

FURTHER NOTES ON BOPYRID ISOPODS PARASITIC ON INDIAN DECAPODA MACRURA.

By B. CHOPRA, D.Sc., F.I.S., Zoological Survey of India, Calcutta.

(Plates IV-VI.)

Since the publication of my paper on the Indian Bopyridae in 1923¹, a number of specimens belonging to this family have been added to the collection of the Zoological Survey of India. They were for the most part got together by Dr. S. W. Kemp, formerly Superintendent, Zoological Survey of India, in the course of his work on various Caridea in 1925², shortly before his departure from India. Some of these Bopyrids belong to species already known to occur in Indian waters and the present records do not add materially to our knowledge of their distribution or range; there are others that are of interest on account of their distribution, or from the point of their hosts, in so far as they are now being recorded from hosts belonging to genera or even families altogether different from those that they were hitherto known to parasitize. There are also a number of other forms that are new to science and are described here for the first time. Among these may be mentioned a species of *Pseudione* Kossmann, a genus that is recorded from Indian waters for the first time, and two species of *Diplophryxus* Richardson, a genus that was so far known from only one species. I give below a table (pp. 114, 115) showing the names of the species represented in the present collection with the names of the hosts they infest and notes on the distribution of the genera to which they have been assigned.

By their excellent report on the Epicaridea of Dr. Th. Mortensen's collections Messrs. H. F. Nierstrasz and G. A. Brender à Brandis³ have quite recently made a very useful addition to our knowledge of the Indo-Pacific Bopyridae. With most of the views expressed by these eminent carcinologists I am in full agreement, but in one or two cases I have not been able to agree with them. They believe, for instance, that the two closely allied genera *Probopyrus* and *Palaegyge* cannot be distinguished from one another and must, therefore, be combined under the former name. For reasons given elsewhere (*vide* pp. 127, 128) I am unable to accept this suggestion. In the same way I am unable to agree with the Dutch authors that Hay's *Synsynella* is distinct from *Bopyrella* Bonnier.

In the terminology of the various parts I have employed the same terms as I used in 1923, with the exception that I have called the lateral parts of the thoracic somites the "anterior" and the "posterior lateral plates" instead of epimera and pleura. Nierstrasz and Brender à Brandis, in their report on the Epicaridea of the Siboga-Expedition⁴,

¹ Chopra, *Rec. Ind. Mus.* XXV, pp. 411-550, pls. xi-xxi (1923).

² Kemp, *Rec. Ind. Mus.* XXVII, pp. 249-343 (1925).

³ Nierstrasz and Brender à Brandis, *Vidensk. Medd. Dansk Naturh. Foren.* LXXXVII, pp. 1-44 (1929).

⁴ Nierstrasz and Brender à Brandis, *Siboga-Exped. Rep.* XXXII b, pp. 67-121, pls. iv-vii (1923).

Name of parasite.	Name of host.	Locality.	Remarks on hosts and distribution, etc.
<i>Hemiarthrus nigrocinctus</i> Chopra	<i>Periclimenes amymone</i> deMan ... <i>Leander tenuicornis</i> (Say) ...	Nancowry Harbour, Nicobar Is. Nicobars; and Port Blair, Andaman Is.	Genus known to infest several families of Caridea; in the Palaemonidae now known to live on <i>Typton</i> , <i>Periclimenes</i> and <i>Leander</i> . Genus common in Europe, along both coasts of North America and in the Indo-Pacific region; one species recorded near Cape Point, South Africa.
<i>Hemiarthrus filiformis</i> , var. <i>attenuata</i> Chopra ...	? <i>Alpheus paralcione</i> Coutière ...	Port Blair, Andaman Is. ...	
<i>Diplophryxus jordani</i> Richardson <i>Diplophryxus richardsoni</i> , sp. nov. <i>Diplophryxus kemp</i> , sp. nov. ...	<i>Leander tenuicornis</i> (Say) ... <i>Pontophilus lowisi</i> Kemp ... <i>Gnathophyllum fasciolatum</i> Stimpson.	Kilakarai, Gulf of Manaar ... Port Blair, Andaman Is. ... Port Blair, Andaman Is. ...	Genus previously known from Japan and Mergui Archipelago only as a parasite of <i>Leander serrifer</i> Stimpson; now known from the western parts of the Bay of Bengal also. Besides <i>Leander</i> (fam. Palaemonidae) genus now known to infest Gnathophyllidae and Crangonidae also.
<i>Palaegyge pica</i> Chopra ... <i>Palaegyge prashadi</i> Chopra ... <i>Palaegyge abhoyai</i> Chopra ...	<i>Palaemon</i> sp. ... <i>Palaemon lamarrei</i> H. M.-Edwards. <i>Palaemon</i> sp. ...	Travancore ... Delta of the Ganges ... Delta of the Ganges ...	Genus known to live mostly on <i>Palaemon</i> , only one species known to infest the allied genus <i>Leander</i> . Occurs in the fresh and estuarine waters of the Malay Archipelago and other islands in the Indo-Pacific region, in India, in the West Indies and in Central America.

<i>Bopyrella nierstraszi</i> , sp. nov. ...	<i>Hippolysmata vittata</i> Stimpson	Port Blair, Andaman Is ...	Genus now known to infest Hippolytidae (<i>Hippolysmata</i> , <i>Tozeuma</i> and <i>Latreutes</i>) and Alpheidae (<i>Alpheus</i> and <i>Synalpheus</i>). Known to occur extensively in the Indian Ocean both in the Arabian Sea (Karachi) and the Bay of Bengal, as far south as the Friendly Islands in Oceania; in the Indo-Pacific in the Strait of Formosa; and in the Atlantic along the coast of N. America and in the West Indies.
<i>Pseudione indica</i> , sp. nov. ..	<i>Pontophilus plebs</i> Kemp ..	Port Blair, Andaman Is. ...	Genus known to have a very wide range of distribution, occurring almost all over the three great Oceans. Most of the species infest different families of the Anomura but among the Macrura the Pandalidae, the Nematocarcinidae and the Crangonidae are known to be parasitized.
<i>Bopyrus squillarum</i> , var <i>bimaculatus</i> Chopra ...	<i>Leander serrifer</i> Stimpson ..	Bombay ...	Genus known to infest <i>Leander</i> only and lives in almost all the seas of Europe, Black Sea, Arabian sea, Delta of the Ganges, Bay of Bengal and the eastern parts of the Indo-Pacific region.
<i>Bopyrina sewelli</i> , sp. nov. ..	<i>Chlorotocella gracilis</i> Balss ..	Nancowry Harbour, Nicobar Is.	Genus known to infest Hippolytidae (<i>Hippolyte</i> , <i>Thor</i> and <i>Gelastocaris</i>), Palaemonidae, subfamily Pontoniinae (<i>Periclimenes</i> , <i>Urocaridella</i> and <i>Harpilius</i>) and Pandalidae (<i>Chlorotocella</i>). Genus known from the British Isles, Atlantic Coast of North America, Mediterranean Sea, Arabian Sea along the Indian coast, Bay of Bengal and the Pacific Coast of North America.

had called the anterior portions as the "coxal plates" and the posterior as the "posterior lateral plates." They have used the same terms in their subsequent works.¹ I am, however, not convinced that the anterior portions represent the true coxopodites of the thoracic appendages. In the same way I have described the first free thoracic somite (which morphologically is believed to be the second) as the first segment, as is done by almost all workers on the taxonomy of the Isopoda.

Most of the illustrations accompanying this paper have been prepared under my supervision by Babu A. C. Chowdhury, the gifted artist of the Zoological Survey of India, while some on Plate V are from the pen of his equally talented colleague Babu S. C. Mondul. My best thanks are due to the artists for the care with which they have done their work.

Most of the hosts were identified by Dr. S. W. Kemp at the time he was engaged in working out the taxonomy of the different families to which they belong and for this my thanks are due to him. His notes and revisions of the various families of Caridea, published in the *Records of the Indian Museum* have been a source of great help to me in understanding the distribution and the affinities of the various Decapoda with which I have been dealing.

Col. R. B. Seymour Sewell, Director, Zoological Survey of India, has gone through the manuscript and has made several valuable suggestions, for which I am very thankful to him.

All the type-specimens are the property of the Zoological Survey of India and are preserved in the collections of the Indian Museum at Calcutta.

GENUS *Hemiarthrus* Giard and Bonnier.

1923. *Hemiarthrus*, Chopra, *Rec. Ind. Mus.* XXV, p. 426.

1926. *Phryxus*, Nierstrasz and Brender à Brandis: in Grimpe and Wagler's *Die Tierwelt der Nord- und Ostsee* X. e₁, p. 35.

For reasons fully explained in 1923 I have adopted the generic designation of *Hemiarthrus* in preference to the preoccupied name of *Phryxus* Rathke. Nierstrasz and Brender à Brandis² have, however, retained the latter designation on the score of its being older and in more common use. This plea is untenable according to the rules of zoological nomenclature and the retention of the name *Phryxus* will, in my opinion, only add further confusion. Rathke's *Phryxus* dates only from 1843, whereas Rafinesque³ in his *Analyse de la Nature* is said to have used the name for insects of the group Hemiptera as far back as 1815. This name is, however, said to be no more than a *nomen nudum*, and though according to the present-day rules of nomenclature it cannot be employed any more in zoology, Hübner used it again in 1820⁴ in his *Verzeichniss*⁵ as a generic

¹ Nierstrasz and Brender à Brandis, *Bijdr. Dierkunde* XXIV, pp. 1-8, 1 pl. (1925); and in Grimpe and Wagler's *Die Tierwelt der Nord- und Ostsee* X. e₁: I. Epicaridea, pp. 1-56 (1926).

² Nierstrasz and Brender à Brandis, *Siboga-Exped. Rep.* XXXII b, p. 108 (1923).

³ I have not been able to see this work, and have taken this reference from Sherborn's *Index Animalium*, part XIX, p. 4928 (1929).

⁴ Hübner's *Verzeichniss* was published in parts and the pages containing a reference to *Phryxus* were probably issued according to Sherborn and Prout [*Ann. Mag. Nat. Hist.* (8) IX, pp. 179, 180 (1912)] in 1820.

⁵ Hübner, *Verzeichniss bekannter Schmettlinge*, p. 137 (1816-1827).

designation for Lepidoptera of the "Stamm Deilephilaë," with *Phryxus livornica* Petiver as its type-species. Thus it is clearly seen that though there may perhaps be some justification for ignoring the use of the name *Phryxus* by Rafinesque, its use by Hübner in Lepidoptera can on no account be overlooked. In any case the retention of this name in Crustacea is not permissible according to the rules of zoological nomenclature.

Hemiarthrus nigrocinctus Chopra.

1923. *Hemiarthrus nigrocinctus*, Chopra, *loc. cit.*, pp. 432-435, pl. xi, figs. 1-3.

I have examined six additional specimens of this species from the Andamans and the Nicobars in the Bay of Bengal. All the specimens are adult females and five of them are accompanied by their males. The Andaman specimens were collected by Dr. S. W. Kemp, while those from the Nicobars were brought back by Lt.-Col. R. B. Seymour Sewell, formerly Surgeon Naturalist on board the Royal Indian Marine Survey Ship "Investigator."

The present specimens agree very closely, in most respects, with those described in 1923 and there cannot be any doubt of their identity. The colour band round the thorax of the female, on which the name of the species is based, however, differs considerably from what has been previously described and figured. In all the present specimens the band is altogether missing on the ventral side, while on the dorsal even it is very much restricted. In one specimen only (C 1403/1, from Nancowry Harbour, Nicobars) the band is present on the entire dorsal surface; in all the rest it is present near the two margins only and leaves a large gap in the mid-dorsal region. Near the margins the band is bent in a posterior direction. Further, in all the specimens the band is formed of reticulations of a dark brownish colour between which the pale yellowish surface of the body can be seen. In examples previously described the band is more or less of a uniform consistency. With relation to the thoracic constriction the band occupies the same position as that previously described. The last oostegite of the shorter side of the body is coloured dark brownish in most of the specimens.

