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## The *Tenagonus-Limnometra* Complex of the Gerridae \*

BY

H. B. HUNGERFORD and RYUICHI MATSUDA

In 1853, Stål described the genus *Tenagonus* in Öfvers af K. Vet.-Ak. Förhandl. 10. p. 263 as follows: "Corpus subellipticum Caput subtriangulare, convexiusculum, tuberculis antenniferis parum productis. Antennae corpore longiores, articulis inter se longitudine fere aequalibus, capite nonnihil longioribus; inter articulum 2 et 3 articulus minimus, globosus adest. Rostrum capite ter fere longius, art. 1 capite vix dimidio brevior, 2 hujus dimidia longitudine, 3 capite nonnihil longiore, 4 hoc plus dimidio brevior. Thorax abdomine multo longior, convexus, lateribus subobliquis. Hemelytra et alae desunt. Abdominis segmentum penultimum utrimque ramulum emittens. Pedes posteriores longissimi; tarsi antici breves, crassiusculi, posteriores longiores, graciliores. (spec. 1.)" He did not designate a species but in the introduction to this paper "Nya Genera bland Hemiptera," he states they came from "Cafferlandet."

In 1855, in the same publication vol. 12, p. 45 he described: "*Tenagonus albovittatus*: supra brunnescens, subtus dilute sordide flavescens, albidosericeus; capitus vittis tribus tuberculisque antenniferis, thoracis linea longitudinali posterius evanescente, vittis 2 anticis abbreviatis, 2 lateralibus aliam dilute flavotestaceum includentibus rostrique art, ultimo nigris; antennis pedibusque fusco-testaceis, his nonnihil dilutioribus. Long. 7-9, lat. 3-3½ millim.—In terra natalensi."

Thus the genus *Tenagonus* Stål was set up for a species which Stål later described as *Tenagonus albovittatus*. Fortunately, although the type of this species is in the Museum of Stockholm, Sweden, we have a good series of specimens from West Africa that Dr. O. Lundblad has compared with the type and says is the same species. These are all apterous but we have five specimens from "Gabon," three of which are winged (one male and two females).

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The distinguishing characters of *Tenagogonus* as set forth by Stål would be: a subelliptical body, a subtriangular head with small antennal tubercles, *antennae longer than the body*, its segments of nearly equal length, each longer than the head and a small intersegment between segments two and three. *Beak nearly three times as long as head*, segment one about half as long as head, segment two very short, three somewhat longer than head and four shorter than half. *Thorax much longer than abdomen*. *Penultimate abdominal segment with a horn on either side*. *Hind legs longest*. Front tarsus short, its *second segment longer than the first*.

Then in 1865, Mayr described the genus *Limnometra* in Verhandl. Zool.-bot. Vereins in Wein, Bd. XV, p. 443. This he described as being closest to *Hydrometra* (now *Gerris* Fabricius) with slender antennae as long as body. Hind femora very long, as long as body. Intermediate femora bidentate at apices. Front tarsi with first segment as long or a little longer than the second. Then he described *L. femorata*, *L. nigripennis*, *L. pulchra*, *L. ciliata*, *L. inermis* and *L. minuta*. Then in Sept. 1865 in Novara-Expedition, Zoologischer Theil, Bd. II, Abth. 1, Hemiptera, p. 174, he gave a key to seven species of *Limnometra* and rewrote the generic description this time saying: Size of *Hydrometra*. *Antennae* filiform, very slender toward the apex, *as long as the body or sometimes shorter*, basal segment as long as the anterolateral margin of the pronotum. *Beak extending to middle of mesosternum*. Eyes distinctly emarginate on inside. Front margin of pronotum straight, posterior part extending over mesonotum, posterior process triangular. Winged. *Front tarsi* with two claws, *the segments subequal in length*. *Middle femora apically bidentate*, *hind femora as long as the body*. The type of the genus *Limnometra* is *L. femorata* Mayr as stated by Dr. Lundblad.

If we compare the descriptions of *Tenagogonus* Stål and *Limnometra* Mayr we find they agree in having long slender antennae, long slender middle and hindlegs and rather long beaks. Possible differences might be that in *Tenagogonus* Stål "Thorax much longer than the abdomen" and "front tarsus short, its second segment longer than the first." While in *Limnometra* Mayr "front tarsi have two segments subequal in length" or "first segment a little longer than the second," "Beak extending to middle of mesosternum" and "Middle femora apically bidentate." The last character is not mentioned in the *Tenagogonus* description nor how far back on the mesosternum the beak extends.

If we examine *T. albovittatus* Stål and *L. femorata* Mayr side by



side they do not appear congeneric. The first is a small species from Africa semielliptical in shape and the male lacks connexival spines but has two conspicuous processes on the ventrolateral margin of the last abdominal segment (7th abdominal segment). Stål mentions these in his generic description as arising from the penultimate abdominal segment which morphologically speaking is not true; moreover, he does not indicate that it is a male character. The abdomen is indeed greatly reduced and much shorter than the thorax, and the enlarged last ventral abdominal segment plus the genital segments in the male are longer than all the preceding abdominal segments. However, the hind legs are shorter than the middle legs, not longer as stated by Stål in his generic description.

In *Limnometra femorata* Mayr we have a large elongate species from the Philippines. The abdomen of the male is elongate, as long or longer than the thorax, with well-developed connexival spines, the last ventral abdominal segment being shorter than the preceding segment and lacking protuberances. Indeed the last abdominal segment plus the genitalia are not as long as the two preceding segments. The beak does not extend to the middle of the mesosternum as stated in Mayr's generic description. The middle femur is apically bidentate, a character we will find of little use. The front tarsal segments are subequal in this species.

In 1901, Champion described *Limnometra opaca* from Panamá and *Limnometra quadrilineata* from Mexico. (*Biologia Centrali Americana*, Rhynchota vol. II, pp. 180-181.) In 1909, Kirkaldy and Bueno in their Catalogue of American aquatic and semi-aquatic Hemiptera (*Proc. Ent. Soc. Washington*, vol. X p. 209) gave *Limnometra* Mayr 1865 as a synonym of *Tenagogonus* Stål 1853 and placed *opacus* (Champion) and *quadrilineatus* (Champion) under *Tenagogonus* Stål.

In 1915, Doctor E. Bergroth in a paper entitled "Some Javanese Hemiptera collected by E. Jacobson and Th. H. Mac Gillavry" (*Zoologische Mededeelingen uitgegeven vanwege's Rijks Museum van Natuurlijke Historie te Leiden*, Deel 1, aflev. 2, pp. 121-123) describes *Tenagogonus pravipes* and states that *Limnometra* Mayr is a synonym of *Tenagogonus* Stål and that *Limnogonus* Stål is not even subgenerically distinct from the above, because "the transitions in the mutual length of the two joints of the fore tarsi and in the apical angles of the last abdominal segment are too numerous."

However, *Limnogonus* Stål is still recognized as a genus and useful as such and his submersion of *Limnometra* Stål is accepted by some and rejected by others. The use of *Tenagogonus* Stål for certain new world gerrids now placed in the genus *Tachygerris*



Drake, was following Kirkaldy and Bueno, 1909. Dr. Poisson, in various papers dealing with African gerrids, follows Bergroth.

In 1925, Dr. W. E. China described *Limnometra gigas* from China, thus bringing again to our attention the genus *Limnometra* Mayr. (Bull. Brooklyn Entomological Society vol. 20, p. 218.) In 1933, Dr. O. Lundblad under *Limnometra* Mayr lists seventeen species and describes *Limnometra brevis*. He states that *Limnometra femorata* Mayr and *Tenagogonus albovittatus* Stål are very dissimilar species and that he is not convinced by Bergroth's opinion that the genera are identical. (Archiv für Hydrobiologie, Suppl. Bd. XII, "Tropische Binnengewässer 4," 388-392, 1933.) Unfortunately, he does not state how these genera may be separated.

Several years ago the senior author became aware of the need for better definition of genera in the Gerridae when called upon to determine species from the East Indies. Dr. Lundblad placed the species *Tenagogonus pravipes* Bergroth, *Gerris kampaspe* Kirkaldy and *L. brevis* Lundblad in the genus *Limnometra* Mayr along with *L. femorata* Mayr and other typical *Limnometra* species and the senior author thought that *Tenagogonus pravipes* Bergroth was correctly named and that *G. kampaspe* Kirkaldy and *L. brevis* Lundblad were congeneric with it.

This has led us into a detailed study of all species we could secure in these two genera. We have re-examined most of the types, made additional descriptive notes, and offer illustrations of them and their structural characteristics. We have studied thirty-seven species from the Old World, nine of them being new. We have placed *Limnometra gigas* China in the new genus *Gigantometra* Hungerford and Matsuda and we are raising *Tenagometrella* Poisson to generic rank to include *T. grandiusculus* Poisson and *T. longicornis* Poisson.

The other thirty-four species have been examined and their position determined on some thirty-five characters. Many of these characters were discarded as generically insignificant when they did not hold for even obviously closely related species. For example, "antennae as long as the body" holds for males of some species but not for their females, while in other very closely related species the male antennae are also shorter than the body.

We have made a chart of the more significant characters and indicated, by number, the species that have these characters. By studying this chart it will be observed that certain species are always found in the line describing a character that is typically *Tenagogonus*, and others are always in a line describing a character that is typically *Limnometra*. In addition there are a few species



that may possess a combination of characters that make them difficult to place. For example in No. 25 *Tenagogonus kuiterti* sp. nov., the male has very small but somewhat variable connexival spines, yet it has the abdominal spiracles in the middle of the segments, has the second front tarsal segment much the longer, the male abdomen is shorter than the mesosternum, and the hind coxae cover the second abdominal segment, all of which relate it to *Tenagogonus*. While all true *Tenagogonus* have the second tarsal segment of the front leg longer than the first there are some *Limnometra*, where the segments are subequal or the second segment a little longer. It is no wonder that Dr. Bergroth gave up trying to separate these genera. However, we do not believe in uniting established genera every time an intermediate species is found. For if we were to follow this practice consistently we would have to unite the families Chrysomelidae and Cerambycidae in Coleoptera, the orders Homoptera and Hemiptera, as some have done and finally unite the Plant and Animal kingdoms! A genus should include a group of closely related species and it is difficult to see close relationship between *T. albovittatus* Stål and *Limnometra femorata* Mayr. It is true that the generic descriptions were both inadequate and inaccurate and we have struggled with this problem for many, many months. We hope that this contribution will be helpful in the identification of species belonging to this complex. We believe it convenient and useful to retain both generic names and redefine them.

NUMBERS AND THE SPECIES FOR WHICH THEY STAND IN THE CHART OF  
SIGNIFICANT CHARACTERS

- |                                       |   |
|---------------------------------------|---|
| 1. <i>albovittatus</i> Stål           | 20. <i>brevis</i> Lundblad                |
| 2. <i>kampaspe</i> Kirkaldy           | 21. <i>minuta</i> Mayr                    |
| 3. <i>divergens</i> sp. nov.          | 22. <i>robustus</i> sp. nov.              |
| 4. <i>madagascariensis</i> Hoberlandt | 23. <i>pravipes</i> Bergroth              |
| 5. <i>dubius</i> Poisson              | 24. <i>lipovsky</i> sp. nov.              |
| 6. <i>femorata</i> Mayr               | 25. <i>kuiterti</i> sp. nov.              |
| 7. <i>kirkaldyi</i> Breddin           | 26. <i>borneensis</i> sp. nov.            |
| 8. <i>fluviorum</i> (Fabricius)       | 27. <i>fijiensis</i> sp. nov.             |
| 9. <i>gigas</i> (China)**             | 28. <i>pravipes bergrothi</i> subsp. nov. |
| 10. <i>octopunctata</i> Hungerford    | 29. <i>nudus</i> Poisson *                |
| 11. <i>ciliata</i> Mayr               | 30. <i>hirsutus</i> Poisson *             |
| 12. <i>cursitans</i> (Fabricius)      | 31. <i>lanugineus</i> Poisson *           |
| 13. <i>pulchra</i> Mayr               | 32. <i>zambezinus</i> Poisson             |
| 14. <i>annulicornis</i> Breddin       | 33. <i>rossi</i> sp. nov.                 |
| 15. <i>nigripennis</i> Mayr           | 34. <i>insularis</i> sp. nov.             |
| 16. <i>inermis</i> Mayr               | 35. <i>kallisto</i> (Kirkaldy)            |
| 17. <i>vulpina</i> Breddin *          | 36. <i>longicornis</i> Poisson **         |
| 18. <i>anadyomene</i> (Kirkaldy)      | 37. <i>grandiusculus</i> Poisson **       |
| 19. <i>palauana</i> Esaki             | 38. <i>euphrosyne</i> (Kirkaldy)**        |

\* known to us only by descriptions and drawings in the literature.

\*\* removed to a new genus recently or its subgenus is going to be raised to generic rank.



## CHART OF SIGNIFICANT CHARACTERS

abdomen ♂ < mesosternum	1,2,3,4,5,20?,22,23?,25,27,28,32,38
abdomen ♂ = mesosternum	18
abdomen ♂ > mesosternum	6,7,8,10,11,12,13,14,15,19,24,26,33,34,35
last ♂ abdominal seg. + gen. = or > than 5 preceding v. abd. segs.	1,2,3,4,5,22,27,28,32,38
last ♂ abdominal seg. + gen. = 4 preceding v. abd. segs.	10,25,33,(24 a wingless ♂)
last ♂ abdominal seg. + gen. < 4 preceding v. abd. segs.	6,7,8,11,12,13,14,15,18,19,24,26,34,35
1st tarsal seg. < 2nd (front leg)	1,2,3,4,5,18,20,21,22,23,25,27,28,32,33,38
1st tarsal seg. = 2nd	10,14
1st tarsal seg. > 2nd	6,8,11,12,13,15,19,24,26,34,35
abd. spiracles in middle	1,2,3,4,5,18,25,27,28,32
abd. spiracles closer to anterior margin	6,7,8,10,11,12,13,14,15,19,24,26,33,34,35
abd. spiracles variable	24,38
♂ without connexival spines	1,2,3,4,5,20,22,23?,27,28,32,(24 in wingless ♂)
♂ with very short connex. spine	24,25,38
♂ with connexival spines or triangular plate	6,7,8,10,11,12,13,14,15,18,19,21,26,33,34,35
♂ with processes on last ventral abd. seg.	1,2,3,4,5
♂ without processes on last abd. seg.	all other species
♂ hind coxae covering 2nd v. abd. seg.	1,2,3,4,5,20?,22,23,25,27,28,32,38
♂ hind coxae <i>not</i> covering 2nd v. abd. seg.	6,7,8,10,11,12,13,14,15,18,19,21?,24,26,33,34,35
♂ hind coxae variable	
♂ metasternum > first two abd. segs	1,2,3,4,5,10,20,22,23,25,26,27,32,38
♂ metasternum = first two abd. segs	15,18,19,24
♂ metasternum < first two abd. segs	6,7,8,11,12,13,14,33,34,35
♂ last ventral abd. seg. > preceding seg.	1,2,3,4,5,20,22,23?,25,27,28,32,38
♂ last ventral abd. seg. = preceding seg.	10,18,19?
♂ last ventral abd. seg. < preceding seg.	6,7,8,11,12,13,14,15,24,26,33,34,35



## KEY TO TENAGOGONUS-LIMNOMETRA COMPLEX \*

1. Male abdomen reduced. Ventral abdominal segments short, last segment plus the genitalia at least as long as preceding four segments, usually longer. Hind coxae of male nearly reaching or surpassing posterior margin of second ventral abdominal segment. Male without typical connexival spines. (Genus *Tenagogonus* Stål) ..... 2
- Male abdomen not reduced. Last ventral abdominal segment plus genital segments shorter than preceding four segments. Hind coxae of male rarely extending beyond middle of second ventral abdominal segment. Male with connexivum produced into a triangular flattened plate or spinelike process.... 1a
- 1a. Pronotum with median longitudinal white line:
  - Omphalium with transverse channels leading to lateral scent-gland pores, guarded by hairs,  
(Genus *Gigantometra* Hungerford and Matsuda)
  - Omphalium, a circular flat inconspicuous pore, farther from the rear margin of metasternum than in *Limnometra*. No transverse channels.... (Genus *Tenagometrella* Poisson)
  - Pronotum with median longitudinal black line (Genus *Limnometra* Mayr) ..... 10
2. The last ventral abdominal segment of male with two hornlike protuberances on its caudal edge or venter... *Tenagogonus*... 3
- The last ventral abdominal segment of male without such protuberances ..... 7
3. The protuberances arise on the edge of lateral flaps of the last ventral abdominal segment... *T. madagascariensis* Hoberlandt p. 383
- The protuberances not arising as above ..... 4
4. The conspicuous protuberances arising just below distal lateral edges of the connexivum in the male ..... 5
- The protuberances arising farther ventrad ..... 6
5. Protuberances upcurved and nearly parallel  
*T. zambezinus* (Poisson) p. 384
- Protuberances nearly straight and diverging... *T. divergens*, sp. nov. p. 385
6. The incurved hornlike protuberances arising laterally from the caudal margin of the last ventral abdominal segment,  
*T. albovittatus* Stål p. 382
- The short sloping conical protuberances on the ventral surface of the last abdominal segment ..... *T. kampaspe* (Kirkaldy) p. 386
7. The male genital capsule (9th segment) with lateral hair tufts... 8
- The male genital capsule without lateral hair tufts ..... 9
8. The first genital segment of male medianly depressed ventrally with a large V shaped depression in its rear margin,  
*T. robustus* sp. nov. p. 388
- The first genital not as above ..... *T. brevis* (Lundblad) p. 390

\* Omitting *Tenagogonus* subgen. *Tenagometra* Poisson 1948 in which he places *T. hirsutus* Poisson. *T. lanugineus* Poisson and *T. nudus* Poisson species which we have not seen. We place in the subgenus *Tenagogonus* the following: *T. albovittatus* Stål, *T. madagascariensis* Hoberlandt, *T. zambezinus* Poisson, *T. divergens* n. sp. and *T. kampaspe* (Kirkaldy).



