Study the present trawl fishery of *Penaeus monodon* (Fabricius, 1798) in coastal waters off Digha coast, West Bengal, India

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Abstract

During the present study the average annual catch of *Penaeus monodon* during 2011 - 2013 was 281.29±9.67 ton, which contributed 0.41 % to the total trawl net catches at Digha coast. The average catch rate was 43.41 kg/h. The percentage of *P. monodon* to total shrimp catch was 1.91% in trawl landings at Digha coast. Monthly mean landings were 28.13±0.97 t from the trawl nets. Peak landings were observed from June to November with a maximum of 56.46±1.97 t in September and lean landings were observed from December to March with a minimum of 6.12±0.21 t.

Keywords: Fishery, *Penaeus monodon*, Digha coast, India

1. Introduction

India is a significant marine fisheries sector that plays important role in the country’s economy and has been an important source of income and occupation and livelihood for not only the coastal communities but also for the millions of people inhabiting our country. In capture fishery besides fishes, shrimps are also very important both biologically and economically. The penaeid shrimps constitute the backbone of seafood export industry and are the major foreign exchange earner as from fishery sector which is the source of livelihood for millions of peoples whose involve with fishery sector directly and indirectly. Some of the important penaeid shrimps that support commercial fisheries along the Indian sea water and available also at Digha coast. *Peneus indicus* (Indian white prawn), *P. semisulcatus* (Green tiger prawn), *P. monodon* (Giant tiger prawn), *P. merguiensis* (Banana prawn), *P. japonicus* (Kuruma prawn), *P. penicillatus* (Red-tail prawn), *Metapenaeus dobsoni* (Flower-tail prawn), *M. monoceros* (Speckled prawn), *M. affinis* (Jinga prawn), *M. Kutchensis* (Ginger shrimp), *M. brevicornis* (Yellow prawn), *Parapenaeopsis stylirosa* (Kiddi prawn), *P. hardwickii* (Spear prawn), *P. sculpitilis* (Rainbow prawn), *P. maxillipeda* (Torpedo prawn), *P. unca* (Uncta prawn), *Trachypeneaus curviristris* (Rough prawn), *Metapenaeopsis stridulans* (Fiddler shrimp), *Parapenaeus longipes* (Flaming prawn), *Solencocera cussicornis* (Coastal mud prawn) and *S. choprai* (Coastal mud prawn). The coastal length of West Bengal is 158 km [1]. Here, marine fishing activity is an important source of income for coastal living people. There are enormous literature on the estuarine prawn fishery resources of West Bengal [2, 3, 4, 5, 6, 7, 8, 9, 10]. However, very little information is available on the marine prawn fisheries of Western Bengal. There are limited information on the seasonal bag net fishery [15] and on the prawn fishery of the large trawlers operating off the West Bengal coast [16, 17, 18, 19]. No published information available till date on the trawl fishery of *P. monodon* from Digha Coast of West Bengal, India. The present study aims to provided details information on trawl fishery of *P. monodon* in coastal waters of Digha Coast, India.

2. Materials and Methods

Data on catch and effort expended in trawls for *P. monodon* were obtained for the period from January 2011 to December 2013 from Digha Mohana landing centre. The monthly and annual estimates of catch and effort were made on based on the catch data of observation days and raised to monthly catch based on the number of fishing days in a month.
The monthly and annual estimates of catch and effort were made following the Multistage Stratified Random Sampling Technique devised by Fishery Resource Assessment Division of Central Marine Fisheries Research Institute, India [20]. Catch data were expressed in terms of numbers. Each sampling days was multiplied by the number of boats engaged in fishing on the day of sampling to obtain average daily catch. Average daily catch was multiplied by the number of fishing days in the particular month to obtain the monthly catch.

3. Results

3.1 Species composition

Species composition of penaeid prawn Digha landings center in West Bengal during 2011 - 2013 shows about 11 commercial species of penaeid prawns, of which five are large sized species viz., *Penaeus monodon* (1.9%), *P. indicus* (3.6%), *P. merguiensis* (6.3%), *P. penicillatus* (1.3%), *Metapenaeus monoceros* (5.9%), *M. affinis* (7.2%), *M. dobsoni* (13.3%), *Parapenaeopsis stylifera* (11.7%), *P. hardwickii* (18.7%), *Solenocera* spp (13.2%) and *Metapenaeopsis* spp (8.6%). Small sized commercial species (*M. lysianassa* and *M. moyebi*) also contributed in very low quantities to the landings at the Digha coast during my research. (Figure 1).

