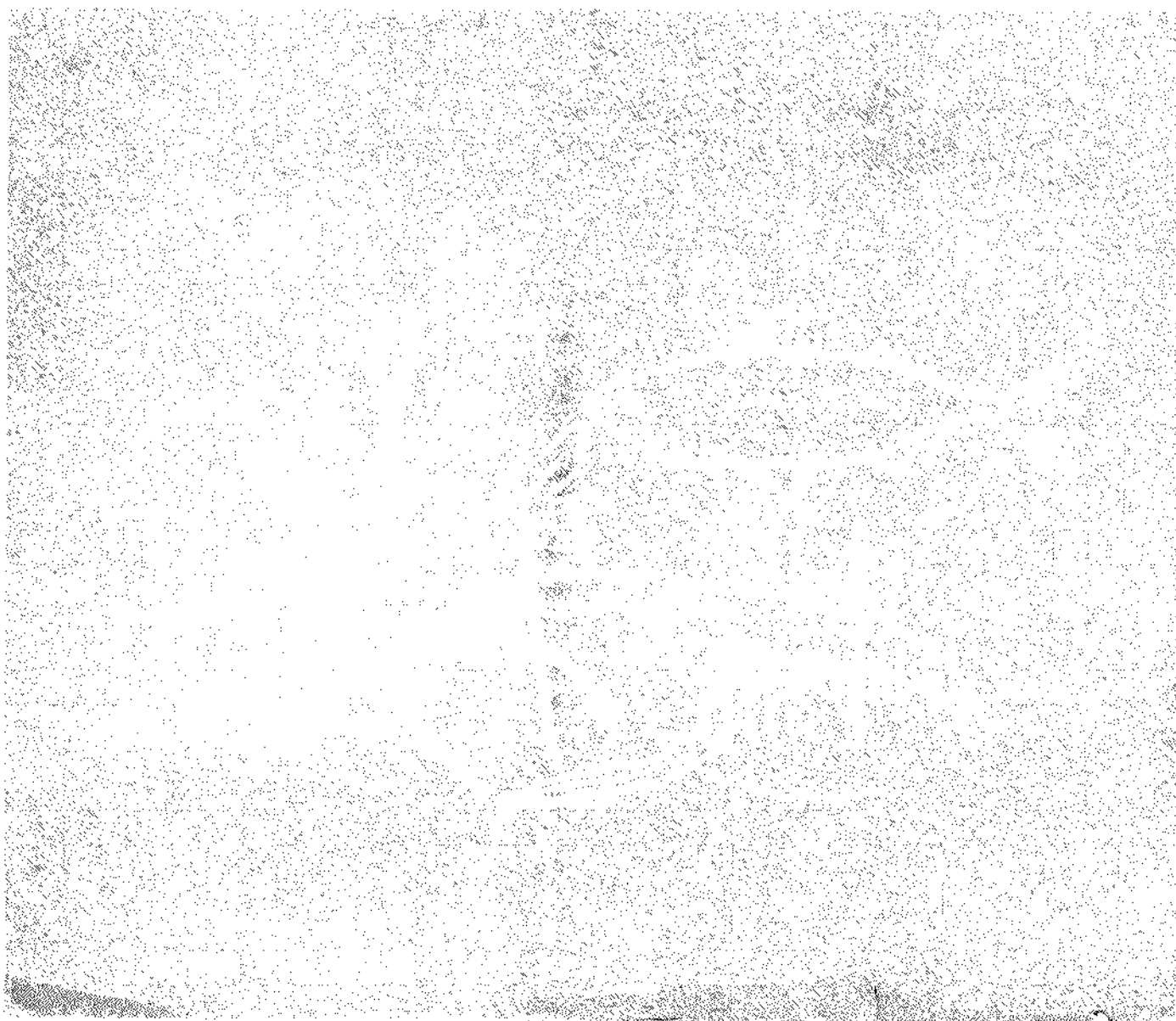


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PENAEID PRAWN RESOURCES OF INDIA

