F 81/237

FIRC 25

No 1981/14 16

- ☐ NEW PROPOSAL
- ☐ CONTINUING PROJECT
- ☒ FINAL REPORT
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FISHING INDUSTRY RESEARCH TRUST ACCOUNT

TITLE OF PROPOSAL/PROJECT: Preliminary Study and Feasibility Survey of Tiger Prawns in the Gulf of Carpentaria

ORGANISATION: CSIRO

PERSON(S) RESPONSIBLE: Marine Laboratories, Cleveland

FUNDS SOUGHT/GRANTED

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1982/83	23,525	

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RECEIVED ...../Jan./19.83

DISTRIBUTED ...Feb./19.83

for Secretary
Fishing Industry Research Council

F139–12/81

/DSFIRT3,/

As sent Cronulla 12/11/82

Preliminary Study and Feasibility Survey of Tiger Prawns in the Gulf of Carpentaria.

Final Report 2/11/82

CSIRO Marine Laboratories, Cleveland.

This report presents a preliminary analysis of results obtained during CSIRO's study on tiger prawns at Weipa during 1981/82. Main conclusions reached from this preliminary analysis should not change significantly after final results and more detailed analyses are available.

Most penaeid prawns spawn at sea, and after hatching, the prawn larvae migrate towards the coast where the postlarvae settle and grow in the coastal and estuarine areas. These areas, therefore, function as nursery areas for the young prawns. The objectives of this study were to: (1) characterize the nursery areas of the two species of tiger prawns (Penaeus semisulcatus and P. esculentus) in the Weipa region of the Gulf of Carpentaria; (2) describe the seasonal cycle of occurrence of juvenile tiger prawns in these areas, and (3) collate these results with data collected earlier on adult tiger prawns in the same region.

Our sampling routinely collected juvenile prawns of three other commercially important species of the Gulf, viz:- the banana prawn, P. merguiensis and the endeavour prawns, Metapenaeus endeavouri and M. ensis. The nursery area requirements of the two tiger prawns, therefore, can also be related to the requirements of these other important species.

STUDY AREA

The Weipa region of the Gulf was chosen for the study mainly because it provided a wide range of habitats which were suitable as juvenile prawn nursery areas. It is also one of the only areas in the Gulf where the five important commercial prawn species occur together both in the offshore fishery in Albatross Bay and in the coastal nursery areas. The Bay is fed by three main river systems all of which contain mangrove-mud habitat, sea-grass meadows, wide intertidal mud banks, shell grit channels and banks which support large numbers of juvenile prawns. The Embley River (Figure 1) was chosen for more intensive study and sampling was carried out on four main habitat types (Figure 2).

SAMPLING

A variety of small beam trawls were used to sample the juvenile prawns from September 1981 to September 1982. To provide reliable estimates of prawn abundances on any day of sampling, samples were taken every two hours over a 24h period and the maximum number taken during the period was used to estimate the relative number of prawns. This procedure was repeated on alternate spring and neap tides (every three weeks) throughout the course of the study. Additional sampling on six other habitat sites, weekly plankton sampling for incoming postlarvae and set net sampling to monitor the offshore migration of older juvenile prawns was also carried out.

RESULTS

1. Catchability Cycles of Juvenile Prawns

Both juvenile green tiger prawns, P. semisulcatus, and juvenile brown tiger prawns, P. esculentus were more catchable at night than during the day. The time of the night when maximum catches were made, however, was quite variable, e.g. peak catch of both species occurred around 2200-0000 on the 26/10/81 but occurred at 0400 on the 7/12/82 (Figures 3 and 4). These changes in catchability were related to changes in both the tidal stage and moon rise and set. Further analyses of these results are being carried out.

2. Habitat Requirements of Juvenile Prawns

The number of prawns of each species caught on the four main habitat types showed a very distinct habitat separation within the estuary (Figure 5). Over 90% of both species of tiger prawns occurred only on the seagrass area. Of the two endeavour prawn species, M. endeavouri was also restricted to the seagrass areas whereas M. ensis ranged across all habitat types and showed few preferences. Banana prawn juveniles were also very restricted in their range, this species preferring the mud-mangrove habitat of site 4 (Figure 2).

Differences in salinity and temperature of the four sites were very slight, and it appears that the presence or absence of vegetative cover was the most important factor influencing the distribution of juvenile prawns in the Embley River estuary. Our additional sampling showed that tiger prawns also used other vegetative areas including algal beds as nursery areas. In other areas of the Gulf where vegetative cover such as seagrass is not available, postlarval tiger prawns enter the estuarine areas but do not settle or survive to become juvenile prawns.

Seasonal Occurrence

Both P. semisulcatus and P. esculentus recruit into the nursery areas of the Embley River twice each year. One pulse of postlarvae was recorded just prior to the wet monsoon season (October-November) while the other occurred post-monsoon (April-May) (Figures 6 and 7). Approximately equal proportions of the two species occurred in the estuary, although P. semisulcatus predominates in the offshore commercial fishery. The two endeavour prawns used the estuary as a nursery area only once during the year (Figures 8 and 9). M. endeavouri numbers increased from November and reached a peak in December, whereas M. ensis reached its peak numbers in February. Thus, although all the commercial prawn species use the Embley River as a nursery area, they are not all present in the area at the same time of the year. Both species of tiger prawns, however, were remarkably similar.

Tiger Prawn Life History

Redfield (1983 ms) reports that the two species of tiger prawns in the Albatross Bay region show different patterns of spawning. Both species have a high spawning activity in late winter and early spring (August-October) but the spawning of P. esculentus drops off throughout the whole summer period and does not increase again until April and May. In P. semisulcatus, on the other hand, spawning continues throughout the year with slightly decreased spawning activity only in March, April and May. The seasonal pattern of juvenile occurrence in the nursery areas did not reflect either of these spawning patterns. As with many other penaeid prawn species, it is the environmental conditions and offshore currents which prevail during the larval migratory stage that determines the time when postlarvae reach the coastal nursery areas. It is interesting to note that in the western Gulf of Carpentaria (Groote Eylandt), our preliminary studies have shown that both species of tiger prawns enter the nursery areas only during the spring months (September-October).

The main period of recruitment from the nursery areas to the offshore fishery has been reported to be in January for both species. This peak recruitment period corresponded to the time of disappearance of spring juvenile tiger prawns from the estuary. A second but smaller recruitment into Albatross Bay also occurred during winter, and can be linked to the autumn nursery area prawns.

The life history of tiger prawns in the Weipa area is therefore complicated by having two generations of prawns spawned and recruited back into the fishery each year.

CONCLUSIONS

1. Juvenile phase of all commercial prawn species studied in the Weipa region of the Gulf of Carpentaria exhibited very definite cycles of catchability, in response to changing day/night and tidal cycles. Sampling strategies can now be adopted which will minimize sampling effort for maximum information return.

2. Both species of tiger prawn (Penaeus semisulcatus and P. esculentus) and one species of endeavour prawn (Metapenaeus endeavouri) use only the vegetative areas of the estuary (such as seagrass meadows) as nursery areas. Any protection of these areas, therefore, will act effectively for all these species.

3. The young postlarvae of both species of tiger prawns immigrate into the estuary during the pre-monsoon season (September-October) and again after the monsoon (March-April). Endeavour prawns utilize the estuary during the monsoon months.

4. The main period of recruitment from the nursery area to the offshore fishery occurs in January and consists mainly of juveniles which originated from the late-winter, spring spawning. Juveniles which immigrated into the estuary in autumn appear to recruit more gradually back into the fishery over the winter months.

