Scientific results of the Cambridge Expedition to the East African Lakes,
1930-1.—8. Hydracarina. By Dr. O. LUNDBLAD, Experimentalfältet,
Sweden. (Communicated by Dr. E. B. WORTHINGTON, F.L.S.)

(With 13 Text-figures)

[Read 8 December 1932]

SOME time ago, Dr. E. B. Worthington, of Cambridge, forwarded to me a small collection of Hydracarina, collected by his expedition in East Africa. My best thanks are due to Dr. Worthington for the delivery of that interesting material. However, the preservation in alcohol was a serious drawback to the study and the making of microscopic preparations, as the mites had become shrunken and too hard. The best fluid for water-mites consists of 10 vol. glycerin, 9 vol. water, and 1 vol. glacial acetic acid.

The following species were found :—

Family HYDRACHNIDAE.

Genus HYDRACHNA O. F. Müll.

Subgenus MONOHYDRACHNA S. Thor.

1. HYDRACHNA (MONOHYDRACHNA) INAEQUISCUTATA, sp. n.

This interesting little species does not fit well into any of the subgenera hitherto established, the frontal shield being differently shaped according to sex. In this respect the species resembles somewhat *H. mertonii* Walt. from the Aru Islands.

Only two specimens, a male and a female, being at my disposal, it seems to me unjustifiable to create a new subgenus until the variation in the shape of the shield could be studied in more material, so I am leaving the species provisionally in the subgenus cited above.

♂.

H. inaequiscutata is one of the smallest members of its genus, the male measuring only 790 μ in length. The skin is covered by papillae and the front region bears a single large chitinous plate, which projects forwards between the eye-capsules, ending somewhat in front of these. Laterally behind the capsule the plate forms a sharp corner, which reaches the bristle situated there. The plate is 431 μ broad and 395 μ long. The frontal organ is almost invisible and seemingly strongly reduced.

The measurements for the palp-segments are (in μ) :—

	I.	II.	III.	IV.	V.
Extensor side	125	104	114	64	36
Flexor side	90	54	79	29	25

The palp is rather bulky, with a short and thick 3rd segment. The 2nd segment is likewise short and thick, with the extensor side unusually high and convex, protruding over the upper line of the basal segment. The last-mentioned segment is very characteristic in having the extensor and flexor sides nearly parallel, not diverging towards the base as usual. The rostrum is relatively short and so are consequently the mandibles, which are $483\ \mu$ long.

TEXT-FIG. 1.

Hydrachna inaequiscutata, sp. n. ♂.

A. Dorsal plate. B. Mandible. C. Palp and rostrum.
D. Epimeral and genital plates.

The 4th pair of epimera is provided with a long and narrow inner process, surrounded by a very insignificant subcutaneous border. The border at the articular socket for the 4th leg, on the other hand, is voluminous. It is very important to call attention in the present species to the shape of that border, the anterior margin of which presents a deep bay, because the border does not, as usual, run more or less straight to the 3rd epimeron, connecting the two plates with one another, but is suddenly interrupted, so that the 4th epimeron has a mutilated appearance. The female, though differing in other respects, presents quite the same structure of the epimeral plates, which therefore no doubt is constant and of specific importance.

The epimera 1-3 in the species in question have but small subcutaneous borders. In many other species, however, such borders are larger and I have found them to be very valuable in separating species, though these characters have not yet been used by other hydracarologists.

The genital organ is broad and short, bearing but few hairs and few acetabula. The anterior margin is excavated in the middle and the genital opening is rounded and wide.

The small excretory opening lies in a chitinous circular plate.

♀.

The female is larger than the male, measuring about $1200\ \mu$ in length. In most characters it fits well the above description of the other sex and will

TEXT-FIG. 2.

Hydrachna inaequiscutata, sp. n. ♀.

A. Dorsal plate. B. Stigma. C. Last pairs of epimera and genital organ.

not therefore be fully described here. For instance, the last epimeron is built up in the same way and the palps agree with those of the male.

The frontal shield, however, differs remarkably in being cleft behind by a very deep bay and in front by a shallow bay, so that only a narrow bridge, including the frontal organ, is left, connecting the two parts of the plates. Thus the plate resembles that of the subgenus *Schizohydrachna* S. Thor. The length of the plate is $483\ \mu$, the breadth of both plates together $569\ \mu$.

