

Notes on the Bionomics and Fishery of the Prawn *Parapenaeopsis stylifera* (M. Edw.) on the Malabar Coast*

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Parapenaeopsis stylifera is one of the commercially important species of penaeids of the Malabar Coast. Unlike most other penaeids belonging to the genera *Penaeus* and *Metapenaeus* it is a purely marine species, rarely migrating into estuaries and backwaters. The following notes are based on the study of samples collected from the regular departmental catches of fish at the West Hill substation during the years 1949-'50 and '50-'51. Fishing was usually done in the foreshore waters up to a depth of 4 fathoms; but in '50-'51 the operations were extended once a fortnight up to 8-9 fathoms. In addition to these, material procured from the Kozhikode market has also been examined.

Breeding—These prawns start appearing in the catches in fairly good numbers in October, and almost all of them are adults. A good proportion

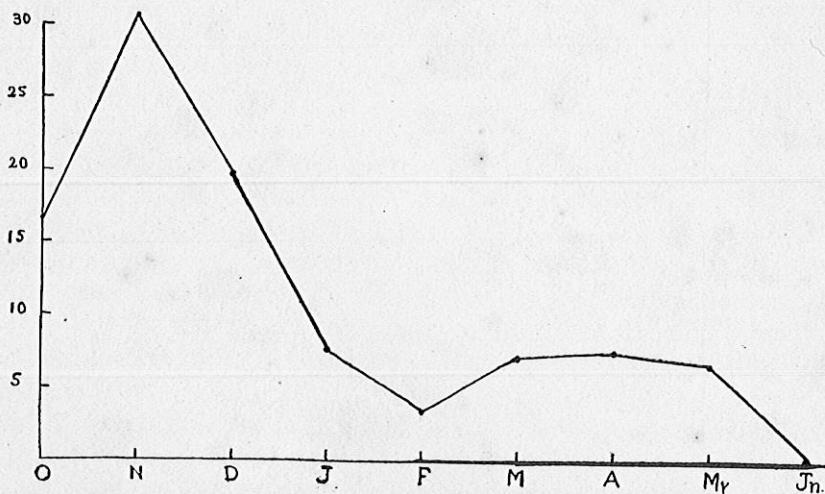


Fig. 1. Monthly percentages of females with ripe ovaries in the year 1950-51. O=October; N=November; D=December; J=January; F=February; M=March; A=April; My=May; Jn=June.

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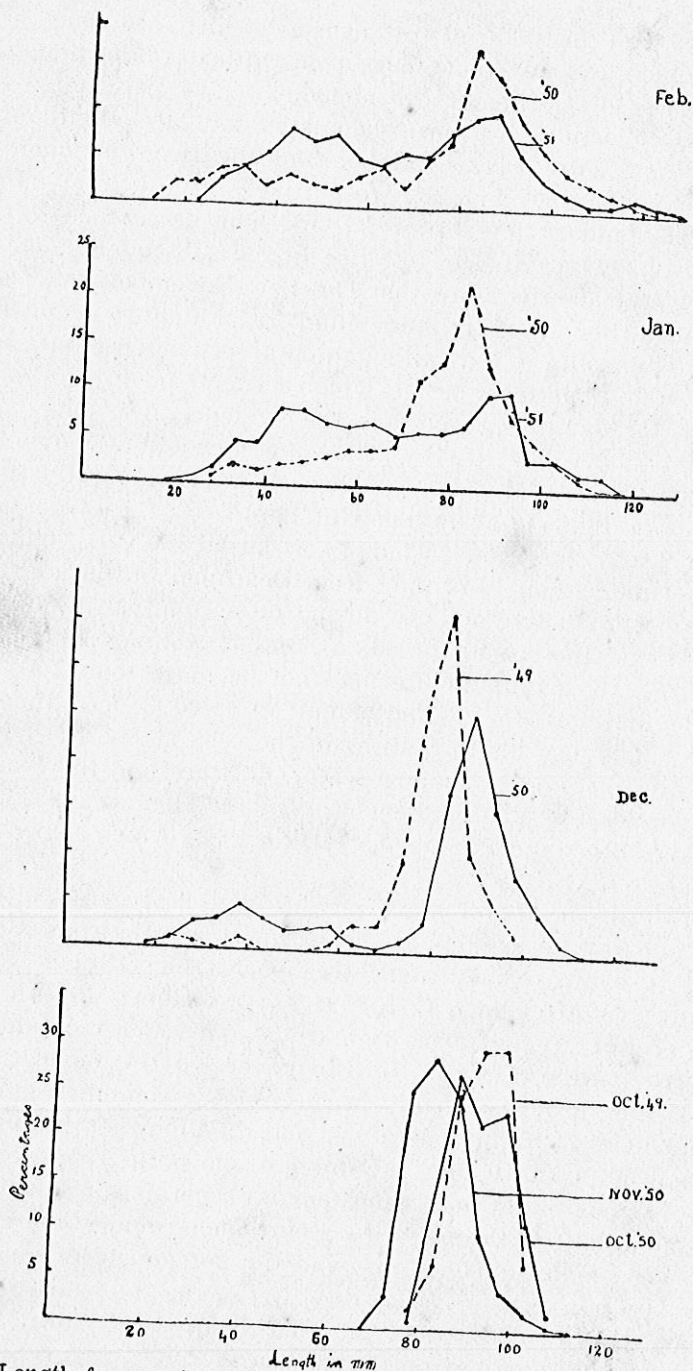


