
Recommendations to reduce ecological and socio-economic impacts of South African Inshore Trawl Fishery due to overlap with other fisheries, bycatch and habitat destruction.

1. INTRODUCTION

Bottom trawling is an unselective fishing technique, that has a high by-catch of non-target species and due to the nature of the fishing gear, it disturbs seafloor habitats and ecosystem structure. There is concern for significant impacts on biodiversity, especially for endangered species and fragile benthic ecosystem types that occur within the trawl footprints. There is also potential for significant conflict between trawl fisheries and other fishery types, including large and small-scale commercial, and recreational fisheries. There is a spatial overlap with these fisheries, and with non-consumptive ocean user activities related to tourism and recreation, that have a high dependence on healthy ocean areas.

An assessment of the South African inshore trawl fishery was undertaken by Anchor Environmental Consultants, commissioned by the WILDTRUST and supported by the Oak Foundation. The goal of this study was to gain an understanding of the interactions of the inshore trawl fishery with other coastal fisheries, spatial overlaps, and the social, economic, and ecological/biodiversity impacts of the inshore trawl fishery on other ocean users. Furthermore, this work aimed to identify legal and policy options and mechanisms while providing recommendations to reduce identified conflicts and impacts of adverse interactions and impacts between the inshore trawl fishery and other fisheries, and management measures to reduce spatial overlaps, negative habitat and by-catch issues.

The Full Report entitled “**An Assessment of the Inshore Trawl Fishery in South Africa**” by Rees et al (2023)¹ can be downloaded via this link:

https://drive.google.com/file/d/14BYdCcVPwP1RRJ46R1duw5JGdHP7QCQW/view?usp=drive_link.

This study assessed the type, and extent, of overlap between the inshore trawl fishery and other commercial fisheries operating within or adjacent to its footprint. This work aimed to gain an understanding of the South African inshore trawl fishery and its interactions with and impacts on other fisheries, including on the socio-economic health of other fisheries and livelihoods of coastal communities. As part of the assessment, the project aimed to improve knowledge of the impacts of the fisheries on Endangered, Threatened and Protected (ETP) species and habitats. A cumulative GIS-based assessment was done using up-to-date fisheries catch and effort data from the Department of Forestry, Fisheries and the Environment (DFFE), as well as numerous other data sources for biodiversity (species and ecosystems), and fisheries and their socio-economic characteristics. These data sources included peer-reviewed literature, systematic conservation planning outputs, unpublished reports and literature, observer data, face-to-face consultations, and online interviews with rights holders/or and representatives from fishery associations.

At a national scale, cumulative assessments of fisheries are required to fully understand the cumulative impact of multiple fisheries that typically occupy the same or similar space and target a range of cross-cutting resources that

¹ Rees A, Hutchings, K & Clark B. 2023. *An assessment of the inshore trawl fishery in South Africa. Specialist Report no. 1997/1 prepared by Anchor Environmental Consultants (Pty) Ltd for WILDOCEANS, a program of the WILDTRUST, 232 pp.*

support a number of different fisheries/fishing sectors. Understanding these interactions can help underpin better management of both fishing activities and exploited resources. Identifying such measures, their designation processes, potential benefits, drawbacks, and underpinning policy is rarely well understood, despite numerous fisheries management tools often being available. The cumulative assessment of the inshore demersal trawl fishery undertaken here is one of the first of its kind and identifies several issues that arise from direct and indirect interactions with overlapping fisheries. The overlap is defined in three dimensions: spatial overlap, temporal overlap, and resource exploitation overlap, and considers the cumulative exploitation of key fishery resources. A review of potential and existing management tools was performed, and the application of these measures as solutions are presented.

This document provides a summary of the key findings outlined in the Full Report and highlights key actionable recommendations to reduce spatial conflicts with other ocean users and to address socio-economic impacts on other fisheries and livelihoods of coastal communities and impacts on biodiversity.

2. KEY FINDINGS

2.1 Interactions between the inshore trawl fishery and other fisheries

There are 22 commercial fisheries in South Africa, including four trawl fisheries (Hake inshore bottom-trawl, Hake offshore bottom-trawl, Horse mackerel midwater trawl, inshore Prawn bottom-trawl). The inshore demersal (bottom) trawl overlaps in catch composition with both the demersal offshore and midwater trawl sectors but not with the KZN prawn demersal trawl fishery, because it operates only on the south and south-east coast of South Africa between Cape Agulhas and Port Elizabeth. The demersal trawl sector primarily targets hake (*Merluccius* spp.), but other species such as Agulhas (or East Cape) sole (*Austroglossus pectoralis*) and Cape horse mackerel (*Trachurus capensis*) are also of commercial importance. The hake-directed fisheries in South Africa target two species, the deep-water Cape hake (*M. paradoxus*) and the shallow-water Cape hake (*M. capensis*). The sector is divided into both an inshore and an offshore sector. Combined, these sectors have been Marine Stewardship Council (MSC) certified since 2014.

The inshore demersal trawl fishery (with 8-10 trawlers operating) is comprised of both hake (*Merluccius* spp.) and East Coast Sole (*Austroglossus pectoralis*) directed fisheries that largely fish in the same way but are spatially separated. Both hake- and sole-directed trawlers in the inshore fleet have diverse catches with high levels of utilisation, and there is an economic reliance on a broader range of fish species than hake and sole. The inshore trawl sector thus operates as a mixed-species fishery. The inshore demersal trawl fishery overlaps with at least eight other fishing sectors (in respect of fishing grounds, target, or bycatch species) including:

1. Mid-water trawl fishery
2. Commercial line fishery
3. Hake long-line fishery
4. Squid jig line-fishery
5. Large pelagic longline
6. Small pelagic purse seine fishery
7. Small-scale subsistence/livelihoods-based fishers
8. Recreational fishers (shore and boat-based line fishing)

2.2 Spatial and resource conflict between the inshore trawl fishery and other fisheries

The inshore trawl footprint is shown in Figure 1 below.

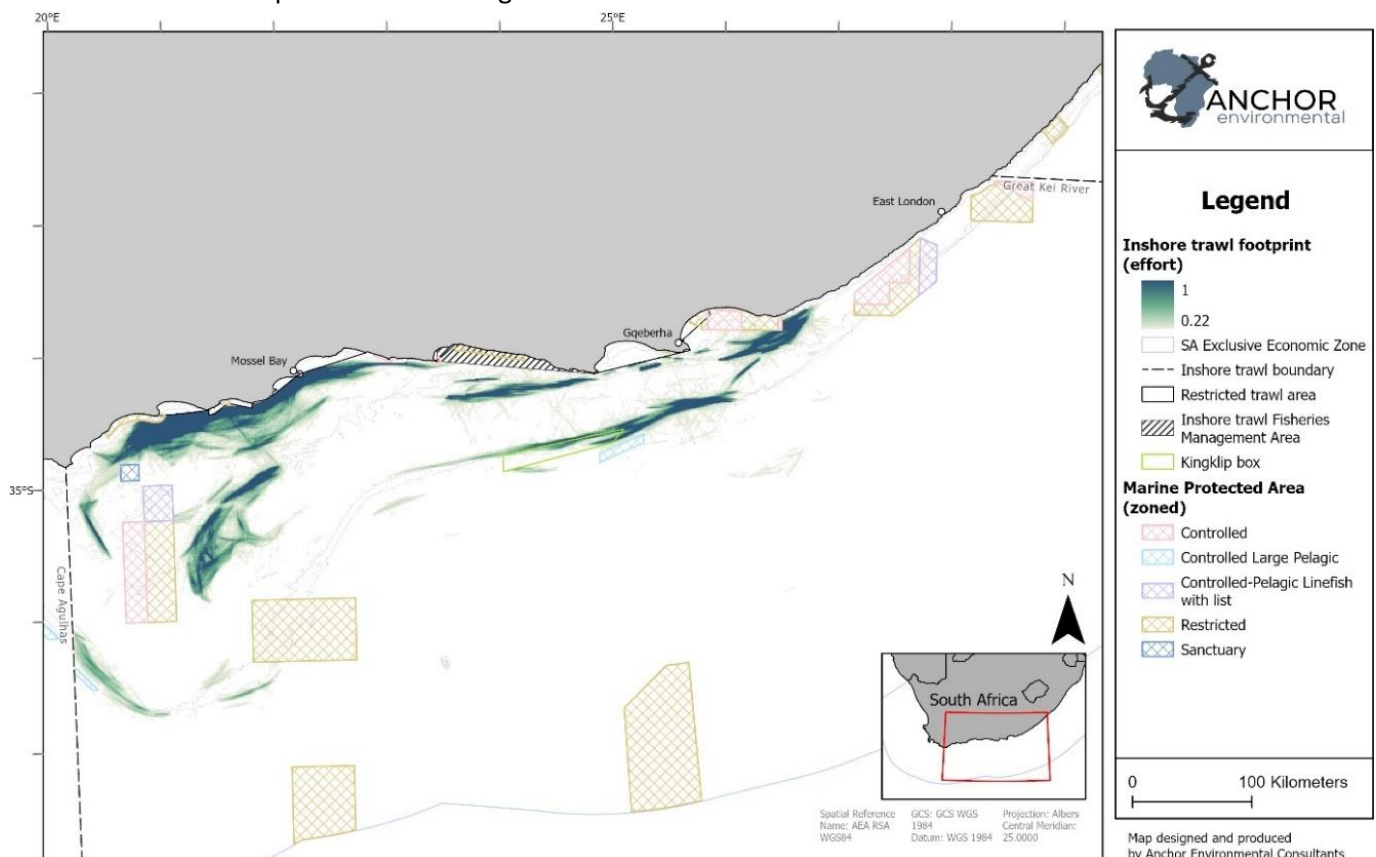


Figure 1: Effort 'Footprint' of the inshore demersal trawl fishery of South Africa. The footprint is scaled (by colour) in terms of frequency of trips being a proxy measure for relative fishing effort. Dark blue areas = most effort. Marine Protected Areas and other spatial restrictions are overlaid (For an explanation of Marine Protected Area types see Error! Reference source not found.). Data are from DFFE for the period 2009-2019.

