



TAXONOMIC DIVERSITY AND COMPOSITION OF SCIAENIDS IN THE SHRIMP TRAWL BY-CATCH OFF HENDALA, SRI LANKA

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By-catch is a common problem in all fisheries particularly in trawling. Species belonging to the family Sciaenidae are reported to be abundant in shrimp trawl by-catch worldwide. This study analyzed the taxonomic diversity and composition of the sciaenids in the shrimp trawl by-catch, off Hendala, Sri Lanka. Data were collected bi-weekly at the Hendala fish landing site from January to December 2021. About 50-60% of the landed shrimp trawlers was sampled randomly to collect catch and effort data (average daily landed boats=65). Sciaenid samples (n=3) of each ~2 kg was collected randomly from the sampled trawlers. External morphology, swim bladder characteristics and sagitta of the inner ear were used in taxonomic identification. The shrimp to by-catch ratio for the study period was 1: 1 and was as high as 1: 4.5 during the northeast monsoon period. Sciaenid species made the highest contribution (31%) to the shrimp trawl by-catch. 14 Sciaenid species belonging to 8 genera were reported in the by-catch. *Otolithes ruber* (27%) reported the highest contribution followed by *Kathala axillaris* (21%), *Johnius belangerii* (15%), *Johnius macropterus* (15%), *Johnius (Johnieops) borneensis* (10%), *Johnius (Johnieops) dussumieri* (6%) and *Nibea maculata* (1%). Other identified species include *Johnius carouna*, *Johnius amblycephalus*, *Johnius carutta*, *Nibea soldado*, *Pennahia anea*, *Protonibea diacanthus* and *Daysciaena albida*. *Johnius (Johnieops) dussumieri* reported in this study is a new record to Sri Lanka as per the available literature. Sciaenids in the trawl by-catch are mainly used for human consumption. The average price of 1 kg of by-catch is ~Rs.150.00. *P. diacanthus* and *D. albida* grow larger in size (5-25 kg) than the other species (50-400 g) and they have a high economic value (~Rs.2000.00 per kg) as their swim bladder is used for fish maw production. Assessment of impact on Sciaenids from shrimp trawl fishery is a timely need.

Keywords: By-catch, Trawl fishery, Sciaenidae, Fish maw, Hendala

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INTRODUCTION

Major shrimp trawling grounds in Sri Lanka are located in the shallow coastal waters of Jaffna, Mannar, Kalpitiya, Negombo and Hendala. The two major shrimp fishing grounds in the west coast of Sri Lanka are located off Negombo and Hendala (de Croos & Valtýsson, 2007). Both Hendala and Negombo trawlers that are operated as mechanized and non-mechanized trawlers, respectively, exploit the parent stock of *Metapenaeus dobsoni*, *Parapenaeopsis coromandelica*, *Penaeus indicus* and *Penaeus merguensis* which utilize the Negombo lagoon for the completion of their nursery phase of life cycle (Jayawardane et al., 2004; Haputhantri & Jayawardane, 2006). Impacts of shrimp trawling have been identified and reported in Sri Lanka to some extent. High by-catch and discard rates which ultimately lead to ecosystem degradation are the major impacts reported due to shrimp trawling (O'meara et al., 2011; Jones et al., 2018). By-catch is a common problem in all fisheries particularly in trawling. Species belonging to the family Sciaenidae are reported to be abundant in shrimp trawl by-catch worldwide. The objective of this paper is to assess the taxonomic diversity and composition of sciaenids in the shrimp trawl by-catch of mechanized shrimp trawl fishery off Hendala which is a major shrimp fishing practice carried out in the west coast of Sri Lanka. This paper will also identify the economic importance of sciaenid by-catch.

MATERIALS AND METHODS

STUDY AREA

Hendala is an area located in Wattala city which belongs to the Western province, Sri Lanka. The shrimp landing site of mechanized trawlers is situated next to the Hamilton canal in Hendala (6°59'25.5"N 79°52'27.9"E) which connects with the Kelani River estuary. It is located close to Elakanda fish market which is a popular marketplace of many people in the area.

DATA COLLECTION AND ANALYSIS

Field data were collected from January to December 2021 by making two field visits per month to the landing site of mechanized shrimp trawlers at Hendala. Sampling was carried out as soon as trawlers return to the landing site. About 50-60% of landed shrimp trawlers were sampled randomly (average daily landed boats=65) and catch and effort data were collected to analyze the shrimp to by-catch ratio. The weight of total shrimp catch and different by-catch groups (i.e., pony fish, sciaenids, crabs, rays etc.) of each boat were recorded. Skippers were interviewed to collect information such as leaving time, duration of haul operation and total number of operated hauls. The number of total registered boats were recorded. The active number of shrimp trawlers were recorded each day at the landing site. Three samples of sciaenid by-catch (n=3), each with ~2kg were collected randomly from the sampled boats, packed in ice and transported to the laboratory of the Department of Zoology, University of Sri Jayewardenepura, Sri Lanka for further analysis.