The males also agree closely with those described in 1923.

With reference to the colour band *H. nigrocinctus* appears to be in an unstable condition. In examples examined in 1923 the band is a very prominent feature of the species, and, except for a small gap in the mid-ventral region, encircles the thorax completely. In the Nancowry specimen the band is not of a uniform consistency, but is formed of reticulations, is continuous on the dorsal surface and is altogether absent on the ventral. In the other five examples now examined, the band is of the same nature as in the Nancowry specimen, but is even further reduced—it is totally absent ventrally and on the dorsal surface even is quite obliterated about the mid-dorsal region. The last oostegite of the shorter side of the body is in most specimens pigmented, but may sometimes be colourless. It would thus appear that the pigmentation in *H. nigrocinctus* is undergoing reduction.

As is usual in this species the parasite is attached on the ventral surface of the host, being held in position by the first three pleopods and

the side plates of the host. The flat dorsal surface of the parasite is apposed to the ventral surface of the host, its anterior end pointing towards the "tail" of the prawn. The small colour spots on the posterior pleopods of the Bopyrid can be seen faintly in the natural position.

H. nigrocinctus was hitherto known from a number of specimens parasitic on *Periclimenes elegans* (Paulson) collected in the Andaman Islands, and one example from the Jack and Una Islands in the Mergui Archipelago, living on the allied species *P. demani* Kemp. Out of the present specimens four are from the Nicobars, while two were collected in the Andamans. All these specimens except one (C 1403/1) from the Nicobars are parasites of *Leander tenuicornis* (Say), while the remaining example was found living on *Periclimenes (Ancylocaris) amymone* de Man. The present record, therefore, extends the range of *H. nigrocinctus* both geographically and from the point of the hosts. It must, however, be observed that *P. amymone*, the host of one of the specimens in the Nicobars, is somewhat closely allied to *P. elegans* and *P. demani*, the hitherto known hosts of the species. The case of *Leander* is, however, more interesting. This genus, or even the subfamily to which it belongs—Palaemoninae of the family Palaemonidae—was not hitherto known to be infested by *H. nigrocinctus*, or, indeed, by any other species of *Hemiarthrus*. *H. nigrocinctus*—as also the doubtful *H. typtonis* Giard and Bonnier, of which no description, except the name of the host, is available—was already known to live on members of the Pontiinae of the family Palaemonidae, but the present is the first record of a *Hemiarthrus* living on a Palaemonine prawn.

C 1403/1	Coral Reef, N. E. of Octavia Bay, Nancowry Harbour, Nicobars.	"Investigator," Nov., 1929.	1 ♀ and ♂ on <i>Periclimenes amymone</i> de Man.
C 1449/1	East and North side, Nancowry Harbour, Nicobars.	"Investigator"	On <i>Leander tenuicornis</i> (Say).
C 1450/1	East Coast, Camorta Island, Nicobars.	"Investigator," Oct., 1921.	"
C 1451/1	Off Naval Point, Nancowry Harbour, Nicobars.	R. B. Seymour Sewell, Dec., 1922.	"
C 1452/1	Off Pier, Ross Island, Andamans : 10-12 fms.	S. Kemp, Feb., 1915.	"
C 1453/1	Off Pier, Ross Island, Andamans : 3-4 fms.	"	"

Hemiarthrus filiformis Chopra.

1923. *Hemiarthrus filiformis*, Chopra, *loc. cit.*, pp. 435-438, pl. xi, figs. 4-6.

var. **attenuata** Chopra.

1923. *Hemiarthrus filiformis*, var. *attenuata*, Chopra, *loc. cit.*, pp. 438, 439, pl. xi, fig. 7.

There are two specimens of this variety in the present collection, both are ovigerous females and one is accompanied by its male. Both the specimens are smaller in size than those described in 1923, being 3.4 and 3.0 mm. long and 2.7 and 2.2 mm. broad respectively. The females agree in almost all respects with the published account of the

variety, but the outer rami of the pleopods are somewhat oval in outline, and the last abdominal segment, especially in the larger of the two specimens, is distinctly notched posteriorly.

The single male specimen, that accompanies the larger of the two females, has the typical appearance characteristic in this variety. It is somewhat curved and its proportions, therefore, cannot be accurately measured, but it has the usual thin and attenuated appearance. The tapering abdomen is truncated posteriorly and, though all its segments appear to be fused, the lateral undulations of the margins seem to mark off some of the segments. The large "pleural lamellae" on the first two abdominal somites have the usual form and structure.

The two specimens now examined are from the Andamans and are parasites of an Alpheid, resembling *Alpheus paralcione* Coutière, the same host from which this species has already been recorded.

C 1454/1 Off Pier, Ross Island, An- S. Kemp, Feb., 1915. 1 ♀ and ♂ on ? *Al-*
damans. *pheus paralcione*
Coutière.

Genus **Diplophryxus** Richardson.

1923. *Diplophryxus*, Chopra, *loc. cit.*, pp. 442, 443.

Besides the genotype, *D. jordani* Richardson, the genus *Diplophryxus* is now known from three species, two new forms being described in the present paper. Though there are some remarkable points of difference in which the three species differ from one another, all of them conform, in most of the important characters, to the generic definition, as given in 1923. The condition of the thoracic legs in the female is somewhat different in the three species. In *Diplophryxus jordani* all seven legs are present on the non-deformed side of the body, though all, except the first, are small and feeble; on the deformed side only the first leg is developed. In *Diplophryxus kempi*, sp. nov. the reduction has gone considerably further; there is one leg, as usual, on the deformed side of the body, while on the other only two (or three) legs are present. In *Diplophryxus richardsoni*, sp. nov., on the other hand, the reduction is much less than in the type-species; all seven legs are present on the shorter side of the body, while even on the other side three or four legs are developed.

The abdominal appendages, which present the most characteristic feature of the genus, also show some modification in the three species. The typical condition, as seen in the genotype, appears to be that there are two biramous pleopods on each side of the first four abdominal somites, so that each somite has four pleopods of two rami each. The pleopods on each side of the abdomen are arranged in two series, one on the margin of the pleon more or less on the dorsal surface, and the second in a more ventral position and partly covered over by the swollen incubatory pouch. Each pleopod—at least of those of the dorsal series—arises as a uniramous structure and is divided into the usual two rami at some distance from the abdomen. In *D. richardsoni* the condition is similar, though the stalk-like basal portion of the dorsal pleopods is considerably reduced, and is flattened like the rami themselves. The pleopods of the ventral series are also reduced and their

exact arrangement is not clearly seen in the single specimen that I have examined. In *D. kempfi* the two pleopods of one side have probably united into one, and there is, for all practical purposes, a single quadri-ramous pleopod, with all the rami appearing to arise from more or less the same point.

In the arrangement of the oostegites also there is some difference between the three species. In this respect *D. jordani* and *D. kempfi* resemble one another, but the third species, *D. richardsoni*, differs from these in so far as the oostegites of the non-deformed side of the body are still further reduced.

The genus *Diplophryxus* was so far known from a single species, *D. jordani* Richardson, a parasite of *Leander serrifer* Stimpson (family Palaemonidae), from Japan and the Mergui Archipelago. This species has now been met with considerably further west, in the Gulf of Manaar, living on a different species of *Leander*. The other two species were collected in the Andamans and are parasites of two different families of the Caridea, *D. richardsoni* of the Crangonid shrimp *Pontophilus*, while *D. kempfi* lives on the genus *Gnathophyllum* of the family Gnathophyllidae.

The three species of *Diplophryxus* may be distinguished from one another with the help of the following key :—

- I. Pleopoda of each side arranged in a dorsal and a ventral series, those of the dorsal series with a uniramous basal peduncle ; all seven legs present on non-deformed side of body.
 - A. Only first leg present on deformed side of body ; ventral pleopods well developed ; basal peduncle of dorsal pleopods prominent *D. jordani* Richardson.
 - B. Three or four legs present on deformed side of body ; ventral pleopods poorly developed ; basal peduncle short and flattened *D. richardsoni*, sp. n. ov.
- II. Pleopoda of each side arising together so that each pleopod provided with four rami ; only two or three legs present on non-deformed side of body *D. kempfi*, sp. n. ov.

***Diplophryxus jordani* Richardson.**

(Plate IV, fig. 1.)

1923. *Diplophryxus jordani*, Chopra, *loc. cit.*, pp. 443, 444.

A single ovigerous female specimen, unaccompanied by its male, is in the collection, having been collected by Dr. Kemp in the Gulf of Manaar. It is considerably larger in size than the one examined in 1923, its greatest length and breadth being 7 mm. and a little less than 5 mm. respectively. The remarkable colour pattern of the species referred to by Miss Richardson¹, and described by me, is clearly brought out in the present example also, and is illustrated in the accompanying figure (Plate IV, fig. 1).

The present specimen agrees in almost all points with the original description of the species, as also with the specimen previously examined by me. Besides other characters, the large biramous and long-stalked

¹ Richardson, *Proc. U. S. Nat. Mus.*, XXVII, p. 51 (1904).

pleopods—two pairs on each somite, or two biramous pleopods on each side of the somite—are a very characteristic feature of this species, and these are very well seen in the present example. The pleopods are arranged in two more or less definite series. On each side of the somite there is a large, biramous, long-stalked pleopod, which can be clearly seen from the dorsal surface, and another similar pleopod is attached in a more ventral position and is visible only from the ventral side of the body. Both the pleopods are more or less subequal in size, and the rami of the two pleopods of one side are also subequal. The pleopods of the shorter side of the body are considerably smaller than those on the other, but even on this side the two pleopods are of about the same size. The stalk-like portions of the ventral pleopods have not been seen. There is, however, one rather important point in which the Gulf of Manaar specimen differs from those previously described. The terminal abdominal segment of the female has so far been described as small and posteriorly rounded. In the present example it is quite large, being considerably larger than any other abdominal segment, and is somewhat pointed posteriorly. The accompanying illustration brings this out clearly.

D. jordani has so far been recorded from Misaki in Japan and Una Island in the Mergui Archipelago; the present record of the species from the Gulf of Manaar extends its range westwards very considerably. Further, the species was so far known to live on *Leander serrifer* Stimpson (*Palaemon serrifer* of Miss Rathbun and some other American carcinologists); the present specimen is a parasite of *L. tenuicornis* (Say), a species that does not appear to be very closely related to the previously known host. *L. tenuicornis*, it will be noticed, harbours another parasite also, *Hemiarthrus nigrocinctus* Chopra, which is even generically different from *D. jordani*.

C 1404/1 Kilakarai, Gulf of Manaar. S. W. Kemp, 1 ♀ on *Leander tenuicornis* Feb., 1913. (Say).

Diplophryxus richardsoni, sp. nov.

(Plate IV, figs. 2, 3.)

Of the two *adult females* that I have examined the larger one is 2 mm. long and a little less than 1.5 mm. broad, while the other is 1.6 and 1.0 mm. in its greatest length and breadth respectively. The body is asymmetrical in outline, one side being considerably more swollen and longer than the other; the asymmetry, however, is much less marked than in *D. jordani* Richardson, the only other species of the genus that was so far known. Even the two present specimens differ from one another in this respect, the larger one being markedly more asymmetrical than the other. The animal is whitish in colour and has no characteristic colour-pattern.

The head, as is usual in the genus, is deeply sunk in the thorax and is partly surrounded, on the posterior and lateral borders, by the first thoracic somite. It is more or less rounded in outline and is somewhat longer than broad. The anterior margin is practically straight, while the posterior is regularly and deeply rounded. A pair of very minute eye-spots appears to be present close behind the anterior margin.

