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Fishery and Stock Assessment of Small Pelagics along the Karnataka Coast

ICAR-CMFRI Mangalore Regional Centre

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Data collection methodology

The landing data of the fishery resources along Karnataka coast is collected using stratified multi-stage random sampling technique from the major and minor landing centres. From 2017 onwards data collection is carried out using electronic tablets by providing login id/username to the survey staff, with centralized processing and retrieval of marine fish landings data at headquarters of ICAR-CMFRI, Kochi through the database server. Using the web application software for online data entry, the survey staff can directly record the information from landings centers and can transmit the information to the server. The estimation of landings will be carried out at headquarters.

Stock assessment of Indian Mackerel

The stock assessment of mackerel was done for the period of three years from 2021 to 2023 using LBB method.

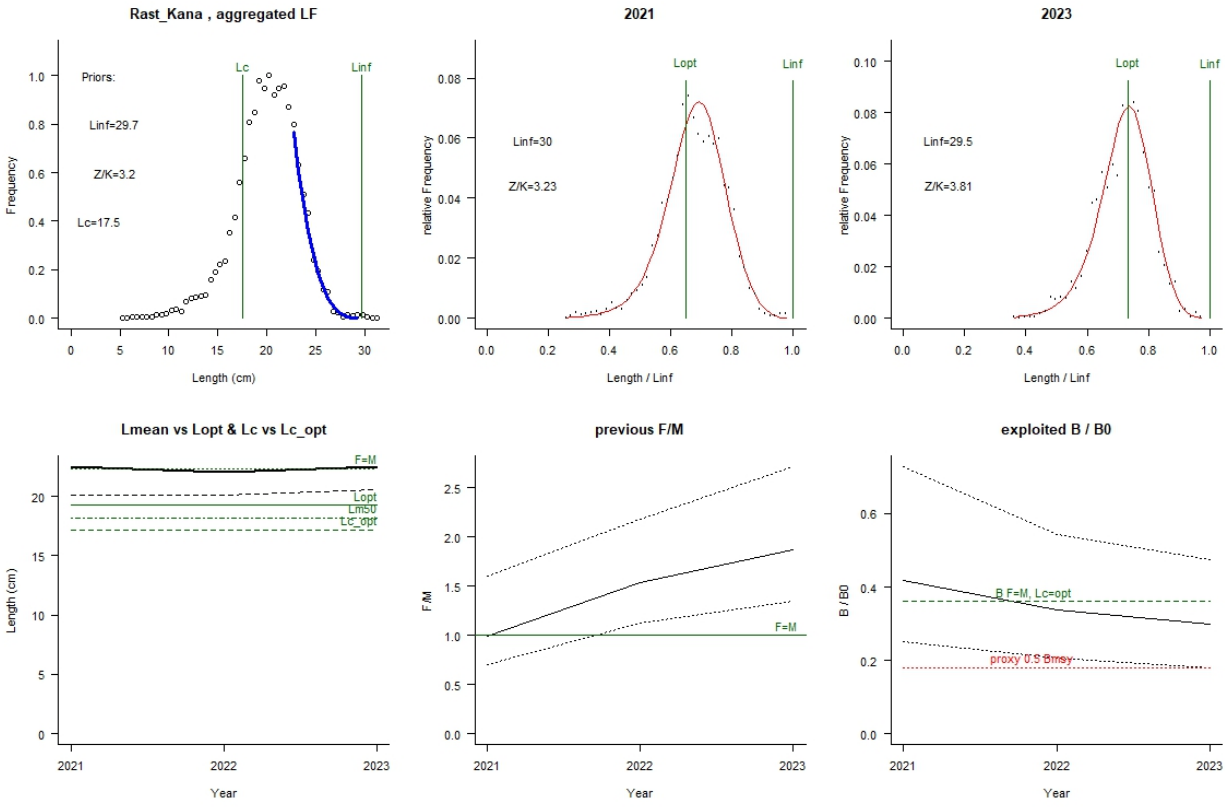
Key results, assessment and advise for the Indian Mackerel stock as evidenced by the Karnataka.