9. The first genital segment of male with a median longitudinal depressed line on its venter . . . . *T. pravipes bergrothi* \* subsp. nov. p. 393  
The first genital segment of male without the depressed line,  
*T. fijienses* sp. nov. p. 394
10. Connexivum produced into a triangular flattened plate,  
*Limnometra minuta* Mayr p. 397  
Connexivum produced into a spinelike process or an acute projection . . . . . 11
11. Connexival spines shorter than first genital in the male and in the apterous males may be little more than an acute projection . . . . . 12  
Connexival spines longer . . . . . 14
12. First genital segment of male with its venter normal, rear margin unmodified . . . . . *T. kuiterti* sp. nov. p. 395  
First genital segment of male with its venter modified . . . . . 13
13. The first genital segment with a backward pointing protuberance on either side and the venter of the body pale, unspotted,  
*L. lipovskyi* sp. nov. p. 399  
The first genital segment with its rear ventral margin angularly produced on either side. Eight large black spots on the venter . . . . . *L. octopunctatus* Hungerford p. 400
14. Middle coxa with a spinelike projection on the dorsolateral rear margin . . . . . *L. fluviorum* (Fabricius) p. 401  
Middle coxa without such projection . . . . . 15
15. Moderately small species. Head width usually under 1.7 mm., even largest males never over 1.76 mm. . . . . 16  
Larger than above. Head width usually over 1.8 mm. . . . . 20
16. Front femur as slender as middle femur . . . . . 17  
Front femur stouter than middle femur . . . . . 18
17. Antennal segments uniform in color, moderately strong. Second tarsal segment of front leg longer than first. Connexival spines of female very short, not surpassing abdomen,  
*L. anadyomene* (Kirkaldy) p. 402  
Antennal segments three and four and sometimes distal half of second, white, the segments slender and long. First tarsal segment of front leg longer than second. Connexival spines of female long and slender, surpassing abdomen,  
*L. insularis* sp. nov. p. 404
18. First tarsal segment of front leg longer than second; wing veins dark brown . . . . . *L. palauana* Esaki p. 405  
First and second tarsal segments subequal; wing veins not dark brown . . . . . 19
19. Underside of body pale grayish, including connexivum. The median longitudinal reddish brown line on pronotum, slender and faintly margined by paler bands; marginal dark line faint . . . . . *L. borneensis* sp. nov. p. 407

\* This species comes from the Philippines but it seems to fit the description of *T. pravipes* Bergroth from Java and Dr. Bergroth may have overlooked the character on the first genital segment of the male. We are unable to locate the Bergroth types.



Underside of body with brown band on front acetabula and extends back on sides of mesothorax; some brown on the mesoacetabula and underside of connexival segments. The median longitudinal black line on pronotum broad and bordered by broader pale bands, marginal black band prominent,

*L. rossi* sp. nov. p. 408

20. Antennae, middle and hind femora uniform in color, the latter not paler near tip. Middle femur of male with conspicuous long cilia ..... 21
- Antennae, middle and hind femora not uniform in color, the latter at least slightly to conspicuously paler near tip. Middle femur of male may have cilia (but not as long as the diameter of the femur) ..... 22
21. Middle femur with a short black line near base dorsally. Rear ventral margin of first genital segment of male produced laterally (see pl. 14, fig. 22d.) ..... *L. ciliata* Mayr p. 409
- Middle femur without the black line. Rear margin of first genital segment of male with faint production laterally, ..... *L. cursitans* (Fabricius) p. 413
22. Middle femur of male with two rows of pegs and a large curved spine near distal end ..... *L. femorata* Mayr p. 413
- Middle femur of male may have two rows of pegs but without the large curved spine near distal end ..... 23
23. Middle femur of male without definite fringe of long cilia. Hemelytra usually chocolate brown with costal margin yellow or orange. Mesosternum not ciliated. Second and third antennal segments usually ringed with white and last segment white ..... *L. nigripennis* Mayr p. 415
- Middle femur of male with definite fringe of cilia. Hemelytra not as above. Mesosternum of males usually ciliated. Antennae not as above ..... 24
24. Both middle and hind femora of male with definite fringe of cilia ..... *L. pulchra* Mayr p. 418
- Only middle femora of male with definite fringe of cilia ..... 25
25. Second antennal segment annulated, shorter or subequal to width of head across eyes. First and second tarsal segments of front leg subequal ..... *L. annulicornis* (Breddin)\* p. 420
- Second antennal segment not annulated, usually longer than width of head across eyes. First tarsal segment of front leg plainly longer than second ..... *L. kallisto* (Kirkaldy) p. 422

\* *L. vulpina* Breddin—The type female from "N. [Matinag Kite, Suds<sup>o</sup>ite, 800-1200 m (Sar.)]" we cannot locate. Since Dr. Breddin identified specimens of *L. pulchra* Mayr as his *L. annulicornis* and the females of *L. pulchra* have shorter connexival spines he probably compared his female *L. vulpina* with a female of *L. pulchra* Mayr and said its connexival spines were longer than *L. annulicornis* when his *L. vulpina* was really a female of his *L. annulicornis*.



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### SYSTEMATIC TREATMENT

The genera *Tenagogonus* Stål and *Limnometra* Mayr have in common: Rather long antennae, slender beaks with third segment reaching onto the mesosternum, long middle and hind legs and venation of hemelytra.

#### The Genus *Tenagogonus* Stål

1853 Stål, C. Öf Vet. Akad. Förh. 10 pp. 263-264. (Described from "Cafferlandet" for one species unnamed.)

1855 Stål, C. Öf Vet. Akad. Förh. 12 (1): 45. (Described *Tenagogonus albobittatus*, which is the type of the genus.)

1865 Stål, C. Hemiptera Africana 3: 168-169. (Assigns to *Tenagogonus* Stål the species *T. fluviorum* (Fabricius) and *T. swakopensis* Stål but does not mention his *T. albobittatus*.)

1909 Kirkaldy, G. W. and Torre Bueno, J. R. de la. Proc. Ent. Soc. Washington, 10: 209. (Give *Limnometra* Mayr as synonym of *Tenagogonus* Stål.)

1915 Bergroth, E. Zool. Med. Rijks Mus. Nat. Hist. Leiden, 1 (2): 121-123. (Gives *Limnometra* Mayr as synonym.)

1916 Bergroth, E. Proc. Nat. Mus. 51, 2150: 237.

1933 Lundblad, O. Archiv für Hydrobiologie 1933 Suppl. 12, "Tropische Binnengewässer 4," pp. 388-392.

1948 Poisson, R. Mem. Inst. Sci. Madagascar, ser. A, 1 (2): 94-95. (Proposes subgenera of *Tenagogonus*.)

Rather small gerrids, with moderately long antennae, middle and hind legs. Male with last ventral abdominal segment plus genital segments equal to or greater than preceding four ventral segments, usually as long as or longer than preceding five ventral abdominal segments. Front leg with first tarsal segment shorter than second. Abdominal spiracles in middle of segments. Male without or with very short connexival spines. Males with hind coxae covering second ventral abdominal segment. Male metasternum longer than first two ventral abdominal segments. Male last ventral abdominal segment greater than preceding segments. In *Tenagogonus* the males are usually smaller than the females.



*Tenagobius albobittatus* Stål

(Pl. 1, fig. 1; Pl. 7, fig. 1)

- 1853 *Tenagobius*. Stål, C. Öf Vet. Acad. Förh., 10: 263-264. (New genus described from "Cafferlandet" for one species unnamed.)  
 1855 *Tenagobius albobittatus* Stål, C. Öf Vet. Akad. Förh., 12 (1): 45. (Described from Natal.)  
 1916 *Tenagobius albobittatus* Bergroth, E. Proc. Nat. Mus. 51 (2150): 237.  
 1940 *Tenagobius albobittatus* Poisson, R. nec Stål. Bull. Mus. Roy. Hist. Nat. Belg. 16 (40): 5-7 (= *T. zambezinus* Poisson.)  
 1941 *Tenagobius albobittatus* Poisson, R. nec Stål. Rev. Franc. Ent. 8 (12): 77.  
 1948 *Tenagobius albobittatus* Poisson, R. nec Stål Mem. Inst. Sci. Madagascar 1: 95.  
 1952 *Tenagobius albobittatus* Poisson, R. nec Stål Res. Nat. Integrale du Mt. Nimba. 13: 282.  
 1954 *Tenagobius* (s. g. *Tenagobius*) *albobittatus* Poisson, R. Institut des Parcs Nationaux du Congo Belge. Exploration du Parc Nat. de l'Upemba 31, 3-4.

Our specimens are represented by one winged male and two winged females, one wingless male and one wingless female from Gabon, French Equatorial Africa; nine wingless females from Sangmelina, West Africa.

*Size*: 6.7—7.4 mm. long; width across mesoacetabula 2.4—2.6 mm. in wingless male. 7.3—7.6 mm. long; width 2.85—3.1 mm. in wingless female. 9.2 mm. long in winged male and 7.4 mm. long in winged female.

*Color*: Dark reddish brown in ground color. Head above with median black longitudinal stripe continuous with black clypeus and a pair of lateral black stripes. Rostrum yellowish brown except for its last segment which is black. Antennae dark reddish brown. Pronotum with median black longitudinal stripe bordered by yellowish area and wide black spot on either side of its median longitudinal stripe in anterior lobe, lateral and posterior margins also black as shown in figure. Mesonotum on either side of pronotum with a broad white area. Body beneath yellowish.

*Structural characteristics*: Proportional length of antennal segments: 1st: 2nd: 3rd: and 4th.: 52: 55: 60: 65 in one wingless male, and 50: 45: 47: 63 (curved) in one wingless female. Front femur about as thick as middle femur and slightly curved in both sexes.

The relative length of leg segments in a wingless male:

	Femur	Tibia	First tarsal segment	Second tarsal segment
Front leg . . . . .	76	67	10	12
Middle leg . . . . .	183	150	46	12
Hind leg . . . . .	175	80	17	9



Hind legs much longer than length of body. Structures of seventh and first genital segments are quite characteristic in male as shown in the figures. Winged form: shape of pronotum and hemelytra as shown in the figures.  $Sc_2$  vein joins with  $R + M$  at the point of forking of the latter.

*Location of types:* Naturhistoriska Riksmuseum, Stockholm.

*Comparative notes:* Broad white band on the mesonotum and peculiar structure of the seventh ventral abdominal and first genital segments in the male readily separate this species from the other related species within the genus *Tenagogonus*. *Tenagogonus dubius* Poisson, according to personal letter from Dr. Poisson, is closely related to *T. albovittatus*, if not synonymous. The specimens from Congo Belge identified as *T. dubius* by Dr. Poisson shows actually very little difference from the specimens from Cameroons, West Africa, identified as *T. albovittatus* Stål by Dr. Lundblad. Whether these two species are the same species or not awaits further investigation.

*Tenagogonus madagascariensis* Hoberlandt

(Pl. 1, fig. 3; Pl. 7, fig. 3)

1947 *Tenagogonus madagascariensis* Hoberlandt, Acta Ent. Mus. Nat. Prag. 25: 105-112. 3 plates.

1948 *Tenagogonus madagascariensis* Poisson, R. Mem. Inst. Sci. Madagascar, 1: 89. Figs. 5, 6, 7.

1948 *Tenagogenus* (s. g. *Tenagogenella*) *madagascariensis* Poisson, Mem. Inst. Sci. Madagascar, 1: 93-94.

*Size:* 7.3 mm. long; width across mesoacetabulae 2.2 mm. in a wingless male paratype. 8.3-8.9 mm. long; width across mesoacetabula 2.95 - 3.35 mm. in wingless female paratypes.

*Color:* Yellowish brown to fuscous in general color. Head with usual three black longitudinal stripes on upper surface. Pronotum with median longitudinal black stripe and broad lateral stripes, posterior lobe occasionally nearly black, subject to individual variation in degree of black pigmentation. Mesonotum yellow on median longitudinal axis, sides fuscous; mesopleural region with broad longitudinal fuscous band. Metanotum and basal abdominal tergites darker, sometimes entirely black. Body beneath yellow, last rostral segment black.

*Structural characteristics:* Proportional length of antennal segments: 1st: 2nd: 3rd: 4th:: 52: 52: 62: 83 in one wingless paratype male; 50: 40: 45: 60 (? curved) in one wingless paratype female.



The relative length of leg segments in one wingless male:

	<i>Femur</i>	<i>Tibia</i>	<i>First tarsal segment</i>	<i>Second tarsal segment</i>
Front leg	72	60	7	10
Middle leg	163	130	53	12
Hind leg	155	73	18	11

Middle legs longer than length of body. Front femur a little thicker than base of middle femur; middle femur much thicker than hind femur. Pronotum prolonged to about middle of mesonotum. No winged form is known.

*Location of types:* National Museum of Praha. Three wingless males and three wingless female paratype specimens are at University of Kansas.

*Comparative notes:* This species can readily be distinguished from the rest of the species of *Tenagogonus s. str.* by the short pronotum. The seventh abdominal and first genital segments are conspicuously modified ventrally, as in other species of *Tenagogonus s. str.*, but they can be recognized from the accompanying figures.

*Data on distribution:* Madagascar: "Vohemar, Ambomja" (type series, Hoberlandt); "Mahilaka (Sambirano); forêt des Roussettes (Montagne d'Ambre)" (Poisson); "(Tananarive)" (New record). 28 wingless males and 56 wingless females from Tananarive, Madagascar are preserved in the Francis Huntington Snow Entomological Museum, University of Kansas.

### *Tenagogonus zambezinus* (Poisson)

(Pl. 1, fig. 2; Pl. 7, fig. 2)

1934 *Gerris* (*Limnopus*) *zambezinus* Poisson, R. Bull. Soc. Zool. France, 59 (1): 92-93.

1940 *Tenagogonus albovittatus* (? *Gerris* [*Limnopus*] *zambezinus* Poisson) Poisson, R. Bull. Mus. roy. Hist. nat. Belg., 16 (40): 5-7.

1941 *Tenagogonus albovittatus* Poisson, R. Rev. Franc. Ent., 8 (2): 77.

1948 *Tenagogonus albovittatus* Poisson, R. Mem. Inst. Sci. Madagascar, 1: 95.

1952 *Tenagogonus albovittatus* Poisson, R. Res. Nat. Integrale du Mt. Nimba, 13: 282.

Dr. W. E. China kindly loaned us one identified wingless male and one female specimen. The following description is based on them.

*Size:* 8.5 mm. long; width across mesoacetabula 2.77 mm. in one wingless male. 9.9 mm. long and 3.75 mm. wide in one wingless female.

*Color:* Pale reddish brown in ground color, with black markings on dorsal surface; black pigmented area densely clothed with short



adpressed grayish hairs. Head with usual three black stripes. Pronotum with median black longitudinal stripe and lateral narrow marginal black stripes evanescent apically, a pair of broad short black bands on either side of middle of anterior lobe. Mesopleural region with three black stripes which are confluent anteriorly and posteriorly, each abdominal tergite from second segment on with a pair of black markings. Connexivum darker laterally or with a continuous median longitudinal black stripe. Rostrum yellow except the last segment black. Body beneath pale yellow.

*Structural characteristics:* Proportional length of antennal segments: 1st: 2nd: 3rd: 4th:: 24: 23: 27: ? in wingless male and 26: 20: ? : ? in wingless female.

The relative length of leg segments in one wingless male is as follows:

	<i>Femur</i>	<i>Tibia</i>	<i>First tarsal segment</i>	<i>Second tarsal segment</i>
Front leg	77	63	10	12
Middle leg	172	147	40	?
Hind leg	165	90	18	10

Seventh segment in male with ventrolateral processes long and they arise more dorsally than in the preceding species. Eighth segment without conspicuous modification ventrally in male.

*Location of types:* Musée Royal d'Histoire Naturelle de Belgique.

*Comparative note:* Relatively large. The shape and location of the process on ventrolateral margin of seventh segment in male and the simple posterior margin of eighth ventral abdominal segment readily separate this species from the rest of *Tenagogonus*.

*Data on distribution:* Mzingaze, environ de Vila Pery, Bas Sandgazé; Calamo (Poisson 1934, 1940).

The specimens we examined bear the following labels: "S. Africa, G. E. Hutchinson coll. B. M. 1928-395." "S. Rhodesia" 1 apterous male (British Mus.). "Zululand, Nagapa Res. Lab. 23-IV-1922 H. H. Curson" 1 apterous female (British Mus.).

*Tenagogonus divergens* n. sp.

(Pl. 1, fig. 4; Pl. 7, fig. 5)

*Size:* Apterous male holotype 7.56 mm. long; width across the mesoacetabula 2.646 mm.; width across the head 1.47 mm.

*Color:* Light brown. Head with two reddish brown spots above the clypeus and a curved line near each eye; pronotum with median longitudinal reddish brown line and another near its margin; dark brown band on propleuron behind the eye and continued as two



bands to mesopleuron, the upper one ending behind mesoacetabulum; two short bands on mesoacetabulum; two longer ones on metaacetabulum; under side of connexivum dark; remainder of venter pale except for short black spot at anterior end of mesoacetabular cleft.

*Structural characteristics:* Proportional length of antennal segments: 1st: 2nd: 3rd: 4th:: 96: 86: 126: 140. Total length of antenna 9.4 mm. Beak slender. Front leg segments: femur: tibia: 1st tarsal: 2nd tarsal:: 150: 127: 16: 26. Middle femur 390 spaces or 8.19 mm. long, remaining segments and hind legs missing. Abdominal segments rather short, the first two ventral abdominal segments together shorter than metasternum. Hind coxa surpassing rear margin of second ventral abdominal segment. Last ventral abdominal segment of male slightly shorter than the two preceding segments. Conspicuous diverging protuberances arising from the surface of the last ventral abdominal segment just beneath connexivum.