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ABSTRACT

India's annual catch of prawns and shrimps is second only to that of the United States and it is estimated at 91,600 tonnes in 1967. The presently exploited prawn resources are spread over a narrow inshore area of about 15 km. width along the entire coastline of the country. Regional as well as specific preponderances of the exploited species are manifested in the overall commercial catches. Of the total quantity of prawns and shrimps landed in the country over 50% by live weight is contributed by penaeid prawns. Ten species included under the four genera *Penaeus*, *Metapenaeus*, *Parapenaeopsis* and *Solenocera* contribute to the commercial fishery. As additional fishing effort was introduced in the capture fishery year by year, the increasing trend observed in the past years in the total landings of penaeid prawns is of little consequence. An attempt is, therefore, made here to assess the effect of this increased effort on the prawn stock. Possibility of increased exploitation of the prawn resources is examined based on catch data of the mechanised fishing vessels operating in the south-west coast of India where the capture fishery for prawns is most developed at present.

INTRODUCTION

AMONG the prawn and shrimp producing countries of the world India ranks second only to the United States. The total production of prawns in India was estimated at 91,600 tonnes in the year 1967 and this figure was reached by yearly increase due to developmental activities. Prawn fishery was in existence in all the maritime states of India from time immemorial but the introduction of modern methods of capture and processing into this industry started to take place only in recent years. The commercial prawn landings of the country can be classified into two distinct categories—the penaeid prawns and the non-penaeid prawns. The former category comprises of practically all the prawns that are being at present exported from the country and it is better represented in the overall prawn catches in most of the years (Table I). Being more valuable for the export industry, the penaeid prawns and their capture engage more attention from all quarters resulting in increased exploitation and better utilisation. During the past ten years the production of penaeid prawns has more than doubled—from 29,000 tonnes in 1958 to 62,000 tonnes in 1967.

74 species of penaeid prawns are known to exist in the Indian region (Table II) but only 21 of them which are marked with asterisk, form significant portions of the commercially exploited resource. Based on the distribution of the different components of the commercial prawn catches India's coastline can be divided into four roughly equal zones namely the north-west zone, the south-west zone, the south-east zone and the north-east zone.

The prawn fishery of the north-west zone is characterised by certain features. Here the penaeid prawns form as much as 30% of the over all prawn catches and they include a number of species which are not even represented in the catches of the southern zones.

Penaeus indicus, *P. penicillatus*, *P. monodon* *Metapenaeus affinis*, *M. monoceros*, *M. brevicornis*, *M. kutchensis*, *Parapenaeopsis stylifera*, *P. hardwickii*, *P. sculptilis* and *Solenocera indica* are the

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common commercial prawns of this zone. *M. dobsoni* which is the principal component of the prawn resources of the country is totally absent here. This zone accounts for about 25% of the total penaeid prawns landed in the country.

TABLE I
Penaeid prawn landings in the marine catch

| Year | Landings of penaeid prawns in tonnes | % in prawn catch |
|------------------|--------------------------------------|------------------|
| 1958 | 29,204 | 34.28 |
| 1959 | 27,632 | 42.23 |
| 1960 | 31,759 | 46.68 |
| 1961 | 39,083 | 62.26 |
| 1962 | 48,251 | 57.97 |
| 1963 | 41,071 | 50.34 |
| 1964 | 63,389 | 66.80 |
| 1965 | 37,129 | 47.27 |
| 1966 | 56,146 | 61.76 |
| 1967 | 61,834 | 68.02 |
| 10 years average | 43,550 | 54.335% |

In the matter of total production the south-west zone is of utmost importance as the catches from this zone account for more than 50% of the all-India production and practically all the prawns landed here belong to the category of penaeid prawns. *P. indicus*, *P. monodon*, *P. semisulcatus*, *M. dobsoni*, *M. affinis*, *M. monoceros* and *Parapenaeopsis stylifera* are the common species found in the commercial catches here.

