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Catch analysis in small mesh gill nets

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ABSTRACT

Gill netting provide important advantages over many other fishing methods in a multispecies fishery. However, the simultaneous use of many small mesh sizes in the inshore waters needs monitoring. Landing data from small mesh gill nets of 30, 32, 34, 36, 38, 40, 48, 50 and 52 mm were collected for two years from canoes operating off Cochin. Seasonal usage of different mesh sizes, species composition, size composition and proportion of juveniles in the catch are discussed. A total of 38 species of fishes were caught pointing out the difficulty in managing the tropical multispecies fishery. Of the different mesh sizes used, 30 and 32 mm are to be used with restraint, as proportion of juveniles caught in these were substantial. This would render gill netting a more ecofriendly fishing method for the inshore waters.

Introduction

As selectivity has a vital role in resource management, the use of selective gear like gill net is gaining importance. However, the fishing fleet in a tropical inshore gill net fishing system may consist of more than one category (mesh size) of gill nets. Thus, in spite of the known selectivity of the gill net for a particular narrow size range of fishes, use of different mesh sizes results in a wide size range (Luther *et al.*, 1994). Gill netting is of utmost importance in Kerala, being a low capital fishing technique and is the single most fishing technique employed by maximum fishermen. There were 32365 units of gill nets out of the total 49899 units of gear in the state (SIFFS, 1992). Up to 1980, gill net fishing in the state was entirely from non-motorised sector, dependent on human energy for propulsion and operation of the gear, except for the 215 mechanized gill-netters. The non-motorised sector use mostly small mesh gill nets (less than 70 mm mesh size). While considering the large number of fishermen depending wholly on this sector and the fact that the catch of this sector is almost exclusively used for domestic consumption, the sustainable development of this fishery is very important.

Luther and Appanna (1993) reviewed the size composition of the gill net fishery resources in various localities of India and indicated that bulk of the landings comprised of juveniles. They suggested that documentation of basic data such as length frequency, percentage occurrence of adults and juveniles facilitate critical evaluation of the status of a particular fishery. Hence, with the following objectives, a study was taken up:

seasonality of usage of different mesh sizes, catch composition of the small mesh gill nets; proportion of immature specimens of important species caught in each mesh size.

Materials and methods

The site of investigation was 'Beach Road' at Kannamaly, a major landing centre of the non-motorised country crafts employing gill nets. Data collection was done weekly for a period of two years, from March 1998 to February 2000. The total length of individual fish was measured to the nearest mm (Sparre *et al.*, 1989). The mesh sizes were determined by measuring the stretched meshes with a centimeter scale (FAO, 1978). Measurements were taken from 5 randomly chosen regions of the net and the average values worked out.

The collection of data from selected units on species composition and total catch were made following Alagaraja, (1984). Samples taken from well-mixed catch were sorted out to generic and species level. These specimens were identified as per Fischer and Bianchi (1984). The craft in use were plank built canoes of OAL 5.7 to 6.7 m and operations were carried out during early mornings at depths of 3 to 12 m. The gill nets used were of polyamide monofilament of 0.16 to 0.20-mm diameter having a fishing height of 2.4 to 4.6 m depending on the mesh size used. The data analysis included calculation of length frequency of major group of fishes and comparison of the length frequency against the size at first maturity available from published records. Specimens with total length below the size at first maturity were considered as juveniles.

Results and discussion

The observations were discussed with respect to seasonal variation in the use of different mesh size; catch characteristics and size composition with occurrence of juveniles.

