MarinTrust Whole fish fishery assessment V 3.0

FIP Reporting document

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Karnataka Small Pelagic Fishery

MRAG Ltd

24th April 2025

Instructions to FIP assessors/assessment teams

This template details the information required from when creating the MarinTrust whole fish fishery assessment report.

If any discrepancies are noted between this template and the MarinTrust whole fish fishery assessment criteria, CBs and assessors/teams shall use the wording of the MarinTrust whole fish fishery assessment criteria.

Please complete all relevant fields in tables.

For all notes and guidance indicated in italics, please delete and replace with your specific information where relevant e.g. the 'Instructions to FIP assessors/assessment teams'' section shall be deleted. 'INSERT FIP NAME' on the front cover will be replaced by the full name of the fishery under assessment. 'Pass/Fail' or Meets/Gap, delete one not relevant to the outcome.

CBs and assessors may amend the scoring tables to reflect multiple species or gear types (e.g. extra rows or additional tables). CBs and assessors shall ensure it is clear which species or gear type is being referenced. CBs and assessors shall provide a rationale for all species under assessment.

If an interpretation is used, CBs or assessors shall cite it in the relevant section of the report.

Do not delete or remove sections or leave content blank. Where a section or requirement is not applicable, please indicate this with n/a.

Any queries on the reporting template or whole fish assessment criteria, and/or requests for interpretation shall be addressed to the MarinTrust secretariate fisheries@marin-trust.com.

Template amendment log

DATE	ISSUE	AMENDMENT	AUTHORISED BY

Table 1. Scope

FIP name	Karnataka Small Pelagic FIP
Main species (common name, Latin name)	Bigeye scad (*Selar crumenophthalmus*), Blackfin scad (*Alepes melanoptera*), Blackflash ribbonfish (*Trachipterus jacksonensis*), Bullet tuna (*Auxis rochei*), Crested hairtail (*Tentoriceps cristatus*), Fringescale sardinella (*Sardinella fimbriata*), Goldstripe sardinella (*Sardinella gibbosa*), Herring scad (*Alepes vari*), Horse mackerel (*Megalaspis cordyla*), Indian mackerel (*Rastrelliger kanagurta*), Indian oil sardine (*Sardinella longiceps*), Indian scad (*Decapterus russelli*), Largehead hairtail (*Trichiurus lepturus*), Longnose trevally (*Platycaranx chrysophrys*), Mackerel scad (*Decapterus macarellus*), Narrow-based Spanish mackerel (*Scomberomorus commerson*) Shortfin scad (*Decapterus macrosoma*), Shrimp scad (*Alepes djedaba*), Smallhead hairtail (*Eupleurogrammus muticus*), White sardinella (*Sardinella albella*), Yellowspotted trevally (*Turrum fulvoguttatum*), Yellowtail scad (*Atule mate*)
Fishery location	FAO Major Area 51 (Western Indian Ocean), State waters and adjacent national waters of Karnataka
Gear type(s)	Purse seine
Management authority (country/state)	Karnataka Department of Fisheries (Karnataka/India)

Table 2. Summary of outcomes of gap analyses

Overall outcome		**Gap**
Clauses failed		**Reason for fail**
M2.1	M2.1.2, M2.1.3	*Gap identified*
M2.2	M2.2.1, M2.2.2	*Gap identified*
M2.3	M2.3.1, M2.3.3, M2.3.3	*Gap identified*
B1	Indian Mackerel *(Rastrelliger kanagurta)*	*Gap identified*
B1	Indian oil sardine (*Sardinella longiceps*)	*Gap identified*
B1	Yellowtail Scad *(Atule mate),*	*Gap identified*

Overall outcome		Gap
	Mackerel Scad *(Decapterus macarellus)*, Bigeye Scad *(Selar crumenophthalmus)*, Shortfin Scad *(Decapterus macrosoma)*, Herring Scad *(Alepes vari)*, Blackfin Scad *(Alepes melanoptera)*, Shrimp Scad *(Alepes djedaba)*, and Indian Scad *(Decapterus russelli)*	
B1	Bullet Tuna *(Auxis rochei)*	*Gap identified*
B1	Fringescale Sardinella (*Sardinella fimbriata*), Goldstripe Sardinella (*Sardinella gibbosa*), and White Sardinella (*Sardinella albella*).	*Gap identified*
D1	Longnose trevally (*Platycaranx chrysophrys*)	*Gap identified*
D1	Yellowspotted trevally (*Turrum fulvoguttatum)*	*Gap identified*
D1	Narrow-based Spanish mackerel (*Scomberomorus commerson)*	*Gap identified*
D1	Blackflash ribbonfish (*Trachipterus jacksonensis)*	*Gap identified*
D1	Crested hairtail (*Tentoriceps cristatus*)	*Gap identified*
D1	Smallhead hairtail (*Eupleurogrammus muticus*)	*Gap identified*
D2	Longnose trevally (*Platycaranx chrysophrys*)	*Gap identified*
D2	Yellowspotted trevally (*Turrum fulvoguttatum)*	*Gap identified*
D2	Narrow-based Spanish mackerel (*Scomberomorus commerson)*	*Gap identified*
E1.1	E1.1.2, E1.1.3	*Gap identified*
E1.2	E1.2.1	*Gap identified*
E2.1	E2.1.3	*Gap identified*
E2.2	E2.2.1	*Gap identified*
E2.3	E2.3.1, E2.3.2	*Gap identified*
E3.2	E3.2.1	*Gap identified*
E3.3	E3.3.2	*Gap identified*

Species composition of the fishery

Landings data provided by the client includes an initial categorization of the catch by species and common name and aligns with the catch composition reported in ICAR-CMFRI (2024). Both the data supplied by the client and the data from ICAR-CMFRI-FRAEED (2024) focus exclusively on purse seine fisheries. As such, the species composition reflects the selectivity of this fishing method. However, historical landings data from neighbouring states indicate potential fluctuations in purse seine catch proportions over time (CMFRI, 2024; Kamble *et al*., 2017). Improved temporal consistency in reporting could further enhance the accuracy of stock assessments and species categorization.

References

CMFRI-FRAEED. (2024). *Marine Fish Landings in India—2023* [Monograph]. ICAR-Central Marine Fisheries Research Institute. https://eprints.cmfri.org.in/18344/

ICAR-CMFRI (2024). Fishery and stock assessment of small pelagics along the Karnataka coast: Annual report 2024-25. ICAR-Central Marine Fisheries Research Institute - Mangalore Regional Centre.

Kamble, S., Kazi, T., Chaudari, K., Shirdhankar, M. & Dhaker, H. (2017). Catch Composition of Purse-Seine Fishing Along Ratnagiri Coast of Maharashtra State, India. *Journal of Experimental Zoology India*, *20*(1), 431–434.

Table 3. Species categorisation table

List of all the species assessed. Type 1 species are assessed against Category A or Category B. Type 1 species must represent 95% of the total annual catch. Type 2 species are assessed against Category C or Category D. Type 2 species may represent a maximum of 5% of the annual catch. Species that comprise less than 0.1% of the catch are not required to be assessed or listed here.

Species name (common & Latin name)	Stock	CITES appendix 1 or 2 listed. Yes/no	IUCN Red list Category	% Catch composition	Management (Y/N)	Category (A, B, C or D)
Indian Mackerel (*Rastrelliger kanagurta*)	Karnataka waters	No	Least Concern (LC)	40	No	B
Indian Oil Sardine (*Sardinella longiceps*)	Karnataka waters	No	Least Concern (LC)	25	No	B
Yellowtail Scad (*Atule mate*)	Karnataka waters	No	Least Concern (LC)	15	No	B
Mackerel scad *(Decapterus macarellus*	Karnataka	No	Least Concern		No	B

)	waters		(LC)			
Bigeye scad (*Selar crumenophthalmus*)	Karnataka waters	No	Least Concern (LC)		No	B
Shortfin scad (*Decapterus macrosoma*)	Karnataka waters	No	Least Concern (LC)		No	B
Herring scad (*Alepes vari*)	Karnataka waters	No	Least Concern (LC)		No	B
Blackfin scad (*Alepes melanoptera*)	Karnataka waters	No	Least Concern (LC)		No	B
Shrimp scad (*Alepes djedaba*)	Karnataka waters	No	Least Concern (LC)		No	B
Indian scad (*Decapterus russelli*)	Karnataka waters	No	Least Concern (LC)		No	B
Bullet tuna (*Auxis rochei*)	Karnataka waters	No	Least Concern (LC)	10	No	B
Fringescale sardinella (*Sardinella fimbriata*)	Karnataka waters	No	Least Concern (LC)		No	B
Goldstripe sardinella (*Sardinella gibbosa*)	Karnataka waters	No	Least Concern (LC)	5	No	B
White sardinella (*Sardinella albella*)	Karnataka waters	No	Least Concern (LC)		No	B
Horse mackerel (*Megalaspis cordyla*)	Karnataka waters	No	Least Concern (LC)	<5%	No	D
Longnose trevally (*Platycaranx chrysophrys*)	Karnataka waters	No	Least Concern (LC)	<5%	No	D
Yellowspotted trevally (*Turrum fulvoguttatum*)	Karnataka waters	No	Least Concern (LC)		No	D

Narrow-based Spanish mackerel (*Scomberomorus commerson*)	Karnataka waters	No	Near Threatened (NT)	<5%	No	D
Blackflash ribbonfish (*Trachipterus jacksonensis*)	Karnataka waters	No	Least Concern (LC)	<5%	No	D
Largehead hairtail (*Trichiurus lepturus*)	Karnataka waters	No	Least Concern (LC)		No	D
Crested hairtail (*Tentoriceps cristatus*)	Karnataka waters	No	Least Concern (LC)		No	D
Smallhead hairtail *(Eupleurogrammus muticus*)	Karnataka waters	No	Least Concern (LC)		No	D

Rationale

The categorization of species was based on MarinTrust (IFFO RS) V3 criteria, which define species assessment categories based on their proportion of total landings and whether species-specific management exists. All species exceeding 5% of total landings were classified as Type 1, while those below 5% were classified as Type 2. The assessment incorporated all species whose landings exceeded 0.1%, aligning with the minimum proportion criterion of 0.1%.

Indian mackerel (*Rastrelliger kanagurta*) and Indian oil sardine (*Sardinella longiceps*) were assessed under Category B due to the lack of a formal, species-specific management plan including Total Allowable Catch (TAC) limits, Harvest Control Rules (HCRs), or long-term stock recovery objectives. Historical regulatory efforts for Indian oil sardine stocks date back to the 1940s, when restrictions on fishing juvenile sardines and specific gear bans were enacted. However, these early conservation measures lapsed by 1947, and modern regulations such as the Marine Fishing Regulation Act (MFRA) focus on broad gear and seasonal restrictions rather than species-specific recovery plans (Rohit *et al.,* 2018). Although Karnataka has implemented seasonal fishing bans and effort restrictions, these do not constitute a comprehensive species-specific management framework.

Scads (*Atule mate, Decapterus spp., Selar crumenophthalmus, Alepes spp.*), bullet tuna (*Auxis rochei*) and Lesser sardines (*Sardinella fimbriata* and *Sardinella gibbosa*), which contribute 5-15% of total landings, were also categorized as Type 1, Category B, due to their high catch composition but lack of dedicated species-level management. Horse mackerel (*Megalaspis cordyla*) were included within Type 1, Category B, making up approximately 5% of the catch.

All species contributing less than 5% of the total catch were categorized as Type 2, Category D, as there is no evidence of stock-specific monitoring, TAC implementation, or targeted conservation measures. These included other

carangids (*Platycaranx chrysophrys* and *Turrum fulvoguttatum*,), and narrow-based Spanish mackerel (Scomberomorus commerson,), which lack any distinct management controls beyond Karnataka's general purse seine fishing regulations.

Ribbonfish species (*Trachipterus jacksonensis, Trichiurus lepturus, Tentoriceps cristatus, Eupleurogrammus muticus* were similarly categorized as Category D due to the absence of specific monitoring or regulatory oversight. All Type 2 species were classified as Category D, aligning with MarinTrust's criteria for species with low catch proportions and no active management framework.

While Karnataka's seasonal closures and mesh size restrictions apply to all purse seine fisheries, these regulations are not tailored to individual species. Furthermore, the absence of species-specific reference points, TACs, or stock rebuilding plans limits the ability of fisheries managers to respond to potential stock declines. Future improvements in stock-specific monitoring and formalized control measures could enhance management effectiveness and allow for the reassessment of some species under Category A or C in future evaluations.

References

CMFRI (Central Marine Fisheries Research Institute) (2024). CMFRI Annual Report 2023 [Monograph]. ICAR-Central Marine Fisheries Research Institute. http://eprints.cmfri.org.in/18810/

ICAR-CMFRI Mangalore Regional Centre. (2024). Fishery and stock assessment of small pelagics along the Karnataka coast: Annual report 2024-25. ICAR-Central Marine Fisheries Research Institute.

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Rohit, Prathibha and Dineshbabu, A P and Sasikumar, Geetha and Swathi Lekshmi, P S and Mini, K G and Vivekanandan, E and Thomas, Sujitha and Rajesh, K M and Purushottama, G B and Sulochanan, Bindu and Viswambharan, Divya and Kini, Sharath (2016) *CMFRI Marine Fisheries Policy Series No.5; Management Plans for the Marine Fisheries of Karnataka.* CMFRI Marine Fisheries Policy (5). ICAR-Central Marine Fisheries Research Institute, Kochi, pp. 1-110. http://eprints.cmfri.org.in/id/eprint/12087

Rohit, Prathibha & Sivadas, Madhavan & Abdussamad, E. & Rathinam, Margaret & Said, Koya & U, Ganga & Ghosh, Shubhadeep & K M, Rajesh & Koya, Mohammed & Chellappan, Anulekshmi & K.G., Mini & George, Grinson & Roul, Subal & S., Surya & Sukumaran, Sandhya & Vivekanandan, E & Retheesh, T. & Prakasan, D & M., Sathish & Supraba, V. (2018). Enigmatic Indian Oil Sardine: An Insight. http://eprints.cmfri.org.in/id/eprint/13281

Management requirements

This section, or module, assesses the general management regime applied to the fishery under assessment. It comprises two parts, M1, which evaluates the management framework, and M2, which evaluates surveillance, control and enforcement within the fishery.

1.1. All management criteria must be met (pass) for a fishery to pass the Management requirements.

1.1.1. The sub-criteria offer a structured evidence base to demonstrate that the fishery

sufficiently meets the management criteria. It is not expected that sub-criteria are assessed independently of the main criterion.

