Karnataka Trawl Fisheries: Decadal Analysis and Fishers' perspectives

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Abstract

Analyses of trawl fisheries in Karnataka was done from 2008-2019 as part of a project on 'Best practices in trawl fisheries'. The fishing days increased from 1 day trips to voyages of 14 days and depth of operation ranged from 11-200 m. Total area trawled ranged from 26324-45869 sq. km. Multiday trawl landings observed 269 taxa of which 224 species belonging to 111 families and 32 orders were identified. 68% were finfishes, followed by crustaceans (17%) and molluscs (14%) with major contribution from carangids (22 %), portunids (10%), clupeids (8 %), penaeids (7 %) and engraulids (6 %). Since 2017, percentage of pelagic fishes in trawl catch has increased. Based on a survey, stakeholder attitudes were also assessed on various socio-economic aspects.

***Keywords**: Fishing ground, Karnataka, species composition, Trawl*

Introduction

In India, mechanised sector contributes more than 80% of the marine fish catch and more than 50% is from trawl. Based on the FAO guidelines on the best practices in trawl fisheries, the present study was done as a part of developing best practices in trawling in India. Karnataka with a coastline of 300 km has 93 fish landing centres with five are major harbours. The gears operated are mainly seines, gillnets and trawl nets. Major gear contributing to the fishery in recent years is trawl which are operating from coast go up to Thane in Maharashtra to Kozhikode in Kerala and contribute 64% of the marine fish landings in Karnataka state. During 2018, the trawlers of Karnataka landed 293 thousand tonnes fishes of which 95% were caught by multiday trawlers and the rest by single day trawlers. In 2019, the total trawl landings showed a phenomenal increase to 440 thousand t with multiday trawlers contribution of 96%.

Methodology

In-situ data collected from 2562 cruise datasets of multiday trawlers during 2008-2018 was used for analyses of trawl fishing operations, spatial extension of trawling operation, species composition and the decadal changes in the composition. For understanding the fishers' perspective on trawl fishery, various stakeholders including traditional fishers and trawl operators were engaged using personal interviews, focus group discussions and using projective techniques. The attitude of respondents on the trawl fisheries of Karnataka was measured using Garret Ranking and a 3 point Likert's scale.

Genesis of trawl fishery in Karnataka

The trawlers were first introduced in the coast in 1957 mainly to exploit shrimps and the contribution by trawlers was minimum in the initial years. Wooden boats of 30-43