Seasonal variation in the use of mesh sizes

The mesh sizes in use were 30, 32, 34, 36, 38, 40, 48, 50 and 52 mm. The fishermen used different mesh size, in different months depending on the availability of fishes. The seasonal use of different mesh sizes is represented in Fig. 1. Mesh sizes of 34, 36 and 38 mm were used almost throughout the year and 30 mm in March, April, October and December. 32 mm was used from March to May and September to January. Mesh sizes of 48, 50 and 52 mm targeted for mackerel were used during October to February. Hornell (1938) reported aila chala vala and mathi chala vala as the two main gill nets in operation for mackerel and sardine respectively during 1930s. Vijayan *et al.* (1993) recorded only six types of gill nets in operation in 1958 and eleven types in 1991. The availability of machine made synthetic webbing in varying mesh sizes may be one of the

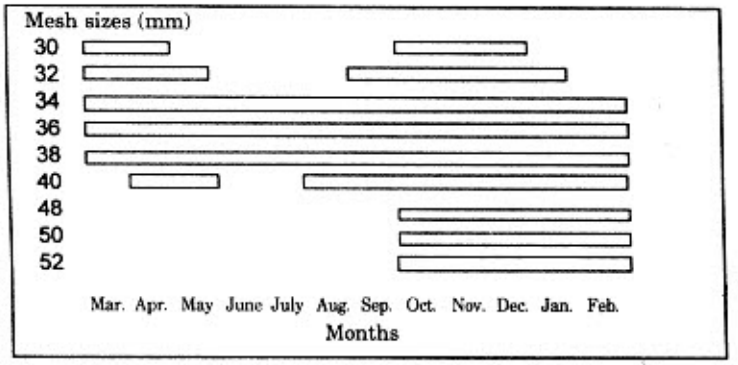

Fig. 1. Months of operation of different mesh sizes of small mesh gill nets

reasons for the present use of specific mesh size for specific resource. Another probable reason can be that fishermen were forced to adopt efficient tackles for catching all size groups in view of the scarcity of resources.

Catch characteristics

A total of 38 genera/species of fishes constituted the catch. The complexity of the multi-species nature of the tropical inshore waters is clearly understood from the varying species caught. The percentage composition of important groups is represented in Fig. 2. Of these, 9 groups: Sciaenids, oil sardine, mackerel, mullets, lesser sardines, soles, *Thrissocles* sp., Penaeidae and Leiognathidae together contributed 95 % (by weight) of the total catch in all the mesh sizes. The remaining 5 % group comprised of *Eleutheronema tetradactylum, Sillago sihama, Scomberomorus commersoni, Megalaspis cordyla, Lactarius lactarius, Stolephorus* spp., *Caranx* spp., *Pampus argenteus, Parastomatus niger, Anadontostoma chacunda, Therapon jarbua, Ambassis* sp., *Pellona* sp., *Scoliodon*

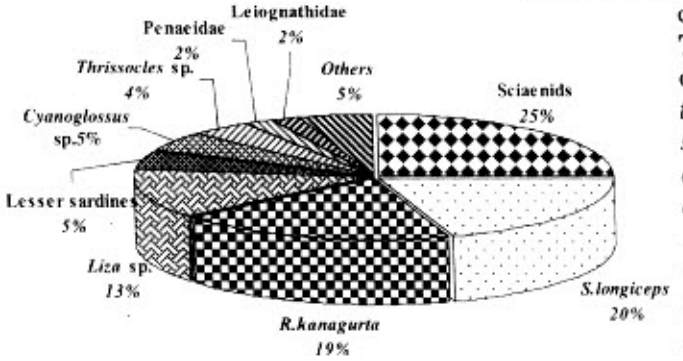

Fig. 2. Percentage composition of fishes

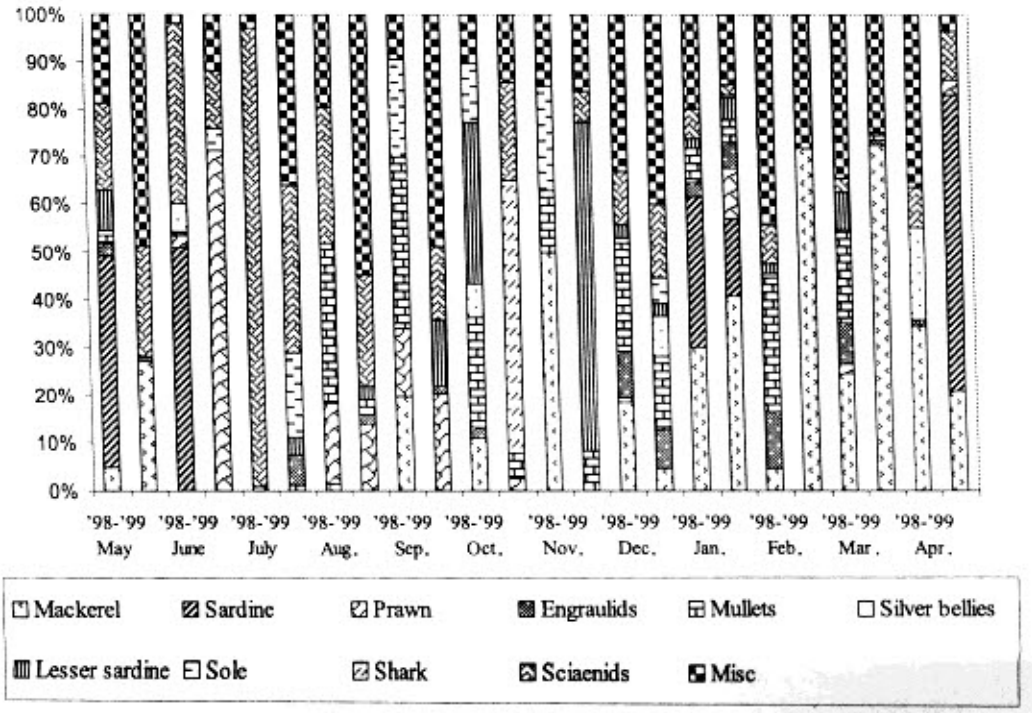

Fig. 3. Monthly species composition in small mesh gill nets during 1998-'99 and '99-'00

spp., and *Neptunus* spp.

The month-wise representation of the group of fishes for, the two-year period 1998-99 and 1999-00 is depicted in Fig. 3. Sciaenids dominated the catch in June, July and August; oil sardine in April, May and June and mackerel formed the dominant group during November and January to March. The dominance of groups had wide variation in different months and even for the same month in successive years.

Size composition with proportion of juveniles

Remarkable difference was evident from the length range and mean length of major groups/species of fishes caught in the different meshed gill nets. While, fishes less than 20cm were well represented in mesh sizes of 30, 32, 34, 36, 38 and 40 mm, they were very less in mesh size of 48 mm and above. Size composition of the catch and proportion of juveniles were worked out with respect to the following dominant groups. The proportion of juveniles caught in each mesh size is given (Table 1).

Sciaenids: Sciaenids known either as jew fishes or croakers comprising of *Johnius* sp. and *Otolithes* spp.occurred in the catch throughout the year. *Johnius* sp. caught in 30 mm mesh size consisted entirely of juveniles. Those caught in 32 and 34 mm had 72 and 24 % juveniles respectively. *O. argenteus* caught in all mesh sizes were mature specimens.

Oil sardine (Sardinella longiceps): Oil sardine caught in mesh size 30, 32, and 34 mm consisted of 32, 16, and 10 % juveniles respectively. Gill

TABLE 1. *Proportion of juveniles caught in different mesh sizes*

Species	% juveniles in total catch Mesh size (mm)								Length at first maturity (cm) and source
	30	32	34	36	38	48	50	52	
S. longiceps	63	40	12	3	0	0	0	0	15-16 Bal & Rao, (1984)
R. kanagurta	100	100	100	97	84	0	0	0	22.4 Pradhan, (1956)
O. argenteus	92	71	60	0	0	0	0	0	13-14 Bhusari, (1971)
Leiognathus sp.	-	23	0	5	-	-	-	-	8.7 Bal & Rao, (1984)
M.cordyla	100	100	100	100	100	72	45	0	22 Bal & Rao, (1984)
S. commersoni	-	100	100	100	100	-	-	-	75 Devaraj, (1977)
E. tetradactylum	-	100	100	100	100	100	100	100	6-39 Kagwade, (1970)

nets of mesh sizes above 34 mm caught mostly of adult sardines. Joseph and Sebastian (1964) worked out 33.4 mm mesh as the optimum, compared to 28, 38.6 and 41.8 mm mesh size for the exploitation of *S.longiceps* in Kerala waters. The majority of sardine catch was during April, May and June. Of these three months, the use of 30 mm was mostly restricted to April only. The mesh sizes of 32 and 34 mm were in use in all the months, however the proportion of nets of 32 mm mesh size formed less than 25 % of the total volume of nets taken for fishing.

