.00032
22nd	Notorynchus cepedianus (VU)	Broadnose sevengill	Hexanchidae	0.00028
23rd	Torpedo marmorata (VU)	Marbled electric ray	Torpedinidae	0.00020
24th	Torpedo fuscomaculata (DD)	black-spotted torpedo ray	Torpedinidae	0.00017
25th	Carcharhinus plumbeus (EN)	Sandbar shark	Carcharhinidae	0.00017
26th	Rostroraja alba (EN)	Spearnose skate	Rajidae	0.00015
27th	Raja straeleni (NT)	Biscuit skate	Rajidae	0.00015
28th	Squalus acanthias (VU)	Spiney dogfish	Squalidae	0.00013
29th	Dasyatis brevicaudata (LC)	Short-tail stingray	Dasyatidae	0.00010
30th	Holohalaelurus Punctatus (EN)	African spotted catshark	Scyliorhininae	0.00010
31st	Carcharhinus limbatus (VU)	Blacktip shark	Carcharhinidae	0.00006
32nd	Dasyatis thetidis (VU)	Thorntail stingray	Dasyatidae	0.00006
33rd	Sphyrna zygaena (VU)	Smooth hammerhead	Sphyrnidae	0.00005

Appendix A3. All elasmobranch species captured in KwaZulu-Natal SASSA league competitions during daylight hours between 2003-2023 ranked by average CPUE over the entire period and locations. Parentheses after species name denote the current global IUCN status of each species.

Rank	Species	Common Name	Family	CPUE (no.angler.day)
1st	Carcharhinus obscurus (EN)	Dusky shark	Carcharhinidae	0.30427
2nd	Acroteriobatus annulatus (VU)	Lesser guitarfish	Aetobatidae	0.19527
3rd	Carcharhinus brevipinna (VU)	Spinner shark	Carcharhinidae	0.18241
4th	Gymnura natalensis (LC)	Backwater butterflyray	Gymnuridae	0.16001
5th	Himantura gerrardi (EN)	Sharpnose stingray	Dasyatidae	0.11790
6th	Rhizoprionodon acutus (VU)	Milkshark	Carcharhinidae	0.10772
7th	Rhynchobatus djiddensis (CR)	Giant guitarfish	Rhinobatidae	0.09973
8th	Dasyatis chrysonota (NT)	Blue stingray	Dasyatidae	0.09788
9th	Mustelus spp	Houndshark	Triakidae	0.08284
10th	Sphyrna spp	Unidentified hammerhead sharks	Sphyrnidae	0.07707
11th	Scylliogaleus quecketti (VU)	Flapnose houndshark	Triakidae	0.06156
12th	Carcharhinus limbatus (VU)	Blacktip shark	Carcharhinidae	0.05658
13th	Mustelus mustelus (EN)	Smoothhound	Triakidae	0.05445
14th	Carcharhinus sealei (VU)	Blackspot shark	Carcharhinidae	0.04856
15th	Sphyrna lewini (CR)	Scalloped hammerhead	Sphyrnidae	0.04723
16th	Himantura leoparda (EN)	Honeycomb stingray	Dasyatidae	0.04399
17th	Carcharias taurus (CR)	Raggedtooth shark	Carchariidae	0.04182
18th	Acroteriobatus leucospilus (EN)	Greyspot guitarfish	Aetobatidae	0.03671
19th	Torpedo sinuspersici (DD)	Marbled electric ray	Torpedinidae	0.03022
20th	Pteromylaeus bovinus (CR)	Duckbill ray	Myliobatidae	0.02738
21st	Himantura spp	Unidentified stingrays	Dasyatidae	0.01557
22nd	Carcharhinus brachyurus (VU)	Copper shark	Carcharhinidae	0.01222
23rd	Myliobatis aquila (CR)	Eagleray	Myliobatidae	0.01208
24th	Poroderma pantherinum (LC)	Leopard catshark	Scyliorhininae	0.01178
25th	Carcharhinus leucas (VU)	Bull shark	Carcharhinidae	0.01166
26th	Halaelurus lineatus (LC)	Banded catshark	Pentanchidae	0.00566
27th	Carcharhinus plumbeus (EN)	Sandbar shark	Carcharhinidae	0.00531
28th	Requiem sharks	Unidentified requiem sharks	Carcharhinidae	0.00359
29th	Sphyrna zygaena (VU)	Smooth hammerhead	Sphyrnidae	0.00312
30th	Dasyatis thetidis (VU)	Thorntail stingray	Dasyatidae	0.00191
31st	Triakis megalopterus (LC)	Spotted gullyshark	Triakidae	0.00182
32nd	Aetobatus narinari (EN)	Spotted eagleray	Aetobatidae	0.00142
33rd	Prionace glauca (NT)	Blue shark	Carcharhinidae	0.00121
34th	Poroderma africanum (LC)	Striped catshark	Scyliorhininae	0.00121
35th	Stegostoma fasciatum (EN)	Zebra shark	Stegostomatidae	0.00097
36th	Scyliorhininae spp	Unidentified shysharks	Scyliorhininae	0.00091
37th	Acroteriobatus spp	Unidentified guitarfishes	Aetobatidae	0.00081
38th	Carcharhinus amboinensis (VU)	Java shark	Carcharhinidae	0.00061
39th	Carcharhinus amblyrhynchos (EN)	Grey reef shark	Carcharhinidae	0.00061
40th	Himantura fai (VU)	Roundnose stingray	Dasyatidae	0.00061
41st	Paragaleus leucolomatus (VU)	Whitetip weasel shark	Scyliorhininae	0.00061
42nd	Squatina africana (NT)	African angelshark	Squatinidae	0.00061