The genital organ is heart-shaped, $232\ \mu$ broad, $157\ \mu$ long, with two large acetabula situated near the posterior margin. The pilosity is very scarce.

Another characteristic is to be found in the opening of the trachea on the

dorsal side of the mandibles. A comparative study of this organ in different *Hydrachna* species has shown me that it is sometimes differently shaped and that it offers important characters for separating species in many cases. Hitherto, however, it has never been used to that purpose. This surely is due to its small size and to the fact that some authors do not make detailed dissections of their specimens.

It is already well known that the two main respiratory tubes in *Hydrachna* run parallel to each other during the last part of their course, being glued close together (text-fig. 2, B), each of them ending in a stigma, closed by a membrane. The shape of this stigma varies from species to species, being short-oval in the one here described.

Locality.—Uganda: Lake Nakavali, from *Papyrus* along shore.

Type (♂) and allotype (♀) in the British Museum.

Subgenus RHABDOHYDRACHNA Viets.

2. HYDRACHNA (RHABDOHYDRACHNA) BISIGNIFERA Viets f. WORTHINGTONI, forma nov.

There are several species of *Hydrachna* with rudimentary dorsal plates occurring in East Africa: viz. *H. spinosa* Koen. from Zanzibar (1893, p. 43), *H. fissigera* Koen., and *H. signata* Koen. from Majunga and Amparandiro in Madagascar (1898, p. 394), *H. dividua* Walt. from Algeria, Tunisia, and Morocco, *H. rimosa* Walt. from Algeria (Walter, 1925, p. 196; 1929, p. 287), and *H. bisignifera* Viets from German East Africa (Viets, 1913, p. 408).

It is rather difficult to separate these species at present. *H. fissigera* Koen. and *H. rimosa* Walt. seem to be extremely nearly related, perhaps identical. The descriptions of some of the other species, e.g. *H. spinosa*, are very unsatisfactory and for the most part give characters common to all *Hydrachna* species and of no specific value.

In Dr. Worthington's material there is a species of *Hydrachna*, which I have identified as *H. bisignifera* Viets, of which the female only was known. The agreement is very good. I have been able to compare the material with the type-specimen, thanks to the courtesy of Dr. K. Viets.

Some drawings and measurements from the Worthington material, which is treated as a special form of Viets's species, may be submitted here.

♂.

This sex has a length of about 1940 μ . The skin is covered with numerous papillae, the shape of which varies from rounded to pointed. The papillae in the anterior part of the body are blunt, those in the posterior part partially pointed.

There are no real dorsal plates, but at a distance behind the eye-capsules a little longer than that between the right and left capsule we find two small plates, serving as muscle-attachments, and in the middle between these and the eyes there are two still smaller chitinous points.

The measurements are (in μ) :—Distance between eye-capsules 470 ; distance between eye-capsules and dorsal plates 655 ; distance between dorsal plates 448.

The palps are much more slender than in the foregoing species. The length of the segments is (in μ) * :—

	I.	II.	III.	IV.	V.
Extensor side	179	232	254	121	54
Flexor side.....	161	114	196	54	46

The mandibles are 965 and the maxillary organ 776 μ long. The shape of the stigma differs considerably from that already described in the preceding species.

TEXT-FIG. 3.

Hydrachna bisignifera Viets f. *worthingtoni*, forma nov. ♂.

A. Frontal region. B. Rostrum. C. Epimeral and genital plates.
D. Genital plate of another specimen.

The epimeral field is not quite as broad as in the type-female, measuring only 1845 μ in breadth and 1034 μ in length. The hind corner of the 4th plate is but slightly prolonged backwards, and surrounded by a small subcutaneous border of various shape.

* The extensor side of first segment is not measured in its full length, only from the distal end to that point near the base, where the inner and outer walls of the segment meet. Thus it is not measured to the very base.

The genital organ is very large (length about $534\ \mu$) and extends halfway outside the genital bay. In front, as well as behind, the organ is divided by a long split, approaching the centre of it. The pilosity in the posterior part is rich and the acetabula are small and numerous. The shape of the organ varies a little in different specimens, sometimes it is broader, sometimes narrower (text-fig. 3, C-D).

The excretory opening lies in a small chitinous ring.

♀.

The body measures $2015\ \mu$ in length, the epimeral field $1862\ \mu$ in breadth and $1052\ \mu$ in length. The genital organ is, as in the male, split up in front, but is considerably smaller, occupying only the anterior half of the genital

TEXT-FIG. 4.

