



MarinTrust Standard V2

Whole fish Fishery Assessment *Report Template (Karnataka)*

MarinTrust Programme

Unit C, Printworks

22 Amelia Street

London

SE17 3BZ

E: standards@marin-trust.com

T: +44 2039 780 819

Table 1 Application details and summary of the assessment outcome

Application details and summary of the assessment outcome			
Name(s):			
Country: India			
Email address:		Applicant Code	
Certification Body Details			
Name of Certification Body:			
Assessor Name	CB Peer Reviewer	Assessment Days	Initial/Surveillance/ Re-approval
Paul Mosnier Sergio Abr			Improver Programme
Assessment Period	July to September 2023		
Scope Details			
Management Authority (Country/State)		India (Karnataka state)	
Main Species		<ul style="list-style-type: none"> Indian Oil Sardine (<i>Sardinella longiceps</i>) Indian Mackerel (<i>Rastrelliger kanagurta</i>) Mauritian sardinella (<i>Sardinella jussieui</i>) Goldstripe sardinella (<i>Sardinella gibbosa</i>) Fringescale sardinella (<i>Sardinella fimbriata</i>) White sardine (<i>Sardinella albella</i>) 	
Fishery Location		Karnataka - State waters and adjacent national waters	
Gear Type(s)		Purse Seine	
Outcome of Assessment			
Overall Outcome			
Clauses Failed		A1.2, A2.1, A2.2, A2.3, A2.4, A3.2, A3.3, B1, D4.1, D4.2, F1.3, F3.3, M2.1, M2.3, M2.4	
CB Peer Review Evaluation			
Fishery Assessment Peer Review Group Evaluation			
Recommendation			

Table 2. Assessment Determination

Assessment Determination
<p><i>Overview of the Fishery</i></p> <p>1) Fishery Characterisation</p> <p>The Indian Oil Sardine fishery extends along the 300 km Karnataka coastline, with a reported mechanised purse seine fleet of over 400 vessels contributing the majority of landings in addition to a significant number of small scale (artisanal) vessels. While fishing occurs within the territorial waters, most large mechanised vessels operate beyond the 12 nautical mile zone limit, with 96 major landings points available to fishermen (not exclusively purse seine) along the Karnataka coastline.</p> <p>2) Landings & Stock Assessment Efforts</p> <p>Landings data and efforts toward stock assessment are reported in numerous publications. National level reports include the Central Marine Fisheries Research Institute’s Annual Report and Marine Fish Landings Reports, which provides details on fisheries in Karnataka and includes landing volumes of major species in addition to information about the fleet. The National Fisheries Development Board provide statistics on fisheries landings, further information is released by the Department of Fisheries in several publications including the Department of Fisheries Annual Report, the Fish Survey of India Annual Report and the Handbook on Fisheries Statistics, which contain information on landings volumes, fishing effort and catch compositions, although these data are not always fully stratified by species and at a state level. The CMFRI also releases spontaneous publications, such as the Enigmatic Oil Sardine Report (2018) which provide further relevant fisheries data.</p> <p>3) Captured Species</p> <p>Given the number of reports and often lack of differentiation between species and fishing method, precise data on the total landings of the main target species under assessment in this report, the Indian Oil Sardine (<i>Sardinella longiceps</i>) (as well as other non-target species landed through this fishery) across the state is difficult to ascertain. Most recent data available from 2022 report Indian oil sardine landings approximating 40,000 tonnes (FRAEED & CMFRI 2022), representing about 6% of total marine landings in the state. Non-target species in this fishery that are landed include the Indian Mackerel (<i>Rastrelliger kanagartha</i>), while the ‘lesser sardines’ grouping, which includes the Mauritian sardinella (<i>Sardinella jussieui</i>), the Goldstripe sardinella (<i>Sardinella gibbosa</i>), the Fringescale sardinella (<i>Sardinella fimbriata</i>) and the White sardine (<i>Sardinella albella</i>), are commonly encountered in the fishery.</p> <p>4) Management Infrastructure</p> <p>The Department of Animal Husbandry, Dairying and Fisheries (DADF) within the Ministry of Agriculture (Union Government) is the main body responsible for management at the national scale, overseeing activities within the countries Exclusive Economic Zone (EEZ) (beyond the 12 nautical mile limit) and assumes responsibility for major fishing harbours, the fishing vessel industry, seafood export and trade, and marine and inland research and training. Other bodies that fall under the DADF and who have responsibility for different aspects of fisheries management at a national level include the Fishery Survey of India (FSI), the National Fisheries Development Board, the Coastal Aquaculture Authority and the National Institute of Fishers Post Harvest Technology and Training, Cochin (NIFPHATT). Other Union/Central Government Ministries involved in some capacity of national fisheries management include the Ministry of Environment, Forests and Climate Change, the Ministry of Earth Sciences, the Ministry of Science and Technology, the Ministry of Defence, and the Ministry of Food Processing Industries. The Karnataka Department of Fisheries is responsible</p>

for management decisions at the state level with input from the numerous fisher cooperative societies across the state.

5) Enforcement

Rules and regulations outlined in the above-mentioned legislation is enforced by combined efforts from the Indian Coast Guard, the Coastal Police and, on occasion, the Indian Navy. A general lack of monitoring (due to non-implementation of VMS/AIS/port inspections etc.) and interstate collaboration and coherence, in addition to conflicts between large scale commercial and small-scale artisanal fishers, presents challenges for and threats to the sustainability of the fishery.

6) Ecosystem Impacts

Generally regarded as having a low environmental impact, the purse seine fishery in these states reports low bycatch numbers, interactions with ETPs and consequently few negative ecosystem impacts. Generally, there is a lack of understanding of and information available on the wider ecosystem and its interactions with the fishery, which make a quantification of ecosystem impacts difficult. Furthermore, clear and reliable data on the catch composition of landings which would inform sustainable exploitation rates are lacking, as is a clear framework of mitigation measures for periods of stock scarcity. Overall, this results in potential threats to the sustainability of the fishery and its ecosystem (both environmentally and socio-economically).

Fishery Assessment Peer Review Comments

Notes for On-site Auditor

Table 3 General Results

General Clause	Outcome (Pass/Fail)
M1 - Management Framework	Pass
M2 - Surveillance, Control and Enforcement	Fail
F1 - Impacts on ETP Species	Fail
F2 - Impacts on Habitats	Pass
F3 - Ecosystem Impacts	Fail

Table 4 Species- Specific Results

List all Category A and B species. List approximate total percentage (%) of landings which are Category C and D species; these do not need to be individually named here.

Category	Species	% landings	Outcome (Pass/Fail)
Category A	<i>Sardinella longiceps</i>	95	Fail
Category B	<i>Sardinella longiceps</i>	95	Fail
Category C	n/a	n/a	n/a
Category D	<i>Rastrelliger kanagurta</i>	3	Pass
	<i>Sardinella fimbriata</i>	<2	Pass
	<i>Sardinella gibbosa</i>	<2	Pass
	<i>Sardinella jussieu</i>	<2	GAP/FAIL
	<i>Sardinella albella</i>	<2	Pass

Table 5 Species Categorisation Table

Common name	Latin name	Stock	IUCN Redlist Category ¹	% of landings	Management	Category
Indian Oil Sardine	<i>Sardinella longiceps</i>	Not defined	Least Concern	95	No species-specific management	A and B
Indian Mackerel	<i>Rastrelliger kanagurta</i>	Multiple	Data Deficient	3	No species-specific management	D
Mauritian sardinella	<i>Sardinella jussieui</i>	Multiple	Data Deficient	<2*	No species-specific management	D
Goldstripe sardinella	<i>Sardinella gibbosa</i>	Multiple	Least Concern	<2*	No species-specific management	D
Fringescale sardinella	<i>Sardinella fimbriata</i>	Multiple	Least Concern	<2*	No species-specific management	D
White sardine	<i>Sardinella albella</i>	Multiple	Least Concern	<2*	No species-specific management	D

Species categorisation rationale

Landings data were supplied by the client, which included an initial categorization of the catch by species and common name. The methodology of MarinTrust (IFFO RS) v2.0 was employed to identify the species eligible for assessment. All species with landings exceeding 0.1% were incorporated into the assessment, adhering to the 0.1% minimum proportion criterion.

Sardinella longiceps was initially assessed under Category A, but the authors note that the lack of a comprehensive and effective management plan necessitated its re-assessment under Category B. Although some management measures are in place (including gear restrictions and closed fishing seasons), the absence of Total Allowable Catch (TAC) limits, clearly defined long-term objectives and formal mechanisms linking scientific findings with management decisions ultimately does not constitute a robust species-specific management plan.

* The percentage composition for all lesser sardines retained was 2%. The exact proportion of each species remains unknown but each species expected to be above 0.1% threshold.

Comments

The catch composition was provided by the client, but the assessment team deduce potential issues with the calculation of the catch composition due to contradictory evidence in Kamble *et al.* (2017) which suggests catch of demersal species. We recommend that empirical data are collected in order to accurately assess the catch composition.

References:

Kamble, S., Tousif, K., Chaudari, K., Shirdhankar, M. and Dhaker, H. (2017). Catch Composition of Purse-Seine Fishing Along Ratnagiri Coast of Maharashtra State, India. *Journal of Experimental Zoology India* 20, no. 1: 431–34.

¹ <https://www.iucnredlist.org/>

MANAGEMENT

The two clauses in this section (M1, M2) relate to the general management regime applied to the fishery under assessment. The clauses should be completed by providing sufficient evidence to justify awarding each of the requirements a pass or fail rating. A fishery must meet all the minimum requirements in every clause before it can be recommended for approval.

M1	Management Framework – Minimum Requirements	
M1.1	There is an organisation responsible for managing the fishery.	PASS
M1.2	There is an organisation responsible for collecting data and assessing the fishery.	PASS
M1.3	Fishery management organisations are publicly committed to sustainability.	PASS
M1.4	Fishery management organisations are legally empowered to take management actions.	PASS
M1.5	There is a consultation process through which fishery stakeholders are engaged in decision-making.	PASS
M1.6	The decision-making process is transparent, with processes and results publicly available.	PASS
Clause outcome:		PASS

M1.1 There is an organisation responsible for managing the fishery.

