
Productivity Susceptibility Analysis (PSA) – Maldives Handline Fishery Livebait

**For Partial Fulfilment of the Conditions Required for
Maldives Handline Yellowfin Tuna FIP**

**November 2022
MSC Reporting Template: Version 1.2**

1 Introduction

The Productivity Susceptibility Analysis (PSA) is described in detail in the MSC Fisheries Certification Process V2.2 (Annex PF4, MSC 2018). In summary, the data required for the PSA are divided in to two sections, one covering 'productivity' attributes (which effectively describe the biological and life history attributes of the species'), and one covering 'susceptibility' attributes (which effectively describe the potential for interaction between the species and the UoA).

The productivity attributes for a species are species-specific and do not change between different fisheries. The facilitator, Shiham Adam, derived productivity information for each species from the available literature (mainly from <https://fishbase.net.br/search.php>) and where possible primary / grey literature listed below.

2 Stakeholder Meeting and PSA

A stakeholder meeting was organised by MSPEA on 10 February 2022. Invitation was sent to key stakeholders – key fishers / vessel owners, processors, managers and scientists. Following officials turned up the meeting:

The PSA analysis was conducted by Dr. Shiham Adam.

1. M. Shiham Adam – Consultant / Advisor + FIP Lead, IPNLF -Maldives / MSPEA - Facilitator
2. Shafin Ahmed – Bigfish Pvt Ltd
3. Umar Jamaal - Ocean Seafood Maldives
4. Ismail Fauzee – Maldives Industrial Fisheries Company.
5. Adam Ziyad – Director General, Ministry of Fisheries, Marine Resources and Agriculture
6. Ibrahim Naeem – Director General, Environmental Protection Agency
7. Ibrahim Saneeh – IPNLF-Maldives
8. Aishath Amaan - MSPEA

Members were briefed of the objective of the meeting: i) to address P2 issues identified in the Maldives handline line yellowfin tuna FIP ii) issues in ETP an livebait on data and monitoring and management). Ministry of Fisheries, Marine Resources & Agriculture noted the logbooks do have fields to indicate ETP interaction and none of them so far have indicated any. It was agreed ETP interaction with the fisheries does not happen to any degree of concern. It was, however, noted that during light bait fishing events, whale sharks, dolphins and manta rays are attracted, but only rarely, and are never harmed. Many observed those encounters may not be truly an interaction since they never become close during hauling. Since night livebait fishing is passive method of fishing, any animal that get close the net at the time of hauling is distracted and chased away.

It was noted that the ETP interactions with livebait and the in the fishery should be investigated through analysis of data captured from IPNLF-Maldives' Observer Programme data which is being collected. A separate summary documents of ETP / Livebait has been prepared and uploaded fisheryprogress.org website.

2.1 Scoring for Productivity and Susceptibly

Below is the summary guidance that was used score productivity and susceptibility attributes. These are summaries extracted from the MSC documents. Where there is limited information available to score a susceptibility attribute, the more precautionary score has been used. Summary tables form MSC documents are given Table 1 and Table 2.

Aerial overlap: Where the impacts of fisheries other than the UoA are considered, the areal overlap is scored as the combined overlap of all listed fisheries with the areal concentration of a stock. Also, the scoring of areal overlap considers the concentration of species and the overlap of the fishing gear with the concentration species.

Encounterability: Where impacts of fisheries other than the UoA are considered, encounterability is scored as the combined encounterability of all listed fisheries. The scoring of encounterability considers concentration of species and the overlap of the fishing gear with the concentration species. The deployment of fishing gear in relation to each species adult habitat is the main aspect to be considered for each species.

Gear selectivity: 'Rarely' means that the capture of individuals smaller than the size at maturity occurs in less than 5% few gear deployments. 'Regularly' means that the capture of individuals smaller than the size at maturity occurs in 5% to 50% of the gear deployments. - 'Frequently' means that the capture of individuals smaller than the size at maturity occurs in more than 50% of gear deployments.

Post-capture mortality: Since UoA targets these for retaining and use as livebait, they would be all dead, although rarely few individuals of some species (e.g., Red-toothed trigger fishes) may survive in open ocean which subsequently may be subjected to natural mortality.

