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# Pre-Assessment of the Groundfish fisheries in Indonesia

Prepared for

**The Nature Conservancy - Indonesia Fisheries Conservation Program**

Prepared by

**Poseidon Aquatic Resource Management (Pty) Ltd.**

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## Glossary

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| BRPL | *Badan Riset Perikanan Laut* (Marine Fisheries Research Institute) |
| CITES | Convention on International Trade in Endangered Species |
| CSA | Consequence Spatial Analysis |
| CoC | Chain of Custody |
| CODRS | Crew-Operated Data Recording System |
| DKP | *Dinas Perikanan* (provincial fishery agency) |
| EEZ | Exclusive Economic Zone |
| ETP | Endangered, Threatened, and Protected |
| FAO | Food & Agriculture Organization |
| FCR | Fishery Certification Requirements |
| FMA | Fishery Management Area (see WPP and WPPNRI) |
| GT | Gross Tonne |
| HCR | Harvest Control Rule |
| IPI | Inseparable or Practically Inseparable (relating to fish stocks) |
| IUCN | International Union for Conservation of Nature |
| IUU | Illegal, Unregulated and Unreported |
| MMAF | Ministry of Marine Affairs and Fisheries |
| MSC | Marine Stewardship Council |
| MSE | Management Strategy Evaluation |
| MSY | Maximum Sustainable Yield |
| PERMEN | *Peraturan Menteri* (ministerial regulation) |
| PRI | Point of Recruitment Impairment |
| PSA | Productivity-Susceptibility Analysis |
| PSDKP | Surveillance of Marine and Fishery Resources |
| RBF | Risk-Based Framework |
| RPP | *Rencana Pengelolaan Perikanan* (fishery management plan) |
| SPR | Spawning Potential Ratio |
| TNC | The Nature Conservancy |
| TNC-IFCP | The Nature Conservancy – Indonesia Fishery Conservation Program |
| UoA | Unit of Assessment |
| UoC | Unit of Certification |
| USAID | United States Agency for International Development |
| WPP | *Wilayah Pengelolaan Perikanan* (Fisheries Management Area) |
| WPPNRI | *Wilayah Pengelolaan Perikanan Negara Republik Indonesia* (Fishery Management Area) |

## Executive summary

Richard Banks, on behalf of Poseidon Aquatic Resource Management, undertook this pre-assessment of the Indonesian multi-species Groundfish Fisheries targeting snappers, groupers, emperors and associated species. The pre-assessment was undertaken using *MSC Fisheries Certification Requirements (FCR) v2.0*, and prepared in accordance with the *MSC Pre-assessment Reporting Template v2.0*.

The pre-assessment was undertaken in September 2017, for The Nature Conservancy - Indonesia Fisheries Conservation Program (TNC-IFCP). The first site visit for the pre-assessment was held at the TNC Benoa Fisheries Station, Bali, from 12-26 September 2017. This was followed by three further site visits, one in early May 2018, one in November 2018 and one in March 2019. These latter visits were used to amend the early preassessment outputs and reassess the UoAs and Fisheries Improvement Plan support activities based on updated information provided and an expansion of the number of UoAs to include all fishing methods targeting groundfish snapper, grouper and associated species. Groundfish fisheries now refer to drop-line, long-line, trap, gill-net and mixed gears. This program will use the pre-assessment as a reference document, and will update the UoAs on an annual basis. The pre-assessment is therefore a dynamic document and will be updated on an annual basis.

Two hundred and seventy-two (272) units of assessment (March, 2019) were identified, covering four fishing methods, drop-line, long-line, trap and gill-net; 6 management areas (WPPs) and 25 species across the range of these management areas. Some vessels are identified as using a combination of gears, which can be added to the main UoAs. These include 130 drop-line UoAs, 110 long-line, 9 trap and 23 gill-net.

| **UoAs No'** | **Species** | **Method of Capture** | **Geographical Area** | **Stock** | **Management framework** |
|---|---|---|---|---|---|
| 25 | *Pristipomoides multidens*<br>*Pristipomoides typus*<br>*Lutjanus malabaricus,*<br>*Lutjanus erythropterus,*<br>*Epinephelus areolatus*<br>*Etils sp.*<br>*Lutjanus sebae*<br>*Epinephelus latifasciatus*<br>*Pristipomoides filamentosus,*<br>*Paracaesio kusakarii,*<br>*Etelis coruscans*<br>*Gymnocranius grandoculis*<br>*Aphareus rutilans*<br>*Lutjanus timorensis*<br>*Seriola rivoliana*<br>*Pristipomoides sieboldii*<br>*Epinephelus bleekeri*<br>*Etelis radiosus*<br>*Symphorus nematophorus*<br>*Wattsia mossambica*<br>*Pinjalo lewisi*<br>*Paracaesio stonei*<br>*Aprion virescens*<br>*Diagramma pictum*<br>*Lethrinus laticaudis* | Drop-line | WPP 573 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |

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| 15 | *Lutjanus malabaricus*<br>*Lutjanus erythropterus*<br>*Pristipomoides multidens*<br>*Pristipomoides typus*<br>*Epinephelus areolatus*<br>*Epinephelus bleekeri*<br>*Diagramma pictum*<br>*Lutjanus sebae*<br>*Pristipomoides typus*<br>*Gymnocranius grandoculis*<br>*Symphorus nematophorus*<br>*Lutjanus timorensis*<br>*Epinephelus latifasciatus*<br>*Seriola rivoliana*<br>*Pinjalo lewisi* | Drop-line | WPP 712 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 25 | *Aphareus rutilans*<br>*Epinephelus areolatus*<br>*Lutjanus malabaricus*<br>*Lutjanus erythropterus*<br>*Pristipomoides multidens*<br>*Pinjalo lewisi*<br>*Etelis sp.*<br>*Etelis coruscans*<br>*Gymnocranius grandoculis*<br>*Diagramma pictum*<br>*Pristipomoides typus*<br>*Symphorus nematophorus*<br>*Lutjanus sebae*<br>*Lutjanus timorensis*<br>*Pristipomoides multidens*<br>*Pristipomoides typus*<br>*Pristipomoides filamentosus*<br>*Etelis radiosus*<br>*Aprion virescens*<br>*Epinephelus bleekeri*<br>*Seriola rivoliana*<br>*Pristipomoides sieboldii*<br>*Wattsia mossambica*<br>*Paracaesio kusakarii*<br>*Paracaesio stonei*<br>*Epinephelus latifasciatus*<br>*Lethrinus laticaudis* | Drop-line | WPP 713 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 25 | *Etils sp,*<br>*Paracaesio kusakarii*<br>*Aphareus rutilans*<br>*Pristipomoides multidens*<br>*Etelis coruscans*<br>*Pristipomoides filamentosus*<br>*Etelis radiosus*<br>*Seriola rivoliana*<br>*Paracaesio stonei*<br>*Epinephelus latifasciatus*<br>*Wattsia mossambica*<br>*Lutjanus malabaricus*<br>*Pristipomoides sieboldii*<br>*Aprion virescens*<br>*Pinjalo lewisi*<br>*Gymnocranius grandoculis*<br>*Lutjanus sebae*<br>*Pristipomoides typus*<br>*Lutjanus timorensis*<br>*Lutjanus erythropterus*<br>*Symphorus nematophorus*<br>*Epinephelus areolatus*<br>*Lethrinus laticaudis*<br>*Epinephelus bleekeri*<br>*Diagramma pictum* | Drop-line | WPP 714 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |

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| 25 | *Etils sp*<br>*Aphareus rutilans*<br>*Paracaesio kusakarii*<br>*Pristipomoides multidens*<br>*Pristipomoides filamentosus*<br>*Etelis coruscans*<br>*Lutjanus erythropterus*<br>*Etilis radiosus*<br>*Seriola rivoliana*<br>*Paracaesio stonei*<br>*Pristipomoides sieboldii*<br>*Epinephelus latifasciatus*<br>*Lutjanus malabaricus*<br>*Wattsia mossambica*<br>*Pinjalo lewisi*<br>*Lutjanus timorensis*<br>*Gymnocranius grandoculis*<br>*Aprion virescens*<br>*Pristipomoides typus*<br>*Lethrinus laticaudis*<br>*Lutjanus sebae*<br>*Epinephelus areolatus*<br>*Diagramma pictum*<br>*Epinephelus bleekeri*<br>*Symphorus nematophorus* | Drop-line | WPP 715 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 25 | *Etelis sp.*<br>*Lethrinus laticaudis*<br>*Pristipomoides multidens*<br>*Aphareus rutilans*<br>*Paracaesio kusakarii*<br>*Pristipomoides filamentosus*<br>*Etelis radiosus*<br>*Epinephelus latifasciatus*<br>*Pristipomoides typus*<br>*Etelis coruscans*<br>*Lutjanus malabaricus*<br>*Seriola rivoliana*<br>*Wattsia mossambica*<br>*Lutjanus timorensis*<br>*Lutjanus sebae*<br>*Paracaesio stonei*<br>*Lutjanus erythropterus*<br>*Gymnocranius grandoculis*<br>*Pristipomoides sieboldii*<br>*Epinephelus areolatus*<br>*Pinjalo lewisi*<br>*Aprion virescens*<br>*Symphorus nematophorus*<br>*Epinephelus bleekeri*<br>*Diagramma pictum* | Drop-line | WPP 718 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 13 | *Pristipomoides multidens*<br>*Lutjanus malabaricus*<br>*Pristipomoides typus*<br>*Epinephelus areolatus*<br>*Lutjanus sebae*<br>*Lutjanus timorensis*<br>*Gymnocranius grandoculis*<br>*Symphorus nematophorus*<br>*Aprion virescens*<br>*Diagramma pictum*<br>*Lutjanus erythropterus*<br>*Pristipomoides filamentosus*<br>*Pinjalo lewisi* | Long-line | WPP 573 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |

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| 21 | *Pristipomoides multidens*<br>*Lutjanus malabaricus*<br>*Pristipomoides typus*<br>*Gymnocranius grandoculis*<br>*Epinephelus areolatus*<br>*Lutjanus sebae*<br>*Diagramma pictum*<br>*Symphorus nematophorus*<br>*Lutjanus timorensis*<br>*Lutjanus erythropterus*<br>*Epinephelus latifasciatus*<br>*Aprion virescens*<br>*Seriola rivoliana*<br>*Epinephelus bleekeri*<br>*Aphareus rutilans*<br>*Pristipomoides filamentosus*<br>*Pinjalo lewisi*<br>*Paracaesio kusakarii*<br>*Wattsia mossambica*<br>*Etelis radiosus*<br>*Paracaesio stonei* | Long-line | WPP 712 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 24 | *Lutjanus malabaricus*<br>*Pristipomoides multidens*<br>*Lutjanus sebae*<br>*Diagramma pictum*<br>*Pristipomoides typus*<br>*Epinephelus areolatus*<br>*Lutjanus erythropterus*<br>*Symphorus nematophorus*<br>*Lutjanus timorensis*<br>*Aprion virescens*<br>*Epinephelus bleekeri*<br>*Epinephelus latifasciatus*<br>*Seriola rivoliana*<br>*Aphareus rutilans*<br>*Pristipomoides filamentosus*<br>*Pinjalo lewisi*<br>*Etelis sp.*<br>*Wattsia mossambica*<br>*Paracaesio kusakarii*<br>*Etelis radiosus*<br>*Lethrinus laticaudis*<br>*Paracaesio stonei*<br>*Pristipomoides sieboldii* | Long-line | WPP 713 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 23 | *Aprion virescens*<br>*Lutjanus malabaricus*<br>*Gymnocranius grandoculis*<br>*Pristipomoides multidens*<br>*Symphorus nematophorus*<br>*Lutjanus sebae*<br>*Diagramma pictum*<br>*Pristipomoides filamentosus*<br>*Pristipomoides typus*<br>*Epinephelus areolatus*<br>*Etelis sp.*<br>*Epinephelus bleekeri*<br>*Seriola rivoliana*<br>*Lutjanus timorensis*<br>*Aphareus rutilans*<br>*Lutjanus erythropterus*<br>*Epinephelus latifasciatus*<br>*Wattsia mossambica*<br>*Etelis radiosus*<br>*Pinjalo lewisi*<br>*Paracaesio kusakarii*<br>*Etelis coruscans*<br>*Paracaesio stone* | Long-line | WPP 714 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |

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| 13 | *Gymnocranius grandoculis*<br>*Symphorus nematophorus*<br>*Lutjanus malabaricus*<br>*Pristipomoides multidens*<br>*Aprion virescens*<br>*Lutjanus sebae*<br>*Pristipomoides filamentosus*<br>*Diagramma pictum*<br>*Epinephelus areolatus*<br>*Aphareus rutilans*<br>*Seriola rivoliana*<br>*Lutjanus timorensis*<br>*Epinephelus bleekeri* | Long-line | WPP 715 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 20 | *Lutjanus malabaricus*<br>*Gymnocranius grandoculis*<br>*Symphorus nematophorus*<br>*Pristipomoides multidens*<br>*Lutjanus malabaricus*<br>*Epinephelus bleekeri*<br>*Lutjanus erythropterus*<br>*Gymnocranius grandoculis*<br>*Epinephelus latifasciatus*<br>*Epinephelus areolatus*<br>*Pristipomoides typus*<br>*Aprion virescens*<br>*Symphorus nematophorus*<br>*Diagramma pictum*<br>*Diagramma pictum*<br>*Seriola rivoliana*<br>*Lutjanus timorensis*<br>*Pristipomoides filamentosus*<br>*Wattsia mossambica*<br>*Paracaesio kusakarii*<br>*Aphareus rutilans*<br>*Etelis sp.Lethrinus laticaudis*<br>*Pristipomoides multidens*<br>*Lutjanus sebae* | Long-line | WPP 718 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 9 | *Lutjanus malabaricus*<br>*Epinephelus areolatus*<br>*Pristipomoides multidens*<br>*Epinephelus bleekeri*<br>*Lutjanus sebae*<br>*Diagramma pictum*<br>*Lutjanus erythropterus*<br>*Pristipomoides typus*<br>*Gymnocranius grandoculis* | Trap | WPP 712 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 23 | *Aphareus rutilans*<br>*Diagramma pictum*<br>*Etelis radiosus*<br>*Seriola rivoliana*<br>*Gymnocranius grandoculis*<br>*Pristipomoides multidens*<br>*Lutjanus malabaricus*<br>*Lutjanus timorensis*<br>*Etelis sp.*<br>*Lutjanus sebae*<br>*Aprion virescens*<br>*Paracaesio kusakarii*<br>*Pristipomoides filamentosus*<br>*Pinjalo lewisi*<br>*Etelis coruscans*<br>*Lutjanus erythropterus*<br>*Epinephelus bleekeri*<br>*Paracaesio stonei*<br>*Symphorus nematophorus*<br>*Pristipomoides typus*<br>*Epinephelus latifasciatus* | Gill-net | WPP 713 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |

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| | *Wattsia mossambica*<br>*Epinephelus areolatus* | | | | |

Table 2 provides a summary of the different UoAs for dropline, longline, trap and gill net. Some of these UoAs may be consolidated where stocks are assessed as transboundary. The species selected as UoA species are where catches in each fishery exceed 2%, or if individually below 2%, are commercially important.

Note that vessels have been identified as using more than one gear (Mixed gears) in WPPs 712, 713, 714, 715. Mixed gears would not classify as a UoA and for UoA purposes, would fit into one of the above categories. New UoAs may be added as new information as the TNC program expands to all WPPs, or where gears (trap and gill-net) may be identified in the areas above.

## P1 issues

There are presently 272 individual Units of Assessment (UoA), across 6 management areas (WPP). The 272 UoAs, are separated between dropline-caught species (130 UoAs), longline-caught species (110 UoAs), trap caught (9) and gill-net caught (23 UoAs). Many, but not all, of these species occur in all fisheries.

Of the target species in the dropline and longline fisheries, using the Spawning Potential Ratio, most are below PRI (high risk), with a few at MSY (low risk), a few at PRI (medium risk) (Table 6). The selected target species are all caught pretty much exclusively in these groundfish fisheries, with other species (>50 in number), classified as primary species, but well below 1%, or in some cases, classified as primary if caught in other fisheries.

The stock assessment programme comprises a number of proxy assessments of the multi-species groundfish dropline and longline fisheries targeting snappers, groupers, emperors, and grunters, located at depths ranging from 50 to 500 metres. These proxy assessments are identified as reasonable proxies of stock biomass for the Point of Recruitment Impairment (PRI) and/or Maximum Sustainable Yield (MSY). The Nature Conservancy is currently in the process of building capacity in BRPL in the use if I-Fish to e-BRPL; and transferring reporting and analysis procedures to strengthen stock assessment.

There is no harvest strategy applied to these fisheries by the management authority, the Ministry of Marine Affairs and Fisheries (MMAF). As described under P3, provision is made to support the implementation of harvest strategies in Indonesian fisheries under Directorate-General of Capture Fisheries Decree 17 of 2017, with management aiming to achieve Maximum Sustainable Yield (MSY). At present, however, there are no clear definitions within the regulation as to what constitutes a harvest strategy and how these are to be supported by harvest control rules and management input or output measures, and at present, fishing effort is loosely controlled by licensing. The current licensing scheme is fairly generalist and not specific to the groundfish dropline and longline fishery.

The Nature Conservancy Indonesia Fisheries Conservation Program (TNC-IFCP), funded by USAID and various private foundations, is implementing a Crew-Operated Data Recording System (CODRS) to assess species and size composition of the catch. CODRS is based on photographed images on measuring boards by participating crew, and thereafter analysed by project staff to generate species-specific length-frequency distributions of catches. These are served as the input for length-based assessments. Fishing vessels with Spot Trace units on board generate accurate data on fishing grounds and fishing locations. These data sets provide *sufficient relevant information related to stock structure, stock productivity, and some other data are available to support the harvest strategy*, and evidence that stock abundance, the estimates of UoA fleet composition and total catch/removals, still need to be improved.

The TNC program is developing a database to estimate the full extent of the dropline and longline fleets, including vessels less than 5 GT.

From the information provided, it would appear that the TNC assessment is appropriate for the stock and will support the design of a harvest strategy. The assessment estimates stock status relative to a number of reference points (age of maturity, the current exploitation rate, the proportion of mega spawners in the catch, and Spawning Potential Ratio (SPR)) *that are appropriate to the stock and can be estimated*. The stock assessment process applied has been externally reviewed.

Uncertainties in stock assessment are addressed by using a range of proxies, as opposed to one single indicator. The effectiveness of the proxies used are also underlined by consistency in results applied across a full range of species. There is *good information on all other fishery removals from the stock*, most specifically trap and gill net fisheries, as well as polyvalent fleets. This information is being strengthened, and in some cases, may lead to an extension of the FIP to cover these methods. A Danish seine (*cantrang*) fleet is also operating in one zone 712, where catch compositions have also been investigated and found not to contain the species identified in the UoA. Species common to the drop line and longline fleet were excluded from the list of Units of Certification. *Lutjanus vitta* for example only accounts for 3% in these two fisheries in area 712.

Additional outcomes for this PI to pass assessment will require: *a harvest strategy and harvest control rules to be in place and for these to be assessed as likely to work* (for those stocks at MSY); a rebuilding strategy (for those above PRI but below MSY); and an improved knowledge of fleet composition within the sector.

## P2 issues

All ecosystem PIs will be assessed by sub-fishery. Primary species are defined as the other target species, other than the specific UoA species, and subject to management. This essentially means that all UoA species, with the exception of the specific target species will be assessed as primary under the standard. Some of these species will be at MSY, some will be at PRI and others below PRI. It is expected that by the time assessment, those species below the PRI, will have measures in place that are expected to ensure that the *UoA does not hinder recovery and rebuilding*.

For the purpose of this assessment all species caught, other than the primary species, will be classified as secondary species. These will include baitfish, which collectively account for around 25% of the total catch, and individually may account for > 2% of the total catch; and sharks, which are likely to be classified as minor, and individually probably under 2%. However, the quantity taken of individual shark species is still under evaluation, and if any species is found to be over 2% of the total catch will be assessed against IUCN vulnerability criteria.

To date, photographed images from the CODRS have been used to record catches of various shark species. CODRS data collection has now been strengthened to include catches of shark and other species, such as *ariid* catfish. The shark species recorded, currently include some 37 species, mostly of which are Carcharhinids, but current data shows that these make up no more than 0.25% of the total catch. Collectively, the combined volume of secondary species, across all UoAs, is no greater than 2.29%.

Small numbers of Scombridae, Carangidae, Acanthuridae and Haemulidae are caught in the gill-net fishery, and some Carangidae in the trap fishery. None are perceived to be vulnerable.

For the purpose of this assessment, sharks have not been defined at Endangered, Threatened and Protected (ETP) species. National measures are in place to prohibit the export of shark (Decree 59/PERMEN-KP/2014). No species are listed as ETP species in the Indonesian government list of protected flora and fauna under Government Decree (Peraturan

Pemerintah) No. 7/1999. If not subject to national management measures or prohibition, MSC classifies ETPs as *Species listed in the binding international agreements CITES, Appendix 1 (SA3.1.5.2)* and *Binding agreements concluded under the Convention on Migratory Species (CMS)*. Indonesia is a Non-Party to CMS, hence this MSC classification does not apply. MSC only applies IUCN to animals classified as 'out-of scope' (amphibians, reptiles, birds and mammals) (SA 3.1.5.3).

A number of baitfish species are used to catch snappers and groupers. These include scads (*Decapterus* spp.) and sardines (*Sardinella* spp), as used by longline; and tongkol (*Auxis* spp. and *Euthinus affinis*), as used by droplines (Leuna, M., pers. comm., June 2016). Some other species might include fish caught on the lines and chopped up for bait, including shark, moray eels, marine catfish and escolars. Field officers suggest around 250 kg bait is used for every 1 MT of target species caught. Indonesia stock assessment work indicates that small pelagic species (*Ikan Pelagis Kecil*) used as baitfish are fully exploited, with the exception of WPP 711 where small pelagics are over-exploited. An RBF assessment indicates low risk. A rough estimate of baitfish utilisation suggests that the groundfish fisheries utilise around 2% of the species caught, hence were the species considered to be over exploited, usage by the groundfish fisheries are highly unlikely to create a significant impact on baitfish exploitation.

Evidence from the TNC project officers suggests that shark finning is occurring (see 2.4.5.1). Fins are cut on board and landed together with the carcasses, or in some cases, the carcasses may be used as bait. A specific shark regulation will need to be established to demonstrate full documentation of the destination of all shark bodies and body parts; and good external validation of the vessels' activities is available to confirm that it is highly likely that shark finning is not taking place.

Other ETP species that may occur on the fishing grounds of the groundfish snapper and grouper fisheries include manta rays, turtles, cetaceans and Napoleon fish (*Cheilinus undulatus*). None of these, however, are likely to be caught in the groundfish snapper and grouper dropline and longline fisheries. However, it is likely that there may be indirect effects (PI 2.3.1c) on some species from gill-net activity, especially cetaceans as a result of loss in gear; and for all fishing methids, when discarding plastic bags by the fishing vessels. These may be swallowed by whales and turtles.

Drop-line fisheries are characterized by a very low impact on habitat at the fishing grounds, whereas some impact from entanglement can be expected from bottom longlines. This is nothing near the habitat impact from destructive dragging gears, but this has not been tested. MSC allows for the Risk-Based Framework to be applied to assess the likely impact on the benthos (PF7 Conducting a Consequence Spatial Analysis (CSA), pp 96-107). A preliminary analysis for outer and inner shelf scored the habitat impact for longline, trap and gill net indicate scores > 80.

Ecosystem impacts were also tested using the SICA (PF8), adopting 'species composition' as the most vulnerable. The CA was scored at 100.

Additional outcomes for this PI to pass assessment will require: a detailed report on all secondary and ETP species caught, or evidence that interactions are low or non-existent, or if they exist are not likely to cause irreversible harm; the setting of shark management measures and evidence that fins are landed together with the carcasses, or a program developed that seeks to eliminate finning from fishing practices; and the implementation of a policy of non-discarding of waste, or any other synthetic or semi-synthetic organic compounds from fishing vessels.

Were the UoAs to be updated to include gill net and trap, some of the above interactions may change, especially for example, gill net catches of other species and ETPs.

## P3 issues

Laws are formulated by parliament and transferred into government regulation or MMAF decree. Fisheries policies are set out through the Directorate-General for Capture Fisheries, MMAF, and these policies also require implementation at provincial and district levels under the Autonomy Law No. 23/2014. The Ministry, in decentralizing authority to the provinces and districts, assumes a facilitation and coordination role to guide these authorities in the management of their respective jurisdictions, consistent with national laws. The Ministry then focuses on implementation of these policies, through fisheries legislation for the offshore fisheries, i.e. vessels fishing outside 12 nautical miles or over 30 GTs, with delegated responsibility to provincial fisheries services for vessels < 30 GT.

National objectives are enshrined by the policy pillars of sovereignty, sustainability, and prosperity, and incorporated into Indonesia's main fisheries law (31 of 2004, revised by 45 of 2009). Both the precautionary and ecosystem approaches to fisheries management have also been introduced as component of the government's core management objectives (Decree PMKDPRI 15/MEN/2012 (National Strategy on Fisheries Management)) and are explicit in deciding on management actions.

Reference is made to fishery management plans in the Fisheries Law as an instrument of fishery specific governance, and definitions for these plans are contained in Ministerial Regulation 29 of 2012 on compilation of fisheries management plans (*Rencana Pengelolaan Perikanan*, RPP), and these apply the requirements to estimate of Maximum Sustainable Yield for each stock, a maximum allowable catch and resource allocation system (from a national aggregate to provincial and district levels), based on historic levels of fishing in each jurisdictional area. There is no fishery-specific management plan prepared for groundfish species and none of the RPPs that exist to date, include concrete plans or reference points to regulate the number of licenses based on the status of the resources. Fishery-specific harvest strategies introduced through Regulation 17 of 2017 of the Director-General of Capture Fisheries are meant to fill this gap. The management tool is to regulate effort by fishing licence, but licensing does not apply to vessels < 5 GT.