*Location of Type:* Described from a specimen bearing the label "Brook near Bawomataluwo, Sumatra, 9-12-31. v. d. Meer Mohr." (K. U. col.)

*Comparative notes:* This species has the protuberances of the last ventral abdominal segment of the male arising just beneath the connexivum instead of farther ventral as in *T. albovittatus* Stål. In this regard it is more like *T. zambezinus* Poisson.

*Tenagogonus kampaspe* (Kirkaldy)

(Pl. 1, fig. 5; Pl. 7, fig. 4)

1900 *Gerris Kampaspe* Kirkaldy, G. W. Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, 20: 804.

1933 *Limnometra kampaspe* Lundblad, O. Archiv für Hydrobiologie Suppl. 12, "Tropische Binnengewässer 4," p. 371 (quotes New Guinea).

The original description: "*Gerris kampaspe* sp. n. Belongs to subg. *Limnometra* Mayr. Size and general structure of *minuta* Mayr, but readily distinguished by its much greater breadth. Fulvo-cinereous; a diamond-shaped mark on the head, a median longitudinal line on the pronotum, and legs blackish brown. Venter pale cinereous. Elytra dark fulvo-cinereous with blackish nervures. Length  $5\frac{1}{2}$  -  $7\frac{1}{2}$  mm. New Guinea: Kelesi (Loria), Rigo (Loria)."

Fortunately, the type series, two males and two females, are in the Kirkaldy collection at the University of Kansas Entomological Museum, otherwise we would never have been able to recognize



it. No specimens are now entire but the following notes and the illustrations should enable one to identify the species.

*Size:* Winged male: 5.33 mm. long; width across humeri 1.43 mm.; width across mesoacetabula 1.7 mm.; width across head 1.16 mm.; wingless male: 4.2 mm. long; width across mesoacetabula 1.64 mm.; width across head 1.09 mm. Wingless female: 6.3 mm. long; width across mesoacetabula 1.64 mm.; width across head 1.43 mm.

*Color:* General color rather light yellowish-brown; the reddish black figures as shown in the illustration; dark brown to black band on propleuron behind the eyes; the two bands on mesopleuron more or less fused; a brown spot on lateral margin of mesosternum may be present. Venter pale.

*Structural characteristics:* One winged male with two antennal segments: 1st: 2nd:: 57: 50. One wingless female with three antennal segments: 1st: 2nd: 3rd:: 80: 66: 76. One specimen, a male with a beak reaching one third the distance on mesosternum. Front femur of male considerably stouter than middle femur and strongly curved, other legs incomplete.

Relative length of leg segments of a winged male:

	<i>Femur</i>	<i>Tibia</i>	<i>First tarsal segment</i>	<i>Second tarsal segment</i>
Front leg	85	78	9	11
Middle leg	190	160	?	?
Hind leg	190	100	21	12

Middle femur not as long as body in either sex. Connexivum rather broad; no connexival spines. Dorsal abdominal segments of male short; last one as long as two preceding. Hind coxa of male reaching penultimate abdominal segment; of female reaching rear margin of second abdominal segment. Abdominal venter of male a little more than half as long as mesosternum, its last abdominal segment plus genital segments longer than the rest of abdomen; the venter of last abdominal segment of male with caudally directed lateral protuberances.

*Winged form:* Shape of pronotum and venation of hemelytra as shown in illustration.

*Location of types:* Described from two males, one winged, and two wingless females labeled as follows:

The winged male: "N. Guinea Mer. Kelesi, Nov. Dic. 1890. L. Loria." "Gerris Kampaspe Kirk. Type ♂." Wingless male: "N. Guinea Mer. Rigo, Luglio 1889. L. Loria." One wingless female: "N. Guinea. Dilo, Loria VI, VII 90." One wingless female: "N.



Guinea Mer. Rigo, L. Luglio 1889." This one bearing the same label as the type should be considered the allotype. These are in the Kirkaldy collection of The University of Kansas Snow Entomological Museum.

*Comparative notes:* This species is related to the *T. albovittatus* Stål group.

*Data on distribution:* Known so far only from these types from New Guinea.

*Tenagogonus robustus* sp. nov.

(Pl. 1, fig. 6; Pl. 8, fig. 9; Pl. 16, fig. 30; text fig. 1)

*Size:* Apterous male: 7.56 mm. long; width across the mesoacetabula 3.15 mm.; width across the head 1.64 mm. Apterous female: 7.35 mm. long; width across the mesoacetabula 3.15 mm.; width across the head 1.57 mm.

*Color:* Yellowish to reddish brown. Head with a short dark median band on its base that splits into two diverging bands that suddenly converge to unite before the base of clypeus, an undulate band near each eye; pronotum with usual median longitudinal line; lateral dark lines near the margin that are broad on the anterior lobe. Abdominal dorsum more or less mottled with darker brown; black band on propleuron behind the eyes and continued as two broad bands separated by a narrow pale line; the upper band broader and continuing onto metaacetabula, the lower one turning down at its end but not connecting with the dark band on mesoacetabula. Venter nearly white; underside of connexivum embrowned.

*Structural characteristics:* Proportional length of the antennal segments of male: 1st: 2nd: 3rd: 4th.: 100: 84: 107: 116. Total length of antenna 8.55 mm. Beak moderately slender, covering less than one third of mesosternum. Front femur slightly, if any shorter, than middle femur.

The relative length of leg segments:

	<i>Femur</i>	<i>Tibia</i>	<i>First tarsal segment</i>	<i>Second tarsal segment</i>
Front leg	157	137	17	30
Middle leg	385	270	114	30
Hind leg	330	200	40	35

Posterior lobe of pronotum in apterous forms rather narrow and exposing mesonotum around its tip. Connexivum rather broad, no connexival spines. Dorsal abdominal segments of male fairly short, last one as long as the two preceding. Hind coxae of male reaching rear margin of third ventral abdominal segment; of female sur-



passing the middle of second ventral abdominal segment. Last ventral abdominal segment of female as long as the two preceding segments. In the male the last ventral abdominal segment as long as the two preceding segments and together with genital segments longer than the rest of abdomen. First genital segment of male medially depressed ventrally, with a large V-shaped notch on its rear margin. Male genital capsule (9th segment) with lateral hair tufts.

*Location of types:* Described from 3 males 3 females from Sumba, five of them bear the label "Prai Jawang, O. Sumba, Rende Wai, 14. 6. 1949, Dr. Bühler, Dr. Stutter." and one with the label "Pogobina 17. 9. 1949, Dr. Bühler, Dr. Stutter." These and one bearing the label "Ost-Java Lavang 1.500' Leg. M. E. Walsh 136" were sent to us for determination by the Museum at Basel, Switzerland. The holotype, allotype and two paratypes will be found there and two paratypes in the University of Kansas collection. Through kindness of Mr. A. M. R. Wegner of the Zoological Museum at Bogor, Indonesia, we have recently been loaned an apterous male and female, two winged males and one winged female bearing the label "Coll. F. C. Drescher, Java, Preanger N. O. I. Bandoeng, 750 m. 1937." These were labelled *Limnometra brevis* Lundblad but not by Lundblad, they are actually our *T. robustus* and are made paratypes. Four of these have been returned to the Museum at Bogor.

*Comparative notes:* This species is most closely related to *Tenagogonus brevis* (Lundblad), from which it is readily distinguished by the shape of the first genital segment of the male, and by its parameres which are quadrate in shape not pointed as in *T. brevis* (Lundblad).

*Data on distribution:* Besides the Sumba and Ost-Java records above we have two females that bear the label "Mt. Apo, Mindanao, Philippine Islds. C. F. Clagg, Baroring Riv. 7.000 ft. Nov. 8." These came to us for determination from the Museum of Comparative Zoology at Harvard College. In size, shape and color pattern they are almost identical with this O. sumba species. However, since they came from the Philippines and have the posterior lobe of the pronotum somewhat broadened at the humeri and have moderately long and spine like projections on the connexivum that are entirely lacking in the Sumba species we believe they represent a good subspecies and give them the name *Tenagogonus robustus claggi* n. subsp. Males, when they are found, may indicate a good species (see pl. 2, fig. 7; pl. 8, fig. 10). One specimen is in M. C. Z. and the other is in the Snow Entomological Collection, University of Kansas.

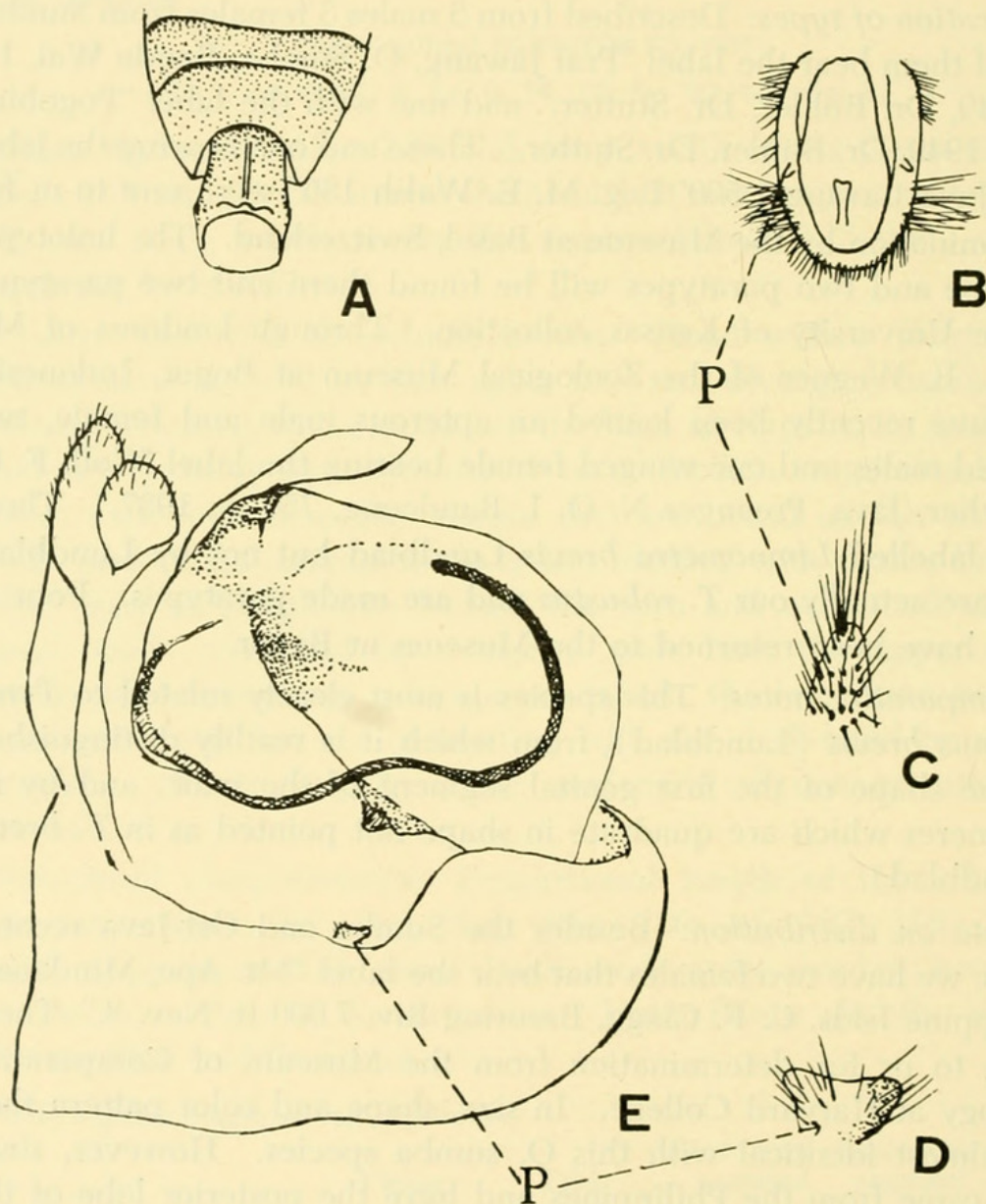


*Tenagonus brevis* (Lundblad)

(Pl. 2, fig. 8; Pl. 2, fig. 6)

1933 *Limnometra brevis* Lundblad, Archiv für Hydrobiologie 1933, Suppl. 12. Tropische Binnengewässer 4, pp. 388-392, Taf. 10, fig. 123.

Thanks to Doctor Lundblad we have seen the winged allotype of this species and have had it redrawn to conform in magnification with the other species reported in this paper and also have had



TEXT FIGURE 1.

(A) Abdominal venter and first genital segment of male of *Limnometra brevis* as drawn by Lundblad in his figure 123 D on page 391. (B) Genital capsule of *L. brevis* Lundblad as shown in above text figure 123 E showing location of paramere or "genital griffel" at p. (C) Paramere of the above enlarged. (D) Paramere of *Tenagonus robustus* n. sp., enlarged. (E) Genital capsule of *T. robustus* from left side showing paramere at p.



his drawing of the apterous female enlarged. His description and illustrations are splendid and adequate.

In the allotype the last antennal segment appears nearly white but the middle and hind femora are uniform in color without the distal ends paler, so usual in many species. While this is a small species it is relatively broad. The width of the head being only 1.53 mm. but width across the mesoacetabula more than 2.73 mm. The second antennal segment is shorter than the width across head. The allotype bears the label "Java Thienemann" and is in the museum at Stockholm, Sweden. The apterous paratype female has the hind coxae slightly surpassing second abdominal segment. The male from Sumba Island, of which Dr. Lundblad gave drawings, must be the holotype and belongs to the Bogor Museum. We have not seen this but the drawing of the first genital segment of the male could not have been made from our *T. robustus* described above. Compare Lundblad's fig. 123, D (p. 391) and our fig. 9a on plate 8. Also compare the male genital hook or paramere (fig. 123, F, p. 391) and the paramere of *T. robustus* on text figure 1 in this work.

### *Tenagogonus pravipes* Bergroth

1915 *Tenagogonus pravipes* Bergroth, E. Zool. Med. Rijks Mus. Nat. Hist., Leiden, Deel 1, 1 : 121-122 (described from Java and says that *Limnometra* Mayr is a synonym of *Tenagogonus* Stål 1855).

1933 *Limnometra pravipes* Lundblad O. Archiv für Hydrobiologie 1933, Suppl. 12, Tropische Binnengewässer 4, p. 371 (quotes Java).

The types of this species have not been located by us. Doctor Blöte says they are not at the Leiden Museum and Doctor Lindberg cannot find them in Helsingfors. We have found no specimens from Java that fit Bergroth's description which follows:

"*Tenagogonus pravipes* n. sp.

"Opacus, supra luride ochraceus, subtus pallide testaceus, linea transversa subbasali verticis, vittis duabus e petiolo communi ab illa linea emisso ortis, antrorsum levissime divergentibus, antice conjunctim basin clypei subattingentibus, vitta verticis paullo intra oculos, vitta laterali ab oculo ad basin antennae ducta, vitta curvata sublaterali pronoti antice cum vitta alterius lateris anguste cohaerente, linea media percurrente pronoti et processus ejus, linea angusta sublaterali processus pronoti paullo ante apicem ejus abrupta, vitta laterali propleurae, vitta lata partis dorsalis meso- et metapleurae, vitta laterali postice abbreviata mesopleurae, vittula ante acetabula media, margine apicali superiore horum, vittula acetabulorum posteriorum, vitta sublaterali connexivi et ventris in maculis subdissoluta articuloque ultimo nitido rostri nigris, metanoto, segmentis duobus primis dorsi abdominis suturisque dorsalibus segmentorum ceterorum hujus infuscatis, antennis et pedibus (coxis exceptis) pallide fuscis. Caput latitudine sua paullo longius, supra pilis paucis longis erectis praeditum,



fronte sat fortiter declivi, oculis antrorsum levissime convergentibus, antennis corpore longioribus, articulis primo, tertio quartoque subaeque longis, primo basin versus nonnihil curvato, secundo adjacentibus brevior, rostro medium mesosterni haud attingente. Metasternum segmentis tribus primis ventris unitis fere aequae longum, orificio prope marginem posticum posito. Abdomen (♂) parte sua dimidia dorsali coxas posticas superans, segmento ultimo dorsali duobus praecedentibus unitis parum longiore, apice truncato, segmento ultimo connexivi ultra ultimum dorsale breviter vix acute retrorsum prominulo, ventre quam dimidio mesosterni paullo longiore, parte sua pone segmentum quartum sita coxas posticas superante, segmento sexto medio duobus praecedentibus conjunctis subaeque longo, segmento genitali dorsali secundo maris perbrevis, nigricante, genitali ventrali secundo dorsale superante et quam hoc latiore. Pedum anticorum femora longiuscula, parte plus quam quarta basali nonnihil incrassata, ad apicem partis incrassatae subconstricta et subangulariter fracta, deinde usque ad apicem recta, linearia; tibiae femoribus paullo breviores; articulus secundus tarsorum primo evidenter longior. Coxae mediae marginem posticum metasterni et basin acetabulorum posticorum attingentes. Femora posteriora corpori subaequa longa. Long. ♀ 6.8 mm.

"Forma aptera: Pronotum a processu suo impressione leni transverse separatum, processu metanotum attingente, quam pronoto proprio paullo augustiore, usque ad trientem apicalem subparallelo, deinde apicem late rotundatum versus levissime angustato.

Magelang (J.).

"Extremely similar in colour to the quite inadequately described *T. anadyomene* Kirk., but it is much smaller and comparison with Ceylonese specimens of that species reveals the following important structural differences: The abdomen in *pravipes* is much shorter and not longitudinally ridged beneath in the middle, the apical angles of its last segment are much less acute, the fore legs and the second male genital segment are quite differently constructed, and the length-relations between the metasternum and the first ventral segments and between the middle coxae and the adjacent parts are different. The macropterous form of *pravipes* is unknown. In *T. anadyomene*, of which almost only the colour-markings have been described by Kirkaldy and Distant, the venter is as long as the meso- and metasternum together and longitudinally carinated in the middle, the apical angles of its last segment are very acutely produced, the second male dorsal genital segment is produced beyond the corresponding ventral segment, the fore femora are almost straight and not incrassated at the base, the fore tibiae are as long as the femora, the two joints of the fore tarsi are of equal length, the metasternum is as long as the two first ventral segments together, the middle coxae reach the middle of the metasternum but not the base of the hind acetabula, and the hind coxae barely reach the middle of the second ventral segment.