Fig. 2. Length frequencies (of both sexes together) for October and December 1949, October, November, December, January and February 1950 and January and February 1951.

of the females had fully developed ovaries, which are dark green in colour, and which can be made out, even without dissecting, through the shell on the dorsal side of the abdomen. The percentage of such females in the collections has been calculated for each month of '50-'51 and is shown in Figure 1. In October and the two following months they formed about 16, 30 and 20% respectively of the total number of females; but in January an abrupt fall in their percentage to about 7 is noticed, beyond which it does not rise in the subsequent months also. It seems fairly certain therefore that October, November and December are the months when the maximum numbers of mature females breed; but breeding extends up to May although on a very much reduced scale.

The capture of planktonic larvae, which seems to belong to this species, from October to March, corroborates the evidence from the gonads in support of the above conclusion. They were caught along with large numbers of the larvae of *Metapenaeus dobsoni* from comparatively shallow water, not more than 10-12 fathoms in depth. The capture of a few females with clearly spent gonads and of post-larval and very young prawns measuring not more than 10-20 mm. from December onwards are further proof of their reproductive activity during these months. Chopra (1943), has remarked that the species breeds a number of times before reaching maximum size. Its maximum life may not be more than 2-3 years and it is possible therefore for an individual to breed 2 or 3 times during its life time. It is also likely that, as in the case of *M. dobsoni* (Menon 1952), eggs are liberated in shallow water, not far from the coast, unlike some other species, for example *Penaeus setiferus* (Pearson 1939; Anderson and co-workers 1949) and *P. plebeius* (Dakin 1938) which spawn far away from the shore.

Growth—Post-larval and young prawns were first caught in December in both the years, the catches of the previous months consisting almost exclusively of adults. The length frequencies for October '49 and '50 and November '50 are shown in Figure 2. In October of both the years the modal groups are between 85 and 100 mm. and individuals below 75 mm. were hardly present. In November '50 the mode has shifted to the 81-85 mm. group, probably because of the combined effect on the length frequencies of fishing operations and the migration of more prawns shorewards from deeper water. Figure 4, a, shows the frequencies in one, catch of November '50 for males and females separately. While 75-85 mm. represent the length of the majority group among males, the corresponding length for females is 80-90 mm. and the percentage of higher groups among the latter is clearly larger.

Post-larval prawns ranging in size from 10-20 mm. have been captured in all the months from December to June. Figure 2 shows the frequencies for December ('49 and '50), January ('50 and '51) and February ('50 and '51). In November '50 hardly any prawns below 65 mm.

were caught, whereas in December of the same year about 22% of the catches were below 60 mm., causing the curves to extend to the left. Most of the juveniles should belong to the generation produced in the two preceding months and the frequency curves for the month show more or less distinctly two generations, namely, the one year class (on the right) with a modal group of 80-90 mm. and the O groups (on the left) with no well marked majority group. The subsequent growth of the O groups can be estimated approximately from the frequency curves of the succeeding months. The curve for January 51 is very diffused, with-