The south-east zone is relatively insignificant in the matter of prawn production but recent developments have increased the catches here considerably. Just as in the south-west zone here also the prawn catch is totally comprised of penaeid prawns. The average production of this zone is about 7% of the total catches. The commercial species are *P. indicus*, *P. monodon*, *P. merguensis*, *P. japonicus*, *P. semisulcatus*, *M. affinis*, *M. dobsoni*, *M. monoceros* and *Parapenaeopsis stylifera*.

The coastiline of Andhra, Orissa and West Bengal forming the north-east zone is characterised by the presence of a number of species of penaeid prawns in the commercial catches which contained non-penaeid prawns also. The contribution of this zone to the all-India penaeid prawn landings is roughly 15%. *P. indicus*, *P. merguensis*, *P. monodon*, *M. dobsoni*, *M. affinis*, *M. monoceros*, *M. brevicornis*, *Parapenaeopsis stylifera*, *P. sculptilis*, *P. hardwickii* and *Solenocera indica* are the common commercial species. This zone has close similarity with the north-west zone particularly in the matter of occurrence of many species.

In addition to these, a totally new resource of deep-water prawns have been found out recently as a result of explorations carried out by the vessels of the Indo-Norwegian Project, Cochin. The deep-water grounds lying on the continental slope off Quilon and Alleppey in depths varying from

275 to 365 metres yielded an average catch of over 38 kg of prawns per trawling hour. Among the prawns obtained from this new source *Solenocera hexitii*, *Aristeus semidentatus*, *Penaeopsis rectacuta*, *Metapenaeopsis andamanensis*, *Parapandalus spinipes*, *Plesionika martia*, *P. ensis*, *Heterocarpus wood-masoni* and *H. gibbosus* appeared to be of commercial importance as judged from their availability and individual size. Mohamed and Suseelan (M.S.) has given a detailed account of this new found prawn resources.

TABLE II

List of penaeid prawns known to occur in Indian region
(Commercially important species are marked with asterisk)

Genus *Aristaeomorpha* WOOD-MASON

1. *Aristaeomorpha wood-masoni* Calman
2. *A. rostridentata* (Spence Bate)

Genus *Aristeus* DUVERNOY

- * 3. *Aristeus semidentatus* (Spence Bate)
4. *A. alcocki* Ramadan
5. *A. virillii* (Spence Bate)

Genus *Hemipenaeus* SPENCE BATE

6. *Hemipenaeus crassipes* (Wood-Mason)
7. *H. carpenteri* Wood-Mason

Genus *Plesiopeanaeus* SPENCE BATE

8. *Plesiopeanaeus armatus* (Spence Bate)
9. *P. edwardsianus* (Johnson)
10. *P. coruscans* (Wood-Mason)

Genus *Hepomadas* SPENCE BATE

11. *Hepomadas tener* Smith

Genus *Benthescymus* SPENCE BATE

12. *Benthescymus investigatoris* Alcock & Anderson
13. *B. bartlettii* Smith

Genus *Solenocera* H. LUCAS

14. *Solenocera pectinata* (Bate)
15. *S. koelbeli* de Man
16. *S. hexitii* Wood-Mason
17. *S. alticarinata* Kubo
18. *S. (Parasolenocera) annectens* Wood-Mason
19. *S. indica* Nataraj
20. *S. choprai* Nataraj
21. *S. waltirensis* George & Muthu
22. *S. melantho* de Man
23. *S. subnuda* Kubo

Genus *Hymenopenaeus* SMITH

24. *Hymenopenaeus aequalis* (Bate)
25. *H. neptunus* (Bate)
26. *H. laevis* (Bate)
27. *H. taprobanensis* (Alcock & Anderson)
28. *H. villosus* (Alcock & Anderson)
29. *H. sewelli* Ramadan

Genus *Miyadiella* KUBO

30. *Miyadiella pedunculata* Kubo

TABLE II—Contd.