Hydrachna bisignifera Viets f. *worthingtoni*, forma nov. A ♂, B-D ♀.

A. Palp. B. Mandible. C. Stigma. D. Last pairs of epimera and genital organ.

bay. It is $379\ \mu$ broad and $276\ \mu$ long, agrees well with Viets's figure, and is provided with a large number of small acetabula. Near the posterior margin there are two larger ones. The pilosity is rather limited.

In most other respects the female resembles the other sex. The female differs from the type in having the inner margins of the 4th pair of epimera diverging backwards. In Viets's type-female the genital bay is narrowed in the posterior part by the end of the 4th epimera, which projects considerably towards the centre. This is even more marked in the type than in Viets's drawing.

Nymph.

The nymph of the type-form is not yet described. Among the adults there were some nymphs, which no doubt belong to this species and which may be briefly described here.

The nymph is a bit smaller than the adults, measuring about $1550\ \mu$ in length. The structure of the skin, the front region, and the stigma does not differ from that of the adults. The palps, however, are much stouter. The measurements are as follows (in μ):—

	I.	II.	III.	IV.	V.
Extensor side	129	154	175	100	50
Flexor side	104	96	121	43	39

TEXT-FIG. 5.

Hydrachna bisignifera Viets f. *worthingtoni*, forma nov. Nymph.

A. Palp. B. Epimeral and genital plates.

Especially the 2nd and 3rd segments are shorter and thicker.

The mandibles attain a length of $707\ \mu$.

The epimeral field resembles that of the adults and reaches a width of $1448\ \mu$. The 4th epimeral plate has a short process bearing a small subcutaneous tongue of chitin. The subcutaneous projection from the 3rd plate lies free in the genital bay; it is not connected with the plate in question.

The genital plates are separated from one another and bear numerous small acetabula. In the soft skin between them there is a central chitinous muscle-attachment. The ring around the excretory opening is very thin.

Localities.—Uganda: Lake Nakavali, from *Papyrus* along shore and from shore-woods. Lake Edward, from swamp by shore.

Type (♂) and allotype (♀) in the British Museum.

Genus BARGENA Koen.

3. BARGENA MIRIFICA Koen.

Bargena mirifica Koenike, 1893, p. 47; Koenike, 1895, p. 4; Piersig, 1901, p. 34; Viets, 1916, p. 247.

This species was described by Koenike from a single male specimen from Zanzibar. Later Viets completed our knowledge by correcting some inaccuracies in Koenike's description and adding some few characteristics from the other sex, which was found among some specimens from the Cameroons. Besides these two records nothing, so far as I know, has been brought to our knowledge concerning this interesting mite, which is still imperfectly known. The present material enables me to discuss some points in the morphology, which needs to be once more elucidated. Male, female, and nymph are represented.

♂.

The body attains a length of 990 μ , a width of 914 μ . The skin is covered by papillae, which are clearly visible only where the skin is soft. The greater part of the body, however, is strongly chitinized, as pointed out already by Koenike. The chitinous armour is mentioned by Koenike (1893, p. 48) in the following way:—'Der Rückenbogen befindet sich auf der hinteren Hälfte der Oberseite und ist vorn offen. Hinten entsendet er, was in ähnlicher Weise noch bei keiner bekannten Hydrachnide beobachtet wurde, zwei Ausläufer, die, anfänglich 0.25 mm. von einander entfernt, sich allmählich einander nähern, indem sie sich am Hinterende des Körpers herabziehen, um beim Umbiegen nach der Bauchseite zusammen zu treffen. Sie begrenzen mit dem dazu gehörigen Teile des Rückenbogens ein glockenförmiges Stück des Hautpanzers.'

As to the 'Rückenbogen' it must be noted that this is not comparable to the 'Rückenbogen' or dorsal groove in *Arrhenurus* or *Frontipoda*, for instance. In reality there is a narrow strip of soft skin along the circular posterior border of the large frontal plate in *Bargena*, and this strip ends blindly on each side in front. Towards the back, however, the two strips coalesce, and then the single strip widens, curving backwards, downwards, and, lastly, forwards on the ventral side to the genital organ. Text-fig. 6, A, shows this 'groove' on the ventral side of the male; on the dorsal side it is about twice as broad.