Taxonomic identification was carried out using available keys. External morphology, swim bladder characteristics and sagitta of the inner ear were used in taxonomic identification. Voucher specimens were preserved and labeled with code and date of collection on waterproof paper. Sciaenids were identified to the lowest possible taxon. The taxonomic status of each specimen was confirmed with the supervision of experts in the field. The wet weight of each specimen of sciaenid species were recorded to the nearest 0.1 g using an electronic balance.

Percentage contribution of major by-catch families (i.e., Leiognathidae, Portunidae, Pristigasteridae, Engraulidae, Rajidae, Lactaridae, Cynoglossidae, Loliginidae/Sepidae and Sciaenidae) to the total by-catch during the study period were calculated. Percentage composition of sciaenid species in the sciaenid catch were calculated.

RESULTS AND DISCUSSION

The shrimp to by-catch ratio was 1:1 for the study period. During the northeast monsoon, the trawl fishery resulted in a high amount of by-catches with shrimp to by-catch ratio of 1:4.5. During the study period, 15 families belonging to finfish, crustaceans and molluscs were identified in the by-catch. They were Family Leiognathidae, Portunidae, Pristigasteridae, Engraulidae, Rajidae, Cynoglossidae, Loliginidae, Sepidae, Sciaenidae, Mullidae, Drepaneidae, Terapontidae, Lactaridae, Sillaginidae, and Polynemidae. Family Sciaenidae accounted for the highest percentage (31%) of the by-catch, followed by Leiognathidae (24%), Portunidae (17%), Rajidae (7%) and Pristigasteridae (7%) and others (14%).

Fourteen sciaenid species belonging to 8 genera were identified during this study. They are *Johnius (Johnieops) borneensis*, *Johnius (Johnieops) dussumieri*, *Johnius (Johnius) carouna*, *Johnius (Johnius) macropterus*, *Johnius (Johnius) carutta*, *Johnius (Johnius) belangerii*, *Johnius (Johnius) amblycephalus*, *Kathala axillaris*, *Otolithes ruber*, *Pennahia anea*, *Nibea maculata*, *Nibea soldado*, *Protonibea diacanthus*, and *Daysciaena albida*. *Johnius (Johnieops) dussumieri*. This is a new record to Sri Lanka according to the available literature. The percentage contribution (by weight) of sciaenid species to the total sciaenid catch landed by the shrimp trawlers were assessed during the study period. *O. ruber* (27%) made the highest contribution followed by *K. axillaris* (21%), *J. belangerii* (15%), *J. macropterus* (15%), *J. borneensis* (10%), *J. dussumieri* (6%) and *N. maculata* (1%). Minority of sciaenid species; *J. carouna*, *J. amblycephalus*, *J. carutta*, *N. soldado*, *P. anea*, *P. diacanthus* and *D. albida* contributed only up to 5% of the sciaenid catch. Sciaenids are primarily demersal, coastal fishes and seasonally use estuarine environments as nursing grounds and feeding grounds and may form larger aggregates during spawning season (Chao, 2003). Therefore, the sciaenid aggregates may overlap with shrimp fishing grounds of nearshore coastal waters. This implies that, the by-catch of coastal shrimp trawling may represent the majority of the available species of the diverse family of Sciaenidae in the west coast. However, there can be species that inhabit the offshore waters and may not be represented in the trawler catches.

Sciaenid by-catch of the shrimp trawlers are utilized for human consumption. The smaller sized individuals (~50 g) are sold as a mixed catch at a price of Rs~150.00 per kg. If larger sized individuals are available in the catch, they are sold separately for human consumption or for the utilization of their swim bladders. The species utilized for the swim bladder are the larger growing *P. diacanthus* (up to ~25 kg) and *D. albida* (up to ~5 kg). These fishes are sold for about Rs.1000.00-3000.00 per kg. Sciaenid swim bladders are used to produce fish maw and are exported to Asian countries. Swim bladder or dried swim bladder of fishes (fish maw) are among the most popular traditional luxurious seafood delicacies, medicine and tonics in East Asian markets (Chao, 2003; Batista, 2007).



CONCLUSIONS

Sciaenid catches generated the highest proportion of by-catch in the mechanized shrimp trawlers off Hendala. Sciaenid by-catch in the shrimp trawl is a highly diverse catch which is constituted of 14 species belonging to the family. *Otolithes ruber* (27%) reported the highest contribution in the sciaenid catch. *Johnius (Johnieops) dussumieri* reported in this study is a new record to Sri Lanka as per the available literature. Sciaenids are used for human consumption at a lower commercial value. However, adult stages of 2 sciaenid species are utilized for the swim bladder extraction; *P. diacanthus* and *D. albida* with a very high commercial value. Assessment of the impact on Sciaenids from shrimp trawl fishery is a timely need.

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