M1 Management framework

M1.1	**M1.1 There is an organisation responsible for managing the fishery.** *In reaching a determination for M1.1, the assessor should consider if the following is in place:*	
	M1.1.1 The management and administration organisations within the fishery are clearly identified.	*Meets*
	M1.1.2 The functions and responsibilities of the management organisations include the overall regulation, administration, science and data collection and enforcement roles, and are documented and publicly available.	*Meets*
	M1.1.3 Fishers have access to information and/or training materials through nationally recognised organisations.	*Meets*
Clause outcome		***Pass***

Rationale

The Karnataka purse seine fishery is managed within a structured governance system that includes both state and union-level authorities. The state Department of Fisheries (DOF), Government of Karnataka, is the primary regulatory authority responsible for policy formulation, licensing, and implementation of fisheries management within the 12 nautical mile (nm) limit (Mohamed *et al.,* 2017). Marine fisheries within the territorial waters, which extend up to 12 nautical miles from the coast, are governed by Marine Fisheries Regulation Acts (MFRAs). These acts were originally established by the nine maritime states, using a model bill circulated by the Union Government in 1979. While these MFRAs have been updated periodically and some states have introduced new legislation, many MFRAs are now considered outdated (Mohamed *et al.,* 2017). At the national level, the Department of Animal Husbandry, Dairying, and Fisheries (DADF) oversees fisheries beyond 12 nm in the Exclusive Economic Zone (EEZ) (Mohamed *et al.,* 2017).

The Fishery Survey of India (FSI) plays a crucial role in surveying and assessing fish stocks and charting fishing grounds in the Indian EEZ and adjoining high seas (Murty, 2015). FSI operates as an exploratory survey organization under the Ministry of Agriculture, conducting resource monitoring to support fisheries regulation, management, and conservation efforts (Murty, 2015). The Central Marine Fisheries Research Institute (CMFRI)[1] is the main body responsible for conducting stock assessments and advising on management strategies, ensuring sustainable exploitation of marine resources (Sathianandan *et al.,* 2021). The Marine Products Export Development Authority (MPEDA) sets quality standards for fisheries exports, ensuring compliance with sustainability practices (Mohamed *et al*., 2017).

[1] CMFRI. [Available at: https://www.cmfri.org.in]

Enforcement responsibilities are shared among multiple agencies. The Karnataka Fisheries Department, in collaboration with the Indian Coast Guard and Marine Police, ensures compliance with regulations and prevents illegal fishing activities (Karnataka Marine Fishing (Regulation) Act (No. 24), Enforcement Section)[2]. Beyond scientific monitoring, national regulatory institutions play a role in overseeing specific fisheries sectors. The Coastal Aquaculture Authority (CAA) regulates aquaculture activities, ensuring that mariculture and aquaculture expansion do not disrupt marine ecosystems (Mohamed *et al.,* 2017). The Ministry of Environment, Forests, and Climate Change (MOEFCC) establishes policies that protect marine biodiversity and prevent habitat degradation (Murty, 2015). Additionally, the Ministry of Earth Sciences (MoES) provides climate-related data and marine ecosystem research, which contribute to fisheries policy development (Murty, 2015).

Several other institutes in India are dedicated to marine fisheries research, including the Central Institute of Fisheries Technology (CIFT), the Central Institute of Fisheries Education (CIFE), the Central Institute of Brackishwater Aquaculture (CIBA), the Central Institute of Coastal Engineering for Fishery (CICEF), the National Institute of Fisheries Post-Harvest Technology and Training (NIFPHATT), and the Central Institute of Fisheries Nautical and Engineering Training (CIFNET). Additionally, supporting research is contributed by institutions under the Ministry of Earth Sciences (MoES), the Ministry of Environment, Forests and Climate Change (MoEF&CC), the Ministry of Commerce (MoC), and the Council of Scientific and Industrial Research (CSIR) (Mohamed et al., 2017).

In summary, the evidence presented clearly demonstrates that each sub-clause under the M1 Management Framework is met. Specifically, the identification of key management organizations (M1.1.1) is confirmed through the roles of the Karnataka DOF, FSI, and CMFRI; the documented functions and responsibilities (M1.1.2) are substantiated by established policies, enforcement mechanisms, and periodic scientific assessments; and fishers' access to information and training (M1.1.3) is ensured through nationally recognized programs.

References

CMFRI (Central Marine Fisheries Research Institute) (2024). CMFRI Annual Report 2023 [Monograph]. ICAR-Central Marine Fisheries Research Institute. http://eprints.cmfri.org.in/18810/

Mohamed, K.S., K. Vijayakumaran, P.U. Zacharia, T.V. Sathianandan, G. Maheswarudu, V. Kripa, R. Narayanakumar, Prathibha Rohit, K.K. Joshi, T. V. Sankar, Leela Edwin, K. Ashok Kumar, Bindu J, Nikita Gopal, and Pravin Puthra (2017). Indian Marine Fisheries Code: Guidance on a Marine Fisheries Management Model for India. *CMFRI Marine Fisheries Policy Series* 4: 120 p

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Sathianandan, T. V., Mohamed, K. S., Jayasankar, J., Kuriakose, S., Mini, K. G., Varghese, E., Zacharia, P. U., Kaladharan, P., Najmudeen, T. M., Koya, M. K., Sasikumar, G., Bharti, V., Rohit, P., Maheswarudu, G., Sindhu, K. A., Sreepriya, V., Alphonsa, J., & Deepthi, A. (2021). Status of Indian marine fish stocks: Modelling stock biomass dynamics in multigear fisheries. ICES Journal of Marine Science, 78(5), 1744–1757.

[2]Karnataka Marine Fishing Regulation Act 1986 [Available at: https://faolex.fao.org/docs/pdf/ind63779.pdf]

https://doi.org/10.1093/icesjms/fsab076

M1.2	**M1.2 Fishery management organisations are legally empowered to take management actions.** *In reaching a determination for M1.2, the assessor should consider if the following is in place:*	
	M1.2.1 There are legal instruments in place to give authority to the management organisation(s) which can include policies, regulations, acts or other legal mechanisms.	*Meets*
	M1.2.2 Vessels wishing to participate in the fishery must be authorised by the management organisation(s).	*Meets*
	M1.2.3 The management system has a mechanism in place for the resolution of legal disputes.	*Meets*
	M1.2.4 There is evidence of the legal rights of people dependent on fishing for food or livelihood.	*Meets*
Clause outcome		***Pass***

Rationale

The Karnataka purse seine fishery is regulated under the Karnataka Marine Fisheries Regulation Act (KMFRA) 1986[3], which grants the Department of Fisheries (DOF), Karnataka, the authority to enforce licensing, seasonal closures, gear restrictions, and fishing effort control measures. This legal framework is further reinforced by the Maritime Zones of India Act, 1981[4] which governs foreign fishing within India's Exclusive Economic Zone (EEZ), and the Environment (Protection) Act, 1986, which mandates Environmental Impact Assessments (EIAs) to ensure sustainability (Rajesh, 2013). National policies such as the New Deep Sea Fishing Policy 1991, the Marine Fisheries (Regulation and Management) Bill 2009, and the National Policy on Marine Fisheries 2017[5] strengthen governance by integrating state and national-level regulatory mechanisms (Rajesh, 2013). The KMFRA 1986 provides Karnataka's fisheries authorities with legal power to regulate the purse seine fishery, while the National Policy on Marine Fisheries 2017[6] sets broader governance objectives at the national level. Karnataka enforces seasonal bans from

[3]Karnataka Marine Fishing (Regulation) Act (No. 24 of 1986) (Available at: https://www.fao.org/faolex/results/details/en/c/LEX-FAOC063779/)

[4]The Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act 1981 [Available at: https://lddashboard.legislative.gov.in/actsofparliamentfromtheyear/maritime-zones-india-regulation-fishing-foreign-vessels-act-1981]

[5]National Policy on Marine Fisheries 2017 [Available at: https://www.fao.org/faolex/results/details/en/c/LEX-FAOC177473/]

[6]National Policy on Marine Fisheries 2017 [Available at: https://www.fao.org/faolex/results/details/en/c/LEX-FAOC177473/]

June to July, vessel licensing requirements, and mesh size regulations to control fishing pressure and promote sustainable practices (Rohit *et al*, 2016).

The KMFRA (1986) mandates that all mechanized and non-mechanized fishing vessels, including purse seiners, be licensed by the Karnataka Fisheries Department. While not explicitly mentioned, purse seiners fall under the broader mechanized vessel category regulated by the Act. Karnataka also enforces fishing zone restrictions and national Monitoring, Control, and Surveillance (MCS) measures to ensure compliance. These regulations prevent unauthorized access and overexploitation of fishery resources, contributing to stock sustainability (Rajesh, 2013). The New Deep Sea Fishing Policy 1991 initially permitted joint ventures, leased vessels, and foreign fishing within India's EEZ, but opposition from artisanal fishers led to a policy review by the Murari Committee in 1995. This committee recommended the cancellation of all foreign fishing licenses, leading to the national adoption of stricter licensing measures in 1997. These reforms reinforced Karnataka's licensing framework, ensuring that only approved domestic fishers operate within state waters (Rajesh, 2013). Additionally, the Murari Committee's recommendations reinforced the regulation of fishing within the EEZ by prohibiting vessels larger than 20 meters from operating in areas exploited by smaller mechanized and traditional fishing craft (Rajesh, 2013). The Marine Fisheries (Regulation and Management) Bill 2009 enhances national fisheries governance by establishing a uniform legal framework for managing and conserving fishery resources across all maritime zones, including territorial waters, the contiguous zone, the EEZ (up to 200 nautical miles), and the continental shelf (up to 350 nautical miles) (Rajesh, 2013).

The KMFRA (1986) establishes mechanisms for dispute resolution, including procedures for resolving licensing conflicts. Chapter 2, Section 9 includes provisions for handling legal conflicts related to licensing and fishing rights, ensuring a structured legal framework for resolving disputes among stakeholders. Additionally, Chapter 3, Section 3(a) specifically outlines protections for different stakeholders, with a focus on safeguarding traditional fishers' rights. At the national level, the Indian National Policy on Marine Fisheries 2017[7] strengthens these legal protections by providing a formal basis for the socio-economic upliftment of the fisher community, ensuring that dispute resolution mechanisms align with broader national objectives. Further legal protection for traditional fishermen is reinforced through the Traditional Fishermen (Protection and Welfare) Bill, 2023[8], which mandates the formulation of a national policy to protect fishing rights and interests while establishing the National Traditional Fishermen Welfare Authority to oversee welfare initiatives. The bill also creates a Traditional Fishermen Welfare Fund, which provides financial assistance, life insurance, and other support measures to secure the livelihoods of small-scale fishers. Additionally, the appropriate government is legally required to take measures to protect the fishing rights and interests of traditional fishermen, ensuring that their access and socio-economic stability are

[7]National Policy on Marine Fisheries 2017 [Available at: https://www.fao.org/faolex/results/details/en/c/LEX-FAOC177473/]

[8]THE TRADITIONAL FISHERMEN (PROTECTION AND WELFARE) BILL, 2023 (2023). [Available at: https://sansad.in/poi]

safeguarded under national law.
References Rajesh, K. M. (2013) *Fisheries Legislation in India*. CMFRI, Mangalore. Rohit, Prathibha and Dineshbabu, A P and Sasikumar, Geetha and Swathi Lekshmi, P S and Mini, K G and Vivekanandan, E and Thomas, Sujitha and Rajesh, K M and Purushottama, G B and Sulochanan, Bindu and Viswambharan, Divya and Kini, Sharath (2016) *CMFRI Marine Fisheries Policy Series No.5; Management Plans for the Marine Fisheries of Karnataka.* CMFRI Marine Fisheries Policy (5). ICAR-Central Marine Fisheries Research Institute, Kochi, pp. 1-110. http://eprints.cmfri.org.in/id/eprint/12087

M1.3	**M1.3 There is an organisation responsible for collecting data and (scientifically) assessing the fishery.** *In reaching a determination for M1.3, the assessor should consider if the following is in place:*	
	M1.3.1 The organisation(s) responsible for collecting data and assessing the fishery is/are clearly identified.	*Meets*
	M1.3.2 The management system receives scientific advice regarding stock, non-target species and ecosystem status.	*Meets*
	M1.3.3 Scientific advice is independent from the management organisation(s) and transparent in its formulation through a clearly defined process.	*Meets*
Clause outcome		***Pass***
Rationale The primary organisation responsible for collecting and assessing fisheries data in India, including Karnataka, is the Indian Council of Agricultural Research-Central Marine Fisheries Research Institute (ICAR-CMFRI)[9]. The CMFRI Mangalore Research Centre and CMFRI Kochi headquarters serve as the primary organisations responsible for collecting and analysing fisheries data along the Karnataka coast. Other research institutions, such as the Central Institute of Fisheries Technology (CIFT) and the Central Institute of Fisheries Education (CIFE), contribute to fisheries research and technology development. Additionally, universities and research institutions at both national and state levels support data analysis and fisheries-related studies (Murty, 2015). The CMFRI employs a stratified multi-stage random sampling technique to systematically estimate fishery landings and assess stock health. Since 2017, data collection has been digitised, with survey staff using electronic tablets to input data		

[9] ICAR – Karnataka [Available at: https://icar.org.in/node/15049]

directly into a centralised database at CMFRI headquarters in Kochi, ensuring accuracy and real-time monitoring (ICAR-CMFRI, 2024). The Fisheries Survey of India (FSI) also plays a role in conducting deep-sea fisheries surveys, while the Karnataka Fisheries Department implements local fisheries management measures, contributing to a multi-tiered approach to fisheries governance (Mohamed *et al.,* 2017).

The fishery management system relies on scientific advice provided by CMFRI regarding stock status, non-target species, and ecosystem health. CMFRI's annual reports provide advisory recommendations regarding spawning season closures, bycatch reduction, and environmental fluctuations impacting fish stocks, particularly the Indian oil sardine (*Sardinella longiceps*), which constitutes a significant portion of the purse seine landings (CMFRI, 2024).

Scientific assessments and recommendations are conducted independently of management authorities, ensuring transparency in the decision-making process. The CMFRI collaborates with international organisations such as FAO, among others, and publishes findings in open-access reports and peer-reviewed journals, making stock assessment methodologies accessible and verifiable (Mohamed *et al.,* 2017). Additionally, the National Marine Fisheries Management Council (NMFMC), as proposed under the Indian Marine Fisheries Code, aims to provide a structured governance model ensuring that scientific data translates into effective policy decisions (Mohamed *et al.,* 2017).