Management of fisheries in Karnataka falls under the authority of both the Union and State Governments. The Department of Animal Husbandry, Dairying and Fisheries (DADF) within the Ministry of Agriculture is the main body responsible for management at the national scale, overseeing activities within the country's Exclusive Economic Zone (EEZ) beyond the 12 nautical mile (nm) limit, and also assumes responsibility for major fishing harbours, the fishing vessel industry, seafood export and trade, and marine and inland research and training (Mohamed *et al.* 2017). Other bodies that fall under the DADF and have responsibility for various aspects of fisheries management at a national level include the Fishery Survey of India (FSI), the National Fisheries Development Board², the Coastal Aquaculture Authority and the National Institute of Fishers Post Harvest Technology and Training, Kochi (NIFPHATT). Other Union/Central Government Ministries involved in some capacity of national fisheries management include the Ministry of Environment, Forests and Climate Change, the Ministry of Earth Sciences, the Ministry of Science and Technology, the Ministry of Defence, and the Ministry of Food Processing Industries (Murty 2015).

At the state level, the Karnataka Department of Fisheries (DOF) oversees fishery management within the 12 nm zone through the Karnataka Marine Fishing (Regulation) Act 1986³ with the ICAR-CMFRI providing guidelines and information on effective sustainable management of marine fishery resources (Rohit *et al.* 2016). Karnataka DOF regulates and enforces rules and orders related to fishing zones, fishing season, vessel and gear specifications and licencing⁴.

Outcome – YES/PASS

M1.2 There is an organisation responsible for collecting data and assessing the fishery.

ICAR (the Indian Council of Agricultural Research)⁵, overseen by the Department of Agricultural Research and Education within the Ministry of Agriculture, is responsible for fishery data collection and assessment. Within ICAR, the main research institutes pertaining to fisheries science in this fishery include the Central Institute of Fisheries Education (CIFE), the Central Institute of Fisheries Technology (CIFT) and the Central Marine Fisheries Institute (CMFRI). The CMFRI – Mangalore Research Centre and the CMFRI – Kochi are the state-level bodies for fishery data collection and assessment in Karnataka (Rohit *et al.* 2016). Additionally, some national (e.g.: Central Institute of Fisheries Education deemed the University of ICAR and the Central Agricultural University) and state universities offer fishery research services (covering Karnataka) including data management and assessment (Murty 2015).

² National Fisheries Development Board [Available at: <https://nfdb.gov.in/welcome/about>]

³ Karnataka Marine Fishing Regulation Act 1986 [Available at: <https://faolex.fao.org/docs/pdf/ind63779.pdf>]

⁴ Karnataka Department of Fisheries Annual Report 2021-2022 [Available at: <https://fisheries.karnataka.gov.in/page/Annual+Report/en>]

⁵ ICAR – Karnataka [Available at: <https://icar.org.in/node/15049>]

Outcome – YES/PASS

M1.3 Fishery management organisations are publicly committed to sustainability.

The CMFRI has ongoing research projects related to fishery management plans for sustainable marine fisheries, project developing strategies to sustain stocks of large pelagics along India’s coast. CMFRI also has ongoing projects related to habitat restoration, sustainable fishery management and ecosystem-based fisheries management, demonstrating at least a national level commitment to sustainability⁶. The 2017 National Policy on Marine Fisheries⁷ also outlines key areas for sustainable development of the national fisheries sector and forms the basis on the Marine Fisheries Development Plan’s aim to include “measures and activities towards sustainable development of marine fisheries along with value chain”⁸. The policy also highlights the union/central governments’ commitments to implementing the provisions of the United Nations (FAO) Voluntary Guidelines on Sustainable Small-Scale Fisheries. The central government also aims to ensure that sustainable fisheries management in India aligns with the FAO Code of Conduct for Responsible Fisheries. The DADF also established the National Fisheries Development Board in 2006 with aim to enhance fisheries development and to “achieve sustainable management and conservation of natural aquatic resources including the fish stocks”⁹.

Mohamed *et al.* (2017) advises on the implementation of legal and institutional frameworks to support the long-term conservation and sustainable use of fisheries resources. India’s National Fisheries Policy 2020 has within its objective to “modernise, rationalise (infuse science and technology) and diversify fishing practices in oceans and seas with sustainability of resources as the core philosophy” and discusses management of Indian fisheries from a sustainability perspective: “the expertise of scientific institutions and fishers will be utilized for optimising fishing efforts and implementing measures to check resource depletion and ensure sustainability”.

The Ministry of Fisheries of the DADF also developed a scheme (Pradhan Mantri Matsya Sampada Yojana)¹⁰, running between 2020-2025 with investments to support India’s Blue Revolution which aims at sustainable and responsible development of the fisheries sector. The scheme is being implemented in all the States and Union Territories. The PMMSY scheme is designed to address key gaps along the value chain from fish production, productivity and quality to technology, post-harvest infrastructure and marketing. The aim of the scheme is to modernize and strengthen the value chain, enhance traceability, and establish a robust fisheries management framework while simultaneously ensuring the socio-economic welfare of fishers and fish farmers, and thus acts as another *de facto* commitment to sustainability. However, how this is specifically being adopted in Karnataka remains unclear.

At a state level, the Department of Fisheries (Government of Karnataka) has a clear commitment to sustainability through its vision of “sustainable growth and management of fishery resources” and driving its mission towards “holistic and sustainable growth and management of inland, marine and brackish water fishery resources and improving the socio-economic condition of fishers”¹¹. Moreover, the Karnataka Fisheries Development Corporation (a government backed enterprise which produces fishmeal/oil as part of its wider business) states in its company policy its mission of “ensuring environmental sustainability, ecological balance, protection of flora and fauna, animal welfare, agroforestry [and] conservation of natural resources”¹²

Outcome – YES/PASS

⁶ CMFRI ongoing research projects. [Available at: <https://www.cmfri.org.in/mangalore>]

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

⁸ India Marine Fisheries Bill (2021) [Available at: https://dof.gov.in/sites/default/files/2021-10/Draft_Indian_Marine_Fisheries_Bill_2021.pdf]

⁹ National Fisheries Development Board [Available at: <https://nfdb.gov.in/welcome/about>]

¹⁰ Pradhan Mantri Matsya Sampada Yojana Scheme, Ministry of Fisheries [Available at: <https://dof.gov.in/pmmsy>]

¹¹ See Government of Karnataka, Department of Fisheries Vision, Objectives, Mission Statements. [Available at: <https://fisheries.karnataka.gov.in/info-1/Vision+Objectives+Mission/en>]

¹² Karnataka Fisheries Development Corporation, Company Policy [Available at: https://kfdcfish.com/csr_policy.html]

M1.4 Fishery management organisations are legally empowered to take management actions.

The Karnataka Marine Fishing Regulation Act⁴ empowers the state government to exercise control over fishing regulations and conservation efforts in their territorial waters, as well as enforcing demarcation of fishing zones. Enforcement powers extend to licencing, fishing gear types, fishing zones, vessel specifications (mechanised, non-mechanised, length), fishing equipment (net mesh size) and seasonal/momentary closures.

Other relevant legislation that empowers fishery managers in Karnataka includes the Maritime Zones of India Act, 1981¹³ (which sets out regulatory activities for foreign fishing vessels within the Indian Maritime Zone); the Environment (Protection) Act 1986 (which legal mandates Environmental Impact Assessments prior to certain fishing activities); the New Deep Sea Fishing Policy 1991 (which controls and issues licenses for deep sea fishing); the recommendations of the 1995 Murari Committee (which introduced a range of technical and licencing measures and were adopted by the India government in 1997); the 2002 Biological Diversity Act (aiming to protect biological diversity); the 2009 Marine Fisheries (Regulation and Management) Bill and 2017 National Policy on Marine Fisheries (Rajesh 2013).

Outcome – YES/PASS

M1.5 There is a consultation process through which fishery stakeholders are engaged in decision-making.

The CMFRI Annual Report 2021¹⁴ outlines the stakeholder consultations that were organised in various states. These stakeholders include fishermen, fishermen representatives, cooperative society members, fish farmers, fishery allied workers, state and central government organisation representatives, members of private and public agencies and scientific and technical personnel working in the field. The Indian Marine Fisheries Code also outlines a commitment including stakeholders (boat owners, traders, fishermen, local authorities, and governments) in consultations and plans related to fishery co-management plans (Mohamed *et al.* 2017). The Fish Survey of India Annual Report (2020-2021) (Raut *et al.* 2021) describes stakeholder engagement initiatives (workshops, presentations) that took place nationally.

In 2016, several stakeholder consultations were carried out across Karnataka as part of the national programme of the International Collective in Support of Fish workers (ICSF) which supported the dissemination and implementation of the FAO Voluntary Guidelines for Sustainable Small-Scale Fisheries (Gunakar 2018). The 2021 CMFRI annual report also provides information on a consultative workshops and seminars on various aspects of marine fisheries management in Karnataka¹⁴.

Outcome – YES/PASS

M1.6 The decision-making process is transparent, with processes and results publicly available.

The annual CMFRI reports provide publicly available qualitative and quantitative information on Indian fishery management programs, catch and landings data, scientific studies, approach to socio-economic issues, stakeholder engagement and training and other major annual events pertaining to fishery and/or aquaculture management. Comprehensive data related to fisheries can be found in the publicly available Handbook of Fisheries Statistics (2020), produced by the Government of India through the DADF and Department of Fisheries¹⁵. Other publicly available reports, such as the National Policy on Marine Fisheries 2017 and Marine Fisheries Landings in India (2022) (FRAEED, CMFRI 2023), provide detailed information on fisheries management and catch data at a national and state level.