The pre-assessment shows that organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction. Similarly, good consultation procedures exist in the form of the WPPNRI (fishery management area, *Wilayah Pengelolaan Perikanan Negara Republik Indonesia*). This will satisfy MSC's consultation requirements: *The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained; and the consultation process provides opportunity for all interested and affected parties to be involved*. However, the pre-assessment also identifies that there is little evidence to suggest that the national decision-making process makes provision for fisheries specific decisions, albeit that this may be implicit within the WPP structure. Prior to full assessment, the program will need to demonstrate that a fishery specific hierarchy for decisions exists which should include:

- fisheries respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner;
- precautionary actions are explicit within the fishery specific management policy;
- evidence that through the WPP structure, explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity;
- and evidence of legal challenges or judicial decisions are adhered to in the management of the fishery.

The pre-assessment also identifies that the compliance system in the fishery is weak, and that

the current tools applied fail to deal effectively with the current management regulations. This suggests that as and when the harvest strategy is implemented, there will be a need to undertake a compliance risk assessment to determine the appropriate control measures for this fishery, and to ensure that the compliance tools adopted are sufficiently effective in eliminating systematic non-compliance.

Finally, consistent with the development of a tuna management plan, the groundfish dropline and longline fisheries will need to have a management plan in place. This plan will need to set out short and long-term objectives that are consistent with achieving the outcomes expressed by MSC's Principles 1 (stock assessment, harvest strategies) and 2 (ecosystem management). The plan will also need to ensure that the outcomes and actions identified are measurable so that the implementation of the management plan is subject to internal and occasional external review.

Based on the information available, we believe the fishery is currently not well placed to proceed to full assessment but could be if it can address potential impediments to certification. Improvements to management that would see the fishery better placed for certification include:

**Principle 1**

- Using a suite of proxies, development of agreed PIs and RPs to define stock status based on existing data sets (e.g. fishery-independent surveys)
- Provide a sufficiently robust estimate of the removals from each stock by Indonesian fisheries other than the sub-fisheries under assessment
- Development of a harvest strategy which is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving the stock management objectives of each target species fluctuating around a level consistent with MSY. These would need to include the following:
    - Select well defined trigger reference points for each species based on one of more proxy indicators (1.2.1a)
    - Investigate appropriate control rules and a primary management tool, most probably some form of effort control system (1.2.1a)
    - Develop a harvest control rule to initiate the response to a fishery indicator moving above or below the trigger reference point (1.2.2a).
    - Undertake a Management Strategy Evaluation to demonstrate that the HCRs will be effective and respond to the main uncertainties (1.1.2 b/1.2.1c), and that a management strategy is expected to work (1.2.2) or that stocks < MSY will recover within 2 times its generation time (1.1.2).
    - Identify a suite of other management tools, e.g. minimum landing size restrictions, that when applied as a co-management strategy, will protect pre-adult species (1.2.1a)
    - Strengthen the information base for monitoring stock status and the responsiveness of the management system and fleet to the management measures applied (1.2.3)
    - Incorporating a sufficiently robust estimate on fleet composition on the target species by Indonesian longline and drop line vessels (1.2.1b/c).

**Principle 2**

- Provide a comprehensive table of secondary species catches, by species, taken by each sub-fishery, and relating these numbers to the total catch in each fishery. This is now being applied as an extension to CODRS (2.3.3a). Once collected, the assessment will need to review species caught ,> 2% of total catch, their status (probably using IUCN as an indicator), and whether the UoA fishery is likely to impact on these stocks.

- Introduce a shark management measure to ensure that if processing of sharks takes place onboard, that these details are recorded to ensure that there is no systematic finning activity in place. Attention will have to be full documentation of the destination of all shark bodies and body parts; and that there is good external validation of the vessels' activities to confirm that it is highly likely that shark finning is not taking place, or is not systematic.
- Provide evidence that CODRS is also applied effectively to the recording of ETP species, namely Napoleon fish, turtles, whales, dolphins and manta rays (2.3.3a)
- Implement a policy of non-discarding of waste, or any other synthetic or semi-synthetic organic compounds from fishing vessels (2.3.1c).

**Principle 3**

- Implement a fishery specific management plan that identifies short and long-term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 (stock assessment, harvest strategies) and 2 (ecosystem management) (3.2.1).
- Develop a comprehensive decision-making system is in place into the WPP consultative process that includes:
    - Decision-making processes are specific to the groundfish snapper and grouper sub fisheries (3.2.2a).
    - Decision-making processes for the groundfish snapper and grouper sub fisheries respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner (3.2.2b)
    - Precautionary actions are explicit within the fishery-specific management policy (3.2.2c).
    - Evidence to show that through these groups, explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity (3.2.2d).
    - Evidence of legal challenges or judicial decisions are adhered to in the management of the fishery (3.2.2e).
- Develop and apply of a compliance risk assessment for the groundfish snapper and grouper sub-fisheries.
- Identify and apply compliance tools to effectively enforce relevant management measures, strategies and/or rules (3.2.3a).
- Provide evidence that sanctions are being applied to the groundfish demersal sector and that they are an effective deterrent (3.2.3b)
- Provide evidence that the compliance tools applied are effective and that they are an effective deterrent (3.2.3c)
- Ensure that there is a fisheries specific management performance review process in place which is subject to internal and occasional external review (3.2.2b).

# 1 Introduction

## 1.1 Aims/scope of pre-assessment

The Marine Stewardship Council (MSC) is an independent, global, non-profit organization. It works to enhance responsible management of seafood resources, to ensure the sustainability of global fish stocks and the health of the marine ecosystem. It is supported by a broad coalition of those with a stake in the future of the global seafood supply. The MSC harnesses consumer power by identifying sustainable seafood products through an eco-label. The MSC has identified the following mission statement:

*To safeguard the world's seafood supply by promoting the best environmental choice.*

The MSC strongly recommends that fisheries that are considering certification according to the MSC standard carry out a pre-assessment. Independent Certification Assessment Bodies (CABs) carry out pre-assessments to assess whether a fishery is likely to pass the scoring standards set by MSC. In case of fisheries that are not deemed ready to proceed with a chance of success to full assessment, the pre-assessment will indicate where the weaknesses lie and as such provides direct entry points for plans to improve the fishery to make it more likely to pass full certification and improve its sustainability. This is known as a Fishery Improvement Plan (FIP).

The MSC recommends pre-assessments of fisheries interested in certification to help the client get a clear picture of whether the fishery is a good candidate for a full certification evaluation, to see what potential issues may arise as part of a full certification evaluation, and to determine the likely costs for a full certification. The client must provide evidence that 1) the policies, management principles, and enforcement programs of the responsible fishery management bodies and fishing fleets can be expected to meet the MSC Principles and Criteria; and 2) that the status of the entire biological stock or stocks of the species utilized by the fishery are healthy, even if the fishery just fishes a small portion of the entire stock(s). This is necessary because the MSC's Standards Council has determined that the biological stock of the species fished must be demonstrated as healthy for a fishery or fisheries to be fully certified. These pieces of information are designed to help a fishery make more informed decisions regarding its ability to move forward with full certification. However, no verification of information occurs during a pre-assessment.

## 1.2 Constraints to the pre-assessment of the fishery

There were no obvious constraints to the pre-assessment. However, whilst most fisheries targeting deepwatwer species, some vessels may involve the use of multiple gears. These are presently excluded as part of the pre-assessment, but assessment issues will be explored as the program's data base is updated, and also once MSC has made it's deliberations on compartmentalisation of fisheries.

Thanks, in particular go to Peter Mous, Jos Pet and staff of the Nature Conservancy for providing technical support along with supporting reference material.

## 1.3 Unit of Assessment

The MSC Guidelines to Certifiers specifies that the unit of certification is "The fishery or fish stock (=biologically distinct unit) combined with the fishing methods/gears and practice (=vessel(s) pursuing the fish of that stock) and management framework."

This pre-assessment assesses the two gears as separate entities, and identifies the UoAs based on each species defined as a target species. It is understood that the UoA definition process will remain dynamic throughout the course of the Fisheries Improvement Plan since the species catch data base is near real time and may be subject to some variation.

Two hundred and seventy-two (272) units of assessment (March, 2019) were identified, covering four fishing methods, drop-line, long-line, trap and gill-net; 6 management areas (WPPs) and 25 species across the range of these management areas. Some vessels are identified as using a combination of gears, which can be added to the main UoAs. These include 130 drop-line UoAs, 110 long-line, 9 trap and 23 gill-net.

**Table 1: Proposed UoAs for the groundfish drop line and longline fisheries.**

| UoAs No' | Species | Method of Capture | Geographical Area | Stock | Management framework |
|---|---|---|---|---|---|
| 25 | *Pristipomoides multidens*<br>*Pristipomoides typus*<br>*Lutjanus malabaricus,*<br>*Lutjanus erythropterus,*<br>*Epinephelus areolatus*<br>*Etils sp.*<br>*Lutjanus sebae*<br>*Epinephelus latifasciatus*<br>*Pristipomoides filamentosus,*<br>*Paracaesio kusakarii,*<br>*Etelis coruscans*<br>*Gymnocranius grandoculis*<br>*Aphareus rutilans*<br>*Lutjanus timorensis*<br>*Seriola rivoliana*<br>*Pristipomoides sieboldii*<br>*Epinephelus bleekeri*<br>*Etelis radiosus*<br>*Symphorus nematophorus*<br>*Wattsia mossambica*<br>*Pinjalo lewisi*<br>*Paracaesio stonei*<br>*Aprion virescens*<br>*Diagramma pictum*<br>*Lethrinus laticaudis* | Drop-line | WPP 573 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 15 | *Lutjanus malabaricus*<br>*Lutjanus erythropterus*<br>*Pristipomoides multidens*<br>*Pristipomoides typus*<br>*Epinephelus areolatus*<br>*Epinephelus bleekeri*<br>*Diagramma pictum*<br>*Lutjanus sebae*<br>*Pristipomoides typus*<br>*Gymnocranius grandoculis*<br>*Symphorus nematophorus*<br>*Lutjanus timorensis*<br>*Epinephelus latifasciatus*<br>*Seriola rivoliana* | Drop-line | WPP 712 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |

| | | | | | |
|---|---|---|---|---|---|
| | *Pinjalo lewisi* | | | | |
| 25 | *Aphareus rutilans*<br>*Epinephelus areolatus*<br>*Lutjanus malabaricus*<br>*Lutjanus erythropterus*<br>*Pristipomoides multidens*<br>*Pinjalo lewisi*<br>*Etelis sp.*<br>*Etelis coruscans*<br>*Gymnocranius grandoculis*<br>*Diagramma pictum*<br>*Pristipomoides typus*<br>*Symphorus nematophorus*<br>*Lutjanus sebae*<br>*Lutjanus timorensis*<br>*Pristipomoides multidens*<br>*Pristipomoides typus*<br>*Pristipomoides filamentosus*<br>*Etelis radiosus*<br>*Aprion virescens*<br>*Epinephelus bleekeri*<br>*Seriola rivoliana*<br>*Pristipomoides sieboldii*<br>*Wattsia mossambica*<br>*Paracaesio kusakarii*<br>*Paracaesio stonei*<br>*Epinephelus latifasciatus*<br>*Lethrinus laticaudis* | Drop-line | WPP 713 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 25 | *Etils sp,*<br>*Paracaesio kusakarii*<br>*Aphareus rutilans*<br>*Pristipomoides multidens*<br>*Etelis coruscans*<br>*Pristipomoides filamentosus*<br>*Etelis radiosus*<br>*Seriola rivoliana*<br>*Paracaesio stonei*<br>*Epinephelus latifasciatus*<br>*Wattsia mossambica*<br>*Lutjanus malabaricus*<br>*Pristipomoides sieboldii*<br>*Aprion virescens*<br>*Pinjalo lewisi*<br>*Gymnocranius grandoculis*<br>*Lutjanus sebae*<br>*Pristipomoides typus*<br>*Lutjanus timorensis*<br>*Lutjanus erythropterus*<br>*Symphorus nematophorus*<br>*Epinephelus areolatus*<br>*Lethrinus laticaudis*<br>*Epinephelus bleekeri*<br>*Diagramma pictum* | Drop-line | WPP 714 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 25 | *Etils sp*<br>*Aphareus rutilans*<br>*Paracaesio kusakarii*<br>*Pristipomoides multidens*<br>*Pristipomoides filamentosus*<br>*Etelis coruscans*<br>*Lutjanus erythropterus*<br>*Etilis radiosus*<br>*Seriola rivoliana*<br>*Paracaesio stonei* | Drop-line | WPP 715 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |

| | | | | | |
|---|---|---|---|---|---|
| | *Pristipomoides sieboldii*<br>*Epinephelus latifasciatus*<br>*Lutjanus malabaricus*<br>*Wattsia mossambica*<br>*Pinjalo lewisi*<br>*Lutjanus timorensis*<br>*Gymnocranius grandoculis*<br>*Aprion virescens*<br>*Pristipomoides typus*<br>*Lethrinus laticaudis*<br>*Lutjanus sebae*<br>*Epinephelus areolatus*<br>*Diagramma pictum*<br>*Epinephelus bleekeri*<br>*Symphorus nematophorus* | | | | |
| 25 | *Etelis sp.*<br>*Lethrinus laticaudis*<br>*Pristipomoides multidens*<br>*Aphareus rutilans*<br>*Paracaesio kusakarii*<br>*Pristipomoides filamentosus*<br>*Etelis radiosus*<br>*Epinephelus latifasciatus*<br>*Pristipomoides typus*<br>*Etelis coruscans*<br>*Lutjanus malabaricus*<br>*Seriola rivoliana*<br>*Wattsia mossambica*<br>*Lutjanus timorensis*<br>*Lutjanus sebae*<br>*Paracaesio stonei*<br>*Lutjanus erythropterus*<br>*Gymnocranius grandoculis*<br>*Pristipomoides sieboldii*<br>*Epinephelus areolatus*<br>*Pinjalo lewisi*<br>*Aprion virescens*<br>*Symphorus nematophorus*<br>*Epinephelus bleekeri*<br>*Diagramma pictum* | Drop-line | WPP 718 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 13 | *Pristipomoides multidens*<br>*Lutjanus malabaricus*<br>*Pristipomoides typus*<br>*Epinephelus areolatus*<br>*Lutjanus sebae*<br>*Lutjanus timorensis*<br>*Gymnocranius grandoculis*<br>*Symphorus nematophorus*<br>*Aprion virescens*<br>*Diagramma pictum*<br>*Lutjanus erythropterus*<br>*Pristipomoides filamentosus*<br>*Pinjalo lewisi* | Long-line | WPP 573 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 21 | *Pristipomoides multidens*<br>*Lutjanus malabaricus*<br>*Pristipomoides typus*<br>*Gymnocranius grandoculis*<br>*Epinephelus areolatus*<br>*Lutjanus sebae*<br>*Diagramma pictum*<br>*Symphorus nematophorus*<br>*Lutjanus timorensis*<br>*Lutjanus erythropterus*<br>*Epinephelus latifasciatus*<br>*Aprion virescens*<br>*Seriola rivoliana*<br>*Epinephelus bleekeri* | Long-line | WPP 712 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |

| | | | | | |
|---|---|---|---|---|---|
| | *Aphareus rutilans*<br>*Pristipomoides filamentosus*<br>*Pinjalo lewisi*<br>*Paracaesio kusakarii*<br>*Wattsia mossambica*<br>*Etelis radiosus*<br>*Paracaesio stonei* | | | | |
| 24 | *Lutjanus malabaricus*<br>*Pristipomoides multidens*<br>*Lutjanus sebae*<br>*Diagramma pictum*<br>*Pristipomoides typus*<br>*Epinephelus areolatus*<br>*Lutjanus erythropterus*<br>*Symphorus nematophorus*<br>*Lutjanus timorensis*<br>*Aprion virescens*<br>*Epinephelus bleekeri*<br>*Epinephelus latifasciatus*<br>*Seriola rivoliana*<br>*Aphareus rutilans*<br>*Pristipomoides filamentosus*<br>*Pinjalo lewisi*<br>*Etelis sp.*<br>*Wattsia mossambica*<br>*Paracaesio kusakarii*<br>*Etelis radiosus*<br>*Lethrinus laticaudis*<br>*Paracaesio stonei*<br>*Pristipomoides sieboldii* | Long-line | WPP 713 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 23 | *Aprion virescens*<br>*Lutjanus malabaricus*<br>*Gymnocranius grandoculis*<br>*Pristipomoides multidens*<br>*Symphorus nematophorus*<br>*Lutjanus sebae*<br>*Diagramma pictum*<br>*Pristipomoides filamentosus*<br>*Pristipomoides typus*<br>*Epinephelus areolatus*<br>*Etelis sp.*<br>*Epinephelus bleekeri*<br>*Seriola rivoliana*<br>*Lutjanus timorensis*<br>*Aphareus rutilans*<br>*Lutjanus erythropterus*<br>*Epinephelus latifasciatus*<br>*Wattsia mossambica*<br>*Etelis radiosus*<br>*Pinjalo lewisi*<br>*Paracaesio kusakarii*<br>*Etelis coruscans*<br>*Paracaesio stone* | Long-line | WPP 714 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 13 | *Gymnocranius grandoculis*<br>*Symphorus nematophorus*<br>*Lutjanus malabaricus*<br>*Pristipomoides multidens*<br>*Aprion virescens*<br>*Lutjanus sebae*<br>*Pristipomoides filamentosus*<br>*Diagramma pictum*<br>*Epinephelus areolatus*<br>*Aphareus rutilans*<br>*Seriola rivoliana*<br>*Lutjanus timorensis* | Long-line | WPP 715 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |

| | | | | | |
|---|---|---|---|---|---|
| | *Epinephelus bleekeri* | | | | |
| 20 | *Lutjanus malabaricus*<br>*Gymnocranius grandoculis*<br>*Symphorus nematophorus*<br>*Pristipomoides multidens*<br>*Lutjanus malabaricus*<br>*Epinephelus bleekeri*<br>*Lutjanus erythropterus*<br>*Gymnocranius grandoculis*<br>*Epinephelus latifasciatus*<br>*Epinephelus areolatus*<br>*Pristipomoides typus*<br>*Aprion virescens*<br>*Symphorus nematophorus*<br>*Diagramma pictum*<br>*Diagramma pictum*<br>*Seriola rivoliana*<br>*Lutjanus timorensis*<br>*Pristipomoides filamentosus*<br>*Wattsia mossambica*<br>*Paracaesio kusakarii*<br>*Aphareus rutilans*<br>*Etelis sp.Lethrinus laticaudis*<br>*Pristipomoides multidens*<br>*Lutjanus sebae* | Long-line | WPP 718 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 9 | *Lutjanus malabaricus*<br>*Epinephelus areolatus*<br>*Pristipomoides multidens*<br>*Epinephelus bleekeri*<br>*Lutjanus sebae*<br>*Diagramma pictum*<br>*Lutjanus erythropterus*<br>*Pristipomoides typus*<br>*Gymnocranius grandoculis* | Trap | WPP 712 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |
| 23 | *Aphareus rutilans*<br>*Diagramma pictum*<br>*Etelis radiosus*<br>*Seriola rivoliana*<br>*Gymnocranius grandoculis*<br>*Pristipomoides multidens*<br>*Lutjanus malabaricus*<br>*Lutjanus timorensis*<br>*Etelis sp.*<br>*Lutjanus sebae*<br>*Aprion virescens*<br>*Paracaesio kusakarii*<br>*Pristipomoides filamentosus*<br>*Pinjalo lewisi*<br>*Etelis coruscans*<br>*Lutjanus erythropterus*<br>*Epinephelus bleekeri*<br>*Paracaesio stonei*<br>*Symphorus nematophorus*<br>*Pristipomoides typus*<br>*Epinephelus latifasciatus*<br>*Wattsia mossambica*<br>*Epinephelus areolatus* | Gill-net | WPP 713 | Multi-species groundfish snappers, groupers, emperors, and grunters | Ministry of Marine Affairs and Fisheries, and provincial fisheries services (DKPs) |

## 1.4 Total Allowable Catch (TAC) and Catch Data

The TNC project currently samples 300 vessels (March 2019, TNC), with the intention of expanding the sample size to 500 vessels across all 11 WPPs. This will ensure that around 5% of the fleet is covered. Almost all the sample is extracted from vessels > 5 GT. Data is available both in terms of the number of fish caught by species, and catch weight. In the years since the data was collected to the present 2015-2018, more than 100 different species have been identified. The estimated take by drop-line, long-line, trap, gill-net and mixed gears vessels are 39,810 MT (50%) and 25,575 MT (32%), 4,770 MT (6%), Gill-net (2%) and mixed gears (10%) respectively (Table 3). The total catch of these groundfish species is estimated to be around 79,930 MT annually (http://72.14.187.103:8080/ifish/pub/IFishSnapperCpUE.xls).

**Table 2: Current number of boats in the Fleet by Fishing Gear and Boat Size Category in All WPPs**.

| Number of boats | Dropline | Longline | Gillnet | Trap | Mixed gear | Total |
|---|---|---|---|---|---|---|
| Nano Dedicated | 2,756 | 178 | 1 | 82 | 318 | 3,335 |
| Nano Seasonal | 2,091 | 975 | 30 | 1 | 817 | 3,914 |
| Small Dedicated | 568 | 186 | 17 | 366 | 309 | 1446 |
| Small Seasonal | 387 | 75 | 0 | 0 | 5 | 467 |
| Medium Dedicated | 50 | 128 | 15 | 226 | 50 | 469 |
| Medium Seasonal | 63 | 5 | 6 | 0 | 1 | 75 |
| Large Dedicated | 36 | 116 | 60 | 5 | 1 | 218 |
| Total | 5,951 | 1,663 | 129 | 680 | 1,501 | 9,924 |

Nano less than 5 GT. Small 5-14 GT. Medium 15-29 GT Large 30 GT and up

The tonnage caught in the groundfish snapper are shown in Table 3 below.

**Table 3: Total Catch in Metric Tons per Year by Fishing Gear and Boat Size Category**

| Total Catch | Dropline | Longline | Gillnet | Trap | Mixed gear | Total |
|---|---|---|---|---|---|---|
| Nano Dedicated | 15,375 | 3,897 | 11 | 506 | 2,482 | 22,271 |
| Nano Seasonal | 5,927 | 5,888 | 24 | 3 | 1,018 | 12,860 |
| Small Dedicated | 9,145 | 1,472 | 232 | 2,185 | 3,264 | 16,298 |
| Small Seasonal | 3,789 | 305 | - | - | 23 | 4,117 |
| Medium Dedicated | 1,422 | 6,102 | 608 | 1,848 | 766 | 10,746 |
| Medium Seasonal | 785 | 88 | 106 | - | 8 | 988 |
| Large Dedicated | 3,369 | 7,823 | 940 | 227 | 291 | 12,651 |
| Total | 39,810 | 25,576 | 1,921 | 4,770 | 7,853 | 79,930 |

Nano less than 5 GT. Small 5-14 GT. Medium 15-29 GTLarge 30 GT and up

TNC is in the process of expanding it's data on fleet size across the three jurisdictional areas - District (territorial waters, < 4 nautical miles), Province (territorial waters, within 12 nautical miles), and national (national EEZ). From this data, it is hoped to develop an improved sampling framework from a larger sampling size.

Effort and CPUE data are presented in tables 4 and 5.

**Table 4: CpUE by Fishing Gear and Boat Size Category in All WPP in the Most Recent 365 Days**

| kg/GT/Day | Dropline | Longline | Gillnet | Trap | Mix Gear |
|---|---|---|---|---|---|
| Nano | 24.1 | 52.7 | 11.0 | 10.8 | 13.2 |
| Small | 11.2 | 5.6 | 11.0 | 4.8 | 7.2 |
| Medium | 7.2 | 7.4 | 7.2 | 1.9 | 5.5 |
| Large | 10.7 | 4.9 | 1.0 | 7.0 | 7.0 |

Nano less than 5 GT. Small 5 - 14 GT. Medium 15 - 29 GT. Large 30 GT - up.

**Table 5: Average Active-Fishing Days per Year by Fishing Gear and Boat Size Category in All WPP**

| Days / Year | Dropline | Longline | Gillnet | Trap | Mix Gear |
|---|---|---|---|---|---|
| Nano Dedicated | 188 | 202 | 196 | 197 | 204 |
| Nano Seasonal | 94 | 101 | 98 | 98 | 102 |
| Small Dedicated | 196 | 202 | 199 | 199 | 201 |
| Small Seasonal | 98 | 101 | 99 | 99 | 100 |
| Medium Dedicated | 178 | 242 | 282 | 214 | 155 |
| Medium Seasonal | 89 | 121 | 141 | 107 | 77 |
| Large Dedicated | 178 | 244 | 211 | 211 | 211 |
| Large Seasonal | 89 | 122 | 105 | 105 | 105 |

Nano less than 5 GT. Small 5 - 14 GT. Medium 15 - 29 GT. Large 30 GT - up

# 2 Description of the fishery

## 2.1 Scope of the fishery in relation to the MSC programme

The Indonesian drop-line, long-line, trap and gill-net fisheries have been assessed with regard to special considerations for the scope of the MSC certification sought (FCR 27.4):

- Unit of Assessment – see Section 2.3;
- Enhanced Fishery – the Indonesian drop-line, long-line. trap and gill-net fisheries do not meet the MSC definition of an enhanced fishery;
- Unilateral Exemption – the Indonesian drop-line, long-line. trap and gill-net fisheries are not conducted under a controversial unilateral exemption to an international agreement;
- Destructive Fishing Practices – the Indonesian drop-line, long-line. trap and gill-net fisheries do not use fishing with poisons or explosives;
- Dispute or Controversy – the Indonesian drop-line, long-line. trap and gill-net fisheries are not the subject of controversy and/or dispute;
- Past MSC Record – the Indonesian drop-line, long-line. trap and gillnet fisheries hav not previously failed assessment nor had a certificate withdrawn;
- Other Eligible Fishers – All license holders in the Indonesian drop-line, long-line. trap and gill-net fisheries would be eligible to use an MSC certificate awarded to the fishery;
- IPI Stocks – There are no issues for the Indonesian drop-line, long-line. trap and gill-net fisheries regarding Inseparable or Practically Inseparable stocks;
- Enhanced Stocks – the Indonesian drop-line, long-line. trap and gill-net fisheries do not comprise any enhanced stocks;
- Overlapping Fisheries – the Indonesian drop-line, long-line. trap and gill-net fisheries units of certification do not directly overlap with other MSC certified fisheries, and whilst there may be some overlap with the Western Australian groundfish fishery, each fishery is subject to a different stock assessment system and a different management system

- Introduced Species – the Indonesian drop-line, long-line. trap and gill-net fisheries fishery is not based on any introduced species.

