ON THE MARKING OF FRESHWATER PRAWN, *MACROBRACHIUM MALCOLMSONII*, IN RIVER GODAVARI

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**ABSTRACT**

Marking with the use of biological stain, Trypan blue, as an aid in determining the mark retention period, mark recapture technique and the behaviour of the prawns in general, has been conducted on the freshwater prawn *Macrobrachium malcolmsonii* of River Godavari.

The period February—March has been found to be the most suitable period for marking prawns in the river. The chief observations from the study are: (1) occurrence of recaptures close to the release spot and recoveries from cast net indicating shoreward movement to shallow waters, (2) recovery of predominant numbers within a week after marking and (3) absence of any homogenous trend in the pattern of migration among the prawns marked.

The maximum travelled distance of a marked prawn was 17 km and the percentage recaptures varied from 2.77 to 24.2 in the different experiments. The total period of mark retention was 75 days.

Marking with the use of biological stains as an aid in determining growth, migrations and fishing mortalities in prawns and shrimps has been gaining considerable importance in recent years (Macrae, 1952; Menzel, 1955; Racek, 1955; Dawson, 1957; Costello, 1959, 1961; Costello and Allen, 1959, 1961; Iversen and Jones, 1961; Kutkuhn, 1962, 1963 and Ranade, 1967). This method permits quick handling of a number of prawns at the same time and permits easy recognition of those recaptured. Dawson's (1957) study on marking of commercial shrimp is an invaluable work on the methodology, and provided the necessary guidance for a preliminary study.

The prawn fishery of River Godavari consists predominantly of one species (*Macrobrachium malcolmsonii*, H.M. Edw.) and is concentrated in two particular regions, (i) Rajahmundry-Tallapudi and (ii) Dummagudem, in a river stretch of 188.8 km, lying between two anicuts (Ibrahim, 1962; Rajyalakshmi and Ranadhir, 1969). These two areas were, therefore, chosen for marking trials during 1967 in order to study (i) the mark recapture technique, (ii) the retention powers or the durability of the stain in fast flowing fresh waters and (iii) behaviour of the marked
prawns in general. This preliminary study has been initiated also with a view to obtaining basic data required for designing large-scale marking trials using size-graded prawns, for studying behaviour patterns and assessing fishing mortalities.

**MATERIAL AND METHODS**

No size-gradation of prawns has been done in the present experiments. The analysis of data, therefore, pertains only to the short-term movements and recapture of aggregate size-groups.

Three stains, Trypan blue, Fast green FCF and Methylene blue were used in laboratory experiments and only Trypan blue in field trials. Distilled water was used as a solvent for all the three stains. The methods followed in these investigations, the injection technique etc., are as detailed by Dawson (1957). The prawn is held in left hand, the tail (abdomen) bent at the 4th and 6th segments and the needle inserted through the articular membrane between the tergum of one segment and the following, slightly to one side of the mid-dorsal line. A volume of 0.03 ml to 0.05 ml of 1% solution was generally injected. In a few prawns an immediate and slight shock resulted which lasted for a few seconds. Subsequently, the prawns became suddenly active and normal and attempted to hide.

**LABORATORY EXPERIMENTS**

A number of laboratory experiments preceded the field trials and in the majority of them, Trypan blue was used. The stain proved to be quite fast and easily distinguishable. After injection of the dye the entire body of the prawn, both cephalothorax and the abdomen, was stained deep blue. Within 4-6 days, however, the colour faded and the blue colour was then noticed clearly on the branchiae of the prawn and was sufficiently distinctive for nearly 10 weeks. The laboratory trials were all towards testing staining characteristics. However, a few controls were also established in each test by releasing equal number of unstained and stained prawns into the same cement cisterns. We could not establish any higher rate of mortality in the stained prawns. Other stains used in the laboratory designs, without any controls, were Fast green FCF and Methylene blue. The latter, however, did not appear to be satisfactorily retained. In marking experiments using Fast green FCF, an immediate pale green colour spread over both the cephalothorax and abdomen, but faded rapidly within an hour. A concentration was evident in the heart and branchiae, lasting for a period of 4 hours, after which fading occurred in the region of heart, but the pale green colour continued to be retained in the branchiae. The total period of retention is being investigated.

The prawns used in these experiments were in the carapace length range of 17 mm (total length 65 mm) to 36 mm (total length 120 mm), of both sexes. An average of 200 prawns could be injected in an hour.
MARKING EXPERIMENTS IN THE FIELD

During 1967, a total of 1800 prawns (Table 1) which were above 75 mm in total length (20 mm carapace length) and were hard (not moulted 5-6 weeks prior to marking) was injected and released in the fishing grounds of Dummagudem and Tallapudi. The experiments were carried out in the months of April and May i.e., prior to the onset of main maturing and breeding season (June to September) and in the middle of the fishing season (which usually lasts from December to June). Distance from the prawn release centre at Dummagudem to the release centre at Tallapudi is about 172 km.

Experiment 1. Centre—Dummagudem

On 30th March and up to 3rd April, 1967, 200-250 live prawns were collected each day by accompanying the cast-net fisherman on his boat. The prawns after being carried to shore were injected with Trypan blue and held in observation tanks filled with water for a short period. Later, all active prawns were released into the river.

In this experiment, 92 out of 1175 prawns died immediately after injecting the dye. The mortality could be due to improper injection, viz., either over-injection incapacitating the prawn, or the prawns could have been injured in capture and, therefore, were unfit for marking. In the subsequent experiments although attempts have been made to keep down this mortality, probably due to the method of capture, (by cast-nets) 6-7% of the marked prawns were dead before release.

Experiment 2. Centre—Tallapudi

At Tallapudi fishing centre, 67 prawns were collected from cast-net fishermen on 25-4-1967 at about 6 A.M. These were immediately injected with Trypan blue and released into a cloth hapa fixed in water near the shore of the river. Injected prawns were of both sexes in the total length range of 75 mm to 100 mm. By 5 P.M., five of the marked prawns died in the hapa and the remaining active ones were released into the river near the shore.

On 26-4-1967, 106 prawns of 65 mm to 100 mm length were injected at 6 A.M. and 8 prawns of considerably large sizes, of 100 mm to 120 mm total length, were marked at 2.30 P.M. About half an hour later, these marked prawns were transported in a boat and released in the midstream. Only three prawns died in this batch.

Experiment 3. Centre—Tallapudi

About 824 prawns in the size-range of 75 mm to 120 mm were collected from 4 A.M. to 6.30 A.M. on 9-5-1967 and 10-5-1967. They were injected by about 7 A.M. and released in the river at 2.30 P.M. 154 prawns were dead before release. This was the maximum number of deaths recorded in these series of trials (Table 1).
<table>
<thead>
<tr>
<th>Period</th>
<th>Centre</th>
<th>Total prawns marked</th>
<th>Mortality before release</th>
<th>Recapture</th>
<th>% Recapture</th>
<th>One week</th>
<th>10 days</th>
<th>30 days</th>
<th>45 days</th>
<th>77 days</th>
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</thead>
<tbody>
<tr>
<td>Experiment 1</td>
<td>30 March — 3 April '67</td>
<td>Dummagudem</td>
<td>1175</td>
<td>92</td>
<td>30</td>
<td>53.3</td>
<td>13.3</td>
<td>13.3</td>
<td>16.7</td>
<td>3.3</td>
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<td>Experiment 2</td>
<td>25-26 April '67</td>
<td>Tallapudi</td>
<td>181</td>
<td>8</td>
<td>3</td>
<td>67.0</td>
<td>33.0</td>
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<td>Experiment 3</td>
<td>9-10 May '67</td>
<td>Tallapudi</td>
<td>824</td>
<td>154</td>
<td>20</td>
<td>100.0</td>
<td>—</td>
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<td>(18.6%)</td>
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**Note:** a) -do- b) about 17 km downstream.
Recapture

Experiment 1

The first experimental area was found more suitable for observations on recapture due to its proximity to the laboratory and the presence of the anicut across the river, which restricted the prawn movements. The river at this region is quite narrow; the river bed is sandy interspersed with boulders. The cast-nets yielded most of the recaptures.

The recapture of marked prawns occurred over a period of 75 days in this centre. Two floods of minor magnitude occurred in the river, between the date of release and the date of latest recapture, resulting in marked changes in the temperature and turbidity of water. Despite this, of the 30 prawns recaptured, 29 were from a radius of one mile (1.6 km) from the point of release and one was captured at a distance of half a mile above the barrier.

Experiments 2 and 3

One large prawn of a total length of 120 mm was recaptured on 7-5-1967 at Rajahmundry, at a distance of 17 km from release spot in a cast-net, 12 days after release. This was the only instance of recovery in the present series of experiments at such a distance, the direction of movement being downstream.

Large numbers of the marked prawns were reported to have been brought to Tallapudi market from cast-net fishing within 3 to 4 days of the two experiments conducted at this centre. However, continued examination of catches in the shore-seines (Jaruguvala) at intervals of 15 days revealed no marked prawns. The cast-nets generally fish in shallow waters and the reported recoveries from these nets were within 1-3 miles of the release point.

Discussion and Conclusions

The recaptures were relatively small. Thirty marked prawns (2.77%) were recaptured in the first experiment, and in the second and third together only 23 were recaptured. As shown in Table 1, maximum number of recoveries occurred within one week to 10 days of marking. The recoveries extended over a total period of 75 days at Dummagudem centre. The chances of recapture depended greatly on opportunity for examining commercial catches.

The time best suited for prawn marking in this river would be about February-March. The commencement of commercial prawn fishing makes available large numbers of live prawns besides which, the favourable temperatures, and four months of continued commercial fishing ahead, before the seasonal flood occurs in July, offer suitable conditions for marking and recaptures.

The observations on movement showed that greater numbers of recaptures were very close to the release spot and occurred within a week after marking. In
all the experiments it became obvious that there was no homogeneous trend in migration among the prawns marked. The prawns migrated in all directions, viz., towards shore and downstream and upstream, obviously in very slow movements. The notable instances were those of one prawn which negotiated the anicut in low-water level and moved a short distance of about half a mile upstream and a second one, which travelled 17 km downstream.

The recoveries were all from cast-nets, indicating greater intensity of shoreward movements towards shallow waters. Probably all the organic wastes released from the adjacent villages into the waters near the shores, attract the prawns for feeding.

More marking experiments are needed to understand the migrations of prawns. Attempts are being made to design experiments where the males or females might try to move towards a particular ground for breeding, and in the case of berried females, towards a particular area of the same ground. Experiments covering marking over different size ranges are also being designed for establishing mortality rates.

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REFERENCES


MARKING OF FRESHWATER PRAWN


