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Study of length frequency of pelagic fishes within PFZ and outside PFZ from the coast of Ratnagiri District, India

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Abstract
Fishery of 7 pelagic fishes within and outside PFZ during 2015 to 2019 reveals that the average length of these fishes within PFZ is more compare to outside PFZ areas. This study carried out on Mirkarwada harbor along the Maharashtra coast. The fish catch from different fishing gears shows the occurrence of few species every year, these fishes were only considered for the average length during study period. The average length of these pelagic species caught in the purse seine found more from within PFZ than outside PFZ. It can be concluded that the advisories seems beneficial for pelagic feeding fishes.

Keywords: Within, outside PFZ, average length frequency, pelagic fishes, Ratnagiri, 2015-2019

Introduction
The fisheries sector occupies very important place in the socio-economic development along the coastal length of 167 km off Ratnagiri district. The continental shelf is about 6600 km^2. At present the number of fishing boats are 4027, out of these mechanized boats are 2464 and non-mechanized boats are 1563. In all 25,286 active fishermen are engaged in fishing activities. Fishing villages are 104 and fish landing centers are 48. The Potential Fishing Zone Advisory dissemination among the fisher community is becoming popular since last five years. In this view of the PFZ areas is more beneficial to the fishermens community for the fishing activities. The PFZ areas fish species were getting more body buildup due to the plenty of food availability, such as chlorophyll, nutrition and food availability Therefore, the total length parameters were determined and comparative study of the total length of fish parameters from within and outside PFZ. In this study the fishes were selected from within and outside PFZ of the landing center Mirkarwada-Ratnagiri. The total 100 number of fish sample were measured each species from within and outside PFZ of major fish landing centres of the Mirakrwada Dist. Ratnagiri for the analysis.

Material and Methods: All the fish samples were collected after hauling is performed by purse-seine operations. The total length of the major fishes are measured and recorded, within and outside PFZ. The pelagic fishes like *Harpadon nehereus, Mugil cephalus, Megalaspis cordyla, Rastrelliger kanagurta, Scomberomorous commersson, Sardinella gibbossa* and *Sardinella longice.* Among the fish catch, most common and important seven fish species were selected for the study of length frequency. Dominancy of these species in different months were also considered.

Results and Discussion: Mirkarwada-Ratnagiri is the fishing harbour situated at 17^{0}00.046N and 73° 16. 695E in Ratnagiri district. The purse-seine, trawl and gill net fishing methods are in operation. The purse-seine fishery is the most productive and proved to be economical by using PFZ advisory at Mirkarwada.

The details of the selected 7 fishes is as given below:

1. ***Harpadon nehereus*:** Forms most important commercial fishery. This is mainly caught in trawl net at the depth range of 15-50 m.

This fish occur from January to March and peak period is during February. It's a soft fish and highly perishable owing to its body composition. During the peak season it is sun-dried on bamboo poles and esteemed by the commoner with delicious taste. It may grow from 9 cm to 45cm in length. (Figure 1.)

2. ***Mugil cephalus*:** It is mostly occurred in trawl net fishing operation. It grows from 9 to 39cm. It regularly makes off-shore and inshore movements in estuarine area during high water mark. Period of dominance in trawl catches from November to April. (Figure 2)
3. ***Megalaspis cordyla*:** It contributes bulk of the catches in February but lasts up to April-May. The species is mainly caught in purse-seine, trawl net and gill net. *M. cordyla* constitute more catch in trawl net fishery and thereafter gill net and purse-seine. The size ranges from 12to 37cm in length. (Figure 3)
4. ***Rastrelliger kanagurta*:** This is the commercially important pelagic fish and mostly caught in purse-seine with mesh size 15-35mm. Fishing season is during November to middle of January. This may grow in range between 12 to 30cm. (figure 4)
5. ***Scomberomorous commersson*:** This is mainly caught in purse-seine with mesh size 10-25mm and gill net with mesh size 20-80mm. It grows from 16 to 68cm. Period of dominance from October to December. (Figure 5)
6. ***Sardinella gibbossa*:** This fish is caught in purse-seine, not much more valuable for consumption, but economically important in industries. At the most time it is sun-dried. Period of occurrence is from November to middle of January. It grows up to 7 to 31 cm. (Figure 6)
7. ***Sardinella longiceps*:** It is mostly captured in purse-seine fishing operation. It is commercial fish used in industrial usage in the production of fish meal and oil. Along the west coast, large shoals of oil sardine occur from Ratnagiri in the north to Quilon in the south. The fishery initiates during the south west monsoon in August and may last up to March. September to December is the peak period. It ranges from 5 to 23cm in length. (Figure 7)