Going by the consistency of performance of the Bayesian assessment of length frequency data with a range of initial values for critical parameters (as well as unconstrained fit) the range of 17 cm to 18 cm seems to be the most informative of the *Rastrelliger kanagurta* stock that is amenable to fishing in the region of study. The ideal value that produces a consistent estimate of health metrics is 17.5 cm. However, it can be eased till the limiting lower point of 17 cm, while the upper limit must be less than 18 cm. Hence the assessment and related suggestions are given with that presumptive prior in place.

The key metrics of stock health are given in Table I

Table I: LBB results for Rastrelliger kanagurta, stock 2021-2023

General reference points (median across year)	
Linf	29.7 (29.2-30.2) cm
Lopt	19 cm, Lopt/Linf=0.65
Lc_opt	17 cm, Lc_opt/Linf=0.58, Lmean if F=M 22.4 cm
M/K	1.62 (1.3-1.91)
F/M	2.08 (1.54-2.75), F/K=2.73 (2.23-3.19), Z/K=3.77 (3.4-4.21)
B/B0	0.26 (0.16-0.36), B/B0 F=M Lc=Lc_opt 0.36
Y/R'	0.035 (0.022-0.061), Y/R' F=M Lc=Lc_opt 0.039
Estimates for 2023 (mean of last 3 years with data)	
Lc50	20.6 (20.3-20.8) cm, Lc/Linf=0.69 (0.68-0.7)
Lc95	25.4, alpha=0.613 (0.596-0.632)
Lmean/Lopt	1.1, Lc/Lc_opt=1.2, L95th=28.6 cm, L95th/Linf=0.96, Mature=90%
F/M	1.9 (1.3-2.7), F/K=2.7 (2.2-3.3), Z/K=4.2 (3.7-4.7)
Y/R'	0.047 (0.028-0.074)
B/B0	0.3 (0.18-0.48), best LF fit year = (-)
B/Bmsy	0.82 (0.49-1.3)

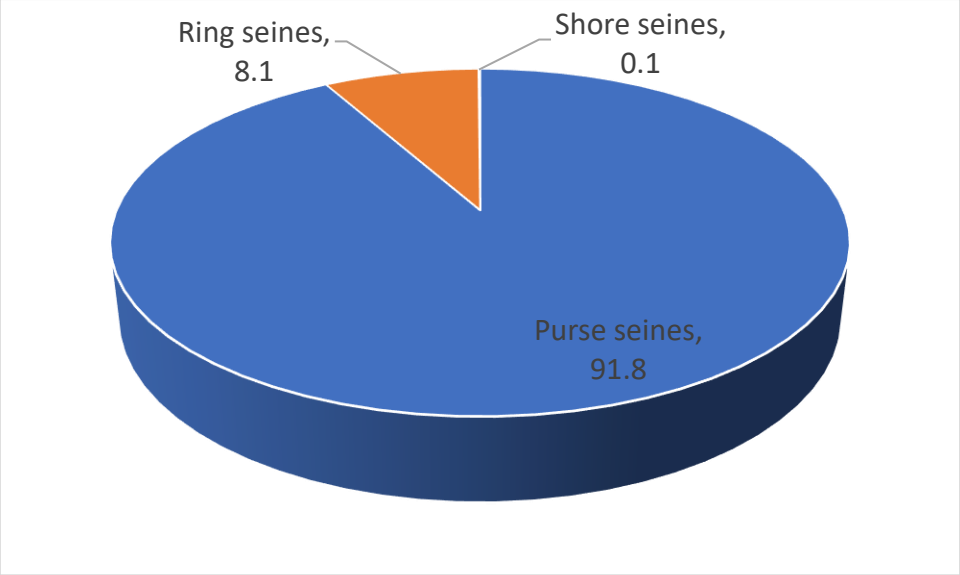


As indicated the ratio of fishing to natural mortality must be optimized to fall in 1.5 to 2.0 range. The biomass at MSY at that optimum has a broader range, yet still focussed around 0.8, which means that the stock hovers within the Overfishing and optimally exploited zone, when the growth and feeding habits of this carnivorous resource is factored in. With the short span of fit influencing the results, it can be safely said that the present level of exploitation must be aimed to be slowly pulled back a bit, so that in the medium run the fishery retains its optimization probability at a high level. The ratios pertaining to lengths at optima and first capture fall a shade below the ideal figures, while the percentage of matured seems to be the best indicator of the whole stock being harvested in a robustly sustainable manner.