References

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M1.4	**M1.4 The fishery management system is based on the principles of sustainable fishing and a precautionary approach.** *In reaching a determination for M1.3, the assessor should consider if the following is in place:*	
	M1.4.1 A policy or long-term management objective for sustainable harvesting based on the best scientific evidence and a precautionary approach is publicly available and implemented for the fishery.	*Meets*
Clause outcome		***Pass***

Rationale

The Karnataka fisheries management system has established a comprehensive regulatory and policy framework for sustainable harvesting, relying on scientific stock assessments and management advice from institutions such as the CMFRI, who play a critical role in stock monitoring, providing evidence-based recommendations for sustainable catch limits to ensure the long-term sustainability of fisheries (Rohit *et al*., 2024). Karnataka has historically recognized the need for sustainable fisheries management, particularly for Indian oil sardine (*Sardinella longiceps*), which is prone to fluctuations in biomass. Management interventions for Indian oil sardine have been in place since the 1940s, reflecting a long-standing commitment to sustainability (Rohit *et al.,* 2018). The CMFRI underpins this system through robust stock assessments and management advice. These assessments include data on fishing effort, landings, and resources, grouped into large pelagics, small pelagics, and demersal species (Rohit, 2024).

The Marine Fishing Regulation Act (MFRA), which has been in force since the 1980s, provides the legal foundation for managing fisheries across India's maritime states, including Karnataka (Rohit *et al*., 2018). Seasonal closures, such as the monsoon fishing ban from June to July/August, are a pivotal measure aimed at protecting spawning aggregations and preventing recruitment overfishing. This measure has evolved to include restrictions on mechanized vessels and motorized canoes with engines exceeding 10 HP, reflecting the state's adaptive management approach (Rohit *et al*., 2024).

A precautionary approach is evident in Karnataka's response to resource pressures. Spatial mapping of fishing grounds and juvenile reduction devices (JRDs) are recommended to safeguard juvenile assemblages and spawning grounds, while some areas are designated as fishery refuges or marine protected areas. For instance, the Netrani Island region, noted for its rocky substrates and biodiversity, remains closed to trawling activities, ensuring ecosystem preservation (Rohit *et al*., 2024). The precautionary approach is also evident in Karnataka's response to stock declines. When assessments indicated a depletion in biomass, the state imposed seasonal bans and effort reductions to allow stocks to recover (ICAR-CMFRI, 2024). The monsoon fishing ban from June to July/August, enforced under MFRA, is a key management measure aimed at preventing recruitment overfishing and supporting stock recovery (CMFRI, 2024).

Input control measures include stringent licensing and registration of fishing crafts. Since 2015, new registrations for purse seiners have been halted, and the maximum operational lifespan of vessels has been capped to prevent overexploitation. Minimum Legal Size (MLS) regulations are also being implemented for commercially important species to curb juvenile exploitation. Inspections, either at sea or at landing centres, are advised to enforce MLS compliance. Mesh size regulations are encouraged to reduce bycatch and ensure juveniles are not disproportionately targeted by non-selective gear (Rohit *et al*., 2024). Output controls are enforced through exploitation ratios, calculated as fishing mortality (F) over total mortality (Z). With many species exploited beyond optimal levels, Karnataka is focused on maintaining exploitation rates at sustainable thresholds. Multi-species and multi-gear fisheries require tailored

measures, and the CMFRI advises limiting fishing effort to levels that avoid over-exploitation (Rohit *et al*., 2024).

The Karnataka Department of Fisheries regularly publishes data on fish landings, stock status, and management measures. This information is made available to stakeholders, including fishers, processors, and exporters, ensuring transparency in the decision-making process[10].

At the national level, India has reinforced its commitment to sustainable fisheries through policies such as the 2017 National Policy on Marine Fisheries (NPMF) and the FAO Voluntary Guidelines on Sustainable Small-Scale Fisheries, which promote science-based fisheries governance (Mohamed *et al*., 2017)[11]. The National Fisheries Development Board (NFDB), established in 2006, plays a key role in fisheries development while ensuring resource conservation[12]. The Pradhan Mantri Matsya Sampada Yojana (PMMSY) scheme (2020-2025) further strengthens this commitment by investing in modernizing fisheries infrastructure, enhancing traceability, and promoting responsible fisheries management[13]. At the state level, the Department of Fisheries (Government of Karnataka) has explicitly committed to sustainable fisheries management[14]. The Karnataka Fisheries Development Corporation (KFDC), a government-backed enterprise involved in fishmeal and fish oil production, has integrated sustainability into its operations by prioritizing environmental conservation and responsible resource use[15].

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[10] https://dof.gov.in/documents/state-fisheries-profile/karnataka

[11] National Policy on Marine Fisheries 2017 [https://www.fao.org/faolex/results/details/en/c/LEX-FAOC177473/]

[12] National Fisheries Development Board [Available at: https://nfdb.gov.in/welcome/about]

[13] Pradhan Mantri Matsya Sampada Yojana Scheme, Ministry of Fisheries [Available at: https://dof.gov.in/pmmsy]

[14] See Government of Karnataka, Department of Fisheries Vision, Objectives, Mission Statements. [Available at: https://fisheries.karnataka.gov.in/info-1/Vision+Objectives+Mission/en]

[15] Karnataka Fisheries Development Corporation https://kfdcfish.karnataka.gov.in/en

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M1.5	**M1.5 There is a clearly defined decision-making process which is transparent, with processes and results made publicly available.** *In reaching a determination for M1.5, the assessor should consider if the following is in place:*	
	M1.5.1 There is participatory engagement through which fishery stakeholders and other stakeholders can access, provide information, consult with, and respond to, the management systems' decision-making process.	*Meets*
	M1.5.2 The decision-making process is transparent, with results made publicly available.	*Meets*
	M1.5.3 The fishery management system is subject to periodic internal or external review to validate the decision-making process, outcomes and scientific data.	*Meets*
Clause outcome		***Pass***

Rationale

Participatory engagement in Karnataka is facilitated through stakeholder meetings that involve fishers, boat owners, fishery cooperatives, research institutions, and government bodies. These consultations provide a platform for stakeholders to access and provide information on fisheries governance. The Department of Fisheries, in collaboration with the ICAR-Central Marine Fisheries Research Institute, has conducted stakeholder meetings and training programs to discuss sustainable marine fisheries management, allowing for participatory learning and collaborative decision-making (CMFRI, 2024). Additionally, the CMFRI Annual Report 2023 outlines stakeholder consultations across multiple states, with participants including fishermen representatives, cooperative society members, fish farmers, state and central government organization representatives, private and public agencies, and scientific and technical personnel working in the field (CMFRI, 2024).

The introduction of a three-tier fisheries council system to be formed in all maritime states—including the Village Fisheries Council, District Fisheries Council, and State Fisheries Council—will ensure the direct involvement of fishers in management decisions at multiple levels (Mohamed *et al.,* 2017). Furthermore, community engagement initiatives, such as training workshops, have been conducted to educate fishers (CMFRI, 2024). Stakeholder consultations were carried out in Karnataka in 2016 as part of the national program of the International Collective in Support of Fish Workers (ICSF), supporting the dissemination and implementation of the FAO

Voluntary Guidelines for Sustainable Small-Scale Fisheries.

Transparency in the fishery's decision-making process is ensured through publicly available reports and scientific assessments (CMFRI, 2024). Stock assessments and marine fishery landings data are published by CMFRI and made accessible to stakeholders, providing insight into the health of fish stocks and the sustainability of fishing practices (CMFRI-FRAEED, 2024). ICAR-CMFRI also provides regular updates on the status of marine fish stocks, ensuring that policy decisions are guided by robust scientific evidence (Mohamed *et al.,* 2017). The Handbook of Fisheries Statistics[16], produced by the Department of Fisheries, Government of India, offers additional publicly available data on fishery management programs, catch and landings statistics, and socio-economic considerations. Additionally, the Karnataka Department of Fisheries publishes its decision-making processes and results through reports available online, enhancing accessibility for all stakeholders.

The Indian Marine Fisheries Code mandates structured assessments and compliance checks developed through extensive expert consultations with multiple internal and external reviews to align with international best practices. The Code requires expert consultations—including marine research institutions and government bodies—to validate decision-making, stock assessments, and regulatory effectiveness. Furthermore, the Code states that "the Core Marine and Ancillary Fisheries Research Institution should ensure that all their research results are peer-reviewed," emphasizing the importance of the review process (Mohamed *et al.,* 2017).

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[16]See Handbook on Fisheries Statistics, Department of Fisheries [Available at: https://dof.gov.in/fisheries-statistics]

M2 Surveillance, control and enforcement

M2.1	**M2.1 There is an organisation responsible for monitoring compliance with fishery laws and regulations.** *In reaching a determination for M2.1, the assessor should consider if the following is in place:*	
	M2.1.1 There is an organisation responsible for monitoring compliance with specific monitoring, control and surveillance (MCS) mechanisms in place.	*Meets*
	M2.1.2 There are relevant tools or mechanisms used to minimise IUU fishing activity.	*Gap*
	M2.1.3 There is evidence of monitoring and surveillance activity appropriate to the intensity, geography, management control measures and compliance behaviour of the fishery.	*Gap*
Clause outcome		***Fail***

Rationale

Multiple legal frameworks and agencies share responsibility for monitoring compliance with fisheries laws in India. The Coast Guard Act 1978[17] grants the Indian Coast Guard (ICG) legal authority to patrol, board, and inspect vessels for compliance within India's maritime zones. Under this Act, the ICG is mandated to take necessary measures to preserve and protect marine resources (Coast Guard Act, 1978). However, while these powers allow the Coast Guard to enforce regulations, the effectiveness of such enforcement—especially in nearshore fisheries—remains unclear.

At the state level, the Karnataka Marine Fishing Regulation Act (1986)[18] designates the State Fisheries Department as the regulatory authority responsible for licensing and enforcing fisheries laws in Karnataka. This Act mandates the licensing of all fishing vessels and regulates gear types to prevent unregulated fishing. Although authorised officers have the power to inspect vessels and impound those in violation, there is no requirement for regular patrols or the use of electronic surveillance to ensure compliance (Karnataka Marine Fishing Regulation Act, 1986).

The Indian Marine Fisheries Bill 2021[19] further reinforces fisheries enforcement by designating authorised officers and establishing a Consultative Committee on Marine

[17]The Coast Guard Act (1978) [Available at: https://lddashboard.legislative.gov.in/actsofparliamentfromtheyear/coast-guard-act-1978]

[18]Karnataka Marine Fishing (Regulation) Act (No. 24 of 1986) (Available at: https://www.fao.org/faolex/results/details/en/c/LEX-FAOC063779/)

[19]India Marine Fisheries Bill (2021) [Available at: https://dof.gov.in/sites/default/files/2021-10/Draft_Indian_Marine_Fisheries_Bill_2021.pdf]

Fisheries for regulatory oversight. The Bill mandates vessel licensing and inspections; however, it does not specify the frequency of monitoring and surveillance activities. Additionally, while a National Plan of Action on IUU Fishing is outlined within the Indian Marine Fisheries Bill, intended to evaluate risks and define regulatory roles, the bill does not outline Vessel Monitoring System (VMS) requirements.

Governance of fisheries in India is highly fragmented, with responsibilities spread across multiple ministries and agencies, which leads to inefficiencies and enforcement gaps (Murty, 2015). Reports confirm that, despite the presence of enforcement agencies such as the Indian Coast Guard and Marine Police, there are persistent gaps in compliance monitoring. For example, although offshore surveillance—including patrols, aerial monitoring via aircraft, and the use of Unmanned Aerial Vehicles (UAVs)—is in place, these measures are less effective in nearshore fisheries where most domestic fishing occurs (Pramod, 2018).

At the local level, state fisheries departments often lack adequate patrol vessels, rendering enforcement in territorial waters ineffective. Compounding this issue, illegal landings, unreported transshipments, and the operation of unregistered fishing vessels within the 12-mile inshore zone further complicate compliance efforts (Pramod, 2010). The absence of a vessel monitoring system (VMS) makes it challenging to track fishing vessel activity and, consequently, to minimise IUU fishing (Pramod, 2018; Pramod, 2010).

Spatial management measures also suffer from enforcement deficiencies. Zonation rules—for instance, restrictions on mechanized boats beyond 10 nautical miles—are only partially complied with due to insufficient surveillance. Prohibited fishing methods, such as FAD-based cuttlefish fisheries, and the continued occurrence of bull/pair trawling despite a 2016 ban (Rohit *et al*., 2016), further underscore the ineffective implementation of regulatory tools.

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M2.2	**M2.2 There is a framework of sanctions which are applied when infringements against laws and regulations are discovered.** *In reaching a determination for M2.2, the assessor should consider if the following is in place:*	
	M2.2.1 The laws and regulations provide for penalties or sanctions that are adequate in severity to act as an effective deterrent.	*Gap*
	M2.2.2 There is no evidence of systematic non-compliance.	*Gap*
Clause outcome		***Fail***

Rationale

The legal framework for fisheries enforcement in India is established under several acts, including the Maritime Zones of India Act, 1976 and the Coast Guard Act 1978[20]. The Coast Guard Act[21] empowers enforcement officers to impose fines, imprisonment, seize vessels, and prosecute repeat offenders for violating fisheries laws or obstructing enforcement activities. However, the deterrent effect of these sanctions relies on their consistent application, and historical enforcement challenges indicate that widespread non-compliance remains an issue.

At the state level, the Karnataka Marine Fishing Regulation Act 1986[22] provides for fines ranging from ₹1,000 to ₹5,000 or up to five times the value of the illegal catch, in addition to measures such as vessel impoundment and license revocation. Yet, similar to the central framework, the effectiveness of these penalties is compromised by inconsistent enforcement practices. Moreover, the appeal process allowed under these laws can delay sanctions, further undermining their deterrent impact.

The 2021 Indian Marine Fisheries Bill[23] also introduces fines and penalties for illegal fishing; however, the relatively low fines (₹2,000–₹50,000 for domestic vessels) may not be sufficient to deter IUU (Illegal, Unreported, and Unregulated) fishing activities. Enforcement is patchy, particularly for issues such as illegal transhipments at sea, reducing the overall impact of these legal sanctions.