Table 1: PF4: PSA productivity attributes and scores, Document: MSC Fisheries Certification Process v2.2 Page 71. Date of publication: 25 August 2020

| Productivity attribute. | High productivity (low risk, score equals 1. | Medium productivity, (medium risk, score equals 2. | Low productivity. (high risk, score equals 3. |
|--|---|--|---|
| Average age at maturity. | < 5 yrs | 5 to 15 yrs. | > 15 yrs. |
| average maximum age. | < 10 yrs | 10 to 25 yrs. | > 25 yrs. |
| Fecundity | > 20,000 eggs per yr. | 100 to 200,000 eggs per year. | < 10 eggs per yr. |
| Average maximum size (not to be used. When scoring invertebrate species.) | < 100 cm. | 100 to 300 cm. | > 300 cm. |
| Every size at maturity. (Not to be used when scoring invertebrate species) | < 40 cm. | 400 to 200 cm. | > 200 cm. |
| Reproductive strategy. | broadcast spawner. | Demersal egg layer. | Live bearer. |
| Trophic level. | < 2.75 | . 2.75 to 3.25. | > 3.25. |
| density dependence (to be used when scoring invertebrate species only. | Compensatory dynamics at low population size, demonstrated or likely. | No dependatory or compensatory dynamics demonstrated. Or likely. | Deep insecurity dynamics at low production sizes. (Allee effects.) demonstrated all likely. |

Table 2: PF5: PSA susceptibility attributes and scores, Document: MSC Fisheries Certification Process v2.2 Page 73 Date of publication: 25 August 2020

| Susceptibility attribute. | Low susceptibility, (low risk, score = 1) | Medium susceptibility. (medium risk, score = 2) | High susceptibility. (High risk, score = 3. |
|---|--|---|--|
| Average, overlap, (availability): Overlap of the fishing effort with a species concentration of the stock. | < 10% overlap. | 10 to 30% overlap. | > 30% overlap. |
| Encounter ability Encounter ability. The position of the stock slash species within the water column relative to the fishing gear, and the position of the stock slash species within the habitat | low overlap with fishing gear (low encounter ability). | Medium overlap with fishing gear. | High overlap with fishing gear. (High encounter ability). Default score for target species. |


| | | | | |
|---|---|--|---|---|
| relative to the position of the gear.: | | | | (Principle 1). |
| selectivity of gear type: Potential of the gear to retain species. | a | Individuals less than size at maturity are rarely caught. | a | Individuals less than size at maturity are regularly caught. |
| | b | Individuals less than size at maturity can escape or avoid gear. | b | Individuals less than half the size at maturity can escape or avoid gear. |
| Post capture mortality, (PCM): The chance that, if captured, a species would be released and that it would be in a condition permitting subsequent survival. | Evidence of majority released post- capture and survival. | | Evidence of some released post-capture and survival. | |
| | | | Retain species or majority or dead when released. Default score for return species, (principle one, or principle 2). | |

Information and provisional scoring of 'Productivity' and 'Susceptibility' is provided in the following sections. MSC RBF Worksheets were used to compute the scores. Decisions on scores were made unanimous.

3 Risk-based Framework Outputs

3.1 Fusiliers – Fam: Caesionidae

| Table 1a – PSA productivity and susceptibility attributes and scores | | |
|--|---|-------|
| Performance Indicator | 2.2.2 | |
| Productivity | | |
| Scoring element (species) | Livebait variety: <i>Caesio spp</i> | |
| Attribute | Rationale | Score |
| Average age at maturity | They have short life, small schooling epi-pelagic variety | 1 |
| Average maximum age | Information not available – if the species are short lived, it is assumed that will be 10 years | 1 |
| Fecundity | It was assumed that number of eggs released per year would be >20,000 per year | 1 |
| Average maximum size Not scored for invertebrates | It is no more than 10 cm FL | 1 |
| Average size at maturity Not scored for invertebrates | Same as above | 1 |