The overall assessment of the stock is that it hovers in the optimal and overexploiting zones, between the bottom second and top second quadrants, which denotes a state of flux that can be considered healthy by robust proportions. The specific suggestion on the exploitation front would be to sustain fishing targeting ideal sized ones (17.5 cm onwards) with a phasing for lessening the pressure in cycles.

Landings Trends from seines operating along Karnataka coast

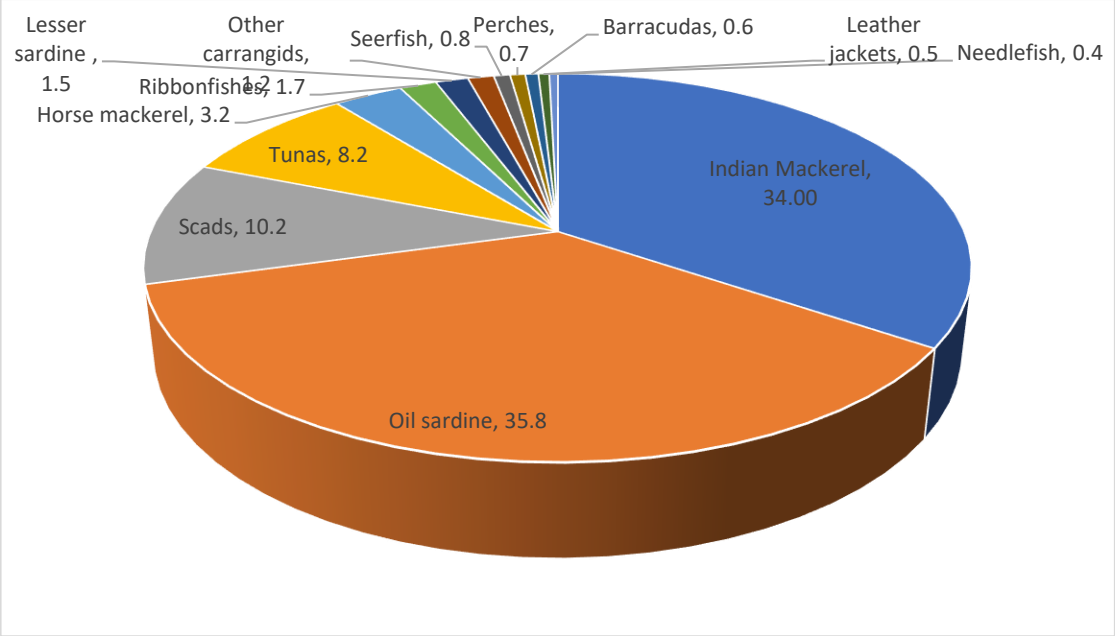
Among seines, Purse seine, ring seine and shore seine are operated along Karnataka coast. The landings of seines (1.6 lakh t) accounts for 26.4% of total marine landings (6.04 lakh t) of the state. Purse seine is the major gear among seines, which contributed to 24.3% (1.5 lakh t) of the total marine landings and 91.8% of the landings of seines. Whereas, the ring seine contributed to 8.1 and 0.1 to the total marine landings and total landings of the seines respectively. However, the contribution of the shore seines to the total marine landings (0.1%) and the landings of seines (0.03%) is negligible.



Contribution (%) of landings from various seines operated along Karnataka coast to the total landings of Seines.

