Indian Ocean Albacore Purse Seine FADs, IOTC

Principle 2: Minimising environmental impact

Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

Catch Profile

Table 2.0 Catch profile for UoA Indian Ocean Albacore, Purse Seine FADs (Note: Catch profile is not an exact match to UoA).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Species | UoA Species Catch | Proportion of Total UoA Catch | Total Species Catch | Proportion of Total Species Catch | Resili-ence Score | Minor/ Main |
| Katsuwonus pelamis | 899756 | 0.593 | 1043390 | 0.862 | 1.57 | Main |
| Thunnus albacares | 397873 | 0.262 | 511883 | 0.777 | 1.57 | Main |
| Thunnus obesus | 141479 | 0.093 | 315714 | 0.448 | 1.71 | Main |
| Auxis thazard | 43323 | 0.029 | 46451 | 0.933 | 1.29 | Minor |
| Euthynnus alletteratus | 14284 | 0.009 | 28327 | 0.504 | 2.00 | Minor |
| Prionace glauca | 2309 | 0.002 | 224625 | 0.010 | 2.86 | Minor |
| Thunnini | 2147 | 0.001 | 6962 | 0.617 | 2.29 | Minor |
| Sarda sarda | 2071 | 0.001 | 13707 | 0.151 | 1.29 | Minor |
| Istiophorus platypterus | 1811 | 0.001 | 9453 | 0.192 | 1.71 | Minor |
| Scombroidei | 1615 | 0.001 | 4409 | 0.733 | 2.29 | Minor |
| Acanthocybium solandri | 1047 | 0.001 | 7527 | 0.139 | 1.71 | Minor |
| Thunnus alalunga | 686 | 0.000 | 34983 | 0.020 | 1.71 | Minor |
| Thunnus atlanticus | 654 | 0.000 | 2398 | 0.273 | 1.71 | Minor |
| Istiophoridae | 613 | 0.000 | 1782 | 0.633 | 2.00 | Minor |
| Orcynopsis unicolor | 425 | 0.000 | 531 | 0.800 | 2.00 | Minor |
| Xiphias gladius | 408 | 0.000 | 80844 | 0.005 | 2.14 | Minor |
| Scomberomorus tritor | 391 | 0.000 | 2382 | 0.164 | 1.43 | Minor |
| Isurus oxyrinchus | 318 | 0.000 | 21469 | 0.015 | 2.86 | Minor |
| Selachimorpha (Pleurotremata) | 273 | 0.000 | 2470 | 0.221 | 3.00 | Minor |
| Scomberomorus spp | 248 | 0.000 | 420 | 0.956 | 2.29 | Minor |
| Carcharhinus falciformis | 216 | 0.000 | 434 | 0.498 | 2.86 | Minor |
| Carcharhinidae | 163 | 0.000 | 1396 | 0.233 | 3.00 | Minor |
| Tetrapturus albidus | 141 | 0.000 | 1751 | 0.081 | 1.57 | Minor |
| Canthidermis maculata | 75 | 0.000 | 75 | 1.000 | 1.86 | Minor |
| Scyliorhinus canicula | 63 | 0.000 | 321 | 0.197 | 2.29 | Minor |
| Makaira nigricans | 62 | 0.000 | 6233 | 0.010 | 1.71 | Minor |
| Sphyrna zygaena | 61 | 0.000 | 84 | 0.728 | 2.86 | Minor |
| Squaliformes | 59 | 0.000 | 614 | 0.192 | 2.71 | Minor |
| Caranx crysos | 56 | 0.000 | 60 | 0.932 | 1.29 | Minor |
| Elagatis bipinnulata | 55 | 0.000 | 58 | 0.940 | 1.57 | Minor |
| Thunnus spp | 51 | 0.000 | 133 | 0.768 | 2.29 | Minor |
| Thunnus thynnus | 44 | 0.000 | 3236 | 0.013 | 2.14 | Minor |
| Mustelus asterias | 39 | 0.000 | 39 | 1.000 | 2.57 | Minor |
| Mustelus spp | 39 | 0.000 | 169 | 0.463 | 2.57 | Minor |
| Auxis rochei | 38 | 0.000 | 783 | 0.048 | 1.29 | Minor |
| Lamna nasus | 30 | 0.000 | 392 | 0.076 | 2.71 | Minor |
| Hexanchus griseus | 23 | 0.000 | 23 | 0.996 | 2.57 | Minor |
| Sphyrna spp | 17 | 0.000 | 825 | 0.040 | 2.86 | Minor |
| Carcharodon carcharias | 16 | 0.000 | 18 | 0.873 | 2.86 | Minor |
| Alopias vulpinus | 14 | 0.000 | 233 | 0.060 | 2.57 | Minor |
| Alopias spp | 14 | 0.000 | 407 | 0.061 | 2.86 | Minor |
| Galeorhinus galeus | 8 | 0.000 | 134 | 0.063 | 2.57 | Minor |
| Coryphaena hippurus | 7 | 0.000 | 13323 | 0.001 | 1.57 | Minor |
| Sphyrna lewini | 7 | 0.000 | 106 | 0.068 | 2.86 | Minor |
| Squalidae | 7 | 0.000 | 146 | 0.093 | 2.71 | Minor |
| Squalus acanthias | 6 | 0.000 | 9 | 0.712 | 2.57 | Minor |
| Scomber japonicus | 6 | 0.000 | 6 | 0.973 | 1.29 | Minor |
| Ruvettus pretiosus | 3 | 0.000 | 242 | 0.012 | 2.00 | Minor |
| Squalidae, Scyliorhinidae | 2 | 0.000 | 56 | 0.088 | 2.71 | Minor |
| Scomberesox saurus | 2 | 0.000 | 5 | 0.510 | 1.43 | Minor |
| Carcharhinus longimanus | 2 | 0.000 | 20 | 0.112 | 2.71 | Minor |
| Ranzania laevis | 2 | 0.000 | 2 | 1.000 | 2.00 | Minor |
| Makaira indica | 1 | 0.000 | 31 | 0.048 | 2.00 | Minor |
| Carcharhinus obscurus | 1 | 0.000 | 9 | 0.140 | 3.00 | Minor |
| Mustelus mustelus | 1 | 0.000 | 562 | 0.001 | 2.57 | Minor |
| Aluterus monoceros | 1 | 0.000 | 1 | 1.000 | 1.86 | Minor |
| Gempylus serpens | 1 | 0.000 | 1 | 0.995 | 1.86 | Minor |
| Sphyraena barracuda | 1 | 0.000 | 18 | 0.029 | 2.00 | Minor |
| Sphyrna mokarran | 0 | 0.000 | 11 | 0.043 | 2.86 | Minor |
| Seriola rivoliana | 0 | 0.000 | 3 | 0.141 | 2.00 | Minor |
| Scyliorhinus spp | 0 | 0.000 | 26 | 0.031 | 2.43 | Minor |
| Scyliorhinidae | 0 | 0.000 | 34 | 0.023 | 2.43 | Minor |
| Mola mola | 0 | 0.000 | 1 | 0.319 | 2.29 | Minor |
| Mobula japanica (=rancurelli) | 0 | 0.000 | 0 | 1.000 | 2.43 | Minor |
| Balistes capriscus | 0 | 0.000 | 0 | 1.000 | 1.71 | Minor |
| Mobula mobular | 0 | 0.000 | 0 | 1.000 | 2.57 | Minor |
| Carcharhiniformes | 0 | 0.000 | 187 | 0.001 | 3.00 | Minor |
| Scyliorhinus stellaris | 0 | 0.000 | 5 | 0.024 | 2.43 | Minor |
| Manta birostris | 0 | 0.000 | 1 | 0.095 | 2.57 | Minor |
| Carcharhinus brevipinna | 0 | 0.000 | 0 | 1.000 | 2.43 | Minor |
| Tetrapturus pfluegeri | 0 | 0.000 | 533 | 0.000 | 1.86 | Minor |
| Isurus paucus | 0 | 0.000 | 691 | 0.000 | 2.86 | Minor |
| Uraspis secunda | 0 | 0.000 | 0 | 0.485 | 1.86 | Minor |
| Pteroplatytrygon violacea | 0 | 0.000 | 10 | 0.003 | 2.00 | Minor |
| Family Exocoetidae | 0 | 0.000 | 5 | 0.007 | 1.43 | Minor |
| Masturus lanceolatus | 0 | 0.000 | 0 | 0.182 | 2.29 | Minor |
| Rhincodon typus | 0 | 0.000 | 0 | 1.000 | 3.00 | Minor |
| Coryphaena equiselis | 0 | 0.000 | 0 | 1.000 | 1.43 | Minor |
| Belone belone | 0 | 0.000 | 2 | 0.001 | 2.00 | Minor |
| Naucrates ductor | 0 | 0.000 | 0 | 0.004 | 1.57 | Minor |

2.1 Primary Species

P.2.1.1 Outcome Status

|  |  |  |
| --- | --- | --- |
| 2.1.1.a Main primary species stock status | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| Main primary species are **likely** to be above the PRI OR If the species is below the PRI, the UoA has measures in place that are **expected** to ensure that the UoA does not hinder recovery and rebuilding. | Main primary species are **highly likely** to be above the PRI OR If the species is below the PRI, there is either **evidence of recovery** or a demonstrably effective strategy in place **between all MSC UoAs which categorise this species as main**, to ensure that they collectively do not hinder recovery and rebuilding. | There is a **high degree of certainty** that main primary species are above PRI **and are** fluctuating around a level consistent with MSY. |

Table 2.1.1 Main primary species status.

|  |  |  |
| --- | --- | --- |
| Species/ Stock | MSC Score | Justification |
| Skipjack tuna  Katsuwonus pelamis  Indian Ocean Skipjack | 100 | The species is 'main' because the catch percentage (59%) is greater than the requirement (5%).  The last stock assessment in 2017 indicated that the stock was fully exploited (B2016=BMSY) and that overfishing is probably not occurring (Average Catch 2012-2016 < MSY). Spawning stock biomass (SB) was estimated to be around 40%B0 in 2016 (35%–47% 80%CI), which is the designated target (i.e. MSY proxy). The point where recruitment would be impaired (PRI) is assumed here to be 50% BMSY (i.e. 20% SB0), which is the limit reference point set by Resolution 16/02. The stock status estimate implies that the stock is likely to be above the PRI with a high degree of certainty. The average catch over the previous five years (2012–2016) also remains below the estimated range of CSB40%.  Thus, on the weight-of-evidence available in 2017, there is a high degree of certainty that the stock is above the point where recruitment would be impaired and fluctuates above the MSY, meeting SG100.  [The PSA score is 3.39.](#T_SKJ" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (86%). |
| Yellowfin tuna  Thunnus albacares  Indian Ocean Yellowfin | 80 | The species is 'main' because the catch percentage (26%) is greater than the requirement (5%).  In 2016, the assessment of yellowfin undertaken in 2015 was updated giving qualitatively similar results. The 2016 update is somewhat more optimistic than the 2015 assessment although the results indicated that the stock is in an overfished state as spawning biomass is below the SBMSY level (SB2015/SBMSY = 0.89; 80% CI 0.79–0.99); and overfishing is occurring since fishing mortality rate (F2015/FMSY) is 1.11 (80% CI 0.86–1.36).  These results indicate that current spawning biomass is 11% below the interim target reference point of SBMSY but above the interim limit reference point of 0.4\*SBMSY set by the Commission. Similarly, current fishing mortality is 11% above the interim target reference point of FMSY, but below the interim limit reference point of 1.4\*FMSY.  In summary, there is an 90% probability that B2015/BMSY is greater than 0.79, the default PRI being B/BMSY=0.5. Allowing for the 95% percentile consistent (adjusting the lower 80%CI to the lower 90%CI assuming the estimate is normally distributed=0.76), the stock would be above the PRI with a high degree of certainty and therefore SG100 would be met. However, with the stock estimated as below the BMSY in 2015, fishing mortality estimated as greater than FMSY and no evidence of a reduction in catches in 2016, the stock is clear not fluctuating around BMSY and therefore, SG80 is met but SG100 is not met.  [The PSA score is 3.39.](#T_YFT" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (78%). |
| Bigeye tuna  Thunnus obesus  Indian Ocean Bigeye | 100 | The species is 'main' because the catch percentage (9%) is greater than the requirement (5%).  The stock status of Indian Ocean bigeye tuna is determined on the basis of the 2016 assessment, which results were qualitatively similar to the 2013 assessment but showed a lower relative biomass and higher relative fishing mortality. Even so, the results indicate that the stock is not overfished (B2015/BMSY = 1.29; 80% CI 0.49–1.03) and overfishing is not occurring (F2015/FMSY=0.76; 80% CI 0.49–1.03). Spawning stock biomass in 2015 was estimated to be 38% of the unfished levels (B0) and 129% (107–151%) of the level that can support MSY, well above the default value for PRI (~50% BMSY). The lower bound of the estimate range for B2015/BMSY is higher than 0.5 and B2015/B0 is higher than 20%, indicating there is a high degree of certainty that the stock is above the point where recruitment would be impaired.  On the other hand, catches in 2016 (86,586 t) remain lower than the estimated MSY values (104,000 t) as well as the average catch over the previous five years (2012–2016; 100,455 t). Also, the fact that current fishing mortality is at 76% of the interim target reference point of FMSY, and 54% of the interim limit reference point of 1.3\*FMSY, indicate that there is a low risk of exceeding MSY-based reference points by the near future. Therefore, on the basis of these results SG100 is achieved.  [The PSA score is 3.46.](#T_BET" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (45%). |

|  |  |  |
| --- | --- | --- |
| 2.1.1.b Minor primary species stock status | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  |  | For minor species that are below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species. |

Table 2.1.1 Minor primary species status.

|  |  |  |
| --- | --- | --- |
| Species/ Stock | MSC Score | Justification |
| Frigate tuna  Auxis thazard  Indian Ocean Frigate Tuna | 56 | The species is 'minor' because the catch percentage (3%) is less than the requirement (5%).  No quantitative stock assessment is currently available for frigate tuna in the Indian Ocean, and due to a lack of fishery data for several gears, only preliminary stock status indicators can be used.  Frigate tuna is taken from across the Indian Ocean area using gillnets, handlines and trolling, and pole-and-lines. This species is also an important bycatch for industrial purse seine vessels, especially in sets on floating objects, and is the target of some ring net fisheries. The catch estimates for frigate tuna were derived from very small amounts of information and are therefore highly uncertain. It has been estimated that the total annual catches for this species have increased substantially in recent years with peak catches taken in 2010 (~100,000 t) which have been maintained at that level until 2014.  No direct measures have been adopted by IOTC, only a series of resolutions regarding the need for CPCs to comply with IOTC data requirements (Resolution 15/01 and 15/02).  There is no stock assessment.  [The PSA score is 3.26.](#T_FRI" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (93%). |
| Little tunny(=Atl.black skipj)  Euthynnus alletteratus | 85 | The species is 'minor' because the catch percentage (1%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.46.](#T_LTA" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (50%). |
| Blue shark  Prionace glauca  Indian Ocean Blue Shark | 100 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  Four stock assessment models were applied to the blue shark in 2017 producing similar results and suggested the stock is currently not overfished nor subject to overfishing. Estimates of spawning stock biomass indicated current levels are above the MSY level (SB2015/SBMSY = 1.54; 80% CI 1.37–1.72) and fishing mortality ratio (F2015/FMSY) was estimated at 0.86 (80% CI 0.67–1.09). Nevertheless, IOTC warns that maintaining current catches is likely to result in decreasing biomass and the stock becoming overfished and subject to overfishing in the near future and recommends that the catches are reduced at least 10%, so that the probability of maintaining stock biomass above MSY reference levels (B>BMSY) over the next 8 years will be increased.  Thus, there is a high degree of certainty that the stock is above the point where recruitment would be impaired and the stock is above MSY, meeting SG100.  [The PSA score is 3.68.](#T_BSH" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (1%). |
| Atlantic bonito  Sarda sarda | 96 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 1.92.](#T_BON" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (15%). |
| Indo-Pacific sailfish  Istiophorus platypterus  Indian Ocean Sailfish | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  In 2015, a new stock assessment for sailfish in the Indian Ocean was conducted. The results revealed that the stock is not yet overfished (B2012-2016/BMSY = 1.13, 80% CI 0.87-1.37), but is already subject to overfishing (F2012-2016/FMSY =1.05, 80% CI 0.63-1.63).  Gillnets account for around 75% of total catches of Indo-Pacific sailfish in the Indian Ocean, followed by troll and hand lines (20%), with remaining catches recorded under longlines and other gears. The estimated increase in coastal gillnet catch and effort in recent years is a substantial cause for concern for the Indian Ocean stock, however there is not sufficient information to evaluate the effect this will have on the resource. No direct measures have been adopted by IOTC.  Because the stock was highly likely above PRI (50% BMSY), it meets SG80. However, with fishing mortality likely higher than the MSY reference point, it not likely it will be fluctuating around or maintained above the MSY level, so SG100 is not met.  [The PSA score is 2.89.](#T_SFA" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (19%). |
| Wahoo  Acanthocybium solandri  Indian Ocean Wahoo | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  No quantitative stock assessment is currently available for wahoo in the Indian Ocean, therefore the stock status is uncertain. However, wahoo is a relatively productive species with high fecundity and rapid growth and these attributes make it relatively resilient and not prone to overfishing. Wahoo is mainly taken with handline and gillnet combined with drifting long line and is caught in similar quantities in both western and eastern areas of the Indian Ocean. Trolling is also a common method in Maldives. Wahoo may be commonly encountered as bycatch in gillnet handline, longline and purse seine sets on floating objects targeting tuna and tuna-like species.  The catch estimates for wahoo were derived from very small amounts of information and are therefore highly uncertain. Estimated catches of wahoo jumped from negligible levels to just below 300t in the 1980’s. Catches peaked in 1991 at 885t and thereafter fluctuated between 300 and 500t. In 2005, catches were around 300 t and in 2014 the Indian Government reported landings of wahoo species in the Indian Ocean around 900t.  IOTC Res. 17/04 requires all purse seine vessels to retain on board and then land the dolphinfish when captured as non-targeted species.  There is no stock assessment.  [The PSA score is 3.46.](#T_WAH" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (14%). |
| Blackfin tuna  Thunnus atlanticus | 87 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.38.](#T_BLF" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (27%). |
| Swordfish  Xiphias gladius  Indian Ocean Swordfish | 100 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  A new assessment was undertaken in 2017 with fisheries data up to 2015. The results indicated that MSY-based reference points were not exceeded for the Indian Ocean population (F2015/FMSY< 1; SB2015/SBMSY> 1) and most recent catches are at the MSY level (31,590 t in 2016). Therefore, the stock is determined to be not overfished and not subject to overfishing.  The decrease in longline catch and effort from 2005 to 2011 lowered the pressure on the Indian Ocean stock, and despite the recent increase in total recorded catches, current fishing mortality is not expected to reduce the population to an overfished state over the next decade. There is a very low risk of exceeding MSY-based reference points by 2026 if catches are maintained at 2015 levels (<1% risk that SB2026< SBMSY, and <1% risk that F2026>FMSY).  Therefore, there is a high degree of certainty that the stock is above PRI and fluctuating around a level consistent with MSY so SG100 is achieved.  [The PSA score is 3.16.](#T_SWO" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (1%). |
| Atlantic white marlin  Tetrapturus albidus | 90 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.28.](#T_WHM" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (8%). |
| Blue Marlin  Makaira nigricans  Indian Ocean Blue Marlin | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  The most recent stock assessment for blue marlin in the Indian Ocean was conducted in 2016 with catch data up to 2015. The results concluded that the stock is not overfished (B2015/BMSY = 1.11, 80% CI 0.90–1.35) but it is currently subjected to overfishing (F2015/FMSY = 1.18, 80% CI 0.80–1.71). The current catches (2012–2016 = 15,859 t) are higher than MSY estimated for 2015 (11,926 t). If catches of blue marlin are reduced to a maximum value of 11,704 t. (24% reduction from average catch 2013-2015 at the time of the assessment), the stock is expected to recover to sustainable levels by 2025 with at least a 50% probability.  Blue marlin are largely considered to be a non-target species of industrial and artisanal fisheries. Longline catches account for around 72% of total catches in the Indian Ocean, followed by gillnets (25%), with remaining catches recorded under troll, handlines and purse seine. Bycatch may be slightly higher in purse seine sets on floating objects than in unassociated sets. IOTC Res. 15/05 encouraged CPCs to make any possible effort to reduce in 2016 the level of catches of their vessels for blue marlin and established the requirement of releasing any capture of blue marlin brought alive onboard.  On the basis of these results, it is highly likely that the blue marlin stock is above the point where recruitment would be impaired, but its future is uncertain and depends on the reduction of catches. With the stock likely above the MSY, but declining, it meets SG80, but does not meet SG100 because the status is too and uncertain and likely to fall below MSY, not fluctuate around it.  [The PSA score is 3.46.](#T_BUM" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (1%). |
| Rainbow runner  Elagatis bipinnulata  Indian Ocean Rainbow Runner | 93 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  The population has not been assessed. Rainbow runners bycatch in tuna purse seine fisheries is relatively high (~1,200 t in 2011) and sets on floating objects have a significantly higher impact than on free swimming schools. IOTC Res. 17/04 recommends purse seine vessels to retain on board and land non-targeted species such as rainbow runner.  There is no stock assessment.  [The PSA score is 2.12.](#T_RRU" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (94%). |
| Northern bluefin tuna  Thunnus thynnus | 82 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 2.57.](#T_BFT" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (1%). |
| Bullet tuna  Auxis rochei | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 3.26.](#T_BLT" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (5%). |
| Common dolphinfish  Coryphaena hippurus | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 3.39.](#T_DOL" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (<0.5%). |
| Picked dogfish  Squalus acanthias | 65 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.06.](#T_DGS" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (71%). |
| Chub mackerel  Scomber japonicus | 90 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.27.](#T_MAS" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (97%). |
| Black marlin  Makaira indica  Indian Ocean Black Marlin | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  The most recent stock assessment for black marlin in the Indian Ocean was conducted in 2016 with catch data up to 2015. The results concluded that the stock is overfished (B2015/BMSY = 0.81, 80% CI 0.55–1.10) and currently subject to overfishing (F2015/FMSY = 2.42, 80% CI 1.52–4.06). The current catches (2012–2016 = 16,638 t) are considerably higher than MSY estimated for 2015 (9,932 t) and even with a 40% reduction, it is very unlikely (less than 5%) to achieve the sustainable levels by 2025.  Black marlins are mainly caught by gillnets (53%) and drifting longlines (17%), but some catches are taken by handline and purse seine. IOTC Res. 15/05 encouraged CPCs to make any possible effort to reduce in 2016 the level of catches of their vessels for black marlin and established the requirement of releasing any capture of black marlin brought alive onboard.  Although the stock is declining, it is highly likely (>80% probability) that the stock is above its PRI, meeting SG80. There are also measures in place that might be expected to ensure the stock does not hinder recovery and rebuilding in the longer term, but they have yet to be fully implemented.  [The PSA score is 2.74.](#T_BLM" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (5%). |
| Longfin yellowtail  Seriola rivoliana | 85 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.46.](#T_YTL" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (14%). |
| Longbill spearfish  Tetrapturus pfluegeri | 85 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.48.](#T_SPF" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (<0.5%). |
| Pompano dolphinfish  Coryphaena equiselis | 77 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.73.](#T_CFW" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (100%). |

Overall Score for Species Elements

Of the 3 main species: 2 main species are highly likely to be at or above their MSY level. One main species may not be at or above MSY, but is still highly likely to be above its PRI level.

