

**PROCEEDINGS**  
**OF THE**  
**NEW ENGLAND ZOÖLOGICAL CLUB**

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FRESH WATER DECAPOD CRUSTACEA FROM  
MOUNT KINABALU, BRITISH NORTH BORNEO

BY FENNER A. CHACE, JR.

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DURING the course of the Asiatic Primate Expedition Mr. J. A. Griswold, Jr., a member of the party, spent the greater parts of the months of June, July and August of 1937 collecting on Mount Kinabalu in British North Borneo. The collection of decapod Crustacea made by him includes more than twenty-five hundred specimens of the following species of fresh-water crabs and shrimps:

*Potamon (Potamon) griswoldi* sp. nov.

*Potamon (Potamon) kinabaluensis* Rathbun

*Potamon (Potamon) anomalus* sp. nov.

*Parathelphusa (Liotelphusa) kadamiana* (Borradaile)

*Parathelphusa (Liotelphusa) luidana* sp. nov.

*Macrobrachium pilimanus* (de Man)

Apparently there have been but three species of fresh-water Crustacea recorded from Mount Kinabalu heretofore: *Potamon (Potamon) consobrinus* de Man (Borradaile) (probably erroneously, and in reality based upon *P. (P.) griswoldi*), *P. (P.) kinabaluensis* Rathbun and *Parathelphusa (Liotelphusa) kadamiana* (Borradaile). Although the shrimp, *Macrobrachium pilimanus*, is known from widespread localities in

the Malay region, the crabs appear to have a much more restricted range, as the two species previously described have not been again recorded until now and the other three species are apparently distinct from, although allied to, species from other parts of Borneo.

The present collection is deposited in the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

**Potamon (Potamon) griswoldi** sp. nov.

Plate I

? *Potamon (Thelyphusa) consobrinum* Borradaile, 1900, Proc. Zool. Soc. London, p. 94.

1 male, holotype (M.C.Z. 10,056), Bundutuan, 3000 ft., July 1, 1937.

1 male, (first abdominal appendage figured) (M.C.Z. 10,057), the same data.

211 males, 221 females, 31 young, (M.C.Z. 10,058), the same data.

5 males, 9 females, (M.C.Z. 10,059) Bundutuan, July 9, 1937.

1 male, (M.C.Z. 10,060) Bundutuan, July 25, 1937.

122 males, 177 females, 11 young, (M.C.Z. 10,061) between Tenompok and Renau, July 16, 1937.

5 males, 18 females, (M.C.Z. 10,062) Kadamayan River, July 11 and August 3, 1937.

Carapace nearly three fourths as long as broad, moderately convex antero-posteriorly in the anterior third, flattened posteriorly, grossly punctate over most of its surface, coarsely wrinkled on the antero-lateral portions of the branchial regions and irregularly pitted on the front and near the margins of the epigastric lobes. Branchial regions depressed and bordered by the upturned antero-lateral margin. Cervical groove broad and rather deep; it pursues a sinuous, but not obviously angular, course from the lateral angles of the mesogastric region toward the epibranchial tooth, and becomes lost in the transverse wrinkles of the branchial regions before reaching the post-ocular crest. If produced backward, the cervical grooves would meet just behind the mesogastric region in an angle slightly greater than a right angle. The semicircular depressions lateral to the cardiac region are well marked, but there is no distinct division between the cardiac and intestinal regions. Indistinct ridges outline the intestinal region laterally. Post-ocular crest sharply defined, and sinuous behind the orbits

but interrupted laterally so that there is only an elongate tubercle to mark the portion that turns forward to the epibranchial tooth. Epigastric lobes sharply defined and very oblique. Median sinus deep, but indistinct posteriorly so that the anterior part of the mesogastric region is ill defined. Orbits slant outward and backward. Front not bent down so sharply as to prevent the edge being just visible in dorsal view. In that position it appears slightly quadrilobate, in anterior view strongly so, the median lobes extending lower than the lateral angles.