Genus *Panaeus* FABRICIUS

- 31. *Panaeus japonicus* Bate
- 32. *P. latissulcatus* Kishinouye
- 33. *P. canaliculatus* (Oliver)
- * 34. *P. monodon* Fabricius
- * 35. *P. semisulcatus* de Haan
- * 36. *P. indicus* H. Milne Edwards
- * 37. *P. merguensis* de Man
- 38. *P. penicillatus* Alcock

Genus *Funchalia* JOHNSON

- 39. *Funchalia woodwardi* Johnson
- 40. *F. balboae* (Faxon)

Genus *Penaeopsis* BATE

- * 41. *Penaeopsis rectacuta* (Bate)

Genus *Metapenaes* WOOD-MASON & ALCOCK

- 42. *Metapenaes lysianassa* (de Man)
- * 43. *M. monoceros* (Fabricius)
- * 44. *M. affinis* (H. Milne-Edwards)
- 45. *M. ensis* (de Haan)
- * 46. *M. dobsoni* (Miers)
- * 47. *M. brevicornis* (H. Milne-Edwards)
- 48. *M. burkenroadi* Kubo
- 49. *M. stebbingi* (Nobili)
- 50. *M. alcocki* George & Rao
- * 51. *M. kutchensis* George, George & Rao

Genus *Atypopenaeus* ALCOCK

- 52. *Atypopenaeus stenodactylus* (Stimpson)

Genus *Parapenaepsis* ALCOCK

- 53. *Parapenaepsis tenella* (Bate)
- 54. *P. cornuta* (Kishinouye)
- * 55. *P. maxillipeda* Alcock
- * 56. *P. hardwickii* (Miers)
- * 57. *P. sculptilis* (Heller)
- * 58. *P. stylifera* (H. Milne-Edwards)
- 59. *P. nana* (Alcock)
- 60. *P. uncta* (Alcock)
- 61. *P. hungerfordi* Alcock
- 62. *P. acclivrostris* (Alcock)

Genus *Trachypenaes* ALCOCK

- 63. *Trachypenaes curvirostris* (Stimpson)

Genus *Parapenaes* SMITH

- * 64. *Parapenaes investigatoris* Alcock & Anderson
- 65. *P. fissurus* (Bate)
- 66. *P. longipes* Alcock

Genus *Metapenaepsis* BOUVIER

- * 67. *Metapenaepsis stridulans* (Alcock)
- 68. *M. barbata* (de Haan)
- 69. *M. mogiensis* (Rathbun)
- * 70. *M. andamanensis* (Wood-Mason & Alcock)
- * 71. *M. philippii* (Bate)
- 72. *M. coniger* (Wood-Mason)
- 73. *M. novaeguineae* (Haswell)

Genus *Sicyonia* H. MILNE-EDWARDS

- 74. *Sicyonia lancifer* (Oliver)

TREND OF PRODUCTION OF PENAEID PRAWNS

Within normal fluctuations, the landings of penaeid prawns in the country are seen to increase year by year (Fig. 1) and the total production of a little over 29,000 tonnes recorded in 1958 has reached 62,000 tonnes in 1967. This upward trend of production which is, no doubt, brought out by the developmental activities, was interrupted by low catches recorded in 1963 and 1965. The decrease in catches noticed in these two years was particularly evident in the states of Maharashtra