The first thoracic somite, as has already been mentioned, encircles the head on the sides and posteriorly. The segmentation of the thorax can only be made out with a considerable amount of difficulty, the lines of demarcation between the various somites being very faint and indistinct. The first five somites are closely crowded together behind the head and are short in length; the last two are long, but even in this case the lines of demarcation have not been clearly made out. There are some rather prominent ridges on the thorax and these obscure the true segmentation very considerably.

The abdomen is broader than long, and the segments of which it is composed are considerably fused on the dorsal surface. The lines of demarcation between the various somites are very indistinct and only some of them can be traced. The abdomen appears to be formed of five somites only, the last of which is a small conically tapering process projecting beyond the penultimate somite.

The head, on the ventral surface, is completely covered over by the swollen incubatory pouch, and nothing has been made out of its structure or that of the mouth parts. The incubatory cavity not only covers the ventral side of the thorax and head completely, but projects along the sides also and can thus be partly seen from the dorsal surface of the animal. The disposition and the arrangement of the oostegites cannot be clearly made out, but most of the incubatory pouch seems to be formed of the first oostegite of the longer side of the body. On the shorter side a number of reduced oostegites can be seen by the side of the swollen pouch, especially in the larger of the two specimens. All the seven legs are present on the shorter side of the body, and some of those belonging to the anterior somites are closely crowded together. On account of the first thoracic segment encircling the head, the leg of this segment, on the shorter side of the body, lies near the anterior margin of the head. On the longer side of the body the exact number of legs has not been made out, but there are certainly more than one. In the larger specimen there are two legs placed on the anterior margin of the body by the side of the head, another near the posterior extremity of the incubatory pouch, while a fourth seems to be placed about half way along its length. In the type-specimen the leg near the posterior extremity of the incubatory pouch has not been seen, but it is possible that it has dropped off owing to an accidental injury. The legs are normal in size and have the usual structure.

The first four abdominal somites have two pairs of pleopods on each somite, a pair, or two biramous pleopods, on each side of the segment. As in *Diplophryxus jordani* the pleopods are arranged in two series, one placed in a more or less dorsal position and visible from above, and the other on the ventral side of the abdomen. Of the dorsal series each pleopod arises as a uniramous, stalk-like structure and divides into two rami after running for a little distance from the abdomen. The basal uniramous portion is also flattened out, and, except in the first pleopod, the two rami are more or less subequal in size. The pleopoda of the shorter deformed side of the body are somewhat larger than those on the other. In the ventral series the pleopods are greatly reduced, and the rami of each appear as small leaf-like structures, more or less pointed

at the tip. The stalk-like origin of the pleopods cannot be clearly seen. The rami of the last pair of the ventral pleopods can be seen from the dorsal surface of the animal and superficially appear like uropods sticking out from behind. The last segment does not appear to carry any appendages.

The male is not known.

Locality.—The two specimens that I have examined are parasites of *Pontophilus lowisi* Kemp (family Crangonidae) and were collected by Dr. Kemp in the Andamans. Both are ovigerous females, large masses of eggs being seen in the closed incubatory cavity, and are without their males. They are attached to the abdomens of their hosts lying between the anterior four pairs of pleopods, having, as is usual, their heads pointing towards the posterior extremity of the host.

C 1455/1	Ross Channel, Port Blair, S. W. Kemp, Feb., 1921.	1 ♀ on <i>Pontophilus lowisi</i> Kemp. TYPE.
C 1456/1	„ „ „	1 ♀ on <i>Pontophilus lowisi</i> Kemp.

The present species differs in some respects from *D. jordani*, the type-species of the genus. The more important points of difference are as follows :—

1. There are at least three or four legs on the longer side of the body.
2. All the legs are normally developed.
3. The incubatory lamellae of the shorter side of the body do not appear to be crowded together at the anterior end of the body.
4. The pleopods of the ventral series are reduced.

In most other characters, however, the present species shows such an unmistakable resemblance to *D. jordani*, that there can hardly be any doubt of its generic identity. The arrangement of the head and the thoracic somites is clearly like that of a typical *Diplophryxus*, while the form and the disposition of the pleopods leave no doubt about the inclusion of this species in Miss Richardson's genus. The incubatory cavity also, as is usual in this genus, is formed mostly by the oostegites of the swollen side of the body.

***Diplophryxus kemp*, sp. nov.**

(Plate IV, figs. 4-8.)

The greatest length of the body in the single adult female that I have examined is 2.8 mm., while the greatest breadth at about the level of the third thoracic somite is a little over 3 mm. Owing to the presence of the greatly swollen incubatory pouch, which extends considerably beyond the posterior extremity of the body, the greatest length of the animal, however, is very nearly 4 mm. The body is highly asymmetrical, and one side of it is very much more swollen and longer than the other. The segmentation is also greatly affected by this asymmetry, but is for the most part distinct, especially on the thoracic region. The colour of the animal is uniformly pale yellowish, except for a large patch of a warmer tint on the dorsal surface of the swollen incubatory cavity

adjoining the body proper. There are no characteristic colour spots on the body either on the dorsal or the ventral surface.

The head is distinct from the thorax, the line of demarcation between it and the thorax being clearly distinguishable. It is deeply sunk in the thorax, and is completely enclosed laterally by some of the anterior thoracic somites. It is a little broader than long, and has its posterior margin broadly rounded. The anterior lamina is totally wanting, and the anterior border, owing to the presence of the encircling anterior thoracic somites, which extend somewhat along the anterior margin also, is more or less irregular in outline. In the anterior portion of the head there is a small heart-shaped area formed by shallow grooves. Eyes seem to be totally absent.

The thoracic segments are quite distinct on the shorter side of the body, while on the other side the lines of demarcation vanish on the dorsal surface of the large incubatory pouch. They are, however, quite distinct throughout their length on the surface of the thorax itself. As already mentioned some of the anterior thoracic somites extend on the sides of the head and more or less enclose it. The first somite is very narrow, but its lines of demarcation are distinct throughout. It encloses the head completely on the sides and also to a considerable extent anteriorly. A pair of legs are placed at the anterior ends of this somite; these, as seen in the accompanying illustrations (Pl. IV, figs. 4, 5) appear to arise from the middle of the anterior margin of the head, and are placed close to one another. In the illustration the left leg (on the left side of the figure) is clearly seen, while the other one is bent under the head and only its base is visible. The second thoracic somite is somewhat longer than the first, and like the latter encloses the head completely on the sides. The leg at the end of this segment on the left side of the body is partly concealed by the oostegite, but its outline can be made out; on the other side the leg is not visible. The third somite is still longer than the second, and near the margins runs anteriorly like the two segments preceding it. On the shorter side of the body it does not seem to have any leg at its extremity, while on the other side its outline is not clearly visible beyond the limits of the thorax proper. The second and third somites (and to some extent the fourth also) form a sharp angle at the margin of the thorax on the deformed side of the body, before running in an anterior direction. This is clearly brought out in the enlarged drawing of the anterior end of the animal. The next three somites, 4th—6th, are somewhat longer than the third and are, more or less, subequal. These somites extend straight from margin to margin, except for the fourth, which on the deformed side of the body helps to form the sharp angle described above. The last thoracic somite is mostly covered over by the abdomen and its dorsally bent appendages, but a trace of it can be faintly made out near the margin on the longer side of the body.

The abdomen is rather short and in the single specimen that I have examined is somewhat bent over on the dorsal side. The abdominal appendages are greatly spread out and cover almost entirely the dorsal surface of the abdomen. For these reasons the segmentation of the abdomen has not been made out, nor its exact dimensions determined.

The head appendages and the mouth parts have not been seen.

The incubatory cavity is very much swollen, and forms not only the ventral surface of the animal, but extends on the sides and forms a considerable part of the dorsal surface also. It exclusively forms the larger side of the body, and a great deal of it can be seen from the dorsal surface of the animal. In the present condition of the specimen it has a wide opening in about its middle, but judging from the broken oostegites it seems likely that the cavity, if open at all, had originally a very small aperture. The incubatory pouch seems to be formed for the most part by the greatly enlarged first oostegite of the longer side of the body ; the remaining oostegites of this side are probably very greatly reduced and cannot be seen in the specimen. On the shorter side four or five oostegites are present ; the first, as seen in figure 5 on plate IV, projects anteriorly beyond the head and is partly turned over it dorsally, the remaining oostegites are applied as small thin plates, partly overlapping one another, on the side of the incubatory pouch, near its anterior end. The last of these is considerably larger than those preceding it. Owing to the extreme asymmetry of the body, and the consequent displacement of most of the body parts I have not been able to make out the exact number and the disposition of the thoracic legs. As described above the first leg is present on both sides of the body ; on the shorter side it is clearly visible, while on the other it is partly concealed by the head and the first oostegite. On the shorter side the leg of the second somite is also partly visible, being somewhat covered over by the oostegite ; the corresponding leg on the other side of the body does not appear to be present. I have also been able to make out faint traces of the third leg on the short side of the body. Beyond this no legs seem to be present. It thus appears that on the deformed side of the body only the first leg is present, while on the other the first two, or perhaps three, have been made out. The first leg has the usual structure and is provided with a strong claw.

The abdomen, as already mentioned, is very much turned over on the dorsal side of the body, with the result that it partly covers the posterior portion of the thorax, and its own segmentation is also entirely concealed. The leaf-like pleopods are spread out on all sides, and are very prominent, when the animal is seen from the dorsal surface. A large number of these foliaceous structures can be seen from the dorsal surface alone, and there are several that are entirely ventral in position. When detached from the abdomen each pleopod is seen to have four rami, all arising from more or less the same point. All the rami of one pleopod are of about the same size, and each ramus is a long, narrow, leaf-like structure. The pleopoda on the longer side of the body are considerably larger than those on the other. There are four such pleopods on each side of the abdomen, and the uropods appear to be altogether absent.

The *male* is long and rather narrow. It is 1.25 mm. long, and at the level of the third thoracic somite is a little less than 0.3 mm. broad. It is whitish in colour, and has no characteristic markings on its surface.

The head is more or less circular in outline, and is definitely separated from the thorax, the line of demarcation between it and the first thoracic somite being quite distinct. It is rather narrow, its breadth being considerably less than that of the thorax. The anterior margin is broadly

rounded, while the posterior is more or less straight. A pair of minute black eyes is distinctly seen in the anterior half of the head, and placed behind these near the posterior margin is another pair of pigment spots, looking somewhat like the eyes. Ventrally the mouth parts are greatly reduced and their structure can hardly be made out. The antennules are very well developed, and extend considerably beyond the anterior margin; they appear to be formed of two large segments only. The distal segment has setae at its tip, and the basal one also carries a few hairs at its antero-internal angle. The antennae are greatly reduced and can be faintly made out a little behind the antennules.

The thoracic somites are all distinctly separated from one another, and their lines of demarcation are well defined. At the margins the somites are deeply cleft, so that the animal has an appearance of being somewhat loosely articulated. Except for the first two somites, which are slightly shorter than the rest, all the thoracic segments are subequal in length. The seven pairs of thoracic legs are well developed, and have the usual structure. Each is provided with a strong claw.

The pleon is long, narrow and tapering. It is only a little less than a third of the total length of the body, and is considerably longer than broad. Even at its broadest point it is a little narrower than the thorax and it tapers posteriorly, where it is somewhat broadly rounded. All the somites of which the abdomen is formed are fused together and there appears to be no trace of segmentation either on the dorsal or ventral surface or along the margins. Pleopods or uropods are totally wanting.

Locality.—A single specimen, an ovigerous female, accompanied by its male, parasitic on *Gnathophyllum fasciolatum* Stimpson (family Gnathophyllidae) was collected by Dr. Kemp in the Andamans. The Bopyrid is an abdominal parasite of the shrimp, living between the first three legs, and the forwardly bending "tail." The male was found inside the incubatory cavity of the female, but may have possibly got there accidentally.