5. Preliminary results obtained from other areas of the Gulf suggest that the life history pattern of tiger prawns differs between different regions of the Gulf. Differences in times of spawning, times when nursery areas are being used and times of recruitment of prawns into the fishery have all been noted. Further work planned by Queensland Fishery Service, Northern Territory Fisheries and CSIRO Division of Fisheries Research should provide a much broader view of the basic life history of tiger prawns and also help explain the geographic differences. These regional differences have obvious implications for management in terms of timing of closures and limitation of fishing effort in the Gulf as a whole.

REFERENCES

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SUMMARY OF EXPENDITURE

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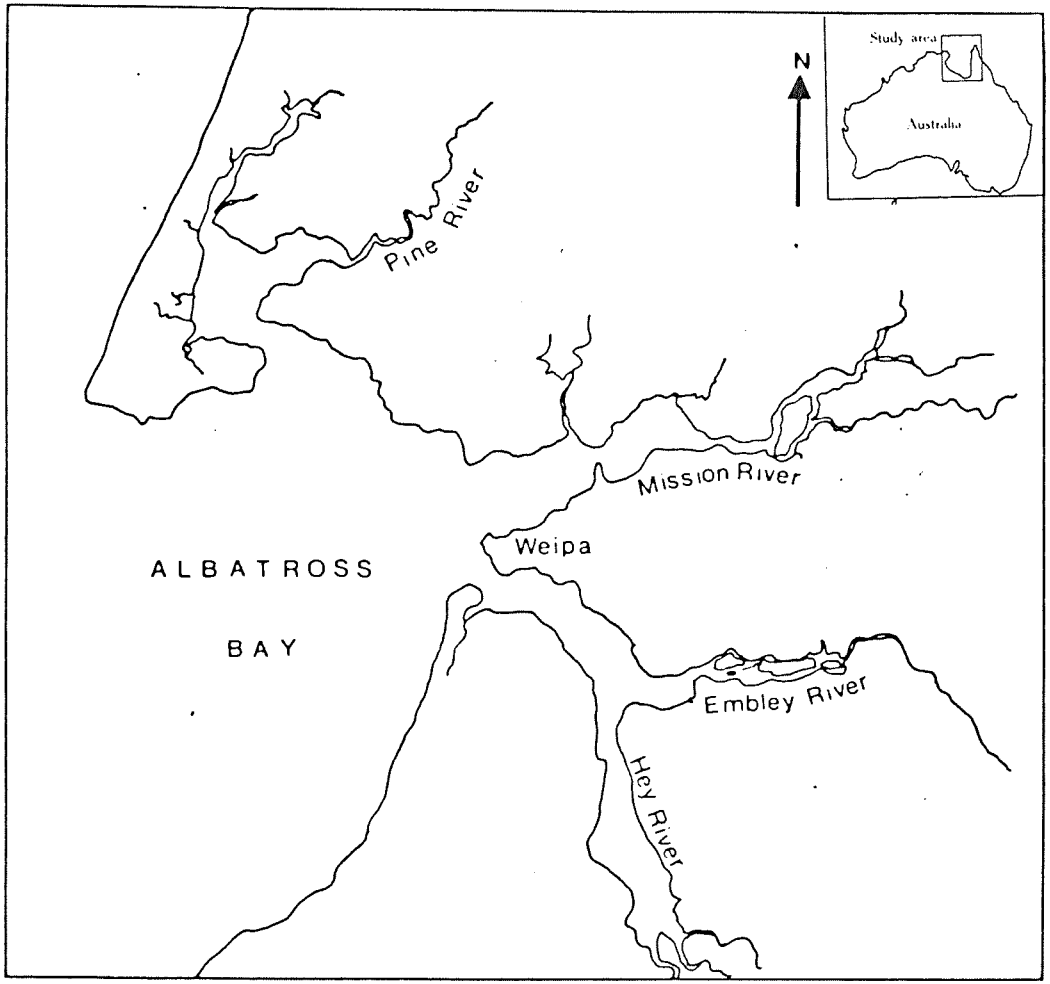
Overtime	14.0	5.6	14.0	5.6
Travel	29.5	8.9	28.9	8.8
Equipment	8.9	-	8.9*	-
Maintenance and Computing	29.5	7.25	30.0	7.3
TOTAL	89.4	26.85	89.60	26.75

* Equipment remaining after the completion of the project includes 1x5 m Quintrex Aluminium boat plus 2 x 70 h.p. Johnson outboard motors.

Permission is requested to either trade the boat or sell the boat to replace with a slightly smaller vessel suitable for sampling from R.V. Karen during CSIRO's FIRTA project on tiger prawns at Groote Eylandt.



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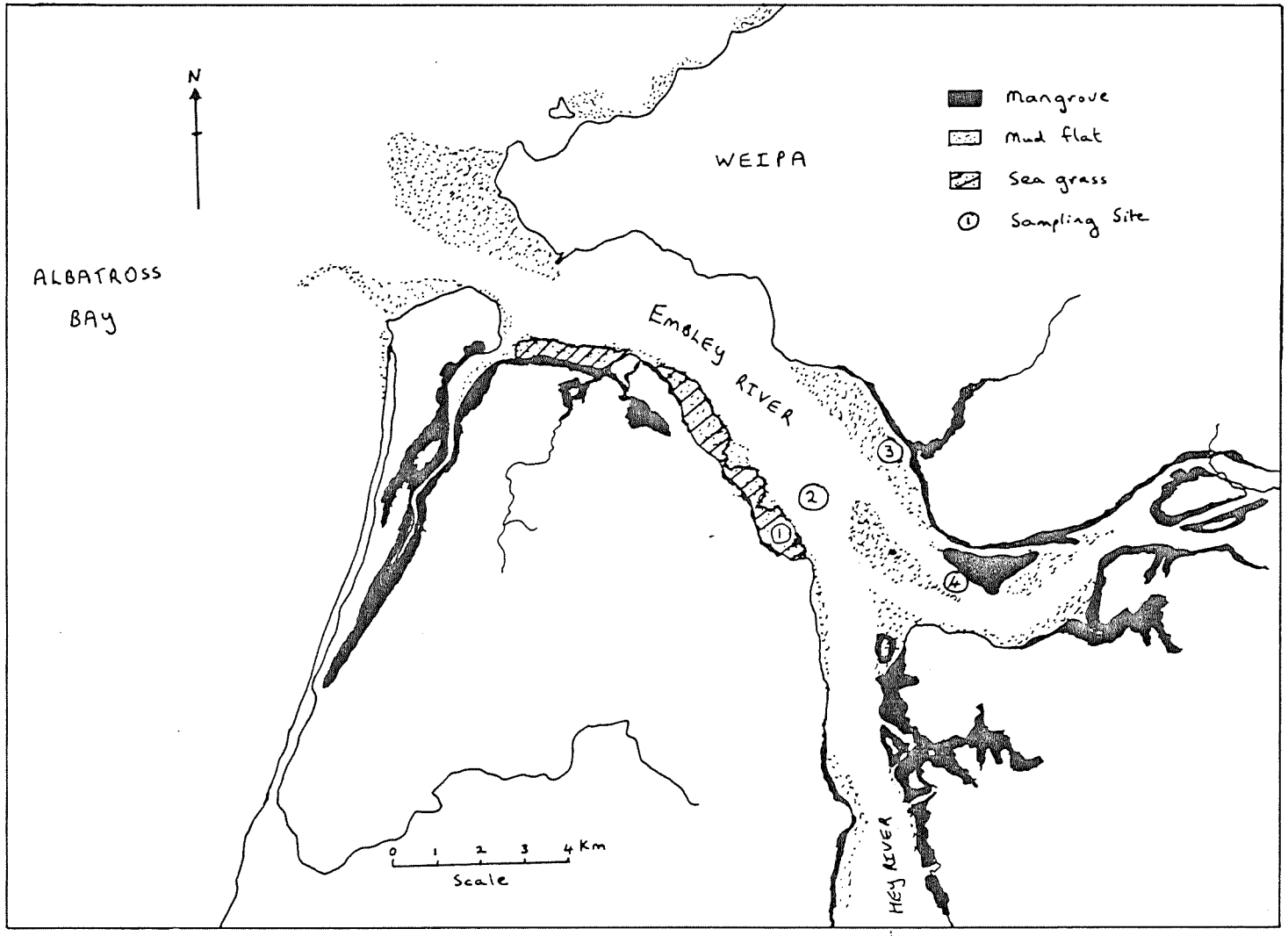


Figure 2. Map of Embley River estuary showing the four main habitat types (seagrass, open channel, bare mud and mangrove-mud) sampled for juvenile penaeid prawns.