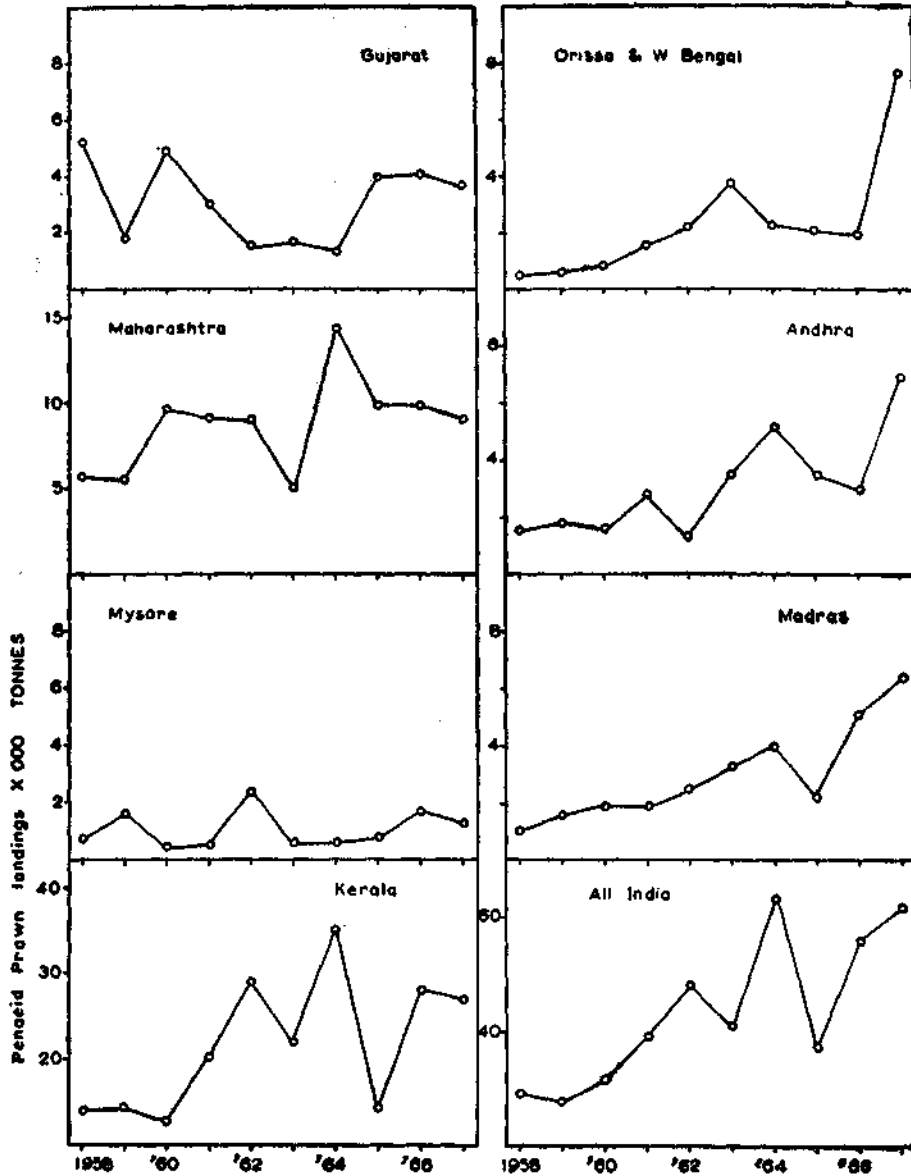


FIG. 1. Trend of penaeid prawn landings in maritime states of India, 1958-67.

and Kerala. 1964 was a year of high availability for all the states except Gujarat and Mysore. The catch-rate of penaeid prawns also increased from 0.093 kg/man-hour to 0.331 kg/man hour during the period between 1958 and 1967. During this period the total fishing effort expended showed decrease from 313 million man-hours to 187 million man-hours. (*Annual Report, C.M.F.R.I.*). For the purpose of computation the all-India figure for fishing effort is taken here without regard for any particular gear. The upward trend in production is seen in the landings from all the maritime states although it is less conspicuous in Gujarat and Mysore. The increase in the catch-rate seen together with the decrease of the total effort is a noteworthy feature, probably brought out by increased application of mechanisation in the field of capture fishery.

TABLE III

Catch per unit of effort of prawns observed in the catches of the mechanised fishing vessels working from Cochin

| | | catch in kg/hour of trawling | | | |
|-----------|-------|------------------------------|---------|---------|---------|
| | | 1964-65 | 1965-66 | 1966-67 | 1967-68 |
| September | | 10.4 | 2.3 | 36.8 | |
| October | .. | 54.4 | 12.8 | 15.3 | 26.1 |
| November | .. | 18.1 | 15.3 | 18.6 | 13.1 |
| December | .. | 24.9 | 16.2 | 13.3 | 15.28 |
| January | .. | 24.6 | 20.6 | 19.1 | 12.36 |
| February | .. | 21.1 | 17.7 | 76.0 | 7.0 |
| March | .. | 12.5 | 7.4 | 11.5 | 7.1 |
| April | .. | 21.9 | 63.0 | 14.7 | 8.8 |
| May | .. | 16.6 | 12.9 | 19.9 | 6.9 |
| June | .. | 10.8 | 13.4 | 22.9 | 8.8 |
| Total | .. | 23.59 | 24.53 | 14.71 | 11.51 |