Reports in the literature reinforce these concerns. Pramod (2018) provides evidence of systematic non-compliance, especially in coastal areas where state-level enforcement is weak and coordination between central and state agencies is lacking. This fragmentation leads to a high incidence of illegal fishing, including incursions by foreign vessels. Similarly, Rohit *et al.* (2016) highlight that bans—such as that on bull/pair trawling—have not been effectively implemented despite orders issued as recently as 2016. Partial compliance with prohibitions, like those on FAD-based

[20]The Coast Guard Act (1978) [Available at: https://lddashboard.legislative.gov.in/actsofparliamentfromtheyear/coast-guard-act-1978]

[21]The Coast Guard Act (1978) [Available at: https://lddashboard.legislative.gov.in/actsofparliamentfromtheyear/coast-guard-act-1978]

[22] Karnataka Marine Fishing (Regulation) Act (No. 24 of 1986) (Available at: https://www.fao.org/faolex/results/details/en/c/LEX-FAOC063779/)

[23]India Marine Fisheries Bill (2021) [Available at: https://dof.gov.in/sites/default/files/2021-10/Draft_Indian_Marine_Fisheries_Bill_2021.pdf]

cuttlefish fisheries, further indicates that the existing enforcement mechanisms do not serve as a strong deterrent.

Although a framework of sanctions exists through various legal instruments, its effectiveness is severely limited by inconsistent enforcement, low penalty levels, and procedural delays in applying sanctions. The persistent evidence of systematic non-compliance—stemming from weak enforcement mechanisms, jurisdictional conflicts, and delayed policy implementation (Murty, 2015; Pramod, 2010)—underscores that the current framework fails to provide an adequate deterrent against infringements.

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M2.3	**M2.3 There is substantial evidence of widespread compliance in the fishery, and no substantial evidence of IUU fishing.** *In reaching a determination for M2.3, the assessor should consider if the following is in place:*	
	M2.3.1 The level of compliance is documented and updated routinely, statistically reviewed and available.	*Gap*
	M2.3.2 Fishers provide additional information and cooperate with management/enforcement agencies/organisations to support the effective management of the fishery.	*Gap*
	M2.3.3 The catch recording and reporting system is sufficient for effective traceability of catches per vessel and supports the prevention of IUU fishing.	*Gap*
Clause outcome		***Fail***

Rationale

While the Coast Guard Act 1978[24] requires that trials and enforcement actions be

[24]The Coast Guard Act (1978) [Available at: https://lddashboard.legislative.gov.in/actsofparliamentfromtheyear/coast-guard-act-1978]

documented and reported, there is no evidence that this compliance data is systematically reviewed, statistically analysed, or made publicly available. Although Coast Guard officers are empowered to inspect fishing records and seize illegal catches under the Act, it does not mandate a structured traceability system to track catches from vessel to landing. The Indian Marine Fisheries Bill 2021[25] calls for every licensed fishing vessel to comply with catch reporting regulations and mandates the establishment of a National Repository of Fisheries Data to collect, process, and disseminate information on compliance. In practice, however, this system remains underdeveloped, and enforcement of data reporting is uncertain. Additionally, research indicates that India lacks a systematic compliance documentation system, with large portions of the catch going unreported (Pramod, 2010), and fisheries data collection is inconsistent across agencies—especially as state governments have assumed responsibilities from CMFRI without sufficient capacity (Murty, 2015). Both Pramod (2018) and Rohit *et al.* (2016) note that routine documentation and statistical reviews of compliance levels are absent, resulting in significant gaps in tracking regulatory adherence.

Evidence of active cooperation from fishers with management and enforcement agencies is limited. Although biometric ID systems have been introduced for coastal security, there is little indication that fishers contribute additional information or actively participate in compliance efforts (Pramod, 2018). The lack of clear evidence regarding fisher cooperation is further highlighted by the ongoing non-compliance in certain areas. For example, despite the longstanding ban on issuing new purse seine licenses since 1995, enforcement agencies continue to face challenges in ensuring overall regulatory compliance, suggesting that industry stakeholders are not adequately supporting or cooperating with enforcement initiatives (Rohit *et al.*, 2016). This weak cooperation further hampers the collection of reliable compliance data.

The effectiveness of catch recording and reporting systems is crucial for traceability and the prevention of IUU fishing. However, Pramod (2018) reports significant deficiencies, including rampant unreported transhipments at sea, the lack of onboard observer programs, and inadequate dockside monitoring. With only 5–20% of fishing vessels inspected at landing centres, there is a high risk of unregulated catch movement. Additionally, data from Rohit *et al.* (2016) raise concerns that weak enforcement of fishing gear regulations and spatial restrictions compromises catch traceability; as a result, catch data may not accurately reflect legal fishing activity. Although the Karnataka Marine Fishing Regulation Act 1986[26] permits enforcement officers to inspect and seize illegally caught fish, it does not provide for a structured catch reporting system to ensure consistent traceability. The absence of a centralized data system for fisheries landings and reporting further weakens the overall traceability framework, making it challenging to effectively prevent IUU fishing (Murty, 2023; Pramod, 2010).

References

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Species requirements

This section, or module, comprises of four species categories. Each species in the catch is subject to an assessment against the relevant species category in this section (see clauses 1.2 and 1.3 and Table 6).

Type 1 species can be considered the 'target' or 'main' species in the fishery under assessment. They make up the bulk of the catch and a subjected to a detailed assessment. Type 1 species must represent 95% of the total annual catch. If a species-specific management regime is in place for a Type 1 species, it shall be assessed under Category A. If there is no species-specific management regime in place for a Type 1 species, it shall be assessed under Category B.

Type 2 Species can be considered the 'non-target' species in the fishery under assessment. They comprise a small proportion of the annual catch and are subjected to a relatively high-level assessment. Type 2 species may represent a maximum of 5% of the annual catch. If a species-specific management regime is in place for a Type 2 species, it shall be assessed under Category C. If there is no species-specific management regime in place for a Type 2 species, it shall be assessed under Category D.

Species that comprise less than 0.1% of the catch are not required to be assessed or listed here.

Category A species

1.2. All clauses must be met for a species to pass the Category A assessment.

1.2.1. If a species fails any of the Category A clauses, it should be re-assessed as a Category B species.

A1 Data collection

A1.1	**A1.1 Landings data are collected such that the fishery-wide removals of this species are known.**
Clause outcome	Choose an item.
Rationale	
References	

A1.2	**A1.2 Sufficient additional information is collected to enable an indication of stock status to be estimated.**
Clause outcome	Choose an item.
Rationale	
References	

A2 Stock assessment

A2.1	**A2.1 A stock assessment is conducted at least once every 3 years (or every 5 years if there is substantial supporting information that this is sufficient for the long-term sustainable management of the stock) and considers all fishery removals and the biological characteristics of the species.**
Clause outcome	Choose an item.
Rationale	
References	

A2.2	**A2.2 The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy.**
Clause outcome	Choose an item.
Rationale	
References	

A2.3	**A2.3 The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status.**
Clause outcome	Choose an item.
Rationale	
References	

A2.4	**A2.4 The assessment is subject to internal or external peer review.**
Clause outcome	Choose an item.
Rationale	
References	

A2.5	**A2.5 The assessment is made publicly available.**
Clause outcome	Choose an item.
Rationale	
References	

A3 Harvest strategy

A3.1	**A3.1 There is a mechanism in place by which total fishing mortality of this species is restricted.**
Clause outcome	Choose an item.
Rationale	
References	

A3.2	**A3.2 Total fishery removals of this species do not regularly exceed the level indicated or stated in the stock assessment. Where a specific quantity of removals is recommended, the actual removals may exceed this by up to 10% ONLY if the stock status is above the limit reference point or proxy.**
Clause outcome	Choose an item.
Rationale	
References	

A3.3	**A3.3 Commercial fishery removals are prohibited when the stock has been estimated to be below the limit reference point or proxy (small quotas for research or non-target catch of the species in other fisheries are permissible).**
Clause outcome	Choose an item.

Rationale	
References	

A4 Stock status

A4.1	**A4.1**	**The stock is at or above the target reference point; OR IF NOT: the stock is above the limit reference point or proxy and there is evidence that a fall below the limit reference point would result in fishery closure; OR IF NOT: the stock is estimated to be below the limit reference point or proxy, but fishery removals are prohibited**
Clause outcome	Choose an item.	
Rationale		
References		

Category B species

Category B species are assessed using a risk-based approach.

1.3. The risk matrix in Table B(a) shall be used when assessing a Category B species when estimates of Fishing mortality (F), Biomass (B) and reference points are available.

1.4. The risk matrix in Table B(b) shall be used when assessing a Category B species when no reference points are available.

B1	**Indian Mackerel** *(Rastrelliger kanagurta)*
Table used. B(a) or B(b)	B(a)
Clause outcome	***Fail***

Rationale

The Indian Mackerel (*Rastrelliger kanagurta*) is classified as a Category B species under MarinTrust due to the lack of a species-specific management plan, absence of TAC limits, and weak enforcement of harvest control rules (HCRs). Stock assessments confirm low biomass and high fishing pressure, yet no formal mechanisms exist to regulate exploitation rates. Additionally, insufficient surveillance against IUU fishing and ongoing juvenile overfishing prevent Category A classification, requiring a risk-based assessment under Category B.

The state-wise contribution to mackerel landings highlights the regional importance of Karnataka, which accounts for 20.7% of national mackerel landings, second only to Kerala (27.5%) (Rohit *et al.,* 2024). Within these landings, Indian Mackerel dominates the group, making up 80.1% of the total mackerel catch. The stock assessment data for Indian Mackerel along the Karnataka coast for 2023 provides the most recent and reliable reference for evaluating stock status and fishing mortality. The key indicators from 2023 show that Fishing Mortality (F/M) is 1.9 (1.3-2.7), still within but at the higher end of the sustainable threshold (1.5-2.0), while B/B_0 is 0.3 (0.18-0.48) and B/B_{msy} is 0.82 (0.49-1.3) (ICAR-CMFRI, 2024). These values suggest that the biomass is below the target reference point and the fishery remains in an overfished state. This is also corroborated by data from Sathianandan *et al.* (2021), which identified fishing above the MSY, and classification of Karnataka India mackerel stock as 'overfished'. While there is a slight improvement compared to the median across years, the stock still does not meet the sustainability requirements of Table B(a) under MarinTrust criteria. According to Table B(a) of the MarinTrust Whole Fish Fishery Assessment Criteria, when biomass is below MSY/target reference point and fishing mortality is above MSY or its reference point, the assessment results in a Fail outcome.

References

ICAR-CMFRI Mangalore Regional Centre. (2024). Fishery and stock assessment of small pelagics along the Karnataka coast: Annual report 2024-25. ICAR-Central Marine Fisheries Research Institute.

Rohit, P., Abdussamad, E. M., Rethinam, A. M. M., Ganga, U., Ghosh, S., Rajesh, K. M., Koya, K. P. S., Koya, K. M., Anulekshmi, C., Nakhawa, A. D., Surya, S., Roul, S. K.,

Azeez, P. A., Kumar, R. V., Manas, H. M., Jayasankar, J., Mini, K. G., & Kuriakose, S. (2024). Pelagic fisheries of India – An overview. Indian Journal of Fisheries, 71(1). https://doi.org/10.21077/ijf.2024.71.1.131154-02

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B1	**Indian Oil Sardine** *(Sardinella longiceps)*
Table used B(a) or B(b)	B(a)
Clause outcome	*Fail*

Rationale

The Indian Oil Sardine (*Sardinella longiceps*) accounts for 25% of the catch composition and is classified as a Category B species under MarinTrust due to the lack of a species-specific management plan, absence of total allowable catch (TAC) limits, and relatively weak enforcement of harvest control rules (HCRs). While some management measures exist, they do not provide a structured framework to prevent overexploitation or ensure long-term stock sustainability. Additionally, stock assessments indicate biomass depletion and excessive fishing pressure, nevertheless, there are no formalized mechanisms to adjust exploitation rates in response to declining stock levels. The absence of effective surveillance against juvenile overfishing and IUU fishing further prevents classification under Category A, necessitating a risk-based assessment under Category B.

Indian Oil Sardine populations exhibit steep fluctuations in landings, influenced not only by fishing pressure but also by environmental variability, making stock assessments complex (Rohit *et al*., 2024). Landings have historically ranged from <1% to 13% of total fish landings in India, averaging 7% nationally during the period of 1985 to 2021, while the species' contribution on the west coast varied from <1% to 24%, averaging 12% (Rohit *et al*., 2024).

Data captured from the Karnataka Indian Oil sardine stocks suggest overfishing is occurring (Rohit 2018). The B_{curr}/B_{MSY} ratio is 0.732, indicating that biomass is below sustainable levels. The E_{curr} (current exploitation rate) is 0.810, which exceeds E_{MSY} (0.782), confirming high fishing pressure. The MSY for Karnataka is 108,447 tonnes, while the average yield from 2010-2015 was 104,408 tonnes, meaning the fishery is operating near its MSY limit but under excessive exploitation.

In addition, according to the Sathianandan *et al*. (2021) stock assessment, the initial biomass (B_0) was 165,651 tonnes, while the carrying capacity (K) was 729,416 tonnes, showing that the stock has been historically depleted compared to its natural potential. The intrinsic growth rate (r) was 0.335, indicating moderate resilience but insufficient for rapid recovery. The exploitation rate (μ) was 3.000,

which is significantly high and suggests continued heavy fishing pressure on the stock.

Further, Karnataka landings data for 2024 indicate that Indian oil sardine contributed just under 40,000 tonnes (ICAR-CMFRI 2024), which remains well below the estimated MSY of 108,447 tonnes, reinforcing that the stock is not currently producing at sustainable levels. The species' short lifespan (<3 years), early maturity, and batch spawning behaviour make it highly susceptible to environmental fluctuations and overexploitation, further supporting the need for a Category B classification under MarinTrust (Rohit *et al.,* 2024).

References

CMFRI, FRAEED (2024) *Marine Fish Landings in India - 2023.* Technical Report. ICAR-Central Marine Fisheries Research Institute, Kochi.

ICAR-CMFRI Mangalore Regional Centre. (2024). *Fishery and stock assessment of small pelagics along the Karnataka coast: Annual report 2024-25.* ICAR-Central Marine Fisheries Research Institute.

Rohit, Prathibha & Sivadas, Madhavan & Abdussamad, E. & Rathinam, Margaret & Said, Koya & U, Ganga & Ghosh, Shubhadeep & K M, Rajesh & Koya, Mohammed & Chellappan, Anulekshmi & K.G., Mini & George, Grinson & Roul, Subal & S., Surya & Sukumaran, Sandhya & Vivekanandan, E & Retheesh, T. & Prakasan, D & M., Sathish & Supraba, V.. (2018). Enigmatic Indian Oil Sardine: An Insight.