| | | |
|---|---|------------------|
| Reproductive strategy | Fusiliers are broadcast spawners | 1 |
| Trophic level | Trophic level is less than 2.75 | 2 |
| Density dependence Invertebrates only | Only for invertebrates | |
| Susceptibility | | |
| Fishery Only where the scoring element is scored cumulatively | <i>Insert list of fisheries impacting the given scoring element (FCP v2.2 Annex PF 7.4.10)</i> The fisheries impacting the given scoring element would be the general reef fish fishery as some fusiliers would be a prey species of the commercial reef fishes being fished in commercial reef fisheries and in sports and other recreational fishery. | |
| Attribute | Rationale | Score |
| Areal Overlap | <p>Fusiliers (Fam: Caesionidae) is common and occurs all throughout the Maldives. They feed on zooplankton that drift in current. They are often seen in current swept area and in reef slopes all throughout the Maldives</p>  <p><i>Distribution of Caesion lunaris on Aquamap (would be a typical distribution map for Caesionidae.</i></p> <p>Given the vast area of the distribution of the species, it was assumed the handline livebait fishery was having access to less 10%</p> | 1 |
| Encounterability | <i>Insert attribute rationale.</i> With regards to encounterability and given their distribution we assumed there would be lower overlap with the gear. | 1 |
| Selectivity of gear type | We assume reasonable amount of the individuals < size at maturity are caught in the fishery | 2 |
| Post capture mortality | All individuals caught are likely to be dead | 3 |
| Catch (weight) Only where the scoring element is scored cumulatively | <i>Insert weights or proportions of fisheries impacting the given scoring element (FCP v2.2 Annex PF4.4.4)</i> | 1 / 2 / 3 |


3.2 Bigeye Scad - *Selar crumenophthalmus*

Bigeye scad (*Selar crumenophthalmus*) of the family Carangidae is a small coastal pelagic fish that is abundantly found in the coastal waters of the Maldives. It is quite a popular food fish. Other than being consumed as a traditional delicacy, the fish are also used as bait to catch tuna. An unknow

quantity of species is caught as food fish. The fishing method is pole-and-line using small lures conducted on small vessel in the lagoons and in coastal area.

Therefore, bigeye scad is considered both socially and economically important for the Maldives. Research shows the size ranges that occur in the Maldives is 7 cm to 25 cm in fork length. Synchronous reproductive behaviour is observed in both sexes and a pronounced peak of Gonadosomatic index observed in females in January. The length at first maturity (L50) for females is at 19.39 cm FL and for males at 21.76 cm FL

| Table 1b – PSA productivity and susceptibility attributes and scores | | |
|---|---|--------------|
| Performance Indicator | 2.2.2 | |
| Productivity | | |
| Scoring element (species) | Livebait variety: Selar crumnephthalmus | |
| Attribute | Rationale | Score |
| Average age at maturity | They live very short life, small schooling epi-pelagic variety | 1 |
| Average maximum age | Information not available – it is short lived; it will be less than 10 years | 1 |
| Fecundity | It was assumed that number of eggs released per year would be >20,000 per year | 1 |
| Average maximum size Not scored for invertebrates | It is no more than 10 cm FL | 1 |
| Average size at maturity Not scored for invertebrates | Same as above | 1 |
| Reproductive strategy | Fusiliers are broad cast spawners | 1 |
| Trophic level | Trophic level is less than 2.75 | 2 |
| Density dependence Invertebrates only | Only for invertebrates | |
| Susceptibility | | |
| Fishery Only where the scoring element is scored cumulatively | <i>Insert list of fisheries impacting the given scoring element (FCP v2.2 Annex PF 7.4.10)</i> The fisheries impacting the given scoring element would be the general reef fish fishery as some fusiliers would be a prey species of the commercial reef fisheries | |
| Attribute | Rationale | Score |

| | | |
|---|--|-----------|
| Areal Overlap | <p><i>Insert attribute rationale. Note specific requirements in FCP v2.2 Annex PF4.4.6.b, where the impacts of fisheries other than the UoA are taken into account</i></p> <p>Given the vast area of the distribution of the species, it was assumed the handline livebait fishery was having access to less 10%</p>  <p><i>Figure 1: Distribution of bigeye scad as given in aquamap.</i></p> | 1 |
| Encounterability | <p><i>Insert attribute rationale. Note specific requirements in FCP v2.2 Annex PF4.4.6.b, where the impacts of fisheries other than the UoA are taken into account</i></p> <p>With regards to encounterability, we assumed there would be medium overlap with the gear.</p> | 2 |
| Selectivity of gear type | We assume reasonable amount of the individuals < size at maturity are caught in the fishery | 2 |
| Post capture mortality | All individuals caught are likely to be dead | 3 |
| Catch (weight) Only where the scoring element is scored cumulatively | <i>Insert weights or proportions of fisheries impacting the given scoring element (FCP v2.2 Annex PF4.4.4)</i> | 1 / 2 / 3 |