"In a paper sent for publication some months ago but not yet printed I have maintained *Limnogonus* Stål as a genus distinct from *Limnometra* Mayr, but after the study of further materials I find that *Limnogonus* cannot be considered even subgenerically distinct, as the transitions in the mutual length of the two joints of the fore tarsi and in the shape of the apical angles of the last abdominal segment are too numerous. *Limnometra* is a synonym of *Tenagogonus* Stål, the type of which is *T. albovittatus* Stål (1855) from Natal, a species totally for-



gotten by Stål himself in his later writings and also omitted in the Catalogue of Lethierry and Severin.

"N. B.—The segment following immediately after the metanotum has by me previously (Ent. Monthly Mag. 1902, p. 259) been called the metaphragma, but I now with Breddin think it more natural to regard it as the first abdominal segment."

*Tenagogonus pravipes bergrothi* subsp. nov.

(Pl. 2, fig. 10; Pl. 8, fig. 8)

**Size:** Winged male 7.56 mm. long; width across the mesoacetabula 2.42 mm.; width across head 1.36 mm. Small wingless male: 5.04 mm. long; width across mesoacetabula 1.76 mm.; width across head 1.16 mm. Winged female 6.93 mm. long; width across mesoacetabula 2.35 mm.; width across head 1.3 mm.; wingless female: 6.6 mm. long; width across mesoacetabula 2.52 mm.; width across head 1.28 mm.

**Color:** General color light yellowish-brown. Head and pronotum yellowish brown with the dark reddish-brown to black figures as shown in the illustrations. Black band on propleuron behind eye, continued as two broad bands on mesopleuron, the upper one broader, ending on the metaacetabula and the lower one turning down and ending before reaching the dark band on mesoacetabula. Venter light, nearly white except for a dark spot on metasternum and underside of connexicum embrowned.

**Structural characteristics:** Proportional length of antennal segments of winged male: 1st: 2nd: 3rd: 4th.: 85: 83: 106: 108, total length of antenna 8.02 mm. Beak moderately slender, covering less than one third of mesosternum. Front femur slightly, if any, stouter than middle femur.

The relative length of leg segments:

	<i>Femur</i>	<i>Tibia</i>	<i>First tarsal segment</i>	<i>Second tarsal segment</i>
Front leg	130	114	13	22
Middle leg	300	235	108	27
Hind leg	270	145	30	25

In winged form, shape of pronotum and venation of hemelytra as shown in the illustration. In the apterous form the shape of pronotum is shown for a female and is relatively broader than in male. Connexivum moderately broad, male without connexival spines and female has the outer angle of connexivum produced almost into a spine. Dorsal abdominal segments of the male fairly short, last one not as long as the two preceding ones. Hind coxae



of male surpassing rear margin of second abdominal segment; of the female reaching or surpassing the middle of second ventral abdominal segment. Last ventral abdominal segment of female shorter than the two preceding segments. In the male the last ventral abdominal segment shorter than the two preceding segments and together with genital segments almost as long as the rest of the abdomen. The venter of first genital segment of the male with a median longitudinally depressed line. Male genital capsule without lateral hair tufts.

*Location of types:* Described from fifteen males (five winged) and twenty females (one winged) labeled "Observatory Garden, Manila, P. I." and two females labeled "Mainit, Surigao Mindanao, P. I. III, 21, 31, A. C. Duyag". The last two belong to California Academy of Sciences. Others are from Bueno coll. in the University of Kansas collection. Holotype and allotype wingless. Holomorphotype and allomorphotype are winged.

*Comparative notes:* As in *Tenagogonus pravipes* Bergroth the males have the basal third of the front femur somewhat thicker and then curved beyond. This is not true for *T. robustus* sp. nov. or for *T. brevis* (Lundblad) which are closely related species.

*Data on distribution:* Known only from the type series above. We have a species from the Philippines that must be very close to *Tenagogonus pravipes* Bergroth. In some respects it does not agree with Bergroth's description and since he did not mention the striking impressed line on the venter of the first genital segment of the male we are describing it as a subspecies.

*Tenagogonus fijiensis* sp. nov.

(Pl. 2, fig. 9; Pl. 8, fig. 7)

*Size:* Apterous male: 5.25 mm. long; width across mesoacetabula 2.41 mm.; width across head 1.51 mm. Apterous female: 6.72 mm. long; width across mesoacetabula 2.73 mm.; width across head 1.74 mm.

*Color:* Head reddish brown with two longitudinal black lines meeting at both ends, a black band along each eye; pronotum reddish brown, with a median longitudinal black line, broader on anterior lobe, lateral black lines near the margin that are very broad on anterior lobe; black band on propleuron behind eye and continued as two bands separated by a pale stripe; the upper band ending on the metaacetabula and the lower one on the mesoace-



tabula. Underside of male connexivum embrowned, venter otherwise pale.

*Structural characteristics:* Proportional length of antennal segments of male: 1st: 2nd: 3rd: 4th:: 92: 64: 62: 70. Total length of antenna 6.05 mm. Beak moderately stout and short for this genus. Front legs stout, femur much thicker than middle femur.

The relative length of leg segments:

	<i>Femur</i>	<i>Tibia</i>	<i>First tarsal segment</i>	<i>Second tarsal segment</i>
Front leg	125	115	14	20
Middle leg	280	262	74	23
Hind leg	290	170	27	17

Pronotum of the apterous form narrowed at caudal end. Connexivum of female, erect on basal segments and reflexed on distal segments, with the caudal angles produced and overlapping. Connexivum of male semierect, no connexival spines, its dorsal abdominal segments short except the last one which is as long as the two preceding segments and as long as the first genital segment. Ventrally, hind coxae of male surpass the rear margin of the fourth abdominal segment; in female they surpass the rear margin of the second. Ventral abdominal segments of male short except last one, which together with the genital segments is longer than rest of abdomen. The ventral surface of first genital segment normal. Last ventral abdominal segment of female as long as three preceding segments, tubular, ending in a mid-ventral point.

*Location of types:* Described from holotype, allotype and two male paratypes labeled "Fiji Islands, July 1934 R. W. Paine" "Taveuni; Ura. Stagnant pool in rocky stream bed of forest 2500 ft." (K. U. coll.)

*Comparative notes:* The shape of the pronotum in these apterous insects and the tubular last ventral abdominal segment of the female are characteristic.

*Tenagogonus kuiterti* sp. nov.

(Pl. 2, fig. 11; Pl. 9, fig. 11)

*Size:* Winged male: 10.37 mm. long; width across humeri 2.1 mm.; width across mesoacetabula 2.83 mm.; width across head 1.64 mm. Apterous male: 8.74 mm. long; width across mesoacetabula 2.77 mm.; width across head 1.55 mm.; apterous female: 8 mm. long; width across mesoacetabula 2.63 mm.; width across head 1.43



mm. The size shows considerable variation. Winged males may be only 7.98 mm. long and apterous males only 6.3 mm.

*Color:* General color light brown. Head and pronotum light brown with the dark reddish brown to black figures as shown in the illustration. Note the pale spot on inner margin of hemelytron in winged forms. Dark brown to black band on propleuron behind eye continued as two bands on mesopleuron, the lower one broader and often broadened in one or two places to join the upper band, usually ending free but occasionally joining the upper of two spots in the mesoacetabula. Venter pale except for a black spot at anterior end of the mesoacetabular cleft and underside of the connexivum embrowned.

*Structural characteristics:* Proportional length of antennal segments: 1st: 2nd: 3rd: 4th.: 90: 83: 108: 100. Total length of antenna in this wingless male 8 mm. this male being 6.55 mm. long. Beak moderately slender, not covering one third of mesosternum. Front femur of male slightly stouter than middle femur.

The relative length of leg segments:

	<i>Femur</i>	<i>Tibia</i>	<i>First tarsal segment</i>	<i>Second tarsal segment</i>
Front leg	118	100	13	20
Middle leg	290	215	95	30
Hind leg	290	125	24	24 including claws

Winged form: shape of pronotum and venation of hemelytron as shown in the illustrations. In apterous male the shape of pronotum is shown and also in a slightly brachypterous male, the wing pads too short to be exposed. The male with very short connexival spines, especially in apterous forms. Female with broad connexivum and short spines. Last dorsal abdominal segment of male not as long as the two preceding segments but longer than the dorsum of the first genital segment. In female last dorsal abdominal segment as long as the next preceding segment. Ventrally the male abdomen nearly as long as mesosternum. First genital segment of male with lateral transverse depression, its venter normal.

*Location of types:* Described from eleven males (three winged) and three females from "Mohnyin, Burma X. 27. 1944 L. C. Kuitert" and "Burma, 1944. L. C. Kuitert" in the University of Kansas collection.

*Comparative notes:* This species we are placing in *Tenagogonus* Stål because it has so many characters of that genus. It is the only



species with connexival spines but they are very short and variable, almost absent in some wingless males.

*Data on distribution:* Besides the type series we have 1 male and 4 females bearing the label "Shingbwiyang, Burma XI-15-1944 Capt. L. C. Kuitert". These are all winged specimens and their connexival spines are evenly developed.

### Genus *Limnometra* Mayr

1865 Mayr, Gustav L. Verh. Zool-bot. Ges. 15: 443. (New genus for: *L. femorata* Mayr and six other species.)

1865 Mayr, Gustav L. Reise der österreichischen Fregatte Novara Expedition um die Erde. Zool. Theil 2 (1): 174 Wien. (Key to species.)

1909 Kirkaldy G. W. and Torre Bueno, J. R. de la. Proceedings of Ent. Soc. Washington 10: 209. (Given as synonym of *Tenagogonus* Stål.)

1915 Bergroth, E. Zool. Med. Rijks Mus. Nat. Hist., Leiden 1 (2): 121-123. (Gives *Limnometra* Mayr as synonym of *Tenagogonus* Stål 1853.)

1925 China, W. E. Bull. Brooklyn Ent. Soc. 20: 218. (Revives *Limnometra* Mayr for *L. gigas*.)

1933 Lundblad, O. Archiv für Hydrobiologie. Suppl. 12. "Tropische Binnengewässer 4," p. 371.

Medium to large elongate gerrids with moderately long antennae, middle and hind legs. Male abdomen longer than the mesosternum. Last male ventral abdominal segment plus the genital segments shorter than the preceding four ventral abdominal segments. First tarsal segment of the front leg usually longer than the second. Abdominal spiracles closer to the anterior margin of the segments. Males with connexival spines or with connexivum produced into a triangular flattened plate. Hind coxae not covering second ventral abdominal segment. Metasternum equal to or shorter than first two ventral abdominal segments. Last ventral abdominal segment of male equal to or shorter than preceding segment. In *Limnometra* the males are often larger than the females.

### *Limnometra minuta* Mayr

(Pl. 2, fig. 13; Pl. 10, fig. 14)

1865 *Limnometra minuta* Mayr, Gustav L. Verh. Zool.-bot. Vereins, Wien, 75: 444.

1865 *Limnometra minuta* Mayr, Gustav L. Hemiptera in Novara Expedition, Zoolog. Theil, Wien, 2 (1): 175, 176-177. figs. 54a, 54b. (Gives additional description and figures.)

1904 *Gerris minuta* Distant W. L. The Fauna of British India Rhynchota 2: 181. (Quotes Nicobar Islands.)

1933 *Limnometra minuta* Lundblad, O. Archiv für Hydrobiologie, Suppl. 12. "Tropische Binnengewässer 4", p. 371, 373.

The type of this species is a winged male bearing the label "Novara Exp. Sambelong". It fits perfectly Mayr's two descriptions and notes. While mostly a color description he gives the length (8.6 mm.), thus smaller than the other species he knew, the nonciliated



middle femora and the broadly based triangular connexival spines, which are useful in recognizing this species; yet one hundred years have passed without any one recognizing additional specimens. Surely on some Nicobar Island this species still exists. The following notes and drawings of the type may be helpful in recovering this much desired little species.

Notes on *Limnometra minuta* Mayr:

*Size:* Type is a winged male, 8.61 mm. long; width across humeri 1.47 mm.; width across mesoacetabula 2.1 mm.

*Color:* Color pattern not striking. Antennae and legs of uniform color with part of tarsi darker. Antennae darker than the legs. Head has a nearly black tylus; just back and laterad of the tylus stripe are light brown lines that converge and unite into a median stripe at the anterior level of the eye emarginations; there is another brown line near the inner margin of eye that unites in front with the mediolateral band, thus producing an M-shaped figure on head; a dark band between the base of antenna and eye. Pronotum has a median longitudinal, nearly black line and another separated from the lateral and caudal margins by a pale line; on the anterior lobe, on either side, between the dark lines is a light brown streak that fades out before the level of humeri; a brown streak on side of prothorax behind eye, this is continued as a dorsolateral streak on mesothorax. There is a dark-brown elongate spot on anterior acetabula, two curved ones on middle acetabula and one on the posterior acetabula. There is a faint brown lateral streak on mesothorax and a black spot at anterior end of mesoacetabular cleft. Venter pale. Last segment of the beak shining, black. Hemelytra brown.

*Structural characteristics:* Antennae slender. Proportional length of antennal segments: 1st: 2nd: 3rd: 4th:: 93: 73: 98: 133. The total length of this antenna is 8.32 mm. Front femur somewhat curved and about twice as thick as tibia. The segmental formula: Femur: tibia: 1st tarsal: 2nd tarsal:: 133: 115: 17: 18. Middle femur measures 6.93 mm. long and has neither cilia nor pegs. Other segments are gone. Metasternum about equal to first two abdominal segments. Abdominal venter with faint median carina. Male genital segments about as long as the last two ventral abdominal segments. The abdominal sides parallel as seen from beneath and the connexival spines are very broad at base, triangular in shape and not quite reaching the tip of the body. We have seen no other species with connexival spines like this.



*Limnometra lipovskyi* sp. nov.

(Pl. 3, fig. 20; Pl. 9, fig. 12)

**Size:** Winged male: 13.44 mm. long; width across humeri 2.47 mm.; width across mesoacetabula 3.78 mm.; width across head 2.14 mm. Winged female: 10.9 mm. long; width across humeri 1.93 mm.; width across mesoacetabula 3 mm.; width across head 1.84 mm. Wingless forms probably smaller, since one wingless male is only 7.35 mm. long.

**Color:** General color pattern quite distinctive, yellowish brown and black. The black figures as shown in the illustration. Dark brown to black band on propleuron behind eye as usual but the upper band on mesopleuron almost obliterated, only the lower one which is dark brown is present and it fades out before reaching mesoacetabula. Males have a longitudinal black line on basal third of middle femur while females have a short black spot near base as do *L. ciliata* Mayr. Venter is pale.

**Structural characteristics:** No male has an entire antenna. One with three segments gives the following proportional lengths: 1st: 2nd: 3rd: 4th.: 150: 145: 130: ?. A female antenna: 1st: 2nd: 3rd: 4th.: 120: 100: 90: 100. Beak moderately slender but not covering one third of mesosternum. Front femur of male not stouter than middle femur.

The relative length of leg segments:

	<i>Femur</i>	<i>Tibia</i>	<i>First tarsal segment</i>	<i>Second tarsal segment</i>
Front leg	255	230	35	33
Middle leg	710	700	191.9*	34.9*
Hind leg	760	432	65	25

The middle femur and tibia of male have, ventrally, a wide brush of scattered cilia. Winged form: Shape of pronotum and venation of hemelytra as shown in illustration. Male with very short connexival spines that are probably more reduced in apterous forms; last abdominal tergite longer than preceding one but shorter than the first genital segment; ventrally the male abdomen longer than the mesosternum; last ventral abdominal segment slightly shorter than preceding one; venter of first genital with stout lateral protuberances arising from its venter. Last venter abdominal segments of female as shown in the drawing.

**Location of types:** Described from three winged males and four winged females labeled "Guadalcanal 1944. L. J. Lipovsky" and

\* Calculated from smaller male.



one female "Guadalcanal 1945. P. H. Eschmeier". All of these are in the University of Kansas collection.

*Comparative notes:* This species, like *L. kuiterti* has very short connexival spines. The protuberances on the venter of the first genital segment of the male distinguish this species.

*Data on distribution:* Known only from Guadalcanal.

*Limnometra octopunctata* Hungerford

(Pl. 4, fig. 22; Pl. 10, fig. 13)

1955 *Limnometra octopunctatus* Hungerford, H. B. Journal Kansas Ent. Soc., 28: 67-68.

*Size:* Apterous male: 9.24 mm. long; width across the mesoacetabula, 2.625 mm. Apterous female: 11.25 mm. long; width across the mesoacetabula, 3.25 mm.

*Color:* Reddish brown above, lighter beneath; head with a broad median brown band that is wider in front and bordered by lighter narrower lines; pronotum with a median black band that is broad in front and tapering on the anterior lobe to a slender line that continues on the posterior lobe to its apex; the posterior lobe with a slender lateral submarginal black line to the shoulders where it broadens and is bordered by a pale line around the apical lobe; behind the pronotum is a median brown to black band that continues to abdominal tip; on this dark band from the third abdominal segment to the eighth there is a median series of gray streaks; on each acetabulum, a pair of black spots; between these spots a small creamy white spot on the mesoacetabulum and on metaacetabulum a large triangular creamy white spot. On the venter eight large nearly round black spots that characterize the species and suggest the name. These spots are located as follows: One black spot in front of and one on the venter beneath each mesoacetabulum, one beneath each metaacetabulum and another on either side of the last abdominal segment. On each side of the first genital segment of the male there is another black spot half hidden beneath the last abdominal segment. If such spots are also on the female they are entirely hidden.