The 'glockenförmige Stück,' mentioned by Koenike, is not at all developed in the specimen studied by me, so I suppose that Koenike has made a mistake in this respect. He remarks also that he could not trace any excretory opening, and this declaration makes it probable that his specimen was not dissected, so that he was unable to see the opening, which otherwise is very easily visible (see text-fig. 6, A), lying in the soft skin, surrounded by a ring of chitin. The width of the 'glockenförmige Stück' (see Koenike's figure) agrees well with the width of the strip of soft skin in my specimens. Perhaps the borders

TEXT-FIG. 6.

Bargena mirifica Koen. A-E ♂, F-G ♀.

A. Mite from beneath. B. Mandible. C. Palp and rostrum. D. Stigma. E. Penis.
F. Mite from above (less magnified). G. Epimeral and genital plates.

of this strip were creased so as to resemble narrow strips of soft skin ('Rückenbogen'). It is very likely that Koenike has been deluded by the preparation not being transparent. Viets does not say anything about this character.

Of course, the non-chitinized parts of the skin are partially homologous to the dorsal groove in *Frontipoda*, for instance, inasmuch as in both cases we find the subcutaneous borders of the 4th epimera much enlarged, curving laterally and dorsally, and approaching each other in the mid-line of the dorsum. In *Frontipoda*, however, there is only a narrow space left, forming a real dorsal

groove, whereas in *Bargena* the space in the male is too wide to be called a groove, and still more so in the female (see below). Moreover, in *Frontipoda* there is no frontal plate, and therefore there is nothing to correspond with the anterior, more or less groove-like strips of *Bargena*, which are situated between the epimeral plates and the frontal plate. A glance at the drawing of the female (text-fig. 6, F) at once makes this intelligible. Undoubtedly the anterior plate in *Bargena* is homologous to the frontal plate in the subgenus *Monohydrachna*. As a matter of fact, *Bargena* differs but little from *Hydrachna*, of which we already know a species having the greater part of the skin armoured with a large shield (*H. junodi* Walter, 1924).

On the ventral side of the body there is a semicircular line between the eyes and the epimera. This line represents the posterior ventral limit of the anterior or frontal shield, in which the eyes are enclosed. Behind this limit the epimera of the pairs 1-3 are embedded in the soft skin. From each of them, however, a sideways projecting subcutaneous piece of chitin is to be found, but these pieces can be seen only in thoroughly cleaned preparations.

The eyes are situated $293\ \mu$ from one another and are very prominent. Their structure could not be investigated in the present material, which is unfortunately preserved in alcohol. No median eye could be detected.

The width of the epimeral field in the region of the 4th plate measures $845\ \mu$. The epimera of the pairs 1-3 are very small and the hind corner of the 4th plate projects much less than in Koenike's figure. The genital organ is large, occupying the whole bay between the 3rd and 4th epimera. It is $193\ \mu$ broad and $218\ \mu$ long. The genital opening forms a long split along the median line of the posterior half of the organ, and the anterior portion of the opening is very narrow. The anterior margin of the organ is angularly incised in the middle. The pilosity is restricted to the hind part.

The occurrence of a penis evidences that the present specimen is a male. It is of usual form, attaining a length of $190\ \mu$ and a width to the anterior larger processes of about $161\ \mu$.

On each side of the excretory opening there is a small piece of chitin, lying in the soft skin and bearing a hair and the opening of a gland.

According to Koenike the maxillary organ has no rostrum and the mouth is said to be placed behind the anterior end of the organ. The mandibles were not dissected out by Koenike. Viets, however, found in his female specimens a well-developed rostrum exactly as in *Hydrachna*, with the mouth at the very tip and the mandibles of the same structure as in *Hydrachna*. I agree fully with Viets that Koenike must have had a mutilated male specimen before him and that Viets's specimens are females.

The rostrum is a normal *Hydrachna*-rostrum and the maxillary plate, when seen in side-view, forms a right angle in front, where it passes over into the rostrum. The maxillary organ (incl. rostrum) is $382\ \mu$ long, and the rather strongly curved, robust, and sharply pointed mandibles are considerably longer, viz. $517\ \mu$.

The measurements for the palps are (in μ) :

	I.	II.	III.	IV.	V.
Extensor side	125	105	118	57	36
Flexor side.....	71	54	75	46	25

The palp is a real *Hydrachna*-palp and the attachment of the basal segment to the maxillary organ is quite the same as in that genus, having the medial side of the basal segment considerably the longer, reaching further backwards than the lateral one (cf. text-fig. 6, C).

It is also worth mentioning that the structure of the stigma is the same as in *Hydrachna*.

The legs also recall those of *Hydrachna*. A characteristic feature, often mentioned for *Hydrachna*, is that the 3rd segment of the three anterior legs is shortened, but I wish to point out here that this applies also to the 4th leg. Though it is not so obvious here, the 3rd segment of the 4th leg is somewhat shorter than the 2nd and 4th. This peculiar structure holds good also for *Bargena*.

♀.

The body reaches 1206 μ in length and 1120 μ in breadth. Besides the larger size it differs from the male in having a less-developed armour, as already mentioned above. The ventral strip of soft skin, extending from genital organ to end of body, is much broader than in the male, and widens considerably backwards, measuring only 138 μ between the inner ends of the 4th epimera, whereas it is 517 μ broad at the end of the body. On the dorsal surface the soft-skinned region widens still more, measuring 724 μ at the widest place (text-fig. 6, F). Therefore it is fictitious to speak of a dorsal or ventral groove in the female. Viets, who also had some females before him, did not object to that expression of Koenike *, and if we look at Viets's drawing of the female (1916, pl. i, fig. 3 a) we will be able to see a rather narrow ventral furrow, for which the name groove seems to be quite adequate. However, the appearance figured by Viets is probably due to shrinking of the mite in consequence of the preservative. This part of the skin being soft, it is also possible that the shape of the mite varies with the distention of the intestines. The female which I have studied, and which was preserved in alcohol, was also shrunk, but was easily restored to its original shape by means of careful preparation.

The process of the 4th pair of epimera is much stouter than in the male. The genital organ is heart-shaped and deeply split up in front and the pilosity is still more scanty than in the male.

The eggs are oval as in *Hydrachna*, 172 μ long and 121 μ broad. Beyond doubt this shape indicates that the *Bargena* female pierces the tissue of plants with her rostrum, boring a hole by means of the mandibles.

* As already mentioned, Koenike had only a male available, but neither for this sex the expression is a good one (see above).

Nymph.

The nymph has not hitherto been described. It reaches a length of $1120\ \mu$ and resembles the adult mite, except that the subcutaneous borders around the 4th epimera reach the sides of the body only, not extending dorsally, and that the provisional genital organ is divided into two lateral parts. The frontal plate is well developed and large. The excretory opening is surrounded by a ring of chitin.

It is curious that Koenike was unable to find the excretory opening in *Bargena*, which is easily visible in both adult and nymph. This seems to confirm my opinion set forth above that Koenike had not dissected his material. Judging from his drawing, Viets has seen the opening (1916, pl. i, fig. 3, a), but he does not mention it.

TEXT-FIG. 7.

Bargena mirifica Koen. Nymph from beneath.

Systematic affinities.

The genus *Bargena* comes very near to *Hydrachna*. Characters common to both are: shape and arrangement of epimera, shape of maxillary organ, palps, mandibles, stigma, scope of sexual dimorphism, shape of eggs, bipartite genital organ in the nymph.

The only real difference is the absence of the frontal organ, which, as a matter of fact, sometimes is very feeble also in *Hydrachna*. Perhaps there is also another difference, viz. the organization of the lateral eyes. According to Koenike this is the case, but unfortunately I was not able to verify his statement in my material because of the state of preservation. Until the two characters just mentioned have been carefully examined, it cannot be decided whether they are satisfactory or not for separating the genera. At any rate, the strongly developed armour in *Bargena* is scarcely of any generic importance (cf. the different species of *Lebertia*).

Localities.—Uganda: Lake Nakavali, from *Papyrus* along shore; Lake Kachira, from shore-weeds.

Family HYDRYPHANTIDAE.

Subfamily HYDRYPHANTINAE.

Genus GEORGELLA Koen.

4. GEORGELLA INCERTA (Koen.).

Hydryphantes incertus Koenike, 1893, p. 40; Koenike, 1895, p. 4; Koenike, 1898, p. 388; Piersig, 1901, p. 63.

Georgella incerta Koenike, 1907, p. 129.

Hydryphantes incertus Daday, 1910, p. 584.

Georgella incerta Daday, 1910 a, p. 239; Viets, 1916, p. 245; Viets, 1921, p. 421.

As in *Hydryphantes* and related genera the frontal shield is sometimes deformed. In one specimen the left half of the shield was separated from the right one, and the frontal organ was connected only with the latter.

The alcohol material of this species was too badly preserved to allow any closer study.

Localities.—Uganda: Lake Nakavali, from *Papyrus* along shore. Lake Kachira, from shore-weeds.

Family DIPLODONTIDAE.

Genus DIPLODONTUS Dug.

5. DIPLODONTUS DESPICIENS (O. F. Müll.).

This common species has been recorded from Europe, Africa, Asia, and America, and probably has a cosmopolitan distribution. There are some other species and varieties described, for instance *Diplodontus despiciens capensis* Viets from South Africa (Viets, 1914, p. 335), *D. tenuipes* Koen. from Java (Koenike, 1906, p. 129), *D. peregrinus* Koen. from Brazil (Koenike, 1905, p. 696), *D. perreptans* Viets and *D. trigonometricus* Walt. from the Cameroons (Viets, 1913, p. 14; Walter, 1927, p. 625), and *D. americanus* Marsh. from N. America (Marshall, 1926, p. 33). At least some of these seem to come very near to *D. despiciens*. Whether they actually are different species is difficult to decide. Some slight differences are described, but as long as the variation within *D. despiciens*—the genotype—has not been studied thoroughly, for instance in connection with sex, much stress cannot be laid upon the interpretations so far. One of these forms, *D. americanus*, has already been withdrawn by the author herself (Marshall, 1929, p. 69).

In Dr. Worthington's material *Diplodontus* is represented by some specimens which I refer to *despiciens*, and which may be delineated and shortly described here.

The second palp segment bears the three usual characteristic bristles, all of which are distinctly pectinated*. The pectination is long. So far

* In the drawing the intermediate bristle is somewhat bent out of ordinary position.

as I can see, the most ventral bristle is constantly curved at the end and the pectination is one-sided only. However, I am well aware of the fact that the aspect of the bristles in various mites often depends upon and changes with the point of observation, and though seemingly being one-sided in the specimens

TEXT-FIG. 8.

Diplodontus despiciens (Müll.). ♀.

A. Palp. B. Epimeral and genital plates.

investigated by me I do not venture to deny absolutely the possibility of the pectination being two-sided. The 4th palp-segment is undulated as in the European *despiciens*. Measurements for the palp-segments are difficult to obtain with accuracy, because the segments are so crowded together and have both sides differently shaped. The maxillary organ has a length of 278 μ .

The epimeral plates are relatively short, but I have found that this property varies in our European species. The posterior ones attain a length (i.e. from

the front backwards)* of $397\ \mu$, a width (i.e. from the lateral projection towards the median border) of $379\ \mu$. The length of the genital plates is $232\ \mu$.

The excretory opening is provided with a ring of chitin. The 4th segment of the last pair of legs bears 11, the following segments 7 swimming hairs. The claws in all legs have a thin dorsal tooth.

The specimen here described is a female, the egg measuring $146\ \mu$.

Locality.—Uganda: Lake Nakavali, from *Papyrus* along shore and from shore-weeds.

TEXT-FIG. 9.

Dipiodontus despiciens (Müll.). ♀.

A. Mandible. B. Maxillary organ.

Family LIMNESIIDAE.

Genus LIMNESIA C. L. Koch.

6. LIMNESIA ASPERA Koen. subsp. MACROPORA Viets.

Limnesia aspera subsp. *macropora* Viets, 1921, p. 422.

Of this species the female only has been described, and in the present material that sex alone was represented. It agrees very well with Viets's description.

Localities.—Uganda: Lake Bunyoni, from weedy shore. Kenya Colony: Lake Naivasha, from weedy shore.

* The subchitinous processes before and behind the plates being included.

• Family HYGROBATIDAE.

Subfamily PIONINAE.

Genus PIONA C. L. Koch.

Subgenus PIONA, s. str.

7. PIONA ANGULATA Viets.

Piona angulata Viets, 1921, p. 434; Lundblad, 1927, p. 410.

For details regarding this species, see the above descriptions. The present specimens agree exactly with these.

Locality.—Kenya Colony: Lake Naivasha, from shore-weeds. The species seems to occur in great numbers there, 7 ♂♂ and 76 ♀♀ being found in one of the samples.

TEXT-FIG. 10.

Limnesia aspera Koen. var. *macropora* Viets. ♀.

A. Maxillary organ. B. Palp. C. Epimeral and genital plates.

Subgenus TETRAPIONA Viets.

8. PIONA CALIGIFERA (Koen.) var. WORTHINGTONI, var. nov.

Piona caligifera was described by Koenike (1898, p. 410) from Madagascar and later re-found in East Africa by Daday (1910 a, p. 254). Like *P. forcipata*

(Koen.), from Bagamoyo in the Tanganyika Territory, and *P. longispina* Viets, from the Cameroons, it is a near relative to *P. paucipora* (Thor) and *P. variabilis* C. L. Koch from Europe. In all these five species the male is characterized by having the last two pairs of epimeral plates separated from one another along the median line and by the genital plates not being united with the epimera. The females of these species all possess four genital plates.

The specimens before me differ from Koenike's description of the species in some respects and will be separated as a special variety.

TEXT-FIG. 11.

Piona caligifera (Koen.) var. *worthingtoni*, var. nov. ♂.

A. Mandible. B. Palp. C. Distal end of sperm-transferrer.
D. Epimeral and genital plates.

♂.

Body about $870\ \mu$ in length. The palps are short and thick as in *caligifera*. The measurements are (in μ) :—

	I.	II.	III.	IV.	V.
Extensor side	39	132	64	125	61
Flexor side.....	32	79	39	82	50

The spines on the 2nd and 3rd segments are very thick and strong. The flexor side of the 4th segment is furnished with two humps, each with one bristle. The humps are arranged side by side, the outer one being larger and situated

a little more distal. The peg inside at the distal end of that segment is rather long, attaining $11\ \mu$ in length, and the claws of the last segment are still longer.

The epimera of the 4th pair have a long hinder projection, and behind they are separated $32\ \mu$ from each other. The distance between the 4th pair of epimera increases in front, and between those of the 3rd pair it is still greater. The claws of the first two pairs of legs are very large, as is consequently the claw-sheath; that of the second pair, for instance, measures $107\ \mu$ out of a length of the last segment of $278\ \mu$. One of the claws of the sperm-transferrer is reduced, semi-circular in shape. The other is greater, but yet rather short. It consists of one pointed main claw in the middle and two lateral, not distinctly separated dilatations, one being better pronounced and more distinctly set apart than the other. The 4th segment of the last leg is long and

TEXT-FIG. 12.

Piona caligifera (Koen.) var. *worthingtoni*, var. nov. ♂.

Clasping segment of 4th leg.

slender with the excavation bordered behind by 3-4 chitinous pegs and 3 swimming hairs. The outer end of the segment has a small pointed spine in each corner, and the side opposite to the excavation bears about 4 long bristles. The number of swimming hairs on the following segment is 3.

The genital plates are very characteristic. They differ from those in *P. caligifera*, *P. forcipata*, *P. longispina*, and *P. variabilis* by being incised in front on each side. In this respect they resemble somewhat those in *P. paucipora*, but in the latter species there are fewer acetabula, the median line of the hinder group of epimera is shorter, the palps are much more slender, as is also the large claw of the sperm-transferrer, which is straighter and possesses a long, curved, accessory hook at the base, shaped in the same way as the smaller claw in *worthingtoni*, and being of about the same size.

In *worthingtoni* there seems always to be an isolated stigma placed in front, which is not the case in *paucipora*, and in some specimens this stigma is considerably larger than the other ones—in other specimens, however, it is of the same size.

♀.

The female reaches a length of about 1293 μ .

The palps are not as bulky as in the male and the humps are less prominent. The measurements are (in μ) :—

	I.	II.	III.	IV.	V.
Extensor side	36	129	62	132	71
Flexor side.....	29	79	36	98	61

TEXT-FIG. 13.

Piona caligifera (Koen.) var. *worthingtoni*, var. nov. ♀.

A. Palp. B. Genital plates.

The genital organ resembles that of *P. variabilis* or *P. variabilis dispersa* Sokolow, inasmuch as some of the acetabula are lying free in the soft skin. One acetabulum is always widely separated from the others, situated in front of them.

The above variety differs considerably from *caligifera* as described by Koenike in having the male genital plates excavated in front, by possessing swimming hairs on the 4th leg, and two claws on the sperm-transferer.

Locality.—Kenya Colony: Lake Naivasha, from weedy shore. Rather common.

Type (♂) and allotype (♀) in British Museum.

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