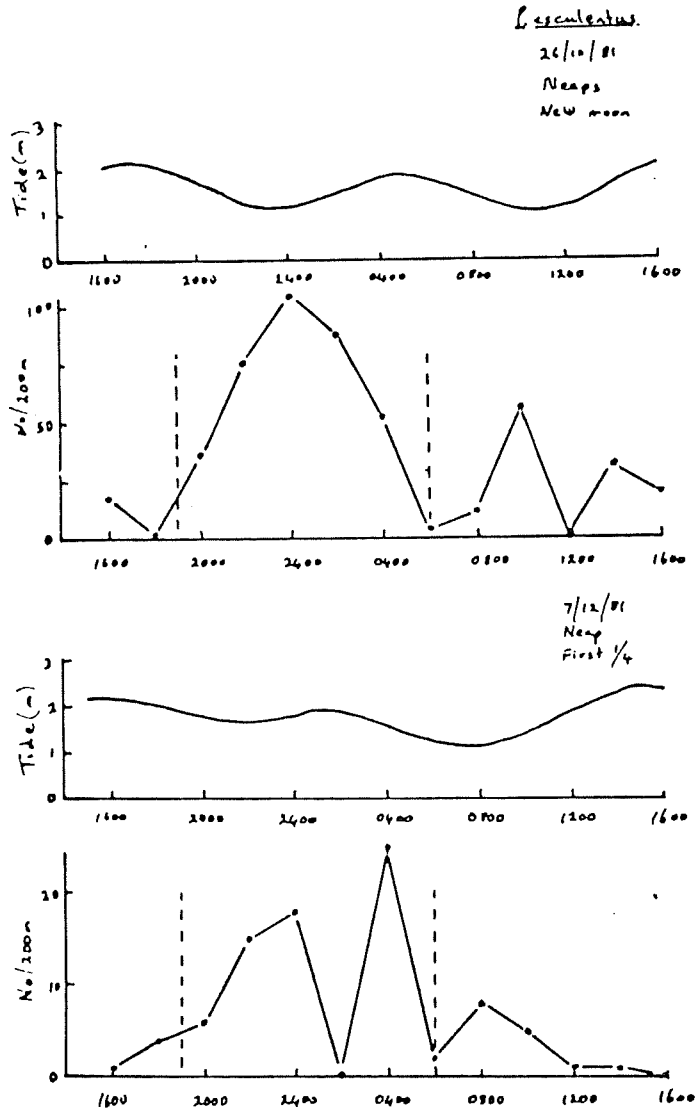
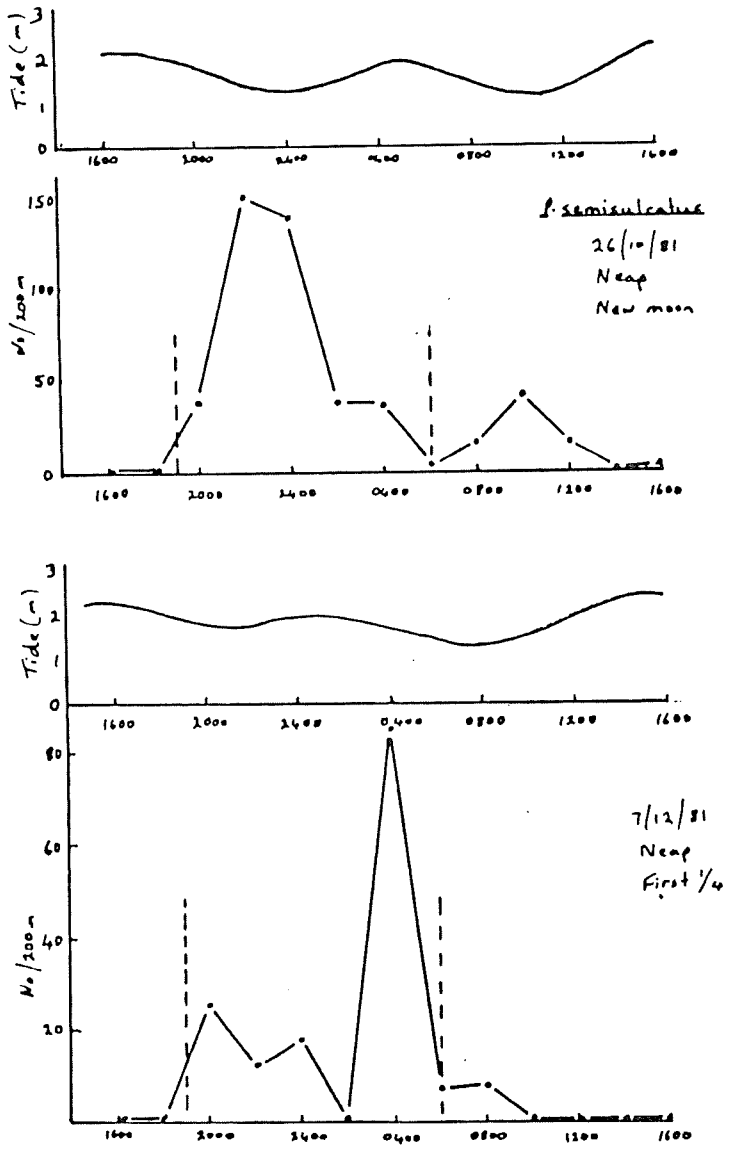


Figure 3. Catchability of juvenile tiger prawns, Penaeus esculentus, (expressed as number of prawns caught per 200 m trawl) over two 24-hour periods sampled during 1981 (26/10/81 and 7/12/81). Dotted lines indicate dawn and dusk, while solid unbroken lines show tide height.