Rohit, P., Abdussamad, E. M., Rethinam, A. M. M., Ganga, U., Ghosh, S., Rajesh, K. M., Koya, K. P. S., Koya, K. M., Anulekshmi, C., Nakhawa, A. D., Surya, S., Roul, S. K., Azeez, P. A., Kumar, R. V., Manas, H. M., Jayasankar, J., Mini, K. G., & Kuriakose, S. (2024). Pelagic fisheries of India – An overview. Indian Journal of Fisheries, 71(1). https://doi.org/10.21077/ijf.2024.71.1.131154-02

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B1	**Yellowtail Scad** *(Atule mate),* **Mackerel Scad** *(Decapterus macarellus),* **Bigeye Scad** *(Selar crumenophthalmus),* **Shortfin Scad** *(Decapterus macrosoma),* **Herring Scad** *(Alepes vari),* **Blackfin Scad** *(Alepes melanoptera),* **Shrimp Scad** *(Alepes djedaba)* and **Indian Scad** *(Decapterus russelli)*
Table used B(a) or B(b)	B(a)
Clause outcome	*Fail*

Rationale

The Scad species group (Yellowtail Scad, Mackerel Scad, Bigeye Scad, Shortfin Scad, Herring Scad, Blackfin Scad, Shrimp Scad and Indian Scad) collectively accounts for 15% of the catch composition and lacks a species-specific management plan. Based on stock data for Karnataka (Sathianandan *et al.,* 2021),

key indicators suggest overfishing concerns. The initial biomass (B_0) for Scads is 16,617 tonnes, while the carrying capacity (K) is 162,752 tonnes, indicating that the stock has been historically depleted compared to its natural potential. The intrinsic growth rate (r) is 0.424, suggesting moderate resilience, but the exploitation rate (μ) is 3.000, which is significantly high and suggests continued excessive removals relative to the stock's natural growth potential. Further supporting concerns over stock depletion, landings in 2023 dropped to 39,030 tonnes, down from 65,880 tonnes in 2022 (CMFRI, FRAEED 2024).

The percentage contribution of scads to the total landings is also unclear, with scads included both as part of and separate to the carangids, with no species specific breakdown (Rohit *et al*. 2024). Additionally, the absence of Total Allowable Catch (TAC) limits, harvest control rules (HCRs), or species-specific adaptive management strategies supports the risk-based assessment under Category B instead of Category A. The 'overfished' categorisation of the scads in Sathianandan *et al.* (2021) suggest low biomass and excessive exploitation, resulting in a Fail outcome under under Table B(a).

References

CMFRI, FRAEED (2024) *Marine Fish Landings in India - 2023.* Technical Report. ICAR-Central Marine Fisheries Research Institute, Kochi.

Rohit, P., Abdussamad, E. M., Rethinam, A. M. M., Ganga, U., Ghosh, S., Rajesh, K. M., Koya, K. P. S., Koya, K. M., Anulekshmi, C., Nakhawa, A. D., Surya, S., Roul, S. K., Azeez, P. A., Kumar, R. V., Manas, H. M., Jayasankar, J., Mini, K. G., & Kuriakose, S. (2024). Pelagic fisheries of India – An overview. Indian Journal of Fisheries, 71(1). https://doi.org/10.21077/ijf.2024.71.1.131154-02

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B1	**Bullet Tuna** *(Auxis rochei)*
Table used B(a) or B(b)	B(a)
Clause outcome	***Fail***

Rationale

Bullet Tuna (*Auxis rochei*) contributes 10% of the catch composition, yet stock assessments do not evaluate it separately from Frigate Tuna (*Auxis thazard*), instead grouping them together under a single assessment (Sathianandan *et al*., 2021). This introduces uncertainty regarding species-specific stock status. The assessment estimates an initial biomass (B_0) of 2,981 tonnes, significantly lower than the carrying capacity (K) of 4,630 tonnes, suggesting historical depletion. While the species has a moderate growth rate (r = 0.650), the exploitation rate (μ = 3.000)

is alarmingly high, pointing to intense fishing pressure.

Further complicating the classification, the ICAR-CMFRI (2024) report on small pelagic stock assessment along Karnataka does not list Bullet Tuna in its catch composition but instead reports *Euthynnus affinis* (Kawakawa) at 3.8%, raising questions about potential misidentification or regional variability in landings data.

Despite its commercial importance, no formal regulatory measures such as TACs or species-specific harvest control rules exist to manage stock sustainability. Given the low biomass, excessive removals, lack of adaptive management strategies, and uncertainty in species-specific assessment, a risk-based assessment under Category B is required, resulting in a Fail outcome under Table B(a) of MarinTrust.

References

CMFRI, FRAEED (2024) *Marine Fish Landings in India - 2023.* Technical Report. ICAR-Central Marine Fisheries Research Institute, Kochi.

Sathianandan, T. V., Mohamed, K. S., Jayasankar, J., Kuriakose, S., Mini, K. G., Varghese, E., Zacharia, P. U., Kaladharan, P., Najmudeen, T. M., Koya, M. K., Sasikumar, G., Bharti, V., Rohit, P., Maheswarudu, G., Sindhu, K. A., Sreepriya, V., Alphonsa, J., & Deepthi, A. (2021). Status of Indian marine fish stocks: Modelling stock biomass dynamics in multigear fisheries. ICES Journal of Marine Science, 78(5), 1744–1757. https://doi.org/10.1093/icesjms/fsab076

B1	**Fringescale Sardinella** *(Sardinella fimbriata),* **Goldstripe Sardinella** *(Sardinella gibbosa), and* **White Sardinella** *(Sardinella albella).*
Table used B(a) or B(b)	B(a)
Clause outcome	***Fail***

Rationale

The Sardinella species group (*Sardinella fimbriata, S. gibbosa, S. albella*) represents 5-7% of the catch composition and lacks a species-specific management plan. Stock assessment data categorize *Sardinella* species under "Other Sardines" (Sathianandan *et al*., 2021), making this the most appropriate reference category. The "Other Sardines" group (B_0 = 47,499 tonnes, K = 161,736 tonnes, r = 0.194, μ = 1.831) provides the most relevant biological and ecological context for these species. Stock indicators suggest moderate depletion, with low biomass (B_0 = 47,499 tonnes) relative to carrying capacity and exploitation pressure (μ = 1.831) that remains high. The intrinsic growth rate (r = 0.194) suggests lower resilience, making these species vulnerable to overfishing. Further supporting concerns over stock sustainability, landings have fluctuated in recent years. The ICAR-CMFRI (2024) Fishery and stock assessment of small pelagics along the Karnataka coast Annual report does not mention these species in the purse seine catch composition but identifies them as major sardine species observed in the purse seine fishery, suggesting their presence is significant but may be underreported.

References

ICAR-CMFRI Mangalore Regional Centre. (2024). *Fishery and stock assessment of small pelagics along the Karnataka coast: Annual report 2024-25.* ICAR-Central Marine Fisheries Research Institute.

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Category C species

1.5. All clauses must be met for a species to pass the Category C assessment.

1.5.1. Where a species fails this Category C clause, it should be assessed as a Category D species instead, except if there is evidence that the species is currently below the limit reference point.

C1.1	**C1.1 Fishery removals of the species in the fishery under assessment are included in the stock assessment process OR are considered by scientific authorities to be negligible.**
Clause outcome	Choose an item.
Rationale	
References	

C1.2	**C1.2 The species is considered, in its most recent stock assessment, to have a biomass above the limit reference point (or proxy), OR removals by the fishery under assessment are considered by scientific authorities to be negligible.**
Clause outcome	Choose an item.
Rationale	
References	

Category D species

Category D species are assessed against a risk-based approach.

1.6. The Productivity-Susceptibility Analysis (PSA) in Table D(a) shall be used when assessing Category D species.

1.7. Table D(b) shall be used to calculate the overall PSA risk rating for the Category D species.

1.8. Should the PSA indicate a high risk, further assessment shall be completed against the requirements in Table D(c).

Table D(a) - Productivity Susceptibility Analysis (PSA) and scores

Table D(a) provides detailed values and scores for the species productivity and susceptibility attributes and attributes, the assessor shall use Table D(a) to the PSA table.
Table D(b) is used to calculate the overall PSA risk rating for the Category D species.

Species name	**Horse mackerel** (*Megalaspis cordyla*)	
Productivity attributes	**Value**	**Score**
Average age at maturity	2.5 years	1
Average maximum age	5 years	1
Fecundity	146,400 eggs	1
Average maximum size	80.0 cm TL	1
Average size at maturity	25.0 cm TL	1
Reproductive strategy	Broadcast spawner	1
Mean Trophic Level (MTL)	3.9	3
Density dependence (to be used when scoring invertebrate species only)	*N/A*	
Susceptibility attributes		
Areal overlap (availability): Overlap of the fishing effort with a species concentration of the stock	>30% overlap	3
Encounterability: The position of the stock/ species within the water column relative to the fishing gear, and the position of the stock/species within the habitat relative to the position of the gear	High, due to pelagic schooling behaviour	3
Selectivity of gear type: Potential of the gear to retain species	Frequently caught before maturity	3
Post-capture mortality (PCM): The chance that, if captured, a species would	Retained species or majority dead when released	3

be released and that it would be in a condition permitting subsequent survival		
Average susceptibility score		3
PSA risk rating (from Table D(b))		Pass
Compliance rating		N/A

Reference

FishBase. (n.d.). *Megalaspis cordyla* (Linnaeus, 1758) summary page. Retrieved 06/02/2025, from https://fishbase.se/summary/384

Qamar, N., Panhwar, S.K. Assessment of Maturity, Reproduction and Reproductive Potentials of Torpedo Scad, Megalaspis cordyla (Linnaeus, 1758) from Northern Arabian Sea Coast of Pakistan. Russ J Mar Biol 44, 42–50 (2018). https://doi.org/10.1134/S1063074018010078

Further assessment for Category D species

Should the PSA indicate a high risk, further assessment shall be completed against the requirements D1 and D2 – Table D(c).

D1	D1. The potential impacts of the fishery on this species are considered during the management process, and reasonable measures are taken to minimise these impacts.
Clause outcome	Choose an item.
Rationale	
References	

D2	D2. There is no substantial evidence that the fishery has a significant negative impact on the species.
Clause outcome	Choose an item.
Rationale	
References	

Species name	**Longnose trevally** *(Platycaranx chrysophrys)*

Productivity attributes	Value	Score
Average age at maturity	Data not available	3
Average maximum age	Data not available	3
Fecundity	Data not available	3
Average maximum size	72.0 cm FL	1
Average size at maturity	Data not available	3
Reproductive strategy	Data not available	3
Mean Trophic Level (MTL)	4.3	3
Density dependence (to be used when scoring invertebrate species only)	N/A	
Susceptibility attributes		
Areal overlap (availability): Overlap of the fishing effort with a species concentration of the stock	>30% overlap	3
Encounterability: The position of the stock/ species within the water column relative to the fishing gear, and the position of the stock/species within the habitat relative to the position of the gear	High, due to pelagic schooling behaviour	3
Selectivity of gear type: Potential of the gear to retain species	Frequently caught before maturity	3
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	Retained species or majority dead when released	3
Average susceptibility score		3
PSA risk rating (from Table D(b))		Further checks – criteria in Table D(c)

Compliance rating	Fail

Reference

FishBase. (n.d.). *Platycaranx chrysophrys* (Cuvier, 1833) summary page. Retrieved February 6, 2025, from https://fishbase.se/summary/4441

Further assessment for Category D species

Should the PSA indicate a high risk, further assessment shall be completed against the requirements D1 and D2 – Table D(c).

D1	D1. The potential impacts of the fishery on this species are considered during the management process, and reasonable measures are taken to minimise these impacts.
Clause outcome	***Fail***

Rationale

There is no evidence of targeted management strategies or regulations aimed at mitigating the impacts of these fishing activities on the Longnose Trevally populations. The absence of such measures suggests that the potential impacts of the fishery on this species are not adequately considered during the management process. The species has a moderate fishing vulnerability score (41/100) (FishBase), indicating that while it is not highly susceptible, it still faces potential risks from unregulated exploitation. Its medium price category (FishBase) suggests moderate commercial value, which could lead to continued fishing pressure in the absence of effective management.

References

FishBase. (n.d.). *Platycaranx chrysophrys* (Cuvier, 1833) summary page. Retrieved February 6, 2025, from https://fishbase.se/summary/4441

D2	D2. There is no substantial evidence that the fishery has a significant negative impact on the species.
Clause outcome	***Fail***

Rationale

Due to the absence of comprehensive studies or data on the population dynamics and stock assessments of the Longnose Trevally, it is not possible to conclusively determine the impact of fishing activities on this species. The lack of evidence does not imply the absence of negative impacts; rather, it highlights a significant gap in research and monitoring. Without substantial evidence to confirm that the fishery does not have a significant negative impact, a precautionary approach necessitates a fail outcome for this clause.

References
FishBase. (n.d.). *Platycaranx chrysophrys* (Cuvier, 1833) summary page. Retrieved February 6, 2025, from https://fishbase.se/summary/4441

Species name	**Yellowspotted trevally** (*Turrum fulvoguttatum*)	
Productivity attributes	**Value**	**Score**
Average age at maturity	Data not available	3
Average maximum age	Data not available	3
Fecundity	Data not available	3
Average maximum size	120 cm FL	2
Average size at maturity	Data not available	3
Reproductive strategy	Data not available	3
Mean Trophic Level (MTL)	4.4	3
Density dependence (to be used when scoring invertebrate species only)	N/A	
Susceptibility attributes		
Areal overlap (availability): Overlap of the fishing effort with a species concentration of the stock	>30% overlap	3
Encounterability: The position of the stock/ species within the water column relative to the fishing gear, and the position of the stock/species within the habitat relative to the position of the gear	High, due to pelagic schooling behaviour	3
Selectivity of gear type: Potential of the gear to retain species	Frequently caught before maturity	3
Post-capture mortality (PCM): The chance that, if captured, a species would be released and that it would be in a condition	Retained species or majority dead when released	3

permitting subsequent survival		
Average susceptibility score		3
PSA risk rating (from Table D(b))		Further checks – criteria in Table D(c)
Compliance rating		Fail

Reference

FishBase. (n.d.). *Turrum fulvoguttatus* summary page. Retrieved February 6, 2025, from https://www.fishbase.se/summary/Turrum-fulvoguttatum.html

Further assessment for Category D species

Should the PSA indicate a high risk, further assessment shall be completed against the requirements D1 and D2 – Table D(c).