C 1457/1	Port Blair, Andaman Is-lands.	S. W. Kemp	1 ♀ and ♂ on <i>Gnathophyllum fasciolatum</i> , Stimpson. TYPE.
----------	-------------------------------	------------	--

Though conforming with the generic definition in almost all important particulars *Diplophryxus kempi* differs in a few material respects from *D. jordani*, the type-species of the genus. The most important difference lies in the shape and the arrangement of the pleopods in the two species. In *D. jordani* there are two pleopods on each side of the first four abdominal somites; each pleopod is biramous, and the two pleopods do not arise at the same point. In *D. kempi*, though there are also four rami on each side of the somite, all the four appear to arise at the same point. Thus the pleopods in the present species have an appearance of being quadriramous instead of two biramous pleopods, as is the case in Miss Richardson's species. It can, however, be easily supposed that the condition of the pleopods in *D. kempi* has been somehow derived from that in *D. jordani*; in both the condition is essentially similar as there are four rami on each side of the somite. Further the long stalk-shaped peduncle in the pleopod of *D. jordani* is absent in the present species.

Another point of difference between the two species is the greater reduction of the thoracic legs in the genotype. In the latter all the seven legs are present on the shorter side of the body, while only the first leg is present on the deformed side. In *D. kempi* the condition is the same so far as the deformed side of the body is concerned, but on the shorter side there are only two (or perhaps three) legs present. All the legs, except the first, are reduced in both the species.

Except for these differences there is, however, such a marked resemblance between the present species and the genotype that there can hardly be any doubt of their being congeneric. The shape of the head, encircled by some of the anterior thoracic somites, the reduced leaf-like oostegites of the shorter side of the body overlapping one another and applied to the side of the incubatory cavity near its anterior end, the reduced thoracic legs, and the double pleopods on the first four abdominal somites—to mention only a few of the more important characters—all show unmistakably a very close resemblance with Miss Richardson's *Diplophryxus jordani*. The males in the two species are also similar, the completely fused abdomen, showing no trace of segmentation and devoid of all appendages, being characteristic of both.

Genus *Palaegyge* Giard and Bonnier.

1923. *Palaegyge*, Chopra, *loc. cit.*, pp. 480-486, and 541.

1929. *Probopyrus*, Nierstrasz and Brender à Brandis, *Vidensk. Medd. Dansk Naturh. Foren.* LXXXVII, pp. 17, 18 (*partim*).

I pointed out in 1923 that the species included in the genus *Palaegyge* resemble very closely those described under the generic name of *Probopyrus* Giard and Bonnier, and in some cases it is difficult to distinguish them from one another. In the same year Nierstrasz and Brender à Brandis¹ had already referred to this difficulty, but had come to the conclusion that the two genera could be distinguished from one another on the characters of the males. They have, however, thought it advisable now to combine the species of the two genera under the designation of *Probopyrus*, on the score that even the males cannot be separated from one another. With this view I am unable to agree, for, though the two genera are very similar and in some cases difficult to distinguish from one another, in the vast majority of cases they can be separated by a more or less definite set of characters. It is difficult to pick out one character which may always be relied on for distinguishing all the species of one genus from all the species of the other, but with the help of a number of characters taken together most of the species of the two genera can be separated off. There are some species of *Palaegyge* that are very similar to certain species of *Probopyrus*, but there are others, on the other hand, that are so different from them that including them in the same genus would be taxonomically unsound. Taking as an example the type-species of the two genera, *Probopyrus ascendens* (Semper)² with its rounded body in the female, with the lateral plates of

¹ Nierstrasz and Brender à Brandis, *Siboga-Exped. Rep.* XXXII b, pp. 89-91 (1923).

² Giard and Bonnier, *Bull. Sci. France Belgique* XIX, pp. 55-63, pls. ii, iii (1888). A good description and illustrations of this species are also given by Bonnier in *Trav. Stat. Zool. Wimereux* VIII, pp. 345, 346, pl. xxxii, figs. 7-9 (1900).

the abdominal somites and the uropoda altogether absent, with the terminal abdominal somite entire and with all the abdominal somites in the male fused with one another, and *Palaegyge borrei* Giard and Bonnier,¹ in which the form is considerably asymmetrical, the somites of the abdomen have distinct lateral plates, the uropods are present, the last abdominal somite is deeply cleft, and the abdominal somites of the male are distinct, it does not appear probable that these can be congeneric. The shape of the terminal abdominal somite of the female is, in most cases, a good character for differentiating between the species of the two genera : in *Palaegyge* the posterior margin is more or less deeply cleft, while it is entire in *Probopyrus*, only one or two American species² constituting an exception to this rule. The two genera may generally be distinguished from one another with the help of the following characters :—

<i>Palaegyge.</i>	<i>Probopyrus.</i>
<p><i>Female :</i></p> <ol style="list-style-type: none"> 1. Form of body generally markedly asymmetrical. 2. Lateral plates of abdominal somites generally present. 3. Last abdominal somite cleft posteriorly. 4. Rudimentary uropods generally present. <p><i>Male :</i></p> <ol style="list-style-type: none"> 5. Abdominal somites generally distinct. 	<p><i>Female :</i></p> <ol style="list-style-type: none"> 1. Form of body generally rounded. 2. Lateral plates of abdominal somites never present. 3. Last abdominal somite generally entire posteriorly. 4. Uropods never present. <p><i>Male :</i></p> <ol style="list-style-type: none"> 5. All abdominal somites never distinct.

Besides the species enumerated in 1923 as belonging to the genus *Palaegyge* a few others have recently been described by Nierstrasz and Brender à Brandis either as *Palaegyge* or under the generic designation of *Probopyrus*. Of these *Palaegyge marina*,³ *Probopyrus latilamellaris*⁴ and *Probopyrus oviformis*⁵ appear to be members of the genus *Palaegyge*, while *Probopyrus semperi*⁶ and *Probopyrus bithynis* Richardson var. *gigas*⁷ seem to be referable to *Probopyrus*. *Probopyrus dubius*⁸ does not appear to be either a *Palaegyge* or a *Probopyrus*, but in my opinion must be referred to some other genus.

¹ Giard and Bonnier, *Bull. Sci. France Belgique*, XIX, pp. 63-70, pls. iv, v (1888).

² In *P. floridensis* Richardson [*Bull. U. S. Nat. Mus.* LIV, pp. 555, 556 (1905)] there is sometimes a minute depression in the middle of the posterior margin of the terminal somite and in *P. panamensis* Richardson [*Proc. U. S. Nat. Mus.* XLII, pp. 523, 524 (1912)] this goes a step further and becomes a small rounded notch in the posterior margin. Recently van Name [*Zoologica, New York*, VI, pp. 481, 482 (1925)] has shown the same character in *P. bithynis* Richardson.

³ Nierstrasz and Brender à Brandis, *Siboga-Exped. Rep.* XXXII b, p. 91, pl. vi, figs. 18a-c (1923).

Nierstrasz and Brender à Brandis, *ibid.*, pp. 93-94, pl. vi, figs. 19a-d (1923).

⁵ Nierstrasz and Brender à Brandis, *Vidensk. Medd. Dansk Naturh. Foren.* LXXXVII, pp. 22-24 (1929).

⁶ Nierstrasz and Brender à Brandis, *ibid.*, pp. 18-20 (1929).

⁷ Nierstrasz and Brender à Brandis, *ibid.*, pp. 20, 21 (1929).

⁸ Nierstrasz and Brender à Brandis, *ibid.*, pp. 24, 25 (1929).

***Palaegyge pica* Chopra.**

(Plate V, figs. 7-9.)

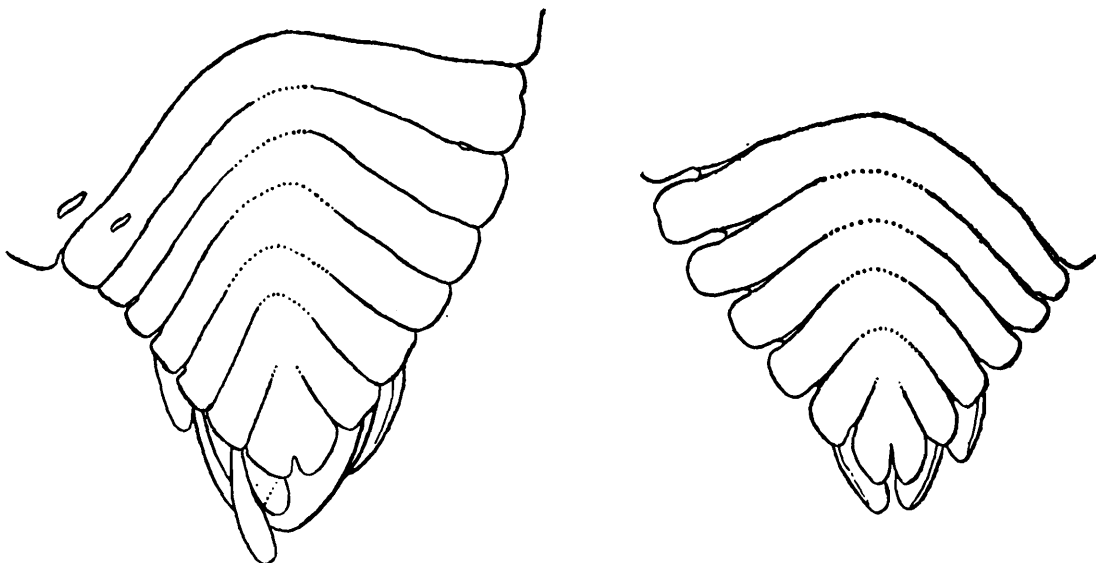
1923. *Palaegyge pica*, Chopra, *loc. cit.*, pp. 503-506, pl. xviii, figs. 5-9.

Two specimens—ovigerous females, accompanied by their males—of this interesting species have recently been added to the Museum collection. Though they agree with the type-specimens in most of the important characters, and are beyond much doubt referable to the present species, there are, however, certain characters in which they show noticeable differences from the latter.

Both the present specimens are considerably larger than those described by me in 1923. Whereas the largest specimen previously examined was 6.2 mm. long and 5.2 mm. broad, the present examples are as much as 9.0 and 8.1 mm. long and 8.2 and 6.8 mm. broad respectively. Both are markedly asymmetrical. The colour pattern, though conforming to the type, is considerably faded, especially so in the smaller of the two specimens. The body is more yellowish and the dark spots are far less conspicuous, and in the smaller specimen are in places barely visible. On the ventral surface the pigment spots are somewhat conspicuous.

The head in the larger specimen is somewhat broader than long, and in shape, etc., agrees with the published description. In the smaller specimen, however, its length almost equals the breadth and the posterior margin is less broadly rounded. Eyes are absent in both the specimens.

In the arrangement and the disposition of the thoracic somites and the various parts and appendages of these the present specimens agree with the published description of the species, except that in the smaller example the second thoracic somite is somewhat shorter in the middle line than those succeeding it.



TEXT-FIG. 1.—*Palaegyge pica* Chopra. Dorsal view of abdominal region of two female specimens showing shape of terminal somite; drawn to same magnification: $\times 11$.

The abdomen is as usual small, but compared with the length of the body is somewhat proportionately longer than in the previously described

specimens. It is broader than long, and in the shape and the arrangement of its somites agrees with the published account. The last somite is in the form of a long triangle, but the posterior margin is more clearly notched than in most of the previously described examples. The accompanying text-figure shows the exact shape of the posterior margin of the terminal somite. The pleopods in both the examples are much larger in size than those in the specimens examined in 1923. In the larger of the two present specimens the pleopods of the two sides meet in the middle line, or even slightly overlap one another, while in the smaller specimen the pleopods of the two sides of the anterior pairs are placed wide apart from one another, while some of the posterior ones meet those of the other side in the middle line. The endopodites are longer than the outer rami, and in both the specimens some of the posterior pleopods project considerably beyond the margins of the abdomen. Uropods similar to those already described are present in the usual position.