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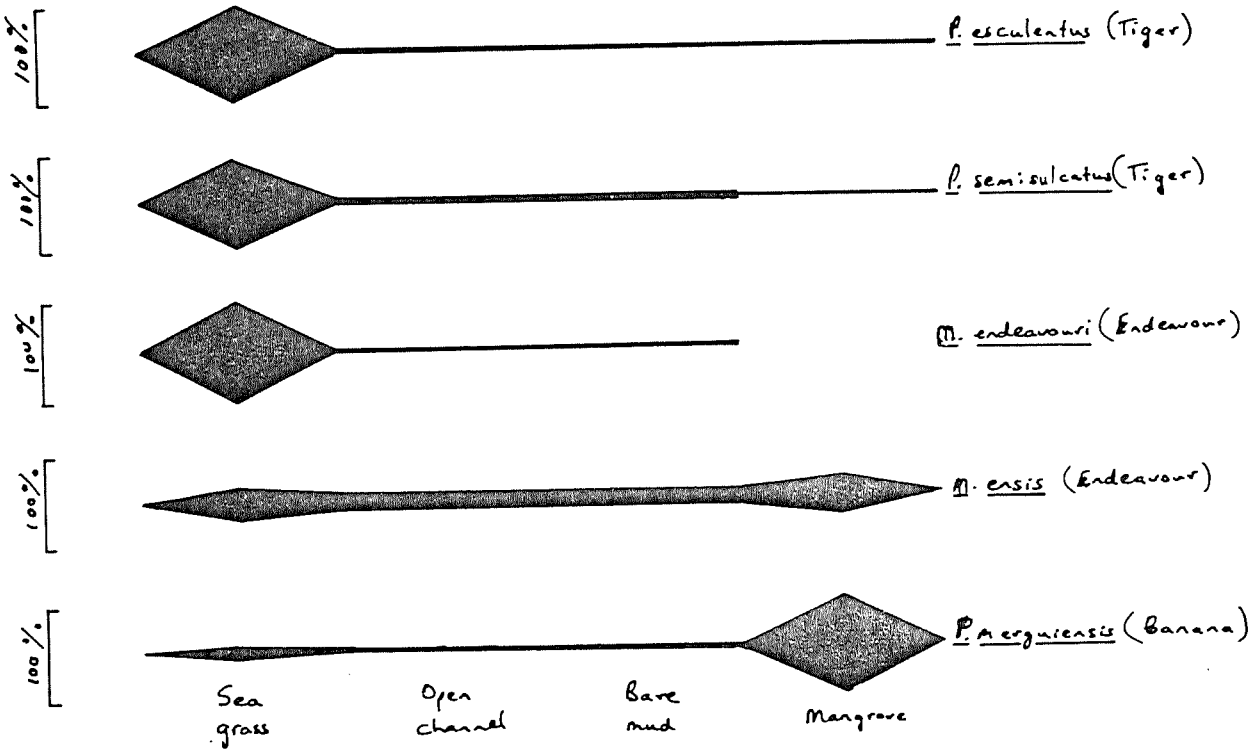


Figure 5. Percentage distribution of the juvenile stage of five species of commercial prawns in four habitat types in the Embley River estuary.

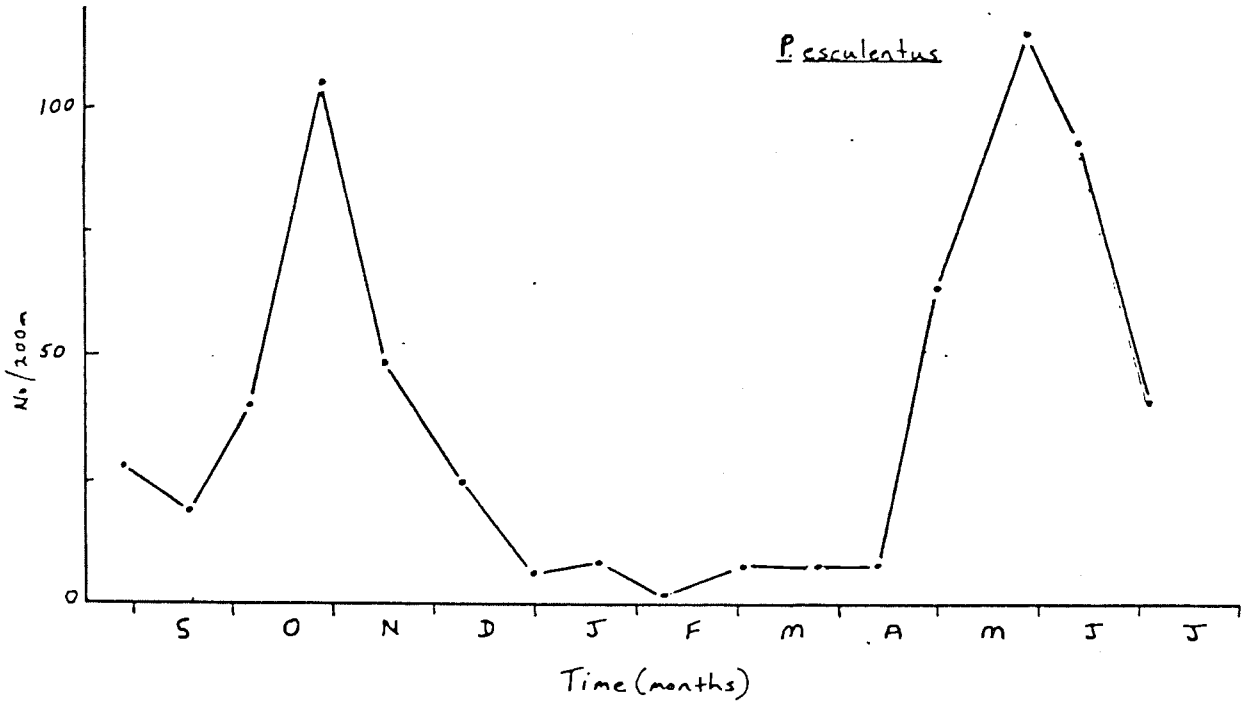
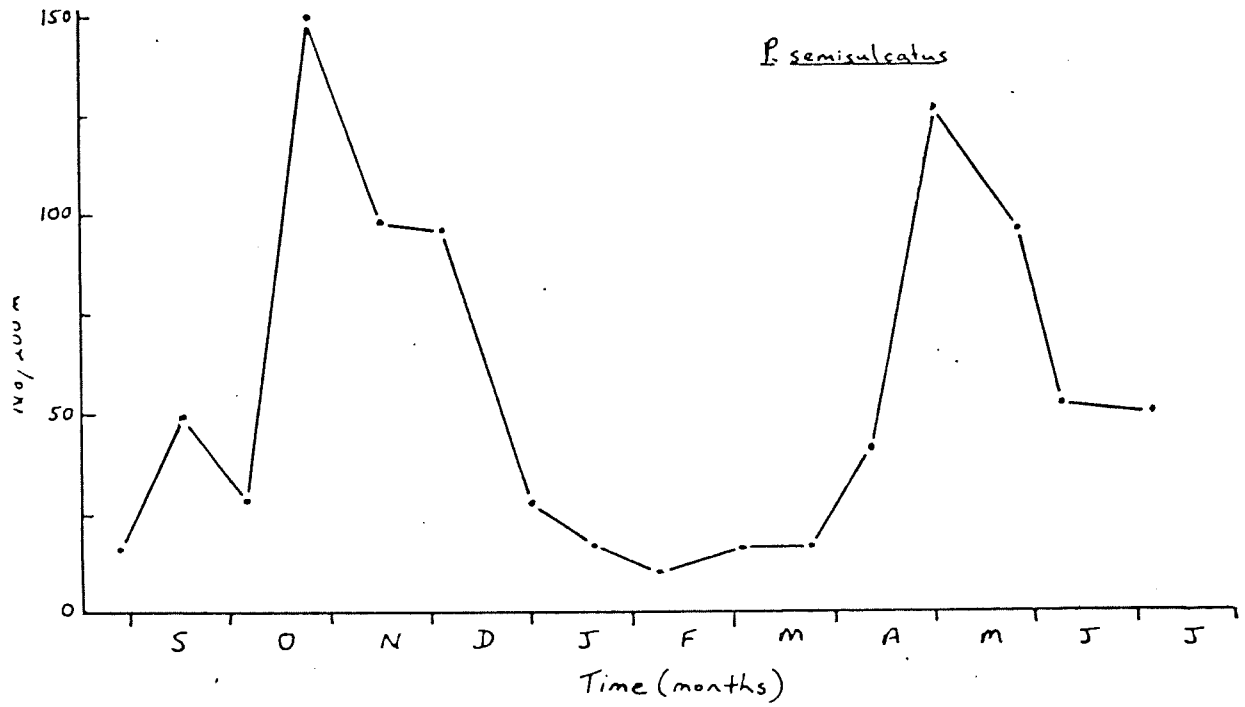


Figure 6. Seasonal cycle of occurrence of the juvenile tiger prawn, Penaeus esculentus, in the Embley River estuary.



