

Diversity and present status of croaker fishery along Odisha Coast

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Abstract

Croakers are locally called as “Patharamundi”, “Sila” or “Borei” are commercially important demersal resources exploited all along the Odisha coast. The diversity and status of croaker fishery along Odisha coast in the Bay of Bengal is reported. Landings of croakers showed an increasing trend over the decades with lowest catch recorded in 1976 (333 tonnes) and peaked in 2011 (46,468 tonnes) after which the catch has been declining till 2018. Among the maritime states of India, Odisha, contributing 20,625 tonnes accounting for 18% of the country’s total croaker landings in 2020, showed a tremendous increase compared to the previous year. It was a significant component in the trawl catches forming 34% of the total demersal fish landings and 12% of the total marine fish landings of Odisha. Lesser sciaenids (49%) dominated the croaker landings. They were caught by various gears such as trawl nets, gillnets, hook & line, ringseines, and shoreseines. Bulk of the catches were taken by trawl nets (73%) followed by gillnets (22%). More than 20 species contribute to the fishery of which the major species were “lesser sciaenids” such as *Johnius carutta* (40%), *Pennahia anea* (30%), *Panna heterolepis* (12%), *Kathala axillaris* (9%), *Nibea maculata* (5%). *Otolithes ruber* (66%), *Chrysochir aureus* (23%), *Pterotolithus maculatus* (7%) dominated in the “intermediate sciaenids” and *Otolithoides pama* among the “greater sciaenids” with 98% contribution. *Protonibea diacanthus* locally called as “Telia” is gaining attention among the fishermen in the recent past due to their high quality swim bladders which are used for the production of isinglass for export. As compared to previous years, the lowest catch was reported in 2020 (0.30 tonnes) probably due to non-fishery causes such as Covid pandemic which affected general fishing activities. However, continuous monitoring and management of this economically important species is required. Juveniles and young adults of several species of croakers in bottom trawls as bycatch can cause an economic loss to the fishery sector and require management measures.

Keywords: Bay of Bengal, Odisha, diversity, fishery, croaker, Sciaenidae

Introduction

The fishes of the Family Sciaenidae commonly called as drums or croakers, contributed by small to large high-quality food fishes. The air bladder of some species (e.g. *Protonibea diacanthus*) are used to produce isinglass for industrial uses and an esteemed Food item in some culture. In 2020, croakers constituted about 4.3% of India’s total marine fish production with northwestern region contributing nearly 37% followed by northeastern

region 36% to the total croaker landings. Among the maritime states, Gujarat landings was 31,411 t (27%) followed by West Bengal 22,114 t (19%), Odisha 20,625 t (18%) and Maharashtra with 12,108 t (10%). The present study documents the diversity and status of croaker fishery along Odisha coast based on observation recorded from Ganjam, Puri, Jagathsingpur, Kendrapara, Bhadrak and Baleshwar fishery centres.

Catch trend

The landing of croakers registered an increasing trend over the decades along the Odisha coast during 1976-2020 with lowest catch of 333 t recorded in 1976 and peak 46,468 t in 2011 after which the landings show a decline till 2018 (Fig. 1). During 2020, croakers stood first position with 20,625 tonnes accounting for 34% of the total demersal fish landings of the state. Group-wise analysis revealed that “lesser sciaenids” constitute

10,076 tonnes of the state total croaker landings followed by “intermediate sciaenids” (8,623 tonnes) and lowest by “greater sciaenids” (1,926 t) (Fig. 2). The highest landings occurred during July-September with 8,670 t (42%) followed by 7,881 t in October-December (38%), 3,732 t in January-March (18%) and lowest of 341 t in April-June (2%) corresponding with the monsoon fishing ban period (Fig. 3). Of the total croakers landed, 18,657 t were caught by mechanized fishing vessels, 1,117 tonnes by motorized and 851 tonnes by non-mechanized fishing