Using spatial analysis techniques and mapping of the inshore trawl footprint together with the other overlapping fisheries, it was found that where fishing effort is greater than 80% i.e., fished heavily between the inshore demersal trawl and at least one other fishery, the area of greatest overlap occurs on the outer shelf along the 200 m depth contour. Here, there are four fisheries overlapping with the inshore demersal trawl spatial footprint, namely the inshore demersal trawl, midwater trawl, large pelagic longline and the squid fishery, who all fish this outer shelf edge of -200m. This shared area is just over 1000km² (See Figure 2; or Fig 5-8 in the full report).

The greatest degree of spatial overlap between the inshore trawl fishery and the commercial line fishery occurs within 15 km of the coastline around Mossel Bay, with a total of 342 km² shared marine area. There is also some overlap within Mossel Bay itself between the inshore demersal trawl and small pelagic purse seine fishery (374 km²), while the inshore demersal trawl and squid fisheries share the marine area just offshore from Plettenberg Bay, running westwards along the 100m depth contour (shared area of 647 km²). The squid fishery, commercial line fishing and inshore demersal trawl fishery also share the grounds to the east of the Addo Marine Protected Area.

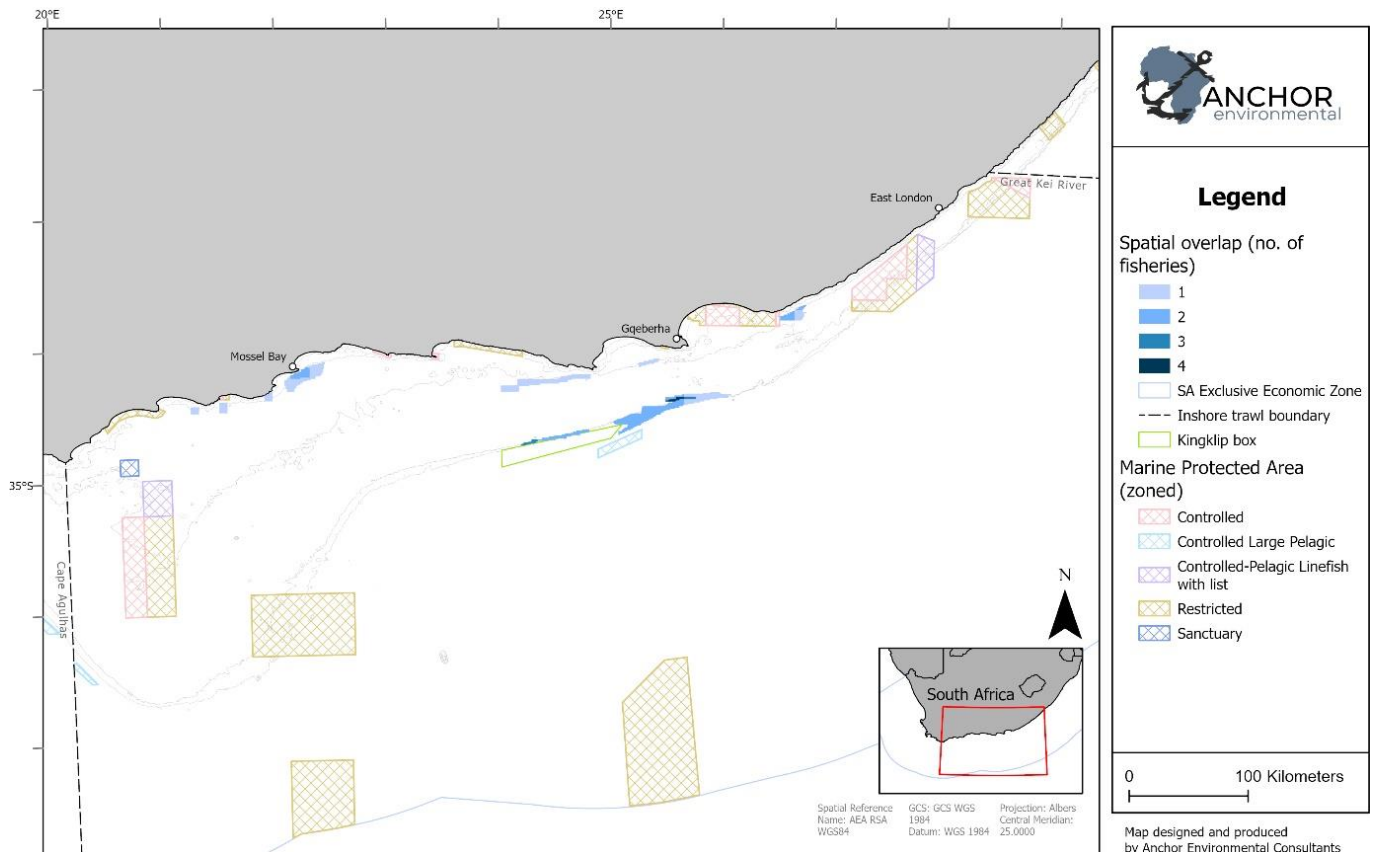


Figure 2 (from Fig 5-8, in Full Report). Areas of Overlap between the inshore demersal trawl fishing grounds and each of the assessed fisheries. Lightest blue indicates the least number of overlapping fisheries, i.e. at least two fisheries, inshore trawl and one other). Darkest blue indicates the greatest number of overlapping fisheries (maximum number of four fisheries).

Table 1, overleaf, summarises spatial or resource conflict between the inshore trawl fishery and other fisheries, the socio-economic characteristics of these fisheries, where overlaps and impacts may occur with inshore trawl, and recommendations for resolving these conflicts and/or impacts. To understand the socio-economic impacts of the South African inshore trawl fishery, and in particular its interactions with, and influences on, the livelihoods of coastal communities, it is imperative to understand the mechanisms of these interactions, including where these interactions are taking place, why are there impacts or conflicts occurring, and what other socio-economic interactions are in play with the fisheries. Table 2 attempts to unpack the complexities of the socio-economic interactions while making recommendations to resolve conflicts and impacts.

Table 1: Fisheries that conflict spatially or in terms of species with inshore trawl fishery in South Africa, the socio-economics of these fisheries, where overlaps and conflict may occur with inshore trawl, and recommendations for resolving these conflicts and/or impacts.

Fisheries conflicted with	Socio-economic considerations	Where spatial or resource conflict may occur	Why conflicts exist and/or where there is potential for conflict with the inshore trawl fishery	Recommendations for resolving conflicts and impacts
Midwater trawl	<ul style="list-style-type: none"> Consistent percentage contribution of approximately 13% of total trawl landings in South Africa (just over 20 000 tonnes, 94% of which was Cape horse mackerel) 	<ul style="list-style-type: none"> Agulhas Bank, near continental shelf break where adult stocks of horse mackerel aggregate. 	<ul style="list-style-type: none"> Bycatch in hake trawl fishery and small pelagic purse seine fishery 	<ul style="list-style-type: none"> Minimise bycatch by having strict bycatch limits in place for hake trawl fisheries Observers to monitor compliance
Commercial line fishery	<ul style="list-style-type: none"> Low-earning, labour intensive industry Despite having largest fleet, contributes only 6% of total estimated value of all SA marine fisheries Important fishery from human livelihood point of view Employs 27% of all fishers (lowest average employment income of all South African fisheries) 	<ul style="list-style-type: none"> Area of Agulhas Bank east of Cape Agulhas between shelf-edge upwelling and cold water ridge (spawning ground for commercially important fish i.e. Silver kob) 	<ul style="list-style-type: none"> Significant joint resource exploitation (species conflict) 18 linefish species landed by inshore trawl, often as bycatch, particularly silver kob and carpenter. Kob third most important linefish species in terms of value 	<ul style="list-style-type: none"> Improvement of the sustainability of target (linefish) and bycatch fisheries (inshore trawl) by: <ul style="list-style-type: none"> - Introducing a winter closed area on offshore Agulhas banks east of Cape Agulhas for sole-directed trawl to seasonally protect part of silver kob spawning ground i.e. FMA. - Reduce kob move-on threshold from 20% to 10% of total weight in permit conditions for sole-directed trawl (supported by widespread observer programme)
Hake long-line fishery	<ul style="list-style-type: none"> Most valuable of all SA fisheries Approximates 3.2% of value for marine commercial fisheries in SA 70% exported High operating costs: challenges with cost of labour, unstable currency, and cost of fuel Labour intensive with majority of crew low-skilled deckhands 	<ul style="list-style-type: none"> Nearshore coastal areas around Mossel Bay (Cape Infanta, Still Bay and surrounds) 	<ul style="list-style-type: none"> Gear type with longline sets increasingly being deployed on grounds also used by the inshore trawl industry 	<ul style="list-style-type: none"> Measures (spatial and temporal options) to mitigate this conflict should be considered i.e. FMAs and/or PFAs to separate these two fisheries.