¹³The Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act 1981 [Available at: <https://iddashboard.legislative.gov.in/actsofparliamentfromtheyear/maritime-zones-india-regulation-fishing-foreign-vessels-act-1981>]

¹⁴CMFRI (2022) Annual Report 2021. Central Marine Fisheries Research Institute, Kochi. 300p [Available at: <https://www.cmfri.org.in/publication/cmfri-annual-reports>]

¹⁵ Handbook on Fisheries Statistics (2020) [Available at: https://dof.gov.in/sites/default/files/2021-02/Final_Book.pdf]

The CMFRI also produce publicly available information on fishery management at a state level (see Rohit *et al.* 2016), and the Karnataka Department of Fisheries also make publicly available their decision-making processes and results through their annual reports available online¹⁶.

Outcome – YES/PASS

References

FRAEED, CMFRI, (2023). Marine Fish Landings in India-2022. *Technical Report, CMFRI Booklet Series No. 31/2023*. ICAR-Central Marine Fisheries Research Institute, Kochi.

Gunakar, S. (2018). Role of Collective Action and Governance in Implementing Sustainable Fishing Practices: A Case Study of Karnataka Marine Fisheries. *Pearl 4 (1): 31–49*.

Mohamed, K.S., K. Vijayakumar, 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*

Murty, V. (2015). The Status of Fisheries Science in India. *Fishing Chimes 34 (11)*.

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

Raut, S. B. M & Kumar, S. A., (2021) Fish Survey of India Annual Report 2020-2021. Ministry of Fisheries, Animal Husbandry and Dairying, Department of Fisheries, Government of India. [Available at: <http://www.fsi.gov.in>]

Rohit, P., Dineshbaby, A. P., Sasiukmar, G., Swathi Lekshmi, P. S., Mini, K. G., Vivekanandan, E., Thomas, S., Rajesh, K. M., Purushottama, G. B., Sulochanan, B., Viswambharan, D. & Kini, S (2016). Management Plans for the Marine Fisheries of Karnataka. *ICAR-CMFRI Marine Fisheries Policy Series No. 5, pp 110*.

Links

MarinTrust Standard clause	1.3.1.1, 1.3.1.2
FAO CCRF	7.2, 7.3.1, 7.4.4, 12.3
GSSI	D.1.01, D.4.01, D2.01, D1.07, D1.04,

M2 Surveillance, Control and Enforcement - Minimum Requirements			
M2.1	There is an organisation responsible for monitoring compliance with fishery laws and regulations.		GAP
M2.2	There is a framework of sanctions which are applied when laws and regulations are discovered to have been broken.		PASS
M2.3	There is no substantial evidence of widespread non-compliance in the fishery, and no substantial evidence of IUU fishing.		GAP
M2.4	Compliance with laws and regulations is actively monitored, through a regime which may include at-sea and portside inspections, observer programmes, and VMS.		GAP
Clause outcome:			GAP

M2.1 There is an organisation responsible for monitoring compliance with fishery laws and regulations.

On a national scale, the 2021 Indian Marine Fisheries Bill⁷ empowers *authorised officers* to implement and enforce fishing regulations, and to act against vessels/fishers acting in contravention to the act and the rules therein, although does not directly state who these authorised officers are. The authors deduces that there are several organisations responsible for regulating and monitoring compliance with fishery laws and regulations in India including the Coastal Police, the Indian Coast Guard, and the navy.

¹⁶ Karnataka Department of Fisheries website [Available at: <https://fisheries.karnataka.gov.in/english>]

According to the 2020 Indian National Fisheries Policy¹⁷, the Coastal Police are one of the “regulatory and enforcing agencies [engaged to] strengthen and implement MCS systems”. The Coast Guard Act 1978¹⁸ states that the “preservation and protection of marine environment and control of marine pollution is the function of the Indian Coast Guard”, which appears to implicate the Coast Guard in at least some capacity in the enforcement of fishery laws and regulations. The Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act 1981 enables the Government “to take measures for protection of the marine environment” and empowers the Coast Guard to issue enforcement of the act, particularly regarding regulation of IUU fishing. However, this act seems to be directed at foreign vessels, and it is not clear whether the act applies equally to domestic vessels (Bhat 2020). The Indian Coast Guard is also supported in their duties by the Indian Navy particularly in matters related to terrorism (as hijacking of fishing vessels and IUU fishing to fund malicious operations are reported target channels of terrorist operatives) and where required for the supervision of national fishing grounds and protection against poaching and unauthorised stock exploitation¹⁹.

At the state level, enforcement and monitoring of compliance with fishery laws and regulations lies with the states’ Marine Enforcement Wing (Mohamed *et al.* 2017). The Karnataka Marine Fishing Regulation Act 1986³ refer to certain aspects of compliance monitoring in Karnataka fisheries within the 12nm zone jurisdiction, but there is no evidence of the formation of an enforcement unit or other responsible organisation for compliance at the state level in Karnataka.

Outcome – FAIL/GAP

M2.2 There is a framework of sanctions which are applied when laws and regulations are discovered to have been broken.

The 1897 Indian Fisheries Act²⁰ empowers officers of the law to arrest anyone in breach of regulations contained in the Act. The Indian Marine Fisheries Bill (2021) empowers authorities to impound, find and sanction foreign vessels fishing in India’s EEZ (Bhatt 2020), however, it is noted that the bill does not consider the activities of small fishing vessels beyond the territorial (state) level waters in India’s EEZ. As noted by Edwin (2022), a lack of uniformity of fishing regulations and cohesion, infrastructure, and manpower between and within enforcement bodies at the state level exists.

Sanctions for transgressions related to fishing laws and regulations are outlined in the Karnataka Marine Fishing Regulation Act of 1986³ and includes impounding of vessels, seizing of any fish found on board a vessel contravening the rules, fines of up to 5,000 rupees or five times the value of the fish caught by the transgressing vessel and/or cancelling/revoking/suspension of registration certificates.

Outcome – YES/PASS

M2.3 There is no substantial evidence of widespread non-compliance in the fishery, and no substantial evidence of IUU fishing.

The 2021 Indian Marine Fisheries Bill⁹ (clause 9 (1)) highlights the central government’s aims, with consultation of state governments, to create a plan of action to implement plans to tackle IUU fishing in line with the FAO International Plan of Action to Prevent, Deter and Eliminate IUU Fishing, suggesting that non-compliance and IUU fishing are of concern. Several Indian registered vessels are listed on the EU lists of IUU engaged vessels, but this has not led to a yellow card sanction²¹. Regarding bycatch management and compliance, there is limited evidence for bycatch management frameworks. Only the 1982 Maritime Zones of India (Regulation of Fishing by Foreign Vessels) refers to the management of bycatch: “the crew of the vessel shall not discard any substantial quantities

¹⁷ India National Fisheries Policy 2020 [Available at: <https://faolex.fao.org/docs/pdf/ind201321.pdf>]

¹⁸ The Coast Guard Act (1978) [Available at: <https://iddashboard.legislative.gov.in/actsofparliamentfromtheyear/coast-guard-act-1978>]

¹⁹ Indian Maritime Doctrine 2016 [Available at: <https://www.indiannavy.nic.in/sites/default/files/Indian-Maritime-Doctrine-2009-Updated-12Feb16.pdf>]

²⁰ Indian Fisheries Act (1897), Section 6 [available at: <https://indiankanoon.org/doc/1136850/>]

²¹ EU list of IUU engaged vessels [Available at: https://oceans-and-fisheries.ec.europa.eu/fisheries/rules/illegal-fishing_en]

of fish of a stock or group of stocks caught more than the quantities set in the licence. Such quantities of stock or group of stocks shall be retained and preserved on board the vessel accounted in form D and shall be surrendered at such place as may be directed by the authorised office”.

Despite this, a study across several states (Pramod 2010) (including Karnataka) found that 80-90% of trash fish were discarded at sea depending on the season and that enforcement of seasonal bans was weak, with fishermen able to circumvent regulations and continue fishing despite banning periods. Pramod (2010) also reported on mesh size regulation violations and indiscriminate capture of juvenile fish/shrimp, contributing to substantial discards, while interviewed stakeholders in this study reported annual losses of over 1000 tonnes because of illegal trawler catches within the inshore artisanal fishing zones in Karnataka. Further assessment of (non) compliance and IUU fishing in Karnataka is difficult, particularly as most fishing occurs outside the 12nm zone, beyond which the Karnataka MFRA does not apply (Rohit *et al.* 2016).

Outcome – FAIL/GAP

M2.4 Compliance with laws and regulations is actively monitored, through a regime which may include at-sea and portside inspections, observer programmes, and VMS.

Evidence to support this statement is limited. The 2021 Indian Marine Fisheries Bill (Act) outlines plans for implementation of MCS systems to combat IUU fishing in India’s EEZ, but whether this would extend to territorial (state level) seas remains unclear. In 2019, the Department of Fisheries (Ministry of Agriculture & Farmer’s Welfare) outlined that the government had taken action to combat IUU fishing in the EEZ, which included states implementing MCS regulations through their respective Marine Fishing Regulation Acts (MFRAs). This seemingly indicates that states are involved in enforcement of regulations beyond the territorial waters. The National Fisheries Policy (2020) recommends that state governments develop and implement legally grounded MCS systems, including the use of “suitable transponder/communication systems when out at sea which reveal the latitude-longitude of vessel adequately”. The 2021 Indian Marine Fisheries Bill (Act) lays out, under clause 8(1), the government’s plans to consult with state governments on the prescribing of MCS standards for different fishing vessels and area(s) of operation. Additionally, this bill states that all crew aboard fishing vessels must carry proof of identification. However, it is unclear how/if this is being implemented on a national scale, with no reference to monitoring through regimes including at-sea or portside inspections. At the state level, a harmonised and holistic MCS systems have not yet been developed (National Maritime Foundation 2021)²². Sufficient data to comprehensively assess how compliance is regulated in Karnataka is unavailable.

Outcome – FAIL/GAP

References

Bhatt, P. (2020) IUU Fishing as a National Security Threat: Revisiting India’s Domestic Framework and Compliance with International Regimes. *International Law Studies* (96).