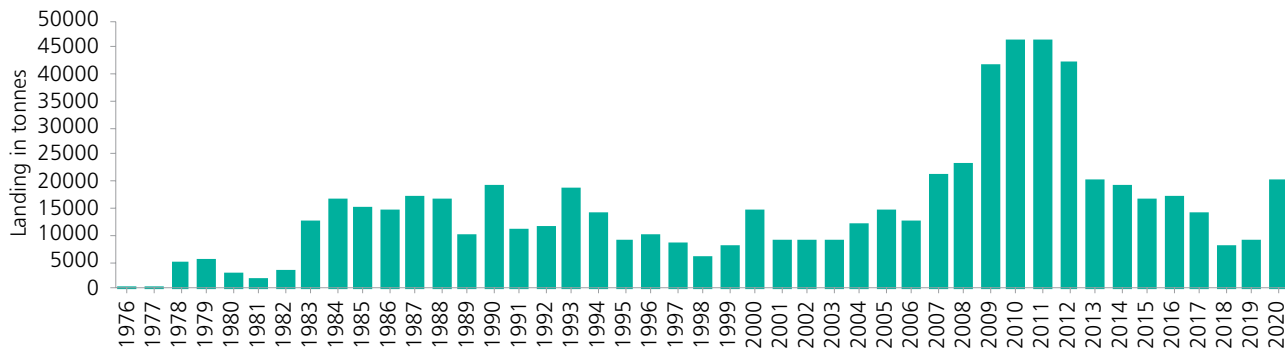


Fig. 1. Catch trend of croakers along Odisha coast during 1976-2020

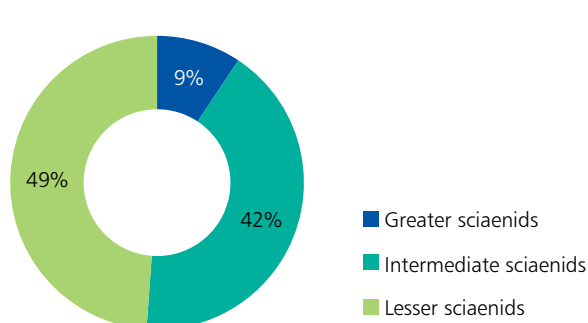


Fig. 2. Group-wise contribution of croaker landings along Odisha coast in 2020

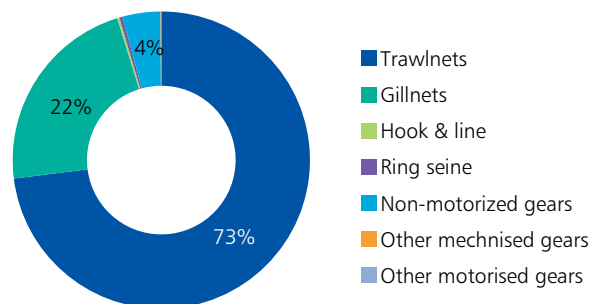


Fig. 4. Gear-wise contribution to the total croaker landings of Odisha coast during 2020