The production trend in the south-west zone, from where over 50% of the annual production is landed, calls for detailed study in view of the greater involvement of the industry there. While the trend of overall catch-rate here is also on the ascent, that of the catch-rate of the mechanised vessels operating here does not seem to conform to this pattern. Regular sampling carried out on the catches of the mechanised fishing vessels working from Cochin bar mouth for the past four years indicate that catch-rate of prawns has decreased during this period (Table III). The estimated annual catch-rate of prawns observed as 23.59 kg/hour in 1964-65 season has decreased to 11.51 kg/hour in 1967-68. This decrease is possibly a local phenomenon emerged out of the concentration of a large number of fishing units in a limited area but it calls for a thorough appraisal of the situation especially in view of the apprehensions voiced by many industrialists who are concerned with the prawn fishery of the area.

One significant aspect which has emerged out of the analysis of the fishing data is that the general area of fishing of these mechanised fishing vessels has gradually shifted to relatively shallow inshore regions during this period. In early 1950s, when the mechanised fishing boats were introduced into the capture fishery of the area their operations were generally in the region of 25 to 30 metres depth,

This has undergone considerable change and the present operations are mostly in the region of 16 to 17 metres depth. The average depths at which fishing operations were conducted off Cochin by two different sets of fishing boats from 1964 to 1968 are given in Table IV.

TABLE IV
Average depths (in metres) at which fishing operations were carried out by mechanised fishing vessels off Cochin

| Year | Average depths in metres | |
|------------|-------------------------------|---------------------------------|
| | Vessels sampled by C.M.F.R.I. | Vessels of M/s. Cochin Co. Ltd. |
| 1964-65 .. | 21.23 | 21.78 |
| 1965-66 .. | 19.02 | 20.69 |
| 1966-67 .. | 17.16 | 17.22 |
| 1967-68 .. | 16.86 | 17.53 |

Simultaneous with these the biological condition of the prawns landed has also undergone some change particularly in the matter of size. The examination of the sizes of the different species of prawns landed from this area showed decrease in their mean sizes over these years (Fig. 2). Only in the case of *P. stylifera*, which is a purely marine species, the mean size remained steady and with slight increase in 1967-68. In all the other species decreasing trend was evident.

DISCUSSION

The increasing trend of penaeid prawn production observed in almost all the states, in spite of the general decrease of fishing effort, is no doubt, very attractive from the stand point of management and might even suggest possibilities of increased exploitation. This is largely true when all India landings as well as those of some states are considered but in Kerala from where bulk of the important species of prawns are landed the situation is slightly different. Here the mean sizes of most of the prawns have shown gradual decrease over the past four years. Since the overall prawn catch in Kerala has increased in quantity during the same period the reduction of mean size would mean that the increased catch obtained year by year contained greater and greater numbers of small sized prawns. The annual recruitment to the fishery has not been, therefore, affected in any detrimental way. The decrease in the mean size of prawns observed could have been due to other reasons such as change in gear for capture, shifting of fishing ground, etc. As neither the trawl nets used by the mechanised fishing boats nor the seine nets used by the country crafts of this area have undergone any significant change during the period the effect of gear need not be considered as a possible reason.