	<ul style="list-style-type: none"> • Provide 1500- 2000 jobs (crew, factory and office) 			
Squid jig fishery	<ul style="list-style-type: none"> • Hand-held jigs used making fishery particularly labour intensive • 99% exported • Volatility in squid availability implies high economic risk and contingency budgeting to maintain economic viability and sustaining employment • Provides employment for approximately 3000 locals (mostly in Eastern Cape where sector is predominantly based) 	<ul style="list-style-type: none"> • South Coast inshore area between Danger Point and Cape Agulhas (important settlement area for juvenile squid) 	<ul style="list-style-type: none"> • Annual average landings approximately 119 tonnes and mostly juvenile squid caught as bycatch by hake-directed inshore demersal trawl 	<ul style="list-style-type: none"> • Temporal FMA to exclude inshore demersal and mid-water trawl during juvenile squid settlement area between Danger Point and Cape Agulhas
Large pelagic longline	<ul style="list-style-type: none"> • Provides significant employment of fishermen, crew, workers in industry for processing, marketing and distribution • More than 90% exported 	<ul style="list-style-type: none"> • Minimal overlap along inshore trawl boundary 	<ul style="list-style-type: none"> • Potential conflicts due to longlines having unpredictable movements as they drift with currents and into areas where they could become entangled with the gear of other activities. 	
Small pelagic purse seine	<ul style="list-style-type: none"> • Approximately 700 sea-going staff • Frozen sardine sold as bait for local use in line, longline, tuna pole, international longline boats for use as bait • Canned sardine sold locally and regionally in SA but TAC below 250 000 tonnes leaves local pelagic fishery unable to meet domestic and regional demand 	<ul style="list-style-type: none"> • < 110 m in nearshore areas around Mossel Bay and Gqeberha 		
Small-scale commercial and subsistence fishers	<ul style="list-style-type: none"> • Important role in South Africa's coastal communities, providing food and income for thousands of people 	<ul style="list-style-type: none"> • Entire coastline but particularly South coast of South Africa 	<ul style="list-style-type: none"> • Small-scale fishers target resources in both marine and estuarine realms 	<ul style="list-style-type: none"> • Careful monitoring of shared resources with potential increased fishing pressure expected

	<ul style="list-style-type: none"> Challenges in limited access to fishing grounds, declining fish stocks, lack of infrastructure and resources for monitoring and enforcement Small-scale fisheries contribute less than 1% to South Africa's GDP, but they play an important role in the provision of protein and employment for an estimated 136 coastal communities distributed along South Africa's ≈3 000 km coastline in both urban and rural areas Subsistence fishers specifically non-commercial and non-recreational 		<ul style="list-style-type: none"> Priority in linefish rights allocations and species set aside for small-scale fishing sector limiting permits to other fisheries sectors. Snoek, Hottentot and Yellowtail fish species are harvested by small-scale fishers and these species are also important for the commercial linefishery and inshore demersal trawl fishery. Groups operating mainly close to shore have less direct overlap with the demersal trawl and other commercial sectors. However, resource sharing between these sectors is likely. Accordingly, there could be indirect effects related to the extent of exploitation of marine resources by competing commercial fishing sectors. There is thus concern by small-scale groups that an adverse impact on the integrity of marine ecosystems caused by overfishing would impact their catch 	<ul style="list-style-type: none"> FMA's that allow only small-scale fishing in priority areas for coastal community livelihoods (i.e. trawl exclusion areas) Multi-zoned MPAs that allow line-fishing for robust (non-threatened) species of fish, but exclude trawling and mining
Recreational fishers	<ul style="list-style-type: none"> In contrast to small-scale commercial fishing enterprises, recreational fishing is a sport/leisure activity. Participation of approximately 1.32 million recreational fishers (around half targeting linefish and rock lobster) 		<ul style="list-style-type: none"> Recreational fishers operating mainly close to shore have less direct overlap with the demersal trawl and other commercial sectors. 	<ul style="list-style-type: none"> FMA's that allow only line-fishing in priority areas for coastal community livelihoods linked to jobs and benefits from tourism activities

			<p>However, resource sharing between these sectors is likely. Accordingly, there could be indirect effects related to the extent of exploitation of marine resources by competing commercial fishing sectors. There is thus concern by recreational fishing, where it is an important attractant for the tourism and hospitality industry in coastal areas, and thus an activity which supports coastal community livelihoods with tourism job opportunities.</p>	<ul style="list-style-type: none"> Multi-zoned MPAs that allow line-fishing for robust (non-threatened) species of fish, but exclude trawling and mining
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2.3 Species impacts and interactions amongst inshore trawl fishery and other fisheries

The key targeted species, bycatch species, habitats, biodiversity and Endangered, Threatened & Protected (ETP) species for fisheries that overlap with the Inshore Trawl Fishery are summarised below in Table 2.

Table 2: Key targeted and bycatch species of the inshore trawl fishery and other fisheries that overlap with it, including biodiversity, habitat and ETP species impacts of these fisheries.

Type of fishery, their operations and effort	Species composition and bycatch	Fisheries considerations
		Biodiversity, habitat and ETP species impacts
<p>Inshore trawl fishery</p> <ul style="list-style-type: none"> Dragging a fishing net ('otter' trawls used in South Africa) behind a vessel, or between two vessels 	<ul style="list-style-type: none"> <i>Target species:</i> Defined as a 'mixed fishery' targeting predominantly Hake (<i>Merluccius</i> species), deep-water Cape hake (<i>M. paradoxus</i>) (80%) and shallow-water Cape hake (<i>M. capensis</i>). Agulhas (Or East Cape) sole (<i>Austroglossus pectoralis</i>) and Cape horse mackerel (<i>Trachurus capensis</i>) are also of commercial importance. 	<ul style="list-style-type: none"> A concern with the inshore trawl fishery is its impact on the diverse populations of non-target species on the shallow parts of the Agulhas Bank. The inshore trawl fishery takes a substantial bycatch which may impact other fishery sectors negatively or have wider ecological impacts. Concerns over catches of juveniles of hake and linefish species such as Silver kob and geelbek have been raised