*Structural characteristics:* The male has lost the last two segments of its antennae. The length of the first and second segments are respectively 2.6 mm. and 2.73 mm. so the second is longer than the first. The female also is imperfect and only one antenna is represented by three segments that measure: 1st, 2.52 mm.; 2nd, 2.14 mm.; 3rd, 2.18 mm. The beak is moderately long (3.21 mm.),



elongate third segment reaching back some distance on mesosternum. The relative lengths of the segments of the beak are 1st: 2nd: 3rd: 4th:: 30: 13: 90: 21 (♂). Fourth segment black and shining and its mean diameter about half that of the third which is slender and its diameter about half of the first segment. Front legs of both sexes have the basal two thirds of femora thickened. The relative lengths of the segments, femur: tibia: 1st tarsal: 2nd tarsal:: 167: 137: 23: 23 (♂) and 180: 155: 30: 30 (♀). Middle legs long, femur being 9.24 mm. long in male and 10.3 mm. in female; the relative lengths of the segments, femur: tibia: tarsus:: 440: 410: 120 (♂) and 490: 466: ? (♀); hind legs shorter than middle legs; the hind femur of the male 9.24 mm. long and that of female 10.25 mm.; the relative lengths of the male segments being, femur: tibia: tarsus:: 440: 217: ?; for the female 488: 290: 70. In the male connexival spines reaching about three fourths the length of first genital and in the female surpassing the first genital and extending half the length of the last genital. Ventrally the rear margin of the first genital segment of the male has laterally on each side a projection.

*Location of types:* Described from holotype male and allotype female and one male paratype bearing the label "Dr. B. Hagen, Tandjong Morawa. Serdang. (N. O. Sumatra.)" These are in the Francis Huntington Snow Museum, University of Kansas.

*Comparative notes:* The eight distinct black spots on the venter will identify this species. The lateral angular projections on the rear margin of the first genital segment of the male appear to relate it to *L. ciliatus*, Mayr. It also has the ciliate row on the rear margin of the middle femur but not as conspicuous as in *L. ciliata* and is a smaller species.

### *Limnometra fluviorum* (Fabricius)

(Pl. 3, fig. 19; Pl. 10, fig. 15)

- 1798 *Gerris fluviorum* Fabricius, J. C. Ent. Syst. Suppl. 543. 2. (Described from Tranquebar in Tanjore Dist. India.)  
 1803 *Hydrometra fluviorum* Fabricius, J. C. Syst. Rhyn. p. 257.  
 1865 *Limnometra fluviorum* Mayr, Gustav L. Hemiptera in Novara Expedition Zool. Theil, Wien. 2 (1): 175.  
 1868 *Limnometra fluviorum* Stål, C. Hemiptera Fabriciana p. 132.  
 1904 *Gerris fluviorum* Distant, W. L. The Fauna of British India. Rhynchota 2: 177. (Records: Pondicherry [coll. sign]). Bombay; Bor. Ghat (Dixon). Trivandrum, (Brit. Mus.) also records Java and Bourbon Isl.  
 1914 *Limnometra fluviorum* Horváth, G. Ann. Mus. Hung. 2: 660.  
 1933 *Limnometra fluviorum* Lundblad, O. Archiv. für Hydrobiologie Suppl. 12. "Tropische Binnengewässer 4" p. 371. (Gives Vorderindien, Ceylon, Java. ? Reunion.)

We believe the following to refer also to this species:



1840 *Gerris armata* Spinola, Maximilien, Essai sur les Insectes Hémiptères, p. 65. This is described from Bombay and is characterized by the spine on the intermediate coxa in both sexes as is *L. fluviorum*.

1904 *Gerris armata* Distant, W. L. The Fauna of British India Rhynchota 2: 180-181. This species is from 10 to 13 mm. long, rather heavily banded with black. The antennae and legs are not annulated. The front tarsal segments with the second segment longer. The mesocoxal spine will identify this species.

*Location of type:* Daldorff collection at the Zoological Museum, Copenhagen, Denmark.

*Data on distribution:* This was described from Tranquebar, India and Lundblad records Ceylon and Java.

We have before us the following: "India, Tanjore Dist. P. S. Nathan". 1 male, 1 female. (K. U.); "India, Tanjore Dist. Nedungadu P. Susai Nathan". 2 males, 2 females. (Basel Mus.); "India, Coimbatore Dist. P. Susai Nathan". 2 females. (Basel Mus.); "South India. Coimbatore 6. VI 1950, P. S. Nathan". 1 male, 1 female. (K. U. coll.); "Coimbatore, India". 1 male. (Calif. Acad. Sci.); "Coromandel, M. Maindron". 3 males, 3 females. (Kirk. coll. K. U.); "Chikkaballapura, S. India T. V. Campbell". 1 female (K. U.); "Kurumbagaram, Karikal Terr. S. India 16-IV-47 coll. P. S. Nathan". (coll. of H. S. Wallace No. 1706.) 1 male.

*Limnometra anadyomene* (Kirkaldy)

(Pl. 5, fig. 30; Pl. 11, fig. 16)

1901 *Gerris (Limnometra) anadyomene* Kirkaldy, G. W. Entomologist 34: 117. (Desc. from Punduloya, Ceylon colls. E. E. Green and Kirkaldy.)

1904 *Gerris anadyomene* Distant, W. L. The Fauna of British India. Rhynchota 2: 177-178. (Records Ceylon; Punduloya [Green]—Philippine Islands [Simon]).

1915 *Tenagogonus anadyomene* Bergroth, E. Zool. Med. Rijks Mus. Nat. Hist. Leiden, Deel 1. 2: 122.

1933 *Limnometra anadyomene* Lundblad, O. Archiv für Hydrobiologie Suppl. 12. "Tropische Binnengewässer 4" p. 371. (Gives Ceylon, Hinterindien, Philippinen.)

The following is Kirkaldy's brief description:

"*Gerris anadyomene* sp. nov.

Belongs to subgenus *Limnometra* Mayr. Flavous, head with an irregular diamond and two lateral stripes, pronotum with a median and two sublateral lines, irregular markings on ambulacra, etc. black. Elytra dark greyish fulvous; nervures fulvous, apically darker. Spines of seventh segment extending beyond apex of abdo-



men, elytra extending far beyond apex of abdomen. Male: seventh segment deeply, roundly emarginate ventrally. Leng. to apex of elytra 11 mm. Ceylon, Punduloya. Collns. E. E. Green and Kirkaldy. Larger and stouter than *minuta* (Mayr) to which it is somewhat allied."

We have before us Kirkaldy's type series bearing the label "Punduloya Ceylon. E. E. Green". There are twenty-five specimens, three of them winged. In only one of the eight males do the connexival spines slightly surpass the tip of the abdomen. In all females they are shorter. Therefore his statement is misleading. The following brief notes may be helpful in recognizing this species.

*Size:* Length: 9 mm.-14 mm.; width across mesoacetabula: male 2.73 mm., female 3.61 mm.; width across eyes: male 1.64 mm. female 1.72 mm.

*Color:* General color medium to light reddish brown especially in apterous forms. The lateral pronotal dark band continuous over the humeri in apterous forms, but often obliterated at tip. Antennae and legs uniform in color, not annulated. Each dorsal abdominal segment in apterous forms with two more or less, crescent-shaped dark bands, embracing a paler spot. Underside of connexivum usually dark. Venter light.

*Structural characteristics:* Proportional length of antennal segments of male: 1st: 2nd: 3rd: 4th:: 118: 87: 108: 120; of female: 113: 72: 96: 110. Total length about equal to body length in male, less than body length in female. Front femur not thicker than middle femur, the second tarsal segment longer than the first. Middle femur longer than the body in male, about equal in female. Connexival spines of the male usually surpass the first genital segment but seldom surpass the abdominal tip, and never do so in the female.

*Location of types:* The types mentioned above are in the Kirkaldy collection in the Francis Huntington Snow Entomological Museum, University of Kansas.

*Comparative notes:* In this species the females are strikingly broader and larger than the males. Its nearest relative appears to be *L. kuiterti* which has shorter connexival spines in the male.

*Data on distribution:* Described from Ceylon and Dr. Lundblad records "Philippines" and "Hinterindien".

We have before us the following:

*Ceylon:* Kirkaldy's type series "Pundaloya, Ceylon E. E. Green". 8 males, 17 females (Kirk. coll. K. U.); "Süd Ceylon, Mai 1889 H.



Fruhstorfer" 1 male, 1 female (K. U.); "Suduganga River, Matale, Ceylon, R. A. Senior-White" 4 males, 6 females, 4 nymphs. (Bueno coll. K. U.); "Woodside, Ungalla, Ceylon 3.IX.22. 1 male (Brit. Mus.).

*S. Shan States*: "Heho, 3800", Yawagheve, S. Shan States 7, III, 17, Gravely. 2 males. (Bueno coll. K. U.)

*Limnometra insularis* sp. nov.

(Pl. 4, fig. 21; Pl. 11, fig. 17)

*Size*: Winged male type 11.76 mm. long; width across humeri 1.78 mm.; width across mesoacetabula 2.52 mm.; width across head 1.64 mm. Winged female 9.77 mm. long; width across humeri 1.68 mm.; width across mesoacetabula 2.63 mm.; width across head 1.64 mm.

*Color*: Yellowish brown, the dark markings reddish brown to black, and limited as shown in the illustration. Head markings faint, the holotype having a faint M-shaped figure. Median longitudinal pronotal stripe with pale band on either side, last two or three antennal segments white. Distal ends of middle and hind femora not pale. Dark band on propleuron close to lateral pronotal band separated by the cream colored marginal band and continued on mesopleuron. One or two brown spots on all three acetabula. Venter pale. Mesosternum partially pubescent.

*Structural characteristics*: Proportional length of antennal segments of the Holotype from N. O. Sumatra: 1st: 2nd: 3rd: 4th:: 125: 103: 133: 155. Total length of antenna 10.8 mm., one male with body length 11.76 mm. Beak moderately slender, covering a little more than one fourth of mesosternum. Front femur of male slender, not thicker than middle femur. Middle femur of male without a definite fringe of cilia beneath but with many minute spicules. Mesosternum of male almost bare.

The relative length of leg segments:

	<i>Femur</i>	<i>Tibia</i>	<i>First tarsal segment</i>	<i>Second tarsal segment</i>
Front leg	172	145	30	27
Middle leg	460	400	130	27
Hind leg	525	260	50	22

Winged form: Shape of pronotum and venation of hemelytra as shown in the illustration, typical for *Limnometra* species. Connexival spines surpassing genital segments in both sexes. Last ventral abdominal segment of male plainly shorter than preceding



segment, in female slightly longer. The median ventral longitudinal keel indistinct on last abdominal segment or two.

*Location of types:* Described from holotype male labeled "Dr. B. Hagen, Tandjong Morawa. Serdang, N. O. Sumatra". Allotype female labeled "Ardjeano, Java" and a paratype male bearing the same label, a female labeled "Chan Yoma, Birmanie" and a male from "Pulo Laout," an island near Borneo.

*Comparative notes:* This species looks like *L. borneensis* sp. nov. but differs greatly in the shape of the front femur of the male, in the proportions of the leg segments and in lacking the fringe of cilia on the middle femur of the male.

*Data on distribution:* The type series includes Sumatra, Java, Burma? and the island of Pulo Laout.

*Limnometra palauana* Esaki

(Pl. 3, fig. 16; Pl. 12, fig. 18)

1925 *Limnometra palauana* Esaki, T. Philippine Jour. Sci. 26, 1: 57.

1933 *Limnometra palauana* Lundblad, O. Archiv für Hydrobiologie Suppl. 12. "Tropische Binnengewässer 4" p. 371. (Records Palau Isl.)

1937 *Limnometra palauana* Esaki, T. Tenthredo 1, 3: 362. (Species occurs only on the Island group of Truk but not in Palau Islands on which the specific name was erroneously created.)

*Original description:* "Body dark yellowish brown. Head dark yellowish brown, with a somewhat indistinct black fascia along the inner margin of eyes; apex black and shining; fasciae on vertex very obscure. Antennae dark brown. Pronotum dark yellowish brown, with the central and marginal lines black; margin and the area along the central median black line yellow. Hemelytra dark yellowish brown, veins much darker. Legs dark yellowish brown. Undersurface of body pale yellowish brown, with two longitudinal black fasciae on mesopleura. First and fourth joints of antennae subequal in length, second about two thirds of first, third a little shorter than first. Length of body: male 9 mm.; female 11 mm. Holotype (male), allotopotype (female), and paratopotypes collected on Jan. 8, 1915, on Palau Island, Micronesia, by S. Fujita; presented by S. Matsumura; in my collection."

This species is nearly allied to *Limnometra annulicornis* (Breddin) from Celebes in shape and coloration, but is much smaller, and the markings on the vertex are much more obscure. The color description would apply to a half-dozen species, the size is within the range of several species, the antennae are variable in many cases, and that leaves the description of the antennal segments the only structural character. Fortunately, Dr. Esaki kindly sent us three



specimens, two females bearing the label "Caroline Islds, Truk: Toloas 21, 1, 1938 Teiso Esaki" and one male "Caroline Islds, Truk: Toloas-Erin-16 XI 1937 Teiso Esaki", all labeled by him "*Limnometra palauana* Esaki". The antennae and legs were mostly free in the bottom of the box but we submit what details we can concerning this species. The fully winged female is 8.82 mm. long; the short winged female 8.19 mm. The male is also short winged, also with complete venation as in the female but the abdomen was free in the box. Both sexes have well-developed connexival spines reaching approximately to the caudal tip of the body. The hind coxae of the male reaching slightly beyond the rear margin of the first abdominal segment and barely reaching it in the female. The abdominal spiracles are nearer to the anterior than to the posterior margins of the segments. The abdominal venter is longer than the mesosternum and typically that of a *Limnometra*. The front femur of the male is thicker than that of the female and is hairy beneath. The first tarsal segment is longer than the second in both sexes. The one unbroken antenna that was free in the box has the antennal formula as follows: 1st: 2nd: 3rd: 4th:: 90: 55: 66: 90, its total length 6.3 mm. The antenna is slender and shorter than the insect but over half its length. The front leg of the male has the following measurements: Femur, 155 spaces long, 22 spaces at greatest diameter; tibia 128 spaces; 1st tarsal 20 spaces; 2nd tarsal 16 spaces. The front leg of a female: Femur 140 spaces long, 14 spaces greatest diameter; tibia 120 spaces; 1st tarsal 30 spaces; 2nd tarsal 17 spaces. The middle femur of the fully winged female is a little larger in diameter than the hind femur and measures 315 spaces or 7.6 mm. long. The middle tibia 280 spaces, 1st tarsal 90 spaces, 2nd tarsal 23 spaces. The hind femur is broken but identifiable and measures 340 spaces long, the tibia 180 spaces, 1st tarsal 37 spaces, 2nd tarsal gone. The rather angular, unevenly thickened front femur with its heavy layer of hair beneath will separate the male of this species from others of similar size and general appearance. Its closest relative appears to be *L. borneensis*, from which it differs in having a broader median black line on the pronotum and the middle and hind femora not being paler at the tips.

We also have a series labeled "Los Negros, Admiralty Islds. 11-8-45 P. T. Richard 174". 9 males, 2 females (U. S. N. M.) that are a little larger, with slightly longer connexival spines and less thickened front femora in the males. This probably represents variation within the species. See pl. 3, fig. 17 and pl. 16, fig. 28.



*Limnometra borneensis* sp. nov.

(Pl. 2, fig. 12; Pl. 12, fig. 9)

**Size:** Winged male: 10 mm. long; width across humeri 1.89 mm.; width across mesoacetabula 2.6 mm.; width across head 1.47 mm. Winged female 9.78 mm. long; width across humeri 1.89 mm.; width across mesoacetabula 2.64 mm.; width across head 1.38 mm.

**Color:** Yellowish brown, the dark markings dark reddish brown to black, and limited as shown in the illustration. Head with faint line near inner margin of eye, the median longitudinal pronotal stripe slender and the pale band on either side indistinct. Tip of last antennal segment probably white; distal ends of middle and hind femora pale. Dark band on propleurum close to the lateral pronotal band separated by the cream-colored marginal band; practically no color markings on mesopleuron. Venter pale.

**Structural characteristics:** Proportional length of antennal segments of male: 1st: 2nd: 3rd: 4th:: 83: 43: 60: 95. The antenna of the female is 5.84 mm. long, her body 9.78 mm. long. Beak moderately slender, rather short, only covering one fourth of mesosternum. Front femur of the male thicker than middle femur and broadest beyond its middle. Middle femur of male with fringe of short cilia beneath. Mesosternum of male without long cilia, with only short pubescence.

The relative length of leg segments:

	<i>Femur</i>	<i>Tibia</i>	<i>First tarsal segment</i>	<i>Second tarsal segment</i>
Front leg	156	130	24	22
Middle leg	415	335	?	?
Hind leg	390	270	82	26

**Winged form:** Shape of pronotum and venation of hemelytra as shown in the illustration, typical for *Limnometra* species. Connexival spines surpassing genital segments in both sexes. Last ventral abdominal segment of male slightly shorter than preceding segment, in female slightly longer. The median ventral longitudinal keel prominent on all abdominal segments.

**Location of types:** Described from two males and two females labeled "Mt. Pol, Sarawak, Borneo. Mjöberg collection, W. W. Funge Begnest" in California Academy collection.

**Comparative notes:** The color pattern and the shape of the front femur of the male are the distinctive features of this species. Its closest relatives appear to be *L. palauana* Esaki and *L. rossi* sp. nov.



*Data on distribution:* Besides the types we have a pair from "Mt. Murud, Borneo. Mjöberg collection W. W. Funge" that are larger, the winged male being 14.3 mm. long but the front femur of the male is like the type. The antennae are entire and more definitely white at tip.

*Limnometra rossi* sp. nov.

(Pl. 3, fig. 18; Pl. 12, fig. 20)

*Size:* Winged male: 6.9 mm. long; width across humeri 1.36 mm.; width across mesoacetabula 1.9 mm.; width across head 1.18 mm. Winged female: 7.56 mm. long; width across humeri 1.5 mm.; width across mesoacetabula 2.23 mm.; width across head 1.26 mm.