Madhu, V. R., (2022). Bycatch issues in fisheries – implications p.1. In: Renjith R.K., Paras Nath Jha and Madhu, V.R. (Eds), Training manual -ICAR- sponsored short course on bycatch reduction in fisheries: recent advances. ICAR-CIFT, Cochin, 129 pp.

Pramod, G. (2010) Estimation of Illegal, Unreported and Unregulated fish catches in India’s marine capture fisheries, Field Trip to eight maritime states and 2 island territories in India, May to November 2008, India.

Rohit, P., Dineshbaby, A. P., Sasiukmar, G., Swathi Lekshmi, P. S., Mini, K. G., Vivekanandan, E., Thomas, S., Rajesh, K. M., Purushottama, G. B., Sulochanan, B., Viswambharan, D. & Kini, S (2016). Management Plans for the Marine Fisheries of Karnataka. ICAR-CMFRI Marine Fisheries Policy Series No. 5, pp 110.

Links

MarinTrust Standard clause	1.3.1.3
-----------------------------------	---------

²² National Maritime Foundation 2021 [Available at: <https://maritimeindia.org/maritime-safety-and-security-in-india-fisheries-mcs-a-key-enabler/>]

FAO CCRF	7.7.2
GSSI	D1.09
<p>Recommendation</p> <p>Clearly defining the authority responsible for enforcement of fishing regulations and reporting on violations and sanctions imposed for these violations would support increased transparency of the management process. Furthermore, coordination between state and national level enforcement bodies would improve monitoring, control and surveillance of fishing activities over territorial and EEZ waters, contributing to improved effectiveness of fishery management. Data collection by on-site fisheries enumerators, in addition to the implementation of MCS technologies (VMS, AIS), could enhance the reliability of information surrounding management and reporting of non-compliance in the fishery. These steps would also drive greater monitoring and control of IUU fishing, some indicators of which are reported in Karnataka.</p>	

CATEGORY A SPECIES

The four clauses in this section apply to Category A species. Clauses A1 - A4 should be completed for **each** Category A species. If there are no Category A species in the fishery under assessment, this section can be deleted. A Category A species must meet the minimum requirements of all four clauses before it can be recommended for approval. The clauses should be completed by providing sufficient evidence to justify awarding each of the requirements a pass or fail rating. The species must achieve a pass rating against all requirements to be awarded a pass overall. **If the species fails any of these clauses it should be re-assessed as a Category B species.**

Species Name		Indian Oil Sardine (<i>Sardinella longiceps</i>)	
A1	Data Collection - Minimum Requirements		
	A1.1	Landings data are collected such that the fishery-wide removals of this species are known.	PASS
	A1.2	Sufficient additional information is collected to enable an indication of stock status to be estimated.	GAP
			Clause outcome: GAP
<p>A1.1 Landings data are collected such that the fishery-wide removals of this species are known.</p> <p>Landings data are collected, analysed, and published annually by the CMFRI, who carry out the FAO-approved multi-stage (two-stage) stratified random sampling methodology at a national level. A first-hand database of marine fish landings estimates for 2022 was completed in real-time using the Fish Catch Survey and Analysis (FCSA) online data collection application. The landings data thus estimated were then used to derive species-, fishing gear- and fishing zone-wise monthly marine fish landings estimates along with the consolidated state and national-level estimates of marine fish landings for 2022 (FRAEED & CMFRI 2022). The Central Marine Fisheries Research Institute reports on the annual catch rates in the state of Karnataka and provides a breakdown of species composition within the landings. In 2022, 694,686 tonnes of fish were landed, of which <i>S. longiceps</i> comprised approximately 6% (FRAEED & CMFRI 2023). The CMFRI Annual Marine Landings Report provides landings data for the state of Karnataka, where total landings of just over 46,000 tonnes of IOS were removed in 2022 (FRAEED & CMFRI, 2023).</p> <p>Outcome: YES/PASS</p>			
<p>A1.2 Sufficient additional information is collected to enable an indication of stock status to be estimated.</p> <p>In the 2018 Enigmatic Indian Oil Sardine report's stock assessment section, Rohit <i>et al.</i> (2018) presents an extensive compilation of information regarding the Indian oil sardine (IOS). This section encompasses vital data on stock structure, growth patterns, mortality rates, yield per recruit, stock status relative to maximum sustainable yield (MSY), and more. Notably, this report also conducts a Catch-MSY analysis, validating stock status and estimating MSY for the southwest coast of India. The authors delve into the dynamics of fishing pressure, addressing concerns such as overfishing and targeted exploitation of the Indian oil sardine. However, it falls short in delivering vital information regarding the stock's structure, productivity, and fleet composition, crucial components needed to bolster the development of a comprehensive and effective harvest strategy.</p> <p>Additional information that may provide data for an assessment of the stock status includes the size of fishing fleets and ports of landing (Rohit <i>et al.</i> 2016), catch per unit effort data of different vessels specified by gear type, quarterly-wise and sector-wise (mechanised, non-mechanised, motorised) landings in the state of Karnataka (CMFRI 2022)¹⁴.</p> <p>Although biological reference points are available from 2018 and rapid stock assessments have been conducted by the CMFRI, there are concerns about the quality and frequency of these assessments. Significant weaknesses persist in the data collection and management efforts, including the absence of up-to-date stock status information, a lack of clearly defined long-term objectives for the fishery, and the absence of formal mechanisms linking scientific findings to management decisions.</p> <p>Outcome: FAIL/GAP</p>			

References

- FRAEED, CMFRI, (2023) Marine Fish Landings in India-2022. *Technical Report, CMFRI Booklet Series No. 31/2023*. ICAR-Central Marine Fisheries Research Institute, Kochi.
- 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.

Links

MarinTrust Standard clause	1.3.2.1.1, 1.3.2.1.2, 1.3.2.1.4, 1.3.1.2
FAO CCRF	7.3.1, 12.3
GSSI	D.4.01, D.5.01, D.6.02, D.3.14

A2 Stock Assessment - Minimum Requirements		
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.	GAP
A2.2	The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy.	PASS
A2.3	The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status.	GAP
A2.4	The assessment is subject to internal or external peer review.	GAP
A2.5	The assessment is made publicly available.	PASS
Clause outcome:		GAP

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.

A stock assessment was performed in 2018 and is publicly available (Rohit *et al.*, 2018). Total landings at a state level are reported each year by the CMFRI, and specific data on the catch of *Sardinella longiceps* are generally provided (typically indicated as a percentage of the total landed finfish catch).

In the Karnataka Department of Fisheries Annual reports, there is a notable lack of data regarding fish species.²³ Unlike some other regions that provide biological data such as growth rates of the species within the catch, Karnataka's reports do not delve into such biological characterizations. This lack of data and biological details hinders a comprehensive understanding of the species-specific dynamics within Karnataka's fisheries. Consequently, it poses challenges for formulating informed management and conservation strategies. While valuable insights are provided by Rohit *et al.* (2018), there is no confirmation of regular assessments, resulting in a lack of clarity regarding consistency of information over time.

Outcome: FAIL/GAP

A2.2 The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy.

According to the 2018 stock assessment for the Indian Oil sardine in the state of Karnataka, the biomass target reference point corresponds to B_{MSY} (Biomass at Maximum Sustainable Yield). The authors utilized reference points, specifically exploitation rates and biomass in relation to their Maximum Sustainable Yield (MSY), to assess stock status. The authors employed the concepts of E_{curr}/E_{msy} and B_{curr}/B_{msy} as reference points for evaluating the stock's condition. Additionally, the report includes graphical representations illustrating whether these ratios exceed or fall below 1, which serve as indicators of the exploitation status and the potential occurrence of overfishing. The stock

²³ <https://fisheries.karnataka.gov.in/storage/pdf-files/EngAnnualReport2022-23.pdf>

assessment report from 2018 prominently utilizes MSY (Maximum Sustainable Yield) indicators, specifically focusing on the current biomass (B_{curr}) and exploitation rate (E_{curr}) in comparison to their respective MSY benchmarks (B_{msy} , E_{msy}), which are crucial for evaluating the health and sustainability of fish stocks. The data from Karnataka reveals that while the E_{curr}/E_{msy} ratio is slightly above 1 ($E_{curr}/E_{msy}=1.04$), the B_{curr}/B_{msy} ratio is below 1 ($B_{curr}/B_{msy}=0.732$), indicating a situation of overfishing. The heightened exploitation rates coupled with biomass levels below MSY values, even in the absence of precise removal volumes, signify considerable pressure from overfishing on the fishery. This current rate of exploitation surpasses sustainable levels, adversely impacting the stock's ability to regenerate, while a current biomass lower than its maximum sustainable yield signifies stock depletion. It's noteworthy that the exact quantification of fishery removals (i.e., the volume or weight of each species caught and removed per year) wasn't provided in the Enigmatic Indian Oil Sardine report.

Outcome: YES/PASS

A2.3 The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status.

In the 2018 stock assessment report, emphasis was placed on MSY (Maximum Sustainable Yield) indicators, particularly on the existing biomass (B_{curr}) and exploitation rate (E_{curr}) relative to their corresponding MSY benchmarks (B_{msy} , E_{msy}). These metrics are crucial in evaluating the health and sustainability of fish populations. Karnataka's data exhibits a scenario of overfishing, with the E_{curr}/E_{msy} ratio marginally exceeding 1 ($E_{curr}/E_{msy}=1.04$), while the B_{curr}/B_{msy} ratio was below 1 ($B_{curr}/B_{msy}=0.732$). Despite the absence of precise removal volumes, the high exploitation rates coupled with biomass levels falling below MSY values reveal significant overfishing stress on the stock. The ongoing rate of exploitation is likely to exceed sustainable thresholds, negatively impacting the stock's capacity for recovery, while the current biomass, falling short of its maximum sustainable yield, indicates stock depletion. It's worth noting that the Enigmatic Indian Oil Sardine report did not provide detailed information on fishery removals (i.e., the volume or weight of each species caught and removed annually).

Outcome: FAIL/GAP

A2.4 The assessment is subject to internal or external peer review.