The following species of fishes

Fig 1; The following fishing gears are used for the capture of pelagic fishes

Purse-seine: The purse-seine net was introduced along the coast in 1980. The purse-seine net with the mesh size of 10-25 mm and in to extension after dropping gamut of whole net ranging from 500 to 1200 m encirclement around fish shoals and vertical hanging of depth altered from 15 to 40m. The nets are usually operated by the help of mechanized fishing boats with different horse power of the engine. The purse-seine fishery is the most productive and substantiated to be materializing by following the PFZ advisory dissemination in time through fisher than trawl net and gill net fishery at Mirkarwada. The purse seine nets were operated by mechanized vessels with a crew complement of 15 to 25 persons. The hauling operation for each time almost took 2.5 to 3 hours. (Photo…..)

Purse-seine boat with purse-seine gear

Fig 2: Purse-seine boat with purse-seine gear

Trawl net: A commencement of trawling in Ratnagiri district initiated in early 1960. Trawl net is the main important fishing gear for exploitation of demersal living resources. The trawl net varying from 30-50 OAL with wooden hull fitted with 40-160 HP engines and power winches. The trawl net is often operated from 15 to 25m long with 20m foot rope and 50-70kg otter boards and 10-20mm cod end mesh size. Trawls are operated with varying at a depth of 10-40m.The standard duration of each haul by trawl net was 1.5 -3 hours. (Photo….).

Trawl boat with otter board and trawl gear

Fig 3: Trawl boat with otter board and trawl gear

Gillnet: The gill nets were usually operated at the inshore waters and the nets had a length of about 500 m and depth around 3-6 m and mesh size ranged from 80 to160 mm. This gear is set subsequently after a gap of 4-6 hours, especially uplifted early in the morning. This net is operated especially at the surface mostly during night time at a depth of 10-15m; consist of 20-25 pieces. Each segment of net varies from 47 to 80m in length and 5m in breadth. Mesh size is 12 to 14mm. The nets are made up of hemp and cotton twine. Such nets are being used for catching pomfrets, tuna, and seer fish. Also the nets are used from September to December and late in summer during April and May.(Photo……)

Gill net and boat

Fig 4: Gill net and boat

Table 1: Length range (Cm.) of pelagic fishes within and outside PFZ during

Species	2015-2016		2016-2017		2017-18		2018-19	
	WithinPFZ	Outside PFZ	WithinPFZ	Outside PFZ	WithinPFZ	Outside PFZ	WithinPFZ	OutsidePFZ
H. neherius	24-41	20-33	28-45	24-37	12-25	14-20	09-26	14-25
M. cephalus	18-33	18-30	18-30	17-39	17-26	16-28	11-20	09-20
M. cordyla	18-32	16-32	19-37	13-35	15-26	12-25	15-32	20-32
R. kanagurta	15-23	13-25	16-26	12-26	14-25	13-23	12-30	14-26
S. commersson	30-45	29-60	34-68	30-34	18-40	16-28	25-45	20-40
S. gibbosa	19-31	20-27	16-21	14-18	11-13	12-15	16-21	07-15
S. longiceps	13-18	14-20	16-18	14-20	11-18	13-23	08-18	05-12

Above table reveals the exact length range manually measured at fish landing center. This table only denotes the pelagic groups of fishes and its length for the period of 2015-2016 to 2016-2017. *H. neherius* length range during 2017-2018 and 2018-2019 is less in outside PFZ but in the year 2017-2018 and 2018-2019 the length range is less within PFZ. *M. cephalus* length range in the year 2018-2019 is lowest from within and outside PFZ, as compared to the year 2017-2018. The length range of *M. cordyla* in the year 2015-2016, 2016-2017 and 2017-2018 is higher than in the year 2018-2019. The length range of *R. kanagurta* for all four years is somewhat similar. *S. commersson* length range is overall less occurred in the year 2017-2018 and 2018-2019 as compared to the 2015-2016 and 2016-2017. *S. gibossa* shows length range observed less during 2017-2018 and 2018-2019 as compare to the year 2015-2016 and 2016-2017. *S. longiceps* average length is less during 2018-2019 and 2017-2018 as compare to the year 2015-2016 and 2017-2018.