*Color:* Rather dark compared with similar species because there are numerous figures of dark brown or black as shown in the illustration. The dark bands on the connexival segments are rather striking. The black band on propleuron is broad and divides on mesopleuron into two narrow bands, the upper one along the upper edge and ending at the spiracle and the lower one, an undulate line that ends at base of mesoacetabula. The brown band across the margin of the proacetabula is continued on the mesothorax to end before reaching anterior end of mesoacetabular cleft. Two brown spots on meso- and metaacetabula. Underside of connexivum with dark spots often joined into a solid band. Venter otherwise pale. Antennae, middle and hind femora not annulated.

*Structural characteristics:* Proportional length of antennal segments of the male holotype: 1st: 2nd: 3rd: 4th.: 70: 45: 65: 100. The total length of the antenna is 5.88 mm. and the insect 6.9 mm. long; of the female: 1st: 2nd: 3rd: 4th.: 73: 38: 60: 103. The total length of antenna is 5.67 mm. and the insect 7.56 mm. long. Beak slender covering not quite one third of mesosternum. Front femur of male much thicker than middle femur and broadest beyond its middle. Middle femur of male with fringe of short cilia beneath. Mesosternum of male with very short pubescence.

The relative length of leg segments.

	<i>Femur</i>	<i>Tibia</i>	<i>First tarsal segment</i>	<i>Second tarsal segment</i>
Front leg	90	93	15	16
Middle leg	250	208	90	26
Hind leg	265	127	40	18

Winged form: Shape of pronotum and venation of hemelytra as shown in illustration. Connexival spines barely reaching tip of genital segments. Last ventral abdominal segment of male equal



in length to preceding segment, in female somewhat longer. Median ventral longitudinal keel on abdominal segments present but not prominent.

*Location of types:* Described from ten males, nine females from "San José, Mindoro, Philippine Islands, E. S. Ross." These were taken on various dates from January to April, 1945. The holotype male, allotype and some paratypes in the California Academy of Sciences and some paratypes in University of Kansas collection.

*Comparative notes:* The checkered pattern of the connexivum separates this species at a glance from its relative *L. borneensis* sp. nov.

*Data on distribution:* Known only from the type series from the Philippines.

*Limnometra ciliata* Mayr

(Pl. 3, fig. 14; Pl. 13, fig. 22)

1865 *Limnometra ciliata* Mayr, Gustav L. Verh. zool.-bot. Vereins, Wien, 15: 444.

1865 *Limnometra ciliata* Mayr, Gustav L. Hemiptera in Novara Expedition Zool. Theil, Wien, 2 (1): 174. (Places in his key to species.)

1908 *Limnometra ciliata* Kirkaldy, G. W. Proc. of Linn. Soc. of N. S. Wales. 33: 367. (Records Viti Levu, in a catalogue of the Hemiptera of Fiji.)

1933 *Limnometra ciliatus* Lundblad, O. Archiv. für Hydrobiologie, Suppl. 12. "Tropische Binnengewässer 4," p. 371. (Records Java, Fidschi?, Molukken?)

Also referring to the above species:

1865 *Limnometra inermis* Mayr, Gustav L. Verh. zool.-bot. Vereins, Wien. 15: 444. (Desc. from Manila but the type is a female, not a male and is the only specimen in the Vienna Museum determined by Mayr as *inermis*. It also bears the label "Novara Exp. Manila." (See Plate 3, fig. 15a.)

1865 *Limnometra inermis* Mayr, Gustav L. Hemiptera in Novara Expedition Zool. Theil, Wien, 2 (1): 174. (Places in his key to *Limnometra* and gives about the same Latin description as above but records "Manilla auf Luçon" and follows with a longer description in German.)

1933 *Limnometra inermis* Lundblad, O. Archiv für Hydrobiologie Suppl. 12. "Tropische Binnengewässer 4," p. 371.

Mayr described this species as follows:

"*L. ciliata* n. sp. ♂ long. 19.5 mm. Fulva, pronoto nigro lineato, capite supra linea mediana lata et lineis 2 lateralibus angustis, acetabulus pedum intermediorum muticis, pedibus fuscis, femoribus intermediis ante apicem absolute inermibus, intus long ciliatis. —Java."

While the above description is short, the large size, the unarmed but densely ciliated middle femur led Kirkaldy 1908 to record the species from "Viti Lavu" in the Fiji Islands. However, since *Limnometra cursitans* (Fabricius) from Australia is also a large species with ciliated middle femur it is necessary to give additional notes on both species. Fortunately, there are good structural characters that separate these species.



Notes on *Limnometra ciliata* Mayr.

**Size:** Mayr give the male as 19.5 mm. long. Since the males are often larger than the females in certain species of *Limnometra* it is not surprising to find the average size of this species to be less than 19.5 mm. We have examined specimens of this species from the Philippines to the Fijis and found the length varies from the large male type from Java 19.5 mm. to a small male from Fiji only 13 mm. long. We have other males from Fiji 17.5 mm. long. A male from Ternate is 19 mm. long. In the series from Guadalcanal the largest male is 18.9 mm. long, while the largest female is 14.2 mm. long.

**Color:** Typical color pattern is shown on Plate 3. The colors are brown and black varying from forms having pronotum and hemelytra mostly black to forms where brown is dominant. Venter is pale. Antennae and legs uniformly brown without pale annulations. On base of middle femur a short black streak.

**Structural characteristics:** The segmental formula for the antenna is not constant even for individuals from the same place. For example the antennal measurements for four specimens, taken at the same time and place in Guadalcanal are as follows:

1st:	2nd:	3rd:	4th
245:	193:	145:	125 ♂
222:	168:	136:	122 ♂
156:	122:	100:	100 ♀
160:	127:	110:	112 ♀

Front femur of male is nearly straight and slender, not thicker than middle femur. First tarsal segment plainly longer than second segment. Middle femur of male with long cilia on its ventral margin, and tibia also somewhat ciliate. No pegs present on femur. Hind femur of male with some short but inconspicuous cilia and a few larger hairs. Tibia with some longer scattered hairs. Metasternum about as long as first two ventral abdominal segments.

Abdominal venter with a moderate median longitudinal carina. Male genital segments shorter than the last two ventral pregenital abdominal segments. Rear margin of venter of the first genital of the male is characteristic of the species. It has two triangular projections. (See drawings on Plate 13, fig. 22d.) This character, combined with the ciliated middle legs and the general color pattern, readily identify the males of this species. The latter also identifies the females. The short black stripe on the base of the middle femur is characteristic of both sexes.



*Comparative notes:* A little smaller, on the average, than *L. cursitans* (Fabricius), has a black streak on the base of the middle femur that is lacking in all our specimens of *L. cursitans*. The latter lacks the triangular projections on the rear margin of the first genital male segment. Dr. Max Beier of Vienna kindly sent us a drawing of the male genital segments of the type from Java.

*Data on distribution:* This species was described from Java and reported by Kirkaldy from Fiji.

We have examined the following from:

*Malay Peninsula:* "Lenggong, Malay Peninsula Lea and Party." 1 male (S. Australian Museum).

*Thailand (Siam):* "Tong. Lower Siam. Dr. W. L. Abbott". 1 male (winged) (U. S. N. M.).

*Sumatra:* male and female (Kirkaldy Coll. K. U.).

*Lesser Sunda Islds:* "Sumbawa". 2 males (winged). (In our Kirkaldy coll.) These are 18 mm. long. One has width across humeri 3.15 mm., the other 2.77 mm.; one with width across the mesoacetabula 5.16 mm., the other 4.62 mm. "O Sumba, Langgai 13.7.1949 Dr. Bühler, Dr. Sutter". 1 male (Basel). "O Sumba Metoto, 4 Mai 1949. Dr. Bühler, Dr. Sutter. 1 male (Basel). "W. Sumba Kodi 3.8.1949. Dr. Bühler, Dr. Sutter. 1 female (Basel).

*Borneo:* "Borneo Multer" 1 female (Kirkaldy coll. K. U.); "Borneo, Schaner" 1 male (Bueno coll. K. U.); "Borneo, Samdahan, C. T. McNamera" 2 females (S. A. Mus.) via Hale.

*Philippines:* "Luzon, Manila 1913 Leg. G. Boettiker" 1 male, 1 female (winged) (British Mus.); "Luzon, 11-27-33. Victor Abalos" 1 female (winged); "Luzon, Manila Observatory Gardens" 7 females, 3 nymphs (Bueno coll. at K. U.); "Los Baños. P. I.—Baker" 3 males, 9 females (winged) (U. S. N. M. and K. U.).

*Celebes:* "Sumanga, S. Celebes Nov. 1895 H. Fruhstorfer" 1 female (winged). (In Kirkaldy coll. K. U.)

*Moluccas:* "Ternate 94 Kükenthal". 1 male, 1 female, winged. Male is 19 mm. long. (Bueno collection at K. U.); "Halmaheira, Soaknorra, Kükenthal". 1 male, winged, 17 mm. long. (In Kirkaldy coll. K. U.); "Dammer". 2 females (Kirk. coll. K. U.).

*New Guinea:* "N. Guinea, Bisiatabu, Port Moresby. W. N. Lock". 1 male. (S. Australian Museum).

*New Britain:* "Movenafen". 1 male, 1 female (winged) (Basel, Switzerland).



*Solomon Islands*: "Guadalcanal. 1944. L. J. Lipovsky". 8 males, 52 females (all winged); "Guadalcanal Jan. 1945. P. H. Eschmeier". 2 males, 3 females (all winged), the largest male 18.9 mm. long, while the largest female 14.2 mm. long. "Guadalcanal and Florida Is. I-III 1945 J. R. Stutz". 1 male (winged) is 17.25 mm. long. (Calif. Acad. Science); "Solomon Islands. July-Aug. 1909. W. W. Froggatt". 1 female (Bueno coll. K. U.).

*Fiji Islands*: "Viti Levu", 1 male, 1 female (both wingless) (In Kirkaldy coll. K. U.); "Viti Levu, Lami. 1-1951 Pool. N. L. H. Krauss". 3 females; "Coll. Camille, Van Volxem". 1 male (wingless). Det. as *G. ciliatus* (Mayr) by Kirkaldy 1898. This male is 15.33 mm. long. (In Kirkaldy coll. K. U.); "Viti Levu, Lami. 1-1951 Pool. N. L. H. Krauss". 3 females (winged); "Muanicula, Vanua Levu July 1934 P. W. Paine. In small shallow well." 2 males (winged); "Taveuni. Ura. Aug. 1934 P. W. Paine. Fresh water pool above high tide." 3 males, 5 females (wingless except one male); also "in shallow fresh water swamps above high tide". 3 females (wingless); "Taveuni. July 1934 P. W. Paine. Stagnant pool in rocky stream-bed in forest. 1000 ft." 1 female (winged) (the largest specimens taken by Paine are 15 mm. long); "Mvana, Vanua, Mbalavu VIII-938 Seashore. E. C. Zimmerman". 1 female (winged) (B. P. Bishop Mus.); "Bavatu, Vanna Mbalavu VIII-17-38 E. C. Zimmerman". 2 males (winged), 5 females (winged). (B. P. Bishop Mus.); "Wainiloka, Ovalan VII-11-38. Along stream. Elev. 200 ft. E. C. Zimmerman". 3 males, 8 females, 3 nymphs. (2 males and 5 females are winged.) (B. P. Bishop Mus.); "Matuku, 7-8-24. E. H. Bryan Jr." 1 male, 2 females; "Fieju" 1 male winged measuring 17.5 mm. in Uhler coll. (U. S. N. M.); "Rewa, Fiji. Muir 1906". 1 female (Bueno coll. K. U.).

*Guam*: "Merizo R. 10-19-45 D. G. Frey". 2 females, 3 nymphs, one female winged. (U. S. N. M.)

*Limnometra inermis* Mayr

(Pl. 3, fig. 15)

See under *Limnometra ciliata* Mayr for references. In the same paper and on the same page Mayr described *Limnometra ciliata* from Java. It was a large male 19.5 mm. long with cilia on middle femur. Then he described *Limnometra inermis* from Manila that he said was 13.6 mm. long and lacked the cilia on middle femur. He mistakenly thought it was a male. However, the type in Vienna is a female. It has the characteristic black streak on the base



of the middle femur that both sexes of *L. ciliata* have and is exactly like the females we have from the Philippines with which were taken the males of *L. ciliata*. The British Museum has a male and female taken in Manilla. The type lacks antennae and front legs entirely. The middle legs have only the femora which are 11.34 mm. long. The hind legs are gone. Actually the type measures 13.02 mm. long, 2.2 mm. across humeri and 3.46 mm. across middle acetabula.

*Limnometra cursitans* (Fabricius)

(Pl. 5, fig. 28; Pl. 14, fig. 23)

- 1794 *Gerris cursitans*. Fabricius, J. C. Ent. Syst. 4, 192 17. "Habitat in Nova Hollandia." (Old name for Australia.)  
 1803 *Hydrometra cursitans* Fabricius, J. C. Syst. Rhyn. p. 259.  
 1868 *Hydrometra cursitans* Stål, Carl Kongl. Svenska Vet. Akad. Handl. 7: 131-133. (Says belongs to *Limnometra* Mayr along with *L. fluviorum* Fabricius.)  
 1909 *Limnometra cursitans* Banks, C. S. Philadelphia Jour. Sci. 4 (6): 583.  
 1933 *Limnometra cursitans* Lundblad, O. Archiv für Hydrobiologie Suppl. 12. "Tropische Binnengewässer 4" p. 371. (Quotes Australia.)

This large Australian species measures from 15 to 22 mm. long and may reach 5.68 mm. across the middle acetabula. Like *L. ciliata* Mayr the males have the middle femora abundantly supplied with long cilia as are the tibiae. The hind femora and tibiae are also ciliated. The middle and hind femora are longer than the body. The front femora stouter. The first tarsal segment plainly longer than the second. The rear margin of the venter of the first genital segment of the male is slightly produced laterally.

*Location of type:* The type is in the British Museum.

*Data on distribution:* We have before us the following:

*Australia:* "Australia, Pr. of Wales Isl. II-15-1939, R. G. Wind." 12 males, 14 females, all winged. (K. U. col.).

*New Guinea:* "Merauke, Dutch New Guinea. III-27-1939. R. G. Wind." 7 winged (3 males, 4 females); 11 wingless (2 males, 9 females).

*Limnometra femorata* Mayr

(Pl. 5, fig. 27; Pl. 13, fig. 21)

- 1865 *Limnometra femorata* Mayr, Gustav L. Verh. Zool-bot. Vereins, Wien 15: 443.  
 1865 *Limnometra femorata* Mayr, Gustav L. Hemiptera in Novara Expedition Zool. Theil. Wien, 2 (1): 174. (Places in his key to species.)  
 1909 *Limnometra femorata* Banks, C. S. Philippine Jour. Sci., 4 (6): 582.  
 1931 *Limnometra femorata* Esaki, T. Bull. Biogeographical Soc. Japan, 9 (2): 211.  
 1933 *Limnometra femoratus* Lundblad, O. Archiv für Hydrobiologie. Suppl. 12 "Tropische Binnengewässer 4," p. 371. (Lists Borneo and Philippines.)  
 Also referring to the above species:



- 1901 *Gerris* (*Limnometra*) *kirkaldyi* Breddin, G. Rev. Ent. 20: 93. (Described from "Ins. Banguay prope Borneo.") In Breddin's collection.  
1905 *Gerris kirkaldyi* Breddin, G. Mitt. Naturhist. Mus. 22: 214 (records).  
1933 *Limnometra kirkaldyi* Lundblad, O. Archiv für Hydrobiologie Suppl. 12. "Tropische Binnengewässer 4," p. 371.

Mayr described this large gerrid from the Philippines. The following brief description will identify it.

*Size:* 15-23 mm. long. The males usually larger than the females.

*Color:* General color light brown with the usual black stripes. Hemelytra brown. Last antennal segment white. Middle and hind femora pale near tip. Distal half of middle tibia pale.

*Structural characters:* Proportional length of antennal segments: 1st: 2nd: 3rd: 4th:: 200: 145: 206: 208. Total length of antenna 15.94 mm. Length of insect 23 mm. Middle femur of male longer than the body. Front femur slender, not thicker than middle femur, its first tarsal segment a little longer than second. The males with a large, somewhat curved spine near distal end of middle femur and two rows of about fifteen pegs. Connexival spines long and slender.

*Location of type:* In the Natural History Museum in Vienna.

*Comparative notes:* The large spine near the distal end of the middle femur of the male is characteristic of this species and of *L. kirkaldyi* Breddin. The former was described from the Philippines and the latter from the Island of Banguay, north of Borneo and south of Balaboe Island of the Philippines. We have a male from Banguay that was labeled by Breddin "*Gerris kirkaldyi* Bredd," and eight other specimens from Banguay that also probably came from Breddin and are in the Kirkaldyi collection at the University of Kansas. All of these are the same color as the Philippine specimens with only a trace of pink on the pronotum and with light brown hemelytra and clear, slightly darker veins. Since they are also structurally the same as *L. femorata* Mayr, we must record *Gerris kirkaldyi* Breddin as a synonym. However, all the specimens we have seen from Borneo are beautiful specimens with light reddish pronotum and bluish-black hemelytra with black veins. They would have been more deserving of a name than *L. kirkaldyi* (Breddin) which has nothing to distinguish it from *L. femorata* Mayr.