3.2 Annual landing

The average annual catch of *P. monodon* for the period 2011 – 2013 was 281.29±9.67 ton, which contributed 0.41% to the total trawl net catches at Digha coast (Table 1). The average catch rate for the period was 43.41 kg/h (Table 2). The percentage contribution of *P. monodon* to total trawl net catch fluctuated between 0.36% (2013) to 0.39% (2012) (Table 3). The percentage contribution of *P. monodon* to total shrimp catch was 1.94% from trawl landings at Digha coast during the study period (Table 4).

3.3 Month wise landing

Monthly mean landing of 28.13±0.97 t was recorded from trawl nets during 2011-2013 (Table 5 and 6). Peak landing was observed from June to November with a maximum of 56.46±1.97 t in the month of September and lean landing was observed during December to March with minimum landings of 6.12±0.21 t in March.

4. Discussion

The marine landings of West Bengal exhibit wide inter-annual fluctuations with an average of around 3 lakh tons, of which the contribution of penaeid prawns is around 5%. According to Maheswarudu [21] in India the average contribution of penaeid prawns is around 7.4% and of non penaeid prawns is around 5.4%. Recent contribution of penaeid prawns in West Bengal has decreased from 6.4% observed during 1996 - 2011, *P. monodon* is caught in small numbers throughout the season in the Kerala backwater fishery. Similarly in the Gautami estuary, though catch is recorded in all the months, intense fishery is from November to early January [22]. In Philippines, the ‘sugpo’ fry season starts from May and ends by October. In Mumbai, the commercial catches observed from August to October. However, the fishing season was generally not evident at most of the places year to year variation in my present study. The catch of *P. monodon* was observed to be steady throughout the year with maximum from June to November. Catch and catch rates recorded in the present study is commensurate with the marine landings recorded by CMFRI from West Bengal over the years [23]. The catch recorded along the north-east coast has increased in recent years due to trawlers extending their range of operations and the duration of voyage [19].

5. Conclusion

This is the first study particularly *Penaeus monodon* at Digha coast. The shrimp trawl fishery at Digha targets of catch a wide variety of penaeid prawns and not *P. monodon* alone. This catch data is authentic and there is no available data at Digha coast on *P. monodon* before my study. This paper will be helpful for further study.

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Table 1: Study the year wise catch of *P. monodon* from Digha coast during January 2011 to December 2013

| Year   | Catch (t) | Catch rate (kg/h) | % shrimp catch | % total trawl catch |
|--------|-----------|-------------------|----------------|---------------------|
| 2011   | 264.26    | 40.78             | 2.00           | 0.41                |
| 2012   | 297.73    | 45.95             | 2.00           | 0.42                |
| 2013   | 281.88    | 43.50             | 1.83           | 0.39                |
| Average| 281.29    | 43.41             | 1.94           | 0.41                |

Table 2: Study the year wise monthly catch rate (kg/h) of *P. monodon* (Mean±SE) from Digha coast during 2011-2013

| Month          | 2011   | 2012   | 2013   | Mean±SE |
|----------------|--------|--------|--------|---------|
| January        | 13.89  | 15.65  | 14.81  | 14.78±0.51 |
| February       | 9.84   | 11.08  | 10.49  | 10.47±0.36 |
| March          | 8.87   | 10.00  | 9.47   | 9.45±0.32 |
| April          | 61.97  | 69.82  | 66.11  | 65.97±2.27 |
| June           | 55.98  | 63.07  | 59.71  | 59.58±2.05 |
| July           | 59.55  | 67.10  | 63.52  | 63.39±2.18 |
| August         | 81.86  | 92.23  | 87.32  | 87.14±2.99 |
| September      | 43.98  | 49.55  | 46.91  | 46.82±1.61 |
| October        | 47.45  | 53.46  | 50.62  | 50.51±1.74 |
| November       | 24.41  | 27.50  | 26.04  | 25.98±0.89 |
| December       | 40.78  | 45.95  | 43.50  | 43.41±1.49 |
Table 3: Study the year wise monthly percentage of *P. monodon* landings in total trawl catch (Mean±SE) from Digha coast during January 2011 to December 2013