Appendix A4. All elasmobranch species captured in KwaZulu-Natal SASSA league competitions during night hours between 2003-2023 ranked by average CPUE over the entire period and locations. Parentheses after species name denote the current global IUCN status of each species.

Rank	Species	Common name	Family	CPUE (no.angler.day)
1st	Carcharhinus obscurus (EN)	Dusky shark	Carcharhinidae	0.25768
2nd	Acroteriobatus annulatus (VU)	Lesser guitarfish	Aetobatidae	0.21812
3rd	Rhizoprionodon acutus (VU)	Milkshark	Carcharhinidae	0.16661
4th	Carcharhinus brevipinna (VU)	Spinner shark	Carcharhinidae	0.15184
5th	Gymnura natalensis (LC)	Backwater butterflyray	Gymnuridae	0.14265
6th	Dasyatis chrysonota (NT)	Blue stingray	Dasyatidae	0.13556
7th	Sphyrna spp	Unidentified hammerhead sharks	Sphyrnidae	0.10777
8th	Himantura gerrardi (EN)	Sharpnose stingray	Dasyatidae	0.10684
9th	Carcharhinus limbatus (VU)	Blacktip shark	Carcharhinidae	0.10287
10th	Mustelus spp	Hound Shark spp	Triakidae	0.10153
11th	Rhynchobatus djiddensis (CR)	Giant guitarfish	Rhinobatidae	0.09717
12th	Carcharhinus sealei (VU)	Blackspot shark	Carcharhinidae	0.06167
13th	Mustelus mustelus (EN)	Smoothhound	Triakidae	0.05778
14th	Scylliogaleus quecketti (VU)	Flapnose houndshark	Triakidae	0.05048
15th	Acroteriobatus leucospilus (EN)	Greyspot guitarfish	Aetobatidae	0.04744
16th	Himantura leoparda (EN)	Honeycomb stingray	Dasyatidae	0.04729
17th	Sphyrna lewini (CR)	Scalloped hammerhead	Sphyrnidae	0.04678
18th	Pteromylaeus bovinus (CR)	Duckbill ray	Myliobatidae	0.04469
19th	Carcharias taurus (CR)	Raggedtooth shark	Carchariidae	0.04014
20th	Torpedo sinuspersici (DD)	Marbled electric ray	Torpedinidae	0.02591
21st	Poroderma pantherinum (LC)	Leopard catshark	Scyliorhininae	0.02254
22nd	Requiem sharks	Unidentified requiem sharks	Carcharhinidae	0.01305
23rd	Sphyrna zygaena (VU)	Smooth hammerhead	Sphyrnidae	0.01287
24th	Carcharhinus brachyurus (VU)	Copper shark	Carcharhinidae	0.01173
25th	Himantura spp	Unidentified stingrays	Dasyatidae	0.01155
26th	Carcharhinus leucas (VU)	Bull shark	Carcharhinidae	0.01134
27th	Acroteriobatus spp	Unidentified guitarfishes	Aetobatidae	0.00943
28th	Myliobatis aquila (CR)	Eagleray	Myliobatidae	0.00883
29th	Halaelurus lineatus (LC)	Banded catshark	Pentanchidae	0.00783
30th	Triakis megalopterus (LC)	Spotted gullyshark	Triakidae	0.00676
31st	Dasyatis thetidis (VU)	Thorntail stingray	Dasyatidae	0.00670
32nd	Aetobatus narinari (EN)	Spotted eagleray	Aetobatidae	0.00566
33rd	Carcharhinus plumbeus (EN)	Sandbar shark	Carcharhinidae	0.00519
34th	Squalidae spp	Unidentified spiny dogfishes	Squalidae	0.00464
35th	Poroderma africanum (LC)	Striped catshark	Scyliorhininae	0.00371
36th	Galeocerdo cuvier (NT)	Tiger shark	Carcharhinidae	0.00260
37th	Carcharhinus amboinensis (VU)	Java shark	Carcharhinidae	0.00167
38th	Himantura fai (VU)	Roundnose stingray	Dasyatidae	0.00120
39th	Rostroraja alba (EN)	Spearnose skate	Rajidae	0.00112
40th	Notorynchus cepedianus (DD)	Broadnose sevengill shark	Hexanchidae	0.00056
41st	Mustelus mosis (NT)	Hardnosed smooth-hound	Triakidae	0.00056
42nd	Squatina africana (NT)	African angelshark	Squatinidae	0.00056
43rd	Taeniura melanospilos (VU)	Round ribbontailray	Dasyatidae	0.00056