<ul style="list-style-type: none"> • The inshore demersal trawl fleet is comprised of wetfish trawlers on which the fish is mainly just gutted and preserved on ice • ~10-30 crew per vessel • Operate in depths of 80 - 110 m although no explicit limits to the depth are specified. (Theoretically inshore hake trawlers can fish in offshore hake grounds) • In the last three decades highest fishing effort occurred between Cape Infanta and Mossel Bay, and to a lesser degree east of Algoa Bay • Effort is focused on muddy and sandy ecosystem types in the mid shelf. • The demersal inshore trawl sector tends to have smaller vessels and smaller nets than the offshore sector, with drag durations of 1-6 hours and towing speeds of 2.5-4 knots. • Cod-end mesh must be > 90mm for hake directed fishery and >75mm for sole directed fishery. 	<ul style="list-style-type: none"> • Bycatch higher in inshore than offshore sectors • 10 'primary' species (Hake (<i>Merluccius</i> spp.), East Coast sole (<i>Austroglossus pectoralis</i>) horse mackerel (<i>Trachurus capensis</i>), panga (<i>Pterogymnus laniarius</i>), St Joseph shark (<i>Callorhinchus capensis</i>), gurnard (<i>Chelidonichthys</i> spp.), Skates and Rays (Rajiformes), Chokka (squid) (<i>Loligo reynaudii</i>) and monk (<i>Lophius vomerinus</i>)) and a diversity of 'secondary species' (e.g., sharks, other demersal teleosts, kob (Silver and Dusky kob), squid) are caught and landed. • Discarded catch comprises undersized hake and a range of species including rattails, sharks, skates, squid, ribbonfish (<i>Lepidopus caudatus</i>), jacobever (<i>Helicolenus dactylopterus</i>), and dory (<i>Zeus capensis</i>). • 137 nominal species documented by observers monitoring this fishery between 2003 and 2006 • Analysis of catch and effort data from both the hake and sole directed inshore demersal trawl fisheries show an average bycatch rate of close to 55%. 	<ul style="list-style-type: none"> • The uncertain stock status of Agulhas Sole is also a biodiversity interaction of concern due to unknown acceptable levels of exploitation • Concern has been expressed about the volume of the bycatch, including gurnards <i>Chelidonichthys</i> spp., skates <i>Raja</i> spp., stingrays (mostly <i>Myliobatis aquila</i>), and sea breams (family Sparidae).
		<ul style="list-style-type: none"> • In addition to bycatch, internationally documented impacts of trawling on marine biota encompass seabed and benthic communities and habitats. These may include increases in smaller and faster growing taxa, reduced abundance of larger slower growing taxa, attraction of scavengers, reduced habitat complexity, and mortality of infauna and epifauna. • Trawling over time, together with climate influences, is likely to have effected changes in the distribution and composition of demersal fish assemblages. i.e., Kob (<i>Argyrosomus</i> spp.), panga, sole (<i>Austroglossus pectoralis</i>), carpenter (<i>Argyrozona argyrozona</i>) and white stumpnose (<i>Rhabdosargus globiceps</i>) appear significantly less abundant than historically while spiny dogfish (<i>Squalus</i> spp.), Cape horse mackerel and gurnards appear more abundant • 14 ETP species are identified as likely to be caught by the inshore demersal trawl sector and a further 4 species are classed as 'Near Threatened' with decreasing populations and are caught in significant quantities by the inshore demersal trawl sectors. These • Near Threatened species are carpenter (<i>Argyrozona argyrozona</i>), geelbek (<i>Atractoscion aequidens</i>) monk (<i>Lophius vomerinus</i>) and the Biscuit skate (<i>Raja straeleni</i>).

<p>Midwater trawl</p> <ul style="list-style-type: none"> • Nets are larger than bottom trawl nets designed to target pelagic rather than demersal and does not interact with seafloor • Trawl duration averages 2.5 hours at 5 knot speed 	<ul style="list-style-type: none"> • <i>Target species:</i> Cape Horse Mackerel • Targeted at night when they disperse off seabed to feed on plankton in midwater • Catches range between 8 000 - 31 000 tonnes annually. • <i>Bycatch species</i> include club mackerel, redeye ribbonfish, round herring, hakes, snoek and chokka squid as well as large fauna including sharks, rays and marine mammals. • Bycatch is estimated at 6.9% weight of total catch, however high catch volumes and low observer sampling suggest high estimation errors for rare species and unmonitored bycatch. 	<ul style="list-style-type: none"> • Uncertain status of horse mackerel resource with recent declines in catch rates • Cape horse mackerel is important component of the Benguela ecosystem as an important food resource for other fish (i.e. hakes) and marine mammals.
<p>Commercial line-fisheries</p> <ul style="list-style-type: none"> • Operates year-round around entire coast of SA • Highly mobile fleet • 455 skiboats • Average of 7 crew per vessel 	<ul style="list-style-type: none"> • <i>Key species:</i> snoek, hottentot, yellowtail, slinger, santer, carpenter, kob, chub mackerel, geelbek • Target species typically predatory in nature i.e. apex predators such as sharks, groupers, tunas and large seabreams. • Annual average: 5000 tonnes (underreported) 	<ul style="list-style-type: none"> • Declines could have significant consequences for the species that rely on cape horse mackerel as a food resource (some of which are ETP species) • Many bycatch species are of conservation concern, particularly several threatened and CITES Appendix II listed shark species, giant manta, devil ray species, sunfish, bottlenose dolphins and Cape fur seals.
		<ul style="list-style-type: none"> • Potential to be one of most ecologically and economically viable fisheries in SA • Highly selective fishing methods help avoid bycatch of unwanted species and undersized fish • Poor stock status and outdated stock assessments for many species and potential impact of reduced populations on ecosystems • Poor compliance and exploitation in other fisheries may hamper recovery of some species
		<ul style="list-style-type: none"> • Many targeted species susceptible to overexploitation due to vulnerable life-history traits • Targeting of sharks, many of which are ETP species when high-value teleost unavailable i.e. smoothhound, soupfin, spiny dogfish and several carcharhinids (dusky and bronze whalers)

<p>Hake longline fishery</p>	<ul style="list-style-type: none"> • <i>Target species:</i> shallow water hake (70% of south coast catch) and deep-water hake (90% of west coast catch) • TAC 9113 tonnes (2021) • 15.76 tonnes of bycatch (2021) with at least 17 species including chondrichthyans and teleosts • Sharks are second highest discarded species, by weight). • Kingklip is primary retained bycatch species (24.2% of catch) 	<ul style="list-style-type: none"> • Uncertainties in stock structure and status for Kingklip • Changes in community structures of VMEs highlighted with potential impacts to habitat-forming species such as deep-sea corals and sponges • Concerns regarding incidental interactions and mortality of vulnerable, non-target species i.e., seabirds, sharks, and turtles • Damage caused to marine benthic habitats and sessile fauna by moving longlines can be significant in reducing diversity and abundance of associated invertebrate and fish species. • Vulnerability of habitats that host VMEs (and VMEs themselves) depend on habitat extent within the longline footprint which is not well understood.
<p>Squid jig fishery</p> <ul style="list-style-type: none"> • 2451 permits, 79 rightsholders, 123 vessels (2013) • Highly variable catch patterns 	<ul style="list-style-type: none"> • <i>Target species:</i> Cape Hope squid (Chokka) • Fishery licensed to only carry squid jiggling gear onboard, therefore, no well-known bycatch issues. 	<ul style="list-style-type: none"> • Chokka squid is currently green under WWF SASSII • Uncertainty over impact of use of bright lights at night • Relatively little impact on other species • Overall low impacts on biodiversity • Localised damage to seabed and squid beds may occur during deployment of fishing boat anchor chains
<p>Large Pelagic longline fishery</p> <ul style="list-style-type: none"> • Operates year-round despite peaks in abundance of certain target species • 60 new fishing rights allocated in 2017 (34 domestic registered vessels and three foreign) • Up to 3500 baited hooks attached to mainline between 25-100km in length 	<ul style="list-style-type: none"> • <i>Target species:</i> large, highly mobile, predatory fish including bigeye tuna, yellowfin tuna, southern bluefin tuna and swordfish • <i>Bycatch species:</i> mainly blue and mako sharks contributing to approximately 47% of total catch • 2613 tonnes landed (2017) 	<ul style="list-style-type: none"> • Great ecological concern over unintentional catch of seabirds and marine turtles, including ETP species that have IUCN Red List status • 15 seabird species, 7 of which are threatened. • Concerns about stock and global conservation status of <i>Endangered</i> southern bluefin tuna and despite generous quota allocations, stock is estimated to be 20%. • Discarding blue sharks by selective fishing for tuna and swordfish has greater impact on their fishing mortality than retention. • Stock status of many sharks uncertain due to paucity of data.

		<ul style="list-style-type: none"> • <i>Vulnerable</i> white-chinned petrel is most frequently caught, with <i>Endangered</i> black-browed and yellow-nosed albatrosses and <i>Critically Endangered</i> Tristan albatross also caught. • Bycatch of pelagic sharks, particularly blue and mako sharks remain high. • Numerous other Red Listed shark species caught • Contravention of CITES Appendix II is high with shortfin mako fins second most traded fins in and out of SA- • Incidental catch of prohibited species such as white sharks and red steenbras remain of primary concern in terms of biodiversity impacts from this sector
<p>Small pelagic purse seine</p> <ul style="list-style-type: none"> • Operates year-round following target species natural migrations • 101 vessels • High levels of variability 	<ul style="list-style-type: none"> • <i>Target species:</i> sardines and anchovy with round herring targeted to a lesser extent • <i>Bycatch species</i> include mesopelagic fish (lantern and light fish) • Juvenile horse mackerel, sardine and round herring are caught as bycatch with anchovy-directed operations and processed into fishmeal and oil • Between 200 000 – 700 000 tonnes caught (2020-2021) 	<ul style="list-style-type: none"> • Uncertainty in stock structure remains biggest biodiversity concern. • Role of fishing on observed eastward shift of sardine distribution needs to be fully understood as well as dumping of unwanted bycatch and undersized catch. • Bycatch of juvenile sardine and horse mackerel in anchovy directed fishery is ongoing concern. • Small pelagic target species (Lower Trophic Level species) are the foundation for food webs in both Benguela and Agulhas ecosystems. Their availability in the food chain and wider ecosystem can impact a range of species supported by this food source. <hr/> <ul style="list-style-type: none"> • Small pelagic target species (Lower Trophic Level species) are the foundation for food webs in both Benguela and Agulhas ecosystems. Their availability in the food chain and wider ecosystem can impact a range of species supported by this food source. This is of concern for various ETP species including numerous marine mammals, seabirds and shark species. • Impacts of reduced food available for <i>Endangered</i> African penguin is the subject of major concern.