3.3 Redtooth Niger – *Odonus niger*

The Red-toothed triggerfish (*Odonus niger*) is a triggerfish of the tropical Indo-Pacific area, and the sole member of its genus. The species is commonly found on reef channels or current swept slopes. They survive by hiding under between rocks and crevices, so they don't get swept away by the water currents. They also may live in the coastal shallow inshore waters at depths of around 30 – 100 feet (9 – 30 meters). Red-toothed triggers are mostly planktivorous eaters. They can form schools and normally feed on zooplankton which gets carried by the currents. Sponges are another part of their diet. They are also known to be carnivorous and can eat many different types of animals such as krill, clams, squid, urchins, and small fish.

These fish have distinct pairing. They meet at mating grounds where males set up their territories. *O. niger* build nests to lay their eggs in. The females take care of the eggs while both males and females guard the eggs waiting for them to hatch.

| Table 1c – PSA productivity and susceptibility attributes and scores | |
|---|-------|
| Performance Indicator | 2.2.2 |

| Productivity | | |
|--|---|--------------|
| Scoring element (species) | Livebait variety: <i>Odonus niger</i> | |
| Attribute | Rationale | Score |
| Average age at maturity | They live very short life, small schooling epi-pelagic variety | 1 |
| Average maximum age | Information not available – it is short lived; it will be less than 10 years | 1 |
| Fecundity | It was assumed that number of eggs released per year would be >20,000 per year | 2 |
| Average maximum size Not scored for invertebrates | It is no more than 10 cm FL | 1 |
| Average size at maturity Not scored for invertebrates | Same as above | 1 |
| Reproductive strategy | Build nests to lay their eggs in. The females take care of the eggs while both males and females guard the eggs waiting for them to hatch | 2 |
| Trophic level | Trophic level is less than 2.75 | 2 |
| Density dependence Invertebrates only | Only for invertebrates | |
| Susceptibility | | |
| Fishery Only where the scoring element is scored cumulatively | <i>Insert list of fisheries impacting the given scoring element (FCP v2.2 Annex PF 7.4.10)</i> The fisheries impacting the given scoring element would be the general reef fish fishery as some fusiliers would be a prey species of the commercial reef fisheries | |
| Attribute | Rationale | Score |
| Areal Overlap | <i>Insert attribute rationale. Note specific requirements in FCP v2.2 Annex PF4.4.6.b, where the impacts of fisheries other than the UoA are taken into account</i> Given the vast area of the distribution of the species, it was assumed the handline livebait fishery was having access to less 10% | 1 |
| Encounterability | <i>Insert attribute rationale. Note specific requirements in FCP v2.2 Annex PF4.4.6.b, where the impacts of fisheries other than the UoA are taken into account</i> With regards to encounterability, we assumed there would be medium overlap with the gear. | 3 |
| Selectivity of gear type | We assume reasonable amount of the individuals < size at maturity is caught in the fishery | 2 |

| | | |
|---|---|------------------|
| Post capture mortality | All individuals caught would be dead since the species is retained and used as livebait, although few (on rare occasions) may survive when through as bait in the open ocean. | 3 |
| Catch (weight) Only where the scoring element is scored cumulatively | <i>Insert weights or proportions of fisheries impacting the given scoring element (FCP v2.2 Annex PF4.4.4)</i> | 1 / 2 / 3 |

3.4 Round Scad - *Decapterus macarellus*

Like the bigeye scad, round scad, is very common in the Maldives. An unknown quantity of species is caught as food fish. The fishing method is pole-and-line using small lures conducted from small vessel in atoll and island lagoons and in coastal areas of the archipelago.