## 2.2 Background

Indonesia's marine capture fisheries are in trouble because of over-fishing and destructive fishing practices. Both are consequences of the “tragedy of the commons”: Fishers, lacking incentives for sustainable use, compete for the last remaining fish in open-access fishing grounds. Small-scale as well as industrial fishers have depleted many of Indonesia's once most valuable fish stocks such as groupers. Besides suffering from the “tragedy of the commons”, fisheries in Indonesia also lack transparency: Because it is difficult or expensive to monitor fish populations and catch, most fisheries are “data-poor”, which means that the scientific basis for fisheries management is weak. The species diversity of Indonesia complicates matters even more, especially in the demersal fisheries, where there are a large number of gears deployed and each species represents a small volume of the total. Consequently, official statistics usually aggregate species in groups that may comprise 10 species or more. Indonesia's groundfish fishery for snappers, groupers and associated species is an example of such a fishery: The species group “red snapper” may comprise about 15 red-coloured species of the genus Lutjanus Etelis, and Pinjalo.

The TNC Indonesia Fisheries Conservation Program has been working on the groundfish fisheries since 2014. The program works together with about 300 fishing vessels (aiming for 500 vessels in 2019), including under 5 GT to 100 GT, each equipped with a tracker (Spot Trace) and where captains take pictures of all fish caught. TNC technicians analyse these pictures to obtain species and size composition. Together with the Spot Trace data, the data on species and size composition provide insights on fishing practices and status of the stock. Stock status is assessed through length-based assessment, including indicators such as percentage of juvenile and adult fish in the catch and spawning potential ratio. All data are available through TNC's data sharing portal, I-Fish Community. I-Fish Community also generates reports with values of indicators together with an interpretation in terms of risk level. TNC is now working with the Ministry's Institute for Marine Fisheries Research (BRPL) to adopt this approach to BRPL's data, and to merge data streams from BRPL's routine data collection programs with data from the vessel that TNC works with. In addition to data collection at fishing vessels, TNC also collects data at two fish processing companies (Indotropic in Luwuk, Central Sulawesi, and Damena in Bali), and TNC works together with various other fishing companies.

Whereas fisheries governance in Indonesia has been weak, the Ministry of Marine Affairs and Fisheries has demonstrated its ability to take action towards sovereignty, prosperity, and sustainability. The Ministry rigorously implemented and enforced a moratorium on foreign-constructed fishing vessels, it banned trawling, and it took action to abate Illegal, Unregulated, and Unreported (IUU) fishing in the South China Sea. It also started building management capacity for its eleven Fishery Management Areas (*Wilayah Pengelolaan Perikanan, WPP*): A supporting ministerial decree on WPPs is nearing finalization (see technical guidelines, formalized through regulation 15 / PER-DJPT / 2017), and it also issued guidelines for formulation of harvest strategies (formalized through regulation 17 / PER-DJPT / 2017). These instruments offer new opportunities to design and implement effective fishery management, and they align with private sector-based initiatives towards sustainability such as certification The Indonesian drop-line, long-line, trap and gill-net fisheries are, collectively, significant, with an estimated 9,924 vessels (Table 2) operating throughout the 11 WWPP zones. These vessels operate across a broad range (i.e. from within the 4-nautical mile baseline to the EEZ boundary), and in depths of 50 to 500 m. The fisheries are within FAO Regions 57 (the Eastern Indian Ocean) and 71 (the Western and Central Pacific Ocean). The geographical range is defined as the waters within the meridians of longitude 110° East and 140° West, and 12°

South, 4° North. To the North, this fishery borders the EEZs of Malaysia and the Philippines, to the East, the EEZs of Papua New Guinea, East Timor and Australia.

Long-line comprises short lines carrying hooks that are attached to a longer main line at regular intervals (FAO). Longlines are laid on the bottom at depths of 50 to 150 m, with the help of small anchors or weights, and marked at the surface with flagged buoys. The lines deployed in the groundfish fishery are estimated to be between 200 to 500 hooks per set, depending on vessels size (Mous, pers com, September 2017). The bottom long-liners fish on the shelf area as well as on the top of the slopes that drop into deeper waters. Bottom long line fishing for snappers and co-occurring species is done with vessels ranging from smaller than 5 GT up to around 100 GT in Indonesian waters.

Drop-lining comprises a main line with one to 10 hooks and a weight (Mous, ibid.), held vertically in the water by hand (handline) or by manual reel. Several droplines may be operated by one fishermen or one vessel (FAO). Drop line fishers target snappers and other demersal species around structures and slopes throughout Indonesia from depths of around 30 to 50 meters on continental shelf areas, to deep slopes and seamounts 50 to 500 meters deep. Drop liners deployed in this fishery range in size from simple canoes to vessels more than 30 GT.

Trap and Gillnet fishing for snappers, groupers, emperors and co-occurring species is less widespread than the use of long line and drop line and is often done in a mixed fishery where hook and line methods are used simultaneously with the traps or gillnets. Commonly used deep water traps for snappers and groupers are made of metal frames and wiring, with the trap cages around 1.5 meters long and wide and about 0.5 to 1 meter high. Traps are usually baited and positioned near structures which are known aggregation sites for target species. Bottom gillnets are set horizontally near structures on continental shelf areas but also vertically along steep slopes and reef drop-offs, with one end tied off to rocks or coral heads on reef tops and the other end weighted and dropped several hundred meters deep, by stretching the net away from the reef over deep water before dropping it.

by Marine Stewardship Council (MSC). TNC has been supporting both initiatives by providing technical expertise to the Directorate-General of Capture Fisheries.

The TNC Fisheries Conservation Program plans to recast its program on the drop-line, long-line, trap and gill-net fisheries as a Fishery Improvement Plan towards MSC certification, either as a Comprehensive FIP as understood by the Conservation Alliance for Sustainable Seafood, or as a MSC “In Transition to MSC”, or ITM program. The approach is that TNC is the client of the FIP, and that TNC will establish a client group of fishing companies who participate in the program. MSC is an international non-profit organization established to address the problem of unsustainable fishing. It established an ecolabel and fishery certification program to contribute to the health of the world’s oceans by recognizing and rewarding sustainable fishing practices, influencing the choices people make when buying seafood.

## 2.3 Overview of the fishery

The Indonesian drop-line, long-line, trap and gill-net fisheries are, collectively, very significant, with an estimated 9,924 vessels (Table 2) operating throughout the 11 WWPP zones. These vessels operate across a broad range (i.e. from within the 4-nautical mile baseline to the EEZ boundary), and in depths of 50 to 500 m. The fisheries are within FAO Regions 57 (the Eastern Indian Ocean) and 71 (the Western and Central Pacific Ocean). The geographical range is defined as the waters within the meridians of longitude 110° East and 140° West, and 12° South, 4° North. To the North, this fishery borders the EEZs of Malaysia and the Philippines, to the East, the EEZs of Papua New Guinea, East Timor and Australia.

Long-line comprises short lines carrying hooks that are attached to a longer main line at regular intervals (FAO). Longlines are laid on the bottom at depths of 50 to 150 m, with the help of small anchors or weights, and marked at the surface with flagged buoys. The lines deployed in the groundfish fishery are estimated to be between 200 to 500 hooks per set, depending on vessels size (Mous, pers com, September 2017). The bottom long-liners fish on the shelf area as well as on the top of the slopes that drop into deeper waters. Bottom long line fishing for snappers and co-occurring species is done with vessels ranging from smaller than 5 GT up to around 100 GT in Indonesian waters.

Drop-lining comprises a main line with one to 10 hooks and a weight (Mous, ibid.), held vertically in the water by hand (handline) or by manual reel. Several droplines may be operated by one fishermen or one vessel (FAO). Drop line fishers target snappers and other demersal species around structures and slopes throughout Indonesia from depths of around 30 to 50 meters on continental shelf areas, to deep slopes and seamounts 50 to 500 meters deep. Drop liners deployed in this fishery range in size from simple canoes to vessels more than 30 GT.

Trap and Gillnet fishing for snappers, groupers, emperors and co-occurring species is less widespread than the use of long line and drop line and is often done in a mixed fishery where hook and line methods are used simultaneously with the traps or gillnets. Commonly used deep water traps for snappers and groupers are made of metal frames and wiring, with the trap cages around 1.5 meters long and wide and about 0.5 to 1 meter high. Traps are usually baited and positioned near structures which are known aggregation sites for target species. Bottom gillnets are set horizontally near structures on continental shelf areas but also vertically along steep slopes and reef drop-offs, with one end tied off to rocks or coral heads on reef tops and the other end weighted and dropped several hundred meters deep, by stretching the net away from the reef over deep water before dropping it.

The size of vessels in these fisheries include a broad range of vessels, including < 5 GT to > 30 GT. Fishers are licensed by permit system with MMAF responsible for licensing vessels > 30 GT, Dinas Perikanan Province, for vessels between 5 to 30 GT, and Dinas districts, for all vessels under 5 GT. Vessels are licensed annually, according to broad definitions of fishing method. However, the method and target species for vessels less than 5 GT may change according to availability of the target species. Larger vessels are known to move long distances and into different jurisdictional area, in which case, they will be required to hold several licenses. Vessels over 30 GT are only allowed to hold two concurrent WPP licenses.

The most important fishing grounds are WPP area:

- South East Indonesia (WPP 573) with the most important fishing grounds in this area located in the Indonesian part of the Timor Sea, near the edge of the Australian continental shelf. Fishing grounds for snappers, groupers, emperors and other target species in this region include deep slopes along the many islands as well as seamounts and other deep structures which are characteristic for this area. There is also fishing around West Timor, Rote Island and other areas around the Savu Sea, as well as on deep slopes throughout WPP 573, mostly by small-scale fishers. Vessels operating in WPP 573 originate from various ports throughout the country, and may also operate in other WPPs. Kupang is one of the main logistical hubs for the Timor Sea fisheries, whereas most of the processing happens in Bali. Larger vessels, ranging from 15 to 100 GT, commonly make trips to distant fishing grounds located 1,000 km or more from port. Smaller boats around 5 to 15 GT range up to 150 km from their home base, while the smallest boats of less than 5 GT commonly range 50 km or more. Gear types in these fisheries include drop lines, bottom-set long-lines, trap and gill-net, deployed from boats of less than 5 GT to medium-scale drop line and long line vessels measuring up to 100 GT for the largest longline vessels. (Mous P and Pet, J., WPP 573, TNC, May 2018).

- The Java Sea (WPP 712) in between the North coast of Java and the South coast of Kalimantan. The most important gear types in these fisheries include drop lines, bottom long lines, deep set fish traps and bottom gillnets, sometimes used as single gears and sometimes used in combination. The target fisheries operate on the deeper parts of the Java Sea shelf from the Southern tip of Sumatra in the West to the deep slopes dropping into the Makassar Strait and the Bali Sea in the East. The majority of fleets and vessels on the fishing grounds in WPP 712 originate from the North coast of Java and they generally fish at depths ranging from 50 meters on the shelf to 250 meters down the deep slopes in the East (Mous P and Pet, J., WPP 712),
- The Makassar Strait and the Flores Sea (WPP 713) with various longline fleets from in East Java and mostly small-scale drop-liners from all around the Makassar Strait. Bottom long line vessels fish on the shelf area as well as on the top of the slopes that drop to deeper waters, with important fishing grounds located around the border between WPP 712 and WPP 713, where the Java Sea meets the Makassar Strait. Drop liners fish deep reefs on the shelf as well as deep slopes dropping into the Makassar Strait and the Bali Sea. (Mous P and Pet, J., WPP 713, TNC, May 2018).
- The Banda Seas (WPP 714), with several fleets from this region including a medium scale drop line fleet based in Kema, North Sulawesi, and a small-scale mini long-line fleet based in the Banggai and Sula Islands on the border of the Maluku and Banda Seas. Fleets originating from outside the region (e.g. Bali, Probolinggo, Kupang) also operate in the zone. Fishing grounds for the small-scale mini long-line fleet are concentrated near the home islands near the centre the area of interest, whereas the medium scale drop liners from Kema make trips to locations up to 1,000 kilometres away from their port (Mous P and Pet, J., WPP 714, TNC, May, 2018).
- The Maluku and Seram Seas (WPP 715), and is surrounded by the Pacific Ocean to the North and the Arafura Sea and Banda Sea to the South. Drop line and mini long line vessels fish on both sides of WPP 715 boundaries some- times even within a single fishing trip, but more often shifting between fishing grounds with the varying seasons and wind directions. Small scale fishing fleets based in the Banggai Islands for example, fish in WPP 715 on the North side of the Banggai and Sula Islands during the South Easterly monsoon winds from May through October, while fishing on the South side of these Islands in WPP 714 during the North West monsoon from December through March. They fish on both sides during the inter-monsoon months of April and November. In terms of habitat and ecology of the target species, WPP 715 and surrounding fisheries management areas, at least for the fishing grounds directly across the boundaries, are very similar and completely connected (Figure 1.2). Fishing grounds for snappers, groupers and other target species in this region include mostly deep slopes along the many islands as well as seamounts, reefs and other structures which are characteristic for this area. The typical habitat in WPP 715 is mostly suitable for deep drop-line fishing along these structures, with some more substantial suitable long-line fishing grounds mainly concentrated close to the shores of the Bird's Head of West Papua. (Mous P and Pet, J., WPP 715, TNC, May, 2018).
- The Arafura Sea (WPP 718), with the main grounds being the Banda Strait and the Timor Trough (Drop line) and Arafura sea (longline). Various fleets are operating in this region, including long-liners and drop liners from Bali (often via Kupang), longliners from Probolinggo, Timika, Dobo, Tual, drop liners from Kema (North Sulawesi) and Ternate (Mous P and Pet, J., WPP 718, TNC, September 2017)

  There is also some activity in the Malacca Straight (571), West Sumatra (572), The South China Sea (WPP 711), North Sulawesi (WPP 716) and Samudera Pasifik (WPP

717), but not presently documented by TNC. These may be added form separate UoA during the course of the program[1].

**Figure 1. Fisheries Management Areas (WPP) in Indonesian marine waters**

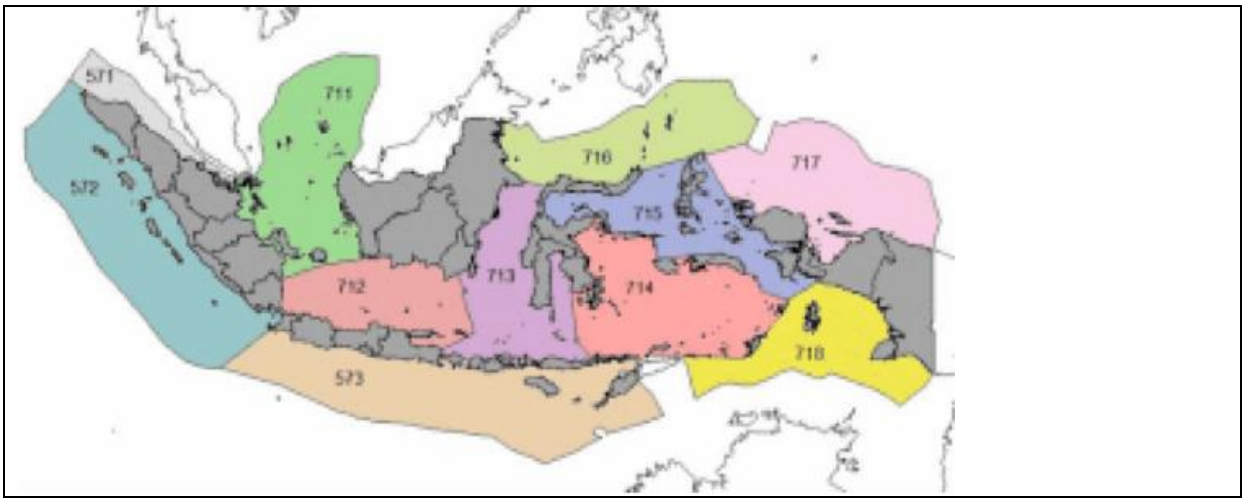
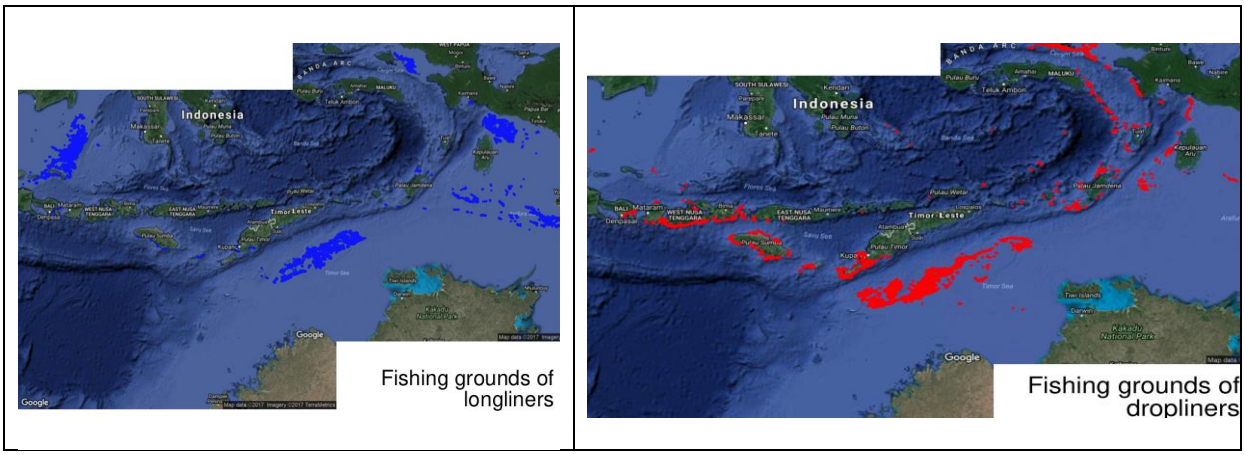



**Figure 2: Fishing grounds for long-liners and drop liners**




## 2.4 Principle One: Target species background

The groundfish fisheries harvest up to 100 separate species of snapper, grouper, emperors and grunter species. The Project selected 25 target species, representing the main groundfish target species across the range of drop-line, long-line, trap and gill-net fisheries and includes a table on mixed gears (Table 6). The selection is based on a number of characteristics, but broadly, includes main species caught exclusively in these fisheries and species with a strong market interest.

The Table also shows species status against a range of proxy indicators and current trends. The definition if these proxies is defined in Section 2.4.1.

[1] TNC has plans to extend the sampling program to these areas (Mous, pers. comm., September 2017).

**Table 6: Target species by fishery, drop line and longline by WPP.**

| Rank | Species WPP-573 Dropline | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Pristipomoides multidens | 36.023 | High | high | High | high | improving | improving | improving | improving |
| 2 | Pristipomoides typus | 21.382 | High | high | High | high | improving | improving | improving | improving |
| 3 | Lutjanus malabaricus | 14.350 | High | high | High | high | deteriorating | improving | improving | improving |
| 4 | Lutjanus erythropterus | 5.218 | Low | Low | Low | medium | improving | deteriorating | deteriorating | improving |
| 5 | Epinephelus areolatus | 2.635 | Low | Low | Low | low | stable | stable | improving | improving |
| 6 | Etelis sp. | 1.917 | High | high | High | high | deteriorating | improving | improving | stable |
| 7 | Lutjanus sebae | 1.580 | High | high | High | high | improving | improving | stable | improving |
| 8 | Epinephelus latifasciatus | 1.417 | Low | Low | Low | low | improving | improving | improving | deteriorating |
| 9 | Pristipomoides filamentosus | 1.297 | High | high | High | high | deteriorating | improving | improving | improving |
| 10 | Paracaesio kusakarii | 1.049 | Medium | high | High | high | improving | improving | improving | improving |
| 11 | Etelis coruscans | 0.956 | High | high | High | high | deteriorating | improving | stable | deteriorating |
| 12 | Gymnocranius grandoculis | 0.883 | Low | medium | Medium | low | improving | improving | improving | improving |
| 13 | Aphareus rutilans | 0.791 | High | high | High | medium | deteriorating | improving | improving | improving |
| 14 | Lutjanus timorensis | 0.741 | Medium | medium | High | high | deteriorating | improving | improving | improving |
| 15 | Seriola rivoliana | 0.681 | Medium | medium | Medium | medium | improving | improving | improving | improving |
| 16 | Pristipomoides sieboldii | 0.425 | Low | high | High | high | deteriorating | deteriorating | improving | improving |
| 17 | Epinephelus bleekeri | 0.421 | Low | Low | Low | low | stable | deteriorating | deteriorating | deteriorating |
| 18 | Etelis radiosus | 0.364 | High | high | High | high | improving | improving | improving | improving |
| 19 | Symphorus nematophorus | 0.185 | Low | medium | High | medium | improving | improving | improving | improving |
| 20 | Wattsia mossambica | 0.171 | Low | medium | High | high | deteriorating | improving | improving | deteriorating |
| 21 | Pinjalo lewisi | 0.148 | Low | high | High | high | improving | improving | improving | improving |
| 22 | Paracaesio stonei | 0.144 | Medium | high | High | high | improving | deteriorating | stable | improving |
| 23 | Aprion virescens | 0.105 | Low | Low | Medium | unknown | improving | improving | improving | unknown |
| 24 | Diagramma pictum | 0.005 | Low | medium | Low | unknown | improving | stable | improving | unknown |
| 25 | Lethrinus laticaudis | 0.001 | Low | Low | Low | unknown | unknown | unknown | unknown | unknown |

| Rank | Species WPP-573 Longline | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Pristipomoides multidens | 49.782 | High | high | High | high | improving | improving | improving | stable |
| 2 | Lutjanus malabaricus | 23.286 | Medium | high | High | high | improving | improving | improving | improving |
| 3 | Pristipomoides typus | 12.540 | Medium | high | High | high | improving | improving | improving | improving |
| 4 | Epinephelus areolatus | 3.100 | Low | Low | Low | low | stable | improving | improving | deteriorating |
| 5 | Lutjanus sebae | 2.212 | High | high | High | high | improving | improving | stable | improving |
| 6 | Lutjanus timorensis | 0.870 | Low | Low | Low | medium | improving | improving | improving | improving |
| 7 | Epinephelus latifasciatus | 0.705 | Medium | high | High | unknown | deteriorating | deteriorating | deteriorating | unknown |
| 8 | Gymnocranius grandoculis | 0.569 | Low | Low | Low | unknown | deteriorating | improving | improving | unknown |
| 9 | Symphorus nematophorus | 0.261 | Low | Low | High | unknown | stable | improving | stable | unknown |
| 10 | Aprion virescens | 0.038 | Low | high | High | unknown | unknown | unknown | unknown | unknown |
| 11 | Diagramma pictum | 0.027 | Unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 12 | Lutjanus erythropterus | 0.019 | Low | Low | Low | unknown | deteriorating | improving | improving | unknown |
| 13 | Pristipomoides filamentosus | 0.015 | Low | high | High | unknown | improving | improving | improving | unknown |
| 14 | Pinjalo lewisi | 0.002 | High | high | High | unknown | deteriorating | deteriorating | stable | unknown |
| | | | | | | | | | | |
| Rank | Species WPP-712 Dropline | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
| 1 | Lutjanus malabaricus | 57.906 | High | high | High | high | improving | improving | improving | improving |
| 2 | Lutjanus erythropterus | 9.954 | High | high | High | high | improving | deteriorating | deteriorating | stable |
| 3 | Pristipomoides multidens | 7.629 | High | high | High | high | improving | improving | improving | improving |
| 4 | Epinephelus areolatus | 6.766 | Low | Low | Low | medium | deteriorating | deteriorating | deteriorating | deteriorating |
| 5 | Epinephelus bleekeri | 1.307 | Low | Low | Low | low | improving | deteriorating | improving | unknown |
| 6 | Diagramma pictum | 1.132 | High | high | High | medium | deteriorating | improving | improving | deteriorating |
| 7 | Lutjanus sebae | 1.109 | High | high | High | high | deteriorating | deteriorating | stable | stable |
| 8 | Pristipomoides typus | 0.802 | High | high | High | high | improving | improving | improving | unknown |
| 9 | Gymnocranius grandoculis | 0.474 | High | high | High | high | deteriorating | improving | improving | stable |
| 10 | Symphorus nematophorus | 0.132 | Medium | Low | Low | unknown | improving | improving | improving | unknown |
| 11 | Lutjanus timorensis | 0.085 | High | high | High | high | deteriorating | improving | improving | unknown |
| 12 | Epinephelus latifasciatus | 0.067 | High | high | High | unknown | improving | improving | improving | unknown |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | Seriola rivoliana | 0.022 | High | high | High | unknown | unknown | unknown | unknown | unknown |
| 14 | Pinjalo lewisi | 0.008 | Unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| | | | | | | | | | | |
| Rank | Species WPP-712 Longline | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
| 1 | Pristipomoides multidens | 46.417 | High | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 2 | Lutjanus malabaricus | 20.576 | High | high | High | medium | deteriorating | improving | improving | deteriorating |
| 3 | Pristipomoides typus | 5.231 | Medium | high | High | high | improving | deteriorating | deteriorating | deteriorating |
| 4 | Gymnocranius grandoculis | 3.884 | High | high | High | high | improving | improving | improving | improving |
| 5 | Epinephelus areolatus | 3.576 | Low | Low | Low | low | improving | improving | improving | improving |
| 6 | Lutjanus sebae | 3.241 | High | high | High | high | improving | stable | improving | improving |
| 7 | Diagramma pictum | 2.082 | Low | Low | Low | unknown | improving | improving | improving | unknown |
| 8 | Symphorus nematophorus | 0.956 | Low | Low | Low | unknown | stable | deteriorating | improving | unknown |
| 9 | Lutjanus timorensis | 0.852 | Low | high | High | unknown | improving | improving | stable | unknown |
| 10 | Lutjanus erythropterus | 0.754 | Low | Low | High | unknown | deteriorating | improving | improving | unknown |
| 11 | Epinephelus latifasciatus | 0.574 | Low | Low | Low | unknown | improving | improving | improving | unknown |
| 12 | Aprion virescens | 0.429 | Low | Low | Low | unknown | deteriorating | deteriorating | improving | unknown |
| 13 | Seriola rivoliana | 0.427 | Low | high | Low | unknown | improving | improving | improving | unknown |
| 14 | Epinephelus bleekeri | 0.377 | Low | Low | Low | unknown | deteriorating | deteriorating | deteriorating | unknown |
| 15 | Aphareus rutilans | 0.370 | Unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 16 | Pristipomoides filamentosus | 0.125 | Low | Low | High | unknown | deteriorating | deteriorating | deteriorating | unknown |
| 17 | Pinjalo lewisi | 0.038 | Unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 18 | Paracaesio kusakarii | 0.035 | Unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 19 | Wattsia mossambica | 0.027 | Unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 20 | Etelis radiosus | 0.021 | Unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 21 | Paracaesio stonei | 0.001 | Unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |

| Rank | Species WPP-712 Traps | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Lutjanus malabaricus | 52.552 | High | high | High | high | unknown | unknown | unknown | unknown |
| 2 | Epinephelus areolatus | 5.875 | Low | Low | Low | medium | unknown | unknown | unknown | unknown |
| 3 | Pristipomoides multidens | 2.693 | Medium | high | High | unknown | unknown | unknown | unknown | unknown |
| 4 | Epinephelus bleekeri | 2.305 | Low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 5 | Lutjanus sebae | 1.530 | High | high | High | unknown | unknown | unknown | unknown | unknown |
| 6 | Diagramma pictum | 1.070 | High | high | High | unknown | unknown | unknown | unknown | unknown |
| 7 | Lutjanus erythropterus | 0.999 | High | high | High | unknown | unknown | unknown | unknown | unknown |
| 8 | Pristipomoides typus | 0.300 | High | high | High | unknown | unknown | unknown | unknown | unknown |
| 9 | Gymnocranius grandoculis | 0.119 | High | high | High | unknown | unknown | unknown | unknown | unknown |
| | | | | | | | | | | |
| Rank | Species WPP-712 Mixgears | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
| 1 | Lutjanus malabaricus | 39.806 | High | high | High | high | improving | improving | improving | unknown |
| 2 | Lutjanus erythropterus | 6.873 | High | high | High | high | unknown | unknown | unknown | unknown |
| 3 | Epinephelus areolatus | 4.442 | Low | Low | Low | medium | unknown | unknown | unknown | unknown |
| 4 | Diagramma pictum | 4.097 | High | high | High | low | unknown | unknown | unknown | unknown |
| 5 | Pristipomoides multidens | 1.238 | High | high | High | high | unknown | unknown | unknown | unknown |
| 6 | Lutjanus sebae | 1.181 | High | high | High | high | deteriorating | improving | stable | unknown |
| 7 | Epinephelus bleekeri | 0.895 | Medium | Low | Low | low | unknown | unknown | unknown | unknown |
| 8 | Gymnocranius grandoculis | 0.287 | High | high | High | high | unknown | unknown | unknown | unknown |
| 9 | Symphorus nematophorus | 0.096 | Low | high | Medium | unknown | unknown | unknown | unknown | unknown |
| 10 | Pristipomoides typus | 0.092 | High | high | High | high | unknown | unknown | unknown | unknown |
| 11 | Lutjanus timorensis | 0.013 | High | high | High | unknown | unknown | unknown | unknown | unknown |

| Rank | Species WPP-713 Dropline | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Aphareus rutilans | 8.553 | High | high | High | high | improving | improving | improving | unknown |
| 2 | Epinephelus areolatus | 7.255 | Low | medium | Medium | high | improving | deteriorating | deteriorating | improving |
| 3 | Lutjanus malabaricus | 6.881 | High | high | High | high | improving | stable | improving | deteriorating |
| 4 | Lutjanus erythropterus | 4.114 | High | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 5 | Pinjalo lewisi | 3.962 | Medium | high | High | high | deteriorating | deteriorating | improving | improving |
| 6 | Etelis sp. | 3.408 | High | high | High | high | unknown | unknown | unknown | unknown |
| 7 | Etelis coruscans | 2.387 | High | high | High | high | unknown | unknown | unknown | unknown |
| 8 | Gymnocranius grandoculis | 1.565 | High | high | High | high | improving | deteriorating | deteriorating | deteriorating |
| 9 | Diagramma pictum | 1.484 | Medium | high | High | medium | deteriorating | deteriorating | deteriorating | improving |
| 10 | Symphorus nematophorus | 1.436 | Medium | Low | Low | low | improving | improving | deteriorating | unknown |
| 11 | Lutjanus sebae | 1.319 | High | high | High | high | improving | stable | stable | stable |
| 12 | Lutjanus timorensis | 1.308 | High | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 13 | Pristipomoides multidens | 1.303 | High | high | High | high | deteriorating | stable | improving | unknown |
| 14 | Pristipomoides typus | 1.019 | High | high | High | high | improving | improving | improving | unknown |
| 15 | Pristipomoides filamentosus | 0.922 | High | high | High | high | unknown | unknown | unknown | unknown |
| 16 | Etelis radiosus | 0.748 | High | high | High | high | unknown | unknown | unknown | unknown |
| 17 | Aprion virescens | 0.683 | High | high | High | high | unknown | unknown | unknown | unknown |
| 18 | Epinephelus bleekeri | 0.597 | Low | Low | Low | low | deteriorating | deteriorating | deteriorating | unknown |
| 19 | Seriola rivoliana | 0.594 | High | high | High | high | deteriorating | improving | improving | unknown |
| 20 | Pristipomoides sieboldii | 0.353 | Low | high | High | high | unknown | unknown | unknown | unknown |
| 21 | Wattsia mossambica | 0.240 | Medium | high | Medium | medium | unknown | unknown | unknown | unknown |
| 22 | Paracaesio kusakarii | 0.184 | Medium | high | High | unknown | unknown | unknown | unknown | unknown |
| 23 | Paracaesio stonei | 0.088 | Medium | high | High | unknown | unknown | unknown | unknown | unknown |
| 24 | Epinephelus latifasciatus | 0.013 | Low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 25 | Lethrinus laticaudis | 0.002 | Unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |

| Rank | Species WPP-713 Longline | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Lutjanus malabaricus | 30.391 | High | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 2 | Pristipomoides multidens | 25.483 | High | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 3 | Lutjanus sebae | 5.468 | high | high | High | high | deteriorating | deteriorating | stable | stable |
| 4 | Diagramma pictum | 5.167 | medium | medium | Medium | low | deteriorating | deteriorating | deteriorating | deteriorating |
| 5 | Pristipomoides typus | 3.694 | high | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 6 | Gymnocranius grandoculis | 3.671 | high | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 7 | Epinephelus areolatus | 2.927 | low | Low | Low | medium | stable | deteriorating | deteriorating | deteriorating |
| 8 | Lutjanus erythropterus | 1.746 | medium | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 9 | Symphorus nematophorus | 1.579 | low | Low | Low | low | improving | deteriorating | improving | improving |
| 10 | Lutjanus timorensis | 1.188 | medium | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 11 | Aprion virescens | 0.681 | medium | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 12 | Epinephelus bleekeri | 0.385 | low | Low | Low | low | deteriorating | deteriorating | deteriorating | deteriorating |
| 13 | Epinephelus latifasciatus | 0.302 | low | Low | Low | unknown | improving | improving | improving | unknown |
| 14 | Seriola rivoliana | 0.244 | high | high | Medium | unknown | improving | improving | improving | unknown |
| 15 | Aphareus rutilans | 0.203 | high | high | High | unknown | deteriorating | deteriorating | deteriorating | unknown |
| 16 | Pristipomoides filamentosus | 0.109 | high | high | High | unknown | deteriorating | deteriorating | deteriorating | deteriorating |
| 17 | Pinjalo lewisi | 0.065 | medium | high | High | high | deteriorating | deteriorating | deteriorating | unknown |
| 18 | Etelis sp. | 0.057 | high | high | High | unknown | unknown | unknown | unknown | unknown |
| 19 | Wattsia mossambica | 0.029 | low | Low | Low | unknown | improving | improving | improving | unknown |
| 20 | Paracaesio kusakarii | 0.020 | medium | high | High | unknown | deteriorating | deteriorating | deteriorating | unknown |
| 21 | Etelis radiosus | 0.010 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 22 | Lethrinus laticaudis | 0.002 | low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 23 | Paracaesio stonei | 0.001 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 24 | Pristipomoides sieboldii | 0.001 | high | high | High | unknown | deteriorating | deteriorating | deteriorating | unknown |

| Rank | Species WPP-713 Gillnet | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Aphareus rutilans | 19.586 | low | Low | Low | low | unknown | unknown | unknown | unknown |
| 2 | Diagramma pictum | 13.588 | low | Low | Low | low | unknown | unknown | unknown | unknown |
| 3 | Etelis radiosus | 7.437 | low | medium | High | high | unknown | unknown | unknown | unknown |
| 4 | Seriola rivoliana | 6.120 | low | high | High | high | unknown | unknown | unknown | unknown |
| 5 | Gymnocranius grandoculis | 3.321 | low | Low | Low | low | unknown | unknown | unknown | unknown |
| 6 | Pristipomoides multidens | 2.383 | low | high | High | high | unknown | unknown | unknown | unknown |
| 7 | Lutjanus malabaricus | 1.889 | medium | high | High | high | unknown | unknown | unknown | unknown |
| 8 | Lutjanus timorensis | 1.293 | low | Low | Low | medium | unknown | unknown | unknown | unknown |
| 9 | Etelis sp. | 1.197 | high | high | High | high | unknown | unknown | unknown | unknown |
| 10 | Lutjanus sebae | 0.506 | high | high | High | high | unknown | unknown | unknown | unknown |
| 11 | Aprion virescens | 0.480 | medium | high | High | unknown | unknown | unknown | unknown | unknown |
| 12 | Paracaesio kusakarii | 0.348 | low | high | High | unknown | unknown | unknown | unknown | unknown |
| 13 | Pristipomoides filamentosus | 0.171 | high | high | High | unknown | unknown | unknown | unknown | unknown |
| 14 | Pinjalo lewisi | 0.160 | low | high | High | high | unknown | unknown | unknown | unknown |
| 15 | Etelis coruscans | 0.132 | low | high | High | unknown | unknown | unknown | unknown | unknown |
| 16 | Lutjanus erythropterus | 0.086 | low | high | High | unknown | unknown | unknown | unknown | unknown |
| 17 | Epinephelus bleekeri | 0.067 | low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 18 | Paracaesio stonei | 0.066 | low | Low | High | unknown | unknown | unknown | unknown | unknown |
| 19 | Symphorus nematophorus | 0.065 | low | high | High | unknown | unknown | unknown | unknown | unknown |
| 20 | Pristipomoides typus | 0.053 | high | high | High | unknown | unknown | unknown | unknown | unknown |
| 21 | Epinephelus latifasciatus | 0.023 | low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 22 | Wattsia mossambica | 0.022 | low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 23 | Epinephelus areolatus | 0.004 | low | Low | Low | unknown | unknown | unknown | unknown | unknown |

| Rank | Species WPP-713 Mixgears | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Lutjanus malabaricus | 30.832 | high | high | High | high | unknown | unknown | unknown | unknown |
| 2 | Lutjanus erythropterus | 8.606 | high | high | High | high | unknown | unknown | unknown | unknown |
| 3 | Diagramma pictum | 3.257 | high | medium | Medium | low | unknown | unknown | unknown | unknown |
| 4 | Epinephelus bleekeri | 1.188 | medium | medium | Low | low | unknown | unknown | unknown | unknown |
| 5 | Lutjanus sebae | 0.663 | high | high | High | high | unknown | unknown | unknown | unknown |
| 6 | Epinephelus areolatus | 0.480 | low | Low | Low | low | unknown | unknown | unknown | unknown |
| 7 | Pristipomoides multidens | 0.136 | high | high | High | unknown | unknown | unknown | unknown | unknown |
| 8 | Gymnocranius grandoculis | 0.072 | high | high | High | unknown | unknown | unknown | unknown | unknown |
| 9 | Pristipomoides typus | 0.021 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| | | | | | | | | | | |
| Rank | Species WPP-714 Dropline | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
| 1 | Etelis sp. | 24.921 | high | high | High | high | deteriorating | deteriorating | deteriorating | unknown |
| 2 | Paracaesio kusakarii | 8.389 | medium | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 3 | Aphareus rutilans | 8.309 | medium | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 4 | Pristipomoides multidens | 6.586 | medium | high | High | high | deteriorating | deteriorating | deteriorating | unknown |
| 5 | Etelis coruscans | 5.416 | high | high | High | high | deteriorating | deteriorating | deteriorating | unknown |
| 6 | Pristipomoides filamentosus | 4.791 | high | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 7 | Etelis radiosus | 3.253 | high | high | High | high | improving | deteriorating | deteriorating | unknown |
| 8 | Seriola rivoliana | 2.361 | medium | high | High | high | improving | deteriorating | deteriorating | unknown |
| 9 | Paracaesio stonei | 1.978 | low | high | High | high | deteriorating | improving | stable | unknown |
| 10 | Epinephelus latifasciatus | 1.960 | low | Low | Low | unknown | improving | improving | improving | unknown |
| 11 | Wattsia mossambica | 1.393 | low | medium | Medium | medium | deteriorating | deteriorating | deteriorating | unknown |
| 12 | Lutjanus malabaricus | 1.229 | high | high | High | medium | unknown | unknown | unknown | unknown |
| 13 | Pristipomoides sieboldii | 1.228 | low | medium | Medium | high | deteriorating | deteriorating | deteriorating | unknown |
| 14 | Aprion virescens | 1.080 | medium | high | High | high | deteriorating | deteriorating | deteriorating | unknown |
| 15 | Pinjalo lewisi | 1.017 | low | high | High | high | deteriorating | deteriorating | deteriorating | unknown |
| 16 | Gymnocranius grandoculis | 0.932 | low | Low | Medium | high | unknown | unknown | unknown | unknown |
| 17 | Lutjanus sebae | 0.731 | high | high | High | unknown | unknown | unknown | unknown | unknown |

| 18 | Pristipomoides typus | 0.664 | medium | high | High | high | deteriorating | deteriorating | deteriorating | unknown |
|---|---|---|---|---|---|---|---|---|---|---|
| 19 | Lutjanus timorensis | 0.662 | low | medium | High | high | improving | stable | improving | unknown |
| 20 | Lutjanus erythropterus | 0.602 | low | Low | Low | low | unknown | unknown | unknown | unknown |
| 21 | Symphorus nematophorus | 0.355 | low | high | High | high | unknown | unknown | unknown | unknown |
| 22 | Epinephelus areolatus | 0.246 | low | Low | Low | low | unknown | unknown | unknown | unknown |
| 23 | Lethrinus laticaudis | 0.149 | low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 24 | Epinephelus bleekeri | 0.117 | low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 25 | Diagramma pictum | 0.050 | low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| | | | | | | | | | | |
| Rank | Species WPP-714 Longline | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
| 1 | Aprion virescens | 10.912 | medium | medium | High | high | deteriorating | deteriorating | deteriorating | improving |
| 2 | Lutjanus malabaricus | 10.052 | medium | Low | Low | unknown | improving | improving | deteriorating | deteriorating |
| 3 | Gymnocranius grandoculis | 9.674 | low | Low | Low | low | deteriorating | deteriorating | deteriorating | improving |
| 4 | Pristipomoides multidens | 8.122 | medium | high | High | high | improving | deteriorating | improving | deteriorating |
| 5 | Symphorus nematophorus | 7.822 | low | Low | Low | unknown | stable | deteriorating | deteriorating | improving |
| 6 | Lutjanus sebae | 6.416 | medium | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 7 | Diagramma pictum | 2.645 | low | Low | Low | low | stable | deteriorating | improving | deteriorating |
| 8 | Pristipomoides filamentosus | 1.853 | high | high | High | unknown | improving | improving | improving | unknown |
| 9 | Pristipomoides typus | 1.036 | low | Low | Medium | unknown | improving | deteriorating | deteriorating | unknown |
| 10 | Epinephelus areolatus | 0.875 | low | Low | Low | low | stable | improving | deteriorating | improving |
| 11 | Etelis sp. | 0.816 | Low | Low | High | unknown | improving | improving | improving | unknown |
| 12 | Epinephelus bleekeri | 0.779 | Low | Low | Low | unknown | stable | improving | improving | unknown |
| 13 | Seriola rivoliana | 0.499 | Low | Low | High | unknown | deteriorating | improving | improving | unknown |
| 14 | Lutjanus timorensis | 0.402 | Low | Low | Low | unknown | deteriorating | improving | improving | unknown |
| 15 | Aphareus rutilans | 0.367 | high | Low | Low | unknown | deteriorating | improving | improving | unknown |
| 16 | Lutjanus erythropterus | 0.093 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 17 | Epinephelus latifasciatus | 0.050 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 18 | Wattsia mossambica | 0.045 | Low | Low | Low | unknown | stable | deteriorating | improving | unknown |
| 19 | Etelis radiosus | 0.037 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 20 | Pinjalo lewisi | 0.017 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 21 | Paracaesio kusakarii | 0.014 | Low | high | High | unknown | improving | improving | stable | unknown |
| 22 | Etelis coruscans | 0.013 | unknown | unknown | Unknown | unknown | improving | stable | stable | unknown |
| 23 | Paracaesio stonei | 0.008 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| | | | | | | | | | | |
| Rank | Species WPP-714 Mixed gears | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
| 1 | Lutjanus malabaricus | 34.173 | high | high | High | high | unknown | unknown | unknown | unknown |
| 2 | Lethrinus laticaudis | 6.471 | Low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 3 | Diagramma pictum | 5.419 | Low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 4 | Lutjanus erythropterus | 4.382 | high | high | High | unknown | unknown | unknown | unknown | unknown |
| 5 | Lutjanus sebae | 1.657 | high | high | High | unknown | unknown | unknown | unknown | unknown |
| 6 | Aprion virescens | 1.127 | high | Low | High | unknown | unknown | unknown | unknown | unknown |
| 7 | Gymnocranius grandoculis | 0.761 | high | high | High | unknown | unknown | unknown | unknown | unknown |
| 8 | Epinephelus areolatus | 0.333 | Low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 9 | Pristipomoides multidens | 0.330 | Low | high | High | unknown | unknown | unknown | unknown | unknown |
| 10 | Epinephelus bleekeri | 0.239 | Low | Low | High | unknown | unknown | unknown | unknown | unknown |
| 11 | Aphareus rutilans | 0.071 | high | high | High | unknown | unknown | unknown | unknown | unknown |
| | | | | | | | | | | |
| Rank | Species WPP-715 Dropline | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
| 1 | Etelis sp. | 17.376 | high | high | High | high | stable | improving | stable | deteriorating |
| 2 | Aphareus rutilans | 13.461 | high | high | High | high | deteriorating | deteriorating | deteriorating | stable |
| 3 | Paracaesio kusakarii | 8.013 | medium | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 4 | Pristipomoides multidens | 7.885 | medium | high | High | high | improving | improving | improving | deteriorating |
| 5 | Pristipomoides filamentosus | 6.678 | high | high | High | high | deteriorating | improving | improving | deteriorating |
| 6 | Etelis coruscans | 5.182 | high | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 7 | Lutjanus erythropterus | 4.443 | medium | Low | Low | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 8 | Etelis radiosus | 3.747 | high | high | High | high | improving | improving | improving | improving |
| 9 | Seriola rivoliana | 2.685 | high | high | High | high | improving | improving | improving | improving |
| 10 | Paracaesio stonei | 2.151 | low | high | High | high | improving | deteriorating | deteriorating | deteriorating |
| 11 | Pristipomoides sieboldii | 1.777 | low | medium | High | high | improving | deteriorating | deteriorating | deteriorating |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | Epinephelus latifasciatus | 1.547 | low | Low | Low | low | improving | deteriorating | deteriorating | unknown |
| 13 | Lutjanus malabaricus | 1.378 | high | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 14 | Wattsia mossambica | 1.354 | low | Low | Low | low | improving | improving | improving | deteriorating |
| 15 | Pinjalo lewisi | 1.331 | low | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 16 | Lutjanus timorensis | 0.901 | low | high | High | high | improving | improving | improving | improving |
| 17 | Gymnocranius grandoculis | 0.761 | low | Low | Low | low | improving | deteriorating | deteriorating | deteriorating |
| 18 | Aprion virescens | 0.700 | medium | high | High | high | deteriorating | deteriorating | improving | improving |
| 19 | Pristipomoides typus | 0.689 | medium | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 20 | Lethrinus laticaudis | 0.236 | low | Low | Low | low | unknown | unknown | unknown | unknown |
| 21 | Lutjanus sebae | 0.203 | high | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 22 | Epinephelus areolatus | 0.137 | low | Low | Low | low | deteriorating | deteriorating | improving | improving |
| 23 | Diagramma pictum | 0.081 | medium | high | High | medium | improving | deteriorating | deteriorating | unknown |
| 24 | Epinephelus bleekeri | 0.065 | low | Low | Low | unknown | deteriorating | deteriorating | deteriorating | unknown |
| 25 | Symphorus nematophorus | 0.058 | medium | high | High | unknown | deteriorating | deteriorating | improving | unknown |
| | | | | | | | | | | |
| Rank | Species WPP-715 Longline | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
| 1 | Gymnocranius grandoculis | 10.160 | low | Low | Low | unknown | deteriorating | improving | deteriorating | unknown |
| 2 | Symphorus nematophorus | 8.609 | low | Low | Low | unknown | stable | deteriorating | deteriorating | unknown |
| 3 | Lutjanus malabaricus | 6.759 | low | Low | High | unknown | deteriorating | deteriorating | deteriorating | unknown |
| 4 | Pristipomoides multidens | 6.359 | medium | high | High | unknown | deteriorating | deteriorating | deteriorating | unknown |
| 5 | Aprion virescens | 5.199 | low | Low | Low | unknown | improving | improving | improving | unknown |
| 6 | Lutjanus sebae | 4.695 | low | high | High | unknown | deteriorating | deteriorating | deteriorating | unknown |
| 7 | Pristipomoides filamentosus | 2.943 | high | high | High | unknown | unknown | unknown | unknown | unknown |
| 8 | Diagramma pictum | 2.720 | low | Low | Low | unknown | stable | deteriorating | deteriorating | unknown |
| 9 | Epinephelus areolatus | 1.344 | low | Low | Low | unknown | stable | deteriorating | improving | unknown |
| 10 | Aphareus rutilans | 1.058 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 11 | Seriola rivoliana | 0.988 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 12 | Lutjanus timorensis | 0.286 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 13 | Epinephelus bleekeri | 0.072 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |

| Rank | Species WPP-715 Mixed gears | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Lutjanus malabaricus | 50.225 | high | High | High | high | unknown | unknown | unknown | unknown |
| 2 | Lutjanus erythropterus | 18.221 | medium | Low | Low | high | unknown | unknown | unknown | unknown |
| 3 | Lethrinus laticaudis | 8.471 | low | Low | Low | low | unknown | unknown | unknown | unknown |
| 4 | Diagramma pictum | 3.296 | low | Low | Medium | high | unknown | unknown | unknown | unknown |
| 5 | Pristipomoides multidens | 1.718 | medium | High | High | unknown | unknown | unknown | unknown | unknown |
| 6 | Lutjanus sebae | 1.661 | high | High | High | unknown | unknown | unknown | unknown | unknown |
| 7 | Epinephelus bleekeri | 0.869 | medium | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 8 | Symphorus nematophorus | 0.528 | medium | High | High | unknown | unknown | unknown | unknown | unknown |
| 9 | Lutjanus timorensis | 0.175 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| 10 | Epinephelus areolatus | 0.089 | low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 11 | Pristipomoides typus | 0.066 | low | Low | High | unknown | unknown | unknown | unknown | unknown |
| 12 | Gymnocranius grandoculis | 0.024 | low | Low | Low | unknown | unknown | unknown | unknown | unknown |
| 13 | Epinephelus latifasciatus | 0.009 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| | | | | | | | | | | |
| Rank | Species WPP-718 Dropline | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
| 1 | Etelis sp. | 17.873 | high | High | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 2 | Lethrinus laticaudis | 12.932 | low | Low | Low | high | unknown | unknown | unknown | unknown |
| 3 | Pristipomoides multidens | 8.646 | medium | High | High | high | improving | improving | improving | improving |
| 4 | Aphareus rutilans | 6.154 | medium | High | High | high | deteriorating | deteriorating | stable | improving |
| 5 | Paracaesio kusakarii | 5.593 | medium | High | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 6 | Pristipomoides filamentosus | 5.167 | high | High | High | high | improving | deteriorating | improving | improving |
| 7 | Etelis radiosus | 4.272 | high | High | High | high | deteriorating | improving | improving | stable |
| 8 | Epinephelus latifasciatus | 2.878 | low | Low | Low | medium | improving | improving | deteriorating | unknown |
| 9 | Pristipomoides typus | 2.130 | medium | high | High | high | improving | improving | improving | deteriorating |
| 10 | Etelis coruscans | 1.985 | high | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 11 | Lutjanus malabaricus | 1.861 | medium | high | High | high | deteriorating | deteriorating | deteriorating | stable |
| 12 | Seriola rivoliana | 1.708 | low | medium | High | high | stable | improving | improving | unknown |
| 13 | Wattsia mossambica | 1.300 | low | Low | Low | medium | stable | improving | improving | unknown |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | Lutjanus timorensis | 1.096 | low | medium | High | high | improving | deteriorating | deteriorating | deteriorating |
| 15 | Lutjanus sebae | 0.874 | high | high | High | high | deteriorating | improving | improving | improving |
| 16 | Paracaesio stonei | 0.792 | low | high | High | high | deteriorating | deteriorating | deteriorating | deteriorating |
| 17 | Lutjanus erythropterus | 0.737 | low | Low | Low | low | deteriorating | deteriorating | deteriorating | deteriorating |
| 18 | Gymnocranius grandoculis | 0.636 | low | medium | High | high | improving | deteriorating | deteriorating | deteriorating |
| 19 | Pristipomoides sieboldii | 0.601 | low | Low | Medium | high | improving | stable | improving | unknown |
| 20 | Epinephelus areolatus | 0.508 | low | Low | Low | low | stable | deteriorating | improving | deteriorating |
| 21 | Pinjalo lewisi | 0.352 | low | high | High | high | deteriorating | improving | deteriorating | deteriorating |
| 22 | Aprion virescens | 0.343 | low | Low | Low | unknown | improving | improving | improving | unknown |
| 23 | Symphorus nematophorus | 0.181 | low | high | High | unknown | deteriorating | improving | improving | unknown |
| 24 | Epinephelus bleekeri | 0.097 | low | Low | Low | unknown | stable | improving | improving | unknown |
| 25 | Diagramma pictum | 0.003 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |
| | | | | | | | | | | |
| Rank | Species WPP-718 Longline | % Catch-Weight | Juvenile Risk | Exploit Risk | Mega Sp Risk | SPR Risk | Juvenile Trend | Large Mature Trend | Mega Sp Trend | SPR Trend |
| 1 | Lutjanus malabaricus | 57.671 | low | high | High | high | deteriorating | improving | stable | deteriorating |
| 2 | Lethrinus laticaudis | 7.471 | low | Low | Low | low | stable | deteriorating | deteriorating | deteriorating |
| 3 | Pristipomoides multidens | 7.046 | medium | high | High | high | improving | improving | improving | deteriorating |
| 4 | Lutjanus sebae | 3.324 | high | high | High | high | improving | deteriorating | stable | stable |
| 5 | Epinephelus bleekeri | 0.568 | low | Low | Low | low | deteriorating | improving | improving | improving |
| 6 | Lutjanus erythropterus | 0.468 | low | Low | Low | low | deteriorating | improving | improving | deteriorating |
| 7 | Gymnocranius grandoculis | 0.433 | low | Low | Low | low | improving | improving | improving | improving |
| 8 | Epinephelus latifasciatus | 0.255 | medium | high | High | low | deteriorating | deteriorating | deteriorating | unknown |
| 9 | Epinephelus areolatus | 0.246 | low | Low | Low | low | deteriorating | deteriorating | deteriorating | improving |
| 10 | Pristipomoides typus | 0.224 | low | high | High | high | improving | improving | improving | improving |
| 11 | Aprion virescens | 0.050 | low | Low | Medium | unknown | improving | improving | improving | unknown |
| 12 | Symphorus nematophorus | 0.048 | low | high | High | unknown | deteriorating | improving | improving | unknown |
| 13 | Diagramma pictum | 0.026 | low | Low | Low | unknown | stable | improving | deteriorating | unknown |
| 14 | Seriola rivoliana | 0.025 | medium | medium | Medium | unknown | deteriorating | deteriorating | deteriorating | unknown |
| 15 | Lutjanus timorensis | 0.022 | low | Low | Low | unknown | improving | improving | deteriorating | unknown |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | Pristipomoides filamentosus | 0.017 | unknown | unknown | Unknown | unknown | improving | improving | improving | unknown |
| 17 | Wattsia mossambica | 0.008 | unknown | unknown | Unknown | unknown | stable | improving | improving | unknown |
| 18 | Paracaesio kusakarii | 0.005 | unknown | unknown | Unknown | unknown | stable | stable | stable | unknown |
| 19 | Aphareus rutilans | 0.003 | unknown | unknown | Unknown | unknown | improving | deteriorating | stable | unknown |
| 20 | Etelis sp. | 0.001 | unknown | unknown | Unknown | unknown | unknown | unknown | unknown | unknown |

### 2.4.1 Biology and life history

Groupers have long lifespans, are slow growing, relatively large in size, and have a low natural mortality rate. The larger species form breeding aggregations, and most species are protogynous hermaphrodites. Among the Epinephelinae, monandry protogynous hermaphroditism is the most common sexual pattern. A few species are diandry, where the males can either develop from the females or they can develop directly from the juvenile phase. Some females do not change sex at all, and some males do not pass through female stages at all. Groupers generally mature as females at a size relative to their maximum size which is lower than for snappers. This strategy enables them to reproduce before they are being caught, although fecundity is still relatively low at sizes below the optimum length. Fecundity for the population peaks at the optimum size for each species, and this is also the size around which sex change from females to males happens in groupers. Separate analysis of all grouper data shows that most groupers have already reached or passed their optimum size (and the size where sex change takes place) when they are caught by the deep slope hook and line fisheries.

Life histories of most deep-sea snappers are characterized by high longevity, slow growth, delayed maturity, and low fecundity[2] (Gomez, 2015). Adult stages of many of the target species in deep slope fisheries remain at well-defined locations, at the edge of the continental shelf. These adult populations do not migrate either to spawn or for other reasons. Deep water snappers and other deep-water predators form feeding aggregations at edges of drop offs and canyons, seamounts and other highly predictable locations. This makes them extremely vulnerable to fishing, much more so than species which are spread out over the at surface of the continental shelf.

Overfishing can happen very quickly at those locations, much faster than the time it takes to collect and analyse data, formulate conclusions and management advice, and ultimately take management action.

The deep water drop-line fishery for snappers, groupers, grunters and emperors is a clean fishery when it comes to the species spectrum in the catch, even though it is much more species-rich than sometimes assumed, also within the snapper category, which forms the main target group. Due to the spatial segregation between size groups in the populations, the fisheries can be size selective to some extent. Fishermen can take conscious decisions to target sub adults and juveniles and will do so normally when densities of larger mature animals on deep water fishing grounds have declined. As such, a policy among fish traders to buy and trade (or not to buy and trade) certain size classes can directly influence the sustainability of the fisheries when the buying behaviour affects the behaviour of fishers.

Interestingly, the groupers seem to be less vulnerable to the deep slope hook and line fisheries than the snappers are. Impact by the deep slope drop line and longline fisheries on grouper populations is limited compared to the snappers. This may be because most groupers stay close to high rugosity bottom habitat, which is avoided by longline vessels due to risk of entanglement, while drop line fishers are targeting schooling snappers that are hovering higher in the water column, above the grouper habitat. Fishing mortality (from deep slope hook and line fisheries) relative to natural mortality in large mature groupers seems to be considerably lower than what is experienced for the snappers.

[2] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4451071/

### 2.4.2 Information and assessment

*SPOT Trace vessel tracking*

Fishing grounds are determined by placing Spot Trace units on all fishing boats participating in this program. When in motion, Spot Trace units automatically report an hourly location, and when at rest for more than 24 hours, they relay daily status reports. Location and status report messages are automatically recorded in I-Fish Community, an online database running PostgreSQL with a user interface programmed in Java and analysis and reporting procedures in R and Latex.

Fishing vessels with Spot Trace units on board generate accurate data on fishing grounds and specific fishing locations within fishing grounds. Traditionally, fishing ground data were often collected from logbook data or captain interviews. However, logbook and interview data are sometimes unclear, inaccurate and can easily be falsified. The Spot Trace enables the project to match catch data with exact fishing locations, while at the same time providing additional safety features on board the fishing vessels. To mitigate IUU fishing, having the Spot Trace onboard can also be used as proof of legal fishing within Indonesian waters.

*Crew-Operated Data Recording System*

Data on species and size distributions of complete catches are needed for accurate length based stock assessments. Such data on individual fishing trips are collected via Crew Operated Data Recording Systems or CODRS. This catch data is geo-referenced as the CODRS works in tandem with the Spot Trace vessel tracking system. Crews of fishing vessels are contracted to take images on project-supplied digital cameras of all fish in the catch, positioned over measuring boards. This procedure takes place when batches of fish are taken from chiller boxes on deck, before they are packed on ice in the hold. The crew photographs all the fish in this manner and at the end of the trip hands in the storage chip from the camera to project statisticians who analyse the images back at the fisheries station. Analysis of the images includes ID of the species and reading of the length of the fish as displayed on the measuring board. Double checking with owner and trader data on total catches, and comparison with weights as calculated from fish lengths, ensures that we are capturing length frequencies of the total catch. It is essential to ensure that no species or size classes are missing before analysis.

*I-Fish Community*

I-Fish Community stores data that are relevant to fisheries management, whereas data on processed volume and sales, from the Smart Weighing and Measuring System, remain on servers at processing companies. Access to the I-Fish Community database is controlled by user name and password. I-Fish Community has different layers of privacy, which is contingent on the user's role in the supply chain. For instance, boat owners may view exact location of their boats, but not of the boats of other owners.

I-Fish Community has an automatic length-frequency distribution reporting system for length-based assessment of the fishery by species. The database generates length frequency distribution graphs for each species, together with life history parameters including length at maturity (Lmat), optimum harvest size (Lopt), asymptotic length- (Linf), and maximum total length (Lmax), as well as size limits used in the trade. These "trade limit" lengths are derived from general buying behaviour (minimal weight) of processing companies. The weights are converted into lengths by using species-species length- weight relationships.

Each graph (length frequency distribution by species) is accompanied by an automated length-based assessment. Any I-Fish Community user can access these graphs and the conclusions from the assessments in real time. The report is updated daily and produces a length based assessment for the 50 most abundant target species in the fishery, based on complete catches recorded on board by fishing boat crews. The graphs show the position of the catch length frequency distributions relative to various life history parameter values and trading limits for

each species.

Immature fish, small mature fish, large mature fish, and a subset of large mature fish, namely "mega-spawners", which are fish larger than 1.1 times the optimum harvest size (Froese 2004), make up the species size groups used in our length based assessment. For all fish of each species in the catch, the percentage in each category is calculated for further use in the length based assessment. These percentages are calculated and presented as the first step in the length based assessment as follows: W% is immature (smaller than the length at maturity), X% is small matures (at or above size at maturity but smaller than the optimum harvest size), and Y% is large mature fish (at or above optimum harvest size). The percentage of mega-spawners is Z%.

The automated assessment comprises of six elements from the catch length frequencies. These elements all work with length based indicators of various kinds to draw conclusions from species length frequencies in the catch.

*Stock assessment*

TNC's automated assessment comprises of six elements from the catch length frequencies. These proxies all work with length based indicators of various kinds to draw conclusions from species length frequencies in the catch. The methodologies applied to each element is described in the assessment reports (Mous and Pet, 2017), and with the results updated constantly based on the information feeds. The five proxies include:

1. Proportion of immature fish in the catch.
2. Minimum size as traded compared to length and maturity.
3. Current exploitation level.
4. Proportion of mega spawners in the catch.
5. Spawning Potential Ratio.

MSC allows the use of proxy indicators to record stock biomass against MSY and the Point of Recruitment Impairment (PRI) (SA2.2.3.1).

## Box 1: Use of proxies indicators and reference points for PRI and BMSY (GSA2.2.3.1).

Fishery assessments may allow the use of surrogate or proxy indicators and reference points in scoring both stock biomass and exploitation rate. Default values for the levels of the PRI and BMSY, as used in scoring the stock status (PI 1.1.1) are given below. They are often related to B0, the stock status that would be present in the absence of fishing. In the case where neither BMSY nor the PRI are analytically determined, the following default reference points may be appropriate for measuring stock status depending on the species: BMSY=40%B0; PRI=20%B0=½BMSY.

In the case where either BMSY or the PRI are analytically determined, those values should be used as reference point for measuring stock status unless additional precaution is sought. In the case where BMSY is analytically determined to be greater than 40%B0, and there is no analytical determination of the PRI, the default PRI should be ½BMSY. This case covers the situation of low productivity stocks, where higher default PRIs may be justified.
In the case where BMSY is analytically determined to be lower than 40%B0 (as in some highly productive stocks), and there is no analytical determination of the PRI, the default PRI should be 20%B0 unless BMSY<27%B0, in which case the default PRI should be 75%BMSY.

For stocks with average productivity, where BMSY is not analytically determined but assumed to be 40%B0 and a management trigger reference point is set greater than 40%B0 for precautionary reasons, the default PRI should still be set at 20%B0=½BMSY unless it is analytically determined. This covers situations where the management authority has deliberately chosen a conservative target reference point, but where the default PRI is still appropriate.

In cases where the PRI is set at 20% B0, a default value for the BMSY may be assumed to be 2xPRI. In other cases, for instance where the PRI is set at the lowest historical biomass, it cannot be assumed that BMSY = 2xPRI. The client shall justify any reference point used as a proxy of BMSY in terms of its consistency with BMSY. The default PRI values given above (½BMSY or 20%B0) apply to stocks with average productivity. Such points are generally consistent with being above the point at which there is an appreciable risk that recruitment is impaired, though for some short-lived stocks the actual point at which there is an appreciable risk that recruitment is impaired may be lower than 20%B0 and for some long-lived species it may be higher than this. Where management has defined a target range for BMSY rather than a single value, the assessor should score the stock status PI 1.1.1 against this range. The assessor should also consider if different reference points are required for different components of the stock in their assessment. Where proxies are used that are not expressed as percentages of B0, teams should generally ensure that:

- Any reference point used as a proxy for scoring the PRI is set above the point where there is an appreciable risk of recruitment failure; and
- Any reference point used as a proxy for the MSY level maintains the stock well above the PRI and at levels of production and stock sizes consistent with BMSY or a similar highly productive level.

Where proxy reference points are defined in this way, the assessors should take account of the difference between the reference point and the required (PRI or MSY) levels in their scoring.

Particular caution should be given regarding 'per-recruit' stock assessment approaches that do not include any form of stock-recruit relationship. Levels of F0.1 or F40%SPR will usually, for example, provide more reliable proxies of FMSY than Fmax when a per-recruit approach is used. Reference points such as BPA that are used as a precautionary buffer to reduce the chance of declining to a limit level such as the PRI should also not be assumed to be consistent with BMSY. The BMSY trigger approach used in ICES, for example, should be regarded as setting a lower limit to the likely range of values that BMSY may take, and not as an estimated value for BMSY.

Proxy indicators and reference points or measuring stock status may also be used where the exact relationship with the PRI, BMSY and FMSY levels are not known. In these cases, the team must provide justification that these proxies are reasonable for the context in which they are used.

Where proxy reference points are used in scoring the stock biomass status, higher scores should be assigned where greater confidence is provided by the proxy information (such as with a 'traffic lights' approach to management).

Examples: **using proxy reference points**
Examples of how the 60, 80 and 100 SG levels may be justified in these situations are given below:
**At SG60**: If no decline has been observed in **one proxy** of biomass for at least one generation time of the species and the proxy indicates that the stock is **likely above the PRI**.
**At SG80**: If no decline has been observed in **two proxies** of biomass for one generation time and at least one proxy indicates that the stock is at a **highly productive level**.
**At SG 100**: If no decline has been observed in three proxies of biomass for one generation time at least two proxies indicate that the stock is at a highly productive level.

In these cases, where higher scores are justified by the use of more than one proxy indicators, such proxies should be independent of each other and also reasonably be expected to be proxies of the quantity of interest (such as CPUE in the case of stock biomass). The team should present a rationale for how the proxies conform to these principles.
In some cases, it may reasonably be argued that one good proxy is better than two or more weak proxies.

Source: MSC FCR pp 391-394

For the application of these proxies TNC presently applies a traffic light system with the following proxy definitions for each risk level.

**Table 7: TNC proxy traffic light system**

| | |
|---|---|
| **1** | **Proportion of immature catch** |
| | IF "% immature" is lower than or equal to 10% THEN: "At least 90% of the fish in the catch are mature specimens that have spawned at least once before they were caught. The fishery does not depend on immature size classes for this species and is considered safe for this indicator. This fishery will not be causing over fishing through over harvesting of juveniles for this species. Risk level is low |
| | IF "% immature" is greater than 10% AND "% immature" is lower than or equal to 30% THEN: "Between 10% and 30% of the fish in the catch are specimens that have not yet reproduced. This is reason for concern in terms of potential over fishing through overharvesting of juveniles, if fishing pressure is high and percentages immature fish would further rise. Targeting larger fish and avoiding small fish in the catch will promote a sustainable fishery. risk level is medium." |
| | IF "% immature" is greater than 30% AND "% immature" is lower than or equal to 50% THEN: "Between 30% and 50% of the fish in the catch are immature and have not had a chance to reproduce before capture. The fishery is in immediate danger of over fishing through overharvesting of juveniles, if fishing pressure is high. Catching small and immature fish needs to be actively avoided and a limit on overall fishing pressure is warranted. Risk level is high." |
| **2** | **Minimum size as traded compared to length and maturity** |
| | IF "TradeLimit" is greater than 1.1 * L-mat THEN: "The trade limit is significantly higher than length at first maturity. This means that the trade puts a premium on fish that have spawned at least once. The trade does not cause any concern of recruitment over fishing for this species. Risk level is low." |
| | IF "TradeLimit" is greater than or equal to 0.9 * L-mat AND "TradeLimit" is lower than or equal to 1.1 * L-mat THEN: "The trade limit is about the same as the length at first maturity. This means that the trade puts a premium on fish that have spawned at least once, which improves sustainability of the fishery. Risk level is medium. |
| | IF "TradeLimit" is lower than 0.9 * L-mat THEN: "The trade limit is significantly lower than the length at first maturity. This means that the trade encourages capture of immature fish, which impairs sustainability. Risk level is high. |
| **3** | **Current exploitation level.** |
| | IF "% immature + % small mature" is lower than or equal to 50% THEN: "The majority of the catch consists of size classes around or above the optimum harvest size. This means that the impact of the fishery is minimized for this species. Potentially higher yields of this species could be achieved by catching them at somewhat smaller size, although capture of smaller specimen may take place already in other fisheries. Risk level is low." |
| | IF "% immature + % small mature" is greater than 50% AND "% immature + % small mature" is lower than 65% THEN: "The bulk of the catch includes age groups that have just matured and are about to achieve their full growth potential. This indicates that the fishery is probably at least being fully exploited. Risk level is medium. |
| | IF "% immature + % small mature" is greater than or equal to 65% THEN: "The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth over fishing and the size distribution for this species indicates that over exploitation through growth over fishing may already be happening. Risk level is high |
| **4** | **Proportion of mega spawners in the catch** |
| | IF "% mega spawners" is greater than 30% THEN: "More than 30% of the catch consists of mega spawners which indicates that this fish population is in good health unless large amounts of much smaller fish from the same population are caught by other fisheries. Risk level is low. |
| | IF "% mega spawners" is greater than 20% AND "% mega spawners" is lower than or equal to 30% THEN: "The percentage of mega spawners is between 20 and 30%. There is no immediate reason for concern, though fishing pressure may be significantly reducing the percentage of mega spawners, which may negatively affect the reproductive output of this population. Risk level is medium. |
| | F "% mega spawners" is lower than or equal to 20%, THEN: "Less than 20% of the catch comprises of mega spawners. This indicates that the population may be severely affected by the fishery, and that there is a substantial risk of recruitment over fishing through over harvesting of the mega spawners, unless large numbers of mega spawners would be surviving at other habitats. There is no reason to assume that this is the case and therefore a reduction of fishing e ort may be necessary in this fishery. Risk level is high. |
| **5** | **Spawning Potential Ratio.** |
| | IF "SPR" is greater than or equal to 40% THEN: "SPR is more than 40%. The stock is probably not over exploited, and the risk that the fishery will cause further stock decline is small. Risk level is low. |
| | IF "SPR" is greater than or equal to 25% AND "SPR" is lower than 40% THEN:<br>"SPR is between 25% and 40%. The stock is heavily exploited, and there is some risk that the fishery will cause further decline of the stock. Risk level is medium. |
| | IF "SPR" is lower than 25% THEN: "SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high. |

Source: Mous, P. and Pet, J. 2017

Uncertainties in stock assessment are addressed by using a range of proxies, as opposed to one single indicator. The effectiveness of the proxies used are also underlines by consistency in results applied across a full range of species.

TNC's assessment methodology applying proxies has been subject to external review (Prince, 2016/2017) (Box 2).

**Box 2: Peer review of the TNC deep water species proxy stock assessment models**

The assessment methodology is a relatively orthodox application of established forms of length analysis (a form of length converted catch curve analysis informing analysis with a form of the Beverton-Holt estimator). There are strong parallels between your approach to length-based assessment, and the LB-SPR approach that Adrian Hordyk and I have developed. The approaches share similar input parameters and the two life history ratios are central to both; in LB-SPR as an input parameter, and to estimate second of the three input parameters required, and also in the formulation of the estimation routines, while the Pet-Mous approach uses them to parameterise the assessment.

Differences between the approach include the larger number of input parameters required by your approach (6 cf. 3) and your reliance on the various published empirical correlations to derive 5 of your 6 input parameters from your observations of maximum size. Requiring a direct measurement of either asymptotic size or size of maturity, the LB-SPR avoids using these empirical correlations to infer input parameters. But the main difference between the two approaches is that the Pet-Mous approach uses the size composition data just to estimate parameters (maximum size and total mortality), and then all 6 input parameters are used within a relatively orthodox age based framework to estimate stock status indicators. In contrast, the LB-SPR approach uses the shape of the size composition directly with the three input parameters, in a single step shape analysis, to derive the same indicators of stock status.

However, as our comparative analyses demonstrated the results from the two approaches, using the same data and assumptions, are essentially identical. To my mind the fact that the two parallel, but in some senses quite different, approaches produce essentially the same results, consolidates the authority of both approaches.

Jeremy Prince, January, 2017

TNC is in the process of developing a data based on fleet structure in the groundfish snapper and grouper fisheries, and are actively checking records from DKP and buyers, as well as acting on field-based intelligence from other sources.

The full extent of the fishery and the level of removals by other fleets are documented (Pet, October, 2018) documented. The target species selected from the groundfish fisheries are not known to enter the supply lines from other fisheries (Pet pers. comm., October 2017) and other evidence (Cawthorn and Mariani, 2017) documents import sourcing from Indonesian *bottom set longlines and handlines*. In all, 27 species caught by the groundfish fisheries are excluded because they occur in other fisheries. These species are all caught at low levels of catch relative to the target species, but are included as part of the P2 primary species assessment.

TNC analysed species interaction from the Cantrang (Danish seine) fishery in the Java Sea, the only area where this fishery would appear to take place in any large volume. The analysis came to the conclusion that the Cantrang fishery had very low encounterability with species caught in the groundfish demersal fisheries. Eleven species were identified as caught in the Cantrang fishery but with very low overlap. Three species were assessed in more detail because of their potential commercial importance. These were: *Lutjanus vitta* (a small snapper), *Pomadasys kaakan* (a grunt) and *Epinephelus areolatus* (a small grouper).

- With an estimated maximum effort of 200,000 boat fishing days per year, the cantrang fisheries would be landing up to about 168,000 specimen of ***L. vitta*** per year. The mean size of ***L. vitta*** in cantrang catches is around 25 cm with not much variance around this mean. At a size of 25 cm ***L. vitta*** weighs around 247 grams so this would lead to a total annual catch of this species by the cantrang fleet of about 41 tons per year. The deep slope hook and line fisheries lands an estimated 100,000 tons of snappers, groupers, emperors and grunts, with about 0.32% of that consisting of ***L. vitta***, based on CODRS information from the deep slope fisheries. That means an estimated 320 tons of ***L. vitta*** landed by the deep hook and line fisheries, which is only about 8 times as much as what may be landed by cantrang boats. Moreover, the mean size in the cantrang boats of 25 cm for ***L. vitta*** is very close to its size at maturity of about 24 cm and many of the ***L. vitta*** in cantrang catches would not yet have had a chance to spawn before capture. We conclude therefore potential significant impact of cantrang fishing on the stocks and fisheries of ***L. vitta*** as a whole. And as we suspect that other shallow water fisheries may have additional impact on stocks of L. vitta, while this species is of relatively little importance in the deep slope hook and line fisheries, we would recommend to ***exclude*** this species from certification.

- With an estimated maximum effort of 200,000 boat fishing days per year, the cantrang fisheries would be landing up to about 108,000 specimen of ***P. kaakan*** per year. The mean size of ***P. kaakan*** in cantrang catches is around 40 cm with not much variance around this mean. At a size of 40 cm ***P. kaakan*** weighs around 1 kg so this would lead to a total annual catch of this species by the cantrang fleet of about 108 tons per year. The deep slope hook and line fisheries lands an estimated 100,000 tons of snappers, groupers, emperors and grunts, with about 0.72% of that consisting of ***P. kaakan***, based on CODRS information from the deep slope fisheries. That means an estimated 720 tons of ***P. kaakan*** landed by the deep hook and line fisheries, which is only about 7 times more than landed by cantrang boats. However, the mean size in the cantrang boats of 40 cm for ***P. kaakan*** is well above its size at maturity of about 32 cm and most if not all of the ***P. kaakan*** in cantrang catches would have had a chance to spawn once or more before capture. We conclude therefore no negative impact of cantrang fishing on the stocks and fisheries of ***P. kaakan*** as a whole.

- With an estimated maximum effort of 200,000 boat fishing days per year, the cantrang fisheries would be landing up to about 74,000 specimen of ***E. areolatus*** per year. The mean size of ***E. areolatus*** in cantrang catches is around 27 cm with not much variance around this mean. At a size of 27 cm ***E. areolatus*** weighs around 254 grams so this would lead to a total annual catch of this species by the cantrang fleet of about 19 tons per year. The deep slope hook and line fisheries lands an estimated 100,000 tons of snappers, groupers, emperors and grunts, with about 1.74% of that consisting of ***E. areolatus***, based on CODRS information from the deep slope fisheries. That means an estimated 1,740 tons of ***E. areolatus*** landed by the deep hook and line fisheries, which is almost a 100 times (or 2 orders of magnitude) more than landed by cantrang boats. Moreover, the mean size in the cantrang boats of 27 cm for ***E. areolatus*** is well above its size at maturity of about 21 cm and most of the ***E. areolatus*** in cantrang catches would have had a chance to spawn at least once. We conclude therefore no significant impact of cantrang fishing on the stocks and fisheries of ***E. areolatus*** as a whole.