Of the 20 minor species: 4 minor species are highly likely to be at or above their MSY level. 10 minor species may not be at or above MSY, but are still highly likely to be above their PRI level. Although the populations may be below their PRI, it is still likely that this UoA is not hindering the recovery of 3 minor species. 2 minor species are only 'likely' to be above their PRI and this UoA could be preventing any recovery. One minor species may not be above its PRI level and this UoA could be preventing recovery.

PI 2.1.1 : 95

References

Amande, J.M., Ariz, J., Chassot, E., Chavance, P., Delgado De Molina, A., Gaertner, D., Murua, H., Pianet, R., Ruiz, J. 2008. By-catch and discards of the European purse seine tuna fishery in the Indian Ocean. Estimation and characteristics for the 2003-2007 period. Ecosystem and By-Catch Working Group, Bangkok, Thailand, 20–22 October 2008. IOTC-2008-WPEB-12.

Amande, M.J., Ariz, J., Chassot, E., Delgado de Molina, A., Gaertner, D., Murua, H., Pianet, R., Ruiz J., Chavance, P. 2010. Bycatch of the European purse seine tuna fishery in the Atlantic Ocean for the 2003-2007 period. Aquatic Living Resources 23: 353–362.

Ardill, D., Itano, D., Gillett, R. 2011. A review of bycatch and discard issues in Indian Ocean tuna fisheries. Australian Government Department of Environment. IOTC-2012-WPEB08-INF20.

Capietto, A., Escalle, L., Chavance, P., Dubroca, L., Delgado de Molina, A., Murua, H., Floch, L., Damiano, A., Rowat D., Merigot, B. 2014. Mortality of marine megafauna induced by fisheries: insights from the whale shark, the world’s largest fish. Biological Conservation 174: 147–151.

Collette, B., Acero, A., Amorim, A.F., Boustany, A., Canales Ramirez, C., Cardenas, G., Carpenter, et al. 2011. *Coryphaena hippurus.* The IUCN Red List of Threatened Species 2011: e.T154712A4614989 (downloaded on 3 May 2018).

Fishbase webpage (www.fishbase.org)

Hoyle, S.D., Edwards, C.T.T., Roux, M.J., Clarke, S.C., Francis, M.P. 2017. Southern Hemisphere porbeagle shark stock status assessment. Final Report prepared for Western and Central Pacific Fisheries Commission. IOTC-2017-WPEB13-41 Rev\_1.

IOTC 2012. Report of the Fifteenth Session of the IOTC Scientific Committee. Victoria, Seychelles, 10–15 December 2012. IOTC–2012– SC15–R[E].

IOTC, 2013. Report of the Sixteenth Session of the IOTC Scientific Committee. Busan, Republic of Korea, 2–6 December 2013. IOTC–2013– SC16–R[E].

IOTC, 2014. Report of the Seventeenth Session of the IOTC Scientific Committee. Seychelles, 8–12 December 2014. IOTC–2014–SC16–R[E].

IOTC 2016. Report of the Eighteenth Session of the IOTC Working Party on Tropical Tunas. Seychelles, 5–10 November 2016. IOTC-2016-WPTT18-R[E].

IOTC 2017. Report of the Nineteenth Session of the IOTC Working Party on Tropical Tunas. Seychelles, 17–22 October 2017. IOTC–2017–WPTT19–R[E].

IOTC 2017. Report of the Twentieth Session of the IOTC Scientific Committee. Seychelles, 30 November–4 December 2017. IOTC–2017–SC20–R[E].

IOTC 2013. Status of the Indian Ocean Bigeye Tuna (*Thunnus obesus*) Resource. Executive Summary. IOTC-2013-SC16-R[E].

IOTC 2015. Status of the Indian Ocean Frigate Tuna (*Auxis thazard*) Resource. Executive Summary. IOTC-2015-SC18-ES07.

IOTC 2012. Resolution 12/09 on the Conservation of Thresher Sharks (Family *Alopiidae*) Caught in Association with Fisheries in the IOTC Area of Competence. Indian Ocean Tuna Commission.

IOTC 2013. Resolution 13/05 on the Conservation of Whale Sharks (*Rhincodon Typus*). Indian Ocean Tuna Commission.

IOTC 2013. Resolution 13/06 on a Scientific and Management Framework on the Conservation of Shark Species Caught in Association with IOTC Managed Fisheries. Indian Ocean Tuna Commission.

IOTC 2015. Resolution 15/02 Mandatory Statistical Reporting Requirements for IOTC Contracting Parties and Cooperating Non-Contracting Parties (CPCs). Indian Ocean Tuna Commission.

IOTC 2015. Resolution 15/05 on Conservation Measures for Striped Marlin, Black Marlin and Blue Marlin. Indian Ocean Tuna Commission.

IOTC 2015. Resolution 15/10 on Target and Limit Reference Points and a Decision Framework. Indian Ocean Tuna Commission.

IOTC 2016. Resolution 16/06 on Measures Applicable in Case of Non-Fulfilment of Reporting Obligations in the IOTC. Indian Ocean Tuna Commission.

IOTC 2015. Resolution 15/01 on the Recording of Catch and Effort Data by Fishing Vessels in the IOTC Area of Competence. Indian Ocean Tuna Commission.

IOTC 2017. Resolution 17/04 on a Ban on Discards of Bigeye Tuna, Skipjack Tuna, Yellowfin Tuna, and Non-Targeted Species Caught by Purse Seine Vessels in the IOTC Area of Competence. Indian Ocean Tuna Commission.

IOTC 2006. Status of the Wahoo Resource. Executive Summary. Scientific Committee of the Indian Ocean Tuna Commission. Victoria, Seychelles, 6–10 November 2006. IOTC-2006-SC-12.

IOTC 2013. Status of the Indian Ocean Yellowfin Tuna (*Thunnus albacares*) Resource. Executive Summary. IOTC–2013–SC16–ES04[E].

Langley, A. 2016. Stock Assessment of Bigeye Tuna in the Indian Ocean for 2016 – Model Development and Evaluation. Eighteenth Session of the IOTC Working Party on Tropical Tunas. Seychelles, 5–10 November 2016. IOTC-2016-WPTT18-20.

Murua, H., Abascal, F.J., Amande, J., Ariz, J., Bach, P., Chavance, P., Coelho, R., Korta, M., Poisson, F., Santos, M.N., Seret, B. 2013. Provision of scientific advice for the purpose of the implementation of the EUPOA sharks. Final Report. European Commission, Studies for Carrying out the Common Fisheries Policy. MARE/2010/11-LOT 2.

Sinha, M.K., Premchand, Tiburtius A. 2015. Status of Seer Fish Fishery Including Some Biological Characterstic of *Scomberomerus commerson* in Indian Waters. Fifth Session of the IOTC Working Party on Neritic Tunas. Zanzibar, Tanzania, 26–29 May 2015. IOTC-2015-WPNT05-14 Rev\_1.

Tolotti, M.T., Capello, M., Bach, P., Romanov, E., Murua, H., Dagorn, L. 2016. Using FADs to estimate a population trend for the oceanic whitetip shark in the Indian Ocean. Twelfth Working Party on Ecosystems and Bycatch (WPEB12) of the Indian Ocean Tuna Commission, Seychelles 12–16 September 2016. IOTC-2016-WPEB12-25 Rev 1.

P.2.1.2 Management strategy

|  |  |  |
| --- | --- | --- |
| 2.1.2.a Management strategy in place | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| There are **measures** in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are likely to be above the PRI. | There is a **partial strategy** in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are highly likely to be above the PRI. | There is a **strategy** in place for the UoA for managing main and minor primary species. |

There is a harvest strategy for all tuna and tuna-like species, as required under the UN Law of the Sea and UN Fish Stocks Agreement for highly migratory species. The strategy consists of regular assessment and management response to control and limit fishing mortality on the stocks within the RFMO jurisdiction. The objective of the strategy is consistent with maintaining stocks at or above MSY levels, and above the PRI. The strategy also includes the objective to rebuild stocks from below the PRI, although the controls that will be applied to achieve this are not well-defined. Examples of controls used within all jurisdictions include seasonal area closures, overall catch limits and limits on vessel capacity.

|  |  |  |
| --- | --- | --- |
| 2.1.2.b Management strategy evaluation | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| The measures are considered **likely** to work, based on plausible argument (e.g., general experience, theory or comparison with similar UoAs/species). | There is some **objective basis for confidence** that the measures/ partial strategy will work, based on some information directly about the UoA and/or species involved. | **Testing** supports **high confidence** that the partial strategy/ strategy will work, based on information directly about the UoA and/or species involved. |

There is some objective basis for confidence that the strategy will work for most, but not all stocks. There has been a response to stock status, but the response has been slow and in some cases, lacks evidence that the management controls so far have been effective in achieving outcomes consistent with BMSY or able to maintain the stock above the PRI. Stock assessments are conducted or attempted on all tuna stocks and these provide an objective basis for assessing whether the current strategy will work. Although the stocks are monitored, parts of the strategy are not well-defined and have therefore not been tested, which limits the confidence that they will continue to work.

Indian Ocean bigeye, yellowfin and skipjack tunas are managed reasonably effectively, given the current management context. The available fishing area was reduced due to security issues along the East African coast, and as a result fishing mortality has remained at sustainable levels. However, the strategy for these stocks has not been tested through simulations or other means and relies to some extent on factors beyond management control.

|  |  |  |
| --- | --- | --- |
| 2.1.2.c Management strategy implementation | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  | There is **some evidence** that the measures/ partial strategy is being **implemented successfully.** | There is **clear evidence** that the partial strategy/ strategy is being **implemented successfully and is achieving its overall objective as set out in scoring issue (a).** |

There is some evidence that the strategies are being implemented successfully for all fisheries. All RFMOs operate a partial observer programme and VMS for larger vessels. Most landings are monitored to enforce TACs. These data amount to some evidence, meeting SG80. However, not all fleets are monitored, and there are substantial gaps in data. In addition, it is not clear that all fisheries within each jurisdiction are meeting their objectives, so SG100 is not met.

|  |  |  |
| --- | --- | --- |
| 2.1.2.d Shark finning | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| It is **likely** that shark finning is not taking place. | It is **highly likely** that shark finning is not taking place. | There is a **high degree of certainty** that shark finning is not taking place. |

None of the primary species considered here are sharks, so shark fining is not relevant.

|  |  |  |
| --- | --- | --- |
| 2.1.2.e Review of alternative measures | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species. | There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species and they are implemented as appropriate. | There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species, and they are implemented, as appropriate. |

Primary species are not usually discarded. Small fish may be discarded and excessive catches may exceed processing capacity aboard vessels. Discarding is regularly considered in RFMO meetings, but these focus on perceived high-risk issues, primarily unwanted catch of secondary and ETP species (see PI 2.2.2).

All SG60 and SG80 were met, and 1 out of 4 SG100 were met.

PI 2.1.2 : 85

References

IATTC 2014. Tunas and Billfishes in the Eastern Pacific Ocean In 2013. Inter-American Tropical Tuna Commission, La Jolla, California, 2014. Fishery Status Report No. 12.

IATTC 2013. Multiannual Program for the Conservation of Tuna in the Eastern Pacific Ocean during 2014-2016. 85th Meeting of the Inter-American Tropical Tuna Commission, Veracruz (Mexico), 10–14 June 2013. Resolution C-13-01.

ICCAT 2017. Basic Texts. International Commission for the Conservation of Atlantic Tunas. 6th Revision. Madrid, Spain.

ICCAT 2011. Recommendation by ICCAT on a Multi-Annual Conservation and Management Program for Bigeye and Yellowfin Tunas. Rec. 11-01.

ICCAT 2014. Report of the Standing Committee on Research and Statistics (SCRS). Madrid, Spain, 29 September–3 October 2014.

IOTC 2013. Report of the Fifteenth Session of the IOTC Working Party on Tropical Tunas. San Sebastian, Spain, 23–28 October 2013. IOTC–2013–WPTT15–R[E].

IOTC 2014. Report of the Eighteenth Session of the Indian Ocean Tuna Commission. Colombo, Sri Lanka, 1–5 June 2014. IOTC–2014–S18–R[E].

IOTC 2015. Resolution 15/10 on Target and Limit Reference Points and a Decision Framework. Indian Ocean Tuna Commission.

IOTC 2014. Report of the Fifth Session of the IOTC Working Party on Temperate Tunas. Busan, Republic of Korea, 28–31 July 2014. IOTC–2014–WPTmT05–R[E].

WCPFC 2014. Summary Report of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. Tenth Regular Session of the Scientific Committee of the WCPFC, Majuro, Republic of the Marshall Islands, 6–14 August 2014.

WCPFC 2013. Conservation and Management Measure for Bigeye, Yellowfin and Skipjack Tuna in the Western and Central Pacific Ocean. Tenth Regular Session of the Western and Central Pacific Fisheries Commission, Cairns, Australia, 2–6 December 2013. CMM-2013-01.

P.2.1.3 Information

|  |  |  |
| --- | --- | --- |
| 2.1.3.a Information adequacy for assessment of impact on main species | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| Qualitative information is **adequate to estimate** the impact of the UoA on the main primary species with respect to status. **OR If RBF is used to score PI 2.1.1 for the UoA:** Qualitative information is adequate to estimate productivity and susceptibility attributes for main primary species. | Some quantitative information is available and is **adequate to assess** the impact of the UoA on the main primary species with respect to status. **OR If RBF is used to score PI 2.1.1 for the UoA:** Some quantitative information is adequate to assess productivity and susceptibility attributes for main primary species. | Quantitative information is available and is **adequate to assess with a high degree of certainty** the impact of the UoA on main primary species with respect to status. |

For all Main primary stocks, full quantitative information is available and is adequate to assess with a high degree of certainty the impact of the fishery. Catches and other data are monitored adequately for stock assessments of all Main stocks, and these can determine status with a high degree of certainty relative to their exploitation levels.

|  |  |  |
| --- | --- | --- |
| 2.1.3.b Information adequacy for assessment of impact on minor species | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  |  | Some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status. |

Almost by definition, the status of all fully managed stocks, minor or not, is determined quantitatively through stock assessment. This is necessary to provide scientific advice. However, with the wider definition of primary species used here, information is not sufficient to conduct stock assessments on them all, and therefore SG100 is not met.

|  |  |  |
| --- | --- | --- |
| 2.1.3.c Information adequacy for management strategy | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| Information is adequate to support **measures** to manage **main** primary species. | Information is adequate to support a **partial strategy** to manage **main** primary species. | Information is adequate to support a **strategy** to manage **all** primary species, and evaluate with a **high degree of certainty** whether the strategy is achieving its objective. |

For all Main primary stocks, there is sufficient data to support full quantitative stock assessments using advanced statistical models, such as Stock Synthesis 3 and Multifan CL. Where stock assessments have not yet been completed, this is because the model structure has not been adequately determined for a result which can be endorsed through the consensus of scientists involved rather the lack of information. This meets SG80. However, with the widened definition of primary species used in this assessment, information is inadequate to manage all primary species. For many species, information is limited. While RFMOs are expanding the number of species that are being assessed, many lack the required information to develop appropriate harvest strategies. Therefore SG100 cannot be met.

All SG60 and SG80 were met, and 1 out of 3 SG100 were met.

PI 2.1.3 : 85

References

IATTC 2014. Tunas and Billfishes in the Eastern Pacific Ocean In 2013. Inter-American Tropical Tuna Commission, La Jolla, California, 2014. Fishery Status Report No. 12.

ICCAT 2014. Report of the Standing Committee on Research and Statistics (SCRS). Madrid, Spain, 29 September–3 October 2014.

IOTC 2014. Report of the Eighteenth Session of the Indian Ocean Tuna Commission. Colombo, Sri Lanka, 1–5 June 2014. IOTC–2014–S18–R[E].

WCPFC 2014. Summary Report of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. Tenth Regular Session of the Scientific Committee of the WCPFC, Majuro, Republic of the Marshall Islands, 6–14 August 2014.

2.2 Secondary Species

P.2.2.1 Outcome Status

|  |  |  |
| --- | --- | --- |
| 2.2.1.a Main secondary species stock status | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| Main secondary species are **likely** to be above biologically based limits. OR If below biologically based limits, there are **measures** in place expected to ensure that the UoA does not hinder recovery and rebuilding. | Main secondary species are **highly likely** to be above biologically based limits OR If below biologically based limits, there is either **evidence of recovery** or a **demonstrably effective partial strategy** in place such that the UoA does not hinder recovery and rebuilding. | There is a **high degree of certainty** that main secondary species are above biologically based limits. |

There are no Main in-scope secondary species.

|  |  |  |
| --- | --- | --- |
| 2.2.1.b Minor secondary species stock status | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  |  | For minor species that are below biologically based limits there is evidence that the UoA does not hinder the recovery and rebuilding of secondary species. |

Table 2.2.1 Minor in-scope secondary species status.