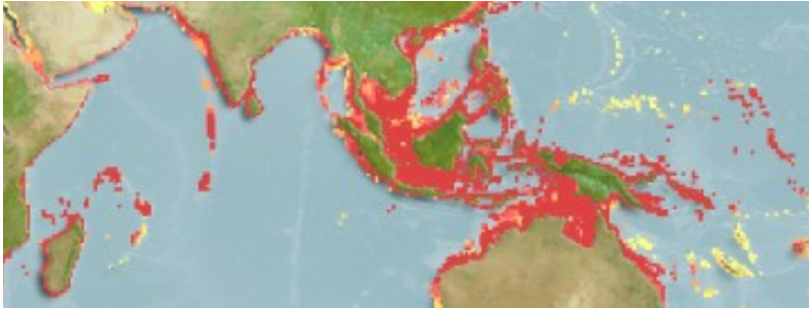
| Table 1d – PSA productivity and susceptibility attributes and scores | | |
|--|---|--------------|
| Performance Indicator | 2.2.2 | |
| Productivity | | |
| Scoring element (species) | Livebait variety: <i>Decapterus macarellus</i> | |
| Attribute | Rationale | Score |
| Average age at maturity | They live very short life, small schooling epi-pelagic variety | 1 |
| Average maximum age | Information not available – it is short lived; it will be less than 10 years | 1 |
| Fecundity | It was assumed that number of eggs released per year would be >20,000 per year | 1 |
| Average maximum size Not scored for invertebrates | It is no more than 15-20 cm FL | 1 |
| Average size at maturity Not scored for invertebrates | Unknown [?] but considered to be, but will be considered <40 cm FL | 1 |
| Reproductive strategy | Round scad are broadcast spawner | 1 |
| Trophic level | Trophic level is less than 2.75 | 2 |
| Density dependence Invertebrates only | Only for invertebrates | |
| Susceptibility | | |
| Fishery Only where the scoring element is scored cumulatively | <i>Insert list of fisheries impacting the given scoring element (FCP v2.2 Annex PF 7.4.10)</i> The fisheries impacting the given scoring element would be the general reef fish fishery as some fusiliers would be a prey species of the commercial reef fisheries | |

| Attribute | Rationale | Score |
|---|---|------------------|
| Areal Overlap | <i>Insert attribute rationale. Note specific requirements in FCP v2.2 Annex PF4.4.6.b, where the impacts of fisheries other than the UoA are taken into account</i> Given the vast area of the distribution of the species, it was assumed the handline livebait fishery was having access to less 10% | 1 |
| Encounterability | <i>Insert attribute rationale. Note specific requirements in FCP v2.2 Annex PF4.4.6.b, where the impacts of fisheries other than the UoA are taken into account</i> With regards to encounterability, we assumed there would be medium overlap with the gear. | 3 |
| Selectivity of gear type | We assume reasonable amount of the individuals < size at maturity are caught in the fishery | 2 |
| Post capture mortality | All individuals caught are likely to be dead | 3 |
| Catch (weight) Only where the scoring element is scored cumulatively | <i>Insert weights or proportions of fisheries impacting the given scoring element (FCP v2.2 Annex PF4.4.4)</i> | 1 / 2 / 3 |

3.5 Indian Mackerel - *Rastrelliger kanagurta*

The Indian mackerel (*Rastrelliger kanagurta*) is a species of mackerel in the scombrid family. It is commonly found in the Indian and West Pacific oceans, and their surrounding seas. It is an important food fish and is commonly used in South and South-East Asian cuisine. In the Maldives, the species occur only in the north. It is not common but occasionally encounter large schools in shallow lagoons and coastal area. Indian mackerel is not very commonly used as livebait for the handline fishery because of its rare occurrence in the Maldives.

| Table 1e – PSA productivity and susceptibility attributes and scores | | |
|--|---|----------|
| Performance Indicator | 2.2.2 | |
| Productivity | | |
| Scoring element (species) | Livebait variety: <i>Rastrelliger kanagurta</i> [Indian Mackerel] | |
| Attribute | Rationale | Score |
| Average age at maturity | They live very short life, schooling epi-pelagic variety | 1 |
| Average maximum age | Information not available – it is short lived; it will be less than 10 years | 1 |
| Fecundity | Spawning occurs in batches. The eggs are laid in the water and are externally fertilized. The Indian mackerel do not guard their eggs, which are left to develop on their own | 2 |