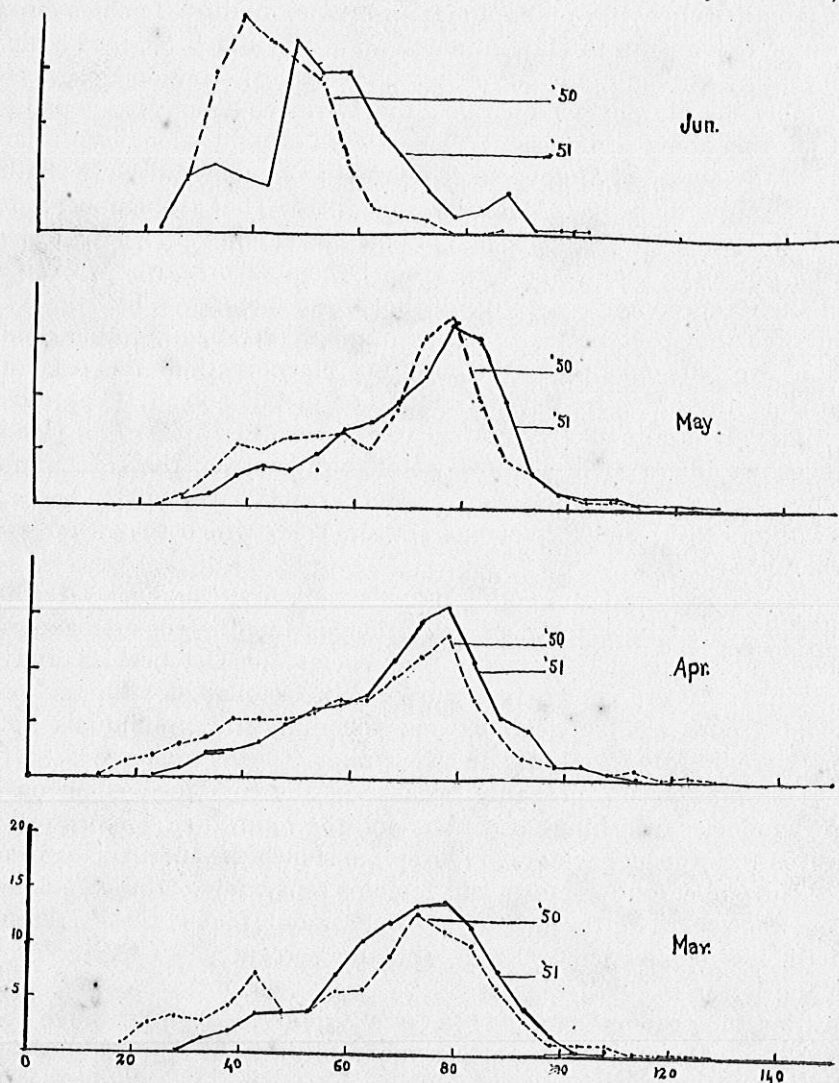


Fig. 3. Length frequencies (of both sexes together) for March (1950 and 1951), April (1950 and 1951), May (1950 and 1951) and June (1950 and 1951).

out sharply defined modes, probably because of the presence in the population of considerable numbers of rapidly growing prawns of the O groups and those of the 1 year class, which may have grown little since the start of the fishery in October. The effect of fishing cannot be overlooked in this connection and may partly account for the reduction in the percentage value of the latter class.

In the following month also the shape of the curves has not altered much, though the mode on the right has moved slightly to the left, indicating a further reduction in the length of the majority group. The corresponding curves of the year '49-'50 are somewhat different, the one year class being the dominant element in the population even in February and no reduction in the length of the majority group being noticeable. It is possible that some unusual factor in the environment may have interfered with the normal rate of reproduction during these months in that year.

In March (Fig. 3) the curves are seen to become more compact and a prominent mode has developed. The length of the majority group has again fallen and is now between 70 and 80 mm. The depletion of the one year class by fishing and the rapid growth of the O groups to reach a length of 70-80 mm. by this time are presumably the causes responsible for the fall. Quite a large number of the young prawns noticed in December have therefore grown to this size within a period of 3-4 months, to form an appreciable part of the catches in the following months.

The curves for April and May are somewhat similar, the modal groups remaining the same, though in the latter month the percentage of the higher groups, especially in '51, shows a distinct increase. In June a precipitous drop in the proportion of these groups is observed, the modes shifting considerably to the left, and is very probably due to the migration of such prawns into deeper water, soon after the commencement of the south-west monsoon towards the close of May. Only the smaller groups stay on in the shallow foreshore waters, since they, in common with similar stages of other species of penaeids, are able to tolerate water of comparatively low salinity.