| Month | 2011 | 2012 | 2013 | Mean±SE |
|-------|------|------|------|---------|
| January | 0.15 | 0.16 | 0.15 | 0.15±0.005 |
| February | 0.14 | 0.14 | 0.17 | 0.17±0.01 |
| March | 0.14 | 0.14 | 0.13 | 0.14±0.004 |
| April | 0.60 | 0.63 | 0.56 | 0.60±0.02 |
| June | 0.60 | 0.55 | 0.56 | 0.57±0.01 |
| July | 0.52 | 0.54 | 0.49 | 0.52±0.02 |
| August | 0.65 | 0.69 | 0.62 | 0.65±0.02 |
| September | 0.40 | 0.40 | 0.38 | 0.39±0.01 |
| October | 0.38 | 0.39 | 0.35 | 0.37±0.01 |
| November | 0.23 | 0.24 | 0.22 | 0.23±0.01 |
| December | 0.38 | 0.39 | 0.36 | 0.38±0.01 |

Table 4: Study the year wise monthly percentage of *P. monodon* landings in total shrimp landings (Mean±SE) from Digha coast during January 2011 to December 2013

| Month | 2011 | 2012 | 2013 | Mean±SE |
|-------|------|------|------|---------|
| January | 0.90 | 0.95 | 0.85 | 0.90±0.03 |
| February | 1.03 | 1.09 | 0.98 | 1.03±0.03 |
| March | 1.40 | 1.48 | 1.32 | 1.40±0.04 |
| April | 4.26 | 4.50 | 4.04 | 4.27±0.13 |
| June | 2.08 | 2.20 | 1.97 | 2.08±0.07 |
| July | 2.86 | 3.02 | 2.71 | 2.86±0.09 |
| August | 2.25 | 2.38 | 2.13 | 2.26±0.07 |
| September | 1.78 | 1.68 | 1.69 | 1.72±0.03 |
| October | 1.57 | 1.30 | 1.19 | 1.35±0.11 |
| November | 1.27 | 1.35 | 1.21 | 1.28±0.04 |
| December | 1.94 | 1.99 | 1.81 | 1.91±0.07 |

Table 5: Study the year wise monthly catch (t) of *P. monodon* (Mean±SE) from Digha coast during January 2011 to December 2013

| Month | 2011 | 2012 | 2013 | Mean±SE |
|-------|------|------|------|---------|
| January | 9.00 | 10.14 | 9.60 | 9.58±0.33 |
| February | 6.38 | 7.18 | 6.80 | 6.79±0.23 |
| March | 5.75 | 6.48 | 6.13 | 6.12±0.21 |
| April | 40.16 | 45.25 | 42.84 | 42.75±1.47 |
| June | 36.27 | 40.87 | 38.69 | 38.61±1.33 |
| July | 38.59 | 43.48 | 41.16 | 41.08±1.41 |
| August | 53.05 | 59.76 | 56.58 | 56.46±1.94 |
| September | 28.50 | 32.11 | 30.40 | 30.34±1.04 |
| October | 30.75 | 34.65 | 32.80 | 32.73±1.12 |
| November | 15.82 | 17.82 | 16.87 | 16.84±0.58 |
| December | 26.43 | 29.77 | 28.19 | 28.13±0.97 |

Table 6: Study the average monthly abundance of *P. monodon* from Digha coast during January 2011 to December 2013

| Month | Catch (t) | Catch rate (kg/h) | % in shrimp catch | % in total catch |
|-------|----------|------------------|------------------|-----------------|
| January | 28.74 | 14.78 | 0.90 | 0.15 |
| February | 20.36 | 10.47 | 1.03 | 0.17 |
| March | 18.36 | 9.45 | 1.40 | 0.14 |
| June | 128.24 | 65.97 | 4.26 | 0.60 |
| July | 115.83 | 59.76 | 2.08 | 0.57 |
| August | 123.23 | 63.39 | 2.86 | 0.52 |
| September | 169.39 | 87.14 | 2.25 | 0.65 |
| October | 91.01 | 46.82 | 1.71 | 0.39 |
| November | 98.20 | 50.51 | 1.33 | 0.37 |
| December | 50.51 | 25.98 | 1.27 | 0.23 |
| Total | 843.87 | 434.09 | 1.94 | 0.41 |
7. References

1. Srinath M, Beena MR, Augustine Sindhu K, Kuriakose Somy, Sreenivasan J. Marine Fisheries Profile West Bengal 2007.

2. Kunju MM. Preliminary studies on the biology of the palaemonid prawn, *Leander styliferus* (Milne-Edwards) in West Bengal, India. Proceeding, Indo-Pacific Fisheries Council 1955;6(3):404-416.