Source: Pet, TNC October, 2017

The Cantrang fishery had been banned in 2015 (Ministerial regulations 2/PERMEN-KP/2015 and 7/PERMEN-KP/2016[3]), though the ban was never implemented.

*Stock status*

Overall the combination of proxy's used show:

- High levels of overfishing of between one third (longline) to a half (dropline) of the species through overharvesting of juveniles;
- The Juvenile risk is significantly lower than the length at first maturity. This means that the trade encourages capture of immature fish, which impairs sustainability
- The vast majority of the fish in the catch have not yet achieved their growth potential.

3 http://kkp.go.id/2017/05/05/infografis-sosialisasi-kebijakan-pelarangan-cantrang/

- The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth over fishing may already be happening
- This indicates that the population may be severely affected by the fishery, and that there is a substantial risk of recruitment over fishing through over harvesting of the mega spawners
- Mortality caused by fishing is greater than or equal to the natural rate of mortality.
- The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced.

*Harvest strategy*

The harvest strategy is defined as the way that the different elements work together to keep the stock at levels consistent with reference points. The applied strategy must allow the management system to be responsive to the state of the stock.

The groundfish fisheries are not subject to a harvest strategy (See MSC FCR GSA2.4 Harvest Strategy PI (PI 1.2.1) pp 405-40. With a new regulation, provision is made to support the implementation of harvest strategies in Indonesian fisheries under Regulation 17 of 2017, with management at Maximum Sustainable Yield (MSY). At present, there are no clear definitions as to what constitutes a harvest strategy and how these are to be supported by harvest control rules and tools, the tools comprising different forms of management input or output regulations. The current system of fishing effort is loosely controlled by licensing, and the licensing scheme is non-specific to groundfish fishery.

MSC requires that key elements of harvest strategies, and applied to these sub-fisheries, must have the following attributes:

- the control rules and tools in place, including the ability of the management system to control effort, taking into account, issues such as overcapacity and its causes;
- the information base and monitoring stock status and the responsiveness of the management system and fleet to stock status.
- A harvest control rule (HCR) to form to initiate the response to a fishery indicator moving above or below the trigger reference point.
- The HCRs must be robust to the main uncertainties.

HCRs are often applied on a frequent basis, such as with the annual setting of TACs (an output control) or effort restrictions (an input control). The HCR must respond dynamically to the monitoring data from the fishery with regular adjustments to the management tool, when required. Other measures, other than TACs and effort control may comprise only technical measures such as size limits, gear restrictions, closed seasons and closed areas. In these cases, the specific terms of the technical measures are usually set and fixed for a relatively long period of time (several years), based on occasional strategic stock assessments. Development of these other measures could address some specific areas of concern identified for specific species or species groups, identified by some of the proxy parameters, e.g. the threat to pre-adult species.

Section SA2.5.6 of the MSC FCR, requires that teams examine the current exploitation levels in the fishery, as part of the evidence that the HCRs are working. Evidence that current F is equal to or less than FMSY should usually be taken as evidence that the HCR is effective. Current F levels greater than FMSY may also sometimes be accepted in cases where stock biomass is currently higher than BMSY or where stock assessment information is comprehensive, and it is appropriate to treat FMSY is a target reference point. Under a Rebuilding Strategy, evidence will need to show that the rebuilding strategies are rebuilding stocks, or it is likely based on simulation modelling (Management Strategy Evaluation),

exploitation rates or previous performance that they will be able to rebuild the stock within the specified timeframe. Available evidence will also need to indicate that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.

## 2.5 Principle Two: Ecosystem background

### 2.5.1 Primary and secondary species

*Primary species*

Primary species are defined as species, that are not identified as the specific target species in each UoA, and where each primary species is subject to fishery specific management. Since the target species list comprises catches of 25 species or less, all primary species caught are below 0.2% across all fisheries.

Note that the primary species will be assessed at a score of 90 (a pass) if only main species are scored. Minor species may be added to achieve a higher 100 score. In this, case minor primary species would have to be highly likely to be above the PRI; or If below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species.

The majority of the main primary component in these fisheries comprises species that will be managed as target in the groundfish fisheries. Some of these species will be at MSY, some will be at PRI and others below PRI. It is expected that by the time assessment, those species below the PRI will have measures in place that are expected to ensure that the UoA does not hinder recovery and rebuilding.

*Secondary species*

For the purpose of the assessment all species not measured by proxies, and explicitly covered under management are considered as secondary species. They include 19 families, as well as  baitfish will be classified as secondary species. For Drop-line and long-line, all families are minor, < 2%, collectively representing 1% in the drop-line fishery (Table 8.1), and 2.3% in the longline fishery Table 8.2).

**Table 8.1: Secondary species (by family) reported as caught in the drop-line fishery (% total catch)**

| Family Name | WPP 573 | WPP 712 | WPP 713 | WPP 714 | WPP 715 | WPP 718 |
|---|---|---|---|---|---|---|
| Acanthuridae | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Ariidae | 0.007 | 0.001 | 0.000 | 0.010 | 0.019 | 0.010 |
| Bramidae | 0.003 | 0.002 | 0.000 | 0.003 | 0.013 | 0.001 |
| Carangidae | 0.073 | 0.307 | 0.118 | 0.079 | 0.165 | 0.026 |
| Coryphaenidae | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Epinephelidae | 0.019 | 0.003 | 0.043 | 0.016 | 0.042 | 0.04 |
| Gempylidae | 0.000 | 0.000 | 0.000 | 0.000 | 0.017 | 0.006 |
| Haemulidae | 0.000 | 0.000 | 0.002 | 0.000 | 0.001 | 0.001 |
| Holocentridae | 0.009 | 0.0000 | 0.005 | 0.000 | 0.004 | 0.001 |
| Lethrinidae | 0.005 | 0.004 | 0.102 | 0.008 | 0.016 | 0.021 |
| Lutjanidae | 0.040 | 0.033 | 0.038 | 0.018 | 0.036 | 0.017 |
| Malacanthidae | 0.004 | 0.000 | 0.000 | 0.000 | 0.006 | 0.001 |
| Nemipteridae | 0.008 | 0.001 | 0.094 | 0.000 | 0.002 | 0.000 |
| Other | 0.231 | 0.154 | 0.429 | 0.076 | 0.234 | 0.105 |
| Priacanthidae | 0.007 | 0.000 | 0.005 | 0.000 | 0.002 | 0.001 |
| Ray | 0.000 | 0.002 | 0.000 | 0.000 | 0002 | 0.000 |
| Scombridae | 0.021 | 0.078 | 0.036 | 0.068 | 0.244 | 0.229 |
| Serranidae | 0.026 | 0.000 | 0.001 | 0.005 | 0.008 | 0.001 |
| Sharks | 0.012 | 0.001 | 0.007 | 0.018 | 0.014 | 0.005 |
| Sphyraenidae | 0.000 | 0.000 | 0.002 | 0.000 | 0.026 | 0.003 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Total | 0.446 | 0.585 | 0.881 | 0.301 | 0.850 | 0.448 |

Source: Mous and Pet, 2018 (Length-based Stock Assessment Snapper Fisheries)

**Table 8.2: Secondary species (by family) reported as caught in the long-line fishery (% total catch)**

| Family Name | WPP 573 | WPP 712 | WPP 713 | WPP 714 | WPP 715 | WPP 718 |
|---|---|---|---|---|---|---|
| Acanthuridae | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Ariidae | 0.017 | 0.021 | 0.410 | 0.005 | 0.000 | 0.029 |
| Bramidae | 0.000 | 0.000 | 0.000 | 0.013 | 0.000 | 0.000 |
| Carangidae | 0.003 | 0.068 | 0.194 | 0.115 | 0.001 | 0.028 |
| Coryphaenidae | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 |
| Epinephelidae | 0.001 | 0.045 | 0.139 | 0.448 | 0.001 | 0.280 |
| Gempylidae | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Haemulidae | 0.000 | 0.001 | 0.009 | 0.008 | 0.000 | 0.005 |
| Holocentridae | 0.001 | 0.002 | 0.071 | 0.005 | 0.000 | 0.002 |
| Lethrinidae | 0.000 | 0.096 | 0.241 | 0.107 | 0.000 | 0.007 |
| Lutjanidae | 0.001 | 0.048 | 0.173 | 0.037 | 0.000 | 0.017 |
| Malacanthidae | 0.000 | 0.042 | 0.032 | 0.000 | 0.000 | 0.000 |
| Nemipteridae | 0.001 | 0.012 | 0.296 | 0.000 | 0.000 | 0.003 |
| Other | 0.027 | 0.125 | 0.816 | 0.301 | 0.003 | 0.317 |
| Priacanthidae | 0.001 | 0.003 | 0.069 | 0.000 | 0.000 | 0.001 |
| Ray | 0.083 | 0.000 | 0.083 | 0.042 | 0.000 | 0.007 |
| Scombridae | 0.004 | 0.020 | 0.038 | 0.202 | 0.001 | 0.010 |
| Serranidae | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Sharks | 0.000 | 0.001 | 0.902 | 0.330 | 0.000 | 0.000 |
| Sphyraenidae | 0.000 | 0.002 | 0.032 | 0.013 | 0.000 | 0.002 |
| Total | 0.055 | 0.486 | 3.496 | 1.628 | 0.005 | 0.712 |

Source: Mous and Pet, 2018 (Length-based Stock Assessment Snapper Fisheries)

Other species caught in the gill-net (Table 8.3) fishery include two main species groups (>5%), Scombridae and Carangidae. Species > 2% in the gillnet fishery include Acanthuridae and Haemulidae. It is possible that none of these species, individually, to contribute >2% of total catch, although because there is no species-specific data, all species in the respective groups are considered ‘main’.

Other species caught in the trap fishery are under 2%, with the exception of Carangidae (4%).

These species have not been assessed against a Productivity Sensitivity Analysis (Appendix 2). More information is required on species. However, it is expected that were any individual species to comprise > 2%, both Scombridae and Carangidae would come out at low risk . These species would also represent < 30% of total catch of these species by the UoA, and as such would not represent the likelihood of irreversible harm.

**Table 8.3: Secondary species (by family) reported as caught in the trap and gill-net fishery (% total catch)**

| Family Name – Traps | %Catch | | Family Name – Gillnet | %Catch |
|---|---|---|---|---|
| Carangidae | 4.17 | | Scombridae | 9.28 |
| Epinephelidae | 1.13 | | Carangidae | 8.04 |
| Balistidae | 0.87 | | Acanthuridae | 2.78 |
| Rays | 0.82 | | Haemulidae | 2.57 |
| Scombridae | 0.77 | | Epinephelidae | 1.96 |

| | | | | |
|---|---|---|---|---|
| Siganidae | 0.68 | | Lutjanidae | 1.94 |
| Holocentridae | 0.36 | | Lethrinidae | 0.94 |
| Ephippidae | 0.29 | | Sharks | 0.75 |
| Sphyraenidae | 0.29 | | Scaridae | 0.67 |
| Lutjanidae | 0.27 | | Ephippidae | 0.53 |
| Sharks | 0.19 | | Gempylidae | 0.26 |
| Nemipteridae | 0.17 | | Priacanthidae | 0.18 |
| Ariidae | 0.14 | | Holocentridae | 0.16 |
| Lethrinidae | 0.07 | | Balistidae | 0.13 |
| Haemulidae | 0.05 | | Rays | 0.12 |
| Mullidae | 0.05 | | Ariidae | 0.09 |
| Tetraodontidae | 0.05 | | Pomacanthidae | 0.06 |
| Other | 3.54 | | Chaetodontidae | 0.03 |
| Total | 13.91 | | Caesionidae | 0.02 |
| | | | Coryphaenidae | 0.02 |
| | | | Rachycentridae | 0.01 |
| | | | Sparidae | 0.01 |
| | | | Sphyraenidae | 0.01 |
| | | | Other | 2.47 |
| | | | Total | 33.02 |

### *Sharks*

Photographed images from the CODRS have been used to record catches of various shark species. However, anecdotal evidence from TNC field officers indicates that not all sharks caught are recorded in CODRS (Wibisono pers. comm., September 2017). One hundred and seventy-eight sharks have been recorded in the sample of 475,000 fish caught (Jaiteh, February, 2017), but on examination there was concern that the data available in these fisheries was not sufficiently comprehensive. The shark species recorded include some 37 species, mostly of which are Carcharhinids, also known as requiem or whaler sharks, which made up 56% of the shark catch. A further 11% and 9% of the catch was made up of hammerhead sharks. CODRS has now been strengthened to ensure that all secondary species are being recorded. Following more extensive work as part of the FIP, it is inevitable there will be differences between UoA in terms of inclusion in CODRS data. For example WPP 713 shows good records, where larger longline vessels from WPP 718 are still falling behind in providing complete data.

A TNC outreach programme has started, extending the CODRS imagery to fishers to include sharks in (TNC, *Apakah Hiu Sudah Difoto di Papan,* October, 2017). Evidence from the TNC project officers suggests that shark finning is occurring. However, either fish are processed on board to be used for bait and the fins cut off, or the fins are landed along with the carcasses, suggesting that the focus of the regulation should be based on full documentation of the destination of all shark bodies and body parts; and good external validation of the vessels' activities is available to confirm that the targeting of shark for fins is highly unlikely finning is not taking place, but some form of documentation to illustrate this would be required.

### *Baitfish*

A number of baitfish species are used to catch snappers and groupers. These can include scads (*Decapterus* spp.) and sardines *Sardinella* spp, used by longline; and Tongkol (*Auxis* spp. and *Euthinus affinis*), used by drop lines (Leuna, M., June, 2016). Some other species might include fish caught on the lines and chopped up for bait, including shark. moray eels and marine catfish and escolars. Exact quantities are unknown, but field evidence provided (Pet, pers. comm., September, 2017) indicates:

1. Qualitative estimate is that 200 to 250 kg of bait (small pelagics) is used to catch 1 MT of snapper, grouper, emperor and grunter.
2. Longline (over all scales) estimated to use 80% of Sardinella and 20% of Decapterus spp. Drop line 75% Auxis and 25% Decapterus spp.
4. The main method of capture is Mini purse seines, and some other small encircling nets such as “payang” in the Java Sea.


Figure 10. Fish bait used in this fishery. a. Lemuru (*Sardinella lemuru* ); b. Layang (*Decapterus* spp.); c. Tongkol (*Auxis* spp. and *Euthinus* spp.).

MMAF, 2016, provides the basis for estimating the status of fish stocks in Indonesia. "Ikan Pelagis Kecil" (small pelagic species)[4] in Indonesia as follows

WPP 571 - 1.06
WPP 572 - 0.62
WPP 573 - 0.91
WPP 711 - 1.64
WPP 712 - 0.59
WPP 713 - 0.61
WPP 714 - 0.69
WPP 715 - 1.05
WPP 716 - 0.59
WPP 717 - 0.73
WPP 718 - 0.52

with

E < 0.5 meaning "under-exploited"
0.5 < E < 1 meaning "fully-exploited", and
E > 1 meaning "over-exploited".

This suggests that the status is "fully exploited", and in only one WPP the status is "over-exploited". The weighted levels of exploitation levels by catch volume in each WPP, would produce an average exploitation level for all of Indonesia's WPPs of around 0.7. Status and fluctuation in the stocks of small pelagics are fully determined by other users of the baitfish stocks (98% of the production) in combination with environmental conditions and fluctuations in those. Sourcing from 711 could conceivably be an issue in assessment, if this management area were to be added at a later stage.

The Ministerial Decision also gives a total for "Potensi" (Max Sustainable Yield), which is 3,522,578 t. The most recent estimate of the actual catch of small pelagics (nation-wide) is

4 IndoKepMenKP47, 2016.xls

from 2010: 1,232 thousand t (Mous, 2012). The Ministry itself has not published any detailed stats since 2014.

The 1.23 million tonnes of small pelagics caught per year in Indonesia. the bait fish used by deep slope hook and line fisheries represents around 73,000 tons of catch by the "snapper fisheries" in Indonesia. This may be a conservative, as it would tend to maximize TNC's estimate for bait consumption. If bait "consumption" in the snapper fisheries is as high as 20% to 25% in weight relative to catch that means that the total hook and line fisheries may consume as much as 14,600 to 18,500 tons per year. Probably much less because of the use of other bait such as bycatch, while traps use not bait or much less bait and there is a considerable trap fishery in the West. While the total catch in the snapper fisheries may be considerably lower. This would mean that the deep slope hook and line fisheries would consume about 2% of the pelagic fisheries catch.

A test RBF was undertaken for baitfish sourced from mini seine and ring net. The scoring (Appendix 1) indicates high levels of productivity robustness (low risk), but higher sensitivities to overfishing (higher risk). The one lower score 'selectivity' was scored a '2' reflecting the Mesh size usually targeting the mature small pelagics, and not pre-adult, in mini purse seine (Pet, J, pers. comm., September, 2017). The likely RBF score would be 81.

MSC also provides for an interpretation of hindering recovery in that given the large quantities if baitfish taken, even where one zone (WPP 711) is expected to have overfished the baitfish stock, the proportion of baitfish catch taken by groundfish demersal fleet will not be hindering recovery.

*UoA catches of less than 30% of the total catch of a species may not normally be influential in hindering a recovery in a marginal sense, i.e., nothing the UoA does would be likely to change the situation. On the other hand, catches of more than 30% might be influential, such that if the UoA took action to reduce its catches, the stock might well start to recover GSA3.4.6*.

### 2.5.2 ETP species

It is highly likely that there are no ETP species caught in this fishery. There is a moratorium on the export the hammerhead and oceanic white tip shark and fins (Decree 59/PERMEN-KP/2014[5]) but these species are not listed the Indonesian government a list of protected flora and fauna under Government Decree (Peraturan Pemerintah, No. 7/1999). Hammerhead sharks are listed as CITES Appendix II, but MSC classifies ETPs as *Species listed in the binding international agreements CITES, Appendix 1 (SA3.1.5.2)* and *Binding agreements concluded under the Convention on Migratory Species (CMS)*. Indonesia is a Non-Party to CMS; hence the classification does not apply to this fishery. MSC only applies IUCN to animals classified as 'out-of-scope' (amphibians, reptiles, birds and mammals) (SA 3.1.5.3). However, Indonesia does not apply limits to the landings of these species, nor is it illegal to land their fins and carcasses.

None of the shark species caught are listed as Endangered, Threatened and Protected species in Government Decree (Peraturan Pemerintah, No. 7/1999).

No other ETP species are caught in these fisheries including manta rays, turtles, cetaceans and Napoleon fish (*Cheilinus undulatus*). However, it is likely that there may be indirect effects (PI 2.3.1c) on some species, especially cetaceans as a result of discarding plastic bags. These may be swallowed by whales and turtles.

5 http://infohukum.kkp.go.id/index.php/hukum/download/610/?type_id=1,

### 2.5.3 Habitats and ecosystems

Drop line fisheries are characterized by a very low impact on habitat at the fishing grounds, whereas some more impact from entanglement can be expected from bottom long-lines (Mous and Pet, ibid).

Dufour and Ouellet (2007) and DFO (2010) provide a comprehensive analysis of the potential impacts of non-trawl fishing gear in Canada. They identify three parts of gillnet gear that can interact with benthic habitats: i) the weights or anchors, ii) the leaded rope or footgear, and iii) the net itself. The weights can destroy benthic fauna or re-suspend sediments through retrieving the gillnet. The leaded rope may have some impact on bottom substrates during retrieval or when the gillnet is moved. The mesh could become entangled on bottom habitats with high vertical structure and when the net is retrieved it can cause damage. The area in which the gear is deployed can exacerbate the impacts of the gear, for example, if the gear its set in areas with high current, poor weather, high vertical heterogeneity or high species diversity. The breaking strength of the lines, ropes and net can also affect the relative impact of the gear on habitats (Fuller 2008, Shester and Micheli 2011). Ropes of greater strength increase the likelihood of damaging entangled biogenic habitat, while weak lines or web increase the possibility of loss leading to entanglement and fouling. This is more common for demersal gillnets; mid-water and surface gillnets interact little with benthic habitats except when the gear is lost. Furthermore there could be other problems such as diminished availability of water column habitat to species groups (e.g. marine mammals) if an area becomes unusable or undesirable due to the presence of gillnets.[6]

MSC allows for the Risk Based Framework to be applied to assess the likely impact on the benthos (PF7 Conducting a Consequence Spatial Analysis (CSA), pp 96-107).

The table below is a preliminary assessment, and the program should assess habitat impacts with the relevant stakeholders.

**Table 9: Preliminary assessment of habitat impacts Longline and dropline,**

| CSA | **Longline/dropline** | |
|---|---|---|
| **SGB habitat nomenclature** | | |
| Substartum | (1) Coarse sediment (2) Gravel & pebble | |
| Geomorphology | Subcrop (rock protrusions from surrounding sediment <1 m) | |
| Biota | No apparent epifauna, infauna, or flora | |
| Biome | Shelf | |
| Sub biome | (1) Inner shelf and (2) outershelf | |
| Feature | (1) sediment plain (2) shelf break | |
| **Habitat productivity** | | |
| Regeneration of biota | Small erect/ encrusting / No epifauna | 1 |
| natural disturbance | Irregular or moderate natural disturbance | 2 |
| **Gear Habitat interaction** | | |
| Removability of biota | Erect, medium (<30 cm), moderately rugose, or inflexible biota<br>OR moderately robust, shallow- burrowing biota | 1 |
| Removability of substratum | <6 cm (transferable) | 1 |
| Substratum hardness | Soft (lightly consolidated, weathered, or | 2 |

[6]https://cert.msc.org/FileLoader/FileLinkDownload.asmx/GetFile?encryptedKey=i5e8YaQtasEQdCmpIntRBYzXT4QeSCZvjahVlxA5Qs9zctX+5hzidzEgo1dpA3o0

| | | |
|---|---|---|
| | biogenic) [7] | |
| Substratum ruggedness | Low relief (<1.0 m), rough surface structure (rubble, small boulders, rock edges), sub crop, or low outcrop | 3 |
| Seabed slope | terraces in mid- slope | 1 |
| **Spatial attributes** | | |
| gear footprint attribute | demersal longline | 2 |
| Spatial overlap | UoA overlap with a habitat is ≤15% | 0.5 |
| Encounterability | Likelihood of encounter- ability is >75% | 3 |

| CSA | **Gillnet – horizontal set** | |
|---|---|---|
| **SGB habitat nomenclature** | | |
| Substartum | Gravel | |
| Geomorphology | Low relief | |
| Biota | No visible flora and fauna | |
| Biome | Shelf | |
| Sub biome | Inner shelf | |
| Feature | sediment plain | |
| **Habitat productivity** | | |
| Regeneration of biota | Small erect/ encrusting / No epifauna | 1 |
| natural disturbance | Irregular or moderate natural disturbance | 2 |
| **Gear Habitat interaction** | | |
| Removability of biota | Robust, deep borrowing | 1 |
| Removability of substratum | <6 cm (transferable) | 1 |
| Substratum hardness | Soft (lightly consolidated, weathered, or biogenic) | 2 |
| Substratum ruggedness | Low relief (<1.0 m), rough surface structure (rubble, small boulders, rock edges), sub crop, or low outcrop | 3 |
| Seabed slope | Plains/inner shelf | 1 |
| **Spatial attributes** | | |
| gear footprint attribute | gill net | 2 |
| Spatial overlap | UoA overlap with a habitat is ≤15% | 0.5 |
| Encounterability | Likelihood of encounter- ability is >75% | 3 |

| CSA | Gillnet – vertical set on coral reef | |
|---|---|---|
| **SGB habitat nomenclature** | | |
| Substartum | Solid reef | |
| Geomorphology | Rugged surface structure | |
| Biota | Large erect, mixed, corals | |
| Biome | Shelf | |
| Sub biome | outer shelf | |
| Feature | Reef drop-off | |
| **Habitat productivity** | | |
| Regeneration of biota | Corals, mixed communities | 3 |
| natural disturbance | Irregular or moderate natural disturbance | 2 |
| **Gear Habitat interaction** | | |
| Removability of biota | Tall, delicate, large (>30 cm high), rugose, or inflexible biota<br>OR<br>delicate, shallow-burrowing biota | 3 |
| Removability of substratum | Immovable | 1 |
| Substratum hardness | Biogenic | 2 |

| | | |
|---|---|---|
| Substratum ruggedness | High relief (>1 m), high outcrop, or rugged surface structure (cracks, crevices, overhangs, large boulders, rock walls) | 2 |
| Seabed slope | High degree | 3 |
| **Spatial attributes** | | |
| gear footprint attribute | Gillnet | 2 |
| Spatial overlap | UoA overlap with a habitat is ≤15% | 0.5 |
| Encounterability | Likelihood of encounter- ability is >75% | 3 |

| | | |
|---|---|---|
| CSA | Gillnet – vertical set on steep slope | |
| **SGB habitat nomenclature** | | |
| Substartum | Mud | |
| Geomorphology | Outcrop | |
| Biota | No visible biota | |
| Biome | Slope | |
| Sub biome | Upper slope | |
| Feature | Steep slope | |
| **Habitat productivity** | | |
| Regeneration of biota | Small erect/ encrusting / No epifauna | 1 |
| natural disturbance | No natural disturbance | 3 |
| **Gear Habitat interaction** | | |
| Removability of biota | Low, robust, small (<5 cm), smooth, or flexible biota<br>OR<br>robust, deep-burrowing biota | 1 |
| Removability of substratum | <6cm (transferable) | 1 |
| Substratum hardness | Soft (lightly consolidated, weathered, or biogenic) | 2 |
| Substratum ruggedness | High relief (>1 m), high outcrop, or rugged surface structure (cracks, crevices, overhangs, large boulders, rock walls) | 2 |
| Seabed slope | High degree | 3 |
| **Spatial attributes** | | |
| gear footprint attribute | Gillnet | 2 |
| Spatial overlap | UoA overlap with a habitat is ≤15% | 0.5 |
| Encounterability | Likelihood of encounter- ability is >75% | 3 |

c)

| | | |
|---|---|---|
| CSA | Trap | |
| **SGB habitat nomenclature** | | |
| Substartum | Soft sediment near structures | |
| Geomorphology | Low relief | |
| Biota | No visible biota | |
| Biome | Slope | |
| Sub biome | Upper slope | |
| Feature | Terrace | |
| **Habitat productivity** | | |
| Regeneration of biota | Small erect/ encrusting / No epifauna | 1 |
| natural disturbance | No natural disturbance | 3 |
| **Gear Habitat interaction** | | |
| Removability of biota | Low, robust, small (<5 cm), smooth, or flexible biota<br>OR<br>robust, deep-burrowing biota | 1 |
| Removability of substratum | <6cm (transferable) | 1 |
| Substratum hardness | Soft (lightly consolidated, weathered, or biogenic) | 2 |

| | | |
|---|---|---|
| Substratum ruggedness | High relief (>1 m), high outcrop, or rugged surface structure (cracks, crevices, overhangs, large boulders, rock walls) | 2 |
| Seabed slope | Low/medium | 1 or 2 |
| **Spatial attributes** | | |
| gear footprint attribute | trap | 1 |
| Spatial overlap | UoA overlap with a habitat is ≤15% | 0.5 |
| Encounterability | Likelihood of encounter- ability is >75% | 3 |

The RBF worksheet 2.03 indicates that the impact is highly likely to be low.