It is therefore clear that prawns, born probably towards the close of October or early in November, grow to a length of 70-80 mm. in the course of 4-5 months. As there is only a difference of about 20 mm. between them and the modal groups of October, their subsequent growth, from April to October, seems to be slow. It is also evident that one year old prawns reach an average length of 90-100 mm.

Differential growth of the sexes—Figure 4, a, as has been pointed out earlier, shows that the rates of growth of the two sexes are not uniform at all stages, inasmuch as the modal group (86-90 mm.) among females is distinctly larger and the percentage value of groups above the

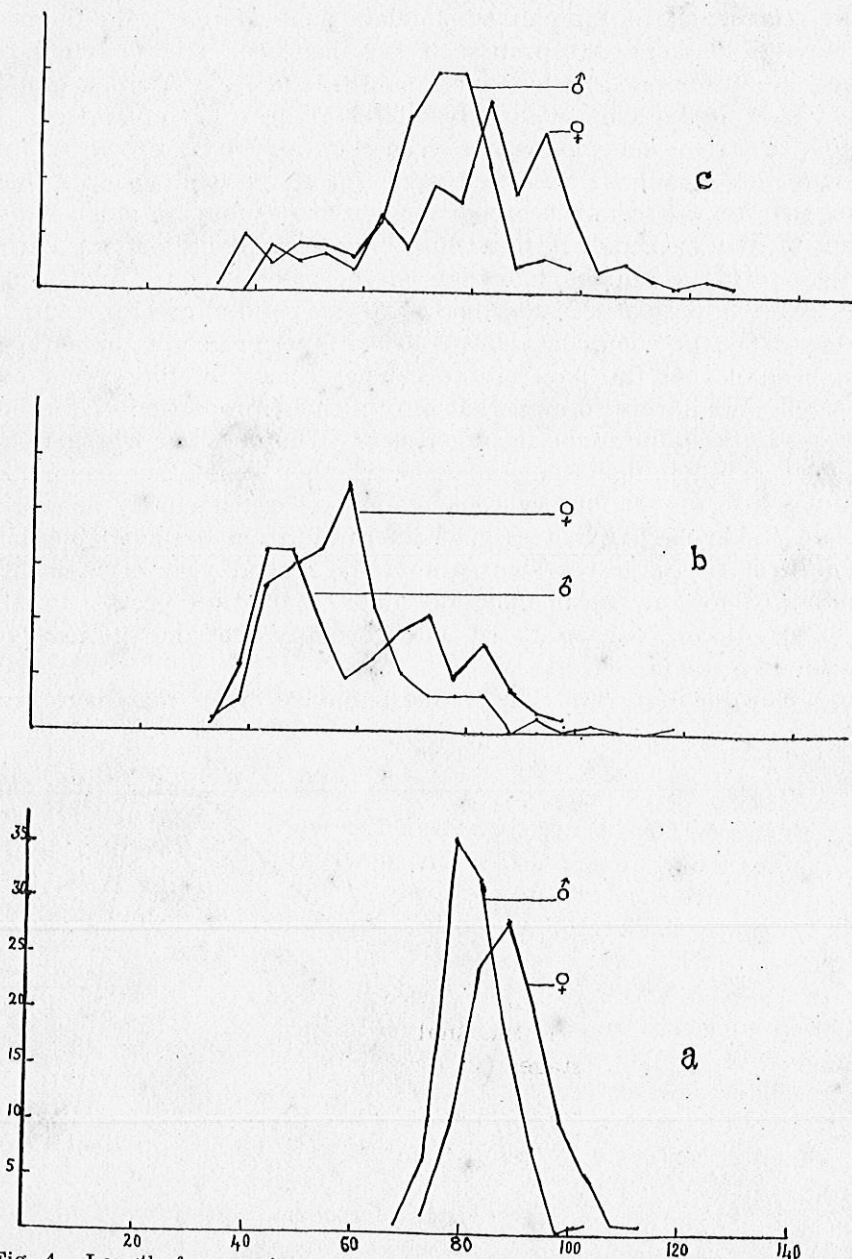


Fig. 4. Length frequencies of males and females in representative samples of November, January and March; a, of 22-11-50, b, of 30-1-51 and c, of 27-3-51. The former is also higher among them. As the minimum size at which the two sexes mature is about 70-80 mm. it appears that after maturity females grow faster than males.