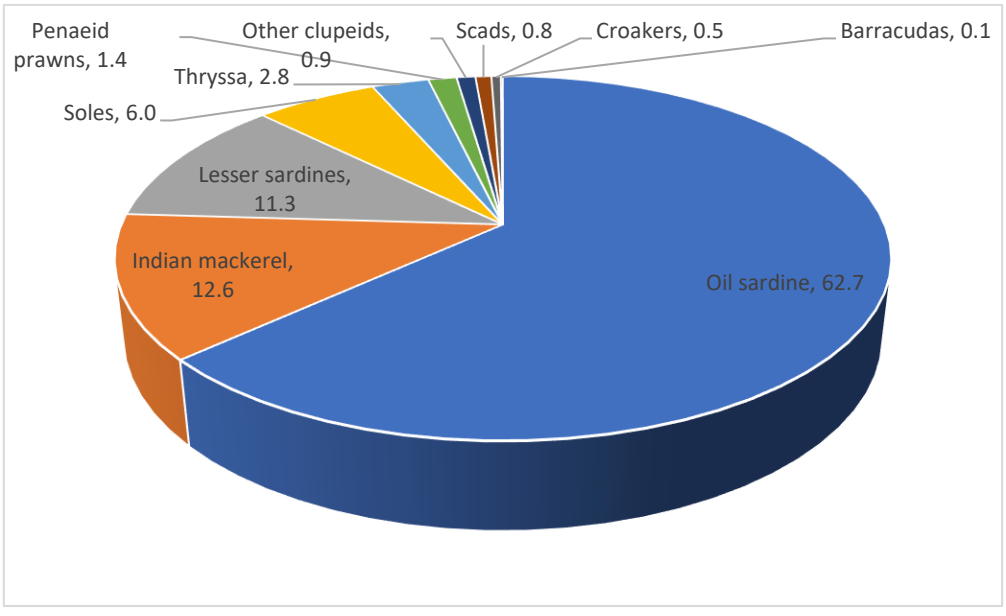
Composition of Purse seine landings

Provisional estimated landings of Purseseine along Karnataka during 2024 was 110865t. The major portion of the landings of purse seines along Karnataka coast was Indian Oil sardines (35.8%) and Indian mackerel (34.0%), together contributed 69.8% of purse seine landings of the state. Scads (10.2%) and tunas (8.2) contributed moderate landings, accounting for 18.4% of the total purse seine landings. Other fishes landed in minute quantity from purse seines included Ribbonfish (1.7%), Lesser sardines (1.5%), other carrangids (1.2%), seerfish (0.8%), perches (0.7%), barracudas (0.6%), Leather jackets (0.5%) and needle fishes (0.4%).