<p>Small-scale commercial and subsistence fishery</p> <ul style="list-style-type: none"> • Takes place along entire SA coastline • Individuals or small groups employing traditional or low-tech fishing gear and methods. - Recreational fishing occurs along almost the entire stretch of coast of interest and is intensive all year round. - Subsistence fishing occurs at medium intensity periodically along this coastline coinciding with coastal towns and cities in each province. 	<ul style="list-style-type: none"> • Small-scale fishing methods target more than 30 species from a range of habitats. • <i>Target species by small-scale fishers:</i> fin-fish, mussels, octopus, rock lobster, sand and mud prawns, limpets and red bait, periwinkle (alikleukel), crabs, rock lobster, oysters, seaweed, sea lice, worms and abalone are generally and traditionally the most harvested resources. 	<ul style="list-style-type: none"> • The biodiversity concerns regarding small-scale fishers and subsistence harvesting relate to the over harvesting of intertidal resources. • Removal of key intertidal species, the clearing of species that include mussels and limpets can affect the abundance, sex ratios and population dynamics of both the target species and indirectly impact other intertidal communities. • Shoreline and boat-based
<p>Recreational fishery</p>		<ul style="list-style-type: none"> • Shoreline and boat-based • Many shark species are also known to be targeted by these sectors. • Recreational fisheries target sharks in certain areas and during certain seasons. • Species such as the soupfin shark and smoothhound species are targeted, as well as larger shark species such as the dusky shark, copper shark, some hammerhead shark species and several skate and ray species.

3. RECOMMENDED MEASURES TO REDUCE CONFLICT AND IMPACTS OF INSHORE TRAWL FISHERY

3.1 Fisheries Management and Biodiversity Protection measures provided for in the existing Legislative Framework

There are two primary tools to manage natural marine resource use and protect marine biodiversity in South Africa. The Marine Living Resources Act 18 of 1998 (MLRA) where the DFFE is responsible for (amongst other roles) the allocation of long-term fishing rights, annual fishing permits, setting of catch (e.g., Total Allowable Catch (TAC)) and other harvest control and processing measures, as well as compliance monitoring. A further provision of the MLRA, to enable effective fisheries management is that of other spatial management instruments in the form of fisheries management areas (FMAs) and priority fishing areas (PFAs). As per the MLRA, regarding FMAs *“the Minister may ... declare any area of the South African waters to be a fisheries management area for the management of the species described in the notice”*. With regards to PFAs, *“if special measures are necessary to ensure that authorised fishing within any area of the South African waters is not impeded or otherwise interfered with”*, the Minister may *“declare such an area to be a priority fishing area”* and *“prohibit any activity”*. In essence, *FMAs mitigate or resolve conflict between competing fisheries, or between fisheries and the environment, while PFAs are seen as an instrument to mitigate or resolve conflict between fisheries and other marine users, such as the oil and gas or marine mining sectors*². With the implementation of a FMA, a ‘fisheries management plan’ may also be developed, which would include plans for the conservation, management and development of the fisheries in the FMA.

The second legal tool is through the declaration and management of Marine Protected Area regulated in terms of the National Environmental Management: Protected Areas Act 57 of 2003 (NEMPAA). Other effective Conservation measures (OECMs) are another mechanism being explored by DFFE to protect specific biodiversity features and/or protection to important fishery support areas, and biodiversity from fishing. These could be in the form of trawl exclusion areas or fishery management areas, and recognised in Sector Plans within the Marine Spatial Plan that is under development (Marine Spatial Planning Act).

3.2 Inshore trawl fishery conflict / impact areas of concern identified

Four broad areas for concern have been identified and recommendations to address issues for specific fisheries and biodiversity features (species/habitats) are discussed further below under the following four headings:

1. Spatial Overlap and Conflict with other fisheries
2. Species Overlap and Conflict with other fisheries
3. Negative impact on ETP Species and/or sensitive biodiversity features
4. Additional Considerations

Each recommendation can be grouped under one or more of five broad categories:

- DATA - Enhanced data collection through increased observers - indicated as [DATA].
- MONITORING/ENFORCEMENT - Improved monitoring, enforcement and compliance of gear and catch - indicated as [MONITORING/ENFORCEMENT].
- PERMIT CONDITIONS, including PUCL / MOVE-ON RULES - Implementation of Precautionary Upper Catch Limits and/or Move-on Rules - indicated as [PUCL / MOVE-ON]
- FMA and/or PFA - Piloting the declaration and use of Fishery Management Areas (FMA) and Priority Fishing Areas (PFA)s in South Africa – indicated as [FMA and/or PFA].
- MPAs or OECMs – formally gazetted, marine protected areas, or areas that meet criteria as marine OECMs (i.e. biodiversity conservation focus) [MPA and/or OECM]

² Reed, JR., Lombard, AT., Sink, KJ. 2020. A diversity of spatial management instruments can support integration of fisheries management and marine spatial planning. Marine Policy 119: 104089. <https://doi.org/10.1016/j.marpol.2020.104089>.

A short explanation of the issues related to each of the 4 areas of concern, together with proposed recommendations to address issues causing conflict/impact are provided below.

3.2.1 Spatial overlap and conflict with other fisheries

Spatial conflict occurs when two fisheries are spatially operating in the same space and includes targeting and catching of the same resource which could lead to overexploitation, negative impacts on each fishery through habitat damage, and gear conflict and associated economic impacts through the loss or damage of gear. In the nearshore, there is some level of spatial overlap between the inshore hake trawl and the commercial linefishery. There is a high degree of overlap in the nearshore coastal areas around Mossel Bay (Cape Infanta, Still Bay and surrounds) between the inshore demersal trawl and the linefishery. On the outer shelf (-200m), approximately 1000km² area of overlap between the inshore trawl and the hake longline, large pelagic longline, squid, midwater trawl and hake-directed inshore demersal trawl fisheries. Since 1997 there has been reported conflict between the hake longline and inshore demersal trawl, primarily related to gear type with longline sets increasingly being deployed on grounds also used by the inshore trawl industry. To address this, measures (spatial and temporal options) to mitigate this conflict should be considered.

Recommendations:

1. Spatially-explicit fishery areas such as FMAs and/or PFAs, designated under the MLRA, may be used to achieve spatial management of these two fisheries in the outer shelf region. PFAs could also be introduced in areas inshore to separate the commercial linefishers and the inshore trawlers. [FMA and/or PFA]
2. Additional/stricter permit conditions for inshore trawl fishery to minimise bycatch and impact on important species for other fisheries. [PUCL / MOVE-ON RULES]
3. Improved monitoring and observer programmes for the inshore trawl fishery to ensure compliance with permit conditions [MONITORING/ENFORCEMENT]

3.2.2 Species Conflict and Overlap

There is significant joint resource exploitation (species conflict) between the inshore demersal trawl and other fisheries, notably the linefishery, exploiting the same resource. We found that 18 linefish species are landed by the inshore trawl. Four species are of concerns which warrant recommendations, namely Silver kob and Carpenter, which are of primary concern, however Kingklip, White stumpnose and Panga are also considered.

Silver Kob

Silver Kob (*Argyrosomus inodorus*) are landed both fisheries the inshore trawl fishery and the commercial linefishery (with the linefishery landing greater quantities on average per annum). There are concerns regarding the stock status which are considered as depleted resource and listed as Vulnerable by the IUCN. Given the depleted stock status and current management being considered as inadequate to facilitate the rebuilding of this stock with current landings and fishing practices (Winker *et al.* 2017b), management interventions are recommended. Despite a 'move-on' management rule imposed for the trawl fishery, there remains a concern regarding current trawling activity in areas important for the nursery and spawning of this species. The area of the Agulhas Bank east of Cape Agulhas between the shelf-edge upwelling and the cold-water ridge is a spawning ground for many commercial important fish stocks including Silver kob. Sole-directed trawling effort occurs here year-round. Kob is the third most important linefish species in terms of value and this sector lands the majority of this species annually (although Silver and Dusky kob are not recorded separately). The commercial linefishery currently does not have any limits in place for kob catches and landings (apart from a restriction on the number of kob >110 cm they are allowed to land, plus a minimum landing size of 50cm). Sufficient management of this species is considered lacking for both inshore trawl and linefish sectors.