D1	D1. The potential impacts of the fishery on this species are considered during the management process, and reasonable measures are taken to minimise these impacts.
Clause outcome	***Fail***

Rationale

The Yellowspotted Trevally is moderately valued in commercial markets, as reflected by its medium price category (FishBase). Despite its economic significance, there is no evidence of targeted management strategies or regulations aimed at mitigating the impacts of these fishing activities on the Yellowspotted Trevally populations. The absence of such measures suggests that the potential impacts of the fishery on this species are not adequately considered during the management process.

References

FishBase. (n.d.). *Turrum fulvoguttatus* summary page. Retrieved February 6, 2025, from https://www.fishbase.se/summary/Turrum-fulvoguttatum.html

D2	D2. There is no substantial evidence that the fishery has a significant negative impact on the species.
Clause outcome	***Fail***

Rationale

FishBase assigns the Yellowspotted Trevally a very high fishing vulnerability score of 80 out of 100, indicating a significant susceptibility to fishing pressures. Additionally, the species has a very high climate vulnerability score of 89 out of 100,

suggesting that it is highly susceptible to the impacts of climate change. These high vulnerability scores, coupled with the lack of specific management measures, suggest that current fishing practices may have a significant negative impact on Yellowspotted Trevally populations.
References FishBase. (n.d.). *Turrum fulvoguttatus* summary page. Retrieved February 6, 2025, from https://www.fishbase.se/summary/Turrum-fulvoguttatum.html

Species name	**Narrow-barred Spanish mackerel** (*Scomberomorus commerson*)	
Productivity attributes	**Value**	**Score**
Average age at maturity	2 years	1
Average maximum age	22 years	2
Fecundity	635,000	1
Average maximum size	240 cm FL	3
Average size at maturity	75.2 cm FL	2
Reproductive strategy	Broadcast spawner	1
Mean Trophic Level (MTL)	4.5	3
Density dependence (to be used when scoring invertebrate species only)	N/A	
Susceptibility attributes		
Areal overlap (availability): Overlap of the fishing effort with a species concentration of the stock	>30% overlap	3
Encounterability: The position of the stock/ species within the water column relative to the fishing gear, and the position of the stock/species within the habitat relative to the position of the gear	High, due to pelagic schooling behaviour	3
Selectivity of gear type: Potential of the gear to retain species	Frequently caught before maturity	3

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	Retained species or majority dead when released	3
Average susceptibility score		3
PSA risk rating (from Table D(b))		Further checks – criteria in Table D(c)
Compliance rating		Fail

Reference:

FishBase. (n.d.). *Scomberomorus commerson* (Lacepède, 1800) summary page. Retrieved February 6, 2025, from https://www.fishbase.se/summary/scomberomorus-commerson.html

Further assessment for Category D species

Should the PSA indicate a high risk, further assessment shall be completed against the requirements D1 and D2 – Table D(c).

D1	D1. The potential impacts of the fishery on this species are considered during the management process, and reasonable measures are taken to minimise these impacts.
Clause outcome	***Fail***

Rationale

The narrow-barred Spanish mackerel (*Scomberomorus commerson*) is an important commercial species; however, fisheries management strategies are fragmented and lack a comprehensive, science-based approach to mitigating fishery impacts. In particular, the species is widely targeted across multiple jurisdictions, yet management measures are inconsistent, often limited to localized input controls such as gear restrictions, size limits, and seasonal fishing bans (Roa-Ureta *et al.,* 2019).

A major gap in the management process is the absence of Total Allowable Catch (TAC) limits and Harvest Control Rules (HCRs) to regulate fishing pressure across the species' full range. Most current regulations focus on limiting fishing effort rather than directly controlling stock exploitation levels. Additionally, there is no coordinated international stock assessment, making it difficult to determine if implemented measures are effective at minimizing fishery impacts.

Furthermore, FishBase mentions the species' fishing vulnerability as moderate to high (52/100) and climate vulnerability as high to very high (75/100). These indicators suggest that current management efforts are insufficient to address the

cumulative effects of fishing pressure and environmental changes. The IUCN classification of Near Threatened (2022) further highlights the ongoing risk of population decline due to inadequate conservation measures.

References

FishBase. (n.d.). *Scomberomorus commerson* (Lacepède, 1800) summary page. Retrieved February 6, 2025, from https://www.fishbase.se/summary/scomberomorus-commerson.html

IUCN Red List. (2022). Scomberomorus commerson. Retrieved from https://www.iucnredlist.org/species/170316/46647677

Roa-Ureta, R. H., Lin, Y. J., Rabaoui, L., Al-Abdulkader, K., & Qurban, M. A. (2019). Life history traits of the narrow-barred Spanish mackerel (*Scomberomorus commerson*) across jurisdictions of the southeast Arabian Peninsula: Implications for regional management policies. Regional Studies in Marine Science, 31, 100797. https://doi.org/10.1016/j.rsma.2019.100797.

D2	D2. There is no substantial evidence that the fishery has a significant negative impact on the species.
Clause outcome	***Fail***

Rationale

Evidence suggests that the fishery has a significant negative impact on *Scomberomorus commerson* populations. The 2022 IUCN assessment estimates a 20–30% population decline over the last three generations, largely attributed to overfishing and climate-related stressors. The species' classification as Near Threatened reflects concerns about stock depletion and the lack of effective management measures to reverse these trends.

Moreover, FishBase ranks the species' fishing vulnerability as moderate to high (52/100) and its climate vulnerability as high to very high (75/100), indicating that it faces ongoing pressure from both direct exploitation and environmental changes. In particular, regions with high fishing effort, such as the Arabian Gulf and Indo-Pacific, have reported significant declines in catch rates, suggesting continued overexploitation. Despite being an economically valuable species (very high price category) (FishBase), the absence of species-specific stock assessments across its full distribution range makes it difficult to accurately quantify the fishery's impact. However, localized studies have consistently reported stock declines, increased fishing effort, and high landings in certain regions, all of which strongly indicate negative impacts from the fishery.

References

FishBase. (n.d.). *Scomberomorus commerson* (Lacepède, 1800) summary page. Retrieved February 6, 2025, from https://www.fishbase.se/summary/scomberomorus-commerson.html

IUCN Red List. (2022). *Scomberomorus commerson*. Retrieved from https://www.iucnredlist.org/species/170316/46647677

Species name	**Blackflash ribbonfish** (*Trachipterus jacksonensis*)	
Productivity attributes	**Value**	**Score**
Average age at maturity	Data not available	3
Average maximum age	Data not available	3
Fecundity	Data not available	3
Average maximum size	220 cm TL	3
Average size at maturity	Data not available	3
Reproductive strategy	Data not available	3
Mean Trophic Level (MTL)	3.6	3
Density dependence (to be used when scoring invertebrate species only)	N/A	
Susceptibility attributes		
Areal overlap (availability): Overlap of the fishing effort with a species concentration of the stock	<10% overlap	1
Encounterability: The position of the stock/ species within the water column relative to the fishing gear, and the position of the stock/species within the habitat relative to the position of the gear	Low overlap with fishing gear (low encounterability)	1
Selectivity of gear type: Potential of the gear to retain species	Retained species or majority dead when released	3
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	Retained species or majority dead when released	3
Average susceptibility score		2

PSA risk rating (from Table D(b))	Further checks – criteria in Table D(c)
Compliance rating	Fail

Further assessment for Category D species

Should the PSA indicate a high risk, further assessment shall be completed against the requirements D1 and D2 – Table D(c).

D1	D1. The potential impacts of the fishery on this species are considered during the management process, and reasonable measures are taken to minimise these impacts.
Clause outcome	***Fail***
Rationale There is no specific information indicating that the potential impacts of fisheries on the Blackflash ribbonfish (*Trachipterus jacksonensis*) are considered during management processes. Additionally, there is no evidence of reasonable measures being implemented to minimize these impacts. The lack of targeted management strategies suggests that the species is not a primary focus in fisheries management plans.	
References FishBase. (n.d.). Trachipterus jacksonensis (Ramsay, 1881). FishBase. Retrieved February 7, 2025, from https://fishbase.se/summary/SpeciesSummary.php?id=14241&lang=portuguese	

D2	D2. There is no substantial evidence that the fishery has a significant negative impact on the species.
Clause outcome	***Pass***
Rationale Currently, there is no substantial evidence indicating that fisheries have a significant negative impact on *Trachipterus jacksonensis* populations. The species is not a primary target of commercial fisheries, and there is no data suggesting significant bycatch or population declines due to fishing activities. However, the absence of evidence does not necessarily confirm the absence of impact, and ongoing monitoring would be beneficial.	
References FishBase. (n.d.). Trachipterus jacksonensis (Ramsay, 1881). FishBase. Retrieved February 7, 2025, from https://fishbase.se/summary/SpeciesSummary.php?id=14241&lang=portuguese	

Species name	**Largehead hairtail** (*Trichiurus lepturus)*	
Productivity attributes	**Value**	**Score**
Average age at maturity	2 years	1
Average maximum age	6 years[27]	1
Fecundity	130,000 eggs per year	1
Average maximum size	234 cm	2
Average size at maturity	50.6 cm	2
Reproductive strategy	Broadcast spawner	1
Mean Trophic Level (MTL)	4.4	3
Density dependence (to be used when scoring invertebrate species only)	N/A	
Susceptibility attributes		
Areal overlap (availability): Overlap of the fishing effort with a species concentration of the stock	10-30% overlap	2
Encounterability: The position of the stock/ species within the water column relative to the fishing gear, and the position of the stock/species within the habitat relative to the position of the gear	Medium overlap with fishing gear	2
Selectivity of gear type: Potential of the gear to retain species	Retained species or majority dead when released	3
Post-capture mortality (PCM): The chance that, if captured, a species would be released and that it would be in a condition	Retained species or majority dead when released	3

[27] Motlagh, T., Amin,S., Hashemi, S.A., & Mirzaei, M.R. (2021) Population dynamics and fishery status of Trichiurus lepturus (*Largehead hairtail*) in the northern waters of the Oman Sea (Sistan and Baluchestan waters, Iran). *Iranian Journal of Fisheries Sciences* 20, no. 4 (July 1, 2021): 1022–34. https://doi.org/10.22092/ijfs.2021.124414.

permitting subsequent survival		
Average susceptibility score		2.5
PSA risk rating (from Table D(b))		Pass
Compliance rating		N/A

Further assessment for Category D species

Should the PSA indicate a high risk, further assessment shall be completed against the requirements D1 and D2 – Table D(c).

D1	D1. The potential impacts of the fishery on this species are considered during the management process, and reasonable measures are taken to minimise these impacts.
Clause outcome	Choose an item.
Rationale	
Reference	

D2	D2. There is no substantial evidence that the fishery has a significant negative impact on the species.
Clause outcome	Choose an item.
Rationale	
References	

Species name	**Crested hairtail (*Tentoriceps cristatus*)**	
Productivity attributes	**Value**	**Score**
Average age at maturity	Data not available	3
Average maximum age	Data not available	3
Fecundity	Data not available	3
Average maximum size	90 cm	2
Average size at maturity	Data not available	3

Reproductive strategy	Data not available	3
Mean Trophic Level (MTL)	4.2	3
Density dependence (to be used when scoring invertebrate species only)	N/A	
Susceptibility attributes		
Areal overlap (availability): Overlap of the fishing effort with a species concentration of the stock	10-30% overlap	2
Encounterability: The position of the stock/ species within the water column relative to the fishing gear, and the position of the stock/species within the habitat relative to the position of the gear	Medium overlap with fishing gear	2
Selectivity of gear type: Potential of the gear to retain species	Retained species or majority dead when released	3
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	Retained species or majority dead when released	3
Average susceptibility score		2.5
PSA risk rating (from Table D(b))		Further checks – criteria in Table D(c)
Compliance rating		Fail

Further assessment for Category D species

Should the PSA indicate a high risk, further assessment shall be completed against the requirements D1 and D2 – Table D(c).

D1	D1. The potential impacts of the fishery on this species are considered during the management process, and reasonable measures are taken to minimise these impacts.
Clause	***Fail***

outcome	
Rationale *Tentoriceps cristatus* is primarily caught incidentally in bottom trawls and bag nets, often mixed with other trichiurid fishes in Southeast Asian countries. Given its minor commercial importance, there is no substantial evidence indicating that the potential impacts of fisheries on this species are specifically considered in management processes. This species has a Moderate Fishing Vulnerability and minor commercial usage, but targeted management measures to minimize fishing impacts on *T. cristatus* are lacking.	
References FishBase. (n.d.). *Tentoriceps cristatus* (Klunzinger, 1884). FishBase. Retrieved February 7, 2025, from https://www.fishbase.se/summary/7947	

D2	D2. There is no substantial evidence that the fishery has a significant negative impact on the species.
Clause outcome	***Pass***
Rationale *Tentoriceps cristatus* is considered a minor component of commercial fisheries and is typically caught as bycatch. There is currently no substantial evidence indicating that fishing activities have a significant negative impact on its populations. Additionally, the species has a moderate fishing vulnerability score of 38 out of 100, suggesting a moderate capacity to withstand fishing pressures. However, the lack of comprehensive studies on its population dynamics and the impact of fishing necessitates caution. Continuous monitoring would be beneficial to ensure that the species remains unaffected by fishing pressures.	
References FishBase. (n.d.). *Tentoriceps cristatus* (Klunzinger, 1884). FishBase. Retrieved February 7, 2025, from https://www.fishbase.se/summary/7947	

Species name	**Smallhead hairtail** (*Eupleurogrammus muticus*)	
Productivity attributes	**Value**	**Score**
Average age at maturity	Data not available	3
Average maximum age	Data not available	3
Fecundity	Data not available	3
Average maximum size	87.0 cm TL male/unsexed; 97.5 cm	1

	TL female	
Average size at maturity	Data not available	3
Reproductive strategy	Data not available	3
Mean Trophic Level (MTL)	4.1	3
Density dependence (to be used when scoring invertebrate species only)	N/A	
Susceptibility attributes		
Areal overlap (availability): Overlap of the fishing effort with a species concentration of the stock	10-30% overlap	2
Encounterability: The position of the stock/ species within the water column relative to the fishing gear, and the position of the stock/species within the habitat relative to the position of the gear	Medium overlap with fishing gear	2
Selectivity of gear type: Potential of the gear to retain species	Retained species or majority dead when released	3
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	Retained species or majority dead when released	3
Average susceptibility score		2.5
PSA risk rating (from Table D(b))		Further checks – criteria in Table D(c)
Compliance rating		Fail

Further assessment for Category D species

Should the PSA indicate a high risk, further assessment shall be completed against the requirements D1 and D2 – Table D(c).