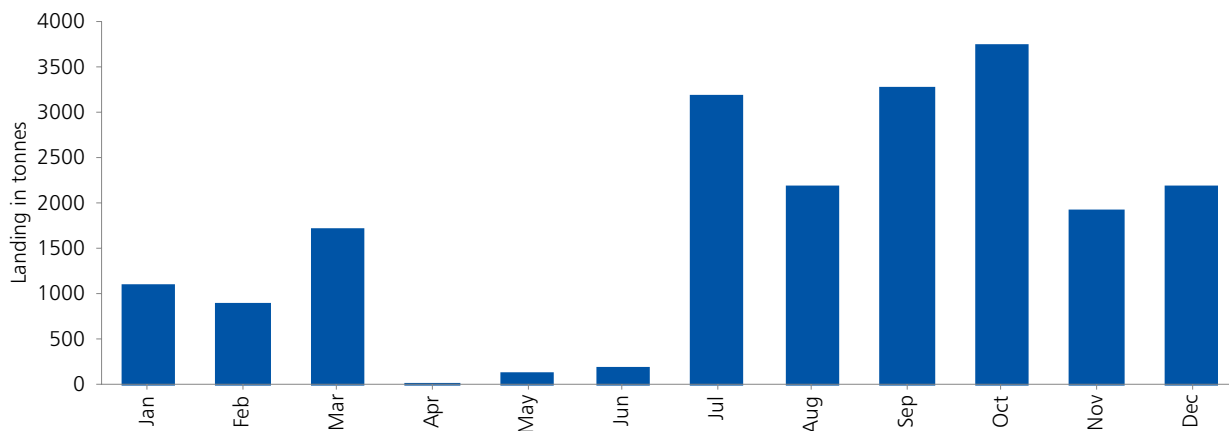


Fig. 3. Month-wise landing of croakers along Odisha coast in 2020

crafts. Among the various fishing gears operated along the coast trawlnets contributed to the highest catch followed by gillnets (Fig. 4).

In the present study, the croaker species were categorized based on the maximum reported size as greater sciaenids (> 100 cm), intermediate sciaenids (50-100 cm) and lesser sciaenids (< 50 cm). More than 20 species of croakers in 14 genera were recorded during the study period 2017-2020 (Table 1). Major species contributing to the croaker

Species composition

Table 1. List of croaker species recorded along Odisha coast during 2017-2020

Species	Common name	Local name	Length range observed (TL mm)	Gears caught	Frequency of occurrence in landings
<i>Protonibea diacanthus</i> (Lacepède, 1802)	Blackspotted croaker	Telia	600-1260	Trawl-net, hook & line, gillnet	Occasional
<i>Otolithoides biauritus</i> (Cantor, 1849)	Bronze croaker	Badia sila, Jamuna borei	420-1140	Trawl-net, hook & line, gillnet	Occasional
<i>Otolithoides pama</i> (Hamilton, 1822)	Pama croaker	Mohana sila, Jamuna borei	130-418	Gillnet, trawl-net, shoreseine	Common
<i>Macropsinosaja cuja</i> (Hamilton, 1822)	-	Paru sila	330-600	Gillnet, trawl-net	Rare
<i>Otolithes ruber</i> (Bloch & Schneider, 1801)	Tigertooth croaker	Silver sila, Dantura	157-490	Gillnet, trawl-net, hook & line, ringseine	Common
<i>Pterotolithus maculatus</i> (Cuvier, 1830)	Blotched tiger-toothed croaker	Biradia sila, Baghada borei	160-500	Gillnet, trawl-net, shoreseine	Common
<i>Chrysochir aureus</i> (Richardson, 1846)	Reeve's croaker	Musura sila, Musura	132-440	Gillnet, trawl-net, hook & line, shoreseine	Common
<i>Daysciaena albida</i> (Cuvier, 1830)	Bengal corvina	Parua sila, Telia borei	400-691	Gillnet	Rare
<i>Nibeasoldado</i> (Lacepède, 1802)	Soldier croaker	Telia borei	185-257	Gillnet, trawl-net	Common