In the same figure are also represented the frequencies of the two

sexes in representative samples of January and March. The highest size group 126-130 mm. irrespective of sex, has been recorded in both years only in March and the following months, and from figure 4, c, it is seen that such individuals captured on 27-3-'51 are mostly females. It is possible that some among the one year class may have grown to this size during the period October to March (in the second year of their life) and that among them the proportion of females may be much larger than that of males. But they constitute only a small part of the entire population, so far as can be judged from the catches of the two years, and it is therefore hardly necessary to discuss this point at greater length.

Duration of life—The data presented in the preceding paragraphs make it evident that the bulk of the catches consist of the O and one year classes. We have also seen that only a small proportion of the one year class survives and grows to larger sizes. The question whether this is the effect of fishing operations alone or whether some other factor like mortality is also a contributory cause cannot be satisfactorily answered at present. Likewise it is not easy to determine from the available data whether all of the largest prawns are in the second year of their life, or whether, some at least, may be older than two years. In the circumstances it can only be stated with certainty that the species lives at least for two years.

Attainment of Maturity—The smallest mature males that have been

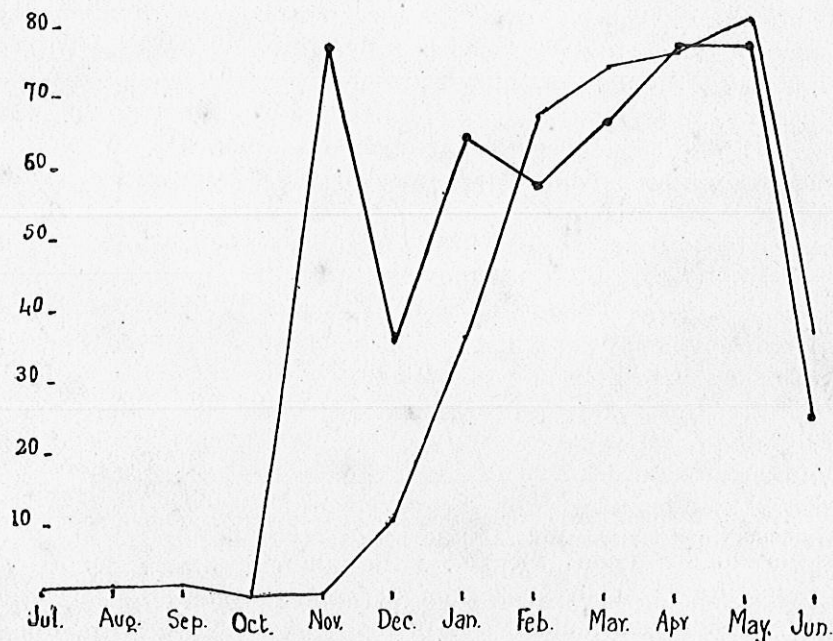


Fig. 5. Monthly percentage values for *P. stylifera* in the prawn catches (Departmental) for 1949-50 and 1950-51.

captured during the course of the two years measure about 65 mm. This may be taken as the minimum size at which males become sexually mature. The corresponding size of females with fully developed ovaries is about 75 mm. As these lengths are reached normally before the prawns are a year old it is obvious that quite a good number of them become mature in the first year of their life.

Sexual union—Throughout the period from October to May or June almost all females measuring over 70-75 mm. in length were found to have been impregnated. A membranous sac placed just internal to the posterior plate of the thelycum on each side and attached to the hinder margin of the plate in front serves as a receptacle for the spermatophores. In females of this size these receptacles always contained spermatophores, in some they were tightly filled, but in others they were only partly full. It is therefore clear that sexual union takes place, not during any particular months, but probably throughout the year, and that the minimum size at which females become impregnated is about 70-75 mm. As is common in other species of prawns, the ovaries may be rudimentary at the time of impregnation and several weeks may have to pass before the ova are ripe and ready for extrusion.