|  |  |  |
| --- | --- | --- |
| Species/ Stock | MSC Score | Justification |
| Tunas nei  Thunnini | 49 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.77.](#T_TUN" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (62%). |
| Tuna-like fishes nei  Scombroidei | 49 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.77.](#T_TUX" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (73%). |
| Marlins,sailfishes,etc. nei  Istiophoridae | 54 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 3.61.](#T_BIL" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (63%). |
| Plain bonito  Orcynopsis unicolor | 84 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.59.](#T_BOP" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (80%). |
| West African Spanish mackerel  Scomberomorus tritor | 92 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.18.](#T_MAW" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (16%). |
| Shortfin mako  Isurus oxyrinchus  Indian Ocean Shortfin Mako | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no quantitative stock assessment currently available for shortfin mako shark in the Indian Ocean. Shortfin mako sharks are most frequently caught by gillnet and longline fisheries but was estimated as the third most vulnerable shark species to purse seine gear. IOTC has not adopted any specific measures, only Resolution 16/06 to encourage CPCs to comply with their recording and reporting requirements.  There is no stock assessment.  [The PSA score is 3.19.](#T_SMA" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (1%). |
| Various sharks nei  Selachimorpha (Pleurotremata) | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 4.24.](#T_SKH" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (22%). |
| Seerfishes nei  Scomberomorus spp | 49 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.77.](#T_KGX" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (96%). |
| Silky shark  Carcharhinus falciformis  Indian Ocean Silky Shark | 71 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  The population has not been assessed, but available information suggests large declines in abundance over the past decades (e.g. a population decline of 46% has been estimated for the Northern Atlantic between 1992-2005). Silky sharks are often targeted by semi‐industrial and artisanal fisheries as well as being a bycatch of industrial tuna fisheries, with significant catches by longline, gillnet and FAD purse seine sets. IOTC has not adopted any specific measures, only Resolution 16/06 to encourage CPCs to comply with their recording and reporting requirements.  There is no stock assessment.  [The PSA score is 3.10.](#T_FAL" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (50%). |
| Requiem sharks nei  Carcharhinidae | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 4.24.](#T_RSK" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (23%). |
| Oceanic triggerfish  Canthidermis maculata | 89 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.34.](#T_CNT" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (100%). |
| Small-spotted catshark  Scyliorhinus canicula | 84 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 2.58.](#T_SYC" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (20%). |
| Smooth hammerhead  Sphyrna zygaena | 52 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.68.](#T_SPZ" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (73%). |
| Dogfish sharks, etc. nei  Squaliformes | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.18.](#T_SHX" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (19%). |
| Blue runner  Caranx crysos | 97 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 1.92.](#T_RUB" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (93%). |
| True tunas nei  Thunnus spp | 49 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.77.](#T_TUS" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (77%). |
| Starry smooth-hound  Mustelus asterias | 78 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 2.84.](#T_SDS" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (100%). |
| Smooth-hounds nei  Mustelus spp | 72 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.06.](#T_SDV" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (46%). |
| Porbeagle  Lamna nasus  Southern Hemisphere Porbeagle | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  In 2017 a global study to assess the status of the Southern Hemisphere population of porbeagle shark was conducted under the auspices of the WCPFC and the CCSBT. For this study, a series of catch rate indicators from various fisheries were used for the five regions previously defined: Western Atlantic Ocean, Western Indian/Eastern Atlantic Ocean, Eastern Indian Ocean, Western Pacific Ocean and Eastern Pacific Ocean. The greatest contributions to fishing mortality were made by the pelagic longline fisheries, with the largest contribution (70-90%) from fleets targeting southern bluefin tuna (SBT) or a mixture of SBT and albacore tuna. In the Western and Eastern Indian Ocean regions, this contribution increased considerably since 2004 and 2005, respectively.  The population of porbeagle shark was assessed using a risk assessment model that evaluates whether current impacts from fisheries exceed a maximum impact sustainable threshold (MIST, a kind of limit reference point). Therefore, this study examines the question of whether overfishing is occurring but does not necessarily answer questions regarding whether the stock is depleted.  The risk assessment model estimated that fishing mortality on the Southern Hemisphere stock is very low and that it decreases eastward from the waters off South Africa to the waters off New Zealand. For all regions combined (Eastern Atlantic Ocean to Western Pacific Ocean) the fishing mortality was less than 10% of the MIST in all years assessed (1992-2014) and fell to half that level in more recent years, with at most a 3% probability of exceeding the MIST in 2010-2014.  These results indicate that the impact of fishing is low across the entire Southern Hemisphere range of the porbeagle shark population and, therefore, it is likely that the stock is above the point where recruitment would be impaired, meeting SG80. It cannot meet SG100 because the stock status relation to MSY is not known and the assessment method remains highly uncertain.  [The PSA score is 3.57.](#T_POR" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (8%). |
| Bluntnose sixgill shark  Hexanchus griseus | 72 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.06.](#T_SBL" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (100%). |
| Hammerhead sharks nei  Sphyrna spp  Indian Oceanic Hammerhead Sharks | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  The population has not been assessed. The current IUCN threat status of ‘Endangered’ applies to scalloped hammerhead sharks globally and specifically for the western Indian Ocean. This species of shark is commonly taken by a range of fisheries in the Indian Ocean. Catch numbers from gillnet, handline and longline fisheries are similar. IOTC has not adopted any specific measures, only Resolution 16/06 to encourage CPCs to comply with their recording and reporting requirements.  There is no stock assessment.  [The PSA score is 4.14.](#T_SPN" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (4%). |
| Thresher  Alopias vulpinus | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.47.](#T_ALV" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (6%). |
| Thresher sharks nei  Alopias spp | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.68.](#T_THR" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (6%). |
| Tope shark  Galeorhinus galeus | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.06.](#T_GAG" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (6%). |
| Scalloped hammerhead  Sphyrna lewini | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.68.](#T_SPL" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (7%). |
| Dogfish sharks nei  Squalidae | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 4.05.](#T_DGX" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (9%). |
| Oilfish  Ruvettus pretiosus | 87 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.46.](#T_OIL" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (1%). |
| Dogfishes and hounds nei  Squalidae, Scyliorhinidae | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.18.](#T_DGH" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (9%). |
| Atlantic saury  Scomberesox saurus | 92 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.18.](#T_SAU" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (51%). |
| Oceanic whitetip shark  Carcharhinus longimanus  Indian Oceanic Whitetip Shark | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  The population has not been assessed. Despite the limited amount of data, recent studies suggest that oceanic whitetip shark abundance has declined in recent years (2000‐2015) compared with historical records (1986‐1999). Because of their life history characteristics, this species is likely vulnerable to overfishing. Oceanic whitetip sharks are commonly taken by a range of fisheries in the Indian Ocean. Estimated catches suggest higher quantities for gillnet and longline fisheries than for purse seine fisheries. IOTC Res. 13/06 prohibits retention onboard, transshipping, landing or storing any part or whole carcass of oceanic whitetip sharks, and IOTC Res. 16/06 establishes the requirement of CPCs to comply with their recording and reporting obligations, including shark species caught in association with IOTC fisheries.  There is no stock assessment.  [The PSA score is 4.05.](#T_OCS" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (11%). |
| Slender sunfish  Ranzania laevis | 54 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 3.61.](#T_RZV" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (100%). |
| Dusky shark  Carcharhinus obscurus | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.32.](#T_DUS" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (14%). |
| Smooth-hound  Mustelus mustelus | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 2.84.](#T_SMD" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (<0.5%). |
| Unicorn leatherjacket filefish  Aluterus monoceros | 57 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 3.53.](#T_ALM" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (100%). |
| Snake mackerel  Gempylus serpens | 74 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.98.](#T_GES" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (99%). |
| Great barracuda  Sphyraena barracuda | 87 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.46.](#T_GBA" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (3%). |
| Great hammerhead  Sphyrna mokarran | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.42.](#T_SPK" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (4%). |
| Catsharks, nursehounds nei  Scyliorhinus spp | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 2.94.](#T_SCL" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (3%). |
| Catsharks, etc. nei  Scyliorhinidae | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 2.94.](#T_SYX" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (2%). |
| Ocean sunfish  Mola mola | 66 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.26.](#T_MOX" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (32%). |
| Grey triggerfish  Balistes capriscus | 92 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.23.](#T_TRG" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (100%). |
| Devil fish  Mobula mobular | 72 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.06.](#T_RMM" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (100%). |
| Ground sharks  Carcharhiniformes | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.80.](#T_CVX" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (<0.5%). |
| Nursehound  Scyliorhinus stellaris | 81 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 2.71.](#T_SYT" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (2%). |
| Giant manta  Manta birostris | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.18.](#T_RMB" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (10%). |
| Spinner shark  Carcharhinus brevipinna | 72 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.07.](#T_CCB" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (100%). |
| Longfin mako  Isurus paucus | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.30.](#T_LMA" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (<0.5%). |
| Cottonmouth jack  Uraspis secunda | 57 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 3.53.](#T_USE" \o "PSA Table)  This UoA could hinder recovery. This species makes up more than 10% of the UoA catch or the UoA species catch makes up more than 30% of the total species catch (48%). |
| Pelagic stingray  Pteroplatytrygon violacea | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 3.07.](#T_PLS" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (<0.5%). |
| Flyingfish  Family Exocoetidae | 81 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.73.](#T_FLY" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (1%). |
| Sharptail mola  Masturus lanceolatus | 80 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (2%).  There is no stock assessment.  [The PSA score is 3.26.](#T_MRW" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (18%). |
| Garfish  Belone belone | 84 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.59.](#T_GAR" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (<0.5%). |
| Pilotfish  Naucrates ductor | 87 | The species is 'minor' because the catch percentage (<0.5%) is less than the requirement (5%).  There is no stock assessment.  [The PSA score is 2.45.](#T_NAU" \o "PSA Table)  This UoA would probably not hinder recovery. This species makes up less than 10% of the UoA catch and the UoA species catch makes up less than 30% of the total species catch (<0.5%). |

Overall Score for Species Elements

All SG60 and SG80 were met, and 1 out of 3 SG100 were met. Out-of-scope species have not been evaluated.

There were no main species.

Of the 53 minor species: 4 minor species are highly likely to be at or above their MSY level. 10 minor species may not be at or above MSY, but are still highly likely to be above their PRI level. Although the populations may be below their PRI, it is still likely that this UoA is not hindering the recovery of 22 minor species. 8 minor species are only 'likely' to be above their PRI and this UoA could be preventing any recovery. 9 minor species may not be above their PRI level and this UoA could be preventing recovery.

PI 2.2.1 : 90

References

Bradai, M.N., Serena, F., Bianchi, I., Ebert, D.A. 2007. *Oxynotus centrina*. The IUCN Red List of Threatened Species 2007: e.T63141A12622296 (downloaded on 4 May 2018).

Fishbase webpage (www.fishbase.org)

Musick, J.A., Stevens, J.D., Baum, J.K., Bradai, M., Clò, S., Fergusson, I., Grubbs, R.D., Soldo, A., Vacchi, M., Vooren, C.M. 2009. *Carcharhinus plumbeus*. The IUCN Red List of Threatened Species 2009: e.T3853A10130397 (downloaded on 4 May 2018).

Serena, F., Mancusi, C., Clo, S., Ellis, J., Valenti, S.V. 2009. *Mustelus mustelus*. The IUCN Red List of Threatened Species 2009: e.T39358A10214694 (downloaded on 4 May 2018).

Walker, T.I., Cavanagh, R.D., Stevens, J.D., Carlisle, A.B., Chiaramonte, G.E., Domingo, A., Ebert, D.A., Mancusi, C.M., Massa, A., McCord, M., Morey, G., Paul, L.J., Serena, F., Vooren, C.M. 2006. *Galeorhinus galeus*. The IUCN Red List of Threatened Species 2006: e.T39352A10212764 (downloaded on 4 May 2018).

P.2.2.2 Management strategy

|  |  |  |
| --- | --- | --- |
| 2.2.2.a Management strategy in place | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| There are **measures** in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery. | There is a **partial strategy** in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery. | There is a **strategy** in place for the UoA for managing main and minor secondary species. |

With respect to sharks, as well as some ETP species, National Plans of Action (NPOA) should be developed by RFMO member states with fisheries where shark bycatch occurs. For tuna fisheries where no such plan has been developed, but one might be considered necessary, such as for longline and purse seine, it will be difficult to argue that there is any type of strategy for relevant secondary species, which may prevent SG80 being met.

A number of resolutions have been adopted which have the purpose of improving collection of information and reducing bycatch. These are primarily directed at a number of vulnerable shark species. Resolution 13/06 prohibits, as an interim pilot measure, the retention onboard, (transshipment, landing, storing etc.) any part of an oceanic whitetip shark (Carcharhinus longimanus), to be reviewed and evaluated in 2016. Resolution 12/09 prohibits the retention onboard of any part of three species of Thresher sharks (family Alopiidae). Resolution 05/05 calls for full utilization of sharks and includes a ratio of fin-to-body weight for shark fins retained onboard a vessel to discourage finning. In all cases, observers may retain biological samples. Resolution 12/12 prohibited the use of large-scale driftnets on the high seas in the IOTC area primarily because these gears have high bycatch. Other resolutions exist on ETP species, such as seabirds, turtles and cetaceans, but are not relevant here. While measures exist and are considered necessary, they do not cover all bycatch identified in 2.2.1, nor have they been developed into any form of strategy. This meets SG60, but not SG80.

|  |  |  |
| --- | --- | --- |
| 2.2.2.b Management strategy evaluation | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| The measures are considered **likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/ species). | There is **some objective basis for confidence** that the measures/ partial strategy will work, based on some information directly about the UoA and/or species involved. | **Testing** supports **high confidence** that the partial strategy/ strategy will work, based on information directly about the UoA and/or species involved. |

The IOTC measures that are being applied might be considered likely to reduce some shark bycatch as they discourage their capture. The sharks that are covered by the measures must be released alive, if possible, or discarded dead, so that their capture is a cost to the fishery. However, no measures have been adopted that might reduce general bycatch directly (such as requiring a monofilament rather than wire trace for longline hooks). Evidence would be required that there are, at the very least, measures limiting mortality for all species at high to medium risk (<80). Currently this is not the case. In addition, IOTC failed to adopt, for example, a measure banning wire trace, which could increase post-capture survival of a wide number of sharks and other species. This lack of measures will make it difficult for any fishery to show that it meets SG60 unless the fishery can clearly demonstrate such measures are not necessary (scoring 80 or better on

|  |  |  |
| --- | --- | --- |
| 2.2.2.c Management strategy implementation | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  | There is **some evidence** that the measures/ partial strategy is being **implemented successfully**. | There is **clear evidence** that the partial strategy/ strategy is being **implemented successfully and is achieving its overall objective as set out in scoring issue (a).** |

There is some evidence that the measures which are required are being implemented successfully in some fleets where information exists. Information from landings inspections and observers may indicate rules on the retention of sharks are being applied where such inspections take place. Compliance is not routinely reported, but low compliance is suspected in some cases. Because enforcement is not universal and effectively absent from some fleets, the SG80 may not be met. Where compliance for a particular fleet can be demonstrated, SG80 could be met, but this cannot be assumed. In any case, there is no evidence that the overall objectives are being achieved at this stage, so SG100 cannot be met except in those cases where there catches of secondary species are demonstrably negligible.

|  |  |  |
| --- | --- | --- |
| 2.2.2.d Shark finning | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| It is **likely** that shark finning is not taking place. | It is **highly likely** that shark finning is not taking place. | There is a **high degree of certainty** that shark finning is not taking place. |

Each RFMO has a measure that concerns the conservation of sharks caught in association with fisheries they manage. The resolutions or measures include minimum reporting requirements for sharks, and call for full utilization, including a specified ratio of fin-to-body weight for shark fins retained onboard a vessel. This effectively requires that shark finning does not take place. Observer coverage and landings inspections would be necessary as clearly there is a market for shark fins and finning has and will take place in some fisheries. Where there is no information supporting compliance with the measure, SG60 may not be met.

|  |  |  |
| --- | --- | --- |
| 2.2.2.e Review of alternative measures to minimise mortality of unwanted catch | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species. | There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species and they are implemented as appropriate. | There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of all secondary species, and they are implemented, as appropriate. |

There is evidence of ongoing review of mitigation measures for fisheries related to reducing unwanted catch of common and vulnerable secondary species in all RFMOs. The reviews are based on studies of bycatch risks and techniques that might reduce bycatch. Such studies are shared among RFMOs and are regularly discussed, so RFMO members should be aware of issues raised and the potential impact on their fisheries. This meets the SG60. However, few measures have been implemented despite evidence they may be appropriate at least for wider trials, so SG80 is not met.

Only 3 out of 4 SG60 were met.

PI 2.2.2 : Fail

References

Ardill, D., Itano, D., Gillett, R. 2013. A review of bycatch and discard issues in Indian Ocean tuna fisheries. SmartFish Programme Report SF/2013/32.

Gilman, E., Passfield, K., Nakamura, K. 2012. Performance assessment of bycatch and discards governance by regional fisheries management organizations. International Union for the Conservation of Nature and Natural Resources, 484 pp.

IATTC 2005. Resolution on the Conservation of Sharks Caught in Association with Fisheries in the Eastern Pacific Ocean. 73rd Meeting of the Inter-American Tropical Tuna Commission, Lanzarote, Spain, 20–24 June 2005. Resolution C-05-03.

IATTC 2014. Ecosystem considerations. Fifth Meeting of the IATTC Scientific Advisory Committee, La Jolla, California (USA), 12–16 May 2014. Document SAC-05-13.

ICCAT 2004. Recommendation Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT. Rec. 04-10

IOTC 2014. Report of the Tenth Session of the IOTC Working Party on Ecosystems and Bycatch. Yokohama, Japan, 27–31 October 2014. IOTC-2014-WPEB10-R.

IOTC 2014. Review of Conservation and Management Measures Relevant to Ecosystems and Bycatch. IOTC Secretariat, 12 September 2014. IOTC–2014–WPEB10–05.

WCPFC 2010. Conservation and Management Measure for Sharks. Seventh Regular Session of the Western and Central Pacific Fisheries Commission, Honolulu, Hawaii (USA), 6–10 December 2010. CMM 2010-071.

WCPFC-OFP-SPC 2012. Preliminary analysis of the potential impacts of wire traces on shark catches in WCPO tuna longline fisheries. Ninth Regular Session of the Western and Central Pacific Fisheries Commission, 19 November 2012. WCPFC9-2012-IP14.

P.2.2.3 Information

|  |  |  |
| --- | --- | --- |
| 2.2.3.a Information adequacy for assessment of impact on main secondary species | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| Qualitative information is **adequate to estimate** the impact of the UoA on the main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species. | Some quantitative information is available and is **adequate to assess** the impact of the UoA on the main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Some quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species. | Quantitative information is available and is **adequate to assess with a high degree of certainty** the impact of the UoA on main secondary species with respect to status. |

RBF has been used to score all species. There is a fairly complete species list of fish and other animals which interact with the fisheries. In general, qualitative information is adequate to score productivity attributes for all these species, although some information is inferred from the taxon and size of the animal. For susceptibility attributes, information is generally less clear, but would probably be available for individual fleets (e.g. better information on the areal extent of the fishery compared to the likely stock, and more specific depth profile for the gear). Given that a higher score is allocated where it is uncertain, the RBF scoring is robust. This meets SG60. In addition, there is some quantitative information (catches) which can be used among other things to identify main species. Ostensibly, this meets SG80. Data may not be adequate for all gears in all areas. Generally, public data used here available for the Atlantic, and to a lesser extent Indian Ocean, appears more precise in terms of estimates by species and area than data from the Pacific fisheries. Because RBF is used, the SG100 cannot be achieved.

|  |  |  |
| --- | --- | --- |
| 2.2.3.b Information adequacy for assessment of impact on minor secondary species | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  |  | Some quantitative information is adequate to estimate the impact of the UoA on minor secondary species with respect to status. |

Information should be sufficient to support measures to manage main secondary species. Landings by species are reported and monitored. All RFMOs include programmes to collect data related on bycatch. Observer programmes report on activities and catches at sea for main industrial fleets, including all interactions with various species as well as catches and discards, but coverages are generally low. However, information remains patchy, and researchers have struggled to develop strategies to manage bycatch effectively. This meets SG60. Information is not adequate to develop a partial strategy. RFMOs have not managed to develop more general strategies, and appear to be struggling to adopt effective measures which might apply to other secondary species, covering, for example, other non-shark, non-ETP species. This does not meet SG80. Data are not adequate to evaluate whether any strategy is achieving its objective, and the diverse nature of some catches would make it difficult to manage all secondary species for these gears. It is unlikely that gears making a diverse catch, like longline or driftnet, will be able to meet SG100 in the foreseeable future. Where it can be shown there is little or no bycatch of any species other than primary species, the SG100 could be met in future, but information will need to be demonstrated to show this.

|  |  |  |
| --- | --- | --- |
| 2.2.3.c Information adequacy for management strategy | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| Information is adequate to support **measures** to manage **main** secondary species. | Information is adequate to support a **partial strategy** to manage **main** secondary species. | Information is adequate to support a **strategy** to manage **all** secondary species, and evaluate with a **high degree of certainty** whether the strategy is **achieving its objective**. |

For secondary species, there is sufficient data to support measures to reduce bycatch and therefore manage main secondary species populations. They are able to determine with current data when and where secondary species are being caught in the main fishing fleets, which would allow management to introduce controls. This meets SG60. However, there are significant gaps in secondary species data, with high levels of discarding likely, low observer coverage for many fleets and missing catch data. For this pre-assessment, publicly availble catch data are poor, which may have led to misclassification between main and minor species. It is unlikely a partial strategy could be developed for all secondary species without improved information, so SG80 is not met.

All SG60 were met, and 1 out of 2 SG80 were met.

PI 2.2.3 : 70

References

BIM 2001. Diversification Trials with Alternative Tuna Fishing Techniques Including the Use of Remote Sensing Technology: Final Report. Commission of the European Communities Directorate General for Fisheries EU Contract No. 98/010 and PESCA Contract No. 98.IR.PA.29.

Birdlife International (http://www.birdlife.org)

Catch reports from ICCAT, IOTC, WCPFC and IATTC

CMS. Convention on the Conservation of Migratory Species of Wild Animals (http://www.cms.int)

Fishbase webpage (www.fishbase.org)

Foster, D.G., Epperly, S.P., Shah, A.K., Watson, J.W. 2012. Evaluation of hook and bait type on the catch rates in the western North Atlantic Ocean pelagic longline fishery. Bulletin of Marine Science 88: 529–545.

Froese, R., Binohlan, C. 2000. Empirical relationships to estimate asymptotic length, length at first maturity, and length at maximum yield per recruit in fishes, with a simple method to evaluate length frequency data. Journal of Fish Biology 56: 758–773.

Gabr, M.H., El-Haweet, A. 2012. Pelagic longline fishery for albacore (*Thunnus alalunga*) in the Mediterranean Sea of Egypt. Turkish Journal of Fisheries and Aquatic Sciences 12: 735–741.

ICCAT 2014. Task-I Nominal Catch from 1950 to 2013.

IOTC 2014. Report of the Tenth Session of the IOTC Working Party on Ecosystems and Bycatch. Yokohama, Japan, 27–31 October 2014. IOTC-2014-WPEB10-R.

IUCN Red List of Threatened Species (http://www.iucnredlist.org)

Kirby, D.S., Hobday, A. 2007. Ecological Risk Assessment for the Effects of Fishing in the Western and Central Pacific Ocean. Productivity-Susceptibility Analysis. Third Regular Session of the Scientific Committee of the WCPFC. Honolulu, United States of America, 13–24 August 2007. WCPFC-SC3-EB SWG/WP-1.

Lutz, P.L., Musick, J.A. (Eds.) 1997. The Biology of Sea Turtles. CRC Press, Boca Raton, Florida (USA), 475 pp.

Mannocci, L., Dabin, W., Augeraud-Véron, E., Dupuy, J.F., Barbraud, C., Ridoux, V. 2012. Assessing the Impact of Bycatch on Dolphin Populations: The Case of the Common Dolphin in the Eastern North Atlantic. PLoS One 7(2): e32615.

Ozumi, Y.U. 1998. Fishery Biology of Arrow Squids, *Nototodarus gouldi* and *N. sloanii* in New Zealand Waters. Bull. Nat. Res. Inst. Far Seas Fish. 35: 1–111.

Pauly, D., Trites, A. W., Capuli, E., and Christensen, V. 1998. Diet composition and trophic levels of marine mammals. ICES Journal of Marine Science 55: 467–481.