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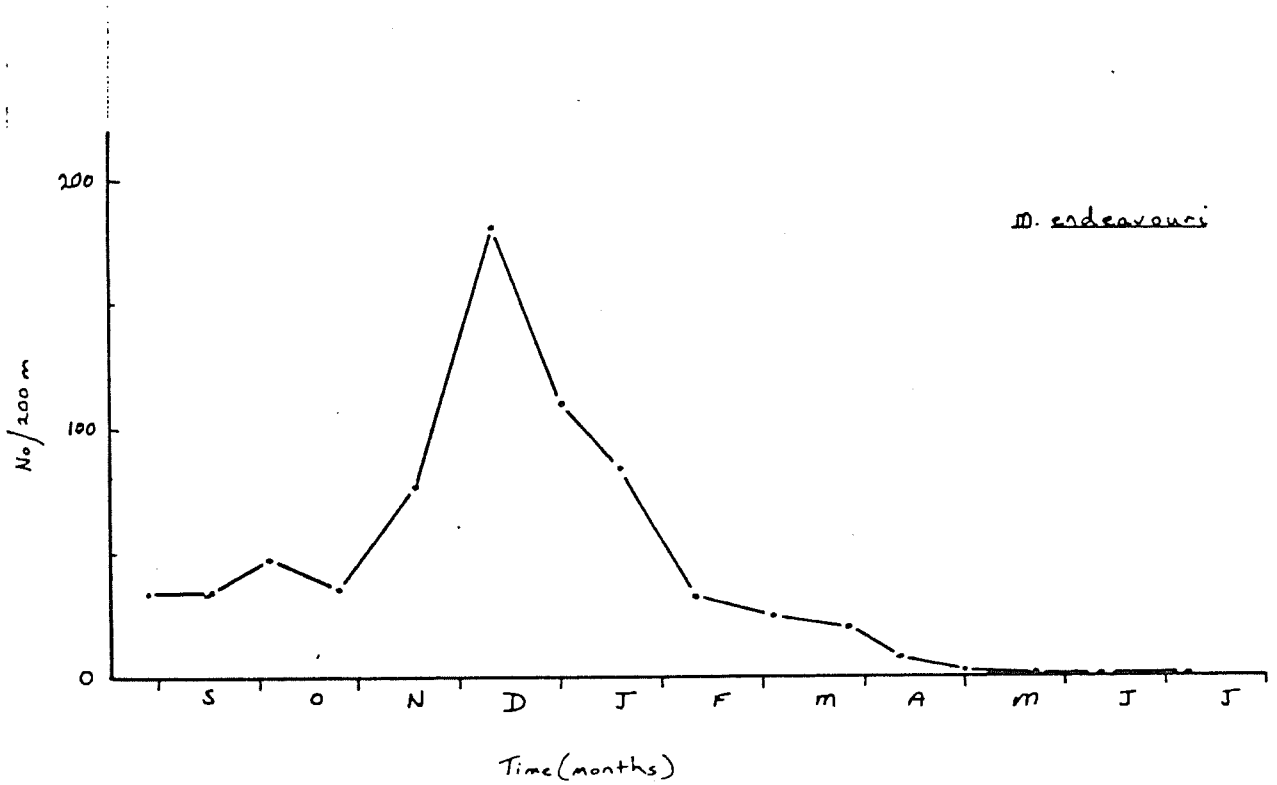

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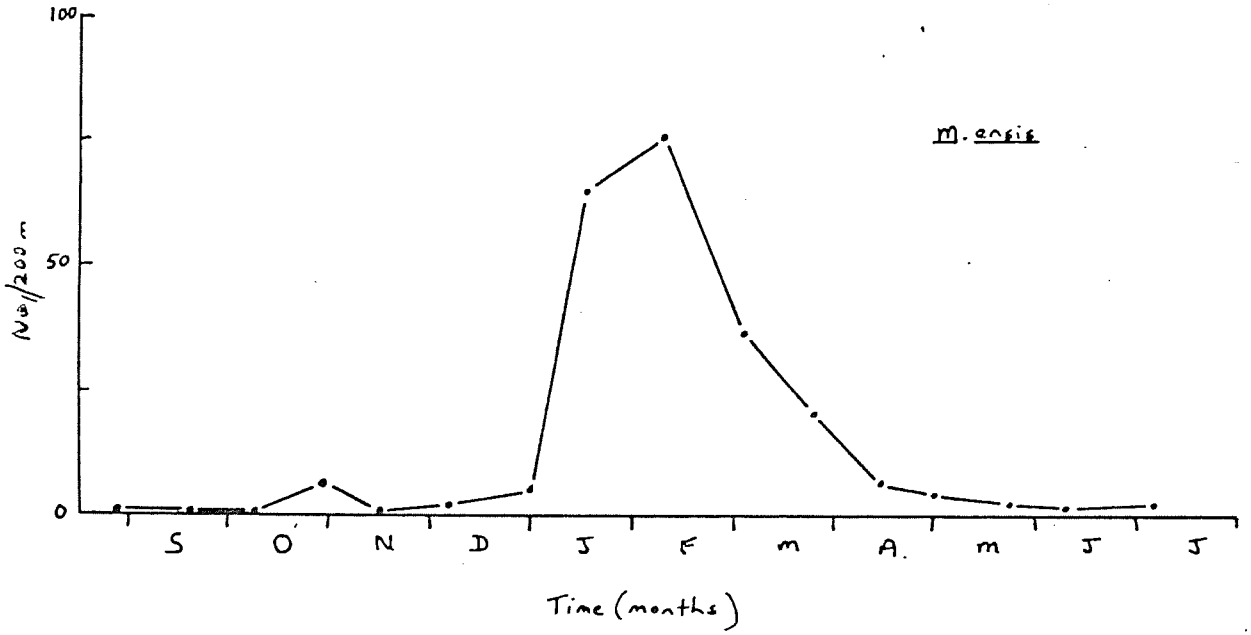

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87

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Briefing note F93.

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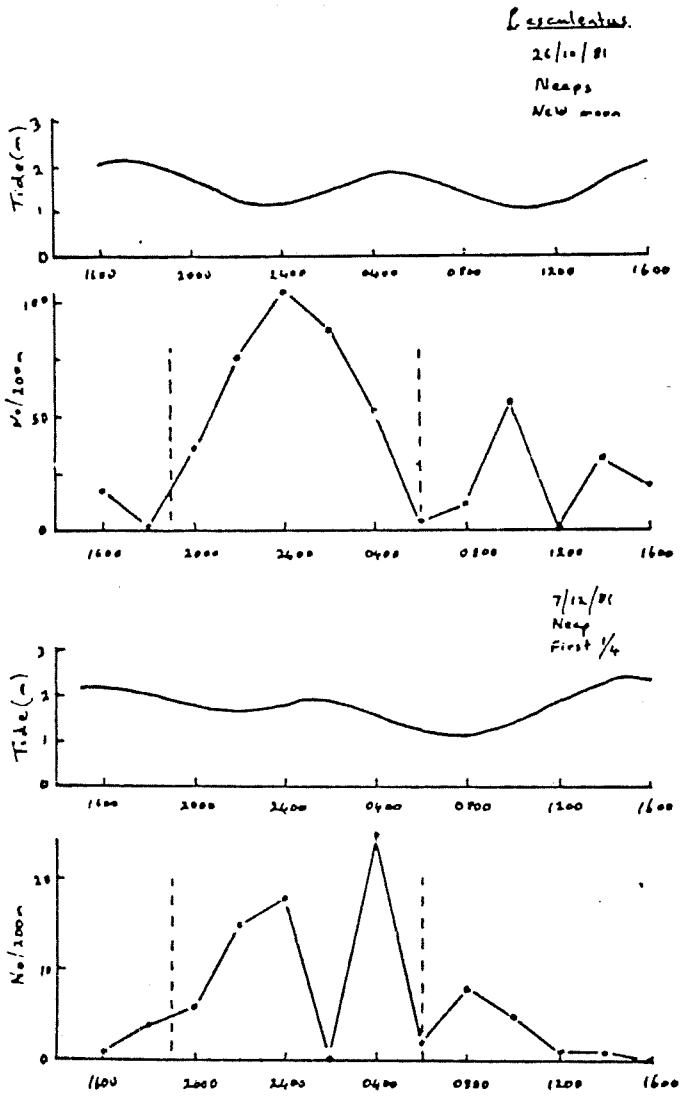