Table 2: Average Length (CM.) of some pelagic fish species observed within and outside PFZ during 2015 to 2019.

SPECIES	2015-2016		2016-2017		2017-2018		2018-2019	
	Within PFZ	Outside PFZ	Within PFZ	Outside PFZ	Within PFZ	Outside PFZ	WithinPFZ	Outside PFZ
H. neherius	32.5	26.5	36.5	30.5	18.5	17.5	17.5	19.5
M. cephalus	25.5	24	24	28	21.5	22	15.5	14.5
M. cordyla	25	24	28	24	20.5	18.5	23.5	26
R. kanagurta	19	19	21	19	19.5	18	21	20
S. commersson	37.5	44.5	51	32	29	22	35	30
S. gibbosa	25	23.5	18.5	16	12	13.5	18.5	11
S. longiceps	15.5	17	17	17	14.5	18	13	13.5

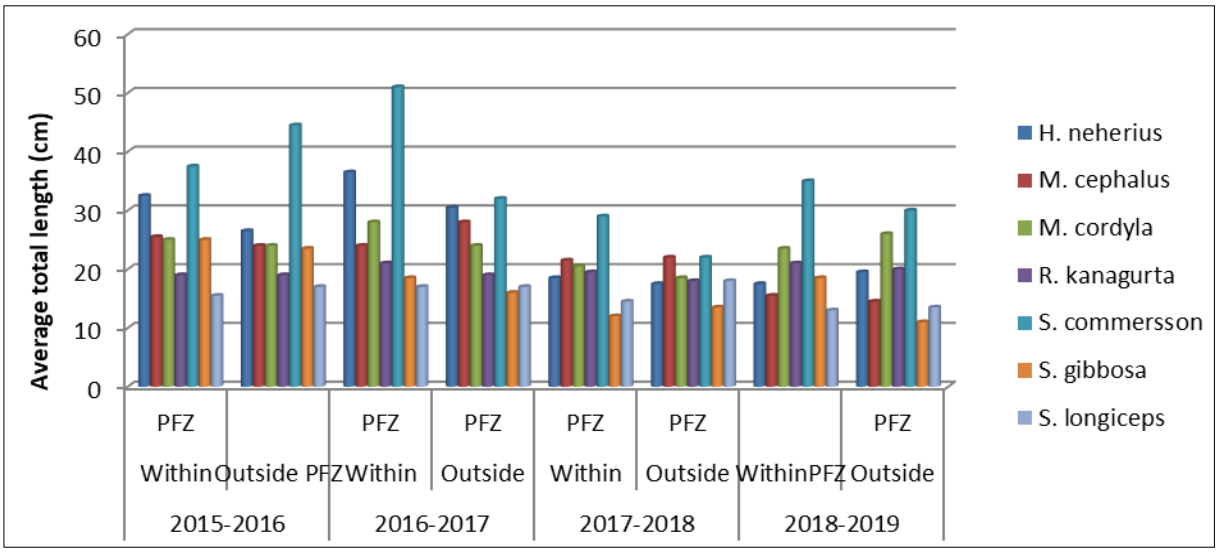

Fig 5: Average Length (CM.) of some pelagic fish species observed within and outside PFZ during 2015 to 2019

From the above table and graph it is observed that, the average length of *H. neherius* in the year 2018-2019, outside PFZ is at higher with compare to all other years. *M. cephalus* shows the average length more in outside PFZ than within PFZ during 2015-2016 to 2018-2019. The average length of *M. cordyla* observed more within PFZ and less outside PFZ during 2015-2016, 2016-2017 and 2017-2018 but in 2018-2019 the average length is less within PFZ than outside PFZ. *R. kanagurta* reveals overall similar average length within and outside PFZ during 2015 to 2019. The average length of *S. commersson* observed from within PFZ is high than outside PFZ in the year 2016-2017 and 2017-2018 but in 2016-2017 from within PFZ average length is less than outside PFZ. *S. gibossa* shows the average length within PFZ for the year 2017-2018 is less than outside PFZ. In the year 2015-2016, 2016-2017 and 2018-2019 average length is higher than outside PFZ. The average length is less within PFZ than outside PFZ during 2015 onwards.

Conclusion

Length frequency study of seven pelagic fishes during 2015-2019 reveals that

1. In majority, the length frequency of seven species is more within PFZ with compare to outside PFZ.

2. Average length of M. cephalus within PFZ is decreasing from 25 to 15cm and 24 to 14cm in outside PFZ every year from 2015-2019.

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