D1	D1. The potential impacts of the fishery on this species are considered during

	the management process, and reasonable measures are taken to minimise these impacts.
Clause outcome	***Fail***
Rationale At the time of the study conducted by Rizvi *et al.* (2003), *Eupleurogrammus muticus* was primarily caught by shore seines, bag nets, and coastal bottom trawls, often mixed with other trichiurid fishes. The species was mainly processed in dried and salted forms, with occasional fresh sales. It constituted 78.2% of ribbonfish landings in Mumbai waters, yet there were no dedicated management measures in place for its conservation. Stock assessment studies at the time indicated that the exploitation rate (E = 0.73) exceeded the sustainable threshold of 0.50, raising overfishing concerns (Rizvi *et al.*, 2003). Despite recommendations to reduce fishing effort by 13.4%, no species-specific regulations existed to address depletion risks. More than two decades later, there is still no substantial evidence that fishery management processes have implemented species-specific conservation measures for *E. muticus*.	
References FishBase. (n.d.). *Eupleurogrammus muticus* (Gray, 1831). FishBase. Retrieved February 7, 2025, from https://fishbase.mnhn.fr/summary/Eupleurogrammus-muticus Rizvi, A. F., Chakraborty, S. K., & Deshmukh, V. D. (2003). Stock assessment of small head hairtail Eupleurogrammus muticus (Gray) from Mumbai coast. Indian Journal of Marine Sciences, 32(1), 85-88.	

D2	D2. There is no substantial evidence that the fishery has a significant negative impact on the species.
Clause outcome	***Fail***
Rationale Stock assessment data from *Eupleurogrammus muticus* collected by Rizvi *et al.* (2003) indicated overfishing, with exploitation rates (E = 0.73) exceeding the sustainable threshold of 0.50. The study found that the species dominated Mumbai's ribbonfish fishery, experiencing high fishing pressure, particularly from non-selective fishing methods such as trawls and shore seines (FishBase, n.d.). While *E. muticus* was often caught incidentally rather than through targeted fishing, its high retention in commercial landings suggested that it was under significant exploitation pressure. At the time of Rizvi *et al.'s* (2003) study, there was no evidence of severe stock collapse, but the fishing mortality rate (F = 3.21) significantly exceeded natural mortality (M = 1.15), indicating excessive fishing pressure that could have led to long-term depletion. The study also warned that the yield per recruit model showed biomass decline, recommending reductions in fishing effort to prevent further stock depletion. Since that study, no recent stock assessments have been conducted to	

evaluate whether the species' status has improved or worsened. *E. muticus* remains moderately vulnerable (Fishing Vulnerability Score: 38/100), but its long-term sustainability remains uncertain due to the lack of updated data. Given the historical findings of overfishing and the continued use of non-selective fishing gear, *E. muticus* fails this criterion.

References

FishBase. (n.d.). *Eupleurogrammus muticus* (Gray, 1831). FishBase. Retrieved February 7, 2025, from https://fishbase.mnhn.fr/summary/Eupleurogrammus-muticus

Rizvi, A. F., Chakraborty, S. K., & Deshmukh, V. D. (2003). Stock assessment of small head hairtail Eupleurogrammus muticus (Gray) from Mumbai coast. Indian Journal of Marine Sciences, 32(1), 85-88.

Ecosystem requirements

This section, or module, assesses the impacts that the fishery under assessment may have on key ecosystem components: ETP species, habitat and the wider ecosystem.

1.9. All ecosystem criteria must be met (pass) for a fishery to pass the Ecosystem Requirements.

1.9.1. The sub-criteria offer a structured evidence base to demonstrate that the fishery sufficiently meets the ecosystem criteria, it is not expected that sub-criteria are assessed independently of the main criterion.

E1 Impact on Endangered, Threatened or Protected species (ETP species)

E1.1	**E1.1 Information on interactions between the fishery and ETP species is collected.** *In reaching a determination for E1.1, the assessor should consider if the following is in place:*	
	E1.1.1 ETP species which may be directly affected by the fishery have been identified.	Meets
	E1.1.2 Interactions between the fishery and ETP species are recorded and reported to management organisations.	Gap
	E1.1.3 Collection and analysis of ETP information is adequate to provide a reliable indication of the impact the fishery has on ETP species.	Gap
Clause outcome		***Fail***

Rationale

A range of marine ETP species is present in Karnataka's waters, including mammals, sea turtles, sea snakes, elasmobranchs, finfish, molluscs, sea cucumbers, corals, and sponges. These species are categorized under the IUCN Red List and protected by the Indian Wildlife Protection Act (1972) [28] (Rohit *et al*., 2016). The fishery operates under national regulations, including the Wildlife Protection Act of 1972, which protects certain marine species. These regulations provide a legal framework for identifying species classified as Endangered, Threatened, or Protected (ETP) (Rajesh, 2013). ETP species that may be affected by fisheries have been identified under the Wildlife Protection Act (1972) and CITES regulations. Interactions with marine turtles remain a concern due to potential entanglements in nets, and further studies are needed to assess bycatch levels specific to this fishery (Bhatta, 2019). In 2011, the Ministry of Environment and Forest, Government of India, released a list of

[28] Wildlife (Protection) Act, 1972 [Available at: https://tribal.nic.in/downloads/FRA/Concerned%20Laws%20and%20Policies/Wildlife%20Protection%20Act,%201972.pdf]

India's critically endangered animal species, which includes several marine species such as the Leatherback Turtle (*Dermochelys coriacea*), among others[29].

In addition to the previously mentioned case of a finless porpoise caught in Mangalore (Yousuf *et al*., 2009), there are historical reports of interactions between purse-seine fishing and dolphins in India, including in Karnataka (Madhu, 2022). Madhu (2022) noted that in 1984, 42 common dolphins (*Delphinus delphis*) were landed in Kochi by a purse-seiner, and in 1995 and 2009, finless porpoises (*Neophocaena phocaenoides*) were landed by purse-seines off Mangalore and the Gulf of Mannar. These incidents suggest that interactions between fishing systems, including targeted captures, have occurred in the past, particularly with dolphin species like *Stenella longirostris*, *Tursiops aduncus*, *Delphinus capensis*, and *Sousa chinensis,* which are abundant in coastal waters and share ecological niches with targeted fish like oil sardine (Madhu, 2022). However, the frequency and current status of such interactions are not well-documented, indicating a need for more comprehensive monitoring to assess the impact accurately.

The presence and protection status of ETP species are well-documented, forming a foundation for assessing fishery interactions. However, explicit documentation of purse seine fishery-specific interactions in Karnataka is limited. While national-level studies indicate potential risks, there is insufficient fishery-level data to determine the direct impact of purse seine operations on ETP species. This gap suggests that the requirements of E1.1.2 and E1.1.3 may not be fully met without further region-specific monitoring and reporting (Rohit *et al.,* 2016).

References

Bhatta, R. (2019). Sustainable Development Goals: Goal 14 - Conserve and sustainably use the oceans, seas, and marine resources for sustainable development. Department of Planning, Program Monitoring, and Statistics, Government of Karnataka.

Madhu, V. R. (2022). Bycatch issues in fisheries – Implications. In R. K. Renjith, P. N. Jha, & V. R. Madhu (Eds.), *Training manual - ICAR-sponsored short course on bycatch reduction in fisheries: Recent advances* (p. 1). ICAR-CIFT.

Rajesh, K. M. (2013) *Fisheries Legislation in India*. CMFRI, Mangalore.

Rohit, Prathibha and Dineshbabu, A P and Sasikumar, Geetha and Swathi Lekshmi, P S and Mini, K G and Vivekanandan, E and Thomas, Sujitha and Rajesh, K M and Purushottama, G B and Sulochanan, Bindu and Viswambharan, Divya and Kini, Sharath (2016) *CMFRI Marine Fisheries Policy Series No.5; Management Plans for the Marine Fisheries of Karnataka.* CMFRI Marine Fisheries Policy (5). ICAR-Central Marine Fisheries Research Institute, Kochi, pp. 1-110. http://eprints.cmfri.org.in/id/eprint/12087

Yousuf, K. S. S. M., Krishnan, A., Anoop, B., Afsal, V. V., Vivekanandan, E., Kumarran, R. P., Rajagopalan, M., Krishnakumar, P., & Jayasankar, P. (2008). Observations on incidental catch of cetaceans in three landing centres along the Indian coast. Marine Biodiversity Records, 2. https://doi.org/10.1017/S175526720900075X

[29]Critically Endangered booklet [Available at: http://www.indiaenvironmentportal.org.in/files/critically%20endangered%20species.pdf

E1.2	**E1.2 The fishery has no significant negative impact on ETP species.** *In reaching a determination for E1.2, the assessor should consider if the following is in place:*	
	E1.2.1 The information collected in relation to E1.1.3 indicates that the fishery does not have a significant negative impact on ETP species.	Gap
Clause outcome		***Fail***

Rationale

The purse seine fishery in India has minimal reported interactions with ETP species, as there are few documented cases of bycatch involving dolphins, sea turtles, and sharks in Indian waters but in the tropical tuna purse seine fisheries (Hall and Roman, 2013). Furthermore, incidental bycatch landings like dolphins and turtles in purse seines operating in Indian waters are rare (Pravin & Meenakumari, 2016). Yousuf *et al*. (2009) recorded the only documented case of an Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) being caught by a purse seine vessel targeting oil sardine off the coast of Mangalore. This marine mammal is listed under Appendix I of CITES and classified as "Vulnerable" on the IUCN Red List. Additionally, historical records indicate broader interactions, such as the landing of 42 common dolphins (*Delphinus delphis*) in Kochi in 1984, which overlap with oil sardine habitats (Madhu, 2022). The presence of ETP species in Karnataka has been documented, including their conservation status. However, the specific extent of interactions with purse seine fisheries in Karnataka has not been explicitly reported (Rohit *et al.,* 2016).

Given the data inadequacy identified in E1.1.3—where collection and analysis of ETP information are insufficient to reliably assess impacts—it is unclear whether the fishery's impact on ETP species, such as population-level effects or frequent bycatch, is significant or negligible. Without comprehensive, fishery-specific monitoring (e.g., through observer programs or independent studies), E1.2.1 cannot be met, as the limited evidence does not conclusively demonstrate a lack of significant negative impact. Additional systematic data collection is necessary to resolve this uncertainty.

References

Hall, M. & Roman, M. 2013. Bycatch and non-tuna catch in the tropical tuna purse seine fisheries of the world. FAO Fisheries and aquaculture technical paper No. 568. Rome, FAO, 249 pp.

Krishnakumar, and P. Jayasankar. "Observations on Incidental Catch of Cetaceans in Three Landing Centres along the Indian Coast." *JMBA2 - Biodiversity Records*, 2009.

Pravin, P. & Bharathiamma, Meenakumari. (2016). Purse seining in India – A review. Indian Journal of Fisheries. 63. 10.21077/ijf.2016.63.3.50404-18.

Rohit, Prathibha and Dineshbabu, A P and Sasikumar, Geetha and Swathi Lekshmi, P S and Mini, K G and Vivekanandan, E and Thomas, Sujitha and Rajesh, K M and Purushottama, G B and Sulochanan, Bindu and Viswambharan, Divya and Kini, Sharath (2016) *CMFRI Marine Fisheries Policy Series No.5; Management Plans for the Marine Fisheries of Karnataka.* CMFRI Marine Fisheries Policy (5). ICAR-Central

Marine Fisheries Research Institute, Kochi, pp. 1-110. http://eprints.cmfri.org.in/id/eprint/12087

Yousuf, K. S. S. M., A. K. Anoop, B. Anoop, V. V. Afsal, E. Vivekanandan, R. P. Kumarran, M. Rajagopalan, P. K. Krishnakumar, and P. Jayasankar. "Observations on Incidental Catch of Cetaceans in Three Landing Centres along the Indian Coast." Accessed December 23, 2024. https://core.ac.uk/outputs/33015827/?utm_source=pdf&utm_medium=banner&utm_campaign=pdf-decoration-v1.

E1.3	**E1.3 There is an ETP management strategy in place for the fishery.** *In reaching a determination for E1.3, the assessor should consider if the following is in place:*	
	E1.3.1 There are measures applied to the fishery which are designed to manage the impacts of the fishery on ETP species.	Meets
	E1.3.2 The measures are considered likely to achieve the objectives of regional, national and international legislation relating to ETP species.	Meets
Clause outcome		***Pass***

Rationale

Under national rules governing India's maritime zones, any animal protected by the Wildlife Protection Act 1972 that is brought aboard must be logged and handed over to authorities, demonstrating that national regulations provide some structure for ETP management. This applies to species identified in E1.1, such as dolphins, sea turtles, and elasmobranchs. Additionally, the immediate release of specific shark species, mandated by international resolutions, also indicates a broader set of regulations that applies to this fishery and underpins a general ETP management framework (Kizahakudan *et al.* 2015). The adoption of Dolphin Wall Nets (DWN) and other gear modifications in the neighbouring state of Kerala suggests that measures have been implemented in some states to mitigate interactions between purse seine operations and marine mammals (Prajith *et al.,* 2014). The FAO Code of Conduct for Responsible Fisheries (CCRF) has been incorporated into India's national fisheries policy, and there are legal frameworks in place to manage ETP species. India's Marine Fishing Regulation Acts (MFRAs) enforce conservation measures, including restrictions on mesh size, minimum-maximum fish sizes, and gear regulations, all of which contribute to ETP species protection (Rajesh, 2013).

However, no fishery-specific ETP management strategy tailored to Karnataka's purse-seine operations is documented, despite the known presence of ETP species and historical interactions noted in E1.1. Given the general applicability of national and international measures, E1.3.1 is met, as they are designed to manage impacts. E1.3.2 is also met, as these measures align with objectives of the Wildlife Protection Act (1972), CITES, and the CCRF to protect ETP species, though their effectiveness in Karnataka remains untested due to the data gaps highlighted in E1.1 and E1.2.

References

Kizhakudan S.J., Zacharia P.U., Thomas S., Vivekanandan E., and Muktha M. 2015. Guidance on National Plan of Action for Sharks in India. CMFRI Marine Fisheries Policy Series No. 2, 104p.

Prajith, K. K., Das, P. H. D. and Edwin, L. 2014. Dolphin wall net (DWN)- An innovative management measure devised by ring seine fishermen of Kerala, India to reducing or eliminating marine mammal fishery interactions. Ocean and Coastal Management, 102(Part A): 1-6.