<i>Nibeamaculata</i> (Bloch & Schneider, 1801)	Blotched croaker	Gadi sila /tiger sila/Alata pati borei	118-274	Gillnet, trawl-net	Common
<i>Atrobucca trewavasae</i> Talwar & Sathirajan, 1975	-	Meigalia sila/Tetra borei	200-370	Trawl-net, gillnet	Occasional
<i>Panna heterolepis</i> Trewavas, 1977	Hooghly croaker	Gadra sila, /nagudia sila/ Jamuna borei	150-210	Gillnet, trawl-net, shoreseine	Common
<i>Pennahia anea</i> (Bloch, 1793)	Donkey croaker	Thikiri sila, Borei, Patharamundi	106-210	Gillnet, trawl-net, shoreseine	Common
<i>Pennahia ovata</i> Sasaki, 1996	-	Thikiri sila, Borei, Patharamundi	100-414	Gillnet, trawl-net, shoreseine	Common
<i>Kathalaxillaris</i> (Cuvier, 1830)	Kathala croaker	Mundi sila, Borei, Patharamundi	133-166	Gillnet, trawl-net, ringseine	Common
<i>Johnius amblycephalus</i> (Bleeker, 1855)	Bearded croaker	Dadhi borei, Thikiri sila, Chocolate borei	71-220	Gillnet, trawl-net	Occasional
<i>Johnius belangerii</i> (Cuvier, 1830)	Belanger's croaker	Thikiri sila, Borei,	80-240	Gillnet, trawl-net	Occasional
<i>Johnius borneensis</i> (Bleeker, 1851)	Sharpnose hammer croaker	Thikiri sila, Borei, Patharamundi	185-252	Gillnet, trawl-net	Common
<i>Johnius carouna</i> (Cuvier, 1830)	Caroun croaker	Thikiri sila, Borei, Patharamundi	90-220	Gillnet, trawl-net	Occasional
<i>Johnius carutta</i> Bloch, 1793	Karut croaker	Sila, Borei, Patharamundi/ Tetra borei	125-220	Gillnet, trawl-net, ringseine	Common
<i>Johnius dussumieri</i> (Cuvier, 1830)	Sin croaker	Thikiri sila, Borei, Patharamundi	75-183	Gillnet, ringseine, trawl-net, shoreseine	Common
<i>Johnius macropterus</i> (Bleeker, 1853)	Largefin croaker	Thikiri sila, Borei, Patharamundi	100-150	Gillnet, trawl-net	Occasional
<i>Johnius macrorhynchus</i> (Lal Mohan, 1976)	Big-snout croaker	Thikiri sila, Borei, Patharamundi	126-240	Gillnet, trawl-net	Common
<i>Dendrophysa russelii</i> (Cuvier, 1829)	Goatee croaker	Thikiri sila, Borei, Patharamundi, Dadhi borei	160-195	Gillnet	Occasional