Xu, L. Zhu, G., Song, L. 2006. Profile of hook depth of Chinese fresh tuna longline in the tropical Indian Ocean based on TDR data. IOTC-2006-WPTT-33.

2.3 ETP Species

P.2.3.1 Outcome Status

|  |  |  |
| --- | --- | --- |
| 2.3.1.a Effects of the UoA on population/ stocks within national or international limits, where applicable | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| Where national and/or international requirements set limits for ETP species, the **effects of the UoA** on the population/ stock are known and **likely** to be within these limits. | Where national and/or international requirements set limits for ETP species, the **combined effects of the MSC UoAs** on the population /stock are known and **highly likely** to be within these limits. | Where national and/or international requirements set limits for ETP species, there is a **high degree of certainty** that the **combined effects of the MSC UoAs** are within these limits. |

Tuna occupies the same space in the pelagic ecosystem as a number of ETP species therefore there is a potential for interaction and impact between tuna fisheries and the ETP species which must be assessed and scored. ETP species are those which are:

* Out of scope of MSC certification (birds, mammals, amphibians, reptiles) and which are also listed as Critically Endangered, Endangered or Vulnerable on the IUCN Redlist.
* Species listed on Appendix I of the Convention on International Trade in Endangered Species (CITES) or other key agreements under the Convention on Migratory Species (CMS), such as the Agreement on Conservation of Albatross and Petrels (ACAP).
* Species that are recognized by national ETP legislation.

It should be noted that not all species of marine turtle, dolphin, bird or cetacean are necessarily ETP (where not classified as ETP they would be scored as ‘secondary’). By contrast, as sharks are “in scope”, they would only qualify as ETP if protected by relevant legislation, regardless of their IUCN Redlist status. It should also be noted that the classification of ETP species is independent of the type of gear interaction, with no ‘main’ qualifier for those with the greatest interaction, as there for primary and secondary species. The ETP species which are likely to be most significant to scoring of tuna fisheries are whales (e.g. *Balaenoptera physalus*, *Balaenoptera borealis*, *Balaenoptera edeni*), marine turtles (e.g. *Caretta caretta*, *Chelonia mydas*, *Eretmochelys imbricate*, *Lepidochelis olivacea*) and to a lesser extent some protected birds (primarily those listed under the Agreement on Conservation of Albatross and Petrels [ACAP]). Sharks are less likely to be listed as ETP species as none are listed on CITES Appendix I (although a number are on Appendix II), and sharks are within scope of the MSC programme and therefore would not be automatically considered ETP on account of their IUCN Redlist status score. The only shark species that are ETP will be those protected by National legislation or other international conventions. For example, whale shark, a species sometimes associated with tuna fisheries is protected and therefore considered ETP in certain waters such as Australia, the Maldives, Philippines, India, Thailand, Malaysia, Honduras, Mexico, US Atlantic waters and a small area off Belize.

To meet SG80, there is a new requirement in the latest version of the MSC Fisheries Certification Requirements (FCR v2 October 2014) that necessitates the consideration the cumulative impacts of all MSC UoAs. This is done by considering what impact overlapping in-assessment and certified UoAs have on the same ETP species. For the purposes of this assessment, we treat all tuna fisheries as being certified.

FAD sets are more likely to have a less mono-specific catch than free school sets. As well as including a wider variety of fish species, this may also include a larger number of ETP species.

**Turtles**:

In studies of the EU purse seine tuna fisheries the majority of turtle bycatch was associated with FAD fisheries (compared to free school sets), although many ETP species were recorded to have been released alive. Restrepo et al. (2014) note that the level of direct turtle mortality in FAD fisheries is low compared to other fisheries. However, they report that up to a couple of hundred individuals per ocean per year are probably caught, with some 90% of these being released alive. A possibly large issue of concern for turtles in FAD fisheries is as a result of entanglement. This is addressed against scoring issue (c).

**Sharks**:

Although there is a potentially high bycatch of shark (through direct capture or entanglement), perhaps the two main species of shark (silky shark and oceanic whitetip) are both classed as secondary species, not ETP, unless protected by national legislation.

|  |  |  |
| --- | --- | --- |
| 2.3.1.b Direct effects | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| Known direct effects of the UoA are likely to not **hinder recovery** of ETP species. | Direct effects of the UoA are **highly likely** to not **hinder recovery** of ETP species. | There is a **high degree of confidence** that there are no **significant detrimental direct effects** of the UoA on ETP species. |

This scoring issue focuses on the direct impacts of the UoA and the likelihood that this would hinder recovery of the ETP species. This will examine the amount of direct mortality that is attributable to the UoA and view this in comparison to overall mortality on the ETP species (including from other fisheries and other sources of mortality) and the overall status (and status trend, if known) of the ETP species. For example, where it can be shown that the mortality attributed to the UoA is small compared to a known other source of mortality, which is connected to the endangerment of the ETP species, then it may be argued that it is not the UoA that is hindering recovery. Similarly, if it can be shown that the stock status of the ETP species is improving, then it may also be argued that the UoA cannot be hindering recovery. The context of other fisheries, other sources of mortality and stock status is therefore important (see SA3.1.5).

**Turtles**:

Comparative studies have shown that the level of turtle bycatch in FAD fisheries remains well above the level of capture in other tuna fisheries – notably free school sets. Although there is a high percentage of turtles released alive, with a high chance of post-capture survival, there remains insufficient evidence to conclude that the impact on populations is insignificant. However, it is noted that greater threats to the recovery of ETP turtles are issues not related to this UoA, such as capture in coastal net fisheries, capture in coastal demersal trawl fisheries, loss of breeding habitat, illegal directed fisheries, etc. However, given the lack of obvious recovery of the affected species and the known level mortality, it cannot be concluded with a high degree of certainty that the UoA is not hindering recovery; however given the more obvious anthropogenic sources of high mortality, it can be concluded that the direct effects of the UoA are likely to not hinder recovery of ETP species, meeting SG60. To meet SG80, more information is needed to increase the level of certainty.

|  |  |  |
| --- | --- | --- |
| 2.3.1.c Indirect effects | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  | Indirect effects have been considered for the UoA and are thought to be **highly likely** to not create unacceptable impacts. | There is a **high degree of confidence** that there are no **significant detrimental indirect effects** of the UoA on ETP species. |

As there is no scoring guidepost provided at the SG60, a lack of consideration of the indirect effects would not cause any fishery to fail. However, if the SG80 is not met, this may cause a condition in some tuna fisheries.

Unobserved or indirect mortality is potentially also a significant concern for FAD fisheries. Entanglement in the sub-surface structure of the FAD is likely to go unobserved and unrecorded. While work on development of mitigation measures, such as ecological or non-entangling FADs is advantageous and would lead to increased scores. In order for these to be verified, sufficient control and traceability systems must be on board / in place to ensure that the only FAD sets were indeed on the fleets own non-entangling ecological FADs. In addition, there remains some stakeholder concern about the uncertain indirect impact that large numbers of FADs may play on ecological balance. WWF’s 2011 position paper on FADs notes that “the ecological impact of a network of thousands of artificial drifting and anchored FADs aggregate tunas and other pelagic species from surrounding waters has not been assessed”. Overall, this score likely depends on the fishery’s level of interaction with ETP species (i.e. if interactions are negligible, indirect effects are also likely negligible). In the absence of demonstrating negligible interactions, fisheries will struggle to meet SG80.

All SG60 were met, but no SG80 or SG100.

PI 2.3.1 : 60

References

Amande, J.M., Ariz, J., Chassot, E., Chavance, P., Delgado De Molina, A., Gaertner, D., Murua, H., Pianet, R., Ruiz, J. 2008. By-catch and discards of the European purse seine tuna fishery in the Indian Ocean. Estimation and characteristics for the 2003-2007 period. Ecosystem and By-Catch Working Group, Bangkok, Thailand, 20–22 October 2008. IOTC-2008-WPEB-12.

Convention on International Trade in Endangered Species of Wild Fauna and Flora. Signed at Washington D.C. on 3 March 1973, amended at Bonn on 22 June 1979. Appendix 1. Available at: http://www.cites.org/eng/app/appendices.php

Dagorn, L., Restrepo, V.R. 2011. Questions and answers about FADs and bycatch. ISSF Technical Report 2011-03. International Seafood Sustainability Foundation, McLean, Virginia, USA.

Gilman, E.L. 2011. Bycatch governance and best practice mitigation technology in global tuna fisheries. Marine Policy 35: 590–609.

Hallier, J.P., Gaertner, D. 2008. Drifting fish aggregation devices could act as an ecological trap for tropical tuna species. Marine Ecology Progress Series 353: 255–264.

IUCN 2017. Redlist of Threatened Species. Searchable Database available at: http://www.iucnredlist.org

Marsac, F., Fonteneau, A., Menard, F. 2000. Drifting FADs used in tuna fisheries: An ecological trap? In: Peche Thoniere et Dispositifs de Concentration de Poissons. LE Gall, J.Y., Cayre, P., Taquet, M. (Eds.). Editorial Ifremer, Actes Colloq. 28, Caribbean-Martinique, pp. 537–552.

Morgan, A.C. 2011. Fish Aggregating Devices and Tuna: Impacts and Management Options. Ocean Science Division, Pew Environment Group, Washington, DC.

MSC 2014. SA3.1.5. In: MSC General Certification Requirements Version 2. Marine Stewardship Council, October 2014.

Pierce, S.J., Norman, B. 2016. *Rhincodon typus*. The IUCN Red List of Threatened Species 2016: e.T19488A2365291 (downloaded on 10 May 2018).

Restrepo, V., Dagorn, L., Itano, D., Justel­Rubio, A., Forget, F., Filmalter J.D. 2014. A summary of bycatch issues and ISSF mitigation initiatives to­date in purse seine fisheries, with emphasis on FADs. ISSF Technical Report 2014­11. International Seafood Sustainability Foundation, Washington, D.C.

Stelfox, M.R., Hudgins, J.A., Ali, K., Anderson, R.C. 2014. High mortality of olive ridley turtles (*Lepidochelys olivacea*) in ghost nets in the central Indian Ocean. IOTC-2014-WPEB10-28.

WWF 2011. WWF Statement on Fish Aggregation Devices (FADs) in Tuna Fisheries. WWF Smart Fishing Initiative. Position Paper. November 2011.

P.2.3.2 Management strategy

|  |  |  |
| --- | --- | --- |
| 2.3.2.a Management strategy in place (national and international requirements) | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| There are **measures** in place that minimise the UoA-related mortality of ETP species, and are expected to be **highly likely to achieve** national and international requirements for the protection of ETP species. | There is a **strategy** in place for managing the UoA’s impact on ETP species, including measures to minimise mortality, which is designed to be **highly likely to achieve** national and international requirements for the protection of ETP species. | There is a **comprehensive strategy** in place for managing the UoA’s impact on ETP species, including measures to minimise mortality, which is designed to **achieve above** national and international requirements for the protection of ETP species. |

The scoring of the management that is in place to mitigate against unwanted ETP bycatch will vary according to fleet nationality, on-board operational practices (such as training and handling) and Codes of Conduct. As such, although scoring commentary may refer to the management in place within a particular tuna RFMO, applying to a particular region or gear type, it is likely that a more tightly defined client group (UoA) may specify further management measures for consideration at the time of a full MSC assessment. Whilst such local or on-board initiatives or mitigation measures may be discussed in relation to 2.3.2, credit is not given in the scoring of this pre-assessment exercise unless they are universally adopted (i.e. an RFMO requirement).

The IOTC have a dedicated Working Party on Ecosystems and Bycatch (WPEB) whose remit includes the review and analysis of bycatch (i.e. sharks, marine turtles, seabirds, marine mammals and other fishes) and the development of mechanisms to better integrate ecosystem considerations into the scientific. The IOTC have adopted a number of resolutions seeking to mitigate the impacts of tuna fisheries on ETP species. In many cases, these resolutions apply across all fleets (of the contracting parties), although artisanal fleets may be exempt. Below are examples of some of the relevant resolutions:

* Resolution 12/04 on the conservation of marine turtles
* Resolution 12/06 on reducing the incidental bycatch of seabirds in longline fisheries
* Resolution 13/04 on the conservation of cetaceans
* Resolution 13/05 on the conservation of whale sharks (Rhincodon typus)
* Resolution 13/08 procedures on a fish aggregating devices (FADs) management plan, including more detailed specification of catch reporting from FAD sets, and the development of improved FAD designs to reduce the incidence of entanglement of non-target species

These resolutions result in a number of measures being applied across all fleets. This includes compulsory reporting of any interaction. Further measures of relevance (contained in the resolutions above) include:

* Prohibiting any intentional whale shark sets and best practice guidelines and reporting requirements in event of unintended capture
* Designing FADs that reduce the incidence of entanglement
* Implementing the handling guidelines in the IOTC Marine Turtle Identification Cards
* Ensuring that the operators of all longline vessels carry line cutters and de-hookers in order to facilitate the appropriate handling and prompt release of marine turtles

These resolutions collectively constitute an in-place strategy that is highly likely to achieve national and international ETP protection requirements. SG100 is not met since there is not a comprehensive strategy that is designed to achieve protection levels above national and international requirements.

The level of interaction with ETP species is greater when fisheries use FAD. Although there is evidence that some practices can effectively reduce the level of impact such as non-entangling or eco FADs, there is little management requirement that these be exclusively used (although an increasing number of RFMO resolutions and recommendations are moving in this direction), and sufficient monitoring and enforcement are often not in place to verify that any such rulings are applied. Although some fleets do make use of these non-entangling FADs, it is difficult to confirm that these are the only FADs that are in use. There remains no record of the number of non-anchored FADs in use, or their ultimate fate, with many more FADs have been added each year. WWF points to some obvious further management measures that could, with further research and investment, be brought in to seek to improve the sustainable management of FAD fisheries. In addition to the measures already mentioned (such as non-entangling FADs), additional possible management measures could include:

* Dedicated FAD management plans to control the number and density of FADs
* Time/area closures for purse seine FAD sets, informed by improved data, to mitigate ecological problems in key areas or seasons

SG60 is met but not SG80 since there is not a strategy in place that is highly likely to achieve national and international ETP protection requirements.

|  |  |  |
| --- | --- | --- |
| 2.3.2.b Management strategy in place (alternative) | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| There are **measures** in place that are expected to ensure the UoA does not hinder the recovery of ETP species. | There is a **strategy** in place that is expected to ensure the UoA does not hinder the recovery of ETP species. | There is a **comprehensive strategy** in place for managing ETP species, to ensure the UoA does not hinder the recovery of ETP species. |

When scoring ETP management strategy, either scoring issue (a) or scoring issue (b) is scored, not both (MSC FCR 2.0 SA3.11.2). Scoring issue (a) is scored where there are requirements for protection and rebuilding provided through national ETP legislation or international agreements. Where these are absent, scoring issue (b) is scored. For the purposes of this pre-assessment exercise, in the context of ETP management measures being applied through an RFMO, it is appropriate to score issue (a) only. However, an artisanal fishery in a country that is not signatory to international agreements may be more appropriately scored under issue (b). In this case, locally specific management measures are likely to be the key determinant of scoring outcome. This is beyond the scope of this pre-assessment.

|  |  |  |
| --- | --- | --- |
| 2.3.2.c Management strategy evaluation | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| The measures are **considered likely** to work, based on **plausible argument** (e.g. general experience, theory or comparison with similar UoAs/ species). | There is an **objective basis for confidence** that the partial strategy/ strategy will work, based on **information** directly about the UoA and/or the species involved. | The strategy/ comprehensive strategy is mainly based on information directly about the UoA and/or species involved, and a **quantitative analysis** supports **high confidence** that the strategy will work. |

Confidence about the success of the management strategy / measures applied at the RFMO level for all tuna fishing fleets comes from the associated requirement for fleets to report ETP interactions and for the contracting state to submit this data annually to the RFMO. This provides some empirical basis, augmented by observer reports upon which analysis can be undertaken and the level of confidence objectively determined. Additionally, there is a good body of independent research on possible approaches to ETP mitigation in tuna fisheries for a wide variety of gears and locations. In many cases, this body of research will be analogous or applicable to the UoA and may be used by the management authority (whether national or RFMO) to evaluate and give confidence to the choice of management strategy to be applied. SG80 is met but not SG100 since a quantitative analysis to support high confidence has not be done.

The IOTC and in particular the Working Party on Ecosystems and Bycatch (WPEB) have oversight for the review and evaluation of the various ETP management measures in place (see references below). This provides management with objective basis for confidence that the measures applied will work, meeting SG80. SG100 is not met since a quantitative analysis to support high confidence has not be done.

|  |  |  |
| --- | --- | --- |
| 2.3.2.d Management strategy implementation | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  | There is some **evidence** that the measures/strategy is being implemented successfully. | There is **clear evidence** that the strategy/ comprehensive strategy is being implemented successfully and is **achieving its objective as set out in scoring issue (a) or (b).** |

The scoring of ‘implementation’ of management strategies and measures is in many ways linked to the scoring of strategies and measures being ‘in place’ in scoring issue (a). The justification provided there is not repeated here. However, in addition the degree of ‘implementation’ scored here will depend upon the observations of the assessors during site visits to determine the degree to which the measures and strategies referred to in scoring issue (a) are in day-to-day operational use. For example, where has an RFMO resolution or recommendation been adopted? To what extent has this been implemented at fleet level? Is there evidence of appropriate training having occurred and relevant logbooks, species identification guides or necessary equipment being in place on board vessels? Do crews have an understanding of the Codes of Good Practice for handling and release of ETP species? Is it evident from logbooks that the requirements for compulsory reporting of ETP interactions are being complied with? This degree of local / fleet level implementation will vary according to the client grouping and the nationality therefore cannot be remotely scored as part of this global generic pre-assessment exercise. At this time, no instances of obvious lack of implementation have been identified; however, this would be further scrutinized at the time of full assessment. Some RFMOs provide details of the level of implementation of their management measures / resolutions and recommendations by contracting parties (i.e. nations). Where available, these lists would also be consulted upon to determine the degree to which the UoA flag state was compliant with the implementation requirements for RFMO management measures (for example, the IOTC provide updates on the level of implementation of national plans of action for sharks and seabirds and implementation of FOA guidelines to reduce marine turtle mortality in fishing operations). Therefore, SG80 is met since there is some evidence that the strategy is being implemented successfully, but due to a lack of clear evidence, SG100 is not met.

|  |  |  |
| --- | --- | --- |
| 2.3.2.e Review of alternative measures to minimise mortality of ETP species | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species. | There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate. | There is a **biannual** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality ETP species, and they are implemented, as appropriate. |

This scoring issue is new to the latest version of the MSC fisheries certification requirements (FCRv2 October 2014). The ‘Alternative Measures’ that are under consideration here may include alternative fishing gears and / or practices in an effort to reduce the level of incidental ETP mortality to the lowest achievable levels. To meet SG80, a review must be regular (i.e. at least once every 5 years). The SG80 requirement for implementation ‘as appropriate’ allows for sensible consideration of cost effectiveness, vessel and crew safety and loss of target catches. It is likely that, when scored, this will look in turn at each of the ETP species that have been identified in 2.3.1 and determine the extent to which these species have been included in reviews of alternative measures (i.e. scoring species separately as scoring elements). The reviews and evaluations referred to in 2.3.2 and the resulting RFMO management measures or recommendations are sufficient to demonstrate that there has been some review of the alternative measures to minimize UoA related mortality of many ETP species. However, even if it can be demonstrated that some ETP species have met the requirement for regular review and implementation, it is possible that for at least some of the identified ETP species the review to date will have only happened once with no plan for regular repeat. The requirement for ‘Regular Review of Alternative Measures’ is one area in which it may be possible for the client fishery (or UoA) to commission or undertake their own review work. Where it can be demonstrated that this is a regular review of alternative methods and that recommendations are implements as appropriate, then this may enable the client fishery to achieve higher scores than might otherwise be the case (if solely reliant on reviews at the RFMO level).

There is evidence that the IOTC has undertaken regular review of conservation and mitigation measures for sea turtles. With the most recent relevant resolution (12/04) superseding, within 5 years, the previous resolutions (9/06 and 05/08). Resolution 12/04 also states “the IOTC Scientific Committee shall annually review the information reported by CPCs pursuant to this measure and, as necessary, provide recommendations to the Commission on ways to strengthen efforts to reduce marine turtle interactions with IOTC fisheries”. There is similar evidence in relation to seabirds. Resolution 12/06 on reducing the incidental bycatch of seabirds in longline fisheries supersedes the earlier resolution 10/06 and 05/09. This again provides an indication of management seeking to review and amend management requirements at regular intervals. The Resolution came into force on 1 July 2014 and states that “the IOTC Scientific Committee…will analyze the impact of this Resolution on seabird bycatch no later than…2016 (and)…advise the Commission on any modifications that are required”. By contrast, Resolution 13/04 on the conservation of cetaceans and Resolution 13/05 on the conservation of whale sharks (*Rhincodon typus*) do not replace previous resolutions and are less explicit about the date of subsequent review. In fisheries where it can be argued that the scale of impact on cetaceans or whale shark is negligible, the level of review and implementation in relation to sea turtles and seabirds may be sufficient for the SG80 to be met. Biennial reviews (i.e. once every two years) are needed to meet SG100.

All SG60 were met, and 2 out of 4 SG80 were met.

PI 2.3.2 : 70

References

Bourjea, J., Clermont, S., Delgado A., Murua, H., Ruiz J., Ciccione, S. Chavance, P. 2014. Marine turtle interaction with purse-seine fishery in the Atlantic and Indian oceans: Lessons for management. Biological Conservation 178: 74–87.