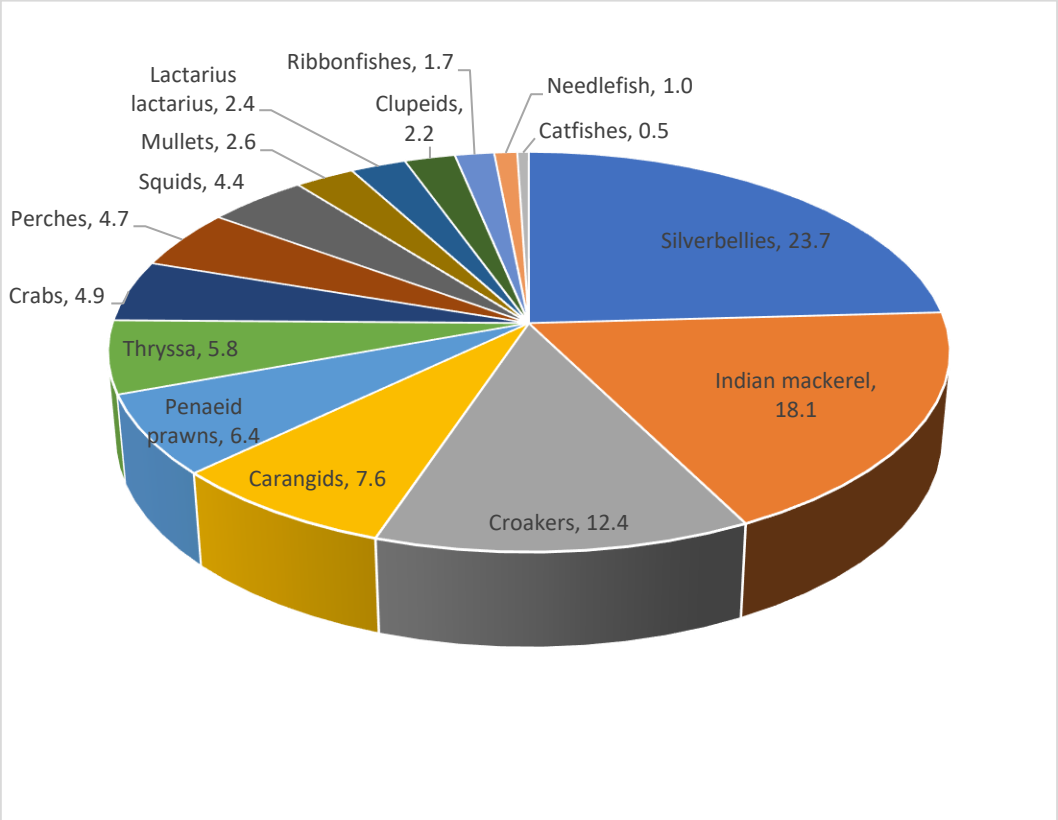
Composition of Ring Seine landings

The three varieties of fishes landed in maximum quantity from ring seines along Karnataka coast included Indian oil sardines (62.7%), Indian mackerel (12.6%) and lesser sardines (11.3%), together formed 86.6% of the ring seine landings. The other fishery resources landed from ring seines were soles (6.0%), Penaeid prawns (1.4%), *Thryssa* spp. (2.8%), Clupeids other than oil sardines (0.9%), scads (0.8%), croakers (0.5%) and barracudas (0.1%).



Composition of Shore Seine landings

The shore seines which are operated in the nearshore waters landed Silverbellies (23.7%), Indian mackerel (18.1%), croakers (12.4%), carangids (7.6%), penaeid prawns and *Thryssa* spp. (5.8%) as the major resources, which together contributed 67.4%. Rest of the landings from shore seines included crabs (4.9%), perches (4.7%), squids (4.4%), mullets (2.6%), *lactarius lactarius* (2.4%), clupeids (2.2%), ribbonfishes (1.7%), needlefish (1.0%) and catfishes (0.5%).



In-situ samples collected from selected purse seines and ring seines landed in Mangalore and Malpe

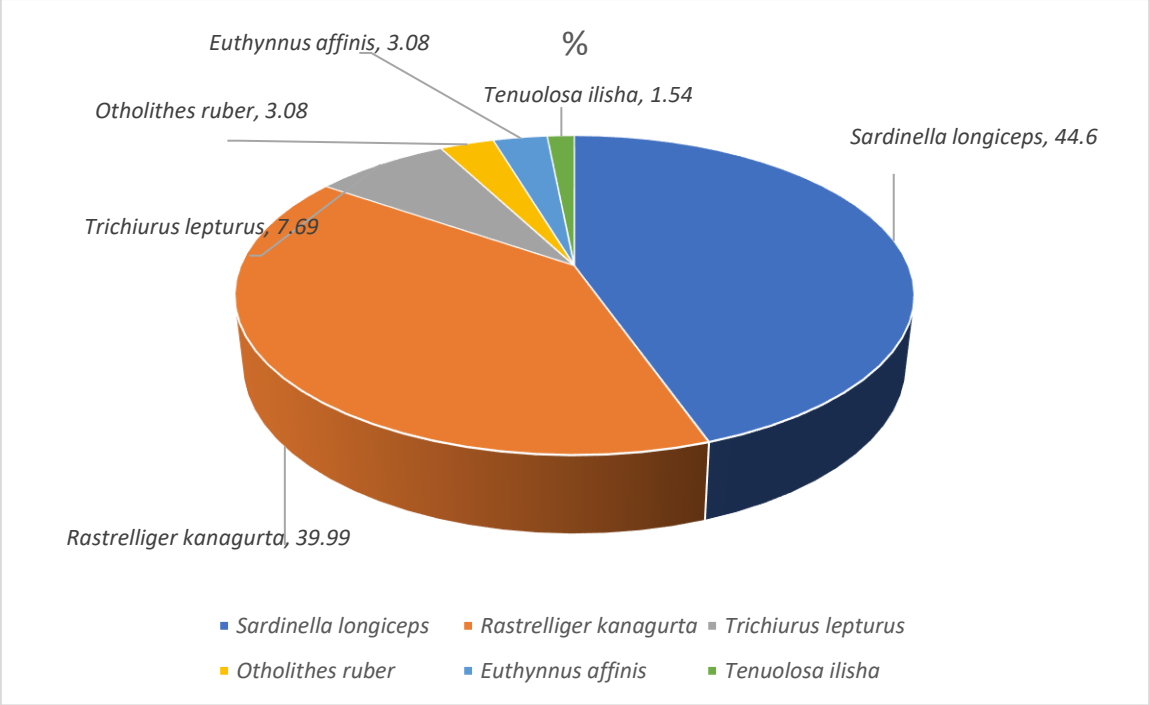
Fish samples were collected during September to December 2004 from selected purse seines and ring seines landed in Mangalore and Malpe fishing harbours. The length and weight of each fish specimen collected were measured and the sex ratio was estimated.