The *males* are whitish in colour, and the three discontinuous bands of pigment running longitudinally on the thorax, that were described in 1923, cannot be made out in the present specimens. Both the males are larger than those previously described, being 2.4 and 1.8 mm. long respectively. The larger of the two specimens agrees in all respects with the published description of the species, but the smaller one shows some important differences. It is considerably narrower than the type-specimen, its breadth at the level of the third thoracic somite being about $\frac{1}{3}$ the total length of the body, while in the type the breadth is about half of the total length. As already described the head, on the dorsal surface, is drawn out posteriorly in the first thoracic somite, but the posterior margin is rounded and not angular. The thoracic segments are more deeply cleft and are widely separated from one another. The abdomen is somewhat longer than broad, and all its somites are distinct both laterally and dorsally. All the six segments can thus be made out; the first four are large and conspicuous; the fifth is small and appears as a pair of projections, one on each side of the terminal segment, near its base; and the last segment is a finger-like projection regularly rounded posteriorly. Ventrally three (or perhaps four) pairs of pleopods appear to be present. The uropods are wanting.

Palaegyge pica was so far known to infest *Leander potamiscus* Kemp, and had been collected only in Portuguese India, in the Sanguem river at places where the water is subject to tidal influence. The two specimens now described were collected in Travancore in places where the water is either definitely brackish, or is strongly subject to the influence of the tides. The host is also different in the present case, being an undetermined species of *Palaemon*.

C 1458/1 Kurumbil Kayal, Travancore. H. S. Rao, Jan., 1928. 1 ♀ and ♂ on *Palaemon* sp.

C 1459/1 Mundattalkari, Travancore. H. S. Rao, Jan., 1928. „

Palaegyge pica was so far the only example of a member of the genus *Palaegyge* living on a host other than a *Palaemon*; now it is known to live on this genus also. The *Palaemon* genera *Leander* and *Palaemon* are so very closely allied to one another that it is sometimes difficult to

distinguish one from the other, and some carcinologists have discussed the advisability of considering the former as only a subgenus of the latter.

Though the specimens described above differ in some respects—notably in the character of the male abdomen—from the type-specimens, the resemblance between the two is so great that there cannot be any serious doubt of their generic position.

***Palaegyge prashadi* Chopra.**

1923. *Palaegyge prashadi*, Chopra, *loc. cit.*, pp. 486-489, pl. xv, figs. 6-11.

About half a dozen specimens of this common deltaic form have recently been found in the Indian Museum collection. They are parasites of the common prawn *Palaemon lamarrei* H. Milne-Edwards, and were collected in the salt-water lakes round about Calcutta. These lakes are extensive stretches of brackish water connected with the tidal flow of the Hooghly, and their water varies greatly with the season in its salinity, etc. In the months of December and January the water is ordinarily strongly saline.

I have nothing to add to the detailed description of this species that has already been published.

C 1460/1	Salt Water Lakes, near Calcutta.	?	6 specimens on <i>Palaemon lamarrei</i> .
C 1461/1	Tollyganj, near Calcutta.	B. L. Choudhary, Dec., 1910.	1 ♀ and ♂ on <i>P. lamarrei</i> .

***Palaegyge abhoyai* Chopra.**

1923. *Palaegyge abhoyai*, Chopra, *loc. cit.*, pp. 497-499, pl. xvii, figs. 6-10.

A single specimen, an ovigerous female with its male, parasitic on the same species of undetermined *Palaemon*, as the one from which this Bopyrid was originally described, is in the collection. It was collected at Tollyganj, near Calcutta.

The specimen agrees in all respects with the types.

C 1462/1	Tollyganj, near Calcutta.	B. L. Choudhary, Dec., 1910.	1 ♀ and ♂ on <i>Palaemon</i> sp.
----------	---------------------------	------------------------------	----------------------------------

***Palaegyge bengalensis* Chopra.**

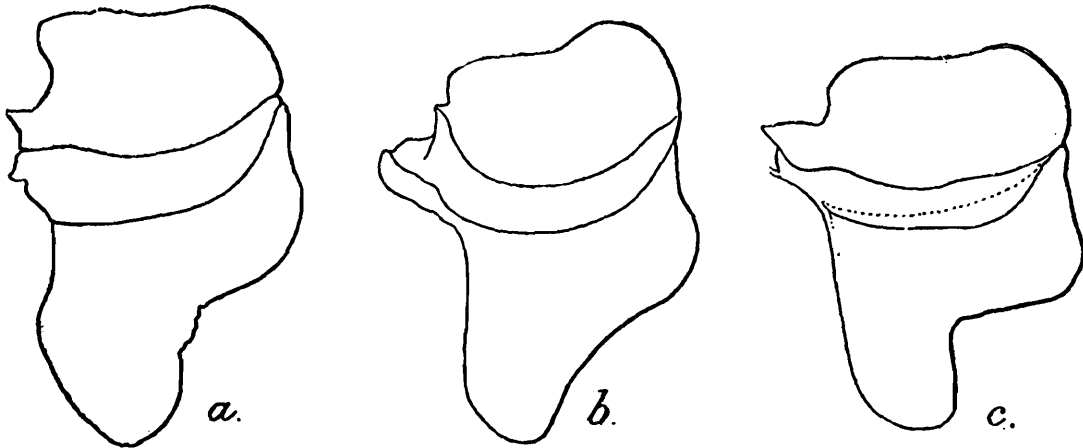
1923. *Palaegyge bengalensis*, Chopra, *loc. cit.*, pp. 501-503, pl. xviii, figs. 1-4.

1929. *Probopyrus bengalensis*, Nierstrasz and Brender à Brandis, *loc. cit.*, pp. 21, 22.

Palaegyge bengalensis was so far known to live only in the Gangetic Delta on the common estuarine prawn *Palaemon malcolmsonii* H. Milne-Edwards; it has now been recorded by Nierstrasz and Brender à Brandis from Bangkok as a parasite of the closely allied *P. carcinus* Fabricius. The latter species is known to be parasitized in India and Java by another species of *Palaegyge*, *P. buitendijki* Horst, which, however, seems to be nearly related to *P. bengalensis*.

The Dutch authors have pointed out some characters in which they believe their specimen differs from my account of the species published in 1923. The first oostegite was illustrated by me in fig. 3 on plate xviii, and the caudal lobe is there seen to be posteriorly rounded; in the

Bangkok specimen it is described as narrow. For purposes of comparison I figure here the first oostegite of the three allied species *Palaegyge*



TEXT-FIG. 2.—First oostegite of *a. Palaegyge buitendijki* Horst ; *b. P. bengalensis* Chopra ; and *c. P. alcocki* Chopra, showing the shape of the posterior lobe ; all drawn to same magnification : $\times 6$.

alcocki Chopra, *P. buitendijki* Horst and *P. bengalensis* Chopra. It will be seen that the caudal lobe is posteriorly rounded in all the three species, but it is much broader in Horst's species than in the other two, and that it is the narrowest in *P. bengalensis*. It is quite usual to find this lobe folded and the exact shape can only be seen after strightening out the fold completely.

In *P. bengalensis* the uropods are placed considerably in advance of the posterior extremity of the pleotelson, near the line of demarcation between it and the fifth somite, almost exactly in the situation mentioned by Nierstrasz and Brender à Brandis. On re-examining some of my specimens I find that in structure also these appendages agree more or less closely with the description given by the Dutch authors. In the type-specimen the trilobed structure is not clearly seen, but in some of the other examples the median lobe is quite distinct, and in one is considerably larger than the lateral lobes. Though I have no doubt that these structures represent the true uropods of the other species, I am unable to homologise their structure with similar appendages in other Bopyrids. In several species the uropods are placed well in advance of the posterior margin of the pleotelson, in a position similar to that figured by Nierstrasz and Brender à Brandis for *Palaegyge latilamellaris*.¹ In the genotype, *Palaegyge borrei* Giard and Bonnier, even the uropods, as seen from the figures² of this species, appear to be placed near the line of demarcation between the fifth abdominal somite and the pleotelson.

Genus *Bopyrella* Bonnier.

1923. *Bopyrella*, Chopra, *loc. cit.*, pp. 467-469, and 540, 541.

1927. *Bopyrella*, Chopra, *Bull. Madras Govt. Mus.* (n.s.) I, pp. 1-4.

1929. *Bopyrella*, Nierstrasz and Brender à Brandis, *loc. cit.*, pp. 29-36.

In 1923 I discussed at length the view that Hay's *Synsynella* cannot be maintained as a distinct genus, for it shares with *Bopyrella* almost

¹ Nierstrasz and Brender à Brandis, *Vidensk. Medd. Dansk Naturh. Foren.* LXXXVII, p. 21, fig. 23 (1929).

² Giard and Bonnier, *Bull. Sci. France Belgique* XIX, pl. v, fig. 7 (1888) ; also Bonnier, *Trav. Stat. Zool. Wimereux* VIII, pl. xxx, fig. 10 (1900).

all the characters on which it was erected. The principal character, according to Hay, which separates *Synsynella* from all the other genera of Bopyridae, is the fusion of the head with the thorax in both the sexes; this character is, however, present in Bonnier's genus also. Nierstrasz and Brender à Brandis have now tried to show that the two genera can be distinguished from one another by an altogether different character, namely, the fusion in the female of *Synsynella* of all the thoracic somites with one another on the middle of the body. In the genotype *Synsynella deformans*, Hay described all the thoracic somites, except the first and the second, as distinct, and I found a similar condition in my specimens which appeared to be only a subspecies of Hay's form. The Dutch authors, however, believe that what Hay and I considered as the lines of demarcation between the various somites are merely folds of the chitinous skin, and that the thoracic somites are really fused in the mid-dorsal region in our specimens. With this I am unable to agree. Hay has described the thoracic segments, except the first and the second, as distinct and his photographs also bring out this point more or less clearly, and unless a re-examination of his specimens for this character shows a different condition there appears to me to be no justification for believing that his *Synsynella* is characterized by a fusion, on the dorsal surface, of all the thoracic somites.

I have also carefully re-examined the type-specimens of my *Bopyrella deformans* subspecies *indica* for this character. One of the two type-specimens is unfortunately in a damaged condition now, but the posterior region of the thorax is intact, and on this the last lines of demarcation can be traced more or less clearly throughout the dorsal surface. The anterior part is damaged but even on this, parts of some of the lines can be seen. In the other type-specimen all the thoracic lines, except the first, can be distinctly made out. The second line, as is to be expected, is obliterated about the middle of the body, but all the others are clear throughout the dorsal surface. The lines of demarcation are quite distinct from lines of the chitinous covering, which are more superficial and can generally be recognized without much difficulty.

It will thus be seen that the only character on which Nierstrasz and Brender à Brandis have separated *Synsynella* from *Bopyrella*, viz., the fusion on the dorsal surface of all the thoracic somites in the female, does not seem to hold good in the case of the type-species of Hay's genus, nor is it applicable to its Indian variety as described by me. Until this question of fusion of the thoracic somites in Hay's type-specimens is definitely settled, I believe it is best to consider his *Synsynella* as a synonym of Bonnier's *Bopyrella*. It is possible that what the Dutch authors have described as *Synsynella* is quite distinct from *Bopyrella*, but Hay's *Synsynella* (unless a re-examination of his material shows to the contrary) is characterized by distinct thoracic somites in the female.

Nierstrasz and Brender à Brandis have described, in the paper cited above, a new genus, under the name of *Prosynsynella*, which is very closely allied to *Bopyrella* (and *Synsynella*). The principal character, which separates this genus from the allied genera, is that in the male the head

is not fused with the thorax, the line of demarcation between it and the first thoracic somite being quite distinct. All the thoracic somites in the female are also fused medially.

A number of new species have recently been described by Nierstrasz and Brender à Brandis under *Bopyrella*. Most of these species are from the West Indies, but two have been recorded from eastern waters: *Bopyrella choprae*¹ from the Bay of Bengal and the Strait of Formosa, and *Bopyrella megatelson*² from the Gulf of Siam. The genus has thus a very wide range of distribution, being met with in several places in all the three great oceans. In the Pacific it has been recorded from the Strait of Formosa; in the Indo-Pacific region and the Indian Ocean it is known from several places from the Friendly Islands, Oceania, in the south-east to as far as Karachi in the Arabian Sea on the west side; in the Atlantic it has been recorded along the coast of North America and in the West Indies.