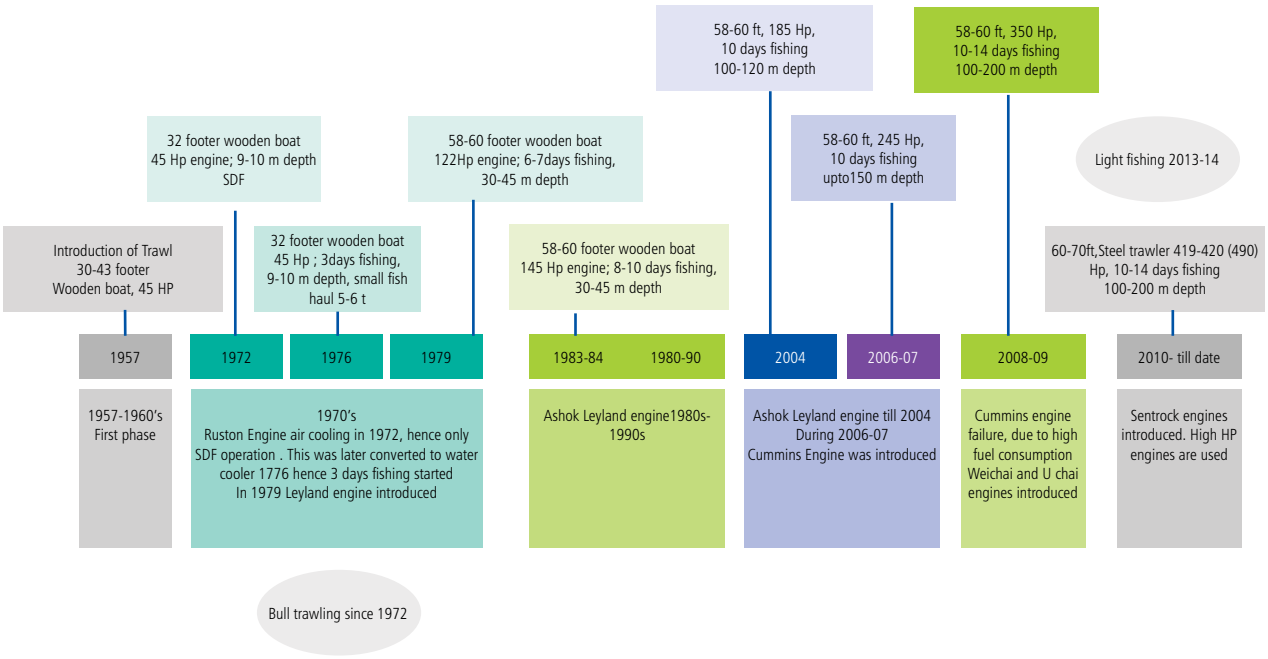

Fig 1. The timeline of trawl fisheries in Karnataka

ft and 45 hp engine were used and depth of operation was about 9-10 m in the early phase of the trawling. Trawling increased to trips of 3 days during 1972-79 period and changes in the engine make occurred during this period. Bull trawling was introduced since 1972. In 1980s and 1990s the engine hp increased to 122- 145 with size of the boat increasing to 50-60 ft. The fishing days increased to 6-10 days with operational depth of 30-45 m. Post year 2000 the depth of trawl operations increased to 100-120 m depth with 10 days of fishing and increase in hp to 185. Over the years the models and companies of the engine also changed. During 2006-07, the engine hp increased to 245, with depth of operation upto 150 m. During 2008-09 the trawlers of 58-60 ft had 350 hp Weichai and U chai engines and the depths operated increased upto 200 m with 10-14 days fishing. From 2010 steel trawlers of 60-70 ft length with depth of operation upto 200 m and 10-14 days fishing are in vogue (Fig. 1). Light fishing by trawlers started in 2013-14, which was banned in 2019 by Govt of Karnataka.

Marine fisheries census -1978 mentioned 246 trawlers which have increased over the years. According to 2016 census, 2,788 trawlers were estimated to be operational along Karnataka coast (CMFRI-DOF, 2020). In 2008, the minimum depth of operation was 9 m and maximum recorded was 200 m, while in 2018, it was 14 -150m. Minimum average depth of operation was 11 m and average maximum depth was 145 m during 2008-2018. The range of total area trawled during 2008-2018 was 26,324 to 45,869 sq km., average area of operation was 35,634 sq km. The area of operation during 2008 was from Kasaragod in Kerala to Goa, which extended from Kozhikode in Kerala to Thane in Maharashtra subsequently. Average extend of operation longitudinally (sq. km) was 746 and with advancement in engine capacity and days of fishing, the distance covered for fishing which was 498 km in 2008 extended upto 830 km in 2018 (Fig.2 & 3).

On an average 50% of the area available for the multiday trawl fishing (MDF) was trawled during 2008-2018 with the minimum area of trawling in 2011 and maximum in

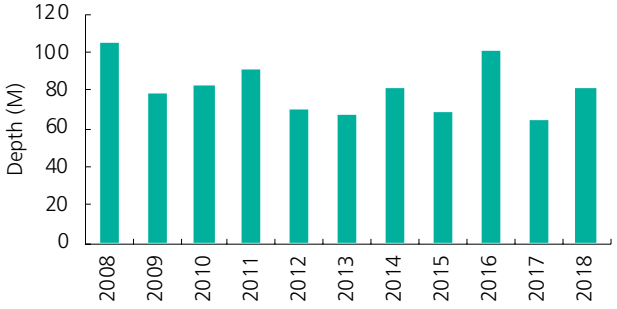

Fig 2. Average Depth of Operation of Multiday Trawlers (2008-2018)

2017 (Fig 4). From 2015 the trawled area increased above 50% of the area available. It was observed that in 2008 when bottom trawling was carried out, there was a gap in 100 m depth zone, caused by the presence of rocky patch (seamounts) which prevented trawling activity. However in 2018, when the pelagic trawl operations were widely adopted, these un-trawled areas could also be covered for trawl fishing (Fig.5)

About 269 taxa were observed in the multiday trawl landings in which 224 species of finfishes, crustaceans, molluscs, belonging to 111 families and 32 orders were identified.