3. Rajyalakshmi T. Observation on the biology and fishery of *Metapenaeus brevicornis* (Milne Edwards) in the Hooghly estuarine system. Indian Journal of Fisheries 1961;8(2):383-403.

4. Rajyalakshmi T. On the age and growth of some estuarine prawns. Proceeding, Indo-Pacific Fisheries Council 1966;11(2):52-83.

5. Rao PV. Genus Parapenaeopsis (Alcock, 1901) In: Prawn Fisheries of India. Bulletin of Central Marine Fisheries Research Institute 1969;14:127-158.

6. Gopalakrishnan V. An assessment of the prawn fishery of the seaward reaches of the Hooghly estuary. Journal of Marine Biological Association of India 1973;15:406-418.

7. Gopalakrishnan V, Rao RM. Observations on the distribution of juveniles of brackish water prawns in the Hooghly-Matla estuarine system. In: Seminar on Production of Quality Fish Seed for Fish Culture. Central Inland Fisheries Research Institute, Barrackpore 1968, 248-261.

8. Gopalakrishnan V, Bhanot KK, Datta SN, Saha SB. Procurement of stocking material for brackish water fish culture from the Hooghly-Matla estuarine system. Journal of Inland Fishery Society of India 1975;7:216-224.

9. Thakur NK. Observation of the availability of brackish water fish seed in the Kulti estuary, West Bengal. Journal of Inland Fishery Society of India 1975;7:105-108.

10. Chakraborti RK, Subrahmanyam M, Pakrasi BB. A note on the collection and segregation of prawn seed for selective stocking. Journal of Inland Fishery Society of India 1977;9:181-183.

11. Basu NC, Pakrasi BB. Brackish water fish and prawn seed potentialities of Bakkhali area in lower Sunderbans, West Bengal. Journal of Inland Fishery Society of India 1979;11(1):40-48.

12. Bhoomik U, Saha S, Chatterjee JG. Need for conservation to protect the brackish water finfish and shellfish seed resources in Sunderbans. Journal of Environmental Ecology 1992;10(4):919-922.

13. Bhoomik ML. Brackish water seed resources of Sunderbans with reference to availability of *Penaeus monodon* (Fabricius) post larvae. Journal of Environmental Ecology 1993;11(1):38-41.

14. Sarkar SK, Bhattacharya AK. Conservation of biodiversity of the coastal resources of Sunderban, northeast India: an integrated approach through environmental education. Marine Pollution Bulletin 2003;47:260-264.

15. Saigal BN, Mitra PM, Karmarkar HC. Migratory winter bag-net fishery in coastal waters of the Hooghly estuary. CMFRI: Bulletin National Symposium on Research and Development in Marine Fisheries Sessions (I & II) 1987;44:94-101.

16. Rao GS. A preliminary study of the prawn fishery of big trawlers along the northeast coast of India. Indian Journal of Fisheries 1987;34:312-328.

17. Rao GS. Prawn fishery of the big trawlers along the northeast coast of India. Marine Fishery Information Service, T & E Ser 1988;87:15-30.

18. Rao GS. Deep sea prawn fishery along the northeast coast of India: A critical appraisal. In: Symposium on Large Marine Ecosystems: Exploration and Exploitation for Sustainable Development and Conservation of Fish Stocks, Somvanshi, V.S. (ed.), Fishery Survey of India 2003, 668-682.

19. Maheswarudu G. Prawn Fisheries West Bengal. In: Handbook of Marine Prawns of India. Rao, G Sudhakara and Radhakrishnan, EV and Josileen, Jose, (eds.) Central Marine Fisheries Research Institute, Kochi 2013, 167-174.

20. Srinath M, Kuriakose S, Mini KG. Methodology for estimation of marine fish landings. Special Publication, Central Marine Fisheries Research Institute 2005;86:57.

21. Maheswarudu G. Diversity and exploitation status of crustacean fishery resources in India. In: Course Manual Summer School on Advanced Methods for Fish Stock Assessment and Fisheries Management. Lecture Note Series No. 2/2017. CMFRI; Kochi, Kochi 2017, 47-55.

22. Subrahmanyam M. Lunar, diurnal and tidal periodicity in relation to the prawn abundance and migration in the Godavari estuarine system. Fisheries Technology 1965;2(1):26-41.

23. Rao, Sudhakara G, Radhakrishnan EV, Josileen Jose. Handbook of Marine Prawns of India. Central Marine Fisheries Research Institute, Kochi 2013.