Mackerel (Rastrelliger kanagurta) : Mackerel caught in 48, 50 and 52 mm consisted of adult specimens only. However, those caught in mesh sizes of 30, 32 and 34 mm consisted exclusively of juveniles. Mesh sizes of 36 and 38 mm had 97 and 84 % of juveniles respectively in the catch. The catch in these five mesh size contributed 43 % of the total mackerel catch and was restricted to March, April, May and September. From October to February, mesh sizes of 48 mm and above were operated. Mackerel caught in the gill nets of 30 to 38 mm mesh size were non-target catch. However, the use of 30 to 40 mm mesh sizes during March to May and September cannot be prevented, as during this period, most of the other fishes especially sardines were caught in plenty in these mesh sizes. Juveniles mostly support mackerel fishery (Bal and Rao, 1984). Noble (1982) reported that large size groups supported the fishery during pre-monsoon period and juveniles were the mainstay of monsoon fishery. The use of larger mesh size 48, 50 and 52 mm during October to February and 30 to 38 mm during March, April, May and September in the present investigation is in agreement with this.

Lesser sardines: Among lesser sardines, white sardine (*Kovala coval), S.gibbosa and Dussumeria hasselti* were encountered in the catch. *K.coval* contributed 4.6 % of the total catch and was caught mainly during September - December in 30 and 32 mm mesh. While considering the length at maturity as 8-9 cm (Chidambaram and Venketaraman, 1946) the entire catch of *K.coval* consisted of adult fishes.

Soles: Soles or flat fishes, which contributed 4.5 % of the total catch, comprised mainly of *Cyanoglossus macrostomus* and were caught mostly in 32 and 34 mm mesh size and 56 % of the catch in 32 mm comprised of juveniles. Its operation was restricted to September, October and November. After the cessation of monsoon these formed shoals in the inshore areas and remained there till October and later migrated into the inshore waters during September – October along the west coast (Zacharia *et al.*, 1991).

Silver bellies: Silver bellies constituted 2 % of the total catch. *Leiognathus bindus* and *Secutor insidiator* were the dominant species caught and 40, 23, and 5 % of them caught in 32, 34 and 38 mm mesh sizes respectively were juveniles. Those caught in mesh size above 38 mm were mature specimens.

Eventhough seer (*Scomberomorus commersoni)* and *Elutheronema tetradactylum* caught in all mesh sizes comprised entirely of juveniles, they constituted only less than 1 % and 1.8 % respectively of the total catch.

Conclusion

Small mesh gill net fishery in the inshore waters of Cochin area project a typical case of multispecies nature of the tropical fishery. The fishes caught in gill nets of all mesh sizes except 30 and 32 mm, were mostly adult fishes. However,

juveniles of seer and polynemus were caught in all mesh sizes and mackerel caught in less than 48 mm.

Gill netting, even though is a selective fishing method, in a multi-species fishery, use of small mesh sizes may result in the capture of juveniles. Luther *et al.* (1994) reported the landing of juveniles of lesser sardines by gill nets less than 28 mm mesh size and stressed the need to regulate gill net fishing. Fig.3 shows the presence of fishes of varying sizes in different months and this makes it difficult to have any regulation on the fishery in inshore waters. Suggesting methods of managing the multispecies and multimesh fishery of Kerala is difficult. As the successful spawning period of most of the fishes is during May to July, the fishing during this period has to be regulated to protect the spawning stock (Yohannan *et al.*, 1999). They also suggested that after July, gill nets of mesh sizes above 40 mm be encouraged to catch post-spawners. The present study suggests that small mesh gill netting can be encouraged as a selective fishing method with the restraint use of 30 and 32-mm meshes. The use of mesh sizes in succession as per the availability of the resource may render gill netting a more eco-friendly fishing method for the inshore waters.

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