Operational performance and catch composition of pomfret gillnets of Maharashtra, India

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HIGHLIGHTS

- Operational performance and species composition of pomfret gillnets was assessed.
- The operational parameters varied monthly and seasonally.
- Monsoon and post-monsoon seasons recorded the highest pomfret catch and CPUE.
- The highest juvenile proportion of silver pomfret has been recorded in the monsoon and pre-monsoon period.
- Mapped pomfret fishing grounds along Satpati coast.

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ABSTRACT

The operational performance, catch composition and fishing grounds have been documented for gillnets used extensively for catching pomfrets from August 2014 to April 2015 along the Satpati coast, Maharashtra, India. The operational activities of the fishery varied monthly and seasonally; hence, parameters like distance travelled from the shore, depth of operation, colour variation of gear, mesh size, catch composition, catch per unit effort (CPUE), total catch, juvenile composition and major fishing grounds were studied. Wooden, Fibre Reinforced Plastic or plywood boats of 5 to 18 m fitted with inboard engines were used for pomfret fishing and the mean distance travelled by the vessels was 116 ± 7 km from the shore during pre-monsoon while the distance travelled was shorter during monsoon season. The mean depth of operation was 37 ± 0.26 m in monsoon and 42 ± 0.44 m in post-monsoon. The mesh size used for targeting pomfrets was 130 mm during monsoon and post-monsoon that was reduced to 110 mm during pre-monsoon. More white nets were used during monsoon and post-monsoon seasons whereas coloured nets were used during the pre-monsoon. The study revealed that monsoon was the peak season for the capture of pomfrets; seasonal trend showed that the mean CPUE was maximum in monsoon (764 ± 34 kg/fishing vessel) while the values for post-monsoon and pre-monsoon period were 335 ± 45 kg/fishing vessel and 64 ± 3 kg/fishing vessel respectively. Operational performance, season-wise species composition, juvenile composition and gillnet fishing grounds are discussed.

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1. Introduction

Gillnet is a selective fishing gear used all over the world in both inland and coastal waters. The operation of the gear varies according to the behaviour of fish and the depth of operation fixed by means of floats and sinkers (Northridge, 1991). With respect to fishing and fuel efficiency, these gears have been more fuel efficient compared to other commercial fishing methods like trawl nets (Brandt, 1984; Gulbrandson, 1986). In India, they are used all along the coast and the species specificity varies depending on the region.

Satpati is one of the major gillnet landing centres of Maharashtra, situated in the north-west coast of India. The conventional fishers of this region prefer to catch high-value fish resources using low energy methods such as species-specific gillnets. This fishery plays an important role in the Indian economy as well as the livelihood of thousands of people living in the particular coastal region. Pomfrets (*Pampus argenteus*, *Pampus chinensis*, *Parastromateus niger*),

seer fishes (*Scomberomorus commerson*, *S. guttatus*), eels (*Congresox talabonoides*), polynemids (*Polynemus indicus*) and Ilisha (*Ilisha filigera*) are the major groups landed in this area. The fishers of this region use gillnets locally called as "*Dalda jal*"; "*Chinese jal*" for seer; "*Magar jal*" for eels; "*Waghra jal*" for polynemids and "*Kati jal*" for shads. Traditional fishing craft, locally called "*Satpati Boati*" made of either wood, Fibre Reinforced Plastic (FRP) or plywood fitted with inboard engines having power up to 120 HP was used for the fishing operations (Gladston et al., 2017).

Maharashtra ranks fifth in the overall marine landings of fish in India (CMFRI, 2017). The pomfret landing in Maharashtra contributes 14.36% of total pomfret landing in India. Pomfrets, the target fish of Satpati have high economic value in domestic as well as global markets. The pomfret group comprises species like *Pampus argenteus*, *P. chinensis* and *Parastomateus niger*. The silver pomfret, *Pampus argenteus* locally known as "*Pamplet*" contributes the most to the landings (Devi et al., 2017). The high price of fish and its demand in the market has rendered the resource scarce in the ecosystem (Keshave and Qureshi, 2014). Fishermen have started fishing of juveniles, below the size at first maturity to overcome the loss and satisfy the consumers (Luther and Appanna, 1993). The fishers use mesh sizes of 130 mm and 110 mm for catching silver pomfrets in the "*Dalda jal*" of Satpati coast. Earlier reports showed that such situations led to the heterogeneity in the size composition and also the decline of such resources in the sea. In a tropical country like India, the proportion of by-catch keeps increasing compared to the targeted fishery (Lobo et al., 2010). Prasannakumari and Dharmaraja (1978) had studied the catch statistics of Maharashtra from 1962 to 1976 and reported that the maximum pomfret catch was recorded during the period October–December.