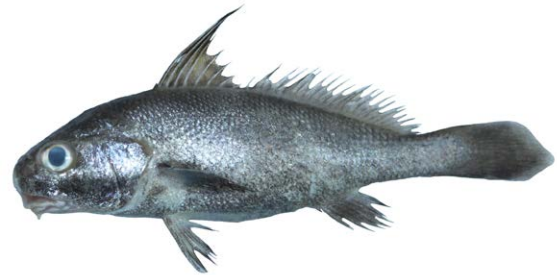
Pennahia anea 162 mm TL



Kathala axillaris 151mm TL



Panna heterolepis 150 mm TL



Johnius amblycephalus 97 mm TL



Johnius macropterus 126 mm TL



Johnius carutta 189 mm TL



Johnius borneensis 210 mm TL



Johnius macrorhynchus 213 mm TL



Johnius dussumieri 137 mm TL

Fig. 5. Major species of lesser sciaenids recorded along Odisha coast during 2017-2020



Pterotolithus maculatus 488 mm TL



Otolithes ruber 370 mm TL



Chrysochir aureus 225 mm TL



Daysciaena albida 509 mm TL

Fig. 6. Major species of intermediate sciaenids recorded along Odisha coast during 2017-2020



Protonibea diacanthus 843 mm TL



Otolithoides biauritus 398 mm TL



Macrospinosa cuja 320 mm TL



Otolithoides pama 418 mm TL

Fig. 7. Major species of greater sciaenids recorded along Odisha coast during 2017-2020

fishery were *Otolithes ruber* (28%) followed by *Johnius carutta* (20%), *Pennahia anea* (15%), *Chrysochir aureus* (10%), and *Otolithoides pama* (9%). Lesser sciaenids are the most abundant and dominated the croaker fishery (Fig. 5) followed by intermediate (Fig. 6) and greater sciaenids (Fig. 7). The major species contributing to the

lesser sciaenid fishery were *J. carutta*, *P. anea*, *Panna heterolepis*, *Kathala axillaris* and *Nibea maculata* (Fig. 8). Similarly, *O. ruber*, *C. aureus* and *Pterotolithus maculatus* were the major species contributing significantly to the intermediate sciaenid (Fig. 9). Among the greater sciaenids *O. pama* contribute about 98% of the catch whereas

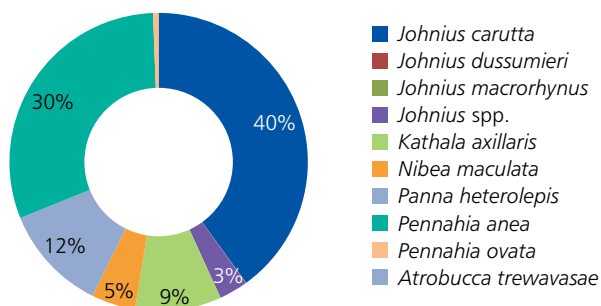


Fig. 8. Species-wise contribution to lesser sciaenid landings along Odisha coast during 2020

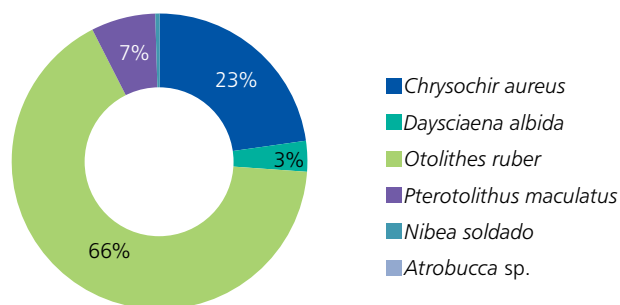


Fig. 9. Species-wise contribution to intermediate sciaenid landings along Odisha coast during 2020

Table 2. Some landing records of *Protonibea diacanthus* along Odisha coast during 2017-2020

Date of landing	Place of landing	Gear used	Depth of fishing (m)	Numbers caught	Total length (cm)	Weight (kg)	Price per kg (₹)
08.03.2018	Pentakota	Drift gillnet	30-40	1	120	26.0	3000
23.03.2019	Paradeep	Trawl net	55	1	105	19.0	7000
28.03.2019	Paradeep	Trawl net	50	1	75	4.0	1000
16.07.2019	Atharbanki	Long line	50	3	60-120	3.5-28.0	1000-6300
17.08.2019	Balaramgadi	Trawl net	60	1	65	3.8	1875
17.09.2019	Atharbanki	Long line	60	7	60-126	3.5-31.5	1100-7350
06.11.2019	Atharbanki	Long line	55	3	112-122	24-30.0	6000-7000
18.11.2019	Atharbanki	Long line	50	2	115-120	27-29.5	5500-6800
19.11.2019	Atharbanki	Bottom set gillnet	35 z	1	108	23.0	5500
4.12.2019	Atharbanki	Long line	35	1	98	18.0	4500
17.12.2019	Atharbanki	Bottom set gillnet	35	1	75	4.0	1000
13.01.2020	Paradeep	Long line	45	1	122	28.5	6200
28.01.2020	Paradeep	Long line	50	1	104	19.0	4000