| | | |
|--|---|--------------|
| | It was assumed that number of eggs released per year would be >20,000 per year | |
| Average maximum size Not scored for invertebrates | It is no more than 25 cm FL | 1 |
| Average size at maturity Not scored for invertebrates | Same as above | 1 |
| Reproductive strategy | Mackerel as cast spawners | 2 |
| Trophic level | Trophic level is less than 2.75 | 2 |
| Density dependence Invertebrates only | Only for invertebrates | |
| Susceptibility | | |
| Fishery Only where the scoring element is scored cumulatively | <i>Insert list of fisheries impacting the given scoring element (FCP v2.2 Annex PF 7.4.10)</i> The fisheries impacting the given scoring element would be the general reef fish fishery as some fusiliers would be a prey species of the commercial reef fisheries | |
| Attribute | Rationale | Score |
| Areal Overlap | <p><i>Insert attribute rationale.</i></p> <p>The Indian mackerel is found in warm shallow waters along the coasts of the Indian and Western Pacific oceans. Its range extends from the Red Sea and East Africa in the west to Indonesia in the east, and from China and the Ryukyu Islands in the north to Australia, Melanesia and Samoa in the south. It has also entered the Mediterranean Sea through the Suez Canal as a Lessepsian migrant.[3] It is widely found in the Tamil Nadu and Karnataka coastal belt and very popular fish food in Kudla.</p> <p>Given the vast area of the distribution of the species, it was assumed the handline livebait fishery was having access to less 10%</p>  <p><i>Figure 2: Distribution of the species as given in aquamap.</i></p> | 1 |
| Encounterability | <i>Insert attribute rationale. Note specific requirements in FCP v2.2 Annex PF4.4.6.b, where the impacts of fisheries other than the UoA are taken into account</i> | 3 |

| | | |
|---|--|-----------|
| | With regards to encounterability, we assumed there would be medium overlap with the gear. | |
| Selectivity of gear type | We assume reasonable amount of the individuals < size at maturity are caught in the fishery | 2 |
| Post capture mortality | All individuals caught are likely to be dead | 3 |
| Catch (weight) Only where the scoring element is scored cumulatively | <i>Insert weights or proportions of fisheries impacting the given scoring element (FCP v2.2 Annex PF4.4.4)</i> | 1 / 2 / 3 |

3.6 Hardyhead silverside; Atherinidae: / *Gumblaha* or *Thaavala*

The species occurs commonly in large schools along sandy shorelines and reef margins. It is reported to be a largely nocturnal fish which forms schools numbering from several hundred individuals to aggregations which may be over 100m long and 20m wide¹. Feeds on a wide variety of plankton and small benthic invertebrates with foraging taking place mostly during the night following the dispersal of the schools.[4][8] It can also be found in estuarine waters. During some seasons, it is quite common in the shoreline of atolls. When they occur they are found about 5-6cm FL, slightly large for pole-and-line livebait, but good for handline livebait

| Table 1f – PSA productivity and susceptibility attributes and scores | | |
|--|---|--------------|
| Performance Indicator | 2.2.2 | |
| Productivity | | |
| Scoring element (species) | Livebait variety: <i>Atherinomorus lacunus</i> Hardyhead silverside | |
| Attribute | Rationale | Score |
| Average age at maturity | They live very short life, small schooling epi-pelagic variety | 1 |
| Average maximum age | Information not available – it is short lived; it will be less than 10 years | 1 |
| Fecundity | It was assumed that number of eggs released per year would be between 10-20,000 eggs per year | 2 |
| Average maximum size Not scored for invertebrates | It is no more than 10 cm FL | 1 |
| Average size at maturity Not scored for invertebrates | Same as above | 1 |
| Reproductive strategy | The species has a relatively low fecundity, and this combined with the extended spawning season suggests that this species utilises a spawning strategy which involves each individual female spawning several times. They have a short lifespan and most | 2 |