Chelipeds massive and unequal in the male. There is a blunt, sub-terminal tooth on the upper margin of the merus. The anterior margin is obscurely tuberculate and the spine below it is low but distinct. Carpus pitted and slightly furrowed. It has a distinct dorsal depression, and is armed on the inner margin with two robust spines, the posterior one smaller and below the level of the other. There is a low lobe behind these spines near the articulation with the merus. Hand of larger cheliped with an oblique crest at the base of the dorsal margin and the dorsal surface elsewhere irregularly pitted and grooved. The upper half of the outer surface is rugose, but the rugae are much less prominent than in *P. (P.) anomalus* and *P. (P.) kinabaluensis*. The diverging lines which outline the triangular area near the mid-line of the hand are reduced to lines of a few obscure punctae. Fingers robust and grooved. Fixed finger bent downward, with the dactyl crossing the tip of it when closed, leaving a gap throughout most of its length. Smaller hand, in the male, almost four fifths as high as the larger, and similar to it except that the fingers close almost completely.

Walking legs quite robust. Merus of last pair between a third and two fifths as broad as long along the dorsal margin; propodus more than four fifths as broad as long along the dorsal margin, with a double row of four or five pairs of spines along ventral margin; dactyl slightly longer than ventral margin of propodus, and the two dorsal spines near the tip so large that they approach the terminal spine in size.

Terminal segment of male abdomen distinctly shorter than wide at base, margins sinuous. Penultimate segment much shorter than ultimate, and half as long as broad at base.

Third maxillipeds with a deep sulcus on ischium, which fails to attain the distal margin. Merus distinctly shorter than broad, and irregularly pitted along the inner margin.

#### MEASUREMENTS OF MALE HOLOTYPE

Length of carapace, 34.0 mm.

Width of carapace, 46.0 mm.

Width of anterior margin of front, 12.1 mm.

Distance between outer orbital angles, 28.8 mm.

Distance between epibranchial teeth, 35.1 mm.

This species probably is the same as that recorded by Borradaile as *Potamon (Thelphusa) consobrinum* de Man from the Kadamayan River, Kinabalu. Dr. A. M. Buitendijk of the Leiden Museum very kindly has sketched for me the first abdominal appendages of the male type of the latter species from Mount Damoes (text figure 1), and his sketch checks reasonably well with the appendages of a specimen from Lundu Mountain, Sarawak, in the Museum of Com-

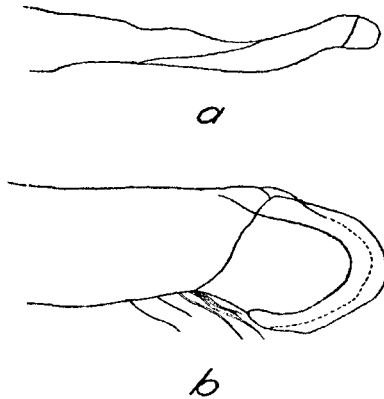


FIGURE 1

*Potamon (Potamon) consobrinus* de Man. First abdominal appendage of male type. a. Entire appendage. b. Tip, more highly magnified. (From sketch made by A. W. Buitendijk.)

parative Zoölogy. Although superficially resembling this species, *P. (P.) griswoldi* is distinguished from it, in addition to the marked differences in the form of the male abdominal appendages, by its more convex and uneven carapace and the much shorter last two segments of the male abdomen.

**Potamon (Potamon) kinabaluensis Rathbun**

*Potamon (Potamon) kinabaluensis* Rathbun, 1904, Nouv. Arch. Mus. Hist. Nat., Paris, 6, p. 269, pl. 10, fig. 2.

2 females (M.C.Z. 10,063) Bundutuan (Bawarack River), July 9, 1937.

2 males (M.C.Z. 10,064) Bundutuan (Nempok River), July 9, 1937.

32 males, 26 females, 2 young (M.C.Z. 10,065) Bundutuan (Luidan River), July 15, 1937.

1 male (M.C.Z. 10,066) Kadamayan River.

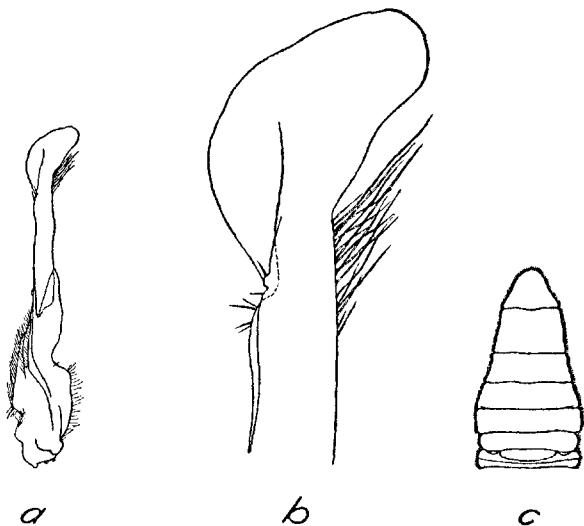


FIGURE 2

*Potamon (Potamon) kinabaluensis* Rathbun. a. First abdominal appendage of male. b. Tip more highly magnified. c. abdomen of male.