The host distribution of the genus has now also been extended. It was previously known to infest the Alpheid genera *Alpheus* and *Synalpheus* only. Nierstrasz and Brender à Brandis have now recorded it from a number of genera of the family Hippolytidae also, viz., *Hippopolysmata* Stimpson, *Tozeuma* Stimpson and *Latreutes* Stimpson.

To this genus I have assigned with some doubt another species, *Bopyrella nierstraszi*, described as new in this paper. The female in this species agrees in all material respects with a typical *Bopyrella*, except for the fact that the abdominal somites are perhaps a little more distinct than is usually the case in the genus. The male, however, differs in one very important respect, namely, that the head is quite distinct from the thorax. In this respect the species resembles *Prosynsynella* Nierstrasz and Brender à Brandis, but differs from it in that all the thoracic somites, except the first, are quite distinct in the female.

***Bopyrella nierstraszi*, sp. nov.**

(Plate V, figs. 1-6.)

The single *adult female* that I have examined is 5.3 mm. long from the middle of the anterior border of the head to the posterior extremity, and is about 4 mm. broad at the level of the third thoracic somite. As is usual in the genus, the body is slightly asymmetrical, the left side being shorter than the right. The body has no characteristic pigmentation on the dorsal or the ventral surface. It is pale yellowish in colour, but there is a brownish area running all round the thorax a little inside the margins. The head and the abdomen are not coloured. Ventrally parts of some of the oostegites are pigmented in a dark brownish shade, while the rest of the surface is pale yellowish. The head as seen on the dorsal surface is partly fused with the thorax, the line of demarcation between it and the first thoracic somite being altogether absent. The line between the first and the second somite is also somewhat indistinct on the middle of the body. The head appears to be somewhat raised

¹ Nierstrasz and Brender à Brandis, *Vidensk. Medd. Dansk Naturh. Foren.* LXXXVII, pp. 29, 30 (1929).

² Nierstrasz and Brender à Brandis, *ibid.*, pp. 31, 32 (1929).

above the general surface of the body and is more or less rounded in shape. The anterior margin is prolonged into a very narrow frontal lamina, which is straight in outline. The posterior portion of the head is broadly rounded. A pair of small indistinct eyes in the form of a number of minute dark spots aggregated together are present, one at each antero-lateral corner of the head.

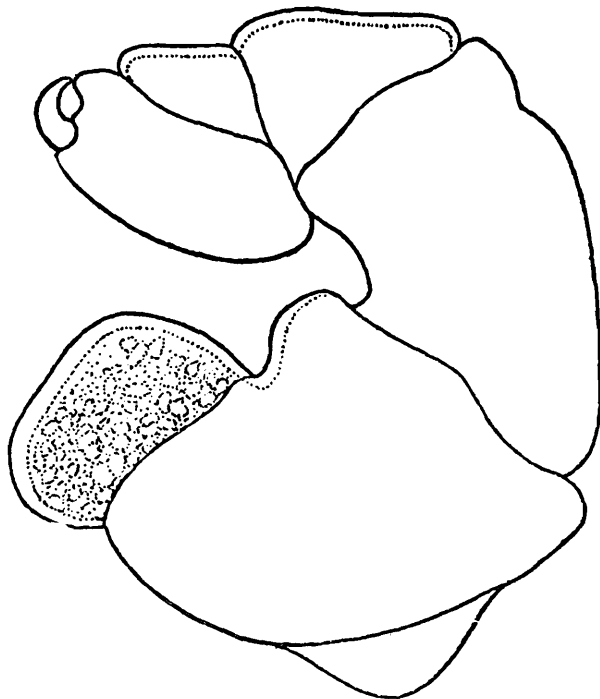
All the thoracic somites are very clearly defined on the dorsal surface. The first appears to be very short ; the second is also somewhat shorter than the third. The remaining somites are subequal in length. The ovarian bosses are very clearly seen on the first four somites, and are, as usual, separated from the "anterior lateral plates" by distinct sutures. These plates are rather narrow on the first four somites, while on the last three, especially on the longer side of the body, they are fairly broad. The posterior lateral plates on the first four somites are quite prominent.

The abdomen is slightly longer than a third of the total length of the body, and is almost as broad as long. The somites of which it is formed are very clearly demarcated along the sides by deep clefts. On the dorsal surface also the first four somites are more or less clearly separated from one another and their lines of demarcation, except on the mid-dorsal region, are quite distinct ; the fifth and the sixth, though distinct along the margins, appear to be fused together dorsally, and the line between them cannot be made out. The last somite appears to be quite large, and its posterior margin is more or less straight and entire.

The head, seen from the ventral surface, after removing the maxillipeds and the first oostegites, is considerably broader than long. The mouth parts and the head appendages are greatly reduced. The antennules and the antennae are placed just behind the anterior margin, and are minute, insignificant structures ; the former appear to be three-segmented, the terminal segment being the smallest. The antennae are formed of two segments only, the basal is large and massive, while the terminal is somewhat rounded. The maxillae have not been clearly seen, while the mandibles have the usual stout and curved appearance. The posterior lamina of the head is broadly rounded in the middle, and of the two lateral lobes the outer, as usual, is larger than the inner. Both are pointed at the tip and have their margins entire. The maxilliped is about one and a half times as long as broad, and has the usual shape. The palp is somewhat deeply set in the anterior side near its internal angle, and is crowned with a number of long hairs. The hairs are longer than usual, and some of them are as long as the palp itself. They bear small secondary hairs. There appear to be 7 or 8 long hairs on the palp, 4 or 5 on the dome-shaped apex, and the rest on the sides. There are also three long hairs on the anterior margin of the maxilliped external to the palp and another three or four on its inner side.

The incubatory cavity is widely open, and the ventral surface of the thorax is seen to be raised in large fleshy ridges. The first oostegite has the usual shape ; the anterior margin is more or less straight and has only a slight depression about the middle. The posterior portion is large and is drawn out at its postero-external angle into a rather small

lobe, rounded at its extremity, and fringed with hairs along its inner margin. The internal crest is fairly well developed, and has four or five prominent lobes near its proximal end. The remaining oostegites have the usual shape, and those of the last pair carry fairly long hairs



TEXT-FIG. 3.—*Bopyrella nierstraszi*, sp. nov. Thoracic leg of female: $\times 135$.

along the posterior margins. The legs have the usual structure, and the basal segment is provided with a large scaly boss. The claw is fairly well developed.

The abdominal structures are somewhat reduced, and the exposed surface of the abdomen is raised in transverse fleshy ridges. The pleopods, on account of their poor development, do not cover the entire surface of the abdomen but leave a considerable part of it exposed in the median region. The pleopods of the first pair approach one another in the middle line, but the posterior ones recede from one another more and more, till those of the last pair are placed quite near the margins of their respective sides of the body, and almost the entire breadth of the abdomen separates one from the other. All the pleopods are biramous and their rami subequal. The uropods seem to be totally absent.

The *male* is short and stumpy, being slightly less than twice as long as broad. It is 1.3 mm. long from its anterior end to the posterior margin of the last abdominal somite, and is about 0.7 mm. broad at the level of the third thoracic somite. There are no characteristic colour markings on any part of the body. The sides of the thorax are very faintly rugose.

The head is distinct from the thorax and is more or less semi-circular in shape. The anterior margin is regularly rounded, while the posterior is prominently drawn backwards, about its middle, in the anterior margin of the first thoracic somite. Eyes are present near the antero-external angles in the form of a number of small pigment spots. Ventrally the head appendages and the mouth parts are very much reduced, and except for the two pairs of antennae the other structures can hardly

be made out. The antennules and the antennae appear to be formed of three segments each, but in the case of the latter it is difficult to make out the segments clearly.

The thoracic somites are all distinct and clearly demarcated. The legs are well formed, each having a large propodus and a strong claw.

The abdomen is considerably broader than long, and the somites of which it is formed are clearly demarcated along the sides. On the dorsal surface, however, the lines of demarcation between the somites are totally obliterated. All the six somites are clearly seen along the margins, and the last somite does not reach as far behind as the posterior end of the fifth. The posterior margin of the last somite is entire and somewhat rounded. On the ventral surface the first five somites have thin plate-like structures diminishing in size progressively in an antero-posterior direction. They are more or less oval in shape, and are arranged in parallel rows one behind the other, one plate on each side of the somite. On account of their position these structures appear to be comparable with the pleopods of other Bopyrids. The last somite seems to carry no appendages.

Locality.—The single specimen, a male and a female, that I have seen was collected by Mr. R. P. Mullen at Port Blair in the Andaman Islands. The parasite was found living in the right branchial chamber of *Hippolyasmata vittata* Stimpson, a Caridean shrimp of the family Hippolytidae. The incubatory cavity had only a few embryos in it.

C 1464/1 Port Blair, Andaman R. P. Mullen. 1 ♀ and ♂ on *Hippolyasmata vittata* Stimpson. TYPE.

As will be seen from the description given above, the female in the new species agrees in almost all material respects with the generic definition of *Bopyrella*, the only noteworthy difference being that the abdominal somites are a little more distinct from one another than is usually the case. In this respect *B. lata*, recently described by Nierstrasz and Brender à Brandis¹ from the West Indies, shows a similar condition: the abdominal somites in this species are marked off from one another perhaps a little more distinctly than even in the Indian form. It is in the character of the male, however, that *B. nierstraszi* differs from all the other species of *Bopyrella*. The head is quite distinct from the thorax, there being a definite line of demarcation between it and the first thoracic somite. The abdomen is also provided with a number of thin plate-like structures that appear to be comparable with pleopods. In the latter character, however, *B. nierstraszi* resembles *B. mortenseni* Nierstrasz and Brender à Brandis from the West Indies, in which the male has similar structures on the abdomen.

Nierstrasz and Brender à Brandis have recently² set up a new genus under the name of *Prosynsynella*, which though very closely resembling *Bopyrella* and *Synsynella* Hay (which I consider only a synonym of the former), differs from these in having the head in the male distinct from the thorax. In this character *B. nierstraszi* resembles very closely

¹ Nierstrasz and Brender à Brandis, *Vidensk. Medd. Dansk Naturh. Foren.* LXXXVII. pp. 34, 35 (1929).

² Nierstrasz and Brender à Brandis, *ibid.*, pp. 36, 37 (1929).

Prosynsynella hayi, the type-species of the Dutch authors' genus. The females in the two are, however, quite different and the male in *P. hayi* also has no appendages.

In the possession of pleopod-like appendages, and in some other characters also, the present species seems to come very close to *B. mortenseni* Nierstrasz and Brender à Brandis.¹ The general outline of the female in the two is more or less similar, the posterior lobe of the first oostegite has a similar shape in both and the males have similar appendages on the abdomen. Both are parasites of the Hippolytid genus *Hippolysmata*, the West Indies species of *H. wurdemanni* (Gibbes) and *B. nierstraszi* of *H. vittata* Stimpson. The differences between the two, however, are equally noteworthy. The head in the female of the Indian species, though fused with the thorax, is more or less marked off from the rest of the body; the abdominal somites are more distinct and the pleotelson is not rounded posteriorly. In the male of *B. nierstraszi* the shape of the body is altogether different, being broadest in the middle and tapering slightly both anteriorly and posteriorly; the head is quite distinct from the thorax and the abdomen is much broader than in the allied species.

Bopyrella choprae,² another species described by Nierstrasz and Brender à Brandis, as a parasite of *Hippolysmata vittata*, the same host on which *B. nierstraszi* is known to live, is also from the Indo-Pacific region, having been obtained from the Nicobar Islands in the Bay of Bengal and the Strait of Formosa in the China Sea. Its male is unknown. It differs from the present species in having a much broader body, a broader abdomen, the somites of which show greater fusion, and in the posterior lobe of the first oostegite having a different shape.