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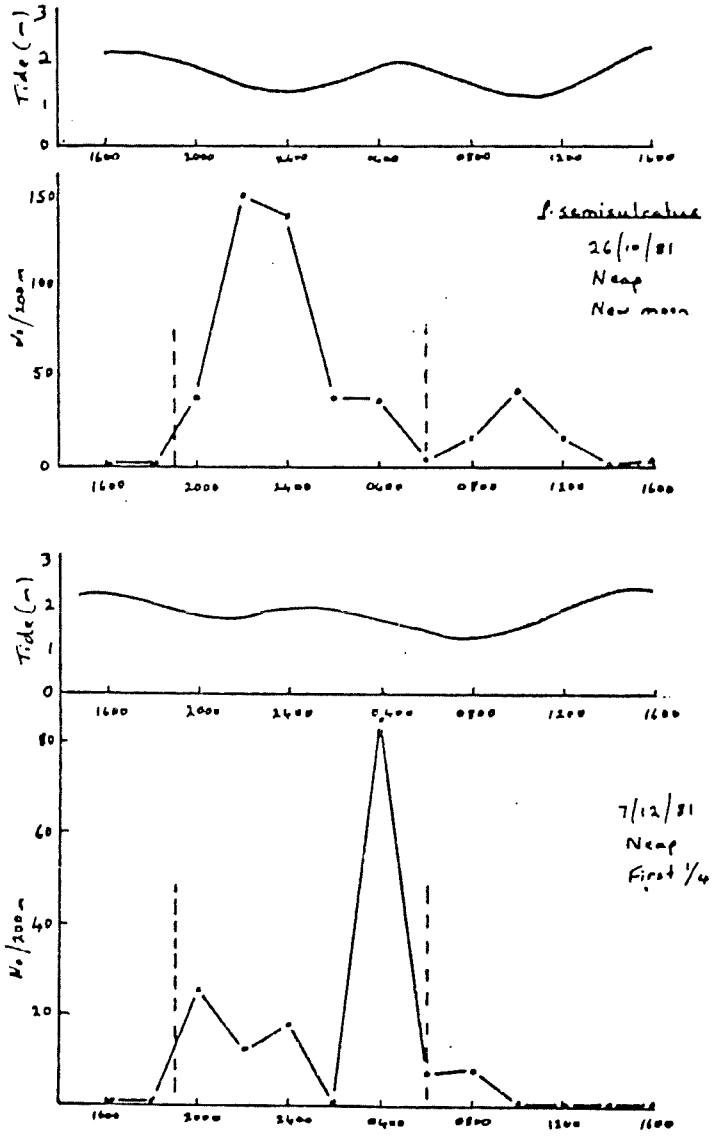

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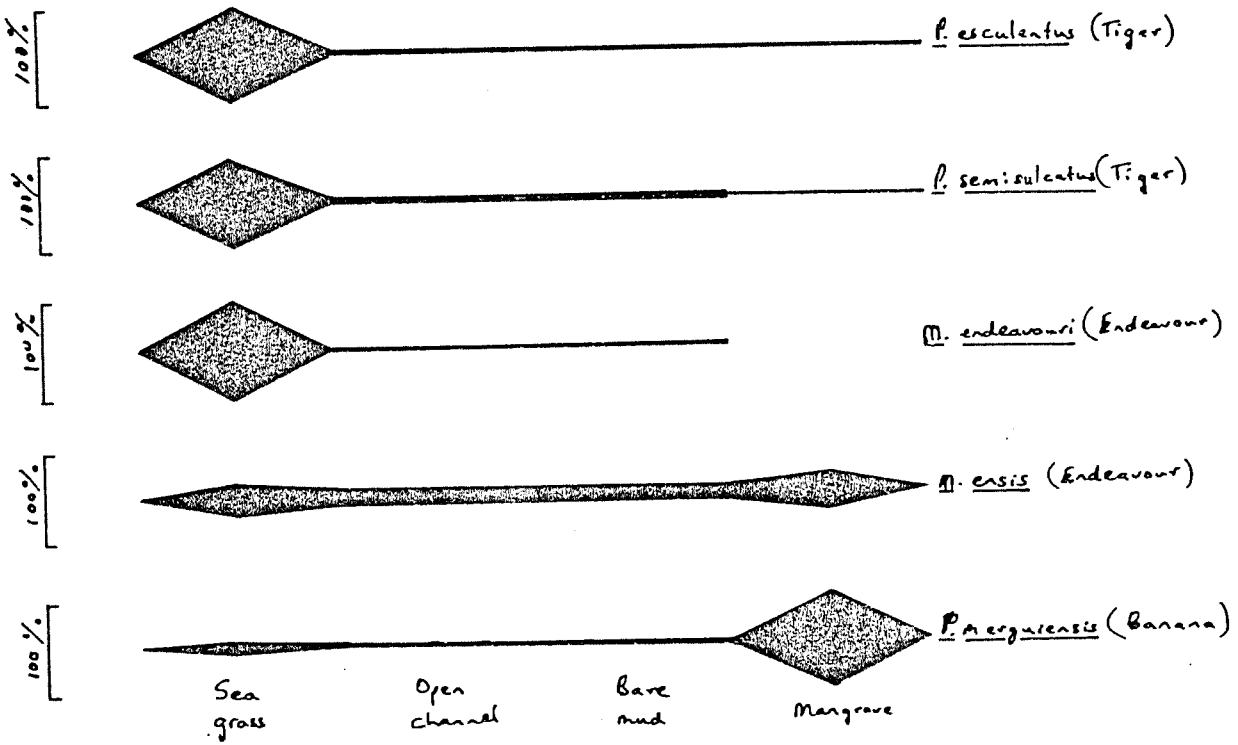