IOTC 2016. Status of development and implementation of National Plans of Action (NPOA) for seabirds and sharks and implementation of the FAO guidelines to reduce marine turtle mortality in fishing operations. IOTC–2016–SC19–06[E].

Morgan, A.C. 2011. Fish Aggregating Devices and Tuna: Impacts and Management Options. Ocean Science Division, Pew Environment Group, Washington, DC.

MSC 2014. SA3.11.2. In: MSC General Certification Requirements Version 2. Marine Stewardship Council, October 2014.

MSC 2014. SA3.5.3 & SA3.11.3. In: MSC General Certification Requirements Version 2. Marine Stewardship Council, October 2014.

Nel, R., Wanless, R.M., Angel, A., Mellet, B. Harris, L. 2013. Ecological Risk Assessment and Productivity - Susceptibility Analysis of sea turtles overlapping with fisheries in the IOTC region. Unpublished Report to IOTC and IOSEA Marine Turtle MoU (http://www.ioseaturtles.org/UserFiles/File/ERA\_FINAL\_27June2013%281%29.pdf)

Stelfox, M.R., Hudgins, J.A., Ali, K., Anderson, R.C. 2014. High mortality of olive ridley turtles (*Lepidochelys olivacea*) in ghost nets in the central Indian Ocean. IOTC-2014-WPEB10-28.

WPEB. Working Party on Ecosystems and Bycatch (http://www.iotc.org/science/wp/working-party-ecosystems-and-bycatch-wpeb)

WWF 2011. WWF Statement on Fish Aggregation Devices (FADs) in Tuna Fisheries. WWF Smart Fishing Initiative. Position Paper. November 2011.

P.2.3.3 Information

|  |  |  |
| --- | --- | --- |
| 2.3.3.a Information adequacy for assessment of impacts | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| Qualitative information is **adequate to estimate** the UoA related mortality on ETP species. **OR If RBF is used to score PI 2.3.1 for the UoA:**  Qualitative information is **adequate to estimate productivity and susceptibility** attributes for ETP species. | Some quantitative information is **adequate to assess** the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species. **OR If RBF is used to score PI 2.3.1 for the UoA:** Some quantitative information is **adequate to estimate productivity and susceptibility** attributes for ETP species. | Quantitative information is available to assess with a high degree of certainty the **magnitude of UoA-related impacts, mortalities and injuries and the consequences for the status** of ETP species. |

ETP interactions with tuna fisheries has been subject to many studies over a range of ecosystems, target fisheries and fishing strategies. There is an extensive list of publications that provide insight into this subject. For most if not all tuna fisheries, it will therefore be possible to draw some qualitative conclusions about the likely scale of impact, in particular when further information about vessel numbers, fishing intensity, ETP species distribution and gear type are included in the consideration. This ensures that all tuna fisheries meet at least the SG60 requirement. By contrast, ETP interactions are not routinely reliably recorded in most tuna fisheries, although RFMO management measures are increasingly including this as a requirement. There is awareness on the part of most fleets that ETP interactions are potentially illegal, are focus of considerable NGO scrutiny and above all are potentially damaging to the reputation of their product with end consumers. Regardless of efforts to avoid ETP interaction and capture (as discussed in 2.3.2), it is certainly conceivable that attempts at self-recording of interactions (for example in logbooks – whether voluntary or a legal requirement) may be inaccurate or represent an under-estimation. Given this potential incentive to under-report interactions, considerable focus of this information performance indicator will fall on the independence and likely veracity of any quantitative data on interaction. Fisheries with more observer coverage are likely to score higher in this performance indicator. In some tuna fisheries, there is 100% observer coverage. Where the remit for this observer work includes quantifying ETP interactions, perhaps complemented by research work focused on the specific fleet or UoA characteristics, then it is likely that this may meet the SG100 level, almost regardless of the level of impact since the focus of this performance indicator is on the quality of information not the scale of the impact. By contrast, those fisheries that lack the high level of observer coverage or independent research are likely to suffer lower scores, even where attempts have been made to augment the level of quantitative information by implementing onboard recording of interactions (for example in logbooks). The score for this performance indicator will therefore likely be influenced by local fleet factors and to some extent nationality / national policy. However, it should be noted that a number of MSC assessments have concluded that there is insufficient quantitative information to assess the UoA related mortality and impact thus triggering a condition. This applies in both the Pacific and Indian Ocean and with both pole and line and purse seine fleets. From a harmonisation point of view, it is therefore likely that this would trigger a condition in any new tuna MSC assessments, unless it was clearly demonstrated that the information gaps identified in these previous assessments did not apply in this instance.

For FAD sets, given the previously discussed potential for indirect mortality (from entanglement), determining a quantitative estimate of UoA-related mortality is more challenging. This is not simply because this indirect mortality is typically unseen. Even where the impact of an individual FAD can be estimated (as has been achieved with a number of studies), the lack of understanding of the number of FADs means that it is not possible to scale up the impact to determine a cumulative impact for all FADs. There is therefore a clear need to monitor the type and number of FADs in use so that the level of overall FAD effort and impact may be determined (and potentially controlled by management – see 2.3.2). SG60 is met but not SG80 since the necessary level of information (i.e. no quantitative information) is not available to adequately assess the UoA’s impact.

|  |  |  |
| --- | --- | --- |
| 2.3.3.b Information adequacy for management strategy | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| Information is adequate to support **measures** to manage the impacts on ETP species | Information is adequate to measure trends and support a **strategy** to manage impacts on ETP species | Information is adequate to support a **comprehensive strategy** to manage impacts, minimize mortality and injury of ETP species, and evaluate with a **high degree of certainty** whether a strategy is achieving its objectives. |

The information adequacy for a management strategy implies not only information in relation to the UoA (which is more the focus of scoring issue a) but also information about the ETP species themselves. There is some understanding as to the status of most ETP species. Indeed, it is partly this understanding of status that has led to their protection under relevant national legislation or international agreements or their classification on the IUCN Redlist. For those ETP species that qualify as such on the basis of being both out of MSC scope (i.e. reptiles, amphibians, birds or mammals) and classified by IUCN as either critically endangered, endangered or vulnerable, the IUCN listing typically provides some information on stock status trends, although this is not always regularly or recently updated. From the perspective of the UoA, there is comprehensive information available in relation to the fleet operations (spatial effort, temporal activity, overall effort). And as seen from scoring issue (a), there is also good understanding of the impacts of different gear types on ETP species and how these may be changed by appropriate mitigation, and the tuna RFMOs are also increasingly requiring that all interactions with ETPs are reported upon. Taken in combination, these separate fields of information could be seen as adequate to support a full strategy to manage impacts on ETP species. This is particularly relevant in the context of a precautionary approach to management where any lack of information should not be taken as a reason for delaying management. However, some past MSC assessments (such as the reference below for Fiji Albacore Tuna Longline) have focused more explicitly on the adequacy of information to support stock assessments on relevant ETP species and have concluded this to be insufficient, therefore triggering a condition. Other assessments have focused less on the quality of available information for ETP stock assessments and more on the availability of information of fleet related impacts. The best approach to scoring of this scoring issue under the latest version of the MSC certification requirements is for each ETP species affected by the fishery (unless the interaction is demonstrably negligible) to be scored as an ‘element’ for the quality and availability of information for a management strategy for that species. Given that many ETP species are not subject to regular assessments, and in many cases, there is only limited understanding on overall anthropogenic causes of mortality, it is probable that for a number of ETP species it may be concluded that information is not sufficient to measure trends (a requirement of SG80), thus triggering a condition. It is not necessarily clear what this scoring issue is addressing. If it is looking for overall information to measure ETP stock trends, then many ETP species will not meet this requirement. The following challenge would be that any condition will be hard to address and will certainly beyond the ability of a client fishery. SG80 is met but not SG100 since the level of information does not support a high degree of certainty regarding the strategy’s success.

All SG60 were met, and 1 out of 2 SG80 were met.

PI 2.3.3 : 70

References

Akroyd, J., Huntington, T., McLoughlin, K. 2012. MSC Assessment Report for Fiji Albacore Tuna Longline Fishery. Marine Stewardship Council Public Certification Report Version 5, November 2012. 20121212\_PCR\_TUN288.

Arreguin-Sanchez F., Muhlia A., Pilling G., Scott I. 2012. MSC Assessment Report for Mexico Baja California Pole and Line Yellowfin and Skipjack Tuna Fishery. Marine Stewardship Council Public Certification Report Version 5, April 2012. 0120501\_PCR.

2.4 Habitats

P.2.4.1 Outcome Status

|  |  |  |
| --- | --- | --- |
| 2.4.1.a Commonly encountered habitat status | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| The UoA is **unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm. | The UoA is **highly unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm. | There is **evidence** that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm. |

Tuna fisheries considered here occur in deep oceanic waters and do not physically impact the seafloor during their operation. The effect on oceanic waters would be negligible. Discarding of trash or pollutants would be detrimental to the habitat. Based on observer data, this is prohibited and appears to be broadly complied with, but a good record in this respect would need to be verified for any UoC vessels. Ghost fishing due to lost or discarded gear would also negatively impact seafloor habitat. However, since tuna fisheries are limited to oceanic waters and the impact of fishing on this habitat is negligible, SG100 is met.

In the case of FAD sets, the FADs themselves form part of the habitat so interactions through FAD fishing include changes to naturally occurring FADs caused by fishing as well as the addition of artificial FAD to the pelagic habitat. The main question is whether fishing on FADs or deploying FADs causes “serious or irreversible harm to habitat structure and function”. A number of factors suggest that fishing on FADs or deploying FADs does not have serious or irreversible impacts. These include: (i) the short residency and aggregation times of fish under FADs imply they are part of a temporary and dynamic process; (ii) in most cases, natural logs are removed from the purse seine, followed by smaller fish to ‘recolonise’ the logs immediately upon release; and (iii) the number of FADs naturally fluctuate, being created by processes such as storms and eventually sinking. FAD structures do not extend beyond 40m depth. Because the FAD population is not stable, the processes linking populations to FADs are likely to be opportunistic and robust, implying the fishery is highly unlikely to alter habitat structure to the where any harm is either serious or irreversible. SG100 is unlikely to be met because not enough is known about these processes to claim there is no evidence of any harm.

|  |  |  |
| --- | --- | --- |
| 2.4.1.b VME habitat status | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| The UoA is **unlikely** to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm. | The UoA is **highly unlikely** to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm. | There is **evidence** that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm. |

There are no VME habitats within tuna fishery areas within any of the oceans. Coral reefs and habitats associated with seamounts would not be affected directly by fishing activities, as they occur strictly near the surface in deep oceanic waters. This is verified by VMS and observer records. Gear could drift onshore if lost, and therefore impact coral reefs, mangroves and seagrass beds, but there is no evidence that this is a significant problem.

Within the MSC scoring template, the 2.4.1.b scoring issue can be marked as “not relevant”. This implies this issue should not be scored as long as the fishery can show it does not take place on any VMEs. In this case, noting exceptions for some fisheries, the directed fishery on tuna does not take place on VMEs, and therefore this issue was not scored.

It is possible that drifting FADs could have impact on VMEs outside the fishing area. This has become an increasing issue as more FADs have been released by purse seine in particular. Research is being conducted on biodegradable materials for FAD construction. While it might be highly unlikely that the impact of drifting FADs causes serious harm to VMEs, there is as yet no evidence. This meets SG80, but not SG100. More information would be needed on FAD lifespans, dispersal, etc. to determine whether or not they interact with or impact VMEs to either not score this issue or to meet SG100.

|  |  |  |
| --- | --- | --- |
| 2.4.1.c Minor habitat status | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  |  | There is **evidence** that the UoA is highly unlikely to reduce structure and function of the minor habitats to a point where there would be serious or irreversible harm. |

Minor habitats in this case are more homogeneous waters away from seamounts, current interfaces and other areas where tuna abundance is lower. There is direct evidence from observer programmes and other sources that the tuna fisheries would not have a direct significant impact on any minor habitat structure and function. This meets SG100.

All SG60 and SG80 were met, and 1 out of 3 SG100 were met.

PI 2.4.1 : 85

References

Hall, M., Román-Verdesoto, M. 2014. The fishery on fish-aggregating devices (FADs) in the eastern Pacific Ocean Inter-American Tropical Tuna Commission. Fifth Meeting of the Scientific Advisory Committee 12–16 May 2014, La Jolla, California (USA). SAC-05-04a.

IATTC 2014. Ecosystem considerations. Fifth Meeting of the IATTC Scientific Advisory Committee, La Jolla, California (USA), 12–16 May 2014. Document SAC-05-13.

ICCAT 2014. Report of the 2014 Inter-Sessional Meeting of the Sub-Committee on Ecosystems. Olhão, Portugal, 1–5 September 2014.

IOTC 2017. Report of the Thirteenth Session of the IOTC Working Party on Ecosystems and Bycatch. San Sebastian, Spain 4–8 September 2017. IOTC–2017–WPEB13–R[E].

MRAG 2009. FAD Management. A study of the impacts of fish aggregating devices (FADs) and the development of effective management strategies for their responsible use by industrial tuna fishing fleets. A report prepared for the WTPO. June 2009.

MSC 2014. MSC Full Assessment Reporting Template v2.0. https://www.msc.org/documents/scheme-documents/forms-and-templates/msc-full-assessment-reporting-template-v2.0/view

WCPFC 2016. Summary Report of the Second Meeting of the FAD Management Options Intersessional Working Group. China Gymnasium, Palikir, Pohnpei, Federated States of Micronesia, 28–29 September 2016. WCPFC-TCC13-2017-16B.

P.2.4.2 Management strategy

|  |  |  |
| --- | --- | --- |
| 2.4.2.a Management strategy in place | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| There are **measures** in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance. | There is a **partial strategy** in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above. | There is a **strategy** in place for managing the impact of all MSC UoAs/non-MSC fisheries on habitats. |

Because the guideposts refer to a management strategy “where necessary”, the strategy applied across all gears is considered in scoring this issue. For all gears except purse seine using FADs, there is no strategy in place for managing impact on habitat because it is not considered necessary. This meets SG80. For purse seine trips, which may include any type of set dependent on what they encounter, the strategy includes recording the type of set, which allows monitoring the fishing activity to detect risks to habitat as well as other aspects of the ecosystem. There is an agreed FAD Management Plan being implemented by RFMOs. The plan includes data collection, FAD design to reduce entangling and requirements on FAD marking and identification. As well as reports required on purse seiners, information has been collected from observers, and there is 100% observer coverage on larger purse seine. The partial strategy consists in monitoring the set type and applying a code of practice, which is in place. However, the strategy does currently not include controlling locations for deployment of FADs, and monitoring has not been complete. Controls on purse seine capacity and season-area controls that are used to reduce bycatch will reduce FAD use. Given that FADs may affect the pelagic habitat, the current approach for purse seine does not constitute a full strategy. Overall, a strategy is not complete but is being developed to mitigate any impact from tuna fisheries that might affect habitat. This strategy is not applied consistently across all fisheries, but is being applied where it is considered necessary so meets SG80. Additionally, in order to meet SG100, the management strategy should be in place even for gears that do not regularly contact benthic habitats since gear loss or unexpected seafloor impacts could occur.

|  |  |  |
| --- | --- | --- |
| 2.4.2.b Management strategy evaluation | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| The measures are **considered likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/ habitats). | There is some **objective basis for confidence** that the measures/ partial strategy will work, based on **information directly about the UoA and/or habitats** involved. | **Testing** supports **high confidence** that the partial strategy/strategy will work, based on **information directly about the UoA and/or habitats** involved. |

The main threat to tuna habitat is likely to be FAD use. Even though the full effects of FADs are unknown, no negative impact has been detected, and further research is planned. Based on research to date and expert evaluation, there is reason for confidence that the current partial strategy and measures have eliminated high risk to habitat, meeting SG80. Across all gears, no habitat management strategy has been tested so SG100 cannot be met.

|  |  |  |
| --- | --- | --- |
| 2.4.2.c Management strategy implementation | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  | There is some **quantitative evidence** that the measures/ partial strategy is being implemented successfully. | There is **clear quantitative evidence** that the partial strategy/strategy is being implemented successfully and is achieving its objective, as outlined in scoring issue (a). |

FAD effects and other associated activities apart from tuna fishing may not be directly monitored. There are considerable uncertainties with their impact so it is not possible at this stage to claim there is evidence that the current strategies are achieving their objectives. However, in most cases, there is quantitative evidence concerning measures applied, such as where and how much of each activity like bait collection, takes place and numbers of FADs and their locations. This suggests that these fisheries may not meet SG100 but are still likely to meet SG80.

For tuna fishing itself, there is no incentive to fish on or near vulnerable habitats. With verifiable VMS data and some observer coverage, it should be possible to provide clear quantitative evidence that the impact on habitats is negligible. A lack of such independent evidence, as might the case for smaller scale fisheries, would likely lead to a lower score here, as alternative monitoring information will be incomplete but is still unlikely to fall below SG80.

|  |  |  |
| --- | --- | --- |
| 2.4.2.d Compliance with management requirements and other MSC UoAs’/non-MSC fisheries’ measures to protect VMEs | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| There is **qualitative evidence** that the UoA complies with its management requirements to protect VMEs. | There is **some quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/ non-MSC fisheries, where relevant. | There is **clear quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/ non-MSC fisheries, where relevant. |

Larger vessels are required to carry VMS, and relevant fleets have observer programmes. Where VMS and observers are used and it can be clearly demonstrated that all fishing activities do not interact with VMEs, SG100 is met. Smaller vessels with incomplete coverage may only meet SG80 where some risk exists. However, VMEs should not occur within the normal areas of vessel operations, and this should be verifiable. As a result, for most tuna fishing operations, this scoring issue would be treated as “not relevant” because VMEs would not be encountered.

All SG60 and SG80 were met, and 0 out of 3 SG100 were met.

PI 2.4.2 : 80

References

Galland, G.R., Gershman, D. 2017. An Assessment of FAD Management Options for the ICCAT Convention Area. Collect. Vol. Sci. Pap. ICCAT 73: 953–957. SCRS/2016/044.

Hall, M., Román-Verdesoto, M. 2014. The fishery on fish-aggregating devices (FADs) in the eastern Pacific Ocean Inter-American Tropical Tuna Commission. Fifth Meeting of the Scientific Advisory Committee 12–16 May 2014, La Jolla, California (USA). SAC-05-04a.

IATTC 2014. Ecosystem considerations. Fifth Meeting of the IATTC Scientific Advisory Committee, La Jolla, California (USA), 12–16 May 2014. Document SAC-05-13.

ICCAT 2014. Report of the 2014 Inter-Sessional Meeting of the Sub-Committee on Ecosystems. Olhão, Portugal, 1–5 September 2014.

IOTC 2017. Report of the Thirteenth Session of the IOTC Working Party on Ecosystems and Bycatch. San Sebastian, Spain 4–8 September 2017. IOTC–2017–WPEB13–R[E].

MSC 2014. MSC Full Assessment Reporting Template v2.0. https://www.msc.org/documents/scheme-documents/forms-and-templates/msc-full-assessment-reporting-template-v2.0/view

WCPFC 2016. Summary Report of the Second Meeting of the FAD Management Options Intersessional Working Group. China Gymnasium, Palikir, Pohnpei, Federated States of Micronesia, 28–29 September 2016. WCPFC-TCC13-2017-16B.

P.2.4.3 Information / monitoring

|  |  |  |
| --- | --- | --- |
| 2.4.3.a Information quality | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| The types and distribution of the main habitats are **broadly understood. OR If CSA is used to score PI 2.4.1 for the UoA:**Qualitative information is adequate to estimate the types and distribution of the main habitats. | The nature, distribution and **vulnerability** of the main habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. **OR If CSA is used to score PI 2.4.1 for the UoA:** Some quantitative information is available and is adequate to estimate the types and distribution of the main habitats. | The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats. |

The physical, chemical and biological properties of the pelagic environment within RFMO jurisdictions are monitored, the habitat itself is adequately mapped in terms of depth and main oceanographic features, and the fishing operations and their location are also accurately recorded in relation to those features. Assessments of habitat preferences among fished species and the effect of environmental changes have also been made. All larger vessels operate a VMS, and thus there is accurate, near real-time monitoring of the spatial extent of interaction and the timing and location of use of the fishing gear. Observer programmes exist for longline and purse seine, and these record information on sets made and outcome of fishing. Information on smaller vessels is more limited, but still it is known VMEs do not occur within tuna fishing areas. Remote sensing data are available to map surface waters, productivity and depth. Shallow water vulnerable habitats, such as coral reefs and seagrass, which might be used by an associated baitfish fishery, would also be identified and mapped in most cases using remote sensing. There are no vulnerable habitats that interact directly with the tuna fishery, and the habitat is well recorded for assessment of the fishery, meeting SG100. Vulnerable habitats that might be used for baitfish would also be well-defined, also meeting SG100.

|  |  |  |
| --- | --- | --- |
| 2.4.3.b Information adequacy for assessment of impacts | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear. **OR If CSA is used to score PI 2.4.1 for the UoA:** Qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats. | Information is adequate to allow for identification of the main impacts of the UoA on the main habitats, and there is reliable information on the spatial extent of interaction and on the timing and location of use of the fishing gear. **OR If CSA is used to score PI 2.4.1 for the UoA:** Some quantitative information is available and is adequate to estimate the consequence and spatial attributes of the main habitats. | The physical impacts of the gear on all habitats have been quantified fully. |

Available information would suggest that physical impact of all gears on the pelagic habitats will be negligible and short-lived. The main impact would be ecological alterations to the environment through use of FADs. Information on the use and distribution of FADs is not complete, although all FADs will be required to have identification information attached from 2015 in the EPO. However, the broad extent of FAD and other gear use is adequate for assessment of impact, including the timing and extent of gear deployment. This meets the SG80. Since the physical impact of the gear on all habitats has not been quantified, the SG100 is not met.

|  |  |  |
| --- | --- | --- |
| 2.4.3.c Monitoring | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  | Adequate information continues to be collected to detect any increase in risk to the main habitats. | Changes in all habitat distributions over time are measured. |

Monitoring consists of recording the time and location of fishing and the type of set or quantity of hooks set, which can be linked to oceanographic data. Oceanographic information including basic physical (e.g. depth, temperature) and biological (e.g. phytoplankton density) data are recorded. However, on changes in deeper waters that tuna may use for foraging, such as current other changes to prey populations and feeding behaviour, are not monitored in detail. The spatial scales for these fisheries are very large, and most such monitoring depends on remote sensing. Increases in risk to habitats should be available from observer information, which is collected routinely for larger vessels. For fisheries that monitor distribution changes to all habitats over time, not just the change to main habitats, information is adequate to meet SG100. Since most tuna fisheries are unlikely to monitor to that extent, it is unlikely that the SG100 would be met.