The Enigmatic Indian Oil Sardine report and the annual CMFRI reports do not explicitly provide information about whether they underwent an internal or external review process. Nevertheless, considering the detailed nature of the studies and their apparent publication under the auspices of research institutes (ICAR - Central Marine Fisheries Research Institute and CMFRI), it is highly likely that some form of internal review was conducted. However, it is important to note that there is no evidence of publication in a peer-reviewed journal or external peer review for these reports. Further information is required to demonstrate these processes occur in order to meet this clause.

Outcome: GAP/FAIL

A2.5 The assessment is made publicly available.

The Enigmatic Oil Sardine report by Rohit *et al.* (2018) and the CMFRI Annual Reports are both publicly accessible.

Outcome: YES/PASS

References

- FRAEED & CMFRI (2023) *Marine Fish Landings in India-2022*. Technical Report, CMFRI Booklet Series No. 31/2023. ICAR-Central Marine Fisheries Research Institute, Kochi.
- 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.

Links

MarinTrust Standard clause	1.3.2.1.2, 1.3.2.1.4, 1.3.1.2
FAO CCRF	12.3
GSSI	D.5.01, D.6.02, D.3.14

A3 Harvest Strategy - Minimum Requirements			
	A3.1	There is a mechanism in place by which total fishing mortality of this species is restricted.	PASS
	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.	GAP
	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).	GAP
Clause outcome:			GAP
A3.1 There is a mechanism in place by which total fishing mortality of this species is restricted.			
Restrictions on the mortality of <i>Sardinella longiceps</i> are in place in the form of regulations that limit and/or control the activity of purse seine fleets.			
The Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981 (amended in 1982), governs and controls foreign fishing in India's maritime zones, defining zones, issuing permits, and ensuring responsible resource management. ²⁴ All vessels involved in purse seine fishing in Karnataka must be licenced and licences have a defined validity period. Across the state, seasonal bans and regulations on mesh size exist ²⁵ .			
Despite the existence of some measures, the absence of a quota system or the establishment of total allowable catches creates a notable gap in the direct mechanisms for controlling fishing mortality in the State of Karnataka.			
Outcome: YES/PASS			
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.			
In their 2018 analysis, Rohit and colleagues (2018) examined the exploitation rates and biomass concerning MSY, revealing indications of overfishing in Karnataka with a ratio of current exploitation to MSY (E_{curr}/E_{MSY}) at 1.04. Furthermore, the stock status fell below the reference point, with the current biomass to MSY (B_{curr}/B_{MSY}) ratio standing at 0.732.			
Outcome: FAIL/GAP			
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).			
There are no mitigation measures or regulations in place to compensate for any drop in the stock below the reference point, such as specific Harvest Control Rules (HCRs) or management plans to address the declining stock. Even though there is information about stock assessment, there is currently no established mechanism to regulate and oversee fishery removals according to scientific recommendations. Furthermore, there is no assurance that the exploitation rate would be reduced if the stock were to decline, as there are no predefined measures in place for such scenarios.			
Outcome: FAIL/GAP			
References			
Standard clause 1.3.2.1.3			
Links			
MarinTrust Standard clause		1.3.2.1.3, 1.3.2.1.4	
FAO CCRF		7.2.1, 7.22 (e), 7.5.3	
GSSI		D3.04, D6.01	

²⁴ <https://dahd.nic.in/acts-rules/maritime-zones-india-regulation-fishing-foreign-vessels-act-1981>

²⁵ More information on licence validity periods [Available at: <https://www.mangaloretoday.com/main/-rsquo-Reduce-number-of-fishing-vessels-rsquo-CMFRI-tells-Karnataka.html>]

A4 Stock Status - Minimum Requirements		
A4.1	<p>The stock is at or above the target reference point, OR IF NOT:</p> <p>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:</p> <p>The stock is estimated to be below the limit reference point or proxy, but fishery removals are prohibited.</p>	GAP
Clause outcome:		GAP
<p>A4.1 The stock is at or above the target reference point, OR IF NOT:</p> <p>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:</p> <p>The stock is estimated to be below the limit reference point or proxy, but fishery removals are prohibited.</p> <p>The 2018 stock assessment's results reflect a scenario of overexploitation within the Karnataka fishery, denoted by a B_{curr}/B_{MSY} value of 0.732, alongside an overfishing situation, as represented by an E_{curr}/E_{MSY} value of 1.04 (Rohit et al., 2018). To date, there are no limits reference points or proxys available, only target reference points associated with MSY. Further to this there is no indication of appropriate management measures being in place within a Harvest Control Rule should the stock levels decline below the designated limit reference points. Additionally, there is an absence of harvest control rules or a well-defined contingency plan for ceasing fishery operations in such occurrences.</p> <p>Outcome: FAIL/GAP</p>		
References		
Links		
MarinTrust Standard clause	1.3.2.1.4	
FAO CCRF	7.2.1, 7.2.2 (e)	
GSSI	D6 01	
Recommendation		
<p>The fishery would benefit from more frequent stock assessments, with formalised reporting procedures to improve the reliability of stock assessments. Current biological reference points only refer to target (i.e. MSY) not limit reference points. It is therefore remains uncertain if the stock has reached a point of recruitment impairment, risking stock collapse. Additionally, no formal procedures for mitigation (for example Harvest Control Rules) in cases of stock declines are in place. Generally speaking, landings data are not always clearly stratified by vessel and gear type, location (within or beyond the territorial waters) and date of data collection. In the case of the lesser sardines, the status of individual species' stocks are difficult to analyse as reports generally forgoe discrimination between these.</p>		

CATEGORY B SPECIES

Category B species are those which make up greater than 5% of landings in the applicant raw material, but which are not subject to a species-specific research and management regime sufficient to pass all Category A clauses. If there are no Category B species in the fishery under assessment, this section can be deleted.

Category B species are assessed using a risk-based approach. The following process should be completed once for each Category B species.

If there are estimates of biomass (B), fishing mortality (F), and reference points.

It is possible for a Category B species to have some biomass and fishing mortality data available. When sufficient information is present, the assessment team should use the following risk matrix to determine whether the species should be recommended for approval.

TABLE B(A) - F, B AND REFERENCE POINTS ARE AVAILABLE

Biomass is above MSY / target reference point	Pass	Pass	Pass	Fail	Fail
Biomass is below MSY / target reference point, but above limit reference point	Pass, but re-assess when fishery removals resume	Pass	Fail	Fail	Fail
Biomass is below limit reference point (stock is overfished)	Pass, but re-assess when fishery removals resume	Fail	Fail	Fail	Fail
Biomass is significantly below limit reference point (Recruitment impaired)	Fail	Fail	Fail	Fail	Fail
	Fishery removals are prohibited	Fishing mortality is below MSY or target reference point	Fishing mortality is around MSY or target reference point, or below the long-term average	Fishing mortality is above the MSY or target reference point, or around the long-term average	Fishing mortality is above the limit reference point or above the long-term average (Stock is subject to overfishing)

If the biomass / fishing pressure risk assessment is not possible

Initially, the resilience of each Category B species to fishing pressure should be estimated using the American Fisheries Society procedure described in Musick, J.A. (1999). This approach is used as the resilience values for many species and stocks have been estimated by FishBase and are already available online. For details of the approach, please refer to Appendix A. Determining the resilience provides a basis for estimating the risk that fishing may pose to the long-term sustainability of the stock. Table B(b) should be used to determine whether the species should be recommended for approval.

TABLE B(b) - NO REFERENCE POINTS AVAILABLE. B = CURRENT BIOMASS; B_{av} = LONG-TERM AVERAGE BIOMASS; F = CURRENT FISHING MORTALITY; F_{av} = LONG-TERM AVERAGE FISHING MORTALITY.

B > B_{av} and F < F_{av}	Pass	Pass	Pass	Fail
B > B_{av} and F or F_{av} unknown	Pass	Pass	Fail	Fail
B = B_{av} and F < F_{av}	Pass	Pass	Fail	Fail
B = B_{av} and F or F_{av} unknown	Pass	Fail	Fail	Fail
B > B_{av} and F > F_{av}	Pass	Fail	Fail	Fail
B < B_{av}	Fail	Fail	Fail	Fail
B unknown	Fail	Fail	Fail	Fail
Resilience	High	Medium	Low	Very Low

Assessment Results

Species Name		Indian Oil Sardine						
B1	Species Name	<i>Sardinella longiceps</i>						
	Table used (Ba, Bb)	Ba						
	Outcome	Fail						
<p>The status of the Indian oil sardine stock in Karnataka was overexploited and was likely fully fished or experiencing overfishing. The current biomass (B_{curr}) trailing below the target biomass for maximum sustainable yield (B_{MSY}), as reflected by a B_{curr}/B_{MSY} ratio of 0.732. Furthermore, an escalated exploitation rate was observed, denoted by an E_{curr}/E_{MSY} ratio of 1.04, implying an overfishing scenario where the catch rates surpassed the sustainable level (Rohit <i>et al.</i>, 2018). The current status of the stock in 2023 is uncertain.</p>								
<p>References</p> <p>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 & Rethesh, T. & Prakasan, D & M., Sathish & Supraba, V.. (2018). Enigmatic Indian Oil Sardine: An Insight.</p>								
<p>Links</p> <table border="1"> <tr> <td>MarinTrust Standard clause</td> <td>1.3.2.2, 4.1.4</td> </tr> <tr> <td>FAO CCRF</td> <td>7.5.1</td> </tr> <tr> <td>GSSI</td> <td>D.5.01</td> </tr> </table>			MarinTrust Standard clause	1.3.2.2, 4.1.4	FAO CCRF	7.5.1	GSSI	D.5.01
MarinTrust Standard clause	1.3.2.2, 4.1.4							
FAO CCRF	7.5.1							
GSSI	D.5.01							

CATEGORY C SPECIES

In a whole fish assessment, Category C species are those which make up less than 5% of landings, but which are subject to a species-specific management regime. In most cases this will be because they are a commercial target in a fishery other than the one under assessment.