Genus **Pseudione** Kossmann.

1881. *Pseudione*,³ Kossmann, *Zeitschr. Wiss. Zool.* XXXV, p. 663, pl. xxxiii, fig. 17.
 1899. *Pseudione*, Sars, *Crust. Norway* II, pp. 200, 201.
 1900. *Pseudione*, Bonnier, *Trav. Stat. Zool. Wimereux* VIII, p. 292.
 1905. *Pseudione*, Richardson, *Bull. U. S. Nat. Mus.* LIV, pp. 522, 523.
 1929. *Pseudione*, Nierstrasz and Brender à Brandis,⁴ *Siboga-Exped. Rep.* XXXIIb, pp. 70-72.

Though several authors have tried to give a satisfactory diagnosis for the heterogeneous assemblage of species grouped under the generic designation of *Pseudione*, the definition proposed by Sars is the only one that is applicable to most of the species. Nierstrasz and Brender à Brandis have also adopted this definition more or less entirely and without any material emendations.

Nierstrasz and Brender à Brandis, in the paper cited above, have discussed very ably the limits of the genus *Pseudione*, and have tried to arrange the numerous species that have been placed under it in more

¹ Nierstrasz and Brender à Brandis, *Vidensk. Medd. Dansk Naturh. Foren.* pp. 30, 31 (1929).

² Nierstrasz and Brender à Brandis, *ibid.*, LXXXVII, pp. 29, 30 (1929).

³ Only a few references, in which either the position of the genus has been discussed or its definition given, have been included in this synonymy.

⁴ According to Nierstrasz and Brender à Brandis the genus *Cryptione* Hansen is a synonym of *Pseudione*.

or less definite and well-marked groups. On account of the material differences between the various members of the genus, and on account of the large number of species that it contains, such a grouping must involve a certain amount of overlapping, but the practical utility of this arrangement cannot be over emphasised.

I have described below a new species under the name of *Pseudione indica*. It is a parasite of a marine Cragonid and constitutes the first record of the occurrence of a member of this genus in the Bay of Bengal. According to the grouping proposed by Nierstrasz and Brender à Brandis, the species belongs to the "group b," which is characterised in the female by the possession of well-developed pleural plates on the abdominal somites, and the absence of separate anterior lateral plates (coxal plates) on the thorax.

The genus *Pseudione* has a very wide range of distribution, having been met with in almost all the seas of the world. In the Atlantic it is known from as far north as the coast of Norway to the Gulf of Mexico in the south; in the Pacific it has been recorded from several places along the coast of North America, from Puget Sound to the Galapagos Islands. In the Indo-Pacific region it is met with in the Philippines to places over 12° south of the Equator on the lower side. The new Indian species is from the Andaman Islands in the Bay of Bengal.

The members of the genus *Pseudione* appear to be cosmopolitan in the choice of their hosts also, living on several families of the Anomura and the Macrura. Most of the species are parasites of the Anomura, but there are a few that are known to infect certain genera of the Caridea also. Amongst the latter may be mentioned *P. affinis* Sars,¹ and *P. hoylei* (Giard and Bonnier),² parasites of two species of *Pandalus* (family Pandalidae), and *P. elongata* (Hansen)³, a parasite of *Nematocarcinus* of the family Nematocarcinidae. The new species described by me is a parasite of the Cragonid genus *Pontophilus* Leach.

***Pseudione indica*, sp. nov.**

(Plate VI, figs. 1-5.)

The single *adult female* that I have examined is more or less regularly oval, and is only slightly asymmetrical in shape, the right side of the body being somewhat shorter than the left. It is small in size, the length of the body from the anterior margin to the posterior extremity of the abdomen, excluding the backwardly projecting appendages of the terminal somite, is 2 mm., while the breadth at the level of the third thoracic somite is about 1.2 mm. The body is whitish in colour, except for the middle of the thorax on the dorsal surface, where it is somewhat pale yellowish. There are no characteristic colour markings; on the last two or three thoracic and the first two abdominal somites, however, there are a few dark pigment spots a little on the inside of the margin. The ventral surface is totally white.

¹ Sars, *Crust. Norway* II, pp. 201, 202, pl. lxxxv, fig. 1 (1899).

² Bonnier, *Trav. Stat. Zool. Wimereux* VIII, pp. 308, 309, pl. xix (1900). Giard and Bonnier originally described this species as a *Palaeogyge*.

³ Hansen, *Bull. Mus. Comp. Zool. Harvard* XXXI, pp. 112-115, pls. iii, iv, (1897). Hansen originally described this species under his new genus *Cryptione*.

The head is quite distinct from the thorax and is considerably broader than long. The anterior margin is regularly and broadly rounded. A pair of dark conspicuous eyes is present, one on each side near the antero-lateral corners, a little behind the anterior margin.

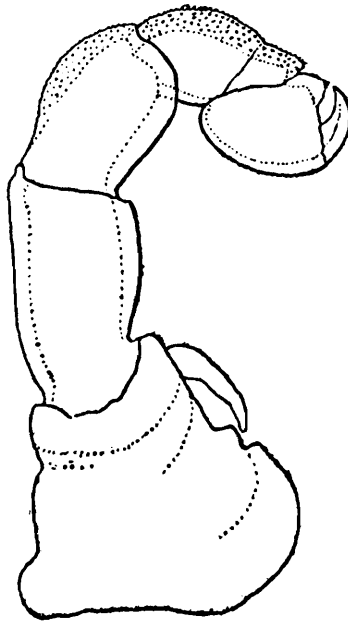
The lines of demarcation between the thoracic somites are not deeply impressed on the dorsal surface, and some of the posterior ones can hardly be made out on the middle of the body. The first somite is short in the mid-dorsal region, and the line between it and the second somite can be made out throughout its length. The second is almost twice as long as the first, and is only a little shorter than those succeeding it. The lines of demarcation between all the somites can be faintly made out under high magnification. The segmental margins are deeply cleft and all the somites can be made out clearly on the sides. Each segmental margin is cleft into two parts by a distinct notch. In the first four segments the anterior part of the margin is larger than the posterior, but in the remaining segments the two parts are subequal. This arrangement is better seen on the longer side of the body. The ovarian bosses can only be made out very indistinctly, and the lateral plates are very poorly developed. On the first four somites the latter do not appear as distinct structures, while on the last three they are better developed and appear as small plates on the sides of the segmental margins.

The abdomen is considerably broader than long, and is clearly seen to be formed of six somites, which are clearly differentiated and well separated from one another on the sides. The lines of demarcation between them are, however, for the most part very indistinct, and can be made out with some difficulty only—especially those between the first two or three somites. The first five somites have well-developed pleural plates, which are lamellar in shape, and are quite separated from one another. On the sides, especially the right side, the first three somites point outwards and somewhat forwards, while the next two are backwardly directed. The terminal somite is a small, somewhat rounded structure, and falls considerably short of the one preceding it.

On the ventral surface the two pairs of antennae and the mouth parts are very greatly reduced, and their shape and structure can hardly be made out. The two maxillipeds do not meet one another in the middle line, but leave a wide gap between them. They are somewhat broad in shape, each being only a little longer than broad. The dome-shaped palp is well developed, and is placed a little away from the antero-internal angle. It is markedly constricted near the base and carries a number of long hairs, but the exact number and disposition of these is somewhat difficult to make out clearly. Besides the smaller hairs there appear to be about eight or ten long hairs, more or less evenly distributed along the margins. There are also two or three other long hairs on the antero-internal angle, and one a little below it along the internal margin. The anterior and the external margins are hairy.

The large incubatory cavity is not completely roofed over by the five pairs of oostegites, which leave a large gap in the mid-ventral region. The ventral wall of the thorax is considerably swollen, but there does not appear to be any regular ridging. The oostegites of the first pair are small, and have the usual shape. They are longer than broad and

are formed of the usual two portions, of which the anterior one is rather small. The anterior margin is concave about the middle and the internal crest is rather poorly developed. The posterior portion is drawn out into the usual lobe, which is quite large and regularly rounded. There are no hairs on the inner margin of the posterior lobe. The remaining oostegites are more or less circular or oval in outline and, except for those of the last pair, do not approach one another in the middle line. The latter are considerably longer than broad, and that of the right side of the body overlaps its companion on the left, and covers a part of the abdomen also. The seven pairs of thoracic legs occupy the usual



TEXT-FIG. 4.—*Pseudione indica*, sp. nov. Thoracic leg of female : $\times 150$.

position along the thoracic margins. There is no boss on the basal segment, but the outer margins of the ischium, merus and carpus are strongly scaly; the propodus has a few short hairs at the point where it meets the dactylus and the latter is strongly developed.

The pleopods are considerably reduced, and occupy only a portion of the ventral surface of the abdomen. They are placed near the margins of the body and leave quite a large gap in the middle, where the surface of the abdomen appears to be raised in slight ridges. There are five pairs of biramous pleopods decreasing in size antero-posteriorly. The pleopods of the anterior pairs are more or less oval, plate-like structures, and in the first two the endopodite and the exopodite are subequal in size. In the remaining three pairs the exopodite becomes progressively longer and narrower, while the endopodite gets smaller and smaller, till in the pleopods of the fifth pair the former becomes a long and narrow finger-shaped appendage projecting beyond the margin of the abdomen, while the endopodite is a minute structure, squarish or rounded in outline, at the base of the outer ramus. The terminal somite carries the uniramous uropods, which are long and narrow structures like the exopodite of the last pleopods, and are sticking out at the posterior extremity of the abdomen. The pleopods and the uropods are quite smooth.

The *male* is not known.

Locality.—The single female specimen that I have seen is a parasite of the Crangonid shrimp *Pontophilus plebs* Kemp, and was collected in the Andaman Islands in the Bay of Bengal. The parasite was found in the branchial chamber of the host and had only a few eggs in its incubatory cavity.

C 1463/1 Mouth of Brigade Creek, S. W. Komp, Feb., 1 ♀ on *Pontophilus*
Port Blair, Andaman Is- 1921. *plebs* Kemp. TYPE.
lands.

Another species of *Pontophilus*, *P. lowisi* Kemp, also collected in the Andamans is infected by an altogether different Bopyrid that has been described in this paper under the name of *Diplophryxus richardsoni*, sp. nov.

Though a number of species of the genus *Pseudione* have already been described from the Indo-Pacific region, *P. indica* is the first species to be recorded from Indian waters.

Genus *Bopyrus* Latreille.

Bopyrus squillarum Latreille.

1923. *Bopyrus squillarum*, Chopra, *loc. cit.*, pp. 519, 520, and 541, 542.

1929. *Bopyrus squillarum*, Nierstrasz and Brender à Brandis, *loc. cit.*, pp. 26, 27.

In 1923 I expressed the opinion that, with the possible exception of *Bopyrus xiphias* Giard and Bonnier, all the species of this genus described by Giard and Bonnier were only synonyms of *B. squillarum*. *B. xiphias* was only doubtfully included in the synonymy of the latter species in so far as the abdomen of its male has a different shape and the first oostegite of the female is also somewhat different. In their report on the Siboga Expedition Epicaridea, Nierstrasz and Brender à Brandis considered most of Giard and Bonnier's species as distinct; they are now of the opinion that the views expressed by me were correct. They have also now shown that even *B. xiphias* is only a synonym of *B. squillarum*, for they have obtained a specimen of *B. squillarum* the male of which has its abdomen intermediate in form between that of *B. xiphias* and a typical *B. squillarum*. The same is the case with the first oostegite also. It is now clear, therefore, that the genus *Bopyrus* contains only two species: *B. squillarum* Latreille (with its Indian variety *bimaculatus* Chopra), a parasite of a number of species of *Leander* occurring in the Northern Atlantic, the North Sea, the English Channel, the Mediterranean Sea, the Black Sea, the Arabian Sea, the Delta of the Ganges and the Bay of Bengal, and *B. stebbingi* Nierstrasz and Brender à Brandis, a parasite of an unknown host and occurring in the eastern parts of the Indo-Pacific region.