The most vulnerable ecosystem component was identified by the TNC team as 'species composition'.

the overlap of the ecosystem with the fishing activity was considered to be < 1 (1)
Fishing intensity at 100 days (3) moderate detectability of fishing activity at broader spatial scale, or obvious but local detectability (3)

The TNC team selected SG 100 (Low Risk) - Interactions may be occurring that affect the internal dynamics of communities, leading to change in species composition not detectable against natural variation.

## 2.6 Principle Three: Management system background

### 2.6.1 Legal and customary framework (P 3.1.1)

Indonesia is a Parliamentary democracy supported by a House of Representatives or Dewan Perwakilan Rakyat (DPR). The President of the Republic of Indonesia executes governmental administration. There are 33 provinces and 354 regencies in Indonesia. A governor heads a Province, while the regency or municipal level of government is headed by a regent or mayor. Following the implementation of decentralization beginning on 1 January 2001, the Provinces and districts or regencies have become the key administrative units responsible for providing most government services.

The legal system of Indonesia is based on Roman-Dutch law. Laws are formulated by Parliament and transferred into a Government or Presidents Regulation (Perman) implemented by the Fisheries Ministers. These are also passed to Provincial Governments for implementation. Fisheries policies or specific decrees that support the implementation of these policies, are set out through the Directorate General for Capture Fisheries, Ministry of Marine Affairs and Fisheries (MMAF - established in 2000) but go through the various processes of adoption, if requiring implementation at Provincial and District levels under the Autonomy Law No. 22/1999, and modified by Law No. 32/2004. The Ministry, in the devolution of authority to the provinces, assumes a facilitation and coordination role to guide these authorities in the management of their respective jurisdictions, consistent with national laws. The Ministry then focuses on implementation of these policies, through fisheries legislation for the offshore fisheries, i.e. vessels fishing outside 12 nautical miles or over 30 GTs, whilst delegating implementation within 12 nautical miles, and for vessels less than 30 GT to each province.

The Government has recently adopted a new system to cover a consultation and decision making process (See below) for each Fishery management area, Wilayah Pengelolaan Perikanan.

The current national core fisheries laws are enshrined in Law (UU) No. 25/2004 concerning Planning System for National Development, UU No. 31/2004 concerning Fisheries and the Presidential Regulation No. 7/2005 concerning the National Development Plan for medium phase (RPJMN) during year of 2004-2009, and modified by Act No. 45/2009[8]. The Act includes specific reference to protection of the livelihoods of community fishers (Article 6 (2) and to consider local customary laws and local wisdom (*kearifan lokal)*.

Further, indirectly-related legislation that impacts on marine capture fisheries includes:

- Endangered species legislation
- Export/import/trade legislation
- Biodiversity legislation
- Oceans policy legislation
- Marine park/sanctuary/reserves legislation
- Port management legislation
- Coastal management legislation

Indonesia's main fisheries law (32 of 2004, amended by 45 of 2009) includes a section on the need Indonesia's guidance on formulation of harvest strategies explicitly requires involvement of private sector and fishing communities (see decision of the Director General of Capture Fisheries 17/PER-DJPT/2017, chapter IV, section 2). Informal local policies in some areas come from traditional, unwritten laws handed down from generation to generation. These are referred to as “customary law” or locally as *sasi* or *adat* law. It occurs only in a specific Province such as “sasi” in Maluku Province applies in some cases to control over specific seamounts (WPP 715). That said, the government has not applied any clear mandate for co-management, and actively seeks to establish its own authority on fisheries management issues.

Generally speaking, Government of Indonesia usually addresses public concerns even though the mechanisms are not always formalized or transparent. For example, advocacy groups succeeded to remove the paragraphs on use rights in coastal fisheries from Indonesia's coastal zone management law (UU 27 of 2007), resulting in revisions formalized in law 1 of 2016. Another example is that the Ministry granted a grace period to boat seine fishers after the prohibition of that gear through 7/PERMEN-KP/2016.

Indonesia ratified UNCLOS 1982 on 3 February 1986 and the Agreement relating to the implementation of Part XI of the Convention on 2 June 2000. The UN Fish Stocks Agreement (UNFSA) was ratified in 2010.

Indonesia is also a member of:

- CCSBT Commission for the Conservation of Southern Bluefin Tuna
- IOTC Indian Ocean Tuna Commission
- BIMP-EAGA Brunei, Indonesia, Malaysia, Philippines – East Asia Growth Area
- SEAFDEC South East Asian Fisheries Development Centre

Indonesia actively participates in the following regional fisheries related bodies:

Conventions to which Indonesia is a party

- IOMAC Indian Ocean Marine Affairs Cooperation
- SEAFDEC South East Asian Fisheries Development Centre

Indonesia is Non-Party to the Convention of Migratory Species (CMS).

8 http://extwprlegs1.fao.org/docs/pdf/ins97600.pdf

Indonesia has taken several actions with respect to international mandates and initiatives including:

- Familiarisation/socialisation training on the Code of Conduct for Responsible Fisheries (CCRF);
- A National Plan of Action for Illegal, Unregulated and Unreported (IUU) Fishing to be implemented, 2012-2016;
- Preparations for implementation in the NPOA for reducing catches of seabirds in long-line fisheries (in draft)[9];
- An NPOA for conservation and management of sharks (2015)[10]
- A draft of national plan of fishing capacity was finalized in 2007. However, the implementation has not taken place until now.
- A National Action Plan / Management Plan for tuna (skipjack, neritic tunas), 2014
- the ratification of the FAO Port State Measures Agreement formalized as presidential regulation 43 of 2016).

Various ministerial and presidential regulations explicitly refer to the FAO Code of Conduct for Responsible Fisheries (for example, ministerial regulation 12/MEN/2012, ministerial decision 54/KEPMEN-KP/2014, the ministerial regulation on management of tuna 107/KEPMEN-KP/2015.

### 2.6.2 Roles, Responsibilities, and Consultation (MSC Criteria 3.1.2)

*Roles and responsibilities*

Fisheries management falls under the joint responsibility of the Ministry of Marine Affairs and Fisheries and the provincial and district governments. MFMR devolves management authority to the provinces and district levels under Decentralisation Law No. 22:

- Districts manage through District Decrees (called Perda) for the area 0-4 nautical miles from their coasts;
- Provinces from 0-12 nm (the overlap being for coordination and consistency between districts at the provincial level); and
- the National government and agencies take responsibility for fisheries management and implementation outside the 12-nm zone.

The establishment of the Ministry of Marine Affairs and Fisheries to coordinate this devolution exercise and provide a guide for consistent implementation according to fisheries legislation is a very positive step for fisheries management in Indonesia. The management planning functions rest with the Directorate General for Capture Fisheries, legal and regulatory development with the Secretary General, and research with earlier noted research directorate. The monitoring, control, and surveillance (MCS) functions rest with the Directorate General for Marine Affairs Resource Controlling and Fisheries Surveillance, supplemented by assistance from the armed forces (mainly the Navy and Air Force), and the Marine Police.

Main task of the Ministry of Marine Affairs and Fisheries is assisting the President implementing governmental tasks in the marine fisheries sectors. These functions include:

1. Formulation of the national policy, implementation policy, technical policy in marine affairs and fisheries;
2. Implementation of governmental affairs appropriate with the task area.
3. Management of goods and wealth owned by state;

9 http://www.fao.org/3/a-br346e.pdf

10 The core WCPFC ETP CMMs are as yet not incorporated into the Decrees including: CMM 2010-07 (covering sharks and finning requirements), CMM 2011-04 and silky sharks CMM 2013-08

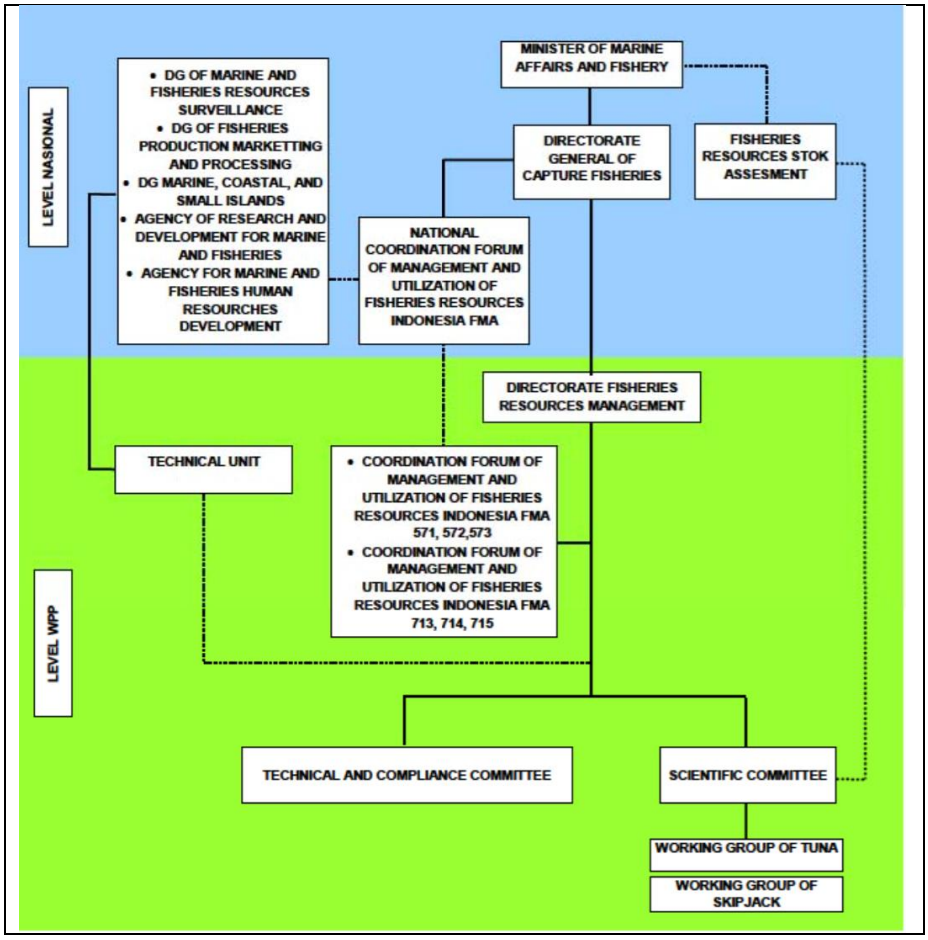
4. Monitoring and evaluation of task implementation;
5. Issuing evaluation reports, suggestions and recommendations to the President.

In term of implementation of the main tasks and functions, the organization structure of MMAF, as stipulated by the Presidential Regulation No, 10/2005 concerning Organization Unit and Task of Echelon I, the State Ministerial of the Republic of Indonesia, consists of 8 (eight) working divisions, namely:

1. **Secretariat General**

   To carry out the coordination in implementation tasks as well as providing departmental administration supports
2. **Directorate General of Capture Fisheries**
   To formulate as well as implement policy and technical standardization on capture fisheries sector
3. **Directorate General of Aquaculture**
   To formulate as well as implement policy and technical standardization on aquaculture sector
4. **Directorate General of Surveillance and Control on Marine and Fisheries Resources**
   To formulate as well as implement policy and technical standardization on surveillance and control on marine and fisheries resource sectors
5. **Directorate General of Marine, Coasts and Small Islands**
   To formulate as well as implement policy and technical standardization on marine, coasts, and small islands sectors
6. **Directorate General of Fish Processing and Marketing**
   To formulate as well as implement policy and technical standardization on fish processing and marketing sectors
7. **Inspectorate General**
   To carry out surveillance on the task implementation in department environment
8. **Agency for Marine Affairs and Fisheries Research**
   To conduct researches in marine and fisheries sectors

**Figure 3: Organisational structure**




There are several agencies whose mandates interact and overlap with fisheries, consequently the legislation of these agencies either directly or indirectly impacts on fisheries policies, laws, and management practices. Some of these agencies include:

- Ministry of Local and Interior Government – for devolution of management authority to both the provinces (0-12 nautical miles) and districts (0-4 nautical miles), and vessel licensing of vessel size groups. National legislation covering boats in excess of 30 GT, provinces covering boats of 0-10 GT) and districts (< 10 GT).
- Ministry of Forestry – that has taken management authority for all marine parks;
- Ministry of Environment for maritime environment issues;
- Navy and Maritime Police for their maritime enforcement roles.
- Ministry of Tourism, Ministry of Transportation,
- State Ministry of Research and Technology and Indonesian Institute for Science.

The liaison between the MMAF and other agencies, as noted above, is facilitated through the National Maritime Council chaired by the Minister of MMAF. The effectiveness of this inter-agency arrangement has appeared to falter largely in the context of the linkages between MMAF and the Provincial and District authorities, especially in the context of devolution of authority. Consequently, new initiatives in fisheries or coastal areas can expect to be required to clear several hurdles before approval. Some of the problems area in relation to agency action are identified as follows:

- Whilst there is an obligation to implement national laws, local governments tend to aim at too high goals of economic growth or quick yielding economic activities as the highest priority;

- The local governments lack qualified human resources on coastal and marine affairs, so that becoming basic constraints in attempting sustainable marine fisheries management;
- A retribution / licensing fee is paid for fisheries company and individual fisheries enterprises. This retribution fee is allocated to cover administration and management cost, including a proportion of administration fees, as well as monitoring, control and surveillance. The because of resource shortages, recovering retribution fees appears to be of paramount importance, over and above issues such as resource sustainability;
- The dissemination of fisheries management actions from National to provincial and district, through socialization appears to be weak. Socialisation may take place from MMAF to Provincial levels around 2 times per year, and from DKP Province to District, at least 4 times per year, but these do not appear to carry specific direction in terms of fisheries management planning.

The Directorate General of Capture Fisheries utilises its port network to cover data collection and fisheries MCS. Log-books are applied to all vessels in excess of 10 GT, and the data recorded by the PPK in the large ports. In some cases, log-book data is extracted from smaller craft (down to 5 GT). Very little information is collected at district level, and data is reliant on estimates from the local District office. Additional information is also collected on fish sizes (MMAF, 2010). This information is disseminated electronically to the Directorate of Capture Fisheries, BRPL and the RFMOs.

Licensing of fishing vessels and reporting requirements are based on vessel size with vessels smaller than 5 gross tonnes (GT) being considered artisanal and not required to report, but they must be registered at the district/provincial level. Where registration of artisanal vessel is actually carried out, it is done annually and with an automatic renewal system, if there are no reported changes to the vessel. Intermediate vessels (10-30 GT) are licensed at Provincial level and larger vessels are normally licensed at the national office. Licenses are renewed annually and then automatically issued at the provincial offices if there are no changes to the vessel or its equipment. All vessels over 5GT are required to be inspected for safety by the Ministry of Sea Communications and Transport prior to being licensed for fishing by the Ministry. MMAF and the Directorate General for Sea Transport at the Ministry of Transport (SEACOM) entered into a MoU in 2015 to address the issue of vessels > 30 GT seeking to register in the provinces (11/2016).

The management of fisheries resources is not based on quota, although in one of the Ministerial of Agriculture Decree in 1990 mentions TACs. The Licensing system developed by MMAF is based on input control by allocating number of fishing vessels by fishing area (Figure 1). MMAF has also established a central data base provinces and MMAF to link provincial vessel registers to a national database system. This also includes the transfer of vessel logbook records from the province to MMAF. Provincial and district government do not have any regulation limiting the number of fishing vessels (completely “open access”), except for the sardine fisheries in the Bali Strait where the number of vessels operating in this Strait has been regulated by the Province of East Java and of Bali Province since 1977.

In support of Fishery Management policies, the Minister is responsible for establishing a Fishery Management Plan, which should contain:

- The potentials & allocation of fish resources
- Establishing TACs
- Types, quantity and size of fishing gears
- Fishing seasons and closed areas
- Size & minimum weight of fish species to be caught
- Fishery reserves
- Protected species

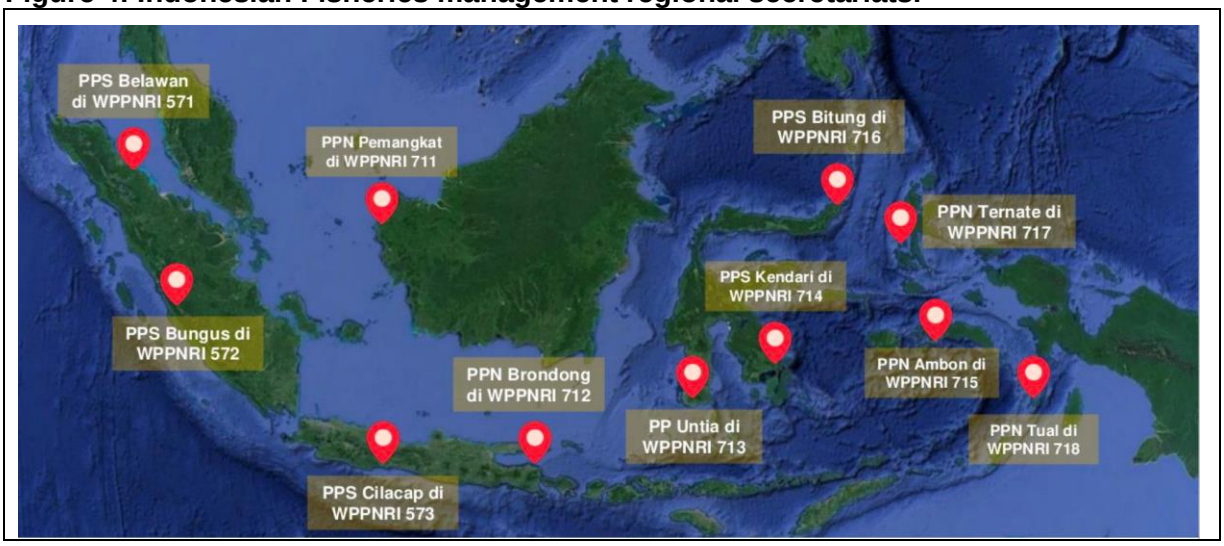
MMAF has commenced the development of fisheries specific management plans, which are

to be extended to incorporate DKPs Provinsi and District. The tuna management plan, 2014 is the first of these.

*Consultation*

The consultation process is through the Fishery management area, Wilayah Pengelolaan Perikanan Negara Republik Indonesia (WPPNRI). The organisation and 11 regional secretariats, 1 for each management area (Figure 4), provides technical advice from relevant research, monitoring, and evaluation.

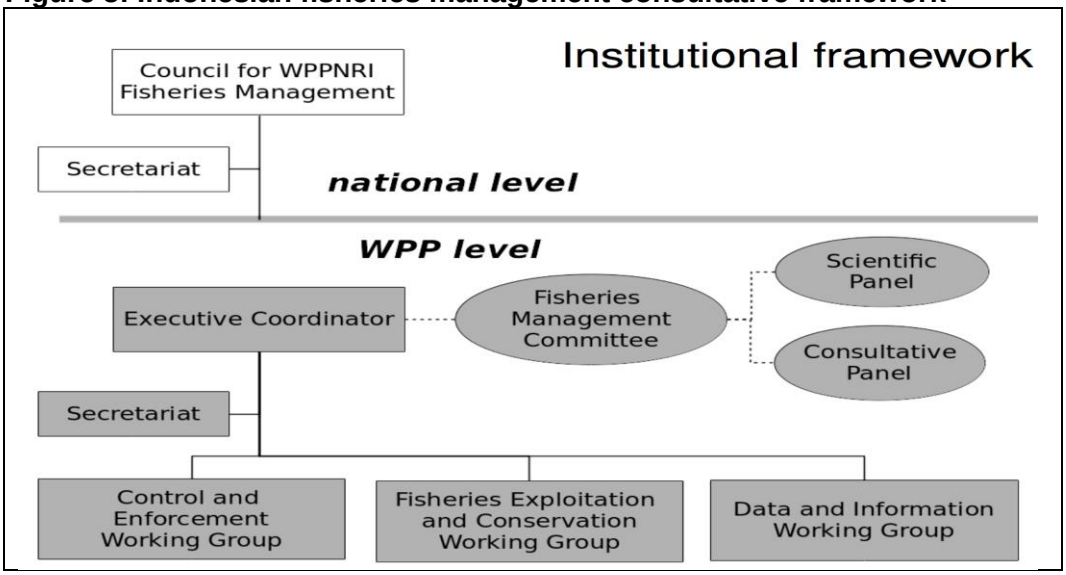
**Figure 4: Indonesian Fisheries management regional secretariats.**




Source: TNCIFCP, ppt

The consultation process provides for a Scientific panel and Consultative Panel in each FMA. Research outputs are generated by the science providers Research Centre for Fishery Management and Conservation of Fishery Resources (P4KSDI) and The Marine Research Agency) (BRPL). The consultative panel comprises industry representatives and NGOs. NGOs, with research credentials, such as the TNC Indonesian Programme, may participate in the Scientific Panel.

**Figure 5: Indonesian fisheries management consultative framework**




Source: TNCIFCP, ppt

Three specials working groups also exists. Namely, the Control and Enforcement Working Group, the Fisheries Exploitation and Conservation Working Group and Data and Information Working Group. These groups provide technical advice to the Director of Capture Fisheries.

Several marine related agencies also contribute to the development of management plans and policies and support their implementation through their legislations. These include: Forestry, LIPI, Navy, Maritime Police, and the scientific network through the universities. NGOs are working on an increasing basis with communities to encourage them to assume stewardship roles in the collaborative (government and community) management schemes for the coastal areas. New policies, legislative instruments and evolving management structures will be required to fully implement these initiatives.

### 2.6.3 Long-term Objectives (MSC Criteria 3.1.3)

National objectives are enshrined by the policy pillars of sovereignty, sustainability, and prosperity, and incorporated into Indonesia's main fisheries law (31 of 2004, revised by 45 of 2009, Article 2 and Article 3)

The current strategy of the Ministry of Marine Affairs and Fisheries elevates sustainability as one of the three pillars (the other two are sovereignty and prosperity---see the opening page of the Ministry's website, kkp.go.id).

The National Fisheries Master Plan (2009-2015), albeit out of date, contains a number of core objectives:

To strengthen an integrated marine and fisheries' human resources and institutions;

a. Demand orientated marine and fisheries' rules and regulations, based on national and global requirements, and implemented as a synergy of cross sectors, central and regional governance
b. Integrated, accountable and real-time planning, implementing and reporting process based on real time and accurate data
c. Competent and requirement-based marine and fisheries' human resources

II. To sustainably manage marine and fisheries resources;
a. Optimal and sustainable utilization of marine and fisheries resources

b. Conservation area and protected aquatic organisms are managed sustainably
c. Small islands are developed to become islands with high economic value
d. Indonesia is free from Illegal, Unreported and Unregulated (IUU) fishing and destructive activities to marine and fisheries resources

III. To increase scientific based productivity and competitiveness
a. All areas with fisheries potential become minapolitan areas with bankable businesses
b. All marine and fisheries production centers have superior commodities, supported by the implementation of innovative technology with guaranteed packaging and quality
c. All marine and fisheries facilities and infrastructures are built integrated and able to support and produce domestic requirement

IV. To extend the access of the Domestic and International markets
a. All villages have markets to facilitate the fisheries product trading process
b. Indonesia becomes the world's market leader and the main destination of marine and fisheries investment destination

Both the precautionary and ecosystem approaches to fisheries management have also been introduced as component of the government's core management objectives (Decree PMKDPRI 15/MEN/2012 (National Strategy on Fisheries Management). MMAF sets overall catch quota for major species groups (large pelagics, small pelagics, demersal fish, etc.) at 80% of the estimated Maximum Sustainable Yield (see Ministerial decree 47/KEPMEN-KP/2016). Whereas this approach is ambiguous (after all, 80% of Maximum Sustainable Yield is achieved to the right-hand side as well as the left-hand side of the yield-effort relationship), the *intention* of this procedure is to serve the precautionary principle (Mouse, pers. comm., 2017).

The ecosystem approach to fisheries management has been incorporated as an objective into the Indonesia Tuna Action Plan. A number of MMAF familiarisation workshops (IMACS/WWF) have also taken place on the Ecosystem approach to Fisheries Management. Following this initiative, MMAF issued a regulation on competency standards for practicing the ecosystem approach to fisheries management (9/PERMEN-KP/2015, tentang standard kompetensi kerja khusus pengelolaan perikanan dengan pendekatan ekosistem).

### 2.6.4 Fishery specific objectives (3.2.1)

Reference is made to fishery management plans in the Fisheries Law as an instrument of fishery specific governance, and definitions for these plans are contained in Ministerial Regulation 29 of 2012 on compilation of fisheries management plans (*Rencana Pengelolaan Perikanan*, RPP), and these apply the requirements to estimate of Maximum Sustainable Yield for each stock a maximum allowable catch and resource allocation system (from a national aggregate to provincial and district levels), based on historic levels of fishing in each jurisdictional area (Mous, P., September, 2017). The management tool is to regulate by effort, or fishing licence. None of the WPPs that exist to date, include concrete plans or reference points to regulate the number of licenses based on the status of the resources. Fishery specific harvest strategies introduced through regulation 17 of 2017 are meant to fill this gap. No fishery specific management plan has been prepared for groundfish slope species. A plan will need to be developed which contains **Short and long-term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 (stock assessment, harvest strategies and 2 (ecosystem management), are explicit within the fishery- specific management system.**

### 2.6.5 Decision-making processes (P 3.2.2)

Decision making (PI 3.2.2) by DGCF and WPPINR will need to demonstrate *established decision- making processes that result in measures and strategies to achieve the fishery-*

*specific objectives (SG 80 a)* and decisions *take account of serious and other important research, monitoring and evaluation, as well as the wider implications of decisions (SG 80 b),* but to a large extent the absence of a fishery specific management strategy and general lack of information has prevented some key decisions being taken for specific fisheries, which makes it difficult to respond in a *timely an adaptive manner* (SG 80 b).

There are **established** decision-making processes that result in measures and strategies to achieve the fishery- specific objectives and measures and strategies can be made specific to each fishery or group of stocks (DKP 22/2019).

The MMAF / WPP decision-making processes responds to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions. However, evidence needs to show that **decision-making processes are specific to each fishery or group of stocks.**

Decision-making processes are required to use the precautionary approach and are based on best available information. However, **precautionary actions to date are not explicit within the management policy**.

The consultative mechanism allows for information on the fishery's performance and management action to be made available on to the decision makers / consultative groups. **Evidence will be required to show that through these groups, explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity**.

There is no evidence of legal challenges or judicial decisions taken to in the fishery. It could be argued that the consultation system proactively seeks avoid legal disputes or rapidly implements judicial decisions arising from legal challenges. However, without an array of management measures designed to control catch and effort, as well as bycatch, this PI has not as yet been tested.

### 2.6.6 Compliance and enforcement PI (P 3.2.3)

Compliance with fisheries laws is executed through Directorate General of Surveillance and Control on Marine and Fisheries Resources (PSDKP), the local provincial and district fisheries administrations, and the navy and maritime police agency. Fisher groups are being urged through several coastal resource development programmes to assume greater input into the management planning, policy development, and the implementation process, although this is still in its infancy. This latter task is often being undertaken with the support of non-government organizations (NGOs). Critical constraints to compliance activities are the lack of financial resources. PSDKP resources 26 patrol craft 80 GT and above, operating throughout Indonesia. These craft usually work collectively with the Navy and Marine police.
The groundfish snapper and grouper fleets are associated with all vessel size groups. All craft over 30 GT are required to carry VMS. Extension to of VMS to vessels between 10 and 30 GT is presently being considered. All vessels in excess of 10 GT are required to register a sailing declaration that must be carried on board. Compliance with licensing regulations appears to be functioning, however, there are some areas where vessels may hold several licences.

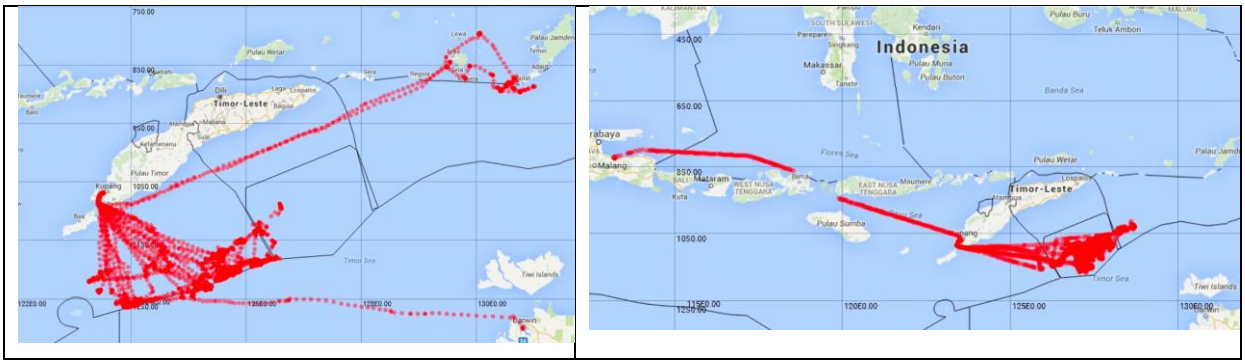
The logbook regulation is covered by Ministerial Decree 48/2014, and supported by a sanction system. The decree includes small-scale fisheries (>5GT). Vessels not completing are supposed to be denied an operational permit, but the application of this measure would appear to be very poor. Other international analysis (Pramod et al) indicates high levels of under reporting of snapper catches (35-50%) imported from Indonesia into the US.

Indonesia has special fisheries courts to handle cases related to fisheries (see article 71 in law 45 of 2009 on fisheries). These courts have been established in Indonesia's main fisheries hubs: North Jakarta, Medan, Pontianak, Bitung, Tual, Tanjung Pinang, Sorong (Keputusan Presiden Nomor 6 Tahun 2014), Merauke (Keputusan Presiden Nomor 6 Tahun 2014), and Ambon (Keputusan Presiden Nomor 6 Tahun 2014). These fishery Courts have the specific authority to examine, adjudicate and decide fishery-related crimes in Indonesia, whether by Indonesian citizens or foreign nationals. Fishery Courts follow criminal procedural law, with several exceptions concerning matters specific to the field and activities of fisheries. These courts are fairly new and to date only five have been established, in the District Courts of North Jakarta, Medan, Pontianak, Bitung, and Tual. Further explanation of Fishery Courts is found in Law No. 45 of 2009 regarding the Amendment to Law No. 31 of 2004 regarding Fisheries.

Fishery Act 31/2004 sets out penalty schedules. Enforcement includes the graduated fiscal penalties, suspension or cancellation of licenses, refusal for new licenses and full removal from the fishery as penalty options. Revision issued on 2009 No 45. lists penalties and fines to deal with specific violations. The range of fines increased was increased 10 fold in 2009 with a penalty range from USD 25,000 and up to USD 500,000 or sent to jail for 6 years. PSPKP maintain a record of infractions, but this information is confidential. However, there is no clarity as to whether sanctions to deal with non-compliance **are consistently applied and thought to provide effective deterrence (3.2.3b)**.

Evidence taken from the SPOT Trace vessel tracking system indicates systematic non-compliance with fishing in restricted zones, notably the Timor Leste/Australian shared zone, the Timor Leste EEZ, across the EEZ boundary into Australia, and in various Marine Protection Areas.

Figure 6: Samples of TNC SPOT Trace readings




Source: TNCIFCP, ppt

Existing tools that are in place evidently do no eliminate IUU (PI 3.2.3) and the fishery and has not demonstrated **an ability to enforce relevant management measures, strategies and/or rules (3.2.3a)**.

One worthwhile output to assess the appropriateness of enforcement measures applied would be to undertake a compliance risk assessment, which would provide some understanding of the tools required to assess compliance risks in the deep water demeral fisheries. It is hoped that MMAF will take the risk assessment and apply these to each of the fisheries. It is unlikely, at this stage, that an assessment will be able to demonstrate that **Fishers are generally thought to comply with the management system under assessment (3.2.3c)**. This PI is unlikely to pass and requires the support of technical assistance to meet with appropriate IUU standards.

### 2.6.7 Performance Review (P3.2.4)

A performance review structure is in place for both MMAF and Provincial DKP. An annual internal review on program planning and performance evaluation is undertaken by the Inspectorate General/Echelon I of MMAF (once a year). An external review is undertaken by the Finance Audit Agency/BPK and Finance and Development Audit Agency/BPKP at least once a year.

A performance review also takes place for P4KSI and its subsidiary research groups. This includes an internal review on research and program planning by Inspectorate General/Echelon I of MMAF (every three months) and M&E of Balitbang KP/Echelon I of MMAF (every month)

- external review on program is conducted by Finance Audit Agency/BPK twice a year during planning and evaluation, while university conducted external review on research plan once a year

An external review of both organization is undertaken by the Finance Audit Agency/BPK and Finance and Development Audit Agency/BPKP at least once a year.

The absence of a Management Plan for the groundfish snapper and grouper fisheries means that there is no fisheries specific management review process in place. This will need to be in place at the start of a full assessment.

# 3 Evaluation Procedure

## 3.1 Assessment methodologies used

This pre-assessment has been undertaken according to the MSC Certification Requirements V2.0.

The MSC Pre-assessment Reporting Template v2.0 was used.

## 3.2 Summary of site visits and meetings held during pre-assessment

A site visit was conducted at the TNC offices, Benoa, Bali from 11-26 September 2017 by Richard Banks. All work undertaken relied on a combination of literature review, interviews with Dr Peter Mous and Dr Jos Pet, and the consultants own knowledge on the application of governance systems in Indonesia.

## 3.3 Harmonisation with any overlapping MSC certified fisheries

At the time of preparing this pre-assessment. There were no other certified fisheries for the species assessed here as P1 in adjacent jurisdictions.

# 4 Traceability (issues relevant to Chain of Custody certification)

In the event that the groundfish snapper and grouper fisheries proceed to full assessment and are subsequently certified, arrangements are required at all stages of the supply chain to ensure identification and segregation of certified product in order for the product to bear the MSC ecolabel.

## 4.1 Traceability within the Fishery

Access to the fishery is currently fairly open ended, without clear definitions of licensing parameters. The programme has not as yet identified the full number of vessels operating in the fishery, and the numbers of vessels involved are likely to exceed 9,500, especially taking account of the number of smaller vessels which may be active at district level. These vessels are not subject to any form of licensing. Catch data is only available from the 300 vessels participating in the sample, but daily logbooks which would specify the species caught, location fished and the number of all retained species, is only partially available. Catches are unloaded onto carriers and into a large number of ports. The vessel unloading stations are also reported to vary depending on where specific fleets may be fishing. This largely hinders the ability of fishery enforcement officers to regularly monitor landings at the point of landing. The chain of custody cycle will commence at the point where mixing is likely to occur, i.e., when transshipped to carrier, or at any of the landing station.

Given the nature of the fishery, multi species demeral groundfish fisheries, and the fact that there is a high probability of mixing certified product with either species caught from vessels operating the UoAs, but not within the UoC there is a high probability of mixing product.

Carriers and landing stations, for example, may source from other fishers. In order to avoid the prospect of mixing at this stage, MSC will most probably require some form of third party verification to ensure that certified product is sold into the chain is separated from non-certified verification.

The product is sold to through vessel agents to a number of individual processing firms. These firms sell product to US, Australian and European markets, and also for smaller sized fish onto the domestic market. Species are filleted and vacuum packed and labelled according to species, weight, vessel details and place of capture. The facility exists at processing levels to ensure that MSC product can be separated from the other.

CoC systems are evaluated by Certification Assessment Bodies. There are a number of specific issues that will need to be addressed by them.

1. The logbook recording system, as applied is too weak. This suggests that a more robust recording system for those in the UoC must be implemented. The application of CODRS system to all vessels participating in the UoC will effectively deal with this issue

2. Verification procedures must avoid the prospect of mixing, and transshipment and unloading stations represent very real risks to the CoC system. Linking CODRS along with processing traceability systems is likely to provide a real opportunity for establishing a robust CoC system. A Comparison of aggregate catch data and each vessels data should reveal anomalies should mixing take place at sea. Digital vessel logs would need to be reconciled with landing/receiving logs to ensure harmonization between reports.

3. The option exists to implement a sampling programme (MSC Chain of Custody Certification Requirements V2[11], Table 12 and Table 15). There is a scoring system which allows for an internal and external audit process. An indicative score is around 55-80 (Table 15), which suggests for a site number of 25, Internal audit samples would have to be taken at 6 sites, and external audits at 4. Advice on the application of this plan would need to require input from a Certification Assessment Body.

### 4.2 Eligibility of fishery products to enter further chains of custody

Any certified products from the fishery are likely to be identifiable and would be eligible to enter further certified chains of custody. The fishery certification will end, and chain of custody begin, at the point at which landings or transshipments are made from fishing vessels to a named buyer or processing facility (i.e., at the point of change of ownership). To continue a chain of custody, entities taking ownership of the product at downstream points must be certified against MSC's Chain of Custody Standard.

Any downstream suppliers taking ownership of any certified product will need arrangements in place to ensure separation of any certified and uncertified material of the same species.

## 5 Preliminary evaluation of the fishery

### 5.1 Applicability of the default assessment tree

The review of information conducted for this pre-assessment indicates that the default assessment tree is applicable and appropriate without revision. None of the species assessed

[11] https://www.msc.org/documents/scheme-documents/msc-scheme-requirements/msc-coc-certification-requirements-v2.0/view

against Principle 1 were considered to be low trophic level species, therefore no modifications to the Principle 1 performance indicators were required.

It is noteworthy that MSC is in the process of reviewing amendments to the default assessment tree to cater for multi species fisheries.

## 5.2 Expectations regarding use of the Risk-Based Framework (RBF)

The use of robust proxy data for all target species, and all other primary and secondary species confined to 'minor' suggests that there is no need to apply the RBF for target, primary and secondary species. National measures are in place for ETP species, which means that were species to be identified, the RBF cannot be used for ETPs. No data is available to assess habitat impacts which suggests that a CSA is likely to be required for the longline fishery. SICA is likely to be required for to assess impacts on ecosystem overall.

## 5.3 Summary of likely PI scoring levels

Key to likely scoring level in Table 7

| Definition of scoring ranges for PI outcome estimates | Shading to be used | Instructions for filling 'Likely Scoring Level' cell |
|---|---|---|
| Information suggests fishery is not likely to meet the SG60 scoring issues. | Fail (<60) | Add either text (pass/pass with condition/fail) or the numerical range (<60/60-79/≥80) appropriate to the estimated outcome to the cell.<br><br>Shade the cell of each PI evaluation table with the colour which represents the estimated PI score. |
| Information suggests fishery will reach SG60 but may not meet all of the scoring issues at SG80. A condition may therefore be needed. | Pass with Condition (60-79) | |
| Information suggests fishery is likely to exceed SG80 resulting in an unconditional pass for this PI. Fishery may meet one or more scoring issues at SG100 level. | Pass (≥80) | |

**Table 7: Simplified Scoring sheet**

| Principle | Component | PI | Performance Indicator | RBF required? (y/n) | Likely scoring level | Rationale/ Key points |
|---|---|---|---|---|---|---|
| 1 | Outcome | 1.1.1 | Stock status | N | ≥80 | Use of proxies (SPR) suggests that 7 species are at MSY |
| | | 1.1.1 | Stock status | N | Pass with Condition (60-79) | Use of proxies (SPR) suggests that 2 species are above PRI |
| | | 1.1.1 | Stock status | N | Fail (<60) | Use of proxies (SPR) suggests that 22 species are below PRI |
| | | 1.1.2 | Stock rebuilding | N | Fail (<60) | Stock-rebuilding isn't in process, but may be scored once introduced for those species above PRI, but not at MSY |
| | Management | 1.2.1 | Harvest Strategy | N | Fail (<60) | No fishery specific strategy in place, but a framework exists to allow for implementation (Regulation 17 of 2017). |
| | | 1.2.2 | Harvest control rules and tools | N | Fail (<60) | Very few fishery specific tools exist. The exception being MPAs. Licensing controls are insufficiently defined and no formal fishery specific input or output restrictions are in place. |
| | | 1.2.3 | Information and monitoring | N | Pass with Condition (60-79) | UoA fleet composition to be identified (at present meets 'some'). |
| | | 1.2.4 | Assessment of stock status | N | ≥80 | Proxy indicators available for all target species, uncertainties taken into account by the suite of measures available and the process of assessment independently reviewed |
| | **Number of PIs less than 60** | | | | | 3 or 4 |
| 2 | Primary Species | 2.1.1 | Outcome | N | ≥80 | For main and minor species above PRI and minor species subject to management |
| | | 2.1.1 | Outcome | N | Fail (<60) | For all other P1 species a demonstrably effective strategy should be in place between all MSC UoAs which categorise this species as main, to ensure that they collectively do not hinder recovery and rebuilding. |

| Principle | Component | PI | Performance Indicator | RBF required? (y/n) | Likely scoring level | Rationale/ Key points |
|---|---|---|---|---|---|---|
| | | 2.1.2 | Management | | Fail (<60) | No strategy in place |
| | | 2.1.3 | Information | | ≥80 | Some quantitative information is available and is **adequate to assess** the impact of the UoA on the main primary species with respect to status. |
| | Secondary species | 2.2.1 | Outcome | Y for baitfish | Pass with Condition (60-79) | Baitfish should score > 80. Need to assess whether individual species shark catches are > 2% or if over 2%, vulnerable. |
| | | 2.2.2 | Management | | Fail (<60) | It is **likely** that shark finning is not taking place |
| | | 2.2.3 | Information | | ≥80 | Some quantitative information is available and is adequate to assess the impact of the UoA on shark species with respect to status. Possible weaknesses in lshark catch information in both fisheries.<br>Baitfish data and RBF (Appendix A) would suggest low risk. |
| | ETP species | 2.3.1 | Outcome | N | Pass with Condition (60-79) | National measures in place. No ETPs recorded BUT Indirect effects have been considered for the UoA and are thought to be **highly likely** to not create unacceptable impacts. |
| | | 2.3.2 | Management | N | ≥80 | No management strategy required as information suggest no interactions |
| | | 2.3.3 | Information | N | Pass with Condition (60-79) | Qualitative information is **adequate to estimate** the UoA related mortality on ETP species |
| | Habitats | 2.4.1 | Outcome | Y | ≥80 | No impact for Drop line. Longline requires RBF SCA and is likely to be low impact (Appendix B) |
| | | 2.4.2 | Management | Y | ≥80 | Not required for > 80 |

| Principle | Component | PI | Performance Indicator | RBF required? (y/n) | Likely scoring level | Rationale/ Key points |
|---|---|---|---|---|---|---|
| | | 2.4.3 | Information | Y | ≥80 | RBF/CSA applied |
| | Ecosystem | 2.5.1 | Outcome | Y | ≥80 | Low risk |
| | | 2.5.2 | Management | N | ≥80 | Not required for SG 100 |
| | | 2.5.3 | Information | N | ≥80 | RBF/SICA applied |
| | **Number of PIs less than 60:** | | | | | 1 or 2 |
| 3 | Governance & policy | 3.1.1 | Legal and customary framework | | ≥80 | Legal and customary framework in place |
| | | 3.1.2 | Consultation, roles and responsibilities | | ≥80 | Institutional and consultation process (WPP) in place |
| | | 3.1.3 | Long term objectives | | ≥80 | Precautionary and Ecosystem approaches explicit in management policy |
| | Fishery specific management system | 3.2.1 | Fishery specific objectives | | Fail (<60) | No fishery specific Management Plan in place, or the means to assess whether the management measures, consistent with P1 and P2 are being monitored |
| | | 3.2.2 | Decision making processes | N | Pass with Condition (60-79) | WPP structure now caters for fishery specific, but this system needs to demonstrate functionality |
| | | 3.2.3 | Compliance and enforcement | N | Fail (<60) | Limited management measures in place. Control measures insufficiently defined for the drop line and longline fishery |

| Principle | Component | PI | Performance Indicator | RBF required? (y/n) | Likely scoring level | Rationale/ Key points |
|---|---|---|---|---|---|---|
| | | 3.2.4 | Management performance evaluation | N | Fail (<60) | No regular internal and occasional external review structure in place for the specific fishery |
| | **Number of PIs less than 60:** | | | | | 4 |

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## Appendix A. Baitfish RBF

| Only main species scored? | | | ... | | | | | | Productivity Scores [1-3] | | | | | | | | | Susceptibility Scores [1-3] | | | | | Cumulative only | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Scoring element | First of each scoring element | Species Grouping only ID 'At Risk' species by selecting associated species group | Species Grouping only Number of species in species group which this species represents (N/2) | Family name | Scientific name | Common name | Species type | Fishery descriptor | Average age at maturity | Average max age | Fecundity | Average max size | Average size at Maturity | Reproductive strategy | Trophic level | Density Dependance | Total Productivity (average) | Availability | Encounterability | Selectivity | Post-capture mortality | Total (multiplicative) | PSA Score | Catch (tons) | Weighting | Weighted Total | Weighted PSA Score | MSC PSA-derived score | Risk Category Name | MSC scoring guidepost |
| 1 | First | Species Group 1 | | | *Decapterus* spp | Scad | Non-invertebrate | Mini seine | 1 | 1 | 2 | 1 | 1 | 1 | 3 | | 1.43 | 3 | 3 | 2 | 3 | 2.33 | 2.73 | | | | | 81 | Low | ≥80 |

## Appendix B. Habitat Consequence Spatial Analysis

| Only main habitats scored? | | | ... | | | | Consequence score [1-3] | | | | | | | Spatial score [0.5-3] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Habitat details | | | | | | | Habitat productivity | | Gear-habitat interaction | | | | | | | | | | | | |
| Scoring element | UoA/Gear type | Biome | Sub-biome | Feature | Habitat type | Depth (m) | Regeneration of biota | Natural disturbance | Removability of biota | Removability of substratum | Substratum hardness | Substratum ruggedness | Seabed slope | Consequence score | Gear footprint | Spatial overlap | Encounterability | Spatial score | CSA score | MSC CSA-derived score | Risk category | MSC scoring guidepost |
| 1 | Longline | Shelf | Outer shelf | Shelf break | Gravel and pebble (4-60 mm) | 150 | 1 | 2 | 1 | 1 | 2 | 3 | 1 | 1.56 | 2 | 1.5 | 3 | 2.08 | 2.60 | 84 | Low | ≥80 |
| 1 | Longline | Shelf | Inner shelf | sediment plain | Coarse sediment | 75 | 1 | 2 | 1 | 1 | 2 | 3 | 1 | 1.56 | 2 | 1.5 | 3 | 2.08 | 2.60 | 84 | Low | ≥80 |

| Only main habitats scored? | Yes | | | | | | Consequence score [1-3] | | | | | | | Spatial score [0.5-3] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Habitat details | | | | | | | Habitat productivity | | Gear-habitat interaction | | | | | | | | | | | | |
| Scoring element | UoA/Gear type | Biome | Sub-biome | Feature | Habitat type | Depth (m) | Regeneration of biota | Natural disturbance | Removability of biota | Removability of substratum | Substratum hardness | Substratum ruggedness | Seabed slope | Consequence score | Gear footprint | Spatial overlap | Encounterability | Spatial score | CSA score | MSC CSA-derived score | Risk category | MSC scoring guidepost |
| 1 | bottom longline/dropline | shelf | Inner shelf | sediment plain | coarse sediment/low relief/no flora or fauna | 75 | 1 | 2 | 1 | 1 | 2 | 3 | 1 | 1.56 | 2 | 0.5 | 3 | 1.44 | 2.12 | 93 | Low | ≥80 |
| 2 | bottom longline/dropline | shelf | outer shelf | shelf break | gravel, pebble/outcrop/no flora and fauna | 150 | 1 | 2 | 1 | 1 | 2 | 3 | 1 | 1.56 | 2 | 0.5 | 3 | 1.44 | 2.12 | 93 | Low | ≥80 |

| Only main habitats scored? | Yes | | | | | | Consequence score [1-3] | | | | | | | Spatial score [0.5-3] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Habitat details | | | | | | | Habitat productivity | | Gear-habitat interaction | | | | | | | | | | | | |
| Scoring element | UoA/Gear type | Biome | Sub-biome | Feature | Habitat type | Depth (m) | Regeneration of biota | Natural disturbance | Removability of biota | Removability of substratum | Substratum hardness | Substratum ruggedness | Seabed slope | Consequence score | Gear footprint | Spatial overlap | Encounterability | Spatial score | CSA score | MSC CSA-derived score | Risk category | MSC scoring guidepost |
| 1 | bottom gillnet-horizontal | shelf | Inner shelf | sediment plain | gravel/low relief/no flora or fauna | 50 | 1 | 2 | 1 | 1 | 3 | 3 | 1 | 1.67 | 2 | 0.5 | 3 | 1.44 | 2.20 | 92 | Low | ≥80 |
| 2 | bottom gillnet - vertical | shelf | outer shelf | reef drop-off | solid reef/ rugged surface structure/possible large erec | up to 200m | 3 | 2 | 3 | 1 | 2 | 2 | 3 | 2.33 | 2 | 0.5 | 3 | 1.44 | 2.74 | 80 | Low | ≥80 |
| 3 | bottom gillnet - vertical | slope | upper slope | steep slope | mud/outcrop/no visible fauna or flora | up to 500m | 1 | 3 | 1 | 1 | 2 | 2 | 3 | 1.89 | 2 | 0.5 | 3 | 1.44 | 2.38 | 89 | Low | ≥80 |

| Only main habitats scored? | Yes | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Habitat details | | | | | | | | Consequence score [1-3] | | | | | | | | Spatial score [0.5-3] | | | | | | | |
| | | | | | | | | Habitat productivity | | Gear-habitat interaction | | | | | | | | | | | | | |
| Scoring element | UoA/Gear type | Biome | Sub-biome | Feature | Habitat type | Depth (m) | Regeneration of biota | Natural disturbance | Removability of biota | Removability of substratum | Substratum hardness | Substratum ruggedness | Seabed slope | Consequence score | Gear footprint | Spatial overlap | Encounterability | Spatial score | CSA score | MSC CSA-derived score | Risk category | MSC scoring guidepost |
| 1 | trap | slope | upper slope | soft sediment near | soft/low relief/no flora or fauna | 50 | 1 | 3 | 1 | 1 | 2 | 3 | 1 | 1.78 | 1 | 0.5 | 3 | 1.14 | 2.11 | 93 | Low | ≥80 |