Clause C1 should be completed for **each** Category C species. If there are no Category C species in the fishery under assessment, this section can be deleted. Where a species fails this Clause, it may be assessed as a Category D species instead, EXCEPT if there is evidence that it is currently below the limit reference point.

Author Note

The species was not assessed under this Category as no species-specific management plan exists.

Species Name		Indian Mackerel (<i>R. kanagurta</i>)	
C1	Category C Stock Status - Minimum Requirements		
	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.	n/a
	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.	n/a
Clause outcome:			n/a
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.			
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.			
References			
Links			
MarinTrust Standard clause		1.3.2.2	
FAO CCRF		7.5.3	
GSSI		D.3.04, D5.01	

Author note

The following species (*S . fimbriata*, *S. gibbosa*, *S. jussieui*, *S. albella*) could not be assessed under Category C as no species-specific management plan exists. Reports generally compile the species into a general 'lesser sardine' classification with no discrimination between the species.

Species Name		<i>Fringescale sardinella (S. fimbriata)</i>	
C1	Category C Stock Status - Minimum Requirements		
	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.	n/a
	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.	n/a
			Clause outcome: n/a
<p>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.</p> <p>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.</p>			
References			
Links			
MarinTrust Standard clause		1.3.2.2	
FAO CCRF		7.5.3	
GSSI		D.3.04, D5.01	

Species Name		<i>Goldstripe sardinella (S. gibbosa)</i>	
C1	Category C Stock Status - Minimum Requirements		
	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.	n/a
	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.	n/a
			Clause outcome: n/a
<p>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.</p> <p>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.</p>			
References			
Links			
MarinTrust Standard clause		1.3.2.2	
FAO CCRF		7.5.3	
GSSI		D.3.04, D5.01	

Species Name		<i>Mauritian sardinella (S. jussieui)</i>	
C1	Category C Stock Status - Minimum Requirements		
	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.	n/a
	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.	n/a
			Clause outcome: n/a
<p>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.</p> <p>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.</p>			
References			
Links			
MarinTrust Standard clause		1.3.2.2	
FAO CCRF		7.5.3	
GSSI		D.3.04, D5.01	

Species Name		<i>White Sardinella (S. albella)</i>	
C1	Category C Stock Status - Minimum Requirements		
	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.	n/a
	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.	n/a
			Clause outcome: n/a
<p>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.</p> <p>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.</p>			
References			
Links			
MarinTrust Standard clause		1.3.2.2	
FAO CCRF		7.5.3	
GSSI		D.3.04, D5.01	

CATEGORY D SPECIES

Category D species are those which make up less than 5% of landings and are not subject to a species-specific management regime. In the case of mixed trawl fisheries, Category D species may make up the majority of landings. The comparative lack of scientific information on the status of the population of the species means that a risk-assessment style approach must be taken.

Author notes:

Tables D2 and D3 were used to complete the report for Category D species. Where a species passed D1, it was not assessed in D4. Unless stated otherwise, all data was collected from FishBase (Available at: <https://fishbase.mnhn.fr/summary/SpeciesSummary.php?ID=1507&AT=Fringescale+sardine>). Where no data were available (Unknown), the precautionary approach was taken and the maximum risk score was allocated.

Table D2 - Productivity / Susceptibility attributes and scores used to complete section D.

Productivity attributes	High productivity (Low risk, score = 1)	Medium productivity (medium risk, score = 2)	Low productivity (high risk, score = 3)
Average age at maturity	<5 years	5-15 years	>15 years
Average maximum age	<10 years	10-25 years	>25 years
Fecundity	>20,000 eggs per year	100-20,000 eggs per year	<100 eggs per year
Average maximum size	<100 cm	100-300 cm	>300 cm
Average size at maturity	<40 cm	40-200 cm	>200 cm
Reproductive strategy	Broadcast spawner	Demersal egg layer	Live bearer
Mean Trophic Level	<2.75	2.75-3.25	>3.25

Susceptibility attributes	Low susceptibility (Low risk, score = 1)	Medium susceptibility (medium risk, score = 2)	High susceptibility (high risk, score = 3)
Areal overlap (availability) Overlap of the fishing effort with the species range	<10% overlap	10-30% overlap	>30% overlap
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).	Medium overlap with fishing gear.	High overlap with fishing gear (high encounterability). Default score for target species

Susceptibility attributes	Low susceptibility (Low risk, score = 1)	Medium susceptibility (medium risk, score = 2)	High susceptibility (high risk, score = 3)
Selectivity of gear type Potential of the gear to retain species	a Individuals < size at maturity are rarely caught	a Individuals < size at maturity are regularly caught.	a Individuals < size at maturity are frequently caught
	b Individuals < size at maturity can escape or avoid gear.	b Individuals < half the size at maturity can escape or avoid gear.	b Individuals < half the size at maturity are retained by gear.
Post-capture mortality (PCM) The chance that, if captured, a species would be released and that it would be in a condition permitting subsequent survival	Evidence of majority released post-capture and survival.	Evidence of some released post-capture and survival.	Retained species or majority dead when released.

D3		Average Susceptibility Score		
		1 - 1.75	1.76 - 2.24	2.25 - 3
Average Productivity Score	1 - 1.75	PASS	PASS	PASS
	1.76 - 2.24	PASS	PASS	TABLE D4
	2.25 - 3	PASS	TABLE D4	TABLE D4

D1	Species Name	Indian Mackerel (<i>R. kanagurta</i>)	
	Productivity Attribute	Value	Score
	Average age at maturity (years)	0.7	1
	Average maximum age (years)	4	1
	Fecundity (eggs/spawning)	68,500	1
	Average maximum size (cm)	36	1
	Average size at maturity (cm)	25	1
	Reproductive strategy	Broadcast spawner	1
	Mean trophic level	3.2	2
	Average Productivity Score		1.14
	Susceptibility Attribute	Value	Score
	Availability (area overlap)	5%	1
	Encounterability (the position of the stock/species within the water column relative to the fishing gear)	High overlap with fishing gear	3
	Selectivity of gear type	<i>Unknown*</i>	3
	Post-capture mortality	Retained species	3
	Average Susceptibility Score		2.5
	PSA Risk Rating (From Table D3)		PASS
	Compliance rating		PASS
	Further justification for susceptibility scoring (where relevant)		
	<p>*Further information on technical specifications of the gear used need to be provided in order to accurately assess the selectivity of the gear. We have taken a precautionary approach and given the maximum score due to this lack of information.</p> <p>The species passed this section so was not assessed further under section D4.</p>		
References			
Standard clauses 1.3.2.2			

D1	Species Name	Fringescale sardinella (<i>S. fimbriata</i>)	
	Productivity Attribute	Value	Score
	Average age at maturity (years)	1	1
	Average maximum age (years)	3.5	1
	Fecundity (eggs/spawning)	40,000	1
	Average maximum size (cm)	19	1
	Average size at maturity (cm)	15-16	1
	Reproductive strategy	Batch/broadcast spawner	1
	Mean trophic level	2.7	1
	Average Productivity Score		1
	Susceptibility Attribute	Value	Score
	Availability (area overlap)	<10%	1
	Encounterability (the position of the stock/species within the water column relative to the fishing gear)	Medium Overlap	2
	Selectivity of gear type	Unknown*	3
	Post-capture mortality	Retained species	3
	Average Susceptibility Score		2.25
	PSA Risk Rating (From Table D3)		PASS
	Compliance rating		PASS
	Further justification for susceptibility scoring (where relevant)		
	<p>*Further information on technical specifications of the gear used need to be provided in order to accurately assess the selectivity of the gear. We have taken a precautionary approach and given the maximum score due to this lack of information.</p> <p>No further assessment required under D4 for this species.</p>		
References			
Standard clauses 1.3.2.2			

D1	Species Name	Goldstripe sardinella (<i>S. gibbosa</i>)	
	Productivity Attribute	Value	Score
	Average age at maturity (years)	2 [†]	1
	Average maximum age (years)	3.1	1
	Fecundity (eggs/spawning)	73000	1
	Average maximum size (cm)	29.6	1
	Average size at maturity (cm)	13.9	1
	Reproductive strategy	Broadcast spawner	1
	Mean trophic level	2.9	2
	Average Productivity Score		1.14
	Susceptibility Attribute	Value	Score
	Availability (area overlap)	5%	1
	Encounterability (the position of the stock/species within the water column relative to the fishing gear)	Medium overlap with fishing gear	2
	Selectivity of gear type	Unknown*	3
	Post-capture mortality	Retained species	3
	Average Susceptibility Score		2.25
	PSA Risk Rating (From Table D3)		PASS
	Compliance rating		PASS
	Further justification for susceptibility scoring (where relevant)		
	<p>*Further information on technical specifications of the gear used need to be provided in order to accurately assess the selectivity of the gear. We have taken a precautionary approach and given the maximum score due to this lack of information.</p> <p>†Calculated with reference to equivalent data in El-Betar, T & Osman H. M. (2021) Population Structure of <i>Sardinella Gibbosa</i> (Bleeker, 1849) with Special Reference to Spawning Ground in the Gulf of Suez, Egypt. <i>Egyptian Journal of Aquatic Biology and Fisheries</i> 25, (3) 353–65. https://doi.org/10.21608/ejabf.2021.175579.</p> <p>It was not necessary to assess this species under Category D4</p>		
	References		
<i>Standard clauses 1.3.2.2</i>			