Recommendations:

To improve the sustainability of this target (linefish) and bycatch fisheries (inshore trawl) the current management measures should be considered:

1. A winter closed area on the offshore Agulhas banks east of Cape Agulhas for the sole directed inshore trawl fishery. This could be achieved through the introduction of an FMA. This measure would seasonally protect part of the spawning grounds of silver kob. [FMA and/or PFA]
2. Within the permit conditions for the inshore trawl fishery, the kob move-on threshold could be reduced to 10% (from 20%) of total weight for the sole directed trawl fishery. However, this needs the support of a more widespread observer programme on inshore demersal trawl vessels. [PUCL / MOVE-ON & DATA]
3. Commercial linefishers should be managed accordingly on account of the landings of kob within this fishery. A Precautionary Upper Catch Limit (PUCL) could be put in place to maintain current levels of exploitation. However, this type of management measure could prove difficult as the commercial linefishery is managed on a total allowable effort basis. A temporary closed area for the linefishery may therefore be more pragmatic. [PUCL / MOVE-ON]
4. The commercial linefish also targets kob on the offshore banks at Cape Infanta and should be managed in a similar way (i.e. PUCL and/or winter closed seasons) proposed for the management of kob landing in the inshore trawl fishery. Further analysis of the feasibility of such management measures are recommended as a next step. [PUCL / MOVE-ON]
5. The assumptions made in the full report rely on the current understanding of the spatial separation of Dusky and Silver kob (i.e., East of Cape Agulhas, Silver kob are generally found in deeper offshore waters, while Dusky kob are more commonly found in estuaries and shallower coastal areas). Further onboard study (onboard observers, analysis of landings) on both commercial linefishing and inshore trawl vessels would be welcomed to more accurately determine the percentage contribution of each kob species to overall catch, and, more importantly, where boundaries for this separation exist. It is acknowledged that there are significant logistical challenges in placing onboard observers in these sectors (more so for linefish vessels which are smaller). Remote monitoring through the use of on-board surveillance cameras and improved catch monitoring by shore-based access point observers in conjunction with analysis of VMS data should be investigated to help overcome these challenges. [DATA]
6. The National Marine Linefish System (NMLS) should be revisited, and efforts taken to ensure this repository remains up to date, accurate and accessible. [DATA]

Carpenter

Carpenter (*Argyrozona argyrozona*) is landed by the trawl fishery and the commercial linefishery with the current status and management stocks in South Africa is considered adequate based on the most recent stock assessments and fishing mortality estimates. However, recent data shows fishing mortality could be higher than previous levels, and landings of this species in the midwater trawl sector have increased in 2018 and 2019, and these landings were not accounted for in the most recent stock assessment (Winker *et al.* 2017). Estimated biomass trajectories indicated that if the current catch (approximately 800 tonnes per annum) is maintained the carpenter stock is likely to recover. However, here we show that recent annual landings of carpenter are increasing, and annual landings exceeded 800 tonnes in 2018 on South Africa's south coast alone, and that national catches will likely be higher. As the carpenter resource is optimally exploited and geographically widespread this species is a suitable alternative in the face of declining linefish catches and is an important component of the inshore demersal trawl, and in more recent times hake longline, bycatch. There are no obvious spatial management recommendations that can be made based on the available catch and effort data analysed in the full report. Although it is clear the Agulhas Banks is an important area for this species for spawning. Should the stock status of this resource change (worsen), spatial management measures could be considered, possibly in the form of a Marine Protected Area (MPA) or FMA which could restrict fisheries in certain areas or during spawning seasons to mitigate the impacts of commercial exploitation on this species.

Recommendation:

7. A Precautionary Upper Catch Limit (PUCL) should be considered for the entire resource. Based on recent stock assessments this could be set at 800 tonnes nationally and could be apportioned to each commercial fishery that exploits this species based on historical contribution to annual landings within each sector. [PUCL / MOVE-ON]

Kingklip

Kingklip (*Genypterus capensis*) inhabit deeper water across the whole southern South African coast and are particularly associated with deep water rocky habitat (Japp *et al.* 1994, Pisces 2018). The species is thought to spawn beyond the 200 m isobaths between Cape St Francis and Port Elizabeth, with juveniles occurring further inshore along the entire south coast. The decline in the kingklip stock prompted the implementation of the “kingklip box”, which was created to protect spawning kingklip in a time/area closure off the coast of Port Elizabeth, near the shelf edge, inside of which is closed to fishing from 1 September – 30 November annually (DFFE 2022b). In 2019, an update of the kingklip stock assessment suggested that despite the ‘Kingklip Box’, the south coast component of the Kingklip resource is decreasing in abundance at about 0.8% per annum while the west coast component is increasing at about 2.4% per annum (DFFE 2020). Bycatch of kingklip in both the hake trawl and longline fisheries has fluctuated over the years, prompting the introduction of an annual PUCL in 2005 that has subsequently been retained as the primary regulatory measure for the resource. This PUCL is a “global” catch limit that applies to the hake-directed sectors (trawl and longline) in which kingklip is caught as bycatch. In 2022/2023, the kingklip bycatch for the trawl and line hake-directed fisheries should not exceed a Precautionary Maximum Catch Limit (PMCL) of 4047 tons. This PUCL applies to the entire Kingklip stock and not to the south or west coast stock separately. Since the introduction, the PUCL level has only been exceeded once in 2013, however, even with current landings below the prescribed PUCL, current management could be improved. If the kingklip on the South African coast is regarded as a single stock, then the resource was estimated to be fully exploited. However, if West and South Coast stocks are assumed to be separate, then the West Coast stock was estimated to be healthy whereas the South Coast stock was estimated to be over-exploited (DFFE 2020a). The questions regarding stock structure remain creating uncertainties in stock status.

Recommendations:

8. An FMA declared under the MLRA would afford more formal protection to the ‘kingklip box’ and provide a more permanent level of protection than via the sector specific permit conditions, which are updated annually and thus prone to changes. The hake inshore trawl fishery policy and the hake longline fishery policy also both reference the possibility of declaring FMAs in an effort to reduce effort on kingklip. [FMA and/or PFA]
9. Further monitoring and sampling by observers could assist in determining the uncertainties of the west coast and south coast stock structure. [DATA]

White stumpnose

White Stumpnose, *Rhabdosargus globiceps*, landings are significant (average landings per annum = 80 tonnes) in the inshore demersal trawl sector, notably in the hake directed trawl sector. The white stumpnose is also landed by the commercial linefishery and midwater trawl fishery but not in very high quantities. White stumpnose is a long-lived species susceptible to overfishing and considered overfished across most of their range (DFFE 2020), currently being listed as Vulnerable on the IUCN Red List. Research indicates four separate stocks of White Stumpnose in South Africa: the Western Cape (Saldanha Bay), the South-Western Cape, the Southern Cape and the South-Eastern Cape (Griffiths *et al.* 2010). On the South Coast average catch has been assessed as higher than the replacement yield. The total average annual landings of white stumpnose in the inshore trawl fishery is 93 tonnes (2009-2019). As the inshore trawl operates on the south coast, and catches are highest in this sector, it is assumed the inshore trawl is having an effect on white stumpnose populations and leading to overexploitation of this particular stock.

Recommendation:

10. A PUCL for white stumpnose should be introduced for the south coast stock and should be set lower than current levels of exploitation in an effort to the rebuilding of stocks. [PUCL / MOVE-ON]
11. Further investigation into the stock status of this species is supported. [DATA]

3.2.3 Negative impact on Endangered, Threatened and Protected species, and sensitive ecosystems

The inshore demersal trawl sector lands a large proportion of soupfin (*Galeorhinus galeus*) and smoothhound (*Mustelus mustelus*) sharks each year. These sharks are commercially fished in South Africa for their meat, liver oil, and fins. They are known to be caught and landed as bycatch in the inshore demersal trawl fishery, the commercial linefish, pelagic longline fishery, demersal shark longline, and small pelagic/midwater trawl fisheries.

Soupfin shark (*Galeorhinus galeus*)

Catch and effort data for soupfin sharks provided by DFFE shows that recent cumulative fishing mortality (2009-2019 average landings per annum), imposed by target and bycatch fisheries, is close to a prescribed maximum landings quantity of 100 tonnes (national landings of 100 tonnes were considered viable while allowing the soupfin shark population to recover). The soupfin shark is classed as Critically Endangered (IUCN Red List 2023) with a declining population in South Africa. Although the inshore demersal trawl sector is just one fishery contribution to landings of soupfin sharks, there is uncertainty over the reporting of landings data. Sharks are typically grouped together and reported as one category, and are further often misidentified or unidentified, as they can even be landed without a head or missing fins, despite South Africa having a *Fins Naturally Attached* policy.

Smoothhound shark (*Mustelus mustelus*)

There are also concerns regarding the current levels of fishing mortality imposed on the smoothhound shark. Modelling conducted in 2018 concluded that there is a 58% probability that the current harvest of this species is unsustainable. Fishing mortality needs to be reduced to below 75 tonnes to stem the stock decline. Catch and effort data provided by the DFFE shows that cumulative landings of smoothhound sharks is well above 75 tonnes (average landings per annum 2009-2019 = 124 tonnes) despite declines in landings in recent years.