Table 2. Length range and Mean length of fishes sampled from selected purse seines and ring seines

Sl. No.	Species	**Purse seine**		**Ring seine**	
		Length range (mm)	**Mean (mm)**	**Length range (mm)**	**Mean (mm)**
1.	*Sardinella longiceps*	94-150	120.2	100-147	123.8
2.	*Rastrelliger kanagurta*	136-215	169.8	-	-
3.	*Otolithes ruber*	133-195	167.3	-	-
4.	*Euthynnus affinis*	221-243	232	-	-
5.	*Tenulosa ilisha*	200-235	217.9	-	-
6.	*Thryssa vitirostris*	-	-	121-190	156
7.	*Hilsa kelee*	-	-	166-171	168.6
8.	*Tenualosa toli*	-	-	121-171	142
9.	*Escualos thoracata*	-	-	89-100	99.5
10.	*Sardinella albella*	-	-	133-144	140.3

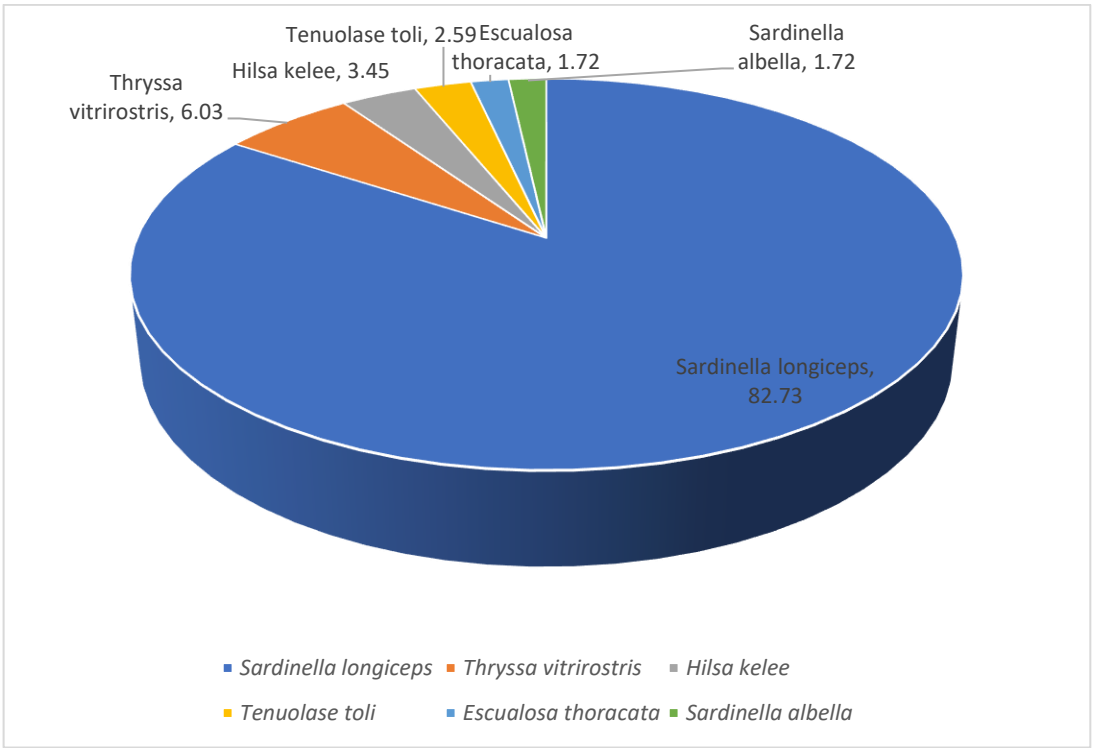
Composition of in-situ samples collected from purse seine

The major fishes recorded in the samples collected from selected purse seine boats during September to December 2024 included Indian oil sardine (44.6%) and Indian mackerel (39.99%).