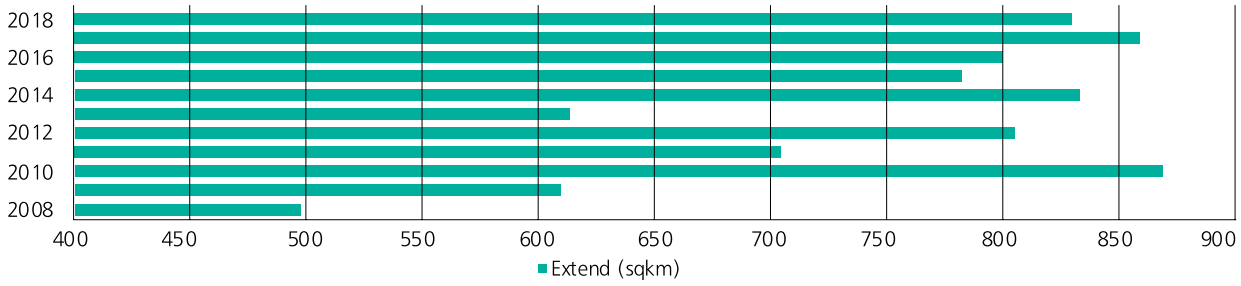

Fig3. Longitudinal extension of trawling area in Karnataka (2008-2018)

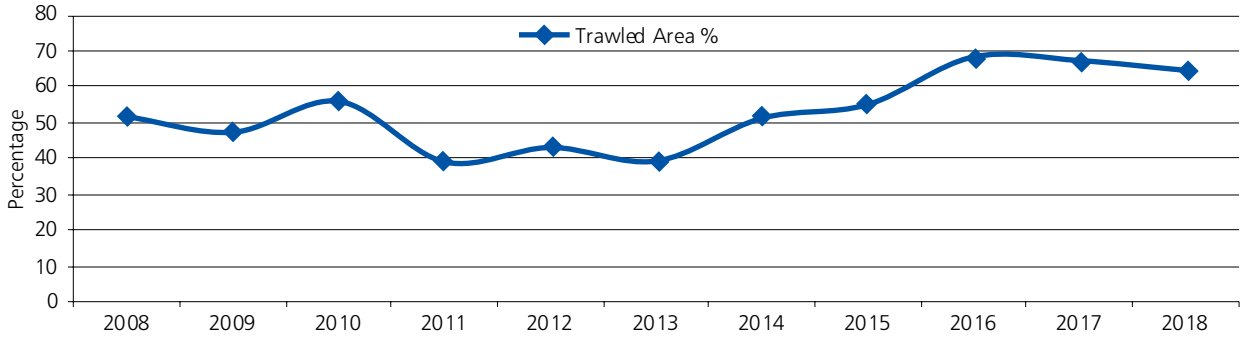

Fig 4. Percentage of Trawled area during 2008-2018

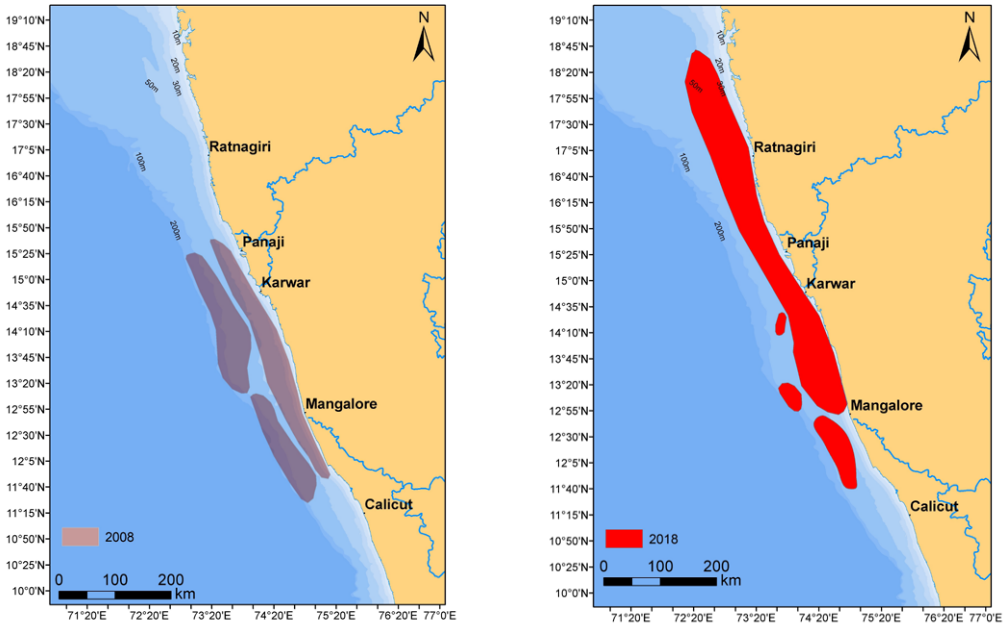

Fig 5. Comparison of trawled area during 2008 &2018

Table 1. List of species occurring in multiday trawlers in Karnataka

FINFISHES

Family	Species	Family	Species
Acanthuridae	*Acanthurus* sp	Haemulidae	*Pomadasys* sp.
Ambassidae	*Ambassis* sp	Hemiramphidae	*Hemiramphus lutkei*
Antennaridae	*Antennarius pictus*	Holocentridae	*Sargocentron rubrum*
Apogonidae	*Apogon* sp	Lactariidae	*Lactarius lactarius*
Ariidae	*Arius arius*	Leiognathidae	*Leiognathus bindus*
	Osteogeneiosus militaris		*Leiognathus splendens*
Balistidae	*Abalistes stellaris*		*Leiognathus brevirostris*
	Balistes sp		*Secutor insidiator*
	Odonus niger	Lethrinidae	*Lethrinus* sp
Bothidae	*Bothus* sp	Lophiidae	*Lophiomussp*
Bregmacerotidae	*Bregmaceros mcclellandi*	Lutjanidae	*Lutjanus* sp
Caesionidae	*Caesio* sp		*Pristipomoides multidens*
Callionymidae	*Callionymus margaretae*	Menidae	*Mene maculata*
Carangidae	*Alectis indicus*	Monocanthidae	*Aluterus monoceros*
	Alepes sp		*Aluterus monoceros*
	Alepes djedaba	Mugilidae	*Mugil cephalus*
	Alepes kleinii		*Mullet* sp
	Alepes mate	Mullidae	*Upeneus* sp
	Atropus atropos	Muraenesocidae	*Muraenesox* sp
	Atule mate		*Muraenesox cinereus*
	Caranxsp	Muraenidae	*Gymnothorax* sp
	Carangoides chrysophrys	Nemipteridae	*Nemipterus japonicus*
	Carangoides coeruleopinnatus		*Nemipterus randalli*
	Carangoides sp		*Parascolopsis aspinosa*
	Caranx sexfasciata		*Scolopsis vosmeri*
	Decapterus macrosoma	Ophidiidae	*Brotula multibarbata*
	Decapterus russelli	Paralichthyidae	*Pseudorhombus* sp
	Decapterus tabl	Pinguipedidae	*Parapercis* sp
	Decapterus sp	Platycephalidae	*Platycephalus* sp
	Megalaspis cordyla	Polotosidae	*Plotosus* sp
	Other carangids	Polynemidae	*Polynemus* sp
	Parastromateus niger	Pomacantridae	*Pomacentrus* sp
	Scomberoides lysan		*Neopomacentrus* sp
	Scomberoides tol	Priacanthidae	*Priacanthus hamrur*
	Selar crumenophthalmus	Pristigasteridae	*Pellona ditchella*
	Selar mate	Psettodidae	*Psettodes erumei*
	Seriolina nigrofasciata	Rachycentridae	*Rachycentron canadum*
	Uraspis sp	Scaridae	*Scarus* spp
Carcharhinidae	*Scoliodon laticaudus*	Scatophagidae	*Scatophagus argus*
Centrolophidae	*Psenopsis intermedia*	Sciaenidae	*Johnius* sp
Cepolidae	*Acanthocepola indica*		*Otolithes cuvieri*
Chaetodontidae	*Chaetodon* sp		*Otolithes ruber*
	Heniochus sp		*Protonibea diacanthus*
Chirocentridae	*Chirocentrus* sp	Scombridae	*Auxis rochei*
Clupeidae	*Amblygaster sirm*		*Euthynnus affinis*
	Anodontostoma chacunda		*Rastrelliger kanagurta*
	Dussumieria acuta		*Scomberomorus commerson*
	Opisthopterus tardoore	Scorpaenidae	*Pterois russelii*

FINFISHES

Family	Species	Family	Species
	Sardinella albella		*Gobius* sp
	Sardinella fimbriata		*Trypauchen vagina*
	Sardinella longiceps		*Pterois volitans*
	Sardinella gibbosa		*Scorpaenodes* sp
Colocongridae	*Coloconger* sp		*Scorpaenopsis* spp
Coryphaenidae	*Coryphaena* sp	Serranidae	*Cephalopholis* sp
Cynoglossidae	*Cynoglossus bilineatus*		*Epinephelus chlorostigma*
	Cynoglossus macrostomus		*Epinephelus diacanthus*
	Cynoglossus puncticeps	Siganidae	*Siganus canaliculatus*
Dactylopteridae	*Dactyloptena* sp		*Siganus vermiculatus*
Dasyatidae	*Dasyatis* sp	Soleidae	*Solea* sp
Diodontidae	*Cyclichthys* sp		*Zebrias* sp
	Diodon sp	Sphyraenidae	*Sphyraena fosteri*
Echeneidae	*Echeneis naucrates*		*Sphyraena jello*
Engraulidae	*Encrasicholinadevisi*		*Sphyraena obtusata*
	Stolephorus commersonnii		*Sphyraena putnamae*
	Stolephorus baganensis	Syngnathidae	*Hippocampus* sp
	Stolephorus indicus	Synodontidae	*Saurida tumbil*
	Stolephoruswaitei		*Saurida undosquamis*
	Thryssa mystax		*Synodus indicus*
	Thryssa vitrirostris		*Trachinocephalus myops*
Ephippidae	*Platax orbicularis*	Terapontidae	*Terapon jarbua*
Exocoetidae	*Hirundichthys cormandelensis*		*Terapon theraps*
Fistulariidae	*Fistularia petimba*	Tetraodontidae	*Lagocephalus inermis*
Gerreidae	*Gerres limbatus*	Triakidae	*Iago omanensis*
	Gerres filamentosus	Trichiuridae	*Trichiurus lepturus*
Gobidae	*Bathygobius* sp	Uranoscopidae	*Uranoscopus guttatus*
	Ctenotrypauchen microcephalus		

CRUSTACEANS

Family	Species	Family	Species
Parthenopidae	*Cryptopodia angulata*	Leucosiidae	*Myra fugax*
Calappidae	*Calappa gallus*	Cirolanidae	*Cirolana fluviatilis*
Calappidae	*Calappa granulata*	Squillidae	*Harpiosquilla harpax*
Calappidae	*Calappa lophos*	Squillidae	*Lysiosquilla* sp
Calappidea	*Matuta planipes*	Squillidae	*Oratosquilla nepa*
Portunidae	*Charybdis feriatus*	Palinuridae	*Panulirus homarus*
Portunidae	*Charybdis hoplites*	Scyllaridae	*Thenus orientalis*
Portunidae	*Charybdis lucifera*	Glyphocrangonidae	*Glyphocrangon* sp
Portunidae	*Charybdis smithii*	Solenoceridae	*Solenocera choprai*
Portunidae	*Charybdis riversandersoni*	Penaeidae	*Trachypenaeus* sp
Portunidae	*Podophathalmus nacreus*	Penaeidae	*Parapenaeopsis stylifera*
Portunidae	*Podophthalmus vigil*	Penaeidae	*Parapenaeus fissuroides*
Portunidae	*Portunus pelagicus*	Penaeidae	*Metapenaeopsis stridulans*
Portunidae	*Portunus sanguinolentus*	Penaeidae	*Metapenaeus affinis*
Portunidae	*Thalamita crenata*	Penaeidae	*Metapenaeopsis andamanensis*
Majidae	*Doclea hybrida*	Penaeidae	*Metapenaeus dobsoni*
Majidae	*Doclea ovis*	Penaeidae	*Metapenaeus monoceros*
Xanthidae	*Etisus levimanus*	Pandalidae	*Heterocarpus gibbosus*
Leucosiidae	*Leucosia anatum*		

MOLLUSCS

Family	Species	Family	Species
Carditidae	*Cardita* sp	Potamididae	*Telescopium*
Pholadidae	*Pholas*	Rostellariidae	*Tibia curta*
Veneridae	*Pitar*	Rostellariidae	*Tibia delicatula*
Bursidae	*Bursa spinosa*	Strombidae	*Strombus listeri*
Calyptraeidae	*Crepidula*	Terebridae	*Terebra*
Cassidae	*Phalium canaliculatus*	Tonnidae	*Tonna dolium*
Conidae	*Conus*	Turridae	*Turri* ssp
Fasciolariidae	*Fusinus nicobaricus*	Turritellidae	*Turritella* sp
Ficidae	*Ficus gracillis*	Xenophoridae	*Xenophora solarioides*
Melongenidae	*Pugilina pugilina*	Loliginidae	*Uroteuthis Photololigo duvaucelli*
Muricidae	*Drupa*	Loliginidae	*Uroteuthis Photololigo edulis*
Muricidae	*Murex trapa*	Octopodidae	*Octopus* spp
Muricidae	*Thais tissoti*	Sepiidae	*Sepia elliptica*
Nassariidae	*Nassarius*	Sepiidae	*Sepia pharaonis*
Naticidae	*Natica*	Sepiidae	*Sepiella inermis*
Olividae	*Olivia*		

Sixty-eight percentage of the species were finfishes, followed by crustaceans (17%) and molluscs(14%). Major families contributing to the trawl landings were Carangidae (22 %), Portunidae (10%) ,Clupeidae (8 %), Penaeidae (7 %) and Engraulidae (6 %) (Table 1).

Change Analysis of trawl Fisheries (2017-2019)

Average multiday trawl catch during 2017-2019 in Mangalore was about 3,29,180 t in which low value catch (LVC) formed about 25-34 %. Major group/species contributing to the low value catch were juveniles of *Odonus niger, Sardinella gibbosa, Megalaspis cordyla, L. inermis, Therapon* spp. *Trichiurus lepturus* and *Nemipterus randalli*. The LVC was highest in October followed by November-December and September (Fig.6). Major portion of juveniles in LVC observed in the trawl was contributed by *L.inermis*, followed by *D. russelli* and *Trichiurus lepturus* (Fig. 7).

Introduction of pelagic trawling in 2015 resulted in the change of species composition in multiday trawlers. The percentage of pelagic fishes in commercial as well as LVC category has increased in recent times as compared to 2008. The increase in *Decapterus russelli, Rastrelliger kanagurta* and other pelagic species and diminished contribution by demersal species were

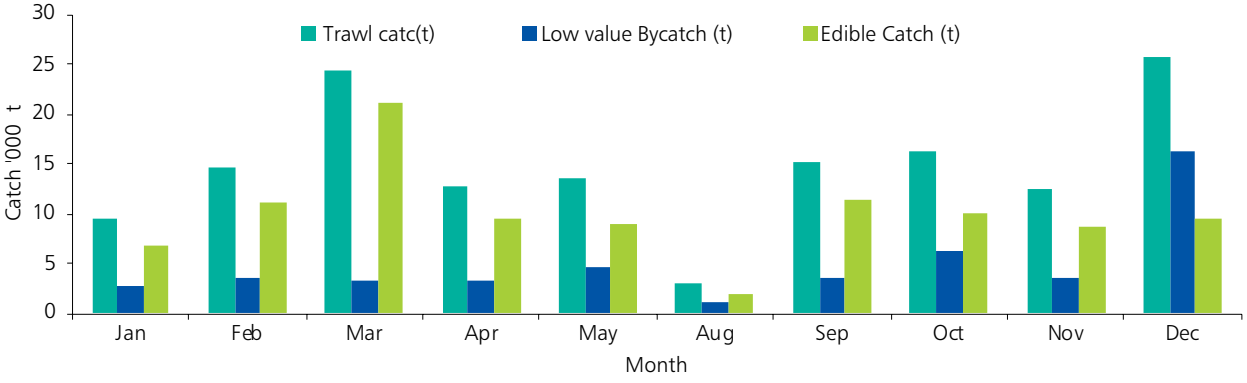

Fig 6. Total Catch, edible catch and low value catch in MDT during 2017-19

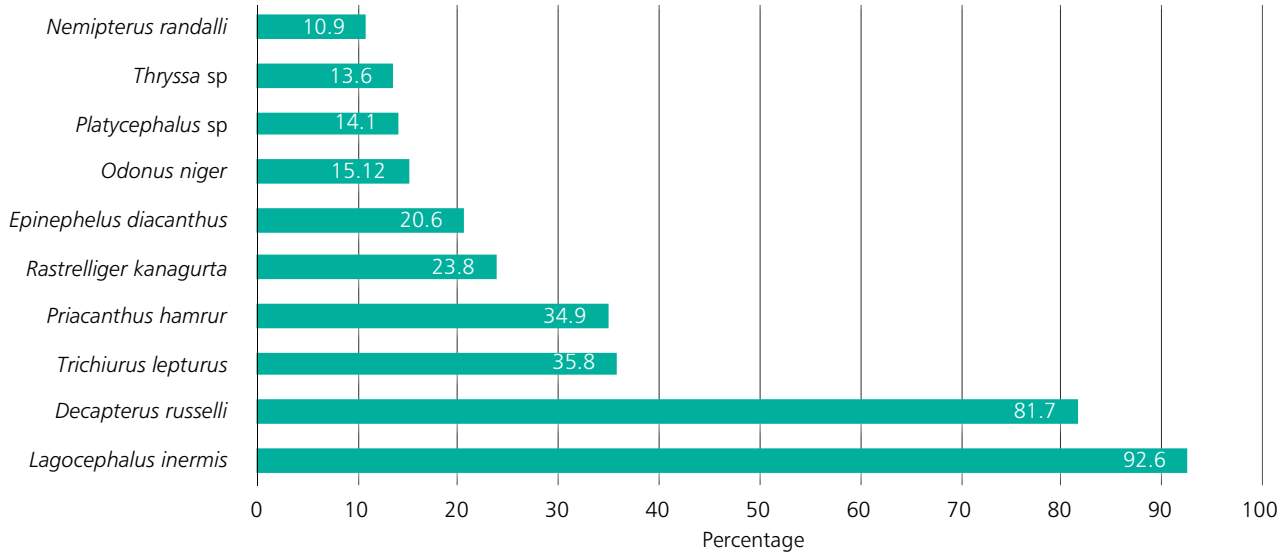

Fig 7. Percentage contribution of juveniles in LVC of major species in the MDT catch

observed in catches from 2017 onwards as compared to 2008 indicating an organised shift towards pelagic trawling (Figs. 8 &9)

Fishers Perception on trawl fisheries

Respondents in the traditional sector (n=30) who operate indigenous gears and outboard engine crafts were of the opinion that there is conflict among the fleets. Majority of the respondents (33.2%) had a medium level of attitude towards monsoon ban. The unanimous opinion was that the monsoon ban should continue and the mesh size regulations should be strictly implemented. All were of the opinion that boundaries should be implemented for the mechanized sector and the bycatch which include juveniles of fishes which sustains the traditional sector should be prevented.

All the mechanized sector respondents (n=35) favoured bull trawling operations , mesh size regulations for avoiding the catch of fish juveniles and the use of high speed engines. "Garret Ranking" employed to rank the attributes in order of magnitude influencing the overcapacity of the fishing fleets indicated that, open access regime was ranked as foremost in importance leading to overcapacity of fishing fleets, followed by provisions in subsidy and unexploited deep sea resources. While ranking the measures suggested for fishing effort regulation, mesh

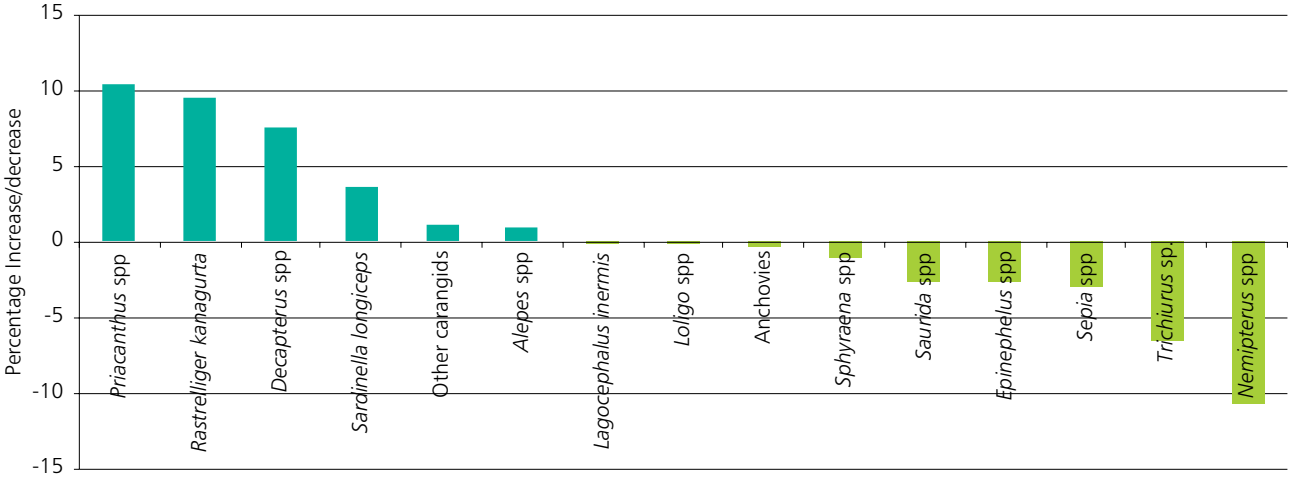

Fig 8. Comparison of percentage contribution of commercial species between 2008 and 2018