Recommendations:

1. For both soupfin and smoothhound sharks, significant efforts should be made to reduce incidental catches of both species. This needs to be undertaken at a multi-fisheries level considering the level of catch and bycatch of both these species by multiple sectors. [MONITORING/ENFORCEMENT]
2. A PUCL in the order of 20 tons combined with a move-on rule has previously been suggested to be placed on the trawl fishery (including the mid-water trawl) so that catches of soupfin sharks are reduced across all fisheries that impact them, however, these measures have not been implemented. [PUCL / MOVE-ON]
3. Improved identification and reporting of the landings of all sharks is highly recommended for the inshore demersal trawl sector, and other sectors which report landings of the soupfin shark. [DATA]
4. Additional MPAs within the inshore trawl footprint should be implemented, in priority areas for these species identified through systematic conservation planning [MPA / OECM]

3.2.4 Additional considerations

Gear Restrictions

The MSC audit revealed that the demersal trawl fishery was found to be using too many undersized mesh nets, which increased the risk of catching juvenile hake and other non-target species. It was not specified whether this was occurring in the inshore or the offshore sector, or both.

Recommendations:

5. Effort should be made to determine the extent of the use of nets within the sector which are beyond the specifications within permit conditions. Furthermore, it should be noted if this is occurring in the inshore or offshore sector, and thus placing pressure on these vessels to comply with permit conditions. [MONITORING/ENFORCEMENT]

6. Additional MPAs or OECMs within the inshore trawl footprint should be implemented, in priority areas for small-scale and recreational linefishers, that allow for pelagic line-fishing but no trawling [MPA / OECM]

Economic consequences of spatial restrictions

The spatial restrictions proposed above to better manage resources at risk from fishing by the inshore trawl fishery and commercial linefishery will have unwanted economic consequences. Panga (*Pterogymnus laniarius*) is a valuable commercial fish species targeted by both commercial and recreational fisheries. It is considered as one of the primary non-target species in the inshore demersal trawl fishery, while in the linefishery Panga are mostly caught within the inshore zone using small skiboats. The Panga stock has historically been assessed as being underexploited with the spawner biomass at approximately 67% of the pristine level. Current stock status is reported to be underfished (Attwood 2019) and the stock appears to be highly likely above the level at which recruitment in the stock would be impaired, but, due to a lack of data currently available, this assessment does not have a high degree of confidence.

Recommendations:

7. Better data collection on the status of this species could support an increase in exploitation of this species by the inshore trawl and commercial linefishers, which could go some way to offset the economic impact of spatial restrictions and a reduction in catches of carpenter and kob. The potential of Panga as a resource for additional exploitation should be considered further. [DATA]
8. Additional MPAs or OECMs within the inshore trawl footprint should be implemented, in priority areas for small-scale and recreational linefishers, that allow for pelagic line-fishing but no trawling [MPA / OECM]

Real-time Monitoring and Fisheries Management

It remains unclear how move-on rules, area closures (i.e. kingklip box) are currently enforced. Most commercial fishing vessels are required to be fitted with AIS systems as per permit conditions, but it remains unknown how this AIS data is monitored and applied in real-time, and how these spatial management measures are enforced. Similarly, the real-time monitoring and management of PUCL exceedance processes are unclear. If a PUCL is exceeded, the fishery can technically be closed, but DFFE may consider closing a fishery as counterproductive. Sectors apportion a PUCL among themselves and they are managed by a third party. Catch data becomes available for use mid-year of the calendar year after the year the data is collected. If the PUCL is exceeded, the reason for the exceedance is then considered, i.e. rather than closing the whole fishery, a targeted approach of closing high-catch areas are considered. Therefore, the PUCL system is designed to prevent constant overshoots of allowable catch.

Recommendations:

9. Processes that address gaps in data processing and creates a link between adaptive management strategies and real time management of fishing vessel is required. Various technological advancements are available and would improve this current gap. [MONITORING/ENFORCEMENT]
10. A more frequent review of catch data to prevent overshooting PUCLs, i.e. the current mid-year review is potentially too reactive in the case of species where current landings are close to exceedance e.g., soupfin shark. [MONITORING/ENFORCEMENT]

Data gaps

There is insufficient data on the economics of small-scale and recreational fisheries that overlap with the inshore trawl fishery. Furthermore, catch data is inadequate or non-existent, for some areas for the line-fishing activities of these sectors which make it difficult to determine sustainability trends and the full extent of the overlap with the inshore trawl fishery.

Recommendations:

11. Monitoring of catches of small-scale fishers and recreational fishers is a gap, and should be improved significantly to better elude the species overlaps and impact of the trawl fishery on these sectors [DATA].

12. Reactivation of NMLS methodology to collect data for recreational linefishing, and expanded to include small scale linefishers [DATA].

3.3 SUMMARY OF ISSUES AND RECOMMENDED MEASURES

Table 2 is a compilation of all the issues / concerns across the four categories explained above (i.e. *Spatial Overlap and Conflict with other fisheries; Species Overlap and Conflict with other fisheries; Negative Impact on ETP Species and biodiversity features; and Additional Considerations*), while identifying measures to reduce impacts of the inshore trawl fishery on other fisheries and ultimately coastal communities, together with recommended solutions grouped into four broad categories as explained above (i.e. *DATA; MONITORING/ENFORCEMENT; PUCL / MOVE-ON RULES; AND FMA'S and/or PFA'S*).

Table 3. Identification of issues associated with the inshore trawl fisheries in South Africa, with recommendations for remediation and desired outcomes and gains.

PROBLEM	RECOMMENDATION GROUP					OUTCOMES/GAIN
	DATA	MONITORING/ ENFORCEMENT	PUCL / MOVE-ON	FMA's AND/OR PFA's	MPAs or OECMs	
<p>1. Spatial overlap and conflict - since 1997 conflict between hake longline and inshore demersal trawl</p>				<p>1. Spatial and temporal options to mitigate conflict i.e. Spatially-explicit fishery areas such as FMA and/or PFAs</p>		<p>1. Spatial management i.e. PFAs introduced in the inshore trawl fishery to separate commercial linefishers and inshore trawlers</p>
<p>2. Species Conflict and Overlap – joint resource exploitation</p> <p>Silver kob</p> <p>1. Depleted resource, Vulnerable (IUCN).</p> <p>2. Lack of sufficient management for inshore trawl and commercial linefish and lack of understanding on spatial separation and identification between Silver vs Dusky kob.</p> <p>3. Inshore trawl - Bycatch in important nursery and spawning areas (particularly sole-directed trawl).</p> <p>4. Commercial linefishery - Targeted catch with very few limits in catches and landings.</p>	<p>1. Further onboard study through observers and analysis of landings to more accurately determine percentage contribution of silver vs dusky kob to overall catch and where boundaries for separation exist.</p> <p>2. Revisit NMLS and ensure it remains current, accurate and accessible.</p>		<p>1. Analysis of feasibility for potential for PUCL to maintain current levels of exploitation and/or a temporary (winter) closed area.</p> <p>2. Permit condition adjustment for kob move-on threshold, reduced from 20% to 10% of total weight for sole-directed trawl (supported by widespread observer programme).</p> <p>3. PUCL set at 800 tonnes nationally (based on recent stock assessments) should be considered and could be apportioned to each commercial fishery that exploits this species based on historical contribution to annual landing within each sector.</p>	<p>1. Winter closure area of offshore Agulhas banks east of Cape Agulhas for sole-directed trawl through introduction of FMA and/or PFA.</p> <p>FMA's that allow only line-fishing in priority areas for coastal community livelihoods linked to jobs and benefits from tourism activities</p>	<p>Multi-zoned MPAs that allow line-fishing for robust (non-threatened) species of fish, but exclude trawling and mining</p>	<p>1. Seasonally protect part of the spawning grounds for silver kob</p> <p>2. Enhance data collection for improved stock assessments.</p>
<p>Carpenter</p> <p>Although current status and management is considered accurate, recent annual landings are increasing and</p>			<p>1. PUCL set at 800 tonnes nationally (based on recent stock assessments) should be considered and could be apportioned to each</p>			<p>1. Avoid stock status of this resource worsening</p>

exceeded 800 tonnes in 2018 on south coast alone (national catches are likely to be higher)			commercial fishery that exploits this species based on historical contribution to annual landing within each sector.			
Kingklip 1. Despite efforts to protect spawning kingklip in the 'Kingklip box' time/area closure off Port Elizabeth, 2019 stock assessment suggested south coast component of the resource is decreasing in abundance at 0.8% per annum.	1. Further monitoring and sampling by observers could assist in determining the uncertainties of the west coast and south coast stock structure.			1. FMA declared under MLRA to afford more formal protection to the 'kingklip box.'		1. Provide a more permanent level of protection and reduce fishing effort on kingklip 2. Obtain further information on stock structure
White stumpnose 1. Vulnerable (IUCN), long-lived, susceptible to overfishing, considered overfished across most of range. 2. Landings are significant in inshore demersal trawl (notable hake directed). 3. Inshore trawl operates on south coast (where catch > replacement yield) and is therefore likely to have effect on white stumpnose populations leading to overexploitation of south coast stock.	1. Further investigation into the stock status of this species is supported.			1. PUCL introduced for south coast stock set lower than current levels of exploitation in an effort.	Multi-zoned MPAs that allow line-fishing for robust (non-threatened) species of fish, but exclude overfished species, trawling and mining	1. Rebuilding of white stumpnose stocks 2. Further information on the stock status and subsequent fisheries management.
3. Endangered, Threatened and Protected species 1. Inshore demersal trawl lands a large portion of sharks and rays annually.	1. More and improved data are needed. 2. Species identification is poor, i.e. lumping of sharks and rays. Better	1. Enforcement of the MLRA and permit conditions is required. 2. Species identification, i.e. lumping of sharks			Implement no-take shark and ray sanctuaries in new and expanded MPAs within thin the inshore trawl footprint	1. Catches of sharks and rays reduced across all fisheries that impact threatened species.