*Data on distribution:*

*The Philippines:* "Island Samar, Baker." 4 males (U. S. N. M.); "Island Sibuyan, Baker." 1 male (U. S. N. M.); "Iligan, Mindanao,



Baker." 2 males, 1 female (U. S. N. M.); "Zamboanga, Mindanao, Baker." 1 male (U. S. N. M.); "Davao, Mindanao, Baker." 1 female (U. S. N. M.); "C. N. H. M. Philippine Zool. Exp. (1946-47) F. G. Werner Leg. E. Slope Mt. McKinley, Davao Province, Mindanao, stream through original forest." 1 male (Chicago, N. H. M.); "C. N. H. M. Philippine Zool. Exp. (1946-47) VIII, 22, 1946 H. Hoogstraal. E. Slope Mt. McKinley, Davao Prov., Mindanao. Forest stream." 1 female (C. N. H. M.); "Surigao, Mindanao." 1 male (British Mus.); "Philippine Islands, Basilan, Maloong. vend. M. E. Walsh." 1 male (British Mus.).

*Banguay Island*: "Banguay, Borneo." 1 male labeled by Breddin "*Gerris kirkaldyi* Bredd." and may be the type. (Kirkaldy coll. K. U.); "Banguay Ins. nordl. Borneo. W. Kedengurg det. 20, VII, 1894." 1 male, 6 females. (Kirkaldy coll. K. U.); "Banguay." 1 male labeled *femorata* but not by Breddin.

*Borneo*: "Nord. Borneo ex. col. Fruhstorfer." 1 female (Kirkaldy coll.); "N. Borneo. Kenabatangan Dist. S. E. end of Dewhurst Bay. C. N. H. M. Borneo Zool. Exp. 1950. R. F. Inger and D. D. Davis leg." 1 male, 1 female (C. N. H. M.); "O. Borneo. Dagavenan, Sangkoelirang Dist. M. E. Walsh." 1 male, 1 female (Basel, Switzerland); "Muller, Borneo." 1 male (Kirkaldy coll. K. U.); "Kuching." (Beebe) 1 male, 1 female.

All of the Borneo specimens have a reddish pronotum and blue-black hemelytra with black veins.

### *Limnometra nigripennis* Mayr

(Pl. 4, fig. 26; Pl. 14, fig. 24)

1865 *Limnometra nigripennis* Mayr, Gustav L. Verh. zool-bot. Vereins, Wien, 15: 443.

1865 *Limnometra nigripennis* Mayr, Gustav L. Hemiptera in Novara Expedition Zool Theil, Wien, 2 (1): 174. (Places in key to species.)

1933 *Limnometra nigripennis* Lundblad, O. Archiv. für Hydrobiologie Suppl. 12 "Tropische Binnengewässer 4", p. 371.

Mayr described this species as follows:

"*L. nigripennis* n. sp. Long. 14 mm. Laete fulva, pronoto nigro-lineato, capite supra lineis 2 longitudinalibus antice confluentibus, fuscis, mesosterno utrinque ad pronoti marginem linea angusta nigra, tegminis cinereo-nigris margine externe laete flavo, acetabulis pedum intermediorum muticis, pedibus fulvis aut brunneis, femoribus intermediis non ciliatis, aute apicem seriebus 2 spinularum minutissimarum sine spina longa, femoribus posticus apice flavis, tibiis tarsisque pedum posteriorum nigricantibus. Philippinen."



The type is a winged male 13.44 mm. long, 2.1 mm. across the head, 2.31 mm. across humeri, 3.53 mm. across mesoacetabula. Its abdomen is somewhat dermestid-eaten beneath. One antenna lacks the last two segments. The right front leg and right middle leg are gone. The right hind leg has lost its tarsus and the left hind leg has only one, the femur. The left middle leg has lost its last tarsal segment. The left middle femur has some short cilia on the margin of the distal one fourth and two rows of pegs, seven pegs in one row and eight in the other, the tibia has a fringe of short cilia throughout its entire length and a row of short, black procumbent spines paralleling it. The antennal formula is, 1st: 2nd: 3rd: 4th:: 145: 103: 130: 95?\*. The fourth segment is white. The second antennal segment is equal to head width.

This species is quite variable in color and relative length of antennal segments. Typically, the winged forms have the costal margin of the hemelytra strikingly lighter than the remainder of the wing but there are specimens that do not show this. Typically the second and third antennal segments have a pale or even white band and the distal segment is white, except its base. All have the last antennal segment white. The antennae are long and slender, as long as the body. In the type and some other specimens the second antennal segment is not longer than the width of the head but in many it is considerably longer and in some specimens the second segment may be equal to head width in one antenna and longer in the other. Front leg with first tarsal segment a little longer than second one. The mesosternum may be bare or partially covered with short cilia. In apterous forms typically the abdominal tergites are dark with a more or less apparent median longitudinal lighter stripe on last four or five segments and connexivum pale. However, there are some specimens that do not have the striking pattern described above.

We have a series of "Island Samar-Baker" 5 males (2 winged), 3 females (apterous) (U. S. N. M. and K. U.). The winged forms have the pale costal margin; wingless forms have black abdominal tergites with paler median stripes on the last 4 or 5, and a pale connexivum. Both sexes have the fringe of short cilia and parallel row of procumbent spines on middle tibia. The middle femur of male may have a band of very short cilia on its rear margin.

---

\* Last segment may be broken.



The relative length of antennal segments:

	1st:	2nd:	3rd:	4th::	2nd seg.: head width::
w. ♂	160:	110:	185:	175	5.6: 4.7
w. ♂	165:	120:	185:	?	5.8: 4.75
a. ♂	177:	138:	210:		6.8: 4.95
a. ♂	210:	142:	215:	?	10.5: 5.35
a. ♂	190:	144:	220:	201	7.2: 5.1
					L. 5.3: 4.7
a. ♀ R.	142:	94:	142:	130?	R. 4.7:
a. ♀	132:	102:	155:	130	5.1: 4.7
					4.6: 4.6
a. ♀	140:	92:	145:	170	4.65

W. = winged; a. = apterous; R. = right; L. = left.

*Data on distribution:*

"Baguio. P. I. W. Robinson". 1 female winged with pale costa and banded antennae, 2nd antennal segment slightly longer than head width.

"Los Banos, P. I. Baker". 3 males (winged), 3 females (wingless) (U. S. N. M. and K. U.). antennae more or less banded, last segment white. 2nd antennal segment from less than to considerably more than head width. The winged male with narrow pale costal margins. The apterous with abdominal tergites dark, with more or less paler longitudinal median stripes on last four or five abdominal segments. Connexivum yellow.

*Philippines:* "Island Polillo, Baker". 1 male, 1 female, apterous. (U. S. N. M.); "Kolambugan, Mindanao Baker". 1 winged female. Costal margin *not* pale. 3rd antennal segment ringed. (U. S. N. M.); "Laguna, Mt. Maquiling, Luzon. P. I. 5,28-30 A. Durjag." 1 male, wingless. (U. S. N. M.); "Majayjay, Laguna, Luzon. P. I. R. C. M. C. Gregor." 1 male, 1 female, apterous. (U. S. N. M.); "Guintaboan, Victorias. Occe. Negros." 1 male (U. S. N. M.); "Guimaras P. I." 1 female; "Calian, Davao Prov., Mindanao. Phil. Islds. C. S. Clagg 31, V." 2 males, 2 females. (M. C. Z.); "Philippines." 3 males apterous. (Kirk. coll. K. U.); "Palawan Is. 750 ft. V-2-47 F. G. Werner" 2 males (winged) (C. N. H. M.); "Busuanga Is. P. I. H. Hoogstraal". 1 female (winged) (C. N. H. M.); "Busuanga Is. P. I. H. Hoogstraal". 2 males (winged), 2 females (apterous) (C. N. H. M.); "Davao Prov., Mindanao sea level. 47 H. Hoogstraal". 1 male, 1 female (apterous); "Mindanao 1500 ft. 47. F. G. Werner". 3 males (apterous), 9 females (1 winged) (C. N. H. M.); "Davao, Mindanao Baker". 3 females (winged), last ant.



seg. white. (U. S. D. A.); "Zamboanga, Mindanao Baker". 4 females (winged), last ant. seg. white, 2nd = head width. (U. S. N. M.); "Davao, Mindanao. R. C. McGregor". 2 females (winged) (U. S. N. M.).

In the last three lots above all have only last ant. seg. white, and 2nd seg. short and costal margin of wings not paler.

"Luzon. P. I." 1 male, 2 females (apterous), antennae banded. *Connexivum* pale. (Kirk. coll. K. U.); "Luzon". 1 male, 1 female (apterous) (Bueno coll. K. U.).

*Limnometra pulchra* Mayr

(Pl. 4, fig. 23; Pl. 15, fig. 25)

- 1865 *Limnometra pulchra* Mayr, Gustav L. Verh. Zool-bot. Vereins, Wien, 15: 443-444. "Java".  
 1865 *Limnometra pulchra* Mayr, Gustav L. Hemiptera in Novara Expedition, Zool. Theil, Wien, 2 (1): 174. (Places in a key with six other species.)  
 1901 *Gerris pulchra* Breddin, Gustav. Abh. Nat. Ges. Halle, 24: 20, 85. (Quotes "Celebes. [S. Walk., He. VIII p. 168]—Jave, Borneo.")  
 1901 *Gerris pulchra* Kirkaldy, G. W. Ann. Mus. Civ. Stor. Nat., Genova 20 (2): 804 (These are from New Guinea and are not *Limnometra pulchra* Mayr but *Limnometra kallisto* Kirkaldy.)  
 1903 *Gerris pulchra* Breddin, Gustav. Abh. Senck Nat. Ges., 25: 164. (Lists Halmahera (Oba 232).)  
 1920 *Limnometra pulchra* Horváth, G. Abh. Senck. Nat. Ges., 35: 313. (Gives distribution as: Java, Borneo, Celebes, Amboina and New Guinea. New for Aru Island.)  
 1933 *Limnometra pulcher* Lundblad, O. Archiv. für Hydrobiologie 1933. Suppl. 12. "Tropische Binnengewässer 4", p. 371. (Lists: Java, Aru-Inseln, Borneo?, Celebes, New Guinea, Molukken.)

**Size:** Mayr gives 14.5-16 mm. long. However, we have specimens ranging from 12-17 mm. long. The males are larger than the females.

**Color:** A tan colored species. A faint figure M on the head with only the margins next the eyes showing dark brown to black. The usual median longitudinal black line, bordered by pale lines on pronotum. Lateral black lines extending from front margin to the base of humeri. Behind the humeri a dark line parallels the margin which is pale yellowish in color. This yellow stripe lying laterad of the black stripe is continued forward on either side of eye. There is a black stripe on the side of prothorax and another one on the proacetabulum. An undulating band on mesopleuron ends above the mesocoxa. Another black band on mesoacetabulum and two on metaacetabulum. Abdominal tergites reddish. Antennae uniformly brown. The ends of middle and hind femora pale.

**Structural characteristics:** The antennal formula for the male type: 1st: 2nd: 3rd: 4th:: 160: 125: 140: 170. The first tarsal



segment of the front leg is plainly longer than the second. All males have mesosternum densely covered with long whitish hairs and all three femora are fringed with cilia, that of the hind femur shorter but plainly visible. The middle femur of the male with many little black pegs among the cilia and two rows of eight or more pegs near distal end. The connexival spines of the female are relatively shorter than in the male. The middle and hind femora as long as the body in the male, a little shorter in female.

*Location of types:* In the "Zoologische Abteilung des Naturhistorischen Museums in Wien." Four male specimens in Mayr's type series. The male bearing his own label "*pulchra*" and "Dr. Doleschal 1859, Amboina" may be designated the type. There are two other males with the same locality and collector label. A fourth male labeled "Molukken. Coll. Signoret." These specimens fit his brief description but do not come from "Java" as he records in his description. However, Dr. Beier assures us that these are the types. They came from the Moluccas.

*Comparative notes:* Dr. Mayr 1869, published a key to seven species of *Limnometra* including *pulchra* which is useful. There are three very close and often confused species. *L. pulchra*, in which the males have both the middle and hind femora plainly fringed with cilia and *L. annulicornis* (Breddin) and *L. kallisto* Kirkaldy that have only the middle femora fringed with cilia and have the connexival spines a little longer, especially in the females.

*Data on distribution: Moluccas:* "Amboina, Dr. Doleschal 1859" 3 males comprising the type series and 1 male labeled "Molukken. coll. Signoret"; "Amboina v. 1909 coll. F. Muir" 1 male, 1 female. (K. U.) and several in (H. S. P. A.); "Prov. Ceram. F. Muir, Jan. 1909" 3 males, Febr. 1909, 1 male (Calif. Acad. Sci.); "Forsten, Ceram" 3 males, 1 female (Kirk. coll. K. U.); "Buru" 1 male (Bueno coll. K. U.)

*Java:* "Java occident. Mons Gede, 4000 Aug. 1892. F. Fruhstorfer." 1 male, 2 females. (Vienna); in the Bueno collection as part of the type series of *G. annulicornis* Breddin we find a female with the label just above and Breddin's label "*Gerris* n. spec. nicht *pulchra*." But it is *pulchra*.

*Celebes:* Here belong two more specimens from Breddin's type series of *G. annulicornis*, namely "Halmaheira Soa komorra, Küken-thal" "*Gerris annulicornis* Bredd." female and "Halmaheira, Oba 94, Küken-thal" a male typical of *L. pulchra* Mayr.



*Limnometra pulchra tanganyikensis* subsp. nov.

(Pl. 4, fig. 25)

Three specimens labeled "Tanganyika S." in the Kirkaldy collection in the University of Kansas collection are the only true *Limnometra* that we have seen from Africa. There is one male that has lost its abdomen and two females, none of them has the antennae present. The color pattern is the same as in *L. pulchra* Mayr and the male has all three femora fringed with cilia and the mesosternum hairy as in *L. pulchra*. We are therefore making it a subspecies of *Limnometra pulchra* Mayr in spite of its distance from the present distribution of *L. pulchra* as we know it.

*Size:* Winged male: 12.7 mm. long; width across humeri 2.06 mm.; width across mesoacetabula 2.98 mm.; width across head 1.93 mm.; winged female: 12.2 mm. long; width across mesoacetabula 3.05 mm.; width across head 1.85 mm.

*Color:* Color and pattern as in *L. pulchra* Mayr. See illustrations on Plate 4, figures 23 and 25.

*Structural characteristics:* Antennae are gone. Front femur of the male plainly stouter than middle femur and fringed beneath with cilia; first tarsal segment plainly longer than the second. Middle and hind femora fringed with cilia, that of hind femur shorter but plainly visible. The middle femur of the male with many little black pegs among the cilia. The connexival spines of the female are relatively shorter than in the male. Middle femur not quite as long as the body in the male and shorter in the female.

*Location of types:* Described from one male and two females from Tanganyika in the Kirkaldy collection of the Francis Huntington Snow Entomological Museum, University of Kansas.

We would like to see other specimens of *Limnometra* that are taken in Africa.

*Limnometra annulicornis* Breddin

(Pl. 4, fig. 24; Pl. 15, fig. 26)

1901 *Gerris annulicornis* Breddin, Gustav. Abh. Nat. Ges., Halle, 24: 20, 83-85. (Describes from Celebes.)

1933 *Limnometra annulicornis* Lundblad, O. Archiv für Hydrobiologie. Suppl. 12. "Tropische Binnengewässer 4," p. 371. (Quotes Celebes.)

Evidently, this species has not been seen since it was described over fifty years ago. We have found in the Kirkaldy collection here at the University of Kansas what appears to be Breddin's type series. The labels are in Breddin's handwriting. There are six



specimens. Three labeled "Celebes Sar. Kratertümpel des Masarang" (one male labeled *Gerris annulicornis* Bredd. and two females). These fit his description and have the second antennal segment annulated. They are undoubtedly of his species. The other three are *L. pulchra* Mayr: a female from "Halmaheira Soa konorra. Kükenthal" labeled by Breddin *Gerris annulicornis* Bredd., a male from "Halmaheira, Oha, 94. Kükenthal" with the following label in Breddin's handwriting: "*Gerris olim pulchra* Bredd. (Kükenthal Hem. p. 164) nicht die Mayr sp." and a female labeled "Java occident. Mons Gede 4000' Aug. 1892 H. Fruhstorfer" labeled by Breddin "*Gerris* n. spec. (*nicht pulchra.*). However, it is *L. pulchra* Mayr and there is one male and two females with the same locality label in the Vienna Museum.

We have then only three specimens of *L. annulicornis* (Breddin): One male, which we consider the type and two females. We supply the following information from these specimens.

*Size:* The male type is 15 mm. long; 3.27 mm. across mesoacetabula; 1.89 mm. across head. The females a little smaller.

*Color:* About the same as *L. pulchra* but a little darker. The figure M on the head is very distinct and the lateral dark bands on the anterior lobe of pronotum are broader. These lateral bands are continuous beneath the humeri in this species but broken in *L. pulchra*. The second antennal segment has a pale annulation on its distal half.

*Structural characteristics:* The proportional length of antennal segments of male type: 1st: 2nd: 3rd: 4th.: 130: 80: 115: 130. Total length of antenna about 9.56 mm.; the second segment shorter than width of head across the eyes. Front femur plainly stouter than middle femur; the first and second tarsal segments of the front leg subequal. The fringe of cilia on middle femur of male about as long as the diameter of the femur. Only four small pegs in a single row near distal end of femur. The hind femur without a fringe of cilia. The mesosternum not exactly bare but not hairy as in *L. pulchra*. The middle and hind femora not as long as the body. Connexival spines rather long in both sexes.

*Location of types:* One male and two females bearing the label "Celebes Sar. Kratertümpel des Masarang" in the Kirkaldy collection at the University of Kansas.

*Comparative notes:* This species was confused with *L. pulchra* Mayr by Breddin but the males may be easily separated from that



species because the hind femur of the male is not fringed with cilia and its second antennal segment is shorter than the width of the head. The connexival spines of female are longer and the second antennal segment is annulated.

*Distribution:* Known only from the types from Celebes.

*Limnometra vulpina* (Breddin)

1901 *Gerris vulpina* Breddin, Gustav. Abh. Nat. Ges., Halle, 24: 20, 85-85.

1933 *Limnometra vulpina* (Breddin) Lundblad, O. Archiv für Hydrobiologie Suppl. 12. "Tropische Binnengewässer 4," p. 371. (Quotes Celebes.)