Composition of in-situ samples collected from ring seine

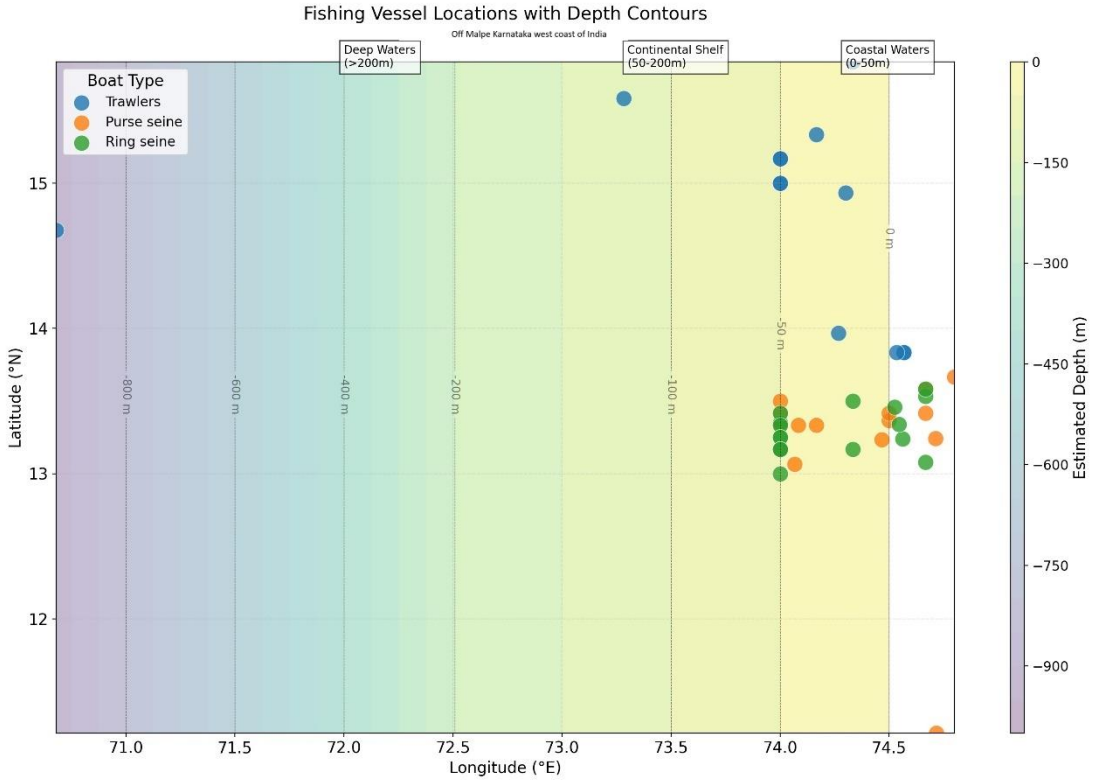
The major fishes recorded in the samples collected from selected ring seine boats during September to December 2024 included Indian oil sardine, which accounted for 82.7%.



Species Diversity and fishing areas off Malpe, Karnataka

Approximately 60 species were identified as contributors to the seine fishery based on in situ data collected from September to December. The highest species diversity was observed in November, indicating a seasonal peak in biodiversity. The operational depths of fishing activities were documented from boats operating off the Malpe coast, providing valuable insights into the fishing dynamics of the region.

Seine nets were primarily deployed at depths of up to 50 meters, while trawl nets extended their operations to depths of 100 meters. This distinction highlights the different operational ranges and ecological niches targeted by the two fishing methods. Such depth-specific data is crucial for understanding resource utilization patterns and managing the fisheries sustainably.



Major Sardine Species observed in Pureseine fishery

Indian oil sardine (*Sardinella longiceps*)

White sardinella (*Sardinella albella*)

Fringescale sardinella (*Sardinella fimbriata*)

Goldstripe sardinella (*Sardinella gibbosa*)

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