Fishery resource management is necessary to resolve such problems by implementing plans to sustain the resource as well as the ecosystem in the long term and protect the livelihoods of fishing dependent people. Documentation of basic data such as length frequency, the occurrence of adults and juveniles, catch per unit effort (CPUE) and fishing ground facilitates the critical evaluation of the status of a particular fishery. This work assesses the operational performance of gillnets used for the exploitation of silver pomfret all along the Satpati coast, Maharashtra, India.

2. Materials and methods

2.1. Study area

The investigation was conducted along the Satpati coast, Maharashtra, north-west coast of India (latitude: 19°25′895″ N–20°30′424″ N, longitude: 70°43′530″ E–72°32′231″ E) where the maximum silver pomfret landing from gillnets was reported.

2.2. Description of the fishing vessel and gear for pomfret fishery

Of the total 323 craft that operated in this region, 223 were mechanized gillnetters and remaining were dolnetters (i.e., type of fixed bagnets) and small traditional vessels. Out of which, 30 vessels were randomly selected to collect information on crafts and gears. The crew and boat owners were interviewed using a well-structured pre-tested interview schedule for gathering information on design parameters such as, vessel type, name of the owner of vessel, registration number of vessel, length, breadth, depth, gross registered tonnage, engine power, number of cylinders, number of crew, year of construction, cost of construction of vessel, speed of vessel, type of engine, life span of the boat and material used for construction. The gear details such as local name, mesh size of main webbing, twine type, twine specification/diameter, number of meshes in depth, number of meshes/unit, colour of

webbing, length of head rope, head rope material, head rope diameter, float material, float dimensions, number of floats/unit, foot rope material/diameter, sinker material/sinker dimensions, sinker weight, number of sinkers/unit fleet length (total length of several pieces of gillnet units joined together during operation), hung depth and hung length were collected. The detailed information collected were verified with vessel registration certificates maintained with the cooperative societies in Satpati.

2.3. Catch composition

The estimation of total monthly catch composition and CPUE was performed by using stratified multi-stage random sampling adopted by Alagaraja and Srinath (1980) and Thomas and Hridayanathan (2006). Five units were randomly selected in each month for the catch composition analysis. Sampling data was collected fortnightly from the selected vessels for the estimation of total catch and CPUE analysis. The fish species were identified as per Fischer and Bianchi (1984).

2.4. Size and juvenile composition of silver pomfret

The size of pomfret was calculated by measuring the fork length (tip of the snout to the caudal fork) by using digital Vernier calipers. The size class ranged from 90 to 300 mm with an interval of 10 mm and a length frequency class was made for each size group. The age at first maturity of silver pomfret (199 mm) was taken from the latest published data (CMFRI, 2016) and fish below this size were assumed to be juveniles. From this, the monthly proportions of juveniles and adults of silver pomfrets were calculated.

2.5. Fishing ground mapping

The data on latitude, longitude, distance and the depth of operation from five randomly selected vessels were collected fortnightly based on the structured interview schedule during the period August 2014 to April 2015. The period from May to July was excluded from the study because of the self-ban (May) on pomfret fishing by the gillnet fishers and co-operative societies in the particular region in addition to the government fishing ban during June–July.

2.6. Analysis of data

The data obtained were analysed using Microsoft Excel and IBM Statistical Package for Social Science (SPSS 16.0 version). One-way ANOVA was performed for determining monthly and seasonal variation in distance from the shore, depth of operation, catch per unit effort, total catch and the significant differences were determined by Duncan's Multiple Range Test (DMRT). Levene's test was done to assess the homogeneity of variance. The level of significance 'α' was 0.05 in all statistical analyses performed and the test statistic results and p-values properly provided. The fishing grounds were mapped using ArcGIS® 10.1 software (Esri, California, United States).

3. Results and discussion

3.1. Details of craft and gear used for the pomfret fishery in Satpati

About 323 boats including 223 mechanized gillnetters, 60 mechanized dolnetters and 40 non-mechanized small boats were operated from the selected fishing village. The materials used in the construction of the boats were wood, plywood and FRP. The gross registered tonnage of vessels ranged from 1.23 GRT to 56.29 GRT. Polyamide (PA) monofilament with a diameter ranging from 0.23 to 0.28 mm was used as the netting material for pomfret gillnets.