<p>2. They are caught and landed as bycatch in the inshore demersal trawl, commercial linefish, pelagic longline, demersal shark longline and small pelagic/midwater trawl fisheries.</p> <p>3. Uncertainty over reporting of landings data with sharks typically grouped together and reported as one category.</p> <p>4. Sharks and rays are often misidentified or unidentified and landed without head or missing fins despite SA having a <i>Fins Naturally Attached</i> policy.</p> <p>5. Significant efforts should be made to reduce incidental catches at a multi-fisheries level considering the level of catch and bycatch of both soupfin and smoothhound species by multiple sectors.</p>	<p>identification required by fisheries.</p>	<p>and rays is not allowed for in permit conditions.</p>			<p>Multi-zoned MPAs that allow line-fishing for robust (non-threatened) species of fish, but exclude overfished species, trawling and mining</p>	<p>2. Update legislation to ensure threatened species have increased protection in fisheries</p>
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<p>4. Endangered, Threatened and Protected species (cont.)</p> <p>Soufjin shark 1. Critically Endangered (IUCN Red List 2020) with a declining population in South Africa.</p> <p>2. Mortality imposed by target and bycatch fisheries.</p> <p>3. Catch and effort data for soupfin sharks provided by DFFE shows that recent cumulative fishing mortality (2009-2019 average landings per annum), imposed by target and bycatch fisheries, is close to a prescribed maximum landings quantity of 100 tonnes (national landings of 100 tonnes were considered viable while allowing the soupfin shark population to recover).</p>	<p>1. Improved identification and reporting of landings of all sharks.</p>	<p>1. Ensure MLRA and permit conditions are being adhered to in terms of species identification, i.e. lumping of sharks and rays is not allowed in permit conditions.</p>	<p>1. A PUCL in the order of 20 tons combined with a move-on rule has previously been suggested to be placed on the trawl fishery (including the mid-water trawl) so that catches of soupfin sharks are reduced across all fisheries that impact them, however, these measures have not been implemented.</p>		<p>Implement no-take shark and ray sanctuaries in new and expanded MPAs within the inshore trawl footprint</p> <p>Multi-zoned MPAs that allow line-fishing for robust (non-threatened) species of fish, but exclude overfished species, trawling and mining</p>	<p>1. Update legislation to ensure threatened species have increased protection in fisheries.</p>
<p>Endangered, Threatened and Protected species (cont.)</p> <p>Smoothhound shark Endangered (IUCN Red List 2020) with a declining population in South Africa.</p>	<p>1. Improved identification and reporting of landings of all sharks</p>	<p>1. Ensure MLRA and permit conditions with regards to species identification are being adhered to</p>	<p>1. Fishing mortality needs to be reduced to below 75 tonnes to stem the stock decline, across fisheries</p>		<p>Implement no-take shark and ray sanctuaries in new and expanded MPAs within thin the inshore trawl footprint</p> <p>Multi-zoned MPAs that allow line-fishing for robust (non-threatened) species of fish, but exclude overfished species, trawling and mining</p>	<p>1. Update legislation to ensure threatened species have increased protection in fisheries</p>

<p>1. There is a 58% probability that the current harvest is unsustainable.</p>						
<p>5. Additional considerations</p> <p>Gear restrictions Demersal trawl using too many undersized mesh nets increasing risk of catching juvenile hake and other non-target species – unspecified whether in inshore, offshore or both sectors.</p>	<p>1. Determine extent of the use of nets within the sector which are beyond specification of permit conditions.</p> <p>2. Clarity on whether this is occurring inshore and/or offshore with monitoring and enforcement placing pressure on vessels to comply with permit conditions</p>	<p>1. Effort should be made to determine the extent of the use of nets within the sector which are beyond the specifications within permit conditions. Furthermore, it should be noted if this is occurring in the inshore or offshore sector, and thus placing pressure on these vessels to comply with permit conditions.</p>			<p>Implement no-take shark and ray sanctuaries in new and expanded MPAs within thin the inshore trawl footprint</p> <p>Multi-zoned MPAs that allow line-fishing for robust (non-threatened) species of fish, but exclude overfished species, trawling and mining</p>	<p>1. Decreases the risk of juvenile and undersized fish being caught, both targeted and bycatch species.</p>
<p>Economic consequences of spatial restrictions</p> <p>1. Spatial restrictions to better manage resources at risk from inshore trawl and commercial linefish can have unwanted economic consequences.</p> <p>2. The Panga stock has historically been assessed as being underexploited with the spawner biomass at approximately 67% of the pristine level. Current stock status is reported to be underfished and the stock appears to be highly likely above the level at which recruitment in the stock would be impaired.</p>	<p>1. Improved data collection on status of panga (valuable fish species targeted by both commercial and recreational fisheries).</p>					<p>1. With the current stock status of panga reported to be underfished, exploring its potential to be used as a resource for additional exploitation should be considered further.</p> <p>2. Could go some way to offset economic impact of spatial restrictions and reduction in catches of carpenter and kob.</p>

<p>Real-time monitoring and fisheries management</p> <p>1. Unclear how spatial management measures are enforced including move-on rules, area closures, AIS data and PUCL exceedance processes.</p>	<p>1. More frequent review of catch data to prevent overshooting PUCLs.</p>	<p>1. Various technological advancements are available to address data processing gaps and create links between adaptive management strategies and real-time management of fishing vessels.</p> <p>2. More frequent review of catch data to prevent overshooting PUCLs</p>				<p>1. Improved enforcement and subsequent compliance by fisheries.</p>
<p>Date gaps</p> <p>There is insufficient data on the economics of small-scale and recreational fisheries that overlap with the inshore trawl fishery. Furthermore, catch data is inadequate or non-existent, for some areas for the line-fishing activities of these sectors which make it difficult to determine sustainability trends and the full extent of the overlap with the inshore trawl fishery.</p>	<p>Monitoring of catches of small-scale fishers and recreational fishers is a gap, and should be improved significantly to better elude the species overlaps and impact of the trawl fishery on these sectors</p> <p>Reactivation of NMLS methodology to collect data for recreational linefishing, and expanded to include small scale linefishers</p>					<p>Improved understanding of catch overlaps</p> <p>Improved understanding of sustainability and trends in catches for small scale and recreational fisheries</p>

4. CONCLUSIONS

The recommended management measures identified through the study to reduce the impacts of the inshore trawl fishery on other fisheries could directly and indirectly enhance more sustainable exploitation of several species currently overexploited or close to overexploitation and bring some measure of relief to impacted ETP species and fragile ecosystems.

However, in practical terms, the avoidance of catching such species without hard closures in place is difficult for an industry like the inshore demersal trawl fishery on account of it being an indiscriminately mixed fishery that relies on a suit of bycatch species as well as its main target species, namely hake. Thus, the feasibility of recommendations requires scrutiny with DFFE fishery and biodiversity scientists, fisheries managers, and industry in a collaborative effort to better manage shared resources of the inshore trawl fishery and other fisheries and limit their negative impacts on biodiversity.

Furthermore, given spatial overlaps and sharing of resources amongst the small-scale commercial fishers and recreational fishers, with the inshore trawl fishery, and by-catch and adverse habitat impacts, it is likely that the inshore trawl fishery does impact on coastal communities who depend on fishing for livelihoods and for jobs within the tourism and hospitality industries (that are reliant on recreational fishing activities as attractions for tourists).

Additional trawl closure areas and additional marine protected areas are likely to be the only option in some cases, to safeguard livelihoods of communities dependent on other fisheries with which the inshore fishery conflicts, and for ETP species and fragile benthic ecosystems.