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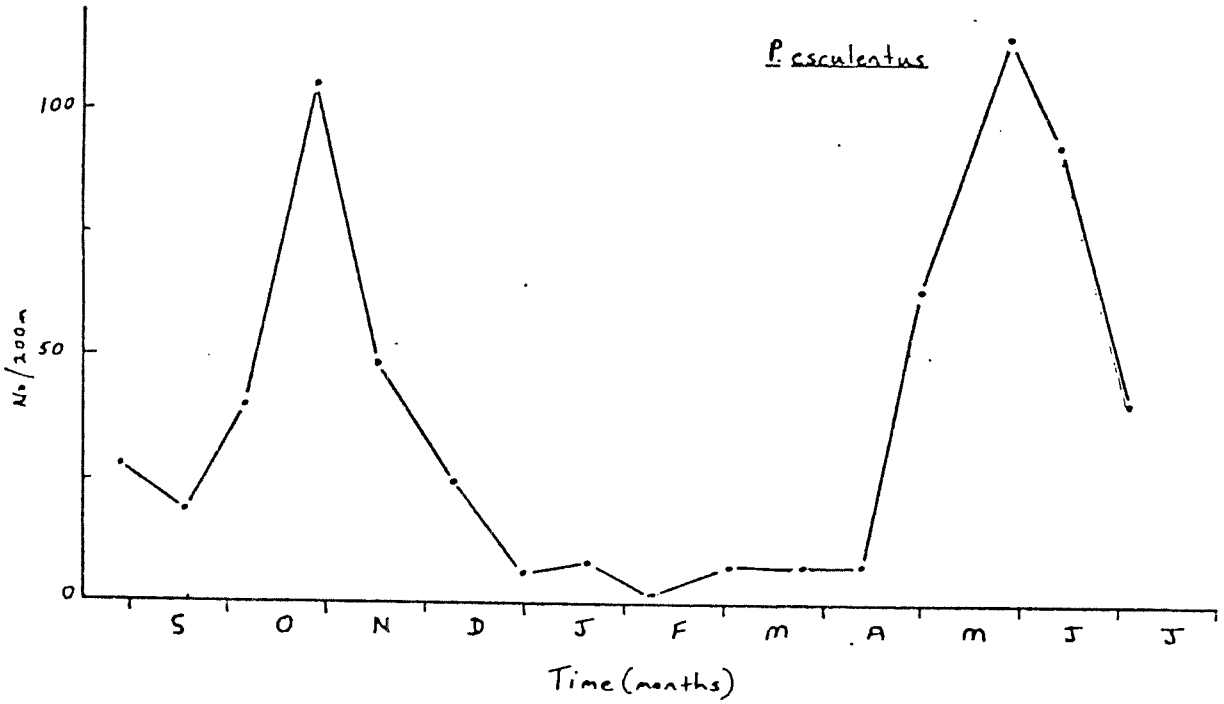

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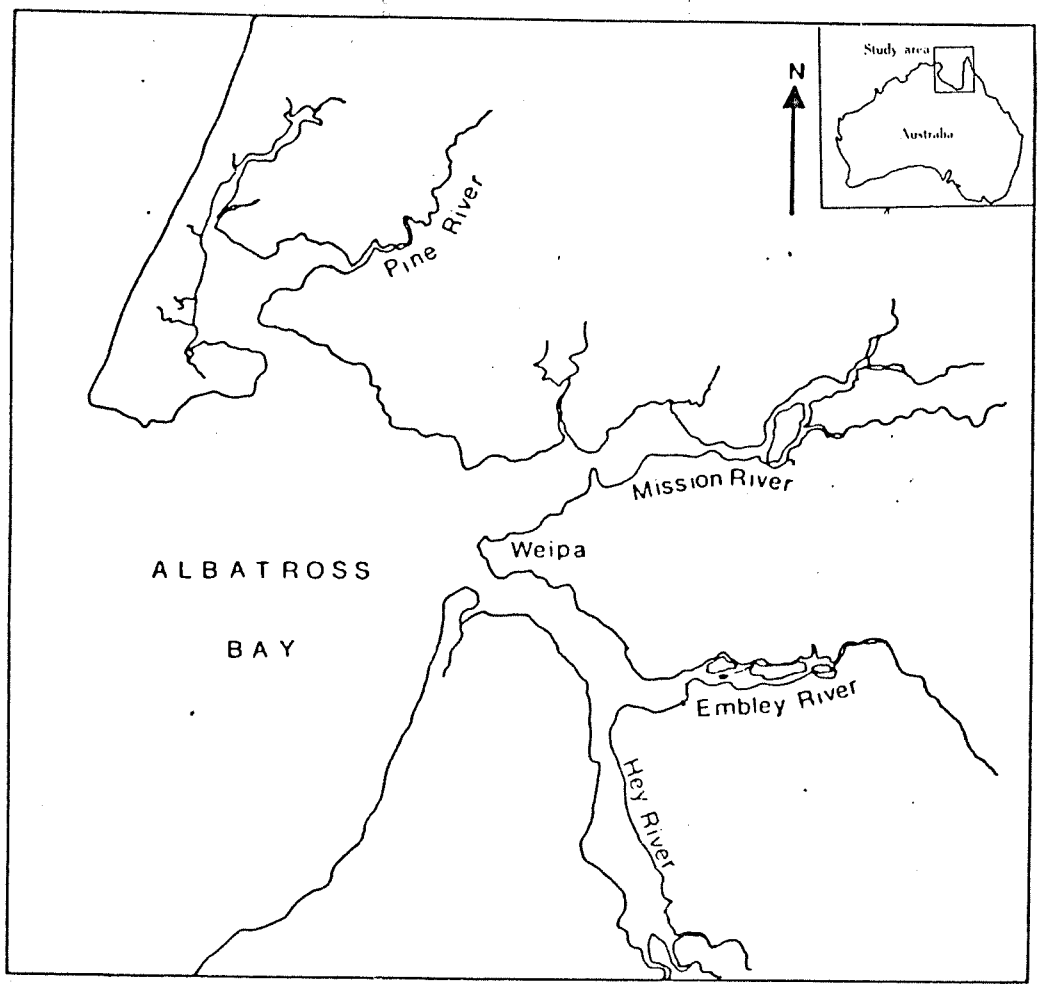

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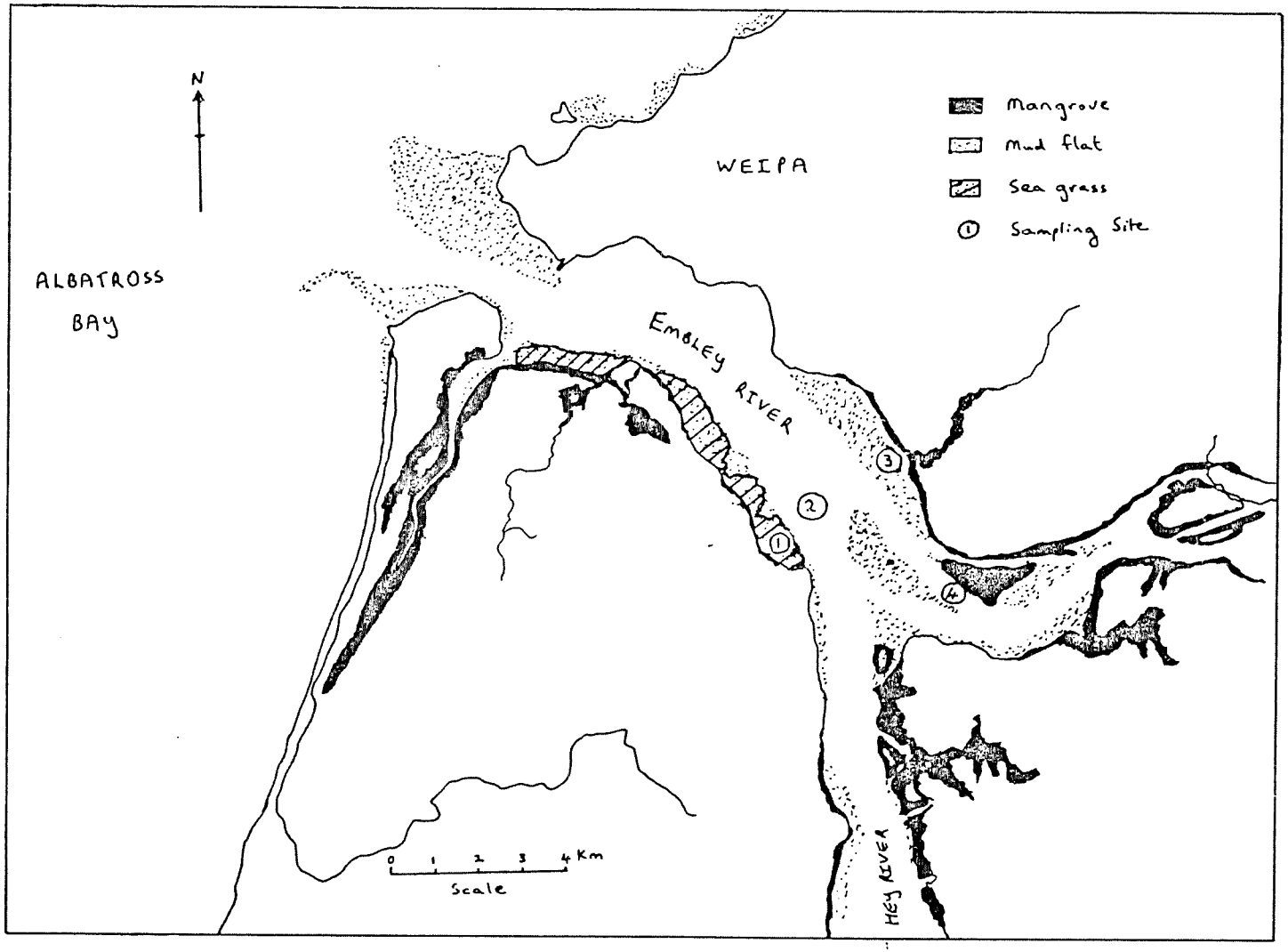