O. biauritus, *Protonibea diacanthus* occur occasionally and *Macrospinosa cuja* very rarely.

Protonibea diacanthus, locally known as "Telia" is one of the most commercially important croaker species and is gaining more attention among the fishermen. The excellent quality of swim bladders of these species fetches very high price in the international markets. Fishes with swim bladders are usually sold at ₹1000-7350 per kg body weight at landing centres depending upon the sizes (Table 2). Airbladders are dissected out, dried and sold separately at ₹40,000-50,000 per kg in the local markets or sent to nearby markets such as Digha or Calcutta for getting better prices. Male fish air bladders are considered superior in quality compare to those from female fishes. After removing the air bladder, fishes are filleted and processed both for local (₹400-600 per kg) and

export markets. Recently, Jakhar *et al.* (2012) confirmed that the skin gelatin of this species can be used in food applications to extend the gelatin market to religious groups which do not accept the porcine and bovine gelatin. The estimated landings of this species during the period 2007-2020 indicates a declining trend with highest landings of 1,227 t recorded in 2010, followed by continuous decline. Most of the catches recorded during the present study were represented by large sized fishes with a narrow length range of 60-126 cm TL (Table 2). Most of the species in the greater sciaenid group have a long life span, larger maximum size, late age and size-at maturity, lower spawning frequency, high batch fecundity, and low relative fecundity compared to the other sciaenid (Waggy *et al.*, 2006) which makes them highly susceptible to overfishing. Thus, capturing mostly large sized fishes will affect the spawning stock



Fig. 10. *Protonibea diacanthus* (120 cm TL & 26 kg TW) landed at Pentokota, Puri, Odisha

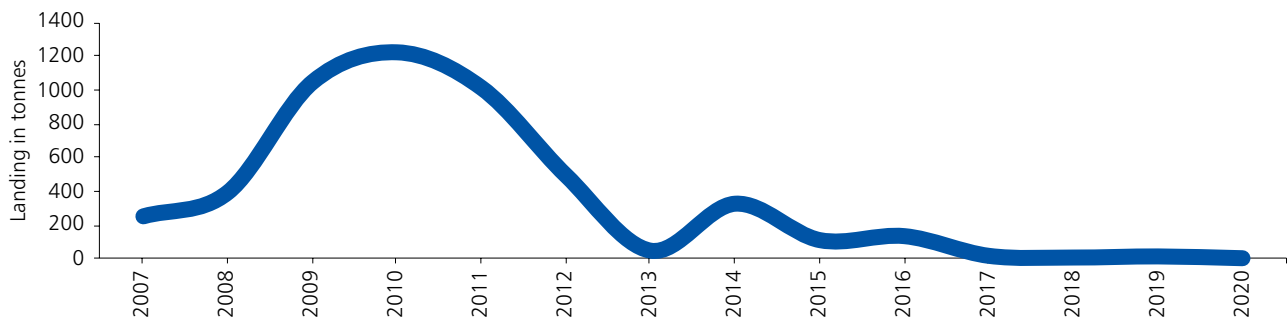


Fig. 11. Catch trend of *Protonibea diacanthus* along Odisha coast during 2007-2020

biomass through recruitment overfishing. Several studies have indicated that the species forms aggregations as a result of seasonal migrations in response to availability of food or based on the species' reproductive cycle and hence capture trends can impact the resource. Hence, continuous monitoring of such economically important species is essential to ensure long term sustainability.

Market trends

The dried air bladders called fish maws are exported mainly to China and Singapore for the manufacture of isinglass, which is used in beverage and cosmetic industry as well as Chinese traditional medicines (Dutta *et al.*, 2014). The lesser and medium sciaenids are mostly sold in fresh condition at the local markets or iced and transported to distant interior markets of Odisha, West

Bengal, Karnataka and Tamil Nadu for fresh consumption. The lesser sciaenids are salted and sundried onboard multiday trawls and brought ashore as dry fish for consumption. Lesser sciaenids (e.g. *Johnius* spp.) and high valued intermediate sciaenids like *O. ruber* and *C. aureus* are also dried when huge quantities of small sized fishes landed during the peak fishing season. The catches of very small juveniles and the lesser sciaenids of poor quality fishes goes for making fish meal

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