Dr. Breddin described this species from a single female from North Celebes "(Matinang-Kette, Südseite, 800-1200 m. (Sar.))" and gave its size as 15½ mm. long and 4 mm. across the middle coxae. We cannot locate this type. He stated that it had longer connexival spines than his *Gerris annulicornis*. However, since Dr. Breddin identified specimens of *L. pulchra* Mayr as his *G. annulicornis* and the females of *L. pulchra* have shorter connexival spines, he probably compared his female *G. vulpina* with a female of *L. pulchra* Mayr and said its connexival spines were longer than in *G. annulicornis* when his *L. vulpina* was really a very large pale *G. annulicornis*. Until both males and females from North Celebes make this species recognizable we will consider it a synonym of *G. annulicornis*.

*Limnometra kallisto* (Kirkaldy)

(Pl. 5, fig. 31; Pl. 16, fig. 27)

1899 *Gerris kallisto* Kirkaldy, G. W. Ann. Soc. Ent. Belg., 43: 506. (Desc. female from Mysol. [W.] which is west of New Guinea.)

1899 *Gerris kallisto* Kirkaldy, G. W. Ann. Mus. Civ. Stor. Nat., Genova, ser. 2.a, 20 (40): 804. (Reports female from "New Guinea, Dorei Hum, Jan. 1875 Beccari".)

1933 *Limnometra kallisto* (Kirkaldy) Lundblad, O. Archiv für Hydrobiologie. Suppl. 12. "Tropische Binnengewässer 4", p. 371. (No additions.)

Kirkaldy described this species from a single female. He says: "Belongs to subgenus *Limnometra* Mayr. ♀. First antennal segment one-third longer than the second, one-twelfth longer than the third, fourth twice as long as the second. Apex of rostrum reaching to two-fifths of the length of the mesosternum, which is narrowly canaliculate for half its length. Base of pronotum subacutely triangular. Mesosternum feebly tuberculate. First segment of anterior tarsi one-half longer than the second. Sixth segment of abdomen feebly emarginate beneath, a little swollen apically, connexival spines prolonged scarcely beyond the apex of the abdomen. Elytra scarcely reaching the apex of the abdomen. Length 11.7



mm.; width 2.4 mm. Mysol (W.) Higgins 1869 coll. Van Volxem. Cinnamon; head immaculate, first and second antennal segments pale yellow, third and fourth darker. Pronotum with a central and two lateral narrow and blackish lines, the former margined with pale yellow on each side, reaching to the base of the pronotum, the latter reaching to the base of the median lobe of the pronotum; posterior lobe margined with pale yellow (a little reflexed), sub-margined with brownish. Elytra with darker nervures. Apex of intermediate and posterior femora, apical half of intermediate and posterior tibiae, and all the tarsi entirely (black apical segment of anterior tarsi excepted) pale yellow. Venter obscure yellow."

Dr. A. Collart has informed us that this species is no longer to be found in the Royal Museum of Belgium. In 1928 the senior author saw in that museum the type of *Velia albotrimaculata* Kirkaldy which was described in the same paper. What has become of the female type of *Gerris kallisto* Kirkaldy is a mystery.

We found, however, in the Kirkaldy collection a female labeled "*Gerris kallisto* Kirk." by Kirkaldy and bearing the label "N. Guinea Dorei Hum. II Beccari 1875". The month does not agree with the one reported in his second paper but it is undoubtedly the same specimen and in the absence of the type from Mysol we are submitting drawings of this specimen and some descriptive notes, but must point out that while it does not meet the specifications of the description of *Gerris kallisto*, unfortunately neither do some of Kirkaldy's known types of other species fit the published descriptions. Moreover, we find in the Kirkaldy collection specimens he had labeled as *G. pulchra* (Mayr) yet the females are structurally indistinguishable from the female he had labeled *G. kallisto*.

We find this species to vary in size from 11.7 mm. to 20 mm. long. The males have the middle femur with a row of short cilia less than one-half as long as diameter of the femur and the hind femur without cilia. The middle femur may or may not have pegs and seems to be a variable character in this species. The first tarsal segment of the front leg is plainly longer than the second.

#### *Distribution:*

*Moluccas:* "Mysol (W.) Higgins 1869 Coll. Van Volxem" the female type.

*New Guinea:* "N. Guinea Dorei Hum II Beccari 1875. A female labeled by Kirkaldy *Gerris kallisto* Kirk. (Kirk. coll. K. U.); "N. Guinea, Dilo Loria VI, VII, 90." 1 male, 2 females (Kirk. coll.



K. U.); "N. Guinea, S. E. Haveri, Loria VII-XI, 93" 2 males, 4 females (Kirk. coll. K. U.); "Laloki, Papua" 1 male. (Kirk. coll. K. U.); "N. Guinea, R. S. Roberts Siph. 1944." 1 male, 1 female; "N. Guinea Milne B." 1 male (Bueno coll. K. U.); "N. Guinea S. E. Maroka 1300 m. Loria VII-XI. 93" 2 large males, 20 mm. long. (Labeled by Kirkaldy *Gerris pulchra* Mayr.); "Maffin Bay, Dutch N. Guinea. VI-II-44. E. S. Ross" 2 males, 1 female (Calif. Acad. Sci.); "Finschhafen, New Guinea, IV-15-44. E. S. Ross" 1 female. Another female IV-21-44. (Calif. Acad. Sci.); "Wareo, Finsch Haven, New Guinea, Rev. L. Wagner" 3 males, 3 females. (South Australian Mus.); "Brena Bay, N. E. Papua, C. T. M. C. Namara" 1 female (South Australian Mus.); "Mt. Lamongton, N. E. Papua. 1300-1500 ft. C. T. McNamera" 3 males, 3 females. (South Australian Mus.); "Mt. Gyifrie, N. New Guinea, sea level 1000 ft. April 39 L. E. Cheeseman" 10 males, 7 females. The males having long front femora, not stouter than middle femora and second antennal segment longer than head width.

With the same label we find 3 males that have stout front femora, second antennal segment not longer than broad width and middle femora with many black pegs among the cilia. Seems to be a variant of the above.

*New Britain:* "Movehafen" 1 male (Basel Mus.).

*Solomon Islands:* "Solomon Is. July-Aug. 1900 W. W. Froggatt" 1 male (Bueno coll. K. U.); "Guadalcanal XI-21-1944. L. J. Lipovsky" 2 males, 3 females. (K. U.); "Solomon Is. T. H. L. Waterhouse" 2 males, 1 female (South Australian Mus.).







## PLATE I

FIG. 1. *Tenagogonus albovittatus* Stål

- a. Winged female. Gabon
- b. Antennae of the winged female. Gabon
- c. Wingless male. Sangmelina Cameroons, West Africa, Dec. 17, 1934, A. I. Good

FIG. 2. *Tenagogonus zambezinus* (Poisson)

- a. Wingless male. S. Rhodesia, S. Africa, G. E. Hutchinson
- b. Wingless female. Nagapa Res. Lab. Zululand, Africa, Apr. 22, 1922, H. H. Curson

FIG. 3. *Tenagogonus madagascariensis* Hoberlandt

- a. Wingless male. Environ de Rogez, Madagascar (paratype)
- b. Wingless female. The same data as above.

FIG. 4. *Tenagogonus divergens* Hungerford and Matsuda

- a. Brook near Bawomataluwo, Sumatra. Sept. 12, 1931, v. d. Meer Mohr (holotype)

FIG. 5. *Tenagogonus kampaspe* (Kirkaldy)

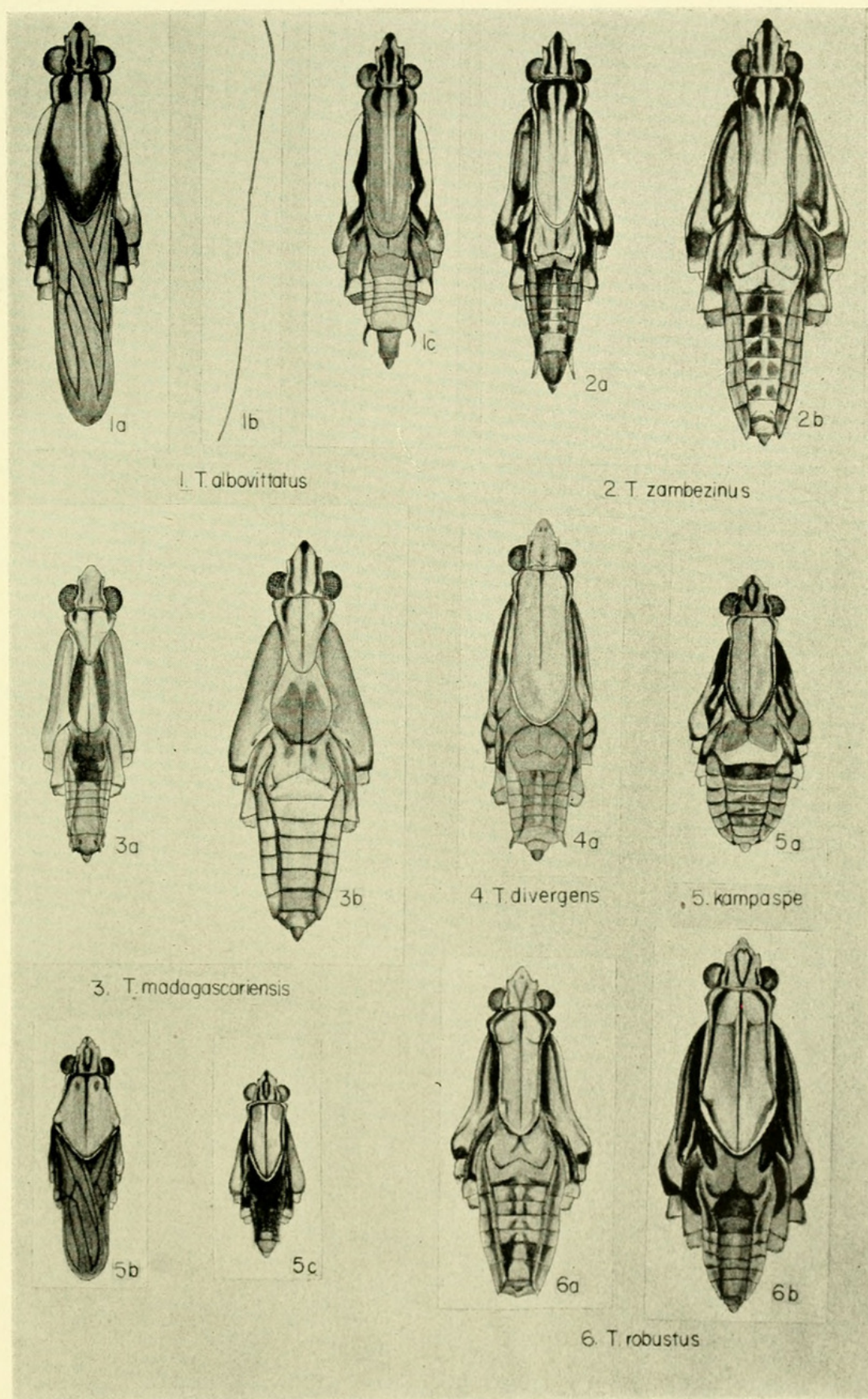
- a. Wingless female. Rigo, New Guinea. July, 1889, L. Loria (type series)
- b. Winged male. Kelsei, New Guinea. Nov.-Dec. 1890, L. Loria (type series)
- c. Wingless male. Rigo, New Guinea. July, 1889, L. Loria (type series)

FIG. 6. *Tenagogonus robustus* Hungerford and Matsuda

- a. Wingless female. Lavang, East Java. (type series)
- b. Brachypterous male. Pogobina, West Sumba. Sept. 17, 1949, D. Bühler, Dr. Sutter (type series)



## PLATE I



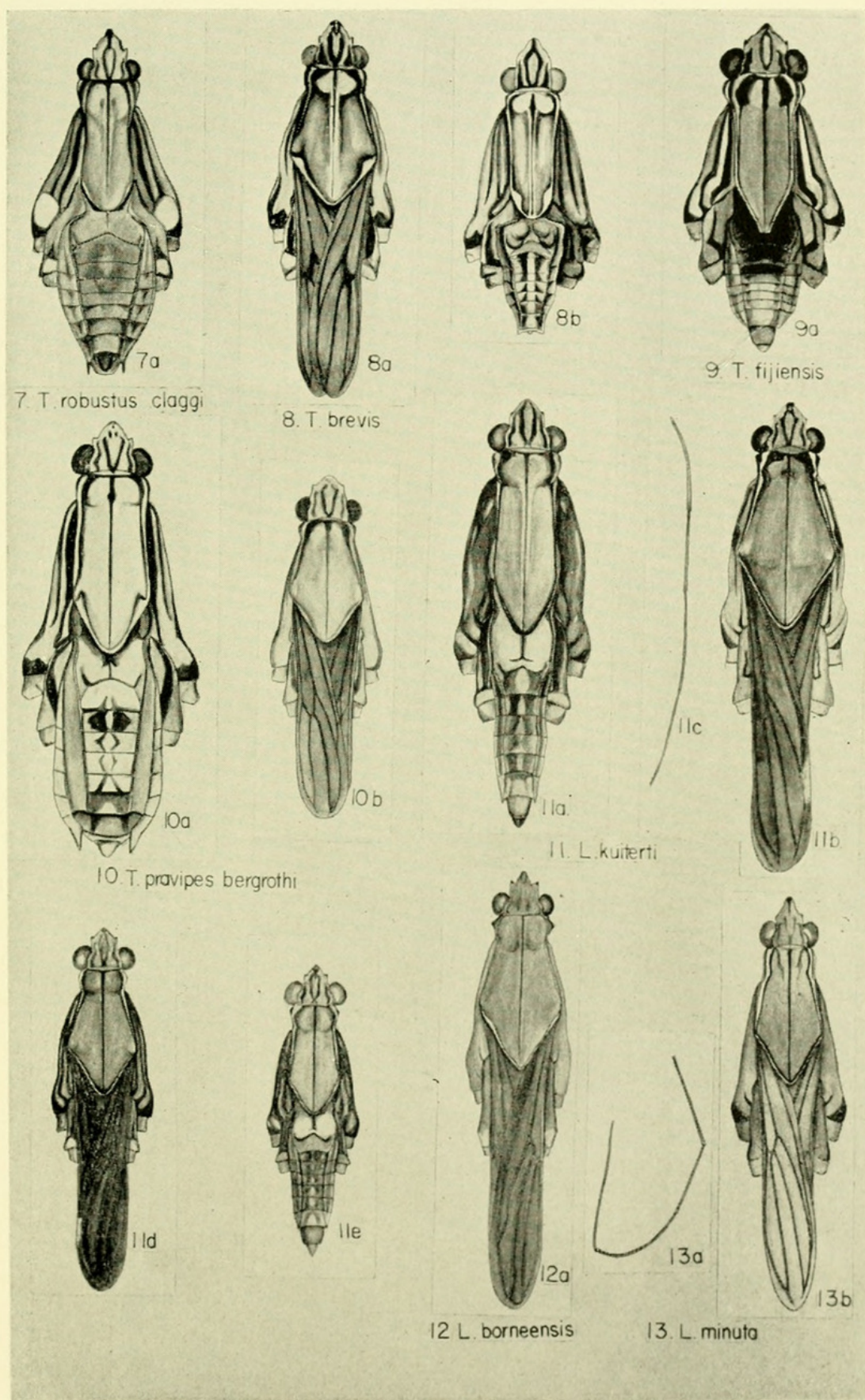


## PLATE II

- FIG. 7. *Tenagogonus robustus claggi* Hungerford and Matsuda  
a. Wingless female. Mt. Apo, Mindanao, Philippine Islands. C. F. Clagg (type)
- FIG. 8. *Tenagogonus brevis* (Lundblad)  
a. Winged (copied from Lundblad)  
b. Wingless female. Java. Thienemann (allotype)
- FIG. 9. *Tenagogonus fijiensis* Hungerford and Matsuda  
a. Wingless male. Taveuni, Fiji Island. July 1934. R. W. Paine (type series)
- FIG. 10. *Tenagogonus pravipes bergrothi* Hungerford and Matsuda  
a. Wingless female. Observatory Garden, Manila, Philippine Islands (type series)  
b. Winged male. The same data as above.
- FIG. 11. *Tenagogonus kuiterti* Hungerford and Matsuda  
a. Wingless male. Mohnyin, Burma. Oct. 27, 1944. K. C. Kuitert (type series)  
b. Winged male. The same data as above.  
c. Antenna of winged male. The same data as above.  
d. Winged male. The same data as above.  
e. Wingless male. The same data as above.
- FIG. 12. *Limnometra borneensis* Hungerford and Matsuda  
a. Winged male. Tandjong Morawa, Serdang, N. E. Sumatra. Dr. B. Hagen (type series)
- FIG. 13. *Limnometra minuta* Mayr  
a. Antenna. Novara Expedition, Sambelong. (type)  
b. Winged male. The same data as above.



## PLATE II





## PLATE III

FIG. 14. *Limnometra ciliata* Mayr

- a. Winged male. Sumbawa, Lesser Sunda Islands
- b. Winged female. Rewa, Fiji. 1903, Muir. Showing an individual with black pronotum.

FIG. 15. *Limnometra inermis* Mayr

- a. Winged female. Novara Expedition, Manila (type)

FIG. 16. *Limnometra palauana* Esaki

- a. Winged female. Toloas, Truk, Caroline Islands. Jan. 21, 1938, T. Esaki (type series?)
- b. Front leg. The same data as above.

FIG. 17. *Limnometra palauana* Esaki?

- a. Winged male. Los Negros, Admiralty Island

FIG. 18. *Limnometra rossi* Hungerford and Matsuda

- a. Winged female. Mindoro, Philippine Islands. Jan. 28, 1945, E. S. Ross (type series)

FIG. 19. *Limