

## Biology of Mysids of the Great Bras d'Or

III. Dajus mysidis Krøyer (Isopoda, Dajidae) a parasite of Mysis.

by W. F. Blake

## Abstract

Dajus mysidis is parasitic on three species of Mysis from the Great Bras d'Or of Cape Breton Island - M. oculata, M. mixta, and M. stenolepis. The records from M. stenolepis represent a host extension for Dajus mysidis. The parasite, formerly recorded from female hosts, has been collected from males of Mysis mixta. This parasite, although not firmly attached to its host, is believed to be the cause of the retarded development of secondary sexual structures in parasitized individuals. Parasitized specimens by failing to mature, live longer and grow larger than normal individuals. One of the parasitized male M. mixta has oostegite-like structures developed at the bases of the penultimate thoracic appendages. It is suggested that these structures are not simple anomalies but have been developed in response to the presence of the parasite.

## Introduction

During the course of studies on mysids collected from the Great Bras d'Or of Cape Breton Island in 1951 and 1952, the isopod parasite Dajus mysidis was removed from the three species of Mysis found in that area, Mysis oculata (Fabricius), Mysis mixta Lilljeborg, and Mysis stenolepis S. I. Smith. The Great Bras d'Or station list and other collection data are presented in another paper (1). The life histories of the mysid hosts are considered elsewhere (2).

Giard and Bonnier (5) and Richardson (9) give records of the occurrence of Dajus mysidis. The following is a partial list

of synonymies.

Dajus mysidis Krøyer 1842

Bopyrus mysidum Packard 1867

Leptophryxus Mysidis Buchholz 1874

Dajus mixtus Giard et Bonnier 1889

Dajus mysidis Sars 1899

The records of Krøyer, Packard and Buchholz are for specimens parasitizing Mysis oculata. Sars (10) has recorded the parasite on Mysis mixta as well as Mysis oculata. Giard and Bonnier (4,5) did not see specimens from M. mixta but created a new species Dajus mixtus (4), since they had never encountered the same epicarid on two separate hosts even when these were closely related. Sars (10) rejected this principle of nominal species since no differences were detectable between the two forms and considered D. mixtus Giard and Bonnier, to be a synonym of Dajus mysidis. Scott (11) has recorded D. mysidis from the brood pouch of Mysis ornatus ( ?-Schistomysis ornata G. O. Sars), which if valid represents an extension of the host range of this parasite to another genus. Since no major work on the isopods has appeared since 1905, the position of this record would appear to be uncertain. Tattersall and Tattersall (13) make no mention of this record although it occurs within the range being considered.

Dajus mysidis is widely distributed (9) as would be expected from the distribution of its hosts. There appear to be no records of this species from M. mixta in the Baltic. There is only a single Canadian record of the parasite, that of Packard (8) from the Labrador (no locality given). Smith (12) has suggested that although Packard did not locate his records for Bopyrus

mysidum, nor state upon what they were parasitic, his notation with respect to the abundance of Mysis oculata would suggest that they came from that species. Harger (6) mentioned that this parasite had not been found south of Labrador, presumably alluding to the specimen(s) of Packard.

Sars (10) and Giard and Bonnier (5) have provided very full descriptions of Dajus mysidis at all stages together with very detailed figures.

Sars (10) describes the female parasite as being located between the brood lamellae of the female host, with the head end turned backwards and the ventral face towards the belly of the host.

### Results

The records of Dajus mysidis from Mysis specimens in the Great Bras d'Or are given in Table I. The host range includes the three species of Mysis found in the area, with the records for M. stenolepis representing a host extension for D. mysidis. Careful comparison of specimens from all three species did not reveal any differences between the parasites from different hosts so that it appears correct to include specimens from M. stenolepis under the same specific name.

#### Table I

In the field, the female parasites were at first thought to be eggs of mysids since among the first specimens collected were many ovigerous individuals. Later, free specimens were found and these, which no doubt had fallen from their hosts, were wrongly considered to be egg sacs of mysids. Only on closer examination at a later date was it realized that these entities represented ovigerous parasites. The female parasite lies between the oostegites

of the female host when attached, but in fact there appears to be no direct attachment of the parasite to the host so that disturbances of the host's oostegites which envelop the parasite, result in the dropping of the parasite. The unattached parasites for which no host is known probably fell from their hosts during the process of capture and sorting.

The male Dajus mysidis is occasionally found attached to host pleopods, sometimes alone in the brood pouch of the host female, but usually attached to the posterior end of the female Dajus as indicated in Figure 2. Because of the loose form of attachment of the male to the female, the male Dajus recovered are often found free in collections having lost their grip before or after preservation.

Sars(10) found Dajus parasitic only on female mysids, and in no case had the female incubatory plates (oostegites) attained full size. He suggested that it was very probable that the presence of the parasite put a stop to the growth of the plates. In general, the specimens from the Bras d'Or were from immature, but not necessarily small, females, the development of the oostegites as Sars observed probably being inhibited by the presence of the parasite. In addition however, four immature female Dajus were removed from the brood chambers of ovigerous female M. mixta. In these latter cases, the parasite may have attached at a late period just prior to oviposition in the female and subsequently had its growth slowed, or it may have entered the brood chamber shortly before examination, after oviposition by the female host had already taken place. There are also a few instances in which fully formed but nonovigerous female M. mixta were carrying female parasites. The effect of the parasite on the development of the host

may be suggested by the relative sizes of the brood chambers of two specimens of M. stenolepis in Figures 1 and 2, respectively a fully-developed female presumably shed, and a female of approximately the same size with male and female parasite between the semi-developed brood plates. Figure 3 depicts graphically the difference in length between mature female M. stenolepis and a few parasitized specimens taken in the spring of 1952. The mean length for fully-developed M. stenolepis taken in May and June is 26.0 millimetres for 37 specimens. For 5 large but sexually immature specimens taken during the same period and including 4 definitely parasitized, the mean length was 28.3 millimetres. No similar comparison of the mean lengths of parasitized and fully-developed females can be made for M. mixta, since in most instances the parasites had fallen from the hosts before measurements were made. Of the 83 large females of M. mixta taken in May and June of 1952 only 5 had fully-developed brood chambers. Of these mature individuals, two, one ovigerous the other presumably shed, harbored female Dajus. The high degree of parasitism amongst large specimens of M. mixta for the spring period of 1952 (Table III) suggests that the retarded development and even the presence of these animals at that time of year is due to their being parasitized. Adult female M. mixta have almost entirely disappeared by May having completed their reproductive function (2).

Figures 1, 2, 3 or interspersed above

Sars (10) found his specimens of Dajus only on female hosts. This appears to be the only direct reference to the sex of host animals. In addition to the many parasitized female mysids, three male M. mixta from the Great Bras d'Or were carrying female parasites. One of these parasitized males (parasite removed)



is shown in Figure 4, while a fully mature specimen of the same species taken some months earlier is shown in Figure 5. The parasitized male has aborted 3rd and 4th pleopods, the 4th extending only as far posteriorly as the anterior margin of the 6th somite of the abdomen. The mature male has fully-developed 4th pleopods which extend to the tips of the uropods (not shown in entirety). The vas deferens and penis of the normal male show up very clearly due to the presence of sperm and associated material in the system. In Figure 5, it is even possible to observe the sperm protruding from the tips of the penes, but there is no indication of the presence of this material within the reproductive system of the parasitized specimen. The penes of the specimen in Figure 4 are much flattened, probably to accommodate the parasite, the function of the oostegites of the female. In addition, the parasitized animal has leaf-like structures attached to the bases of the penultimate thoracic legs. These structures both in form and location appear to be comparable to the first functional pair of oostegites of an immature female. The other two parasitized males lack these oostegite-like structures but resemble the specimen shown in Figure 4 in the stunted condition of the 3rd and 4th pleopods and in the flattening of the penes. The aborted condition of these males suggests that the development of "oostegites" on one individual was a secondary response to the presence of the parasite and not a mere abnormality on the part of this particular male.

Figures 4, 5

Only three large male M. stenolepis were taken in the spring of 1952. While none of these were found bearing parasites,

the retarded reproductive condition and the flattening of the penes suggests that they had been parasitized.

Mysis mixta begins its breeding period in late November (2). After breeding the males die off and the females live on until release of young from their brood chambers. By May, as noted above, the bulk of the breeding population has died off, the majority of the large individuals present at that time being immature. The synchronization of parasite development to that of the host may be surmised from a consideration of Table II which gives the numbers of mature and immature male and female parasites. The proportion of mature individuals appears to be highest in the period preceding November, 1951, after which in that year only immature or maturing females and larval males were recorded in 1951. In 1952 the parasite population was composed of both mature and immature individuals of both sexes. Table III gives the degree of parasitism on M. mixta for three periods, the first and second being based upon all specimens in collections from which the parasite was recovered. Considered together with the relative numbers of mature and immature individuals, the incidence rates indicate the completion of the life cycle between September and November, with the immature specimens of the earlier releases beginning to appear on the maturing mysids of the year in November and December. Further details of the life cycle of Dajus mysidis will be presented in a projected paper on the isopods of the Great Bras d'Or.

Tables II, III or above

The high degree of parasite occurrence on large immature specimens in May and June of 1952 when most potential hosts have matured and died, ~~indicates hosts have matured and died,~~ indicates a lengthening of the life span of parasitized hosts. Because the

parasite falls from its host so readily, the actual degree of parasitism cannot be determined and the overall effect of the parasite on the mysid life cycle can only be inferred. The very confusing length distribution of male and female M. mixta taken in 1951 from July to September (2) may be due to parasitism by Dajus. The animals of the year are presumably free of parasites while the larger but equally undeveloped animals are of the previous generation having had their life span extended beyond the normal period by the presence of the parasite. There is no direct indication of parasite occurrence amongst males collected before November in 1951 but suggestive of parasitism is the retarded development of the 4th pleopods of many of the specimens coupled with the relatively large size of these animals(2). The lengths of the two female groups do not overlap and can be segregated as can be seen from Figure 6. The large females disappear before November, at the same time as the onset of the new life cycle of the parasite and before the commencement of the breeding period (2). The male lengths overlap and it is only possible to infer from the decrease in mean lengths of males from September to November (2), that the parasite is similarly affecting the males in lengthening the life span. This decrease in mean lengths is suggested as being due to the death of large parasitized males, rather than to the death after breeding of large mature males since breeding did not begin until early November (2).

Figure 6

#### Summary

1. Dajus mysidis is parasitic on three species of mysids in the Great Bras d'Or of Cape Breton Island, Mysis oculata, Mysis mixta and Mysis stenolepis.



2. Mysis stenolepis is recorded as a host for this isopod parasite for the first time.
3. The parasite has been found attached to immature female hosts in general, but some of the specimens from the Great Bras d'Or were taken from mature female hosts.
4. The parasite, formerly recorded from female hosts, has been recovered from male Mysis mixta. It is also probably parasitic on male Mysis stenolepis.
5. Dajus mysidis appears to inhibit development towards maturity of its host. Most parasitized females have only poorly developed brood lamellae. Parasitized males have only slightly elongated third and fourth pleopods.
6. One parasitized male Mysis mixta has oostegite-like structures at the bases of the penultimate thoracic appendages. It is suggested that these structures were developed in response to the presence of the parasite.
7. Parasitized mysids appear to live longer and grow larger than non-parasitized individuals. The parasite by inhibiting sexual development appears to prolong the life span and growth of its host.
8. In the Great Bras d'Or, Dajus mysidis appears to reach maturity between September and November. The young of the earliest maturing females attach themselves to the maturing mysids of the year in November and December and probably later. The means by which attachment is effected is not known.

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Table I

Dajus mysidis from Great Bras d'Or Mysids

Collection	Date	Host Species	No. Parasites		
			Female	Male	
55,56	K.H.	10-VII-51	<u>M. mixta</u>	17	8
71,72	K.H.	31-VII-51	<u>M. mixta</u>	36	14
			<u>M. oculata</u>	1	1
76	K.H.	11-IX-51	<u>M. mixta</u> (?)	25	19
100	K.H.	17-XI-51	?	1	
100,103,104	K.H.	17-20-XI-51	<u>M. mixta</u>	3	1
			<u>M. stenolepis</u>	1	
108	K.H.	4-XII-51	<u>M. mixta</u>	1	2
			?	5	
111,112	K.H.	20-XII-51	<u>M. mixta</u>	4	1
111	K.H.	20-XII-51	?	1	
4	K.H.	21-V-52	<u>M. mixta</u>	1	
5	K.H.	23-V-52	<u>M. mixta</u>	30	40
			<u>M. stenolepis</u>	5	8
11	K.H.	2-VI-52	<u>M. mixta</u>	1	1
12	B.B.	4-VI-52	<u>M. mixta</u>	2	
16	K.H.	10-VI-52	<u>M. mixta</u>	1	
17	K.H.	10-VI-52	<u>M. mixta</u>	1	1
			<u>M. stenolepis</u>	1	1
22	B.B.	20-VI-52	<u>M. mixta</u>	2	
25,25	K.H.	21-VI-52	<u>M. mixta</u>	3	1

Table II

Dajus mysidis ex Mysis mixta

Date	Ovigerous Females	Other Females	Males	Larval Males
10-VII-51	4	13	8	0
31-VII-51	22	14	14	0
11-IX-51	12	13	15	4
17-20-XI-51	0	3	0	1
4-XII-51	0	1	0	2
20-XII-51	0	4	0	1
21-V-52	0	1	-	-
23-V-52	10	20	24	16
2-VI-52	0	1	1	0
4-VI-52	0	2	-	-
10-VI-52	0	2	1	1
20-VI-52	1	1	-	-
21-VI-52	0	3	1	0



Table III  
Incidence of Dajus mysidis on Mysis mixta

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Period	No. Mysids*	No. Female Dajus	% Incidence
July 10 - Sept. 11, 1951	463	78	16.8%
Nov. 17 - Dec. 20, 1951	138	8	5.8%
May 12 - June 21, 1952	87	41	47.1%

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\* Includes only 1951 collections in which Dajus was recovered, and only large specimens of 1952 collections.

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## Captions for Figures

- Figure 1. Mysis stenolepis, mature shed female.
- Figure 2. Mysis stenolepis, large immature parasitized female.
- Figure 3. Mysis stenolepis, mean monthly lengths of large immature(5), and mature (37) females, spring, 1952.
- Figure 4. Mysis mixta, large immature male parasitized by Dajus mysidis (parasite removed).
- Figure 5. Mysis mixta, mature male.
- Figure 6. Mysis mixta, mean monthly lengths of females.



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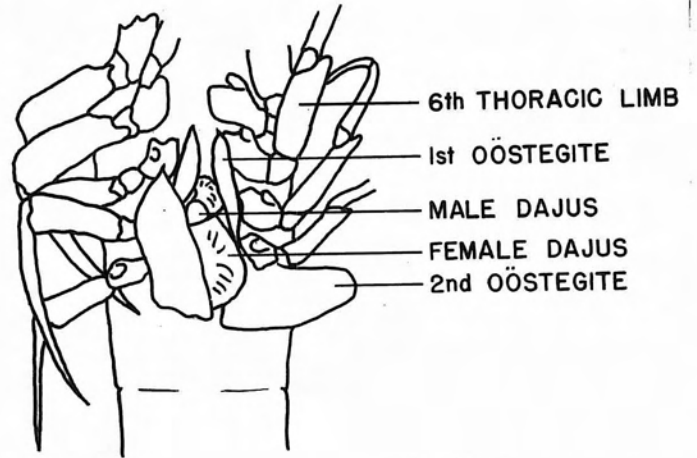


Figure 2

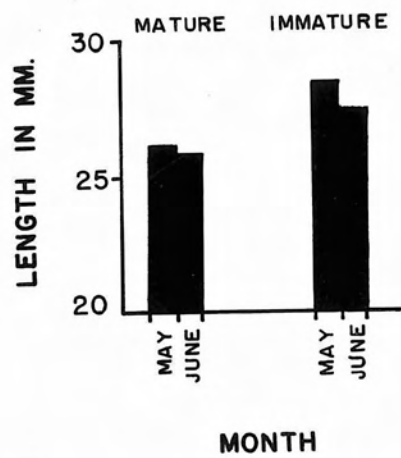
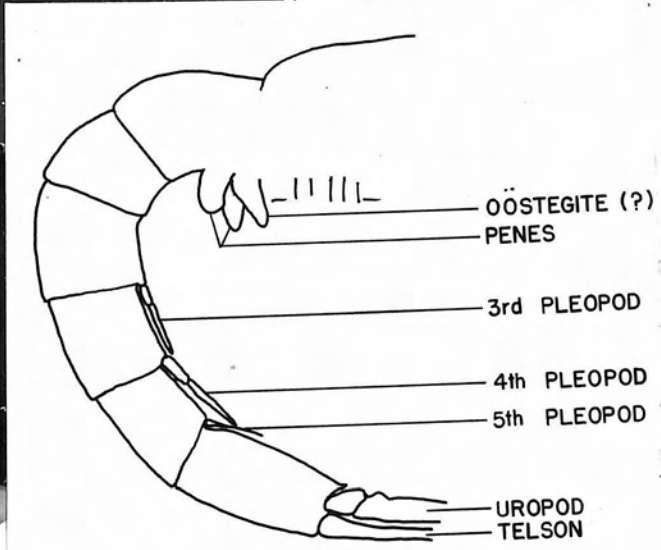
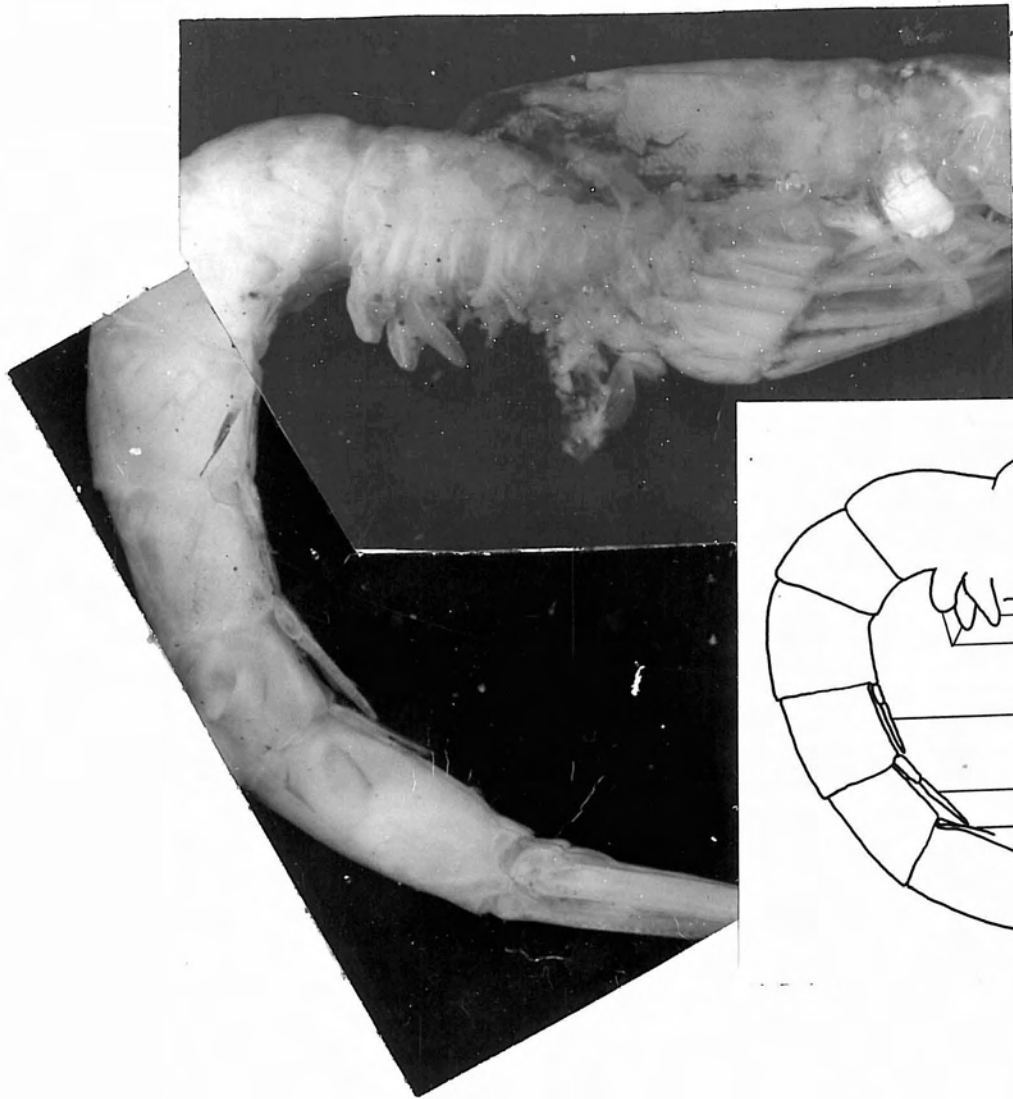


Figure 3





Figures 4

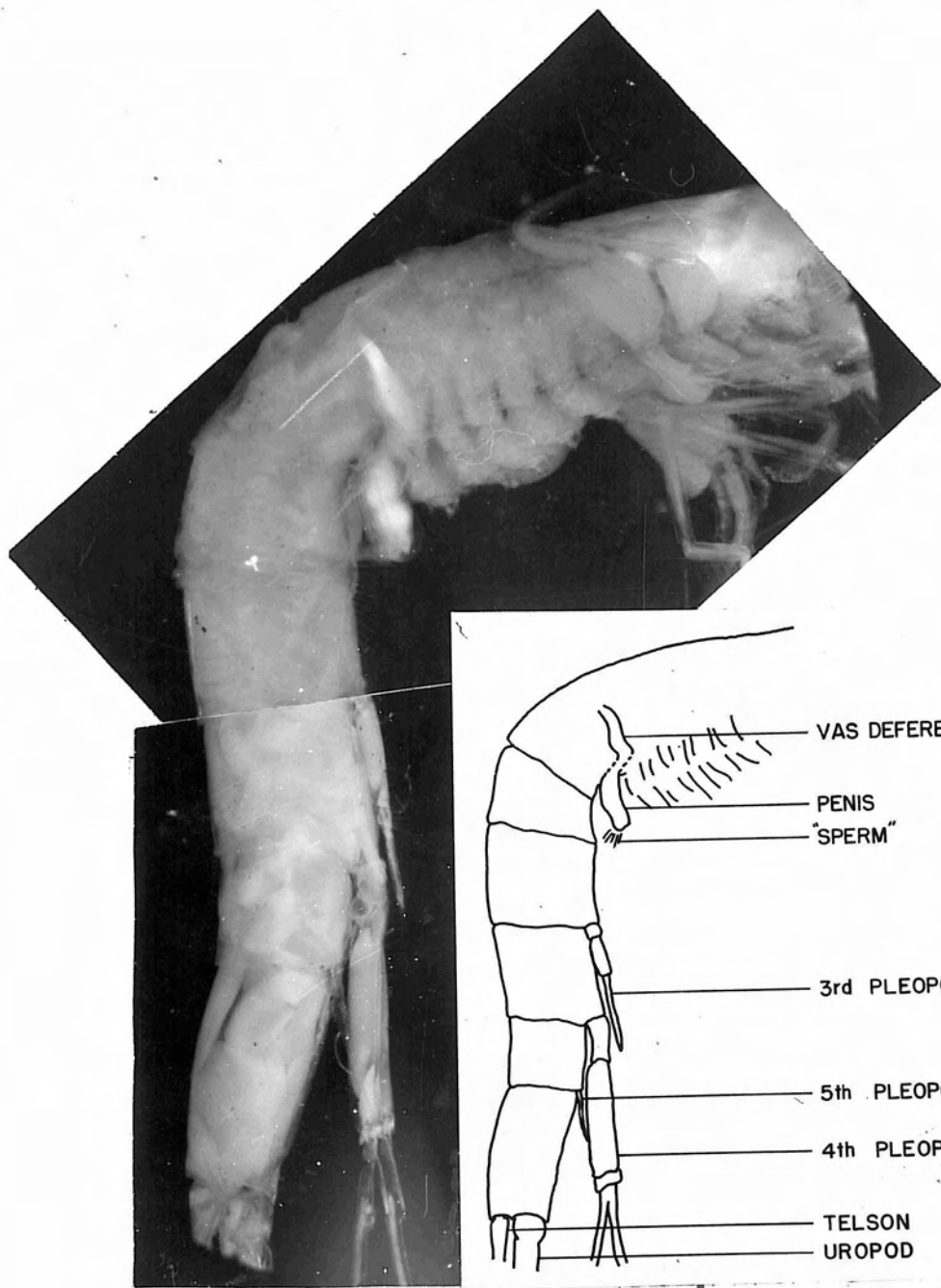


Figure 5

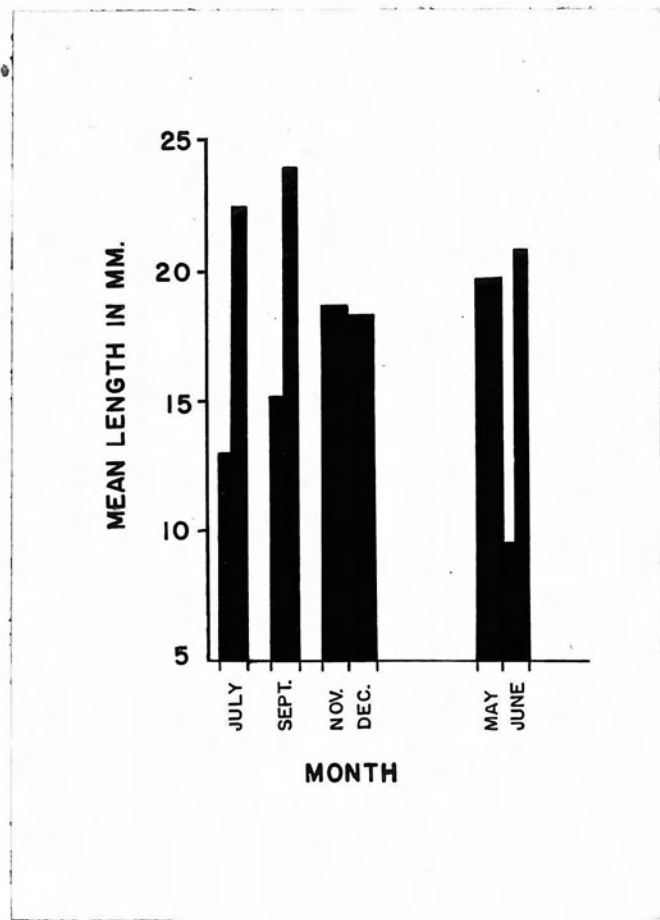


Figure 6