D1	Species Name	Mauritian sardinella (<i>S. jussieui</i>)	
	Productivity Attribute	Value	Score
	Average age at maturity (years)	<i>Unknown*</i>	3
	Average maximum age (years)	<i>Unknown</i>	3
	Fecundity (eggs/spawning)	<i>Unknown</i>	3
	Average maximum size (cm)	16	1
	Average size at maturity (cm)	10	1
	Reproductive strategy	Broadcast spawner [†]	1
	Mean trophic level	2.9	2
	Average Productivity Score		2
	Susceptibility Attribute	Value	Score
	Availability (area overlap)	5%	1
	Encounterability (the position of the stock/species within the water column relative to the fishing gear)	Medium overlap with fishing gear	2
	Selectivity of gear type	<i>Unknown</i>	3
	Post-capture mortality	Retained species	3
	Average Susceptibility Score		2.25
	PSA Risk Rating (From Table D3)		GAP
	Compliance rating		GAP
	Further justification for susceptibility scoring (where relevant)		
	A GAP was identified for this species, so it was assessed further under section D4		
	References		
[†] Sourced from Kimberley J.H., (2021) The Biology and Ecology of Tropical Marine Sardines and Herrings in Indo-West Pacific Fisheries: A Review. <i>Reviews in Fish Biology and Fisheries</i> 31: 449–484.			
*Further information for these categories was not available for an accurate assessment and so we have taken a precautionary approach and given the maximum score due to this lack of information.			
<i>Standard clauses 1.3.2.2</i>			

D4	Species Name	Mauritian sardinella (<i>S. jussieu</i>)	
Impacts On Species Categorised as Vulnerable by D1-D3 - Minimum Requirements			
	D4.1	The potential impacts of the fishery on this species are considered during the management process, and reasonable measures are taken to minimise these impacts.	GAP
	D4.2	There is no substantial evidence that the fishery has a significant negative impact on the species.	GAP
Outcome:			GAP
Evidence			
<p>D4.1: The potential impacts of the fishery on this species are considered during the management process, and reasonable measures are taken to minimise these impacts.</p> <p>There is no clear evidence as to/if impacts of the fishery on the species are considered in the management process, and no indication of measures being taken to minimise impacts if they are occurring on the species is evident.</p> <p><i>Outcome – FAIL/GAP</i></p>			
<p>D4.2 There is no substantial evidence that the fishery has a significant negative impact on the species.</p> <p>The species is not listed on the CITES register and has an IUCN status of ‘Data Deficient’, therefore the impact of the fishery on the species cannot be assessed accurately.</p> <p><i>Outcome – FAIL/GAP</i></p>			
References			
Links			
MarinTrust Standard clause		1.3.2.2, 4.1.4	
FAO CCRF		7.5.1	
GSSI		D.5.01	
Recommendation			
Key information on the life history and reproductive traits of this species should be collected before an accurate risk assessment can be conducted. Further information on the geographical distribution and details of the gear type are required.			

D1	Species Name	White sardinella (<i>S. albella</i>)	
	Productivity Attribute	Value	Score
	Average age at maturity (years)	1*	1
	Average maximum age (years)	1.5	1
	Fecundity (eggs/spawning)	Unknown [†]	3
	Average maximum size (cm)	15	1
	Average size at maturity (cm)	9	1
	Reproductive strategy	Unknown	3
	Mean trophic level	2.6	1
	Average Productivity Score		1.57
	Susceptibility Attribute	Value	Score
	Availability (area overlap)	5%	1
	Encounterability (the position of the stock/species within the water column relative to the fishing gear)	Medium overlap with fishing gear	2
	Selectivity of gear type	Unknown	3
	Post-capture mortality	Retained species	3
	Average Susceptibility Score		2.25
	PSA Risk Rating (From Table D3)		PASS
	Compliance rating		PASS
	Further justification for susceptibility scoring (where relevant)		
	<p>[†] Further information for these categories was not available for an accurate assessment and so we have taken a precautionary approach and given the maximum score due to this lack of information.</p> <p>*Data from Dayarante, P & Gjosaerter, J. (1986). Age and Growth of Four Sardinella Species from Sri Lanka. <i>Fisheries Research</i> 4: 1–33.</p> <p>It was not necessary to assess this species under Category D4</p>		
	References		
<i>Standard clauses 1.3.2.2</i>			

FURTHER IMPACTS

The three clauses in this section relate to impacts the fishery may have in other areas. A fishery must meet the minimum requirements of all three clauses before it can be recommended for approval.

F1	Impacts on ETP Species - Minimum Requirements		
	F1.1	Interactions with ETP species are recorded.	GAP
	F1.2	There is no substantial evidence that the fishery has a significant negative effect on ETP species.	PASS
	F1.3	If the fishery is known to interact with ETP species, measures are in place to minimise mortality.	GAP
Clause outcome:			GAP

F1.1 Interactions with ETP species are recorded.

Evidence of ETP species interactions with the fishery is limited. At a national level, elasmobranch interactions with fisheries have been recorded, but the fishery and gear types used are not recorded. Additionally, purse seine fishing is generally considered a low bycatch method which may reduce the likelihood that there is bycatch of ETP species²⁶. (Madhu 2022) reported that interactions with dolphins were most common (for ring net fishing, though no discrimination was made between purse and ring seines) due to their ecological and behavioural overlap with the small pelagics of this fishery. A single interaction was reported by Yousuf *et al.* (2009), where an Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) (an IUCN Vulnerable species and listed in CITES Annex 1) was caught by a purse seine vessel off the Karnataka coast. No further evidence is available (e.g. from observer reports) to demonstrate that ETP interactions are recorded at a level sufficient to determine the impact of the fishery on their status.

Outcome – No/GAP

F1.2 There is no substantial evidence that the fishery has a significant negative effect on ETP species.

Reports on ETP interactions in the Karnataka Indian Oil Sardine Purse Seine Fishery is limited. At a national level, elasmobranch stocks have been shown to be in decline in recent years but whether this is a result of overexploitation of the stock or due to non-target bycatch remains unknown (Gupta *et al.* 2020). Additionally, the generally low bycatch purse seine method mitigates further the likelihood that this fishery has a negative impact on these species²⁷ and the low impact of purse seine fishing on ETP is corroborated by the generally low number of reports of incidental bycatch (dolphins, turtles) in Indian purse seine fisheries (Edwin *et al.* 2022). There is no substantial evidence available to suggest that the fishery has a significant negative effect on ETP species. Although Rohit *et al.* (2016) list several ETP species present in Karnataka waters, there is no further evidence to suggest that the fishery interacts negatively on the status of these species. Note however, this may be due to limited recording of ETP species interactions in the fishery.

Outcome – YES/PASS

F1.3 If the fishery is known to interact with ETP species, measures are in place to minimise mortality.

There is limited guidance in the case of interactions with ETP species. India is a signatory of IOTC Resolution 13/06/2013 which orders the immediate release of unharmed oceanic white tip sharks in case of bycatch (Kizahakudan *et al.* 2015). Conversely, the Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Rules 1982 states that in the case of catches of species listed under the Wildlife Protection Act 1972²⁷, the species must be kept on board, recorded, and surrendered to the necessary regulators. The incident must be documented by the completion of a form (Form C) which contains details of the catch, the vessel, and details of fishing trip, although it is assumed that this does not minimise mortality of the captured species. Further guidance for the

²⁶ Fishing methods and gear types – Purse seine. Marine Stewardship Council [Available at: <https://www.msc.org/what-we-are-doing/our-approach/fishing-methods-and-gear-types/purse-seine#:~:text=This%20fishing%20method%20can%20result,smaller%20fish%20to%20swim%20free.>]

²⁷India's Wildlife (Protection) Act 1972. [Available at: https://web.archive.org/web/20201130145631/http://legislative.gov.in/sites/default/files/A1972-53_0.pdf]

reduction of mortality in cases of ETP interactions (such as crew training, gear modifications and codes of conduct) could not be found.

Outcome – FAIL/GAP

References

Edwin *et al.* (2022). *Fishing Regulations in India*. In : Madhu, V. R., (2022). Bycatch issues in fisheries – implications p.1, Training manual -ICAR- sponsored short course on bycatch reduction in fisheries : recent advances. ICAR-CIFT, Cochin, 129 pp.

Gupta T, Booth H, Arlidge W, Rao C, Manoharakrishnan M, Amboothri N, Shanker K and Milner-Gulland EJ (2020) Mitigation of Elasmobranch Bycatch in trawlers: A Case Study in Indian Fisheries. *Frontiers in Marine Science*. 7:571.

K.S.S.M. Yousuf, B. Anoop, A.K. 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.” *JMBA2 - Biodiversity Records*, 2009.

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.

Madhu, V. R., (2022). Bycatch issues in fisheries – implications p.1. In: Renjith R.K., Paras Nath Jha and Madhu, V.R. (Eds), Training manual -ICAR- sponsored short course on bycatch reduction in fisheries: recent advances. ICAR-CIFT, Cochin, 129 pp.

Rohit, P., Dineshbaby, A. P., Sasiukmar, G., Swathi Lekshmi, P. S., Mini, K. G., Vivekanandan, E., Thomas, S., Rajesh, K. M., Purushottama, G. B., Sulochanan, B., Viswambharan, D. & Kini, S (2016). Management Plans for the Marine Fisheries of Karnataka. *ICAR-CMFRI Marine Fisheries Policy Series No. 5*, pp 110.

Links

MarinTrust Standard clause	1.3.3.1
FAO CCRF	7.2.2 (d)
GSSI	D4.04, D.3.08

Recommendation

Further information on ETP species interactions should be documented within logbook data or through fisheries observer reports to determine the level of impact.

The fishery lacks a plan for dealing with potential interactions with ETP species which could be integrated with existing documents. Furthermore, licensing conditions could specify mitigation (and potentially precautionary) measures to be taken in cases of ETP interactions, and these measures should be subject to ongoing research to evaluate impacts. Guidelines and training for safe release of ETP species should be developed and implemented.