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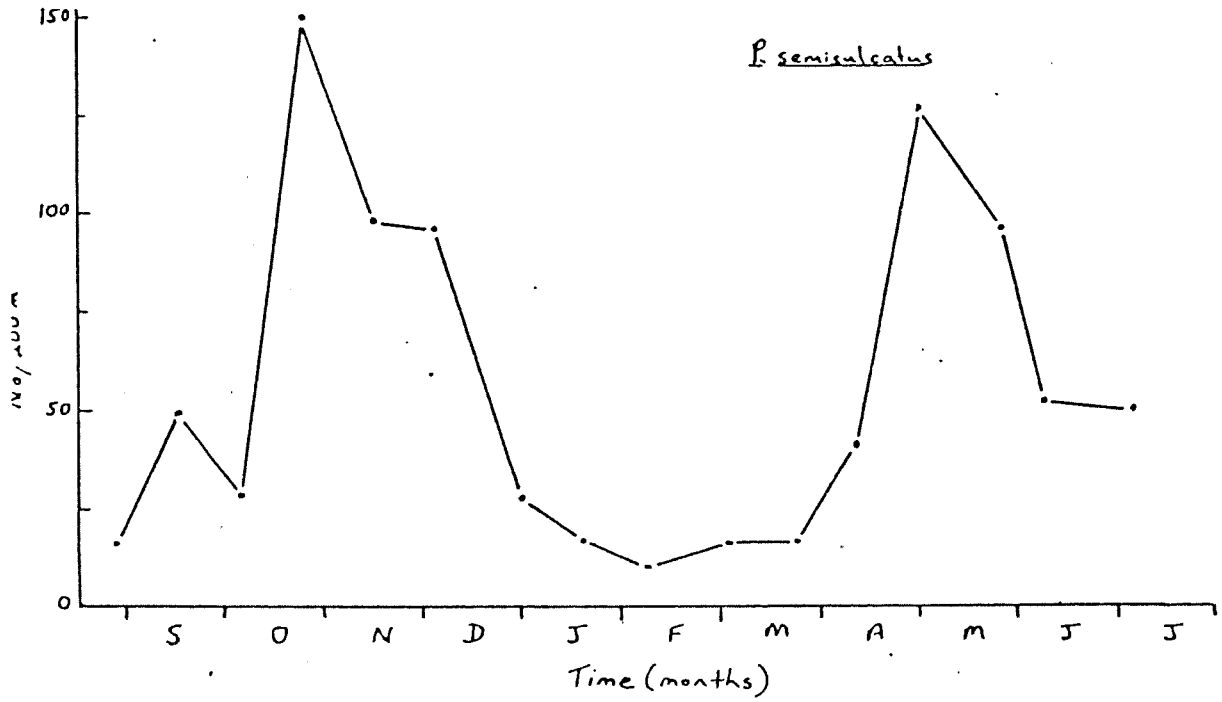

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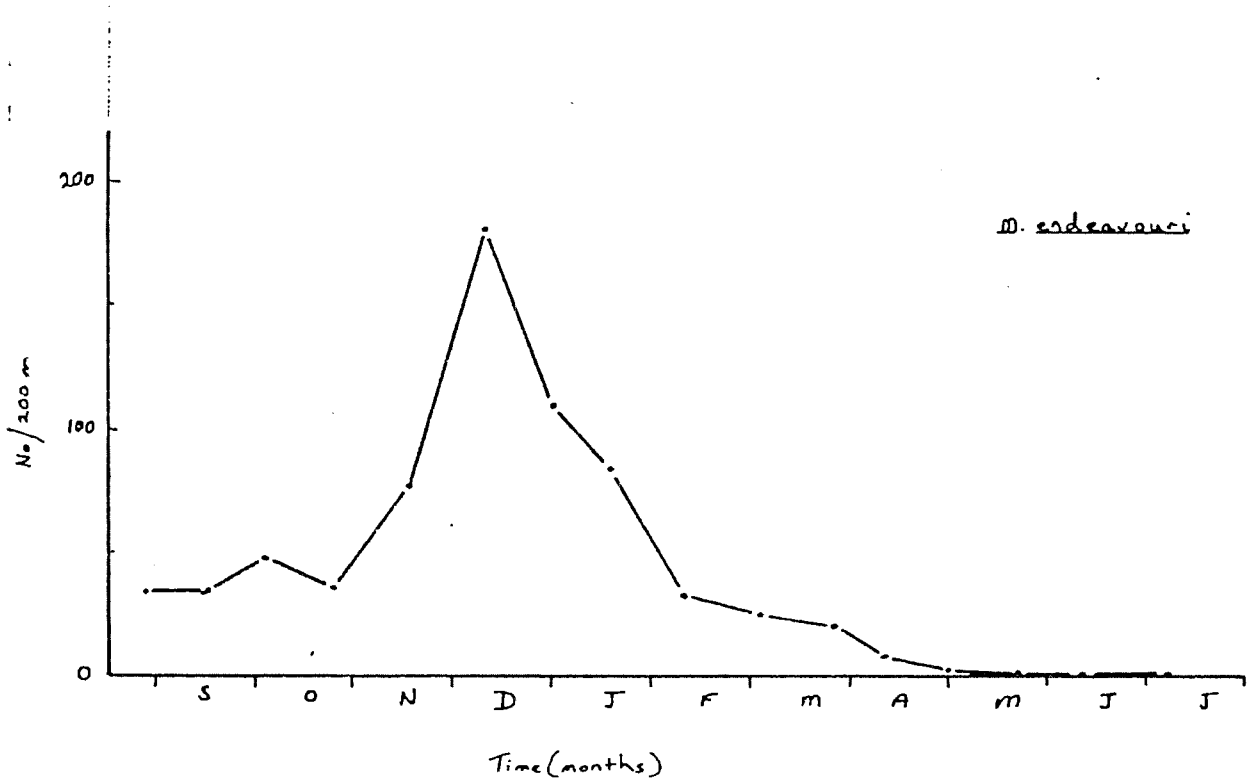

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