Food—The stomach contents of several prawns ranging in size from 45-105 mm. have been examined in order to determine the nature of the food consumed. Penaeid prawns in general feed on the detritus at the bottom and the stomach contents therefore usually show considerable amounts of sand and mud. Among the recognizable animal remains those of crustaceans belonging to various orders like copepods, cirripedes (Cypris larvae), mysids, amphipods and larval decapods predominate. Minute gastropods, bivalves and foraminifera are the other groups whose remains have also been observed frequently. Vegetable matter, other than diatoms, has been noticed only rarely. This is in marked contrast to what has been observed in regard to other prawns, as for example *M. dobsoni*, the stomachs of several individuals of which were found crammed with algal filaments (Menon 1952).

Parasite—A Bopyrid parasite has been frequently found infesting the branchial chamber of these prawns. It belongs to the genus *Epipenaeon* Nobili, but does not agree closely with any of the species described by Chopra (1923). It has not so far been observed on any other species of penaeids of the West Coast. A study of the gonads and external sexual organs of the parasitized prawns has revealed that they remain imperfectly developed or rudimentary even in specimens measuring over 100 mm. The parasite therefore seems to produce a marked inhibitory effect on the development of the sexual organs of the host.

Migration—It has been mentioned in the introductory paragraph that *P. stylifera* is a purely marine species, spending all its life in the sea, unlike a number of other penaeids that migrate into estuaries and back-

waters when quite young. But in the sea itself it appears to perform annual migratory movements to and from the foreshore waters. The shoreward movement seems to commence in October, as the first catches have been made during that month. Towards the end of May, after the commencement of the south-west monsoon, they begin to move into deeper waters. When discussing the length frequencies of June, it has been explained that the sudden fall in the proportion of large sized prawns may be due to this movement away from the shore. They are the first to leave the inshore area, owing probably to their inability to tolerate the lowering of the salinity as a result of the influx of large volumes of rain-water. The younger ones follow them later and from July onwards only stray individuals have been captured. The migratory movements of this species seem to be comparable to the similar movements reported in respect of *Pandalina brevirostris* on the British coast (Stevens 1930). The latter travels shorewards in the spring and the movement is regarded as a spawning migration into shallower water.

Fishery—These prawns are common in the markets from October to June. But regular fishing during these months is probably never done at any part of the south-west coast, the reason being that the more profitable mackerel and sardine fisheries are in full swing during most of the time. On the Cochin coast it starts only after the latter fisheries have come to a close towards the end of March or early in April. *P. stylifera* is not the only species contributing to the prawn fishery of the period; *M. dobsoni*, *M. affinis* and *P. indicus* are also caught in varying numbers. The boat seine is the usual type of net used, and besides prawns, the catches often contain large numbers of the flat fish *Cynoglossus*, and a miscellaneous collection of several other small species of fish. Figure 5 shows the monthly average percentage values of the species in the Departmental catches of both the years. During the 4 months February, March, April and May it made up 60-80% of the catches. In spite of the high percentages of November and January '49-'50, the proportions during the earlier months are normally much less, as shown by the curve for '50-'51. There can be little doubt therefore, that during the summer months, February to May, *P. stylifera* is the dominant species in the prawn fishery of the Malabar coast.

The size range of the catches at the start of the season shows that in October and November they are almost entirely composed of the one year class. As the season advances, however, the rapidly growing O groups also begin to make their appearance so that in March and the subsequent months it is practically impossible to determine the proportions contributed by the two generations.

Summary—Various aspects of the bionomics of *Parapenaeopsis stylifera* have been discussed in the paper. Evidence has been adduced to show that its breeding period extends from October to May with the

peak of the activity in October, November and December. Prawns, born probably late in October or early in November, grow to a length of 70-80 mm. in the course of 4-5 months. Thereafter growth apparently slows down and an average length of 90-100 mm. is reached when they are one year old. Females seem to grow quicker after maturity and outnumber the males during the second year of their life. Several prawns may attain sexual maturity before they are one year old. The food is similar to that of other species of penaeids; but they do not consume algae and other plant material so freely as the latter. A Bopyrid parasite *Epipenaeon* sp. has been commonly seen infesting the branchial chamber of these prawns, and it inhibits the growth of their sexual organs. Annual migrations to and from the foreshore waters are usually observed.

P. stylifera is the dominant species in the prawn fishery of the Malabar coast during the months February to May. It begins to appear in the catches in October and in the following 2 or 3 months most of the prawns caught are adults belonging to the one year class. By March the O group prawns begin to enter the catches in appreciable numbers.

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