Mohamed, K.S., K. Vijayakumaran, P.U. Zacharia, T.V. Sathianandan, G. Maheswarudu, V. Kripa, R. Narayanakumar, Prathibha Rohit, K.K. Joshi, T. V. Sankar, Leela Edwin, K. Ashok Kumar, Bindu J, Nikita Gopal, and Pravin Puthra (2017). Indian Marine Fisheries Code: Guidance on a Marine Fisheries Management Model for India. *CMFRI Marine Fisheries Policy Series* 4: 120 p

Rajesh, K. M. (2013) *Fisheries Legislation in India*. CMFRI, Mangalore.

E2 Impact on the habitat

E2.1	**E2.1 Information on interactions between the fishery and marine habitats is collected.** *In reaching a determination for E2.1, the assessor should consider if the following is in place:*	
	E2.1.1 Habitats which may be directly affected by the fishery have been identified, including any habitats which may be particularly vulnerable.	Meets
	E2.1.2 Information on the scale, location and intensity of fishing activity relative to habitats is collected.	Meets
	E2.1.3 Collection and analysis of habitat information is adequate to provide a reliable indication of the impact the fishery has on marine habitats.	Gap
Clause outcome		***Fail***

Rationale

Purse seine fisheries generally target midwater shoaling fish, so the nets rarely contact the seabed. Studies from other regions indicate that the direct physical disturbance to benthic habitats from purse seining is low, as fishers avoid touching the bottom to prevent net damage (Benoit *et al*., 2010). Additionally, the Marine Stewardship Council notes that purse seines' impact on seafloor habitats is generally considered low because the gear does not scrape the bottom[30]. However, indirect or ecosystem-level effects have been documented. For example, heavy exploitation of key pelagic species by purse seiners can alter predator–prey dynamics and overall ecosystem structure. An ecosystem modeling study off

[30] Marine Stewardship Council [Available at: https://www.msc.org/what-we-are-doing/our-approach/fishing-methods-and-gear-types/purse-seine]

Karnataka suggested that increasing fishing effort (including purse seining) may lead to rapid declines of important marine resources and have serious ecosystem effects (Mohamed *et al*., 2009).

Commercial purse seining was introduced along the southwest coast of India in the late 1970s and expanded rapidly in the 1980s (Rajesh, 2013). By the mid-2010s, Karnataka had roughly 274 mechanized purse seine vessels operating from its ports, contributing around 25–30% of Karnataka's total fish landings from 1990 to 2015 (Rohit *et al.,* 2016). Purse seine fishing occurs at depths of 15–20 m, typically 5–8 km offshore, but larger vessels now venture beyond 12 nautical miles (22 km) (Pravin *et al*., 2016). State law reserves the zone up to 6 km from shore (or 4 fathoms depth) exclusively for traditional non-mechanized fishing, requiring purse seiners to operate further offshore (Rajesh, 2013). While purse seines target pelagic species, incidental interactions with demersal or benthic species in shallow coastal areas cannot be ruled out, suggesting a need for further habitat-specific monitoring.

Documented interactions with benthic or demersal species have occurred in Karnataka's coastal ecosystem, often when demersal organisms form surface shoals or when nets are deployed in shallow areas. A notable case is the exploitation of marine catfish: Purse seiners off Karnataka periodically netted large shoals of spotted catfish (*Ariidae*), a normally bottom-associated fish. Rohit (2016) found that this fishery was catching significant numbers of male brooders (mouth-brooding catfish carrying eggs/young), leading to a sharp decline in catfish stock, thus demonstrating how a pelagic fishing technique can have unintended demersal impacts.

Studies in Karnataka have assessed marine habitat conditions, including marine debris and pollution, However, direct assessments of the purse seine fishery's impact on habitats are absent (CMFRI, 2024). The fishery operates within Coastal Regulation Zone (CRZ) classifications, which identify ecologically sensitive habitats such as coral reefs, mangroves, and spawning grounds (Rajesh, 2013). While these regulations help define sensitive habitats, no fishery-specific studies exist to determine the direct impact of purse seine operations on these ecosystems.

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Rajesh, K. M. (2013) *Fisheries Legislation in India*. CMFRI, Mangalore.

E2.2	**E2.2 The fishery has no significant impact on marine habitats.** *In reaching a determination for E2.2, the assessor should consider if the following is in place:*	
	E2.2.1 The information collected in relation to E2.1.3 indicates that the fishery does not have a significant negative impact on marine habitats.	Gap
Clause outcome		***Fail***

Rationale

Purse seines target pelagic shoaling fish (e.g. sardines, mackerel, anchovies) that often aggregate in shallow inshore waters. The nets used in Karnataka measure around 800–1200 m in length and 80–100 m in depth, enabling operations relatively close to shore. Fishers often visually spot schools in near-surface waters or use sonar at night (Pravin *et al*., 2016).

A purse seine is designed to encircle fish in midwater and does not normally contact the seafloor. In deeper-water operations, the net's lower edge (leadline) stays well above the bottom, so the direct impact on benthic habitats is minimal or none. However, Pravin *et al*. (2016) noted that purse seining has "no impact on the bottom habitat except in shallow water operations when the lower edge of the gear contacts the sea bottom." Evidence of benthic interaction comes from unusual catches in purse seines: for instance, field reports document that shrimps and flatfishes like tongue sole (a bottom-dwelling species) have been caught by purse seiners off Mangalore and Malpe, indicating that the net sometimes sweeps close to or touches the seabed (Pravin *et al.,* 2016).

While no comprehensive impact study has been conducted for Karnataka's purse seine fishery, localized reports suggest that unregulated fishing, including purse seining, has contributed to habitat degradation in sensitive areas. For example, Netrani Island's coral reefs have been observed to be impacted by human activities, including fishing, prompting recommendations for a marine reserve.[31] However, there is no conclusive data isolating the specific impact of purse seines on corals. Similarly, historical accounts note that in the early expansion of purse seining, there were "instances of destructive fishing using purse seine" in coastal waters, which led scientists to call for area and seasonal restrictions (Pravin *et al*., 2016). Historical overharvest of spawning catfish near the coast also depleted stocks (Rohit et al., 2016), hinting at ecological effects in coastal habitats.

Although the available evidence suggests purse seines generally have low direct as in E2.1, the absence of fishery-specific studies—despite E2.1's identified CRZ habitats and E1.1's coastal ETP overlap—means there is not enough data to confirm that interactions (e.g., physical damage or ecological disruption) are insignificant. Given this data gap from E2.1.3, E2.2.1 fails to confirm no significant

[31] Mangaluru: Scientists seek protection for Netrani Island Available at [https://bangaloremirror.indiatimes.com/news/state/Mangaluru-Scientists-seek-protection-for-Netrani-Island/articleshow/60831959.cms]

habitat impact, and further monitoring is necessary to determine the fishery's effect on marine habitats.
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E2.3	**E2.3 There is a habitat management strategy in place for the fishery.** *In reaching a determination for E2.3, the assessor should consider if the following is in place:*	
	E2.3.1 There are measures applied to the fishery which are designed to manage the impact of the fishery on marine habitats.	Gap
	E2.3.2 The measures are considered likely to prevent the fishery from having a significant negative impact on marine habitats.	Gap
Clause outcome		***Fail***

Rationale

The degradation of marine habitats in Karnataka is documented, particularly due to overfishing, coastal pollution, and habitat destruction (Bhatta, 2019). The National Coastal Zone Management Authority (NCZMA) and State Coastal Zone Management Authority (SCZMA) oversee habitat protection efforts. The seasonal monsoon trawl ban imposed in Karnataka serves as a management measure to prevent habitat degradation during critical spawning periods (Rajesh, 2013). The Karnataka Marine Fisheries Regulation Act and the Coastal Regulation Zone (CRZ) Notification, 2011, established a framework for habitat protection, but their enforcement remains a challenge (Bhatta, 2019). There are **no detailed specific habitat management measures** for Karnataka's purse seine fishery (Mohamed *et al.,* 2017).

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E3 Impact on the ecosystem

E3.1	**E3.1 Information on the potential impacts of the fishery on marine ecosystems is collected.** *In reaching a determination for E3.1, the assessor should consider if the following is in place:*	
	E3.1.1 The main elements of the marine ecosystems in the area(s) where the fishery takes place have been identified.	Meets
	E3.1.2 The role of the species caught in the fishery within the marine ecosystem is understood, either through research on this specific fishery or inferred from other fisheries.	Meets
	E3.1.3 Collection and analysis of ecosystem information is adequate to provide a reliable indication of the impact the fishery has on marine ecosystems.	Meets
Clause outcome		***Pass***

Rationale

The main ecosystem elements within Karnataka's coastal waters have been identified through studies by the Central Marine Fisheries Research Institute (CMFRI) and others. These include estuarine habitats, coral reefs, mangroves, seagrass beds, and spawning and nursery grounds for commercially important species (Rajesh, 2013). The purse seine target species — oil sardine (*Sardinella longiceps*), Indian mackerel (*Rastrelliger kanagurta),* among others — play well-documented ecological roles as forage fish, forming the primary prey base for larger pelagic predators like tuna, seerfish, and barracuda (Vivekanandan *et al*., 2005). Their importance in transferring energy from lower to higher trophic levels is established both through research specific to India's west coast and inferred from global studies of small pelagic fisheries (Vivekanandan *et al*., 2005; Pravin & Meenakumari, 2016). Research and management further support this understanding: measures like mesh size optimization reduce juvenile mortality (Pravin & Meenakumari, 2016), while ecosystem-level studies show heavy exploitation of small pelagics can disrupt predator-prey dynamics, potentially affecting higher trophic resilience (Mohamed *et al*., 2009). Karnataka's fisheries management framework, including the Marine Fisheries Regulation Act (MFRA) and Coastal Regulation Zone (CRZ) laws, integrates ecosystem protection by restricting purse seining in critical habitats such as nearshore mangroves and coral reefs (Rajesh, 2013). Ecosystem modelling studies off Karnataka have specifically investigated the cumulative impacts of various fishing gears, including purse seines, on trophic interactions, species abundance, and ecosystem stability (Mohamed *et al*., 2009). CMFRI's annual reports also include ecosystem health indicators, such as plankton surveys and environmental monitoring, providing additional context.

Although gaps in long-term purse-seine-specific monitoring remain, as in E2.1, the available data—combined with broader West Coast studies—provide a reasonable indication of potential ecosystem impacts, meeting E3.1.3's intent.

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E3.2	**E3.2 There is no substantial evidence that the fishery has a significant negative impact on the marine ecosystem.** *In reaching a determination for E3.2, the assessor should consider if the following is in place:*	
	E3.2.1 The information collected in relation to E3.1.3 indicates that the fishery does not have a significant negative impact on marine ecosystems.	Gap
Clause outcome		***Fail***

Rationale

There is documented evidence of overexploitation and declining fish productivity in Karnataka's marine ecosystem, which may be exacerbated by intensive purse seining activities (Bhatta, 2019). The Karnataka purse seine fishery operates within an ecosystem-based fisheries management (EBFM) framework, which emphasizes the evaluation and modelling of ecosystem interactions to assess and predict potential impacts. The existence of trophic models for Karnataka suggests that key ecosystem components have been studied to understand their interrelations and potential effects of fishing activities (Antony & Jose, 2015). Purse seine vessels generally focus on catching species with minimal variation in size and diversity, leading to a low discard rate (Kelleher, 2005). However, certain fisheries using this method have been observed capturing a wide array of species, such as the Malaysian multispecies purse-seine fishery (Harlyan, 2021). Available data indicate a reduction in fish populations due to overfishing, but no direct evidence specifically implicates purse seine fishing as a primary contributor to ecosystem decline (Bhatta, 2019). Studies tracking ring net fisheries have revealed bycatch interactions with dolphins, although there is uncertainty about how much purse seines specifically contribute to these interactions, highlighting a potential concern for wider ecosystem effects (Madhu 2022).

Nevertheless, research suggests that heavily exploiting small pelagic species, which play a critical role in nutrient flow, may destabilize the ecosystem if such fishing intensifies or remains unchecked (Vivekanandan *et al.,* 2003; Mohamed & Zacharia 2009). Current stock assessments showing ‘overfished’ or ‘recovering’ statuses for important pelagic stocks raise the possibility of ecosystem-level impacts, placing a

question mark over whether the fishery exerts pressure that could exacerbate declines (ICAR-CMFRI, 2024; Sathianandan *et al,* 2021).
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E3.3	**E3.1 Information on the potential impacts of the fishery on marine ecosystems is collected.** *In reaching a determination for E3.3, the assessor should consider if the following is in place:*	
	E3.3.1 There are measures applied to the fishery which are designed to manage the impacts of the fishery on marine ecosystems.	Meets
	E3.3.2 The measures are considered likely to prevent the fishery from having a significant negative impact on marine ecosystems.	Gap
Clause outcome		***Fail***
Rationale		

India has been moving towards an Ecosystem Approach to Fisheries Management (EAFM), and regional fishery management councils, including those covering Karnataka, assume responsibility for ecosystem-based aspects of the fishery (Mohamed *et al.,* 2017). Building on E3.1's ecosystem framework, several measures designed to manage ecosystem impacts are in place for the purse-seine fishery in Karnataka. The Karnataka Marine Fisheries Regulation Act (KMFRA) prohibits mechanized purse seining within 6 km of the shore, which helps protect sensitive nearshore ecosystems, including mangroves, coral reefs, and spawning grounds (Rajesh, 2013). This is a fishery-specific spatial measure directly linked to ecosystem protection. Additionally, purse seine fisheries must comply with mesh size regulations designed to reduce the capture of juvenile fish, which contributes to maintaining stock productivity and preserving food web stability (Pravin & Meenakumari, 2016). Seasonal monsoon bans further act as a temporal safeguard, protecting spawning and recruitment periods for key species (Rajesh, 2013). The use of trophic models and ecosystem assessments by CMFRI specifically includes data collected from purse seine catches. This scientific analysis feeds into broader ecosystem modeling exercises (Mohamed *et al*., 2009), which directly inform management decisions affecting the purse seine fishery.

Together, these measures show that ecosystem considerations are actively integrated into the management of purse seining in Karnataka, fulfilling the intent of E3.3.1. However, despite these measures, evidence of overfished or declining small pelagic stocks (Sathianandan *et al*., 2021) raises concerns that these measures may not be sufficient to fully prevent ecosystem-level impacts (e.g., trophic disruption or stock collapse). As E3.2 notes overfished stocks and E2.2 shows ecological stress (e.g., catfish depletion), purse-seining, targeting species critical to ecosystem balance, may contribute to wider ecosystem stress. While the management system acknowledges ecosystem risks, the effectiveness of existing measures in fully preventing negative impacts is not demonstrated, creating a failure under E3.3.2. Thus, while E3.3.1 is met, the unproven effectiveness results in a failure for E3.3.

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