¹ https://en.wikipedia.org/wiki/Hardyhead_silverside

| | | |
|---|--|------------------|
| | normally die after the spawning season although some individuals survived into their second year. | |
| Trophic level | Trophic level is less than 2.75 | 2 |
| Density dependence Invertebrates only | Only for invertebrates | |
| Susceptibility | | |
| Fishery Only where the scoring element is scored cumulatively | <i>Insert list of fisheries impacting the given scoring element (FCP v2.2 Annex PF 7.4.10)</i> | |
| Attribute | Rationale | Score |
| Areal Overlap | <i>Insert attribute rationale. Note specific requirements in FCP v2.2 Annex PF4.4.6.b, where the impacts of fisheries other than the UoA are taken into account</i> The hardyhead silverside occurs commonly in large schools along sandy shorelines and reef margins. It is reported to be a largely nocturnal fish which forms schools numbering from several hundred individuals to aggregations which may be over 100m long and 20m wide. Given the vast area of the distribution of the species in UoA, it was assumed the handline livebait fishery was having access to less 10% | 1 |
| Encounterability | <i>Insert attribute rationale.</i> With regards to encounterability, we assumed there would be high overlap with the gear. | 3 |
| Selectivity of gear type | We assume reasonable amount of the individuals < size at maturity is caught in the fishery | 2 |
| Post capture mortality | All individuals caught will be used as livebait, therefore end up being dead | 3 |
| Catch (weight) Only where the scoring element is scored cumulatively | <i>Insert weights or proportions of fisheries impacting the given scoring element (FCP v2.2 Annex PF4.4.4)</i> | 1 / 2 / 3 |

4 Conclusion

It was clear the species being taken as livebait in the Maldives yellowfin tuna handline fishery have distribution in the entire Maldives and beyond. They also have life history attributes that display high intrinsic rate of population growth and natured mortality rates and therefore shorter life spans. The overall susceptibility to fishery was considered and populations are affected directly. The Automated MSC score obtained from spread sheet was 95 – an unconditional pass.

Table 3: Summary score of the PSA Analysis on MSC RBF Worksheets – truncate to show the results.

| Scientific name | Productivity Scores [1-3] | | | | | | | Susceptibility Scores [1-3] | | | | | Cumulative only | | | | MSC PSA-derived score | Risk Category/Name | MSC scoring guidepost |
|------------------------|---------------------------|------------------|--------------------------|-----------------------|---------------|--------------------|------------------------------|-----------------------------|------------------|-------------|------------------------|------------------------|---------------------------|--------------|-----------|----------------|-----------------------|--------------------|-----------------------|
| | Fecundity | Average max size | Average size at Maturity | Reproductive strateg. | Trophic level | Density Dependence | Total Productivity (average) | Availability | Encounterability | Selectivity | Post-capture mortality | Total (multiplicative) | PSA Score | Catch (tons) | Weighting | Weighted Total | | | |
| Caesio caerulea | 1 | 1 | 1 | 1 | 1 | 2 | 1.14 | 1 | 1 | 2 | 3 | 1.13 | 1.60 | | | | 100 | Low | ≥80 |
| Selar crumenophthalmu | 1 | 1 | 1 | 1 | 1 | 2 | 1.14 | 1 | 2 | 2 | 3 | 1.28 | 1.71 | | | | 100 | Low | ≥80 |
| Odonus niger | 2 | 1 | 1 | 1 | 1 | 2 | 1.29 | 1 | 3 | 2 | 3 | 1.43 | 1.92 | | | | 97 | Low | ≥80 |
| Decapterus macarellus | 1 | 1 | 1 | 1 | 1 | 2 | 1.14 | 1 | 3 | 2 | 3 | 1.43 | 1.83 | | | | 98 | Low | ≥80 |
| Rastrelliger kanagurta | 1 | 1 | 1 | 1 | 1 | 2 | 1.14 | 1 | 3 | 2 | 3 | 1.28 | 1.71 | | | | 100 | Low | ≥80 |
| Atherinomorus lacunus | 2 | 1 | 1 | 1 | 1 | 2 | 1.29 | Score added automatically | | | | | Score added automatically | | | | | | |

5 References

Adam, M.S., Jauharee, A.R., 2009. Development of large yellowfin tuna fishery in the Maldives. Presented at the 10th Session of the Working Party on Tropical Tunas, IOTC (www.iotc.org), Mombasa, Kenya 15-23 October 2009, p. 14.

Jauharee, A.R., Ken Neal & Kelsey I Miller(2015) Maldives Pole and line Tuna Fishery: Livebait Fishery Review 2015 - <https://mrc.gov.mv/en/publications/show/maldives-pole-and-line-tuna-fishery-livebait-fishery-review-2015>, accessed - October 2022

Jauharee A..R (Undated) - Common live bait used in handline tuna fishery of the Maldives - <https://mrc.gov.mv/assets/Uploads/Livebait-Handline-tuna-fishery-Aug-2014.pdf>

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