This species appears to be intermediate between *P. (P.) griswoldi* and *P. (P.) anomalus*. Although closely resembling the former as regards the slightly raised antero-lateral border of the carapace and the transverse rugae on the outer part of the branchial region, it is easily distinguished from that species by the more slender walking legs, particularly the

propodus and dactyl of the last pair. Other differences between these two are the slightly more swollen branchial region, the narrower merus joint of the third maxillipeds, the narrower penultimate segment of the male abdomen and the very different form of the first abdominal appendages of the male in *P. (P.) kinabaluensis*. The species may be distinguished from *P. (P.) anomalus* by the more rugose and less vaulted carapace, less turned down front, differently shaped merus joint of the third maxillipeds (in which the outer angle is lower and the anterior edge very convex, so that the segment appears wider than in *P. (P.) anomalus*), slightly narrower penultimate segment of the male abdomen, and differently formed first abdominal appendage in the male.

Although there is little difficulty in separating adult specimens of *P. (P.) kinabaluensis* from *P. (P.) anomalus* and *P. (P.) griswoldi*, the task is more difficult in young specimens, particularly in distinguishing it from the latter species when the last pair of legs is missing.

### **Potamon (Potamon) anomalus** sp. nov.

#### Plate II

1 male, holotype (M.C.Z., 10,067), Bundutuan (Luidan River), 3000 ft., July 11, 1937.

1 male (first abdominal appendage figured) (M.C.Z., 10,068), the same data.

21 males, 8 females, (M.C.Z., 10,069), the same data.

4 males, three females, (M.C.Z., 10,070), Tenompok, 4700 ft., July 10, 1937.

1 male, 2 females, (M.C.Z., 10,071), Tenompok River, July 16, 1937.

1 male (M.C.Z., 10,072), between Tenompok and Renau, July 16, 1937.

Carapace three fourths as long as broad, rather strongly convex antero-posteriorly, particularly in the anterior half, nearly smooth and finely punctate to the naked eye, except for fine granulation on frontal and post-orbital regions and scattered coarser granules which tend to form rugae on the lateral parts of the branchial regions; everywhere finely granulate

under a lens. Branchial regions swollen toward the lateral margins. Cervical groove broad and deep and distinctly angled. This groove does not reach the post-frontal crest; but, if produced, the anterior portion would attain the margin of the carapace just anterior to the epibranchial tooth. The posterior two thirds is much more transverse and, if produced posteriorly, these grooves would meet in a very oblique angle at about the centre of the mesogastric region. The anterior half of the cardiac region is depressed below the level of the rest of the carapace, and the semicircular depressions on either side of the cardiac region are very deep. An indistinct, interrupted sulcus separates the cardiac and intestinal regions, and a well marked, sinuous groove bounds the intestinal region laterally. The post-frontal crest is well marked behind the orbits but it becomes less distinct laterally, where it curves forward to the epibranchial tooth. Epigastric lobes low and rounded and ornamented with irregular rugae. The median sinus is deep anteriorly, but the anterior portion of the mesogastric region is poorly defined and very narrow. Orbits very nearly transverse. Front bent down sharply so that the edge is invisible in dorsal view, and the visible portion therefore appears bilobate. Viewed from in front, it is distinctly quadrilobate.

Chelipeds unequal in the male. There is a blunt tooth on the dorsal margin of the merus near the distal end. The anterior margin is denticulate, and there is a well marked spine below this margin near the distal end. Carpus rather coarsely rugose. It has a distinct dorsal depression, and is armed on the inner margin with one strong spine and a small spine below the base of the first. Near its articulation with the merus on the inner margin there is a granular lobe. There are a few sharp granules on the inner portion of the dorsal margin of the manus. On the outer face the granules are low, and tend to form reticulating rugae, which become less well marked toward the ventral margin. There is a distinct line of granules passing along the mid-line of the hand and, below this, a second line which originates at the same point as the first, near the proximal end of the hand, and then diverges distally. Fingers crossing at the tips, and closing almost completely, although there may be a few gaps where the teeth do not interlock. There are two lines of sharpish granules on the dorsal part of the movable finger, and a strong ridge on the outer surface. Fixed finger with a deep longitudinal groove bordered ventrally by a pronounced ridge. Smaller hand more than four fifths as high as the larger, and similarly, though less coarsely, ornamented.