A shoreward shifting of the fishing grounds is already indicated in the foregoing account. The number of fishing boats introduced into the capture fishery of this area has increased considerably year by year and this has resulted in keen competition between fishing units. As a direct consequence of this competition it would appear that the fishing units are forced to fish in shallower regions for larger quantities of smaller sized prawns rather than fishing in the deeper grounds where large sized prawns normally remain. The life-history of most of these prawns is such that the entire recruitment to the trawling ground takes place from the estuaries and backwaters, which habitat they abandon when they reach specific sizes to migrate into the offshore grounds. This process

of movement of prawns to the offshore grounds takes place more or less throughout the year and it is disturbed or interrupted only by the occasional changes in the environment such as upwelling, mud-bank formation, monsoon, etc. The migration of these prawns to the deeper grounds is possibly accomplished in a few months time during which they feed and grow. The shifting of the trawling grounds to shallow waters, therefore, subjects the smaller prawns which are on the course of movement to deeper grounds to capture too soon.

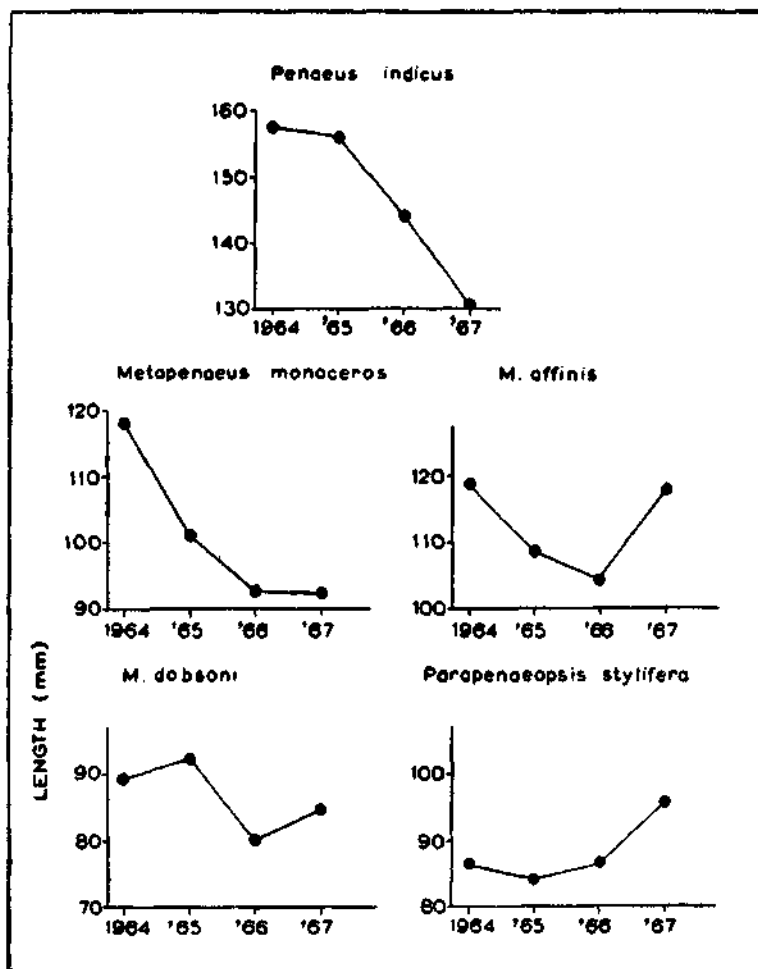


FIG. 2. Mean size of different species of prawns in commercial landings at Cochin.

From the foregoing it is evident that the available prawns in these grounds are at present subjected to capture and that the present exploitation is probably at a level from where further increase may not be advisable. Under the circumstances further introduction of fishing effort into the capture fishery becomes meaningless as it will not only be unprofitable but also create difficulties to the existing units unless they are deployed in a different fishing ground.

The insatiable demand for prawns from the processing industry has stepped up efforts of procurement of prawns from all sources. This had its effects in the estuaries and backwaters too.

There is a general feeling that the increased exploitation of the juvenile prawns from estuaries and backwaters is the reason for the diminishing catch-rate observed in the marine trawl fishery. Menon (1967) reported that large scale backwater reclamations and saltwater exclusion schemes undertaken for agricultural purposes have reduced the extent of nursery grounds for prawns and indirectly affected the prawn catch. The fact that increased numbers of prawns are being caught from the marine source is good enough proof to conclude that the recruitment to the marine source is not affected in detrimental way.

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