For fisheries based on FADs, a key issue is the deployment of FADs and distribution of natural logs, which are not yet recorded except through set types. Such monitoring of FADs themselves as well as natural logs (their movement and the behaviour of populations in behaviour to these) has been proposed, but monitoring has not yet been fully implemented. This prevents these fisheries meeting SG100, although information is adequate for SG80.

All SG60 and SG80 were met, and 1 out of 3 SG100 were met.

PI 2.4.3 : 85

References

Gillett, R. 2012. Report of the 2012 ISSF Workshop: the management of tuna baitfisheries: the results of a global study. ISSF Technical Report 2012-08. International Seafood Sustainability Foundation, Washington, D.C., USA.

IATTC 2014. Ecosystem considerations. Fifth Meeting of the IATTC Scientific Advisory Committee, La Jolla, California (USA), 12–16 May 2014. Document SAC-05-13.

ICCAT 2014. Report of the 2014 Inter-Sessional Meeting of the Sub-Committee on Ecosystems. Olhão, Portugal, 1–5 September 2014.

IOTC 2017. Report of the Thirteenth Session of the IOTC Working Party on Ecosystems and Bycatch. San Sebastian, Spain 4–8 September 2017. IOTC–2017–WPEB13–R[E].

MRAG 2009. FAD Management. A study of the impacts of fish aggregating devices (FADs) and the development of effective management strategies for their responsible use by industrial tuna fishing fleets. A report prepared for the WTPO. June 2009.

WCPFC 2016. Summary Report of the Second Meeting of the FAD Management Options Intersessional Working Group. China Gymnasium, Palikir, Pohnpei, Federated States of Micronesia, 28–29 September 2016. WCPFC-TCC13-2017-16B.

2.5 Ecosystem

P.2.5.1 Outcome Status

|  |  |  |
| --- | --- | --- |
| 2.5.1.a Ecosystem status | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| The UoA is **unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. | The UoA is **highly unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. | There is **evidence** that the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. |

In cases where there is only one scoring issue in a performance indicator, the MSC allows partial scoring. This means that, for example, a score of 90 can be given if SG80 is met and half of SG100 is also met. In this instance, it could mean that there is evidence that the UoA is not disrupting key elements but maybe that evidence has not been fully substantiated.

For these fisheries, there is no evidence of major disruption to the pelagic ecosystem beyond direct depletion due to fishing covered under other performance indicators. There are no reports of responses in the ecosystem, such as outbreaks of unexpected fluctuations, that cannot be attributed to natural responses. On balance, it is likely that the fishery would be considered highly unlikely to disrupt key elements of the ecosystem, but specific evidence is lacking to support this. Therefore, tuna fishing meets SG80 but not SG100.

All SG60 and SG80 were met, and 0 out of 1 SG100 were met.

PI 2.5.1 : 80

References

Brouwer, S., Pilling, G., Hampton, J., Williams, P., McKechnie, S. Tremblay-Boyer, L. 2016. The Western and Central Pacific Tuna Fishery: 2016 Overview and Status of Stocks. Oceanic Fisheries Programme. Tuna Fisheries Assessment Report No. 17.

IATTC 2014. Ecosystem considerations. Fifth Meeting of the IATTC Scientific Advisory Committee, La Jolla, California (USA), 12–16 May 2014. Document SAC-05-13.

ICCAT 2014. Report of the 2014 Inter-Sessional Meeting of the Sub-Committee on Ecosystems. Olhão, Portugal, 1–5 September 2014.

IOTC 2017. Report of the Thirteenth Session of the IOTC Working Party on Ecosystems and Bycatch. San Sebastian, Spain 4–8 September 2017. IOTC–2017–WPEB13–R[E].

P.2.5.2 Management strategy

|  |  |  |
| --- | --- | --- |
| 2.5.2.a Management strategy in place | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| There are **measures** in place, if necessary which take into account the **potential impacts** of the UoA on key elements of the ecosystem. | There is a **partial strategy** in place, if necessary, which takes into account **available information and is expected to restrain impacts** of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance. | There is a **strategy** that consists of a **plan**, in place which contains measures to **address all main impacts of the UoA** on the ecosystem, and at least some of these measures are in place. |

The management system primarily works to minimise bycatch and limit the reduction in the biomass of target species to acceptable levels (MSY). By default, where species are caught together, the management system applies controls to protect the most vulnerable reducing risks not only to this species but to the ecosystem as a whole. Hence, the ecosystem is protected to an extent by controls aimed at regulating mortality on target stocks. In addition, activities that might cause potential hazards to marine life (such as discarding rubbish or entanglement in FADs) are controlled through resolutions, codes of practice and training. Because of the background research and attempts to control the type of fishing and where and when fishing takes place fishing gear used and behaviour at sea, these are more than just measures and arguably amount to a partial strategy. These controls and the overall strategy of research with management responses are expected to protect the ecosystem over the longer term. This meets SG80. However, there is no overall ecosystem plan to detected risks so SG100 is not met.

|  |  |  |
| --- | --- | --- |
| 2.5.2.b Management strategy evaluation | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| The **measures** are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar UoAs/ ecosystems). | There is **some objective basis for confidence** that the measures/ partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved. | **Testing** supports **high confidence** that the partial strategy/ strategy will work, based on information directly about the UoA and/or ecosystem involved. |

The partial strategy is using available information to monitor success and is likely to restrain and reduce impacts in the medium term, achieving the Outcome SG80 for PI 2.5.1. The lack of a full strategy and lack of research prevents the management addressing all impacts. The strategy is not clear enough, and information is limited preventing testing of the strategy. Overall, there is an objective basis for confidence that the partial strategy will work based on the process of management interventions and evaluation. Monitoring and evaluation has led to responses that have clearly reduced impacts. However, whether or not current controls are sufficient is uncertain so confidence is limited and based on ongoing effective measures and evaluation. The current approach meets SG80 but not SG100.

|  |  |  |
| --- | --- | --- |
| 2.5.2.c Management strategy implementation | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  | There is **some evidence** that the measures/partial strategy is being **implemented successfully.** | There is **clear evidence** that the partial strategy/strategy is being **implemented successfully and is achieving its objective as set out in scoring issue (a).** |

For larger longline and purse seine vessels, there is evidence from the observer program that existing measures are being implemented successfully. It is less clear that the measures are achieving objectives at this point. Furthermore, direct observations are only available for some fleets so coverage is limited. This amounts to some evidence that measures are being implemented successfully, meeting SG80, but evidence and whether overall objectives will be achieved are not yet clear so SG100 is not met.

All SG60 and SG80 were met, and 0 out of 3 SG100 were met.

PI 2.5.2 : 80

References

Brouwer, S., Pilling, G., Hampton, J., Williams, P., McKechnie, S. Tremblay-Boyer, L. 2016. The Western and Central Pacific Tuna Fishery: 2016 Overview and Status of Stocks. Oceanic Fisheries Programme. Tuna Fisheries Assessment Report No. 17.

IATTC 2014. Ecosystem considerations. Fifth Meeting of the IATTC Scientific Advisory Committee, La Jolla, California (USA), 12–16 May 2014. Document SAC-05-13.

ICCAT 2014. Report of the 2014 Inter-Sessional Meeting of the Sub-Committee on Ecosystems. Olhão, Portugal, 1–5 September 2014.

IOTC 2017. Report of the Thirteenth Session of the IOTC Working Party on Ecosystems and Bycatch. San Sebastian, Spain 4–8 September 2017. IOTC–2017–WPEB13–R[E].

MRAG 2009. FAD Management. A study of the impacts of fish aggregating devices (FADs) and the development of effective management strategies for their responsible use by industrial tuna fishing fleets. A report prepared for the WTPO. June 2009.

P.2.5.3 Information / monitoring

|  |  |  |
| --- | --- | --- |
| 2.5.3.a Information quality | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| Information is adequate to **identify** the key elements of the ecosystem. | Information is adequate to **broadly understand** the key elements of the ecosystem. |  |

Information is adequate to broadly understand all key elements of ecosystems that tuna fisheries interact with. All tuna RFMOs are developing a number of measures covering key elements of the ecosystem. This includes main genus and species (including phyto- and zoo-plankton) as well their trophic relationships, which are most likely the major determinants of abundance. The broad effects of the physical oceanography are also understood. Inshore ecosystems, which might provide baitfish, are managed locally, but these ecosystems are not well studied across the range they exist. Therefore, this meets SG80 but not SG100.

|  |  |  |
| --- | --- | --- |
| 2.5.3.b Investigation of UoA impacts | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
| Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, but **have not been investigated** in detail. | Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, and **some have been investigated in detail.** | Main interactions between the UoA and these ecosystem elements can be inferred from existing information, and **have been investigated in detail.** |

The main impact from fishing will likely be through catches affecting trophic relationships. Discards are being recorded by observers and retained catch from landings. In addition, more qualitative information has been used in a measure of susceptibility for a preliminary ecological risk assessment. Some aspects of ecosystem and the impact of fishing, including baitfish fishing, have been investigated in detail through various models. This meets SG80.

Main interactions between tuna fisheries can be inferred from considerable ecosystem information that is available, but not all such interactions have been investigated. For example, further research is required to investigate how FADs may affect population dynamics of tuna and other pelagic species or how species interact with each other (e.g. spinner dolphins and yellowfin tuna). Although some interactions have been investigated in detail and are used in ecosystem models, not all important interactions are well enough understood for this so SG100 is not met.

|  |  |  |
| --- | --- | --- |
| 2.5.3.c Understanding of component functions | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  | The main functions of the components (i.e., P1 target species, primary, secondary and ETP species and Habitats) in the ecosystem are **known.** | The impacts of the UoA on P1 target species, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are **understood.** |

The main functions of all ecosystem components are known. The oceanic pelagic ecosystem has been well studied, and the ecosystem role of large species such as tuna, other tuna-like species and surface pelagic fish species is well understood. This has allowed for the development and use of spatial ecosystem models for management advice in some fisheries. Modelling however has mostly related to trophic relationships among species. Other types of interaction, such as competition, interaction with the physical environment and the effect of predation on dynamics, have been explored, and their roles are understood. Assessment of fishery-related impacts on the ecosystem is limited by the available data on the wide range of species involved in tuna fisheries. Recording direct and indirect impacts is difficult across the large spatial scales that these fisheries operate. The impacts of the fishery on these components can be inferred. While these impacts have not been fully quantified, risks to the ecosystem and its components have been identified. Since all potential and actual impacts on the different components of the ecosystem have been identified and the functions of these components are understood, SG100 is met.

There is an additional issue arising for both dolphin sets and FAD sets. In either case, the functions of these between tuna and dolphins or objects are not well understood so the effect of the disturbance of these during fishing is also not perhaps well understood. However, it is likely that the main ecosystem impacts will be through the discarded bycatch under FADs, dolphin mortality or altering the number of FADs as part of the habitat or all of which are addressed under other performance indicators. Beyond these factors, there is no evidence of ecosystem impact, but the lack of information is likely to prevent these gears from meeting the SG100.

|  |  |  |
| --- | --- | --- |
| 2.5.3.d Information relevance | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  | Adequate information is available on the impacts of the UoA on these components to allow some of the main consequences for the ecosystem to be inferred. | Adequate information is available on the impacts of the UoA on the components **and elements** to allow the main consequences for the ecosystem to be inferred. |

Sufficient information is available to infer the main consequences of the fishery impact, and information is sufficient to keep risks to the ecosystem low. The implication on trophic relationships of declines in biomass of bycatch species can be obtained from the available models and qualitative consideration of the likely knock-on effects. It is not clear that the individual ecosystem elements are well enough understood that consequences at this greater level of detail might be inferred. Models and expert opinion would currently only be able to infer broad and direct effects on the ecosystem (e.g. lower natural mortality on tunas from a reduced shark population). This is adequate to infer some important consequences of fishing on the ecosystem, meeting SG80. However, although impacts on components and elements (species and habitat categories) have been considered, it is not clear that all main consequences of the fisheries can be yet determined so SG100 is not met.

|  |  |  |
| --- | --- | --- |
| 2.5.3.e Monitoring | | |
| 60 Guidepost | 80 Guidepost | 100 Guidepost |
|  | Adequate data continue to be collected to detect any increase in risk level. | Information is adequate to support the development of strategies to manage ecosystem impacts. |

Adequate data are being collected to detect increases in risk. These include monitoring all catches, bycatch and independent environmental data on the oceanic pelagic ecosystem. Data are not yet extensive enough to develop full strategies to manage ecosystem impacts. Bycatch data are not complete, and secondary effects are not well enough understood to develop these. Therefore, SG80 is met but not SG100.

All SG60 and SG80 were met, and 0 out of 4 SG100 were met.

PI 2.5.3 : 80

References

Brouwer, S., Pilling, G., Hampton, J., Williams, P., McKechnie, S. Tremblay-Boyer, L. 2016. The Western and Central Pacific Tuna Fishery: 2016 Overview and Status of Stocks. Oceanic Fisheries Programme. Tuna Fisheries Assessment Report No. 17.

Gillett, R. 2012. Report of the 2012 ISSF Workshop: the management of tuna baitfisheries: the results of a global study. ISSF Technical Report 2012-08. International Seafood Sustainability Foundation, Washington, D.C., USA.

IATTC 2014. Ecosystem considerations. Fifth Meeting of the IATTC Scientific Advisory Committee, La Jolla, California (USA), 12–16 May 2014. Document SAC-05-13.

ICCAT 2014. Report of the 2014 Inter-Sessional Meeting of the Sub-Committee on Ecosystems. Olhão, Portugal, 1–5 September 2014.

IOTC 2017. Report of the Thirteenth Session of the IOTC Working Party on Ecosystems and Bycatch. San Sebastian, Spain 4–8 September 2017. IOTC–2017–WPEB13–R[E].

Lehodey, P., Senina, I., Murtugudde, R. 2008. A spatial ecosystem and populations dynamics model (SEAPODYM) – Modeling of tuna and tuna-like populations. Progress in Oceanography 78: 304–318.

MRAG 2009. FAD Management. A study of the impacts of fish aggregating devices (FADs) and the development of effective management strategies for their responsible use by industrial tuna fishing fleets. A report prepared for the WTPO. June 2009.