F2 Impacts on Habitats - Minimum Requirements		
F2.1	Potential habitat interactions are considered in the management decision-making process.	PASS
F2.2	There is no substantial evidence that the fishery has a significant negative impact on physical habitats.	PASS
F2.3	If the fishery is known to interact with physical habitats, there are measures in place to minimise and mitigate negative impacts.	PASS
Clause outcome:		PASS
<p>F2.1 Potential habitat interactions are considered in the management decision-making process.</p> <p>The Indian Marine Fisheries Code provides guidance for adopting the FAO’s Code of Conduct for Responsible Fisheries and consider the impact of fishing activities on habitats. It recommends that key habitats be identified, and instruments designed “for their rehabilitation and protection” (Mohamed <i>et al.</i> 2017). The code also recommends that ecosystems/habitats should be considered by state level authorities in the design of their MFRAs to ensure that “biodiversity of aquatic habitats and ecosystems is conserved and endangered species are protected”, while new proposed fishing methods/gears should be assessed for their potential impacts on “stocks and habitats before being approved for commercial fishing” (Mohamed <i>et al.</i> 2017).The CMFRI also highlights critical conservation issues to be considered in developing fisheries management plans, and considers habitat impacts (such as discarded fishing gear) (CMFRI 2022). ICAR also provides guidance on fisheries management in Karnataka state, highlighting important habitats in this area, and reports on existing and potential anthropogenic impacts on these habitats (Rohit <i>et al.</i> 2016).</p> <p>Outcome – YES/PASS</p> <p>F2.2 There is no substantial evidence that the fishery has a significant negative impact on physical habitats.</p> <p>Purse seine fishing is typically considered as having a low impact on physical habitats²⁷. Although some indicators of poor habitat health in Karnataka waters were reported by Rohit <i>et al.</i> (2016), there is no evidence to suggest that this is due to the fishing methods of the Karnataka Oil Sardine fishery. Negative impacts on the physical habitat may come from absent, lost or discarded fishing gear (ALDFG), but direct impacts caused by the Karnataka Indian Oil Sardine fishery could be considered minimal.</p> <p>Outcome – YES/PASS</p> <p>F2.3 If the fishery is known to interact with physical habitats, there are measures in place to minimise and mitigate negative impacts.</p> <p>It is unlikely that the fishery interacts negatively due to the fishing method. No measures to minimise and mitigate negative impacts could be found by the author.</p> <p>Outcome – YES/PASS</p>		
<p>References</p> <p>CMFRI (2022) Annual Report 2021. <i>Central Marine Fisheries Research Institute, Kochi.</i> 300p</p> <p>Madhu, V. R., (2022). Bycatch issues in fisheries – implications p.1. In: Renjith R.K., Paras Nath Jha and Madhu, V.R. (Eds), <i>Training manual -ICAR- sponsored short course on bycatch reduction in fisheries: recent advances.</i> ICAR-CIFT, Cochin, 129 pp.</p> <p>Mohamed, K.S., K. Vijayakumar, 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. <i>CMFRI Marine Fisheries Policy Series 4:</i> 120 p</p> <p>Rohit, P., Dineshbaby, A. P., Sasiukmar, G., Swathi Lekshmi, P. S., Mini, K. G., Vivekanandan, E., Thomas, S., Rajesh, K. M., Purushottama, G. B., Sulochanan, B., Viswambharan, D. & Kini, S (2016). Management Plans for the Marine Fisheries of Karnataka. <i>ICAR-CMFRI Marine Fisheries Policy Series No. 5,</i> pp 110.</p>		
Links		
MarinTrust Standard clause	1.3.3.2	
FAO CCRF	6.8	
GSSI	D.2.07, D.6.07, D3.09	

F3 Ecosystem Impacts - Minimum Requirements		
F3.1	The broader ecosystem within which the fishery occurs is considered during the management decision-making process.	PASS
F3.2	There is no substantial evidence that the fishery has a significant negative impact on the marine ecosystem.	PASS
F3.3	If one or more of the species identified during species categorisation plays a key role in the marine ecosystem, additional precaution is included in recommendations relating to the total permissible fishery removals.	GAP
Clause outcome:		GAP
<p>F3.1 The broader ecosystem within which the fishery occurs is considered during the management decision-making process.</p> <p>The 2021 Indian Marine Fisheries Bill⁹ highlights India’s commitment to developing fisheries management plans in line with the Ecosystem Approach to Fisheries Management and Co-Management. ICAR provides information and guidance on ecosystem interactions in Rohit <i>et al.</i> (2016) in the state of Karnataka.</p> <p>Outcome – YES/PASS</p>		
<p>F3.2 There is no substantial evidence that the fishery has a significant negative impact on the marine ecosystem.</p> <p>(Madhu 2022) has reported that interactions with dolphins were most common in ring net fisheries (though no discrimination is made between purse and ring seines) due to their ecological and behavioural overlap with the small pelagics of this fishery. A single interaction was reported by Yousuf <i>et al.</i> (2009), where an Indo-Pacific finless porpoise (<i>Neophocaena phocaenoides</i>) (an IUCN Vulnerable species and listed in CITES Annex 1) was caught by a purse seine vessel off the Karnataka coast. The knock-on ecosystem impacts of these limited interactions are likely to be negligible. Despite some indicators of poor habitat health in certain parts of a Karnataka MPA (Rohit <i>et al.</i> 2016), no evidence exists to implicate the oil sardine fishery in this.</p> <p>Outcome – YES/PASS</p>		
<p>F3.3 If one or more of the species identified during species categorisation plays a key role in the marine ecosystem, additional precaution is included in recommendations relating to the total permissible fishery removals.</p> <p>The impact of this fishery on the ecosystem has yet to be comprehensively assessed and therefore it remains a challenge to determine which species play key roles. Additionally, there are no precautionary management measures established to guarantee the sustainable exploitation of the fishery. Current management measures do not explicitly list the species that can be caught by the purse-seine fleet and biological reference points (BRPs) have not been established for other species other than the Indian Oil Sardine.</p> <p>Outcome – FAIL/GAP</p>		
<p>References</p> <p>Madhu, V. R., (2022). Bycatch issues in fisheries – implications p.1. In: Renjith R.K., Paras Nath Jha and Madhu, V.R. (Eds), <i>Training manual -ICAR- sponsored short course on bycatch reduction in fisheries: recent advances. ICAR-CIFT, Cochin, 129 pp.</i></p> <p>Rohit, P., Dineshbaby, A. P., Sasiukmar, G., Swathi Lekshmi, P. S., Mini, K. G., Vivekanandan, E., Thomas, S., Rajesh, K. M., Purushottama, G. B., Sulochanan, B., Viswambharan, D. & Kini, S (2016). Management Plans for the Marine Fisheries of Karnataka. <i>ICAR-CMFRI Marine Fisheries Policy Series No. 5</i>, pp 110.</p> <p>Yousuf, K., B. Anoop, A.K. 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.” <i>JMBA2 - Biodiversity Records</i>, 2009.</p>		
Links		
MarinTrust Standard clause	1.3.3.3	
FAO CCRF	7.2.2 (d)	

GSSI	D.2.09, D3.10, D.6.09
<p>Recommendation</p> <p>An accurate assessment of the status of the captured stocks in this fishery would allow for a comprehensive analysis of potential negative impacts on the marine ecosystem and would inform precautionary measures to be taken. A wider understanding of the fishery ecosystem, assessment of key predator interactions with the stocks and the calculation of exploitation rates which consider the wider ecosystem could enhance the sustainability of this fishery.</p> <p>A detailed analysis of the catch composition might show evidence of fishing within shallow inshore areas. Presence of demersal or benthic species would indicate spatial-temporal management measures need to be introduced and effectively monitored and enforced.</p>	

SOCIAL CRITERION

In addition to the scored criteria listed above, applicants must commit to ensuring that vessels operating in the fishery adhere to internationally recognised guidance on human rights. They must also commit to ensuring there is no use of enforced or unpaid labour in the fleet(s) operating upon the resource.

Appendix A - Determining Resilience Ratings

The assessment of Category B species described in this assessment report template utilises a resilience rating system suggested by the American Fisheries Society. This approach was chosen because it is also used by FishBase, and so the resilience ratings for many thousands of species are freely available online. As described by FishBase, the following is the process used to arrive at the resilience ratings:

“The American Fisheries Society (AFS) has suggested values for several biological parameters that allow classification of a fish population or species into categories of high, medium, low and very low resilience or productivity (Musick 1999). If no reliable estimate of r_m (see below) is available, the assignment is to the lowest category for which any of the available parameters fits. For each of these categories, AFS has suggested thresholds for decline over the longer of 10 years or three generations. If an observed decline measured in biomass or numbers of mature individuals exceeds the indicated threshold value, the population or species is considered vulnerable to extinction unless explicitly shown otherwise. If one sex strongly limits the reproductive capacity of the species or population, then only the decline in the limiting sex should be considered. We decided to restrict the automatic assignment of resilience categories in the Key Facts page to values of K , t_m and t_{max} and those records of fecundity estimates that referred to minimum number of eggs or pups per female per year, assuming that these were equivalent to average fecundity at first maturity (Musick 1999). Note that many small fishes may spawn several times per year (we exclude these for the time being) and large live bearers such as the coelacanth may have gestation periods of more than one year (we corrected fecundity estimates for those cases reported in the literature). Also, we excluded resilience estimates based on r_m (see below) as we are not yet confident with the reliability of the current method for estimating r_m . If users have independent r_m or fecundity estimates, they can refer to Table 1 for using this information.”

Parameter	High	Medium	Low	Very low
Threshold	0.99	0.95	0.85	0.70
r_{max} (1/year)	> 0.5	0.16 - 0.50	0.05 - 0.15	< 0.05
K (1/year)	> 0.3	0.16 - 0.30	0.05 - 0.15	< 0.05
Fecundity (1/year)	> 10,000	100 - 1000	10 - 100	< 10
t_m (years)	< 1	2 - 4	5 - 10	> 10
t_{max} (years)	1 - 3	4 - 10	11 - 30	> 30

[Taken from the FishBase manual, “Estimation of Life-History Key Facts”, <http://www.fishbase.us/manual/English/key%20facts.htm#resilience>]

Glossary

Non-target: Species for which the gear is not specifically set, although they may have immediate commercial value and be a desirable component of the catch. OECD (1996), Synthesis report for the study on the economic aspects of the management of marine living resources. AGR/FI(96)12

Target: In the context of fishery certification, the target catch is the catch of stock under consideration by the unit of certification – i.e. the fish that are being assessed for certification and ecolabelling. (GSSI)