Nierstrasz and Brender à Brandis have now rightly adopted the name of *B. squillarum* in place of Giard and Bonnier's designation of *fougerouxii*.

var. *bimaculatus* Chopra.

1923. *Bopyrus squillarum*, var. *bimaculatus*, Chopra, *loc. cit.*, pp. 520-522, pl. xix, figs. 6-11.

Two additional specimens of the Indian variety of *B. squillarum*, collected as long ago as 1911, have recently been found in the Indian

Museum collection. They are ovigerous females accompanied by their males, and agree in all important characters with the description published in 1923. Except for the fact that the two dark spots on the dorsal surface of the female abdomen, to which the specific name refers, are very faint, there is hardly any recognisable difference between the present examples and those previously described.

C 1465/1 Bandra, near Bombay. J. W. Caunter, Feb., 2 ♀♀ and ♂♂ on
1911. *Leander* prox. *serrifer* Stimpson.

The Bopyrids were found attached to the branchial wall of the host in the usual position, with the dorsal surface apposed to the bodywall, and the anterior end pointing towards the posterior extremity of the host. The large incubatory cavity with its mass of eggs could be seen through the host's carapace, and the dark ring formed all round the marsupium by the pigment spots on the oostegites was clearly visible.

The occurrence of this Bopyrid near Bombay extends the range of the species considerably, as all the previously described examples came from the eastern part of the Indo-Pacific region. *Leander serrifer* it may, however, be noted is a common species all over the Indo-Pacific region from Hong Kong in the east to the coast of Africa in the west.

Genus *Bopyrina* Kossmann.

1923. *Bopyrina*, Chopra, *loc. cit.*, pp. 522-524, and 542, 543.

1929. *Bopyrina*, Nierstrasz and Brender à Brandis, *loc. cit.*, pp. 39-42.

Nierstrasz and Brender à Brandis set up in 1925¹ a new genus under the name of *Bopyrinella*, based on a single species parasitic on *Thor floridanus* Kingsley, collected off Curaco Island in the Caribbean sea. This species of *Thor* was already known to be infested by a species of *Bopyrina*, *B. thori* Richardson, from the neighbouring coast of Florida. The new genus, as stated by the authors themselves, is very closely allied to *Bopyrina*, and except for the fact that the female is said to have an additional pleopod, the two genera are indistinguishable from one another. The fifth pleopod in *Bopyrinella* is, however, said to be greatly reduced.

The genus *Bopyrina* has a very wide range of distribution, and, besides the localities enumerated in 1923, is now known to occur also along the Pacific coast of North America (*B. striata* Nierstrasz and Brender à Brender) and further east in the Indian Ocean than it was so far known to live. The new species described in this paper is from the Nicobar Islands in the Bay of Bengal.

To the list of hosts that *Bopyrina* was hitherto known to parasitize may now be added another genus of the Pontoniinae, *viz.*, *Harpilius* Dana, the host of *B. choprae* Nierstrasz and Brender à Brandis, and the Pandalid *Chlorotocella* Balss, on which *B. sewelli*, sp. nov. is known to live. The genus is thus now known to infest members of three families, the Hippolytidae, the Palaemonidae (subfamily Pontoniinae) and the Pandalidae.

¹Nierstrasz and Brender à Brandis, *Bijdr. Dierkunde* XXIV, pp. 6, 7, pl. figs. 22-25 (1925).

Bopyrina sewelli, sp. nov.

(Plate VI, figs. 6-11.)

The *adult female* is highly asymmetrical, one side of the body being considerably longer and more swollen than the other. The greatest length of the body is 2.8 mm., while the breadth at the level of the third thoracic somite is 1.6 mm. On account of the marked asymmetry of form the head is very much pushed over to one side. The body is whitish in colour, and has no characteristic markings on the dorsal surface. The margin near the longer side of the body is, however, somewhat cream-coloured. The ventral surface is also white in colour, and the oostegites are without any pigment.

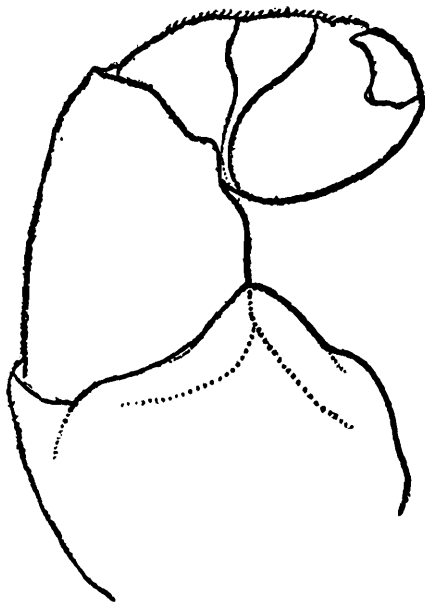
The head has a narrow anterior lamina which is slightly projecting in front of it, and is broadly rounded anteriorly. The antero-lateral angle on the longer side of the body is somewhat prominent, while that on the other side is barely discernable. A pair of very minute eyespots is seen close behind the anterior lamina. The posterior margin of the head is more or less completely fused with the first thoracic somite and cannot be made out.

The thoracic somites are also considerably fused with one another in the mid-dorsal region of the body, but can be clearly made out along the margins, especially on the longer side of the body. As is usual, the first four segmental margins are broken up into two each by a distinct constriction, while the remaining three are entire. The lateral plates are very poorly developed, but can be faintly made out on the anterior parts of the first four somites. The ovarian bosses have not been seen. The last three somites are somewhat small.

The abdomen is quite large, and is almost as long as broad. The segments of which it is composed are considerably fused with one another on the dorsal surface, though they can be made out more or less clearly along the margins. On the shorter side of the body the marginal indentations marking off the somites are not very deeply impressed, but all the six somites can still be made out on this side. On the other side only four somites, including the large median terminal segment, can be distinguished. The last somite, which forms the posterior extremity of the body, is a comparatively large triangular structure, and has a slight notch about the middle of its posterior margin, which is otherwise regularly rounded.

The mouth parts and the head appendages are extremely reduced, and cannot be easily made out. The posterior lamina has a large median lobe, which is regularly and broadly rounded. Of the secondary lobes only one pair has been seen; this is rather small, but has the usual shape. The maxillipeds are rather broad in shape, being only a little longer than broad. The basal triangular portion is proportionately small, and the palp at the antero-internal angle, which is such a prominent structure in other species of the genus, seems to be altogether absent. It seems to be represented by a very slight rising of the anterior margin, and carries a single short seta. There are no hairs on the rest of the anterior margin, though the internal margin is distinctly hairy. The muscles at the base of the anterior segment are very well developed.

The incubatory cavity is large, and is only very partially roofed over by the oostegites. The wall of the thorax is considerably swollen, especially on the shorter side of the body, but there are no distinct ridges. The oostegites of the first pair have the usual shape and structure. The anterior portion is much longer from side to side than in an antero-posterior direction, and has a distinct concavity along its anterior border. The internal crest is not strongly developed, and, except for a few small lobes near its proximal end, is entire. The posterior portion of the oostegite is prolonged into the usual posteriorly directed lobe, but the latter has its inner margin convex, instead of being concave as is usually the case. The outer margin is practically straight. In this respect the first oostegite of the present species resembles that of *B. giardi* Bonnier¹, or to some extent that of *B. abbreviata* Richardson.² The remaining oostegites are greatly reduced, and are so transparent, at least those on the swollen side of the body, that it is very difficult to make out their exact shape and disposition. The oostegites of the fifth pair do not completely enclose the incubatory cavity posteriorly. The legs are considerably reduced in size, but have the usual structure.



TEXT-FIG. 5.—*Bopyrina rewelli*, sp. nov. Thoracic leg of female : $\times 250$.

The boss on the basal segment is small, and does not bear any hair or scales. The ischium is large, the external margins of the merus and carpus are hairy, and the propodus and dactylus are well formed.

The abdomen has only four pairs of pleopods, which are uniramous in structure and are somewhat reduced in size. The pleopods decrease in size from the first to the fourth, and each has an ovalish outline. The pleopods of the two sides do not meet each other in the middle line. The last two pairs do not carry any appendages. The surface of the abdomen is raised in somewhat inconspicuous ridges, that can be seen in the middle of the abdomen between the pleopods of the two sides.

The *male* is small in size, being about 0.8 mm. long and a little over 0.2 mm. broad at the level of the third thoracic somite. The

¹ Bonnier, *Trav. Stat. Zool. Wimereux* VIII, p. 367, pl. xxxix, fig. 5 (1900).

² Richardson, *Bull. U. S. Nat. Mus.* LIV, p. 564, fig. 621 (1905).

body is white in colour, and has no characteristic colour-spots either on the dorsal or the ventral surface.

The head is more or less circular in outline, and is somewhat deeply sunk in the first thoracic somite. The anterior margin is straight, except for a minute depression about the middle. Posteriorly it is partly fused with the thorax, the line of demarcation between the two being more or less indistinguishable. A pair of minute eyes is placed a little behind the anterior margin. The antennules and the antennae are both well developed, and are of about the same size. Each appears to be triarticulate, and has its terminal segment fringed with setae. There is also a prominent hair on the second segment of the antennule at its anterior margin.

The abdomen is nearly one-third of the total length of the body, and is considerably longer than broad. The first three somites are distinct both dorsally and laterally; the fourth is distinct laterally, while dorsally its line of demarcation cannot be clearly made out. The fifth and the sixth somites are fused. The pleopods are absent. The terminal somite is a large posteriorly rounded structure, and carries a pair of prominent "anal spines," each bearing three hairs at its posterior tip.

Locality.—The single specimen that I have examined is a parasite of *Chlorotocella gracilis* Balss (family Pandalidae), and was collected by Lt.-Col. R. B. Seymour Sewell, then Surgeon-Naturalist on board the R. I. M. S. S. Investigator, at a depth of 13 fathoms in Octavia Bay, Nancowry Harbour, Nicobar Islands. It is a branchial parasite, having been found in the right gill-chamber of the host. The incubatory cavity of the parasite was full of a mass of eggs, which could be faintly seen through the host's carapace. This mass of eggs was not only filling the entire incubatory pouch of the Bopyrid, but was extending considerably beyond it on one side of the body, and was also covering up practically the entire surface of the abdomen.

C 1466/1 Octavia Bay, Nancowry R. B. S. Sewell, Oct., 1 ♀ and ♂ on *Chloro-*
Harbour, Nicobars : 13 1921. *tocella gracilis*
fathoms. Balss. TYPE.

Bopyrina sewelli seems to be closely allied to *Bopyrina giardi* Bonnier, which it resembles in the general shape of the body, as also in that of the first oostegite of the female. The posterior lamina also has a single secondary lobe in both. But it differs from Bonnier's species in a number of well-marked characters. The abdomen in the female shows a clearer segmentation in the present species than it does in *B. giardi*. In the latter no trace of segmentation can be seen on the shorter side of the body, while on the other also only three somites, excluding the terminal, can be made out. In *B. sewelli* all the six somites can be made out on the margin of the shorter side of the body, while on the other, as in Bonnier's species, four somites are seen quite distinctly. Further there are well-defined pleopods in the Nicobar species, while in *B. giard* no abdominal appendages exist. The ridging of the abdomen is also very indistinct in the present species, while in Bonnier's form it is a very characteristic feature of the female abdomen. The maxillipeds of the two species, though superficially resembling in shape, also show some

difference ; in *B. giardi* there is a small palp without any setae, in *B. sewelli* the palp is practically absent and one seta is present. The males of the two species are also different in shape and proportions, that of the present species being considerably narrower, and having a larger abdomen. The segmentation of the abdomen is somewhat different in the two, and the "anal spines" are better developed in the present species.