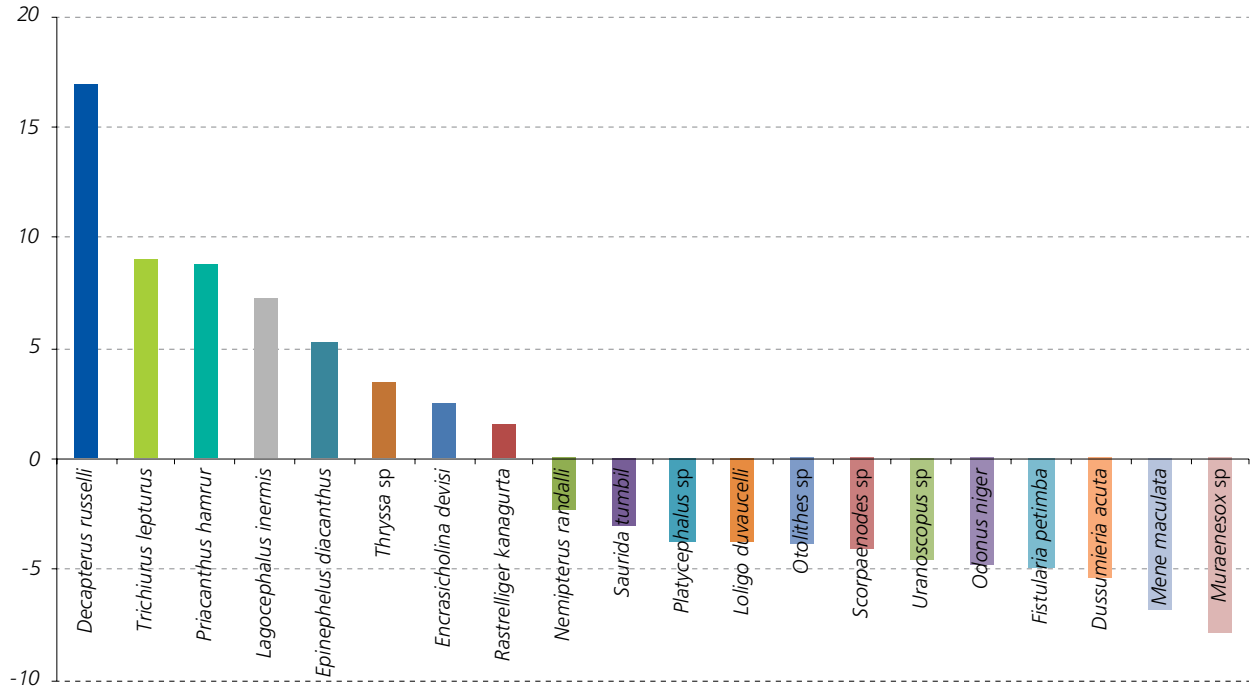

Fig 9. Comparison of species contribution in LVC between 2008 and 2018

size regulation (for avoiding the capture of juveniles) was ranked first followed by minimum harvest size. While analysing the perception of fishermen towards bycatch reduction devices (BRDs), the results of the analysis revealed that most of the fishermen (60%) had a low level of perception towards the BRD with a scoring of 26, which is below 50 that indicates satisfactory perception level. Although the perception level was low, all were of the opinion that conservation is required. Mechanised sector fishers had a medium level of attitude towards willingness to collaborate in conservation measures. The Garret Ranking also revealed that as a source of finance, co-operative societies were the first preference, followed by public banks, private banks, money lenders and self-help groups (SHGs). Attitude of trawl owners towards over capitalisation (using a 5-point Likert's scale) showed that, 67 per cent had medium level of perception towards over capitalisation and viewed it was as more of a threat rather than a beneficial phenomenon. Ghost fishing was perceived as a man-made disaster which can be managed by timely interventions of the fisher community as a whole. For participatory approach to management of the marine fisheries in Karnataka, these perceptions also have to be considered.

Reference

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