Appendix: PSA Score Justification

|  |  |  |  |
| --- | --- | --- | --- |
| **[Skipjack tuna](#S_SKJ" \o "PSA Score)** | | ***Katsuwonus pelamis*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.500, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.500, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | Species fecundity is 115821 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 110, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 40, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.4, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-260m. For surface gears, the vertical overlap index with this species is 38.46%. | | 3 |
| Selectivity | The maximum length of the species is 110cm. For albacore fisheries, the length overlap index with this species is 78.57%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.39 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Yellowfin tuna](#S_YFT" \o "PSA Score)** | | ***Thunnus albacares*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.500, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.500, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | Species fecundity is 2408153 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 239, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 103, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.4, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-250m. For surface gears, the vertical overlap index with this species is 40.00%. | | 3 |
| Selectivity | The maximum length of the species is 239cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.39 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Bigeye tuna](#S_BET" \o "PSA Score)** | | ***Thunnus obesus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.200, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.200, which is in the medium risk K range (0.12-0.30) for maximum age. | | 2 |
| Fecundity | Species fecundity is 5531858 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 250, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 100, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.71 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-250m. For surface gears, the vertical overlap index with this species is 40.00%. | | 3 |
| Selectivity | The maximum length of the species is 250cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.46 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Frigate tuna](#S_FRI" \o "PSA Score)** | | ***Auxis thazard*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.787, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.787, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | Species fecundity is 200000 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 65, which is lower than the lowest risk value (100cm). | | 1 |
| Average size at maturity | Species length at maturity is 30, which is lower than the lowest risk value (40cm). | | 1 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.4, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.29 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 50-200m. For surface gears, the vertical overlap index with this species is 33.77%. | | 3 |
| Selectivity | The maximum length of the species is 65cm. For albacore fisheries, the length overlap index with this species is 46.43%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.26 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Little tunny](#S_LTA" \o "PSA Score)** | | ***Euthynnus alletteratus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.100, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.100, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 71000 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 122, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 42, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Mainly Atlantic distribution, but some catches reported in Indian Ocean. Species is coastal. | | 1 |
| Encounterability | The depth range of the species is 1-150m. For surface gears, the vertical overlap index with this species is 66.67%. This species is reef associated. | | 2 |
| Selectivity | The maximum length of the species is 122cm. For albacore fisheries, the length overlap index with this species is 87.14%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.43 |
|  | Vulnerability score | | 2.46 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Blue shark](#S_BSH" \o "PSA Score)** | | ***Prionace glauca*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.100, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.100, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 4 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 400, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 206, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.4, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-1000m. For surface gears, the vertical overlap index with this species is 10.00%. | | 2 |
| Selectivity | The maximum length of the species is 400cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 3.68 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Atlantic bonito](#S_BON" \o "PSA Score)** | | ***Sarda sarda*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.529, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.529, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | The score is based on the maximum risk score in the family Scombridae, which included 27 species. | | 1 |
| Average max size | Species maximum length is 91, which is lower than the lowest risk value (100cm). | | 1 |
| Average size at maturity | Species length at maturity is 37, which is lower than the lowest risk value (40cm). | | 1 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.29 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Atlantic distribution, mostly absent in Pacific and Indian Oceans | | 1 |
| Encounterability | The depth range of the species is 80-200m. For surface gears, the vertical overlap index with this species is 17.36%. | | 2 |
| Selectivity | The maximum length of the species is 91.4cm. For albacore fisheries, the length overlap index with this species is 65.29%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.43 |
|  | Vulnerability score | | 1.92 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Indo-Pacific sailfish](#S_SFA" \o "PSA Score)** | | ***Istiophorus platypterus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.311, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.311, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | Species fecundity is 2000000 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 348, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 150, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.71 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide distribution, absent in Mediterranean. Species is coastal. | | 2 |
| Encounterability | The depth range of the species is 1-200m. For surface gears, the vertical overlap index with this species is 50.00%. | | 3 |
| Selectivity | The maximum length of the species is 348cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 2.89 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Wahoo](#S_WAH" \o "PSA Score)** | | ***Acanthocybium solandri*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.300, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.300, which is in the medium risk K range (0.12-0.30) for maximum age. | | 2 |
| Fecundity | Species fecundity is 6000000 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 250, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 99, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.3, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.71 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-20m. For surface gears, the vertical overlap index with this species is 100.00%. | | 3 |
| Selectivity | The maximum length of the species is 250cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.46 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Blackfin tuna](#S_BLF" \o "PSA Score)** | | ***Thunnus atlanticus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.300, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.300, which is in the medium risk K range (0.12-0.30) for maximum age. | | 2 |
| Fecundity | The score is based on the maximum risk score in the family Scombridae, which included 27 species. | | 1 |
| Average max size | Species maximum length is 108, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 49, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.4, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.71 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Atlantic distribution, mostly absent in Pacific and Indian Oceans | | 1 |
| Encounterability | The depth range of the species is 50-200m. For surface gears, the vertical overlap index with this species is 33.77%. | | 3 |
| Selectivity | The maximum length of the species is 108cm. For albacore fisheries, the length overlap index with this species is 77.14%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 2.38 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Swordfish](#S_SWO" \o "PSA Score)** | | ***Xiphias gladius*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.158, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.158, which is in the medium risk K range (0.12-0.30) for maximum age. | | 2 |
| Fecundity | Species fecundity is 17000000 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 455, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 221, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.14 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-800m. For surface gears, the vertical overlap index with this species is 12.50%. | | 2 |
| Selectivity | The maximum length of the species is 455cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 3.16 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Atlantic white marlin](#S_WHM" \o "PSA Score)** | | ***Kajikia albida*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.600, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.600, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | The score is based on the maximum risk score in the family Engraulidae, which included 4 species. | | 1 |
| Average max size | Species maximum length is 300, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 164, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Atlantic distribution, absent in Pacific Ocean, but catches reported in Indian Ocean. | | 1 |
| Encounterability | The depth range of the species is 1-150m. For surface gears, the vertical overlap index with this species is 66.67%. | | 3 |
| Selectivity | The maximum length of the species is 300cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 2.28 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Blue marlin](#S_BUM" \o "PSA Score)** | | ***Makaira nigricans*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.324, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.324, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | The score is based on the maximum risk score in the family Scombridae, which included 27 species. | | 1 |
| Average max size | Species maximum length is 500, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 50, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.71 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Mainly Atlantic distribution, but catches allocated to this species in other oceans (see fishbase as could be the same species as M. mazara). | | 3 |
| Encounterability | The depth range of the species is 1-200m. For surface gears, the vertical overlap index with this species is 50.00%. | | 3 |
| Selectivity | The maximum length of the species is 500cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.46 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Rainbow runner](#S_RRU" \o "PSA Score)** | | ***Elagatis bipinnulata*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.354, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.354, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | The score is based on the maximum risk score in the family Echeneidae , which included 1 species. | | 1 |
| Average max size | Species maximum length is 180, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 65, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.3, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide coastal distribution, mainly coastal | | 1 |
| Encounterability | The depth range of the species is 2-10m. For surface gears, the vertical overlap index with this species is 100.00%. This species is reef associated. | | 2 |
| Selectivity | The maximum length of the species is 180cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.43 |
|  | Vulnerability score | | 2.12 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Atlantic bluefin tuna](#S_BFT" \o "PSA Score)** | | ***Thunnus thynnus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.100, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.100, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 34833333 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 458, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 97, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.14 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Mainly Atlantic distribution, but some catches reported in the Indian Ocean. | | 1 |
| Encounterability | The depth range of the species is 1-985m. For surface gears, the vertical overlap index with this species is 10.15%. | | 2 |
| Selectivity | The maximum length of the species is 458cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.43 |
|  | Vulnerability score | | 2.57 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Bullet tuna](#S_BLT" \o "PSA Score)** | | ***Auxis rochei*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.464, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.464, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | Species fecundity is 31000 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 50, which is lower than the lowest risk value (100cm). | | 1 |
| Average size at maturity | Species length at maturity is 35, which is lower than the lowest risk value (40cm). | | 1 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.3, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.29 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 10-200m. For surface gears, the vertical overlap index with this species is 47.64%. | | 3 |
| Selectivity | The maximum length of the species is 50cm. For albacore fisheries, the length overlap index with this species is 35.71%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.26 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Common dolphinfish](#S_DOL" \o "PSA Score)** | | ***Coryphaena hippurus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 1.340, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 1.340, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | Species fecundity is 58000 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 210, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 56, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.4, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-85m. For surface gears, the vertical overlap index with this species is 100.00%. | | 3 |
| Selectivity | The maximum length of the species is 210cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.39 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Picked/ spiny dogfish](#S_DGS" \o "PSA Score)** | | ***Squalus acanthias*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.100, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.100, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 1 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 160, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 81, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.4, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Northern and Southern oceans subtropical distrbution | | 3 |
| Encounterability | The depth range of the species is 1-1460m. For surface gears, the vertical overlap index with this species is 6.85%. | | 1 |
| Selectivity | The maximum length of the species is 160cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 3.06 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Chub mackerel](#S_MAS" \o "PSA Score)** | | ***Scomber japonicus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.500, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.500, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 1 |
| Average max size | Species maximum length is 64, which is lower than the lowest risk value (100cm). | | 1 |
| Average size at maturity | Species length at maturity is 26, which is lower than the lowest risk value (40cm). | | 1 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 3.4, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.29 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Commercial bait fisheries as well as bycatch in tropical gears. Species is coastal. | | 2 |
| Encounterability | Primarily bait for longline/troll gears, but also reported as bycatch in some tuna fisheries. | | 2 |
| Selectivity | The maximum length of the species is 64cm. For albacore fisheries, the length overlap index with this species is 45.71%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.88 |
|  | Vulnerability score | | 2.27 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Black marlin](#S_BLM" \o "PSA Score)** | | ***Istiompax indica*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.231, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.231, which is in the medium risk K range (0.12-0.30) for maximum age. | | 2 |
| Fecundity | Species fecundity is 40000000 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 465, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species maximum length is 465cm, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide distribution, absent in North and Central Atlantic. Species is coastal. | | 2 |
| Encounterability | The depth range of the species is 1-915m. For surface gears, the vertical overlap index with this species is 10.93%. | | 2 |
| Selectivity | The maximum length of the species is 465cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.88 |
|  | Vulnerability score | | 2.74 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Longfin yellowtail](#S_YTL" \o "PSA Score)** | | ***Seriola rivoliana*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Carangidae, which included 17 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Carangidae, which included 17 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Carangidae, which included 3 species. | | 1 |
| Average max size | Species maximum length is 160, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species maximum length is 160cm, which is in the length at maturity medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide distribution, uncommon in North Atlantic Ocean and southern Oceans, mainly coastal. | | 1 |
| Encounterability | The depth range of the species is 5-245m. For surface gears, the vertical overlap index with this species is 39.83%. This species is reef associated. | | 2 |
| Selectivity | The maximum length of the species is 160cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.43 |
|  | Vulnerability score | | 2.46 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Longbill spearfish](#S_SPF" \o "PSA Score)** | | ***Tetrapturus pfluegeri*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Somniosidae, which included 2 species. | | 1 |
| Average max age | The score is based on the maximum risk score in the family Somniosidae, which included 2 species. | | 2 |
| Fecundity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 1 |
| Average max size | Species maximum length is 254, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species maximum length is 254cm, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.4, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Atlantic distribution, but catches reported in Indian Ocean and Pacific. | | 1 |
| Encounterability | The depth range of the species is 1-200m. For surface gears, the vertical overlap index with this species is 50.00%. | | 3 |
| Selectivity | The maximum length of the species is 254cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 2.48 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Pompano dolphinfish](#S_CFW" \o "PSA Score)** | | ***Coryphaena equiselis*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.500, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.500, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 1 |
| Average max size | Species maximum length is 127, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 22, which is lower than the lowest risk value (40cm). | | 1 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.43 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-400m. For surface gears, the vertical overlap index with this species is 25.00%. | | 2 |
| Selectivity | The maximum length of the species is 127cm. For albacore fisheries, the length overlap index with this species is 90.71%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 2.73 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Tunas nei](#S_TUN" \o "PSA Score)** | | ***Thunnini*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 1 |
| Average max size | The score is based on the maximum risk score in the family Triakidae, which included 6 species. | | 3 |
| Average size at maturity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Reproductive strategy | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 1 |
| Trophic level | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
|  | Productivity score | | 2.29 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-150m. For surface gears, the vertical overlap index with this species is 66.67%. | | 3 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 50 species is 458cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.77 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Mackerels and tunas](#S_TUX" \o "PSA Score)** | | ***Family Scombridae*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Centrolophidae, which included 2 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Centrolophidae, which included 2 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 1 |
| Average max size | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Average size at maturity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Reproductive strategy | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 1 |
| Trophic level | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
|  | Productivity score | | 2.29 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-100m. For surface gears, the vertical overlap index with this species is 100.00%. | | 3 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 50 species is 458cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.77 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Billfish](#S_BIL" \o "PSA Score)** | | ***Family Istiophoridae*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Belonidae, which included 2 species. | | 1 |
| Average max age | The score is based on the maximum risk score in the family Belonidae, which included 2 species. | | 2 |
| Fecundity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 1 |
| Average max size | The score is based on the maximum risk score in the family Belonidae, which included 3 species. | | 3 |
| Average size at maturity | The score is based on the maximum risk score in the family Belonidae, which included 3 species. | | 3 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | The score is based on the maximum risk score in the family Belonidae, which included 3 species. | | 3 |
|  | Productivity score | | 2.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-200m. For surface gears, the vertical overlap index with this species is 50.00%. | | 3 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 9 species is 500cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.61 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Plain bonito](#S_BOP" \o "PSA Score)** | | ***Orcynopsis unicolor*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Carcharhinidae, which included 23 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Carcharhinidae, which included 23 species. | | 3 |
| Fecundity | Species fecundity is 3000000 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 130, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 75, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | East Atlantic distribution, uncommon in West Atlantic. Catches reported elsewhere. | | 1 |
| Encounterability | The depth range of the species is 1-200m. For surface gears, the vertical overlap index with this species is 50.00%. | | 3 |
| Selectivity | The maximum length of the species is 130cm. For albacore fisheries, the length overlap index with this species is 92.86%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 2.59 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[West African Spanish mackerel](#S_MAW" \o "PSA Score)** | | ***Scomberomorus tritor*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.318, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.318, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | Species fecundity is 1000000 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 100, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 37, which is lower than the lowest risk value (40cm). | | 1 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.3, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.43 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Atlantic distribution, but catches reported in Pacific and Indian Oceans. | | 1 |
| Encounterability | The depth range of the species is 1-40m. For surface gears, the vertical overlap index with this species is 100.00%. | | 3 |
| Selectivity | The maximum length of the species is 100cm. For albacore fisheries, the length overlap index with this species is 71.43%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 2.18 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Shortfin mako](#S_SMA" \o "PSA Score)** | | ***Isurus oxyrinchus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.100, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.100, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 4 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 445, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 278, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Coastal, oceanic species occurring from the surface to at least 500 m depth and is widespread in temperate and tropical waters of all oceans from about 50°N (up to 60°N in the NE Atlantic) to 50°S; occasionally found close inshore where the continental shelf is narrow; not normally found in waters below 16°C. Absent or rare in Indo-Pacific subtropics, uncommon in Mediterranean. | | 1 |
| Encounterability | The depth range of the species is 1-750m. For surface gears, the vertical overlap index with this species is 13.33%. | | 2 |
| Selectivity | The maximum length of the species is 445cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.43 |
|  | Vulnerability score | | 3.19 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Various sharks nei](#S_SKH" \o "PSA Score)** | | ***Selachimorpha (Pleurotremata)*** | |
| **Productivity** | | | |
| Average age at maturity | There is no information. | | 3 |
| Average max age | There is no information. | | 3 |
| Fecundity | The score is the maximum risk score in the catch group, Angelshark, of 1 species. | | 3 |
| Average max size | The score is the maximum risk score in the catch group, Various sharks nei, of 1 species. | | 3 |
| Average size at maturity | The score is the maximum risk score in the catch group, Various sharks nei, of 4 species. | | 3 |
| Reproductive strategy | The score is the maximum risk score in the catch group, Various sharks nei, of 4 species. | | 3 |
| Trophic level | The score is the maximum risk score in the catch group, Various sharks nei, of 4 species. | | 3 |
|  | Productivity score | | 3.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | No information. | | 3 |
| Encounterability | No information. | | 3 |
| Selectivity | No information. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 4.24 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Seerfishes nei](#S_KGX" \o "PSA Score)** | | ***Scomberomorus spp*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Molidae, which included 1 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Molidae, which included 1 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Scombridae, which included 27 species. | | 1 |
| Average max size | The score is based on the maximum risk score in the family Carcharhinidae, which included 32 species. | | 3 |
| Average size at maturity | The score is based on the maximum risk score in the family Carcharhinidae, which included 32 species. | | 3 |
| Reproductive strategy | The score is based on the maximum risk score in the family Centrolophidae, which included 1 species. | | 1 |
| Trophic level | The score is based on the maximum risk score in the family Carcharhinidae, which included 32 species. | | 3 |
|  | Productivity score | | 2.29 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-20m. For surface gears, the vertical overlap index with this species is 100.00%. | | 3 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 50 species is 458cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.77 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Silky shark](#S_FAL" \o "PSA Score)** | | ***Carcharhinus falciformis*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.100, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.100, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 2 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 350, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 228, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide coastal distribution, mainly coastal | | 1 |
| Encounterability | The depth range of the species is 1-4000m. For surface gears, the vertical overlap index with this species is 2.50%. This species is reef associated. | | 1 |
| Selectivity | The maximum length of the species is 350cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.20 |
|  | Vulnerability score | | 3.10 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Requiem sharks](#S_RSK" \o "PSA Score)** | | ***Family Carcharhinidae*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Myliobatidae, which included 1 species. | | 3 |
| Average max age | The score is based on the maximum risk score in the family Myliobatidae, which included 1 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Average max size | The score is based on the maximum risk score in the family Myliobatidae, which included 14 species. | | 3 |
| Average size at maturity | The score is based on the maximum risk score in the family Myliobatidae, which included 14 species. | | 3 |
| Reproductive strategy | The score is based on the maximum risk score in the family Scombridae, which included 44 species. | | 3 |
| Trophic level | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
|  | Productivity score | | 3.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-200m. For surface gears, the vertical overlap index with this species is 50.00%. | | 3 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 32 species is 750cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 4.24 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Oceanic triggerfish](#S_CNT" \o "PSA Score)** | | ***Canthidermis maculata*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Caesionidae, which included 1 species. | | 1 |
| Average max age | The score is based on the maximum risk score in the family Caesionidae, which included 1 species. | | 2 |
| Fecundity | There is no information, but fish are likely to produce >100 eggs/year. | | 2 |
| Average max size | Species maximum length is 50, which is lower than the lowest risk value (100cm). | | 1 |
| Average size at maturity | Species maximum length is 50cm, which is in the length at maturity medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is demersal egg layer, which is medium risk. | | 2 |
| Trophic level | Species trophic level is 3.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide coastal distribution, mainly coastal | | 1 |
| Encounterability | The depth range of the species is 1-110m. For surface gears, the vertical overlap index with this species is 90.91%. This species is reef associated. | | 2 |
| Selectivity | The maximum length of the species is 50cm. For albacore fisheries, the length overlap index with this species is 35.71%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.43 |
|  | Vulnerability score | | 2.34 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Small-spotted catshark](#S_SYC" \o "PSA Score)** | | ***Scyliorhinus canicula*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.100, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.100, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 29 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 100, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 57, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 3.8, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.29 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Southeast Atlantic distribution, but catches reported elsewhere. | | 1 |
| Encounterability | The depth range of the species is 10-780m. For surface gears, the vertical overlap index with this species is 11.80%. This species is demersal. | | 1 |
| Selectivity | The maximum length of the species is 100cm. For albacore fisheries, the length overlap index with this species is 71.43%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.20 |
|  | Vulnerability score | | 2.58 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Smooth hammerhead](#S_SPZ" \o "PSA Score)** | | ***Sphyrna zygaena*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Fecundity | Species fecundity is 20 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 500, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 265, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.9, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution. Species is coastal. | | 2 |
| Encounterability | The depth range of the species is 1-200m. For surface gears, the vertical overlap index with this species is 50.00%. | | 3 |
| Selectivity | The maximum length of the species is 500cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 3.68 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Dogfish sharks, etc. nei](#S_SHX" \o "PSA Score)** | | ***Squaliformes*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Scyliorhinidae, which included 1 species. | | 3 |
| Average max age | The score is based on the maximum risk score in the family Scyliorhinidae, which included 1 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Scombridae, which included 27 species. | | 3 |
| Average max size | The score is based on the maximum risk score in the family Etmopteridae, which included 5 species. | | 2 |
| Average size at maturity | The score is based on the maximum risk score in the family Etmopteridae, which included 5 species. | | 2 |
| Reproductive strategy | The score is based on the maximum risk score in the family Etmopteridae, which included 5 species. | | 3 |
| Trophic level | The score is based on the maximum risk score in the family Etmopteridae, which included 5 species. | | 3 |
|  | Productivity score | | 2.71 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-1460m. For surface gears, the vertical overlap index with this species is 6.85%. | | 1 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 3 species is 160cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 3.18 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Blue runner](#S_RUB" \o "PSA Score)** | | ***Caranx crysos*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.347, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.347, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | Species fecundity is 41000 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 70, which is lower than the lowest risk value (100cm). | | 1 |
| Average size at maturity | Species length at maturity is 27, which is lower than the lowest risk value (40cm). | | 1 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.1, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.29 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Atlantic distribution, catches reported in Pacific and Indian Oceans | | 1 |
| Encounterability | The depth range of the species is 1-100m. For surface gears, the vertical overlap index with this species is 100.00%. This species is reef associated. | | 2 |
| Selectivity | The maximum length of the species is 70cm. For albacore fisheries, the length overlap index with this species is 50.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.43 |
|  | Vulnerability score | | 1.92 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[True tunas nei](#S_TUS" \o "PSA Score)** | | ***Thunnus spp*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Scombridae, which included 35 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Scombridae, which included 35 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Scombridae, which included 27 species. | | 1 |
| Average max size | The score is based on the maximum risk score in the family Scombridae, which included 50 species. | | 3 |
| Average size at maturity | The score is based on the maximum risk score in the family Scombridae, which included 50 species. | | 3 |
| Reproductive strategy | The score is based on the maximum risk score in the family Scombridae, which included 44 species. | | 1 |
| Trophic level | The score is based on the maximum risk score in the family Scombridae, which included 50 species. | | 3 |
|  | Productivity score | | 2.29 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-250m. For surface gears, the vertical overlap index with this species is 40.00%. | | 3 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 50 species is 458cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.77 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Starry smooth-hound](#S_SDS" \o "PSA Score)** | | ***Mustelus asterias*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.100, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.100, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 7 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 140, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 80, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 3.6, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Southeast Atlantic distribution, but catches reported elsewhere | | 1 |
| Encounterability | The depth range of the species is 1-350m. For surface gears, the vertical overlap index with this species is 28.57%. This species is demersal. | | 1 |
| Selectivity | The maximum length of the species is 140cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.20 |
|  | Vulnerability score | | 2.84 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Smooth-hounds nei](#S_SDV" \o "PSA Score)** | | ***Mustelus spp*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Scyliorhinidae, which included 1 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Scyliorhinidae, which included 1 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Scyliorhinidae, which included 2 species. | | 3 |
| Average max size | The score is based on the maximum risk score in the family Scyliorhinidae, which included 5 species. | | 2 |
| Average size at maturity | The score is based on the maximum risk score in the family Scyliorhinidae, which included 5 species. | | 2 |
| Reproductive strategy | The score is based on the maximum risk score in the family Scyliorhinidae, which included 5 species. | | 3 |
| Trophic level | The score is based on the maximum risk score in the family Scyliorhinidae, which included 5 species. | | 3 |
|  | Productivity score | | 2.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide demersal distribution | | 3 |
| Encounterability | The depth range of the species is 1-350m. For surface gears, the vertical overlap index with this species is 28.57%. This species is demersal. | | 1 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 6 species is 200cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 3.06 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Porbeagle shark](#S_POR" \o "PSA Score)** | | ***Lamna nasus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.100, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.100, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 1 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 350, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 175, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.6, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.71 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Wide-ranging coastal and oceanic species found in temperate and cold-temperate waters worldwide, more common on continental shelves; coastal and oceanic, amphitemperate, with centres of distribution in the North Atlantic and in a circumglobal band of temperate water of the southern Atlantic, southern Indian Ocean, southern Pacific and Antarctic Ocean; In the SW Atlantic Ocean it is found below 26°S and SE Pacific, between 23 and 37°S. | | 3 |
| Encounterability | The depth range of the species is 1-715m. For surface gears, the vertical overlap index with this species is 13.99%. | | 2 |
| Selectivity | The maximum length of the species is 350cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 3.57 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Bluntnose sixgill shark](#S_SBL" \o "PSA Score)** | | ***Hexanchus griseus*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Molidae, which included 1 species. | | 1 |
| Average max age | The score is based on the maximum risk score in the family Molidae, which included 1 species. | | 2 |
| Fecundity | Species fecundity is 22 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 482, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 410, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide demersal distribution | | 3 |
| Encounterability | The depth range of the species is 1-2500m. For surface gears, the vertical overlap index with this species is 4.00%. This species is demersal. | | 1 |
| Selectivity | The maximum length of the species is 482cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 3.06 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Hammerhead sharks](#S_SPN" \o "PSA Score)** | | ***Family Sphyrnidae*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Sphyrnidae, which included 2 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Sphyrnidae, which included 2 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Clupeidae, which included 3 species. | | 3 |
| Average max size | The score is based on the maximum risk score in the family Ephippidae, which included 1 species. | | 3 |
| Average size at maturity | The score is based on the maximum risk score in the family Ephippidae, which included 1 species. | | 3 |
| Reproductive strategy | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Trophic level | The score is based on the maximum risk score in the family Ephippidae, which included 1 species. | | 3 |
|  | Productivity score | | 2.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-200m. For surface gears, the vertical overlap index with this species is 50.00%. | | 3 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 4 species is 610cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 4.14 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Thintail Thresher Shark](#S_ALV" \o "PSA Score)** | | ***Alopias vulpinus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.200, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.200, which is in the medium risk K range (0.12-0.30) for maximum age. | | 2 |
| Fecundity | Species fecundity is 2 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 573, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 303, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-650m. For surface gears, the vertical overlap index with this species is 15.38%. | | 2 |
| Selectivity | The maximum length of the species is 573cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 3.47 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Thresher sharks nei](#S_THR" \o "PSA Score)** | | ***Alopias spp*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Caesionidae, which included 1 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Caesionidae, which included 1 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Average max size | The score is based on the maximum risk score in the family Scyliorhinidae, which included 5 species. | | 3 |
| Average size at maturity | The score is based on the maximum risk score in the family Scyliorhinidae, which included 5 species. | | 3 |
| Reproductive strategy | The score is based on the maximum risk score in the family Scyliorhinidae, which included 5 species. | | 3 |
| Trophic level | The score is based on the maximum risk score in the family Scyliorhinidae, which included 5 species. | | 3 |
|  | Productivity score | | 2.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-500m. For surface gears, the vertical overlap index with this species is 20.00%. | | 2 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 3 species is 573cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 3.68 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[School Shark, Tope shark](#S_GAG" \o "PSA Score)** | | ***Galeorhinus galeus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.100, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.100, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 6 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 193, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 146, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.3, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide distribution, uncommon in tropics | | 3 |
| Encounterability | The depth range of the species is 1-1100m. For surface gears, the vertical overlap index with this species is 9.09%. | | 1 |
| Selectivity | The maximum length of the species is 193cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 3.06 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Scalloped hammerhead](#S_SPL" \o "PSA Score)** | | ***Sphyrna lewini*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.100, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.100, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 13 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 430, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 225, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.1, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-1000m. For surface gears, the vertical overlap index with this species is 10.00%. | | 2 |
| Selectivity | The maximum length of the species is 430cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 3.68 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Dogfish sharks nei](#S_DGX" \o "PSA Score)** | | ***Squalidae*** | |
| **Productivity** | | | |
| Average age at maturity | There is no information. | | 3 |
| Average max age | There is no information. | | 3 |
| Fecundity | The score is the maximum risk score in the catch group, Angelshark, of 1 species. | | 3 |
| Average max size | The score is the maximum risk score in the catch group, Dogfish sharks nei, of 3 species. | | 2 |
| Average size at maturity | The score is the maximum risk score in the catch group, Dogfish sharks nei, of 5 species. | | 2 |
| Reproductive strategy | The score is the maximum risk score in the catch group, Dogfish sharks nei, of 5 species. | | 3 |
| Trophic level | The score is the maximum risk score in the catch group, Dogfish sharks nei, of 5 species. | | 3 |
|  | Productivity score | | 2.71 |
| **Susceptibility** | | | |
| Areal overlap (availability) | No information. | | 3 |
| Encounterability | No information. | | 3 |
| Selectivity | No information. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 4.05 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Oilfish](#S_OIL" \o "PSA Score)** | | ***Ruvettus pretiosus*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Odontaspididae, which included 1 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Odontaspididae, which included 1 species. | | 2 |
| Fecundity | The score is based on the maximum risk score in the family Odontaspididae, which included 1 species. | | 1 |
| Average max size | Species maximum length is 300, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species maximum length is 300cm, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | The score is based on the maximum risk score in the family Myliobatidae, which included 15 species. | | 1 |
| Trophic level | Species trophic level is 4.2, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide distribution, mainly West Atlantic, absent East Pacific and subtropical Pacific Oceans. | | 2 |
| Encounterability | The depth range of the species is 100-800m. For surface gears, the vertical overlap index with this species is 0.14%. | | 1 |
| Selectivity | The maximum length of the species is 300cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.43 |
|  | Vulnerability score | | 2.46 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Dogfishes and hounds nei](#S_DGH" \o "PSA Score)** | | ***Squalidae, Scyliorhinidae*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Average max age | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Average max size | The score is based on the maximum risk score in the family Carcharhinidae, which included 32 species. | | 2 |
| Average size at maturity | The score is based on the maximum risk score in the family Diodontidae, which included 2 species. | | 2 |
| Reproductive strategy | The score is based on the maximum risk score in the family Carcharhinidae, which included 32 species. | | 3 |
| Trophic level | The score is based on the maximum risk score in the family Carcharhinidae, which included 32 species. | | 3 |
|  | Productivity score | | 2.71 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-1460m. For surface gears, the vertical overlap index with this species is 6.85%. | | 1 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 3 species is 160cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 3.18 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Atlantic saury](#S_SAU" \o "PSA Score)** | | ***Scomberesox saurus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.710, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.710, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | There is no information, but fish are likely to produce >100 eggs/year. | | 2 |
| Average max size | Species maximum length is 50, which is lower than the lowest risk value (100cm). | | 1 |
| Average size at maturity | Species length at maturity is 27, which is lower than the lowest risk value (40cm). | | 1 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 3.9, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.43 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Atlantic distribution, catches reported in Pacific and Indian Oceans | | 1 |
| Encounterability | The depth range of the species is 1-30m. For surface gears, the vertical overlap index with this species is 100.00%. | | 3 |
| Selectivity | The maximum length of the species is 50cm. For albacore fisheries, the length overlap index with this species is 35.71%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 2.18 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Oceanic whitetip shark](#S_OCS" \o "PSA Score)** | | ***Carcharhinus longimanus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.100, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.100, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 1 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 400, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 187, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.2, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.71 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-230m. For surface gears, the vertical overlap index with this species is 43.48%. | | 3 |
| Selectivity | The maximum length of the species is 400cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 4.05 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Slender sunfish](#S_RZV" \o "PSA Score)** | | ***Ranzania laevis*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Dasyatidae, which included 3 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Dasyatidae, which included 3 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Dasyatidae, which included 6 species. | | 1 |
| Average max size | Species maximum length is 100, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species maximum length is 100cm, which is in the length at maturity medium risk range (40-200cm). | | 2 |
| Reproductive strategy | The score is based on the maximum risk score in the family Echeneidae , which included 1 species. | | 1 |
| Trophic level | Species trophic level is 3.7, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-140m. For surface gears, the vertical overlap index with this species is 71.43%. | | 3 |
| Selectivity | The maximum length of the species is 100cm. For albacore fisheries, the length overlap index with this species is 71.43%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.61 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Dusky shark](#S_DUS" \o "PSA Score)** | | ***Carcharhinus obscurus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.040, which is lower than highest risk K (0.061) for age at maturity. | | 3 |
| Average max age | Species growth rate (K) is 0.040, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 3 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 420, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 235, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.3, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 3.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide coastal distribution | | 2 |
| Encounterability | The depth range of the species is 1-400m. For surface gears, the vertical overlap index with this species is 25.00%. This species is reef associated. | | 1 |
| Selectivity | The maximum length of the species is 420cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.43 |
|  | Vulnerability score | | 3.32 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Smooth-hound](#S_SMD" \o "PSA Score)** | | ***Mustelus mustelus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.100, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.100, which is lower than highest risk K (0.12) for maximum age. | | 3 |
| Fecundity | Species fecundity is 4 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 200, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 80, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 3.8, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Widespread, from Northern Europe to S. Africa, including the Mediterranean Sea, although it is less common in the northern portion of its range; usually found in shallow waters at 5-50 m depth, although it occurs to at least 350 m deep. Although mainly found in the coastal East Atantic, catches are reported in the Indian Ocean. | | 1 |
| Encounterability | The depth range of the species is 5-624m. For surface gears, the vertical overlap index with this species is 15.48%. This species is demersal. | | 1 |
| Selectivity | The maximum length of the species is 200cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.20 |
|  | Vulnerability score | | 2.84 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Unicorn leatherjacket filefish](#S_ALM" \o "PSA Score)** | | ***Aluterus monoceros*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.220, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.220, which is in the medium risk K range (0.12-0.30) for maximum age. | | 2 |
| Fecundity | There is no information, but fish are likely to produce >100 eggs/year. | | 2 |
| Average max size | Species maximum length is 76, which is lower than the lowest risk value (100cm). | | 1 |
| Average size at maturity | Species maximum length is 76cm, which is in the length at maturity medium risk range (40-200cm). | | 2 |
| Reproductive strategy | There is no information, but fish are not live bearers. | | 2 |
| Trophic level | Species trophic level is 3.8, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide juvenile pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-80m. For surface gears, the vertical overlap index with this species is 100.00%. | | 3 |
| Selectivity | The maximum length of the species is 76.2cm. For albacore fisheries, the length overlap index with this species is 54.43%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.53 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Snake mackerel](#S_GES" \o "PSA Score)** | | ***Gempylus serpens*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Gempylidae, which included 3 species. | | 2 |
| Fecundity | Species fecundity is 650000 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 100, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 50, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.4, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Distribution worldwide in tropical and subtropical seas. | | 3 |
| Encounterability | The depth range of the species is 1-600m. For surface gears, the vertical overlap index with this species is 16.67%. | | 2 |
| Selectivity | The maximum length of the species is 100cm. For albacore fisheries, the length overlap index with this species is 71.43%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 2.98 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Great barracuda](#S_GBA" \o "PSA Score)** | | ***Sphyraena barracuda*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.124, which is in the medium risk K range (0.061-0.183) for age at maturity. | | 2 |
| Average max age | Species growth rate (K) is 0.124, which is in the medium risk K range (0.12-0.30) for maximum age. | | 2 |
| Fecundity | There is no information, but fish are likely to produce >100 eggs/year. | | 2 |
| Average max size | Species maximum length is 200, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 66, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide coastal distribution, mainly coastal | | 1 |
| Encounterability | The depth range of the species is 1-100m. For surface gears, the vertical overlap index with this species is 100.00%. This species is reef associated. | | 2 |
| Selectivity | The maximum length of the species is 200cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.43 |
|  | Vulnerability score | | 2.46 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Great hammerhead](#S_SPK" \o "PSA Score)** | | ***Sphyrna mokarran*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Istiophoridae, which included 5 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Istiophoridae, which included 5 species. | | 3 |
| Fecundity | Species fecundity is 13 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 610, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 251, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.3, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution. Species is coastal. | | 2 |
| Encounterability | The depth range of the species is 1-300m. For surface gears, the vertical overlap index with this species is 33.33%. This species is reef associated. | | 2 |
| Selectivity | The maximum length of the species is 610cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.88 |
|  | Vulnerability score | | 3.42 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Catsharks, nursehounds nei](#S_SCL" \o "PSA Score)** | | ***Scyliorhinus spp*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Average max size | The score is based on the maximum risk score in the family Myliobatidae, which included 14 species. | | 2 |
| Average size at maturity | The score is based on the maximum risk score in the family Myliobatidae, which included 14 species. | | 2 |
| Reproductive strategy | The score is based on the maximum risk score in the family Molidae, which included 4 species. | | 2 |
| Trophic level | The score is based on the maximum risk score in the family Myliobatidae, which included 15 species. | | 3 |
|  | Productivity score | | 2.43 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide demersal distribution | | 3 |
| Encounterability | The depth range of the species is 1-800m. For surface gears, the vertical overlap index with this species is 12.50%. This species is demersal. | | 1 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 5 species is 170cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 2.94 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Cat sharks](#S_SYX" \o "PSA Score)** | | ***Scyliorhinidae*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Scyliorhinidae, which included 1 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Somniosidae, which included 2 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Somniosidae, which included 7 species. | | 3 |
| Average max size | The score is based on the maximum risk score in the family Scombridae, which included 50 species. | | 2 |
| Average size at maturity | The score is based on the maximum risk score in the family Scombridae, which included 50 species. | | 2 |
| Reproductive strategy | The score is based on the maximum risk score in the family Scombridae, which included 44 species. | | 2 |
| Trophic level | The score is based on the maximum risk score in the family Scombridae, which included 50 species. | | 3 |
|  | Productivity score | | 2.43 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide demersal distribution | | 3 |
| Encounterability | The depth range of the species is 1-800m. For surface gears, the vertical overlap index with this species is 12.50%. This species is demersal. | | 1 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 5 species is 170cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 2.94 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Ocean sunfish](#S_MOX" \o "PSA Score)** | | ***Mola mola*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Scombridae, which included 35 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Scombridae, which included 35 species. | | 3 |
| Fecundity | Species fecundity is 300000000 eggs/year, which is higher than the lowest risk value (20000). | | 1 |
| Average max size | Species maximum length is 333, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species maximum length is 333cm, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 3.7, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.29 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 30-480m. For surface gears, the vertical overlap index with this species is 15.74%. | | 2 |
| Selectivity | The maximum length of the species is 333cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 3.26 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Grey triggerfish](#S_TRG" \o "PSA Score)** | | ***Balistes capriscus*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.200, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.200, which is in the medium risk K range (0.12-0.30) for maximum age. | | 2 |
| Fecundity | There is no information, but fish are likely to produce >100 eggs/year. | | 2 |
| Average max size | Species maximum length is 60, which is lower than the lowest risk value (100cm). | | 1 |
| Average size at maturity | Species length at maturity is 16, which is lower than the lowest risk value (40cm). | | 1 |
| Reproductive strategy | Species reproductive strategy is demersal egg layer, which is medium risk. | | 2 |
| Trophic level | Species trophic level is 4.1, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.71 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Atlantic distribution, but catches reported in Pacific and Indian Oceans | | 1 |
| Encounterability | The depth range of the species is 1-100m. For surface gears, the vertical overlap index with this species is 100.00%. This species is reef associated. | | 2 |
| Selectivity | The maximum length of the species is 60cm. For albacore fisheries, the length overlap index with this species is 42.86%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.43 |
|  | Vulnerability score | | 2.23 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Giant Devil Ray](#S_RMM" \o "PSA Score)** | | ***Mobula mobular*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Myliobatidae, which included 1 species. | | 1 |
| Average max age | The score is based on the maximum risk score in the family Carangidae, which included 17 species. | | 2 |
| Fecundity | The score is based on the maximum risk score in the family Carangidae, which included 3 species. | | 3 |
| Average max size | Species maximum length is 520, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species maximum length is 520cm, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 3.7, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Occurs throughout the Mediterranean Sea, and possibly in the nearby NE Atlantic, but absent from the Black Sea. It has been reported from the coast of NW Africa (Morocco to Senegal), the Canary Islands, Madeira, the Azores, Portugal, and as a vagrant off southern Ireland . Species is coastal. However, catches have been reported in Atlantic and Indian Ocean fisheries. | | 1 |
| Encounterability | The depth range of the species is 1-100m. For surface gears, the vertical overlap index with this species is 100.00%. | | 3 |
| Selectivity | The maximum length of the species is 520cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 3.06 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Ground sharks](#S_CVX" \o "PSA Score)** | | ***Carcharhiniformes*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Centrophoridae, which included 3 species. | | 3 |
| Average max age | The score is based on the maximum risk score in the family Centrophoridae, which included 3 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Average max size | The score is based on the maximum risk score in the family Scombridae, which included 50 species. | | 3 |
| Average size at maturity | The score is based on the maximum risk score in the family Scombridae, which included 50 species. | | 3 |
| Reproductive strategy | The score is based on the maximum risk score in the family Scombridae, which included 44 species. | | 3 |
| Trophic level | The score is based on the maximum risk score in the family Scombridae, which included 50 species. | | 3 |
|  | Productivity score | | 3.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-800m. For surface gears, the vertical overlap index with this species is 12.50%. | | 2 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 32 species is 750cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 3.80 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Nursehound](#S_SYT" \o "PSA Score)** | | ***Scyliorhinus stellaris*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Somniosidae, which included 2 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Scombridae, which included 35 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Dasyatidae, which included 6 species. | | 3 |
| Average max size | Species maximum length is 170, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 77, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is demersal egg layer, which is medium risk. | | 2 |
| Trophic level | Species trophic level is 4.0, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.43 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Southeast Atlantic distribution, but catches reported elsewhere | | 1 |
| Encounterability | The depth range of the species is 1-400m. For surface gears, the vertical overlap index with this species is 25.00%. This species is reef associated. | | 1 |
| Selectivity | The maximum length of the species is 170cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.20 |
|  | Vulnerability score | | 2.71 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Giant manta](#S_RMB" \o "PSA Score)** | | ***Manta birostris*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Carangidae, which included 17 species. | | 1 |
| Average max age | The score is based on the maximum risk score in the family Myliobatidae, which included 1 species. | | 2 |
| Fecundity | Species fecundity is 1 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 910, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 400, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 3.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide coastal distribution | | 2 |
| Encounterability | The depth range of the species is 1-120m. For surface gears, the vertical overlap index with this species is 83.33%. This species is reef associated. | | 2 |
| Selectivity | The maximum length of the species is 910cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.88 |
|  | Vulnerability score | | 3.18 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Spinner shark](#S_CCB" \o "PSA Score)** | | ***Carcharhinus brevipinna*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.200, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.200, which is in the medium risk K range (0.12-0.30) for maximum age. | | 2 |
| Fecundity | Species fecundity is 3 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 300, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 210, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.2, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.43 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide distribution, absent in Mediterranean / Southern Indian Ocean, mainly coastal | | 2 |
| Encounterability | The depth range of the species is 1-100m. For surface gears, the vertical overlap index with this species is 100.00%. This species is reef associated. | | 2 |
| Selectivity | The maximum length of the species is 300cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.88 |
|  | Vulnerability score | | 3.07 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Longfin mako](#S_LMA" \o "PSA Score)** | | ***Isurus paucus*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 3 |
| Fecundity | Species fecundity is 2 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 427, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species length at maturity is 205, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.5, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-1752m. For surface gears, the vertical overlap index with this species is 5.71%. | | 1 |
| Selectivity | The maximum length of the species is 427cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 3.30 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Cottonmouth jack](#S_USE" \o "PSA Score)** | | ***Uraspis secunda*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Carangidae, which included 17 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Carangidae, which included 17 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Carangidae, which included 3 species. | | 1 |
| Average max size | Species maximum length is 50, which is lower than the lowest risk value (100cm). | | 1 |
| Average size at maturity | Species maximum length is 50cm, which is in the length at maturity medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 4.0, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.86 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-50m. For surface gears, the vertical overlap index with this species is 100.00%. | | 3 |
| Selectivity | The maximum length of the species is 50cm. For albacore fisheries, the length overlap index with this species is 35.71%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 3.00 |
|  | Vulnerability score | | 3.53 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Pelagic stingray](#S_PLS" \o "PSA Score)** | | ***Pteroplatytrygon violacea*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.200, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.200, which is in the medium risk K range (0.12-0.30) for maximum age. | | 2 |
| Fecundity | Species fecundity is 2 eggs/year, which is lower than the highest risk value (100). | | 3 |
| Average max size | Species maximum length is 96, which is lower than the lowest risk value (100cm). | | 1 |
| Average size at maturity | Species length at maturity is 38, which is lower than the lowest risk value (40cm). | | 1 |
| Reproductive strategy | Species reproductive strategy is live bearer, which is high risk. | | 3 |
| Trophic level | Species trophic level is 4.4, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-381m. For surface gears, the vertical overlap index with this species is 26.25%. | | 2 |
| Selectivity | The maximum length of the species is 96cm. For albacore fisheries, the length overlap index with this species is 68.57%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 3.07 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Flyingfish](#S_FLY" \o "PSA Score)** | | ***Family Exocoetidae*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 1 |
| Average max age | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 1 |
| Fecundity | There is no information, but fish are likely to produce >100 eggs/year. | | 2 |
| Average max size | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 1 |
| Average size at maturity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 1 |
| Reproductive strategy | Species reproductive strategy is demersal egg layer, which is medium risk. | | 2 |
| Trophic level | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 2 |
|  | Productivity score | | 1.43 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-20m. For surface gears, the vertical overlap index with this species is 100.00%. | | 3 |
| Selectivity | The maximum length of the species is missing, but the family's maximum length based on 1 species is 30cm. For albacore fisheries, the length overlap index with this species is 21.43%. | | 2 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 2.73 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Sharptail mola](#S_MRW" \o "PSA Score)** | | ***Masturus lanceolatus*** | |
| **Productivity** | | | |
| Average age at maturity | The score is based on the maximum risk score in the family Myliobatidae, which included 1 species. | | 2 |
| Average max age | The score is based on the maximum risk score in the family Myliobatidae, which included 1 species. | | 3 |
| Fecundity | The score is based on the maximum risk score in the family Scombridae, which included 27 species. | | 1 |
| Average max size | Species maximum length is 337, which is higher than the highest risk value (300cm). | | 3 |
| Average size at maturity | Species maximum length is 337cm, which is higher than the highest risk value (200cm). | | 3 |
| Reproductive strategy | Species reproductive strategy is broadcast spawner, which is low risk. | | 1 |
| Trophic level | Species trophic level is 3.8, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.29 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide pelagic distribution | | 3 |
| Encounterability | The depth range of the species is 1-670m. For surface gears, the vertical overlap index with this species is 14.93%. | | 2 |
| Selectivity | The maximum length of the species is 337cm. For albacore fisheries, the length overlap index with this species is 100.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 2.33 |
|  | Vulnerability score | | 3.26 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Garfish](#S_GAR" \o "PSA Score)** | | ***Belone belone*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 0.290, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 0.290, which is in the medium risk K range (0.12-0.30) for maximum age. | | 2 |
| Fecundity | Species fecundity is 19252 eggs/year, which is in the medium risk range (100-20000). | | 2 |
| Average max size | Species maximum length is 104, which is in the medium risk range (100-300cm). | | 2 |
| Average size at maturity | Species length at maturity is 45, which is in the medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is demersal egg layer, which is medium risk. | | 2 |
| Trophic level | Species trophic level is 4.2, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 2.00 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Northeastern Atlantic and Mediterranean Sea only, but catches reported for elsewhere. | | 1 |
| Encounterability | The depth range of the species is 1-200m. For surface gears, the vertical overlap index with this species is 50.00%. | | 3 |
| Selectivity | The maximum length of the species is 104cm. For albacore fisheries, the length overlap index with this species is 74.29%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.65 |
|  | Vulnerability score | | 2.59 |