Walking legs rather slender. Of the last pair, the merus is one third as wide as long along the dorsal margin; the propodus more than half as wide as long along the dorsal margin, with four small spines on the distal half of the ventral margin; and dactyl distinctly longer than propodus.

Terminal segment of male abdomen slightly shorter than wide at base and with a slight median swelling bordered on either side by small triangu-

lar depressions near the tip. Penultimate segment distinctly shorter and less than three fourths as long as broad at the distal margin.

Third maxillipeds with a distinct sulcus on the ischium, but the sulcus fails to attain the anterior margin. Merus but little shorter than wide, and with some irregular ridges and depressions near the inner margin.

#### MEASUREMENTS OF MALE HOLOTYPE

Length of carapace, 35.2 mm.

Width of carapace, 45.2 mm.

Width of anterior margin of front, 10.8 mm.

Distance between outer orbital angles, 28.7 mm.

Distance between epibranchial teeth, 36.0 mm.

This species may be easily separated from the two preceding species by the much more convex carapace. The inter-regional furrows are deeper, making the carapace appear much more uneven. There are no distinct transverse wrinkles on the outer part of the branchial region, such as are found in the foregoing species, and the antero-lateral margin is not upturned.

### **Parathelphusa (Liotelphusa) kadamiana** (Borradaile)

#### Plate III

*Potamon (Geothelphusa) kadamianum* Borradaile, 1900, Proc. Zool. Soc. London, p. 94.

2 males (figured), (M.C.Z., 10,073), Bundutuan (Luidan River), 3000 ft., July, 1937.

90 males, 75 females (3 ovigerous, 4 with young), (M.C.Z., 10,074), the same data.

10 males, 4 females (1 ovigerous), (M.C.Z., 10,075), Tenempok, 4700 ft., July 10, 1937.

16 males, 12 females, (M.C.Z., 10,076), Tenempok River, July 16, 1937.

There is, unfortunately, some doubt that this species is the one so briefly diagnosed by Borradaile, but, of the two species of the old comprehensive genus *Geothelphusa* in the



present collection, this one certainly most nearly approaches, both in size and form, the one described by Borradaile. Inasmuch as this doubt does exist, and Borradaile's original description was so brief, it is deemed advisable to figure the present series, and to describe it more completely.

Carapace four fifths as long as wide; strongly convex antero-posteriorly in the anterior half; coarsely punctate, and everywhere polished except on the outer parts of the branchial regions, where there are a few coarse granules on the post-ocular crest and a few raised lines curving onto the dorsal surface from below. Gastric and anterior branchial regions are somewhat swollen, and a broad, distinct depression divides the anterior and posterior parts of the branchial region. Cervical groove very slightly curved, just failing to reach the outer end of the post-ocular crest and ending abruptly posteriorly in a shallow pit before attaining the mesogastric region; if prolonged posteriorly the grooves would meet on the cardiac region in an angle very slightly less than a right angle. The curved furrow delimiting the mesogastric region posteriorly is well marked, but the semicircular depressions on either side of the cardiac region are shallow, and there is no distinct division between the cardiac and intestinal regions. Although not prominent, the post-ocular ridge is easily discernible, due to the well marked transverse depression crossing the entire width of the carapace behind the front and orbits and to the scattered granules on the lateral ends of the ridges. The median sinus is well marked between the epigastric lobes, and it becomes less distinct posteriorly, until it disappears about half way to the posterior margin of the mesogastric region. Orbits with a slight inclination outward and backward. Front turned down so that the anterior part is nearly vertical; it is distinctly bilobed in dorsal view, the median sinus being broad and deep. The lower edge, viewed from in front, is slightly convex. There is no epibranchial tooth; sometimes, as in many of the specimens from Tenompok, there is a notch in the raised antero-lateral line which runs back from the orbit onto the anterior branchial region, where it curves inward subparallel to the lines curving up from below.

Chelipeds very unequal in the male, the major chela being more than half again as high as the minor one; less dissimilar in the female, although the difference even in that sex is well marked. The upper margin of the merus is rugose, but without a sub-terminal tooth. Carpus punctate, with a distinct dorsal depression and a blunt tooth on the inner margin. Major palm of male swollen, smooth and punctate. Fixed finger bent slightly downward beyond the depression in the lower border at the base of the finger. Dactyl rather strongly curved and obscurely denticulate, so that a large ovoid gap is left when the fingers are closed. Minor chela

of the male and both chelae of the female, similar to the major chela in the male, except that they are less high and the fingers leave an insignificant gap when closed. The carpus in the female is rugose-reticulate, and there is a faint reticulate pattern on the proximal portion of the hand.

Walking legs not particularly long or slender. Dactyls armed with robust spines, and the dactyl of the last pair is as long as the propodus and one third of the carpus.

Last two segments of the male abdomen of subequal length, each being longer than wide at the widest point. Merus of third maxillipeds much longer than broad, and the sulcus on the ischium much nearer the inner than the outer margin.

#### MEASUREMENTS OF MALE

Length of carapace, 13.5 mm.

Width of carapace, 16.7 mm.

Width of front between antennae, 5.6 mm.

Distance between outer orbital angles, 11.3 mm.

The constricted form of the male abdomen, the form of the mandibular palp, and the flagellate exopod of the third maxillipeds necessitate placing this species in the present genus and subgenus, according to the scheme proposed by Alcock. Although the species may show a superficial resemblance to *Potamon* (*Geothelphusa*) *debaani* Stimpson, with which species Borradaile compared it, it is obviously far removed from that form.

The present species apparently belongs to that group of the comprehensive genus *Geothelphusa* including *Potamon* (*Geothelphusa*) *kenepai* de Man, *P. (G.) bendersonianum* de Man, *P. (G.) kubli* de Man and *P. (G.) montanum* Bürger. There is little doubt that all of these species belong to the genus *Parathelphusa*. Borradaile's species is distinguished from the first of these by the greater width of the carapace in relation to the distance between the outer orbital angles. Although it closely resembles *P. (G.) bendersonianum* from Mt. Damoes, Sambas, it is apparently distinguished by the slightly shorter distance between the external orbital angles, as compared with the length of the carapace, and by the absence of a distinct ridge at the proximal outer angle of the merus of the

maxillipeds. From *P. (G.) kubli* from Java this species is distinguished by the fact that the superior margin of the orbits runs outward and backward, not forward. Finally, it is readily separated from *P. (G.) montanum* from Luzon by the different form of the carapace and the well marked cervical groove. A direct comparison with specimens of these related species would probably reveal much more important differences.

**Parathelphusa (Liotelphusa) luidana** sp. nov.

Plate IV

1 male, holotype (M.C.Z., 10,077), Bundutuan (Luidan River), 3000 ft., July 5, 1937.

1 male (third maxilliped and first abdominal appendage figured), (M.C.Z., 10,078), the same data.

9 males, 12 females, (M.C.Z., 10,079), the same data.

Carapace roughly subquadrate, strongly convex antero-posteriorly in the anterior half, flattened posteriorly. There are some short oblique lines on the outer branchial region and some fine granules in the region of the post-ocular crests and on the front; elsewhere the carapace is polished and punctate. Although there is a furrow behind the orbits, there is no real post-ocular crest. Cervical groove also is lacking entirely. The only sculpturings on the carapace are the well marked epibranchial lobes, divided by a very short median groove, the furrow bounding the gastric region posteriorly, the semicircular grooves on either side of the cardiac region, a pair of indistinct lines separating the cardiac and intestinal regions, some irregular depressions lateral to the intestinal region, and a very shallow depression separating the anterior and posterior branchial regions. A slightly raised line runs back from the orbit a short distance along the antero-lateral margin, and curves inward onto the branchial region; there is no trace of an epibranchial tooth or notch. Front turned down so that the anterior portion is vertical; and, in dorsal view, it appears bilobate. In anterior view it is nearly straight with a shallow median sinus, and just above the lower margin is a small median depression bordered dorsally by an angled carina. Postocular grooves curve downward onto the front, and are very deep at either side of the proximal part of the front.

Chelipeds very unequal in the male, the major chela being nearly twice as high as the minor one, nearly subequal in the female. The upper mar-

gin of the merus is rugose, but there is no subterminal tooth. Carpus nearly smooth with some irregular pits on the median part of the dorsal surface and a single spine on the inner margin. Hand swollen and smooth, the fingers thick, meeting at the tips but leaving a small gap proximally. There are some scattered sharpish granules near the tips of both fingers. Minor chela of the male and both chelae of the female with long, slender fingers which meet throughout most of their length when closed.

Walking legs slender, the penultimate one being about twice as long as the carapace, the merus being less than two thirds as long as the carapace.

Last two segments of the male abdomen subequal in length, each being slightly longer than its greatest width.

Merus of the third maxillipeds subquadrate, slightly broader than long, with no depression in the anterior margin. The third maxillipeds are sparsely pubescent, the pterygostomial regions and the anterior portion of the sternum rather densely so.

#### MEASUREMENTS OF MALE HOLOTYPE

Length of carapace, 8.3 mm.

Width of carapace, 10.0 mm.

Width of anterior margin of front, 3.8 mm.

Distance between outer orbital angles, 7.9 mm.

This species agrees with the species described by de Man as *Potamon (Geothelphusa) burgeri* from Mt. Liang Koeboeng in the general form of the carapace and larger chela of the male and the absence of a cervical groove, but it is easily distinguished from that species by the shorter ambulatory legs, wider front and different form of the merus of the third maxillipeds.

### **Macrobrachium pilimanus** (de Man)

*Palaemon pilimanus* de Man, 1879, Notes Leiden Mus., I, p. 181.

630 males, 627 females (23 ovigerous), (M.C.Z., 10,080), Bundutuan (Luidan River), 3000 ft., July 7-16, 1937.

24 males, 33 females (7 ovigerous), (M.C.Z., 10,081), Bundutuan (Bararak River), July 9, 1937.

9 males, 6 females, (M.C.Z., 10,082), Bundutuan (Nempok River), July 9, 1937.

56 males, 49 females (7 ovigerous), (M.C.Z., 10,083), between Tenompok and Renau, July 16, 1937.

3 males, (M.C.Z., 10,084), Tenompok, 4700 ft., July 10, 1937.

The smallest ovigerous specimen has a carapace length of 9.2 mm. If this size is assumed to be the line of demarcation between mature and immature individuals, the following specimens of those listed above may be considered immature:

332 males, 362 females, from Bundutuan (Luidan River).

6 males, 3 females, from Bundutuan (Bawarack River).

8 males, 6 females, from Bundutuan (Nempok River).

22 males, 16 females, from between Tenompok and Renau.

2 males from Tenompok.

The figures of the entire crabs (figures a) in the plates were taken from photographs, so there is, unfortunately, some foreshortening of the carapace and leg segments in most cases. The correct proportions are given in the text.

## PLATE I

*Potamon (Potamon) griswoldi* sp. nov.

- a. Male, holotype, dorsal view.
- b. Fifth leg of holotype.
- c. Abdomen of holotype.
- d. Outer face of larger chela of holotype.
- e. Outer maxilliped of holotype.
- f. First abdominal appendage of male paratype, posterior view.
- g. The same, posterior view of tip.
- h. The same, anterior view of tip.

## PLATE II

*Potamon (Potamon) anomalus* sp. nov.

- a. Male, holotype, dorsal view.
- b. Fifth leg of holotype.
- c. Abdomen of holotype.
- d. Outer face of larger chela of holotype.
- e. Outer maxilliped of holotype.
- f. First abdominal appendage of male paratype, posterior view.
- g. The same, posterior view of tip.
- h. The same, anterior view of tip.

## PLATE III

*Parathelphusa (Liotelphusa) kadamiana* (Borradaile)

- a. Dorsal view of male.
- b. Outer maxilliped of male.
- c. Fifth leg of male.
- d. Abdomen of male.
- e. Outer face of larger chela of male.
- f. First abdominal appendage of male, posterior view.

## PLATE IV

*Parathelphusa (Liotelphusa) luidana* sp. nov.

- a. Male, holotype, dorsal view.
- b. Outer maxilliped of male paratype.
- c. Fronto-orbital region of holotype, anterior view.
- d. Fifth leg of holotype.
- e. Outer face of larger chela of holotype.
- f. Abdomen of holotype.
- g. First abdominal appendage of male paratype, posterior view.