|  |  |  |  |
| --- | --- | --- | --- |
| **[Pilotfish](#S_NAU" \o "PSA Score)** | | ***Naucrates ductor*** | |
| **Productivity** | | | |
| Average age at maturity | Species growth rate (K) is 2.360, which is higher than lowest risk K (0.183) for age at maturity. | | 1 |
| Average max age | Species growth rate (K) is 2.360, which is higher than lowest risk K (0.30) for maximum age. | | 1 |
| Fecundity | The score is based on the maximum risk score in the family Agonidae, which included 1 species. | | 1 |
| Average max size | Species maximum length is 70, which is lower than the lowest risk value (100cm). | | 1 |
| Average size at maturity | Species maximum length is 70cm, which is in the length at maturity medium risk range (40-200cm). | | 2 |
| Reproductive strategy | Species reproductive strategy is demersal egg layer, which is medium risk. | | 2 |
| Trophic level | Species trophic level is 3.4, which is higher than the highest risk value (3.25). | | 3 |
|  | Productivity score | | 1.57 |
| **Susceptibility** | | | |
| Areal overlap (availability) | Worldwide distribution, mainly coastal | | 2 |
| Encounterability | The depth range of the species is 1-300m. For surface gears, the vertical overlap index with this species is 33.33%. This species is reef associated. | | 2 |
| Selectivity | The maximum length of the species is 70cm. For albacore fisheries, the length overlap index with this species is 50.00%. | | 3 |
| Post capture mortality | No direct evidence of survival after capture. | | 3 |
|  | Susceptibility score | | 1.88 |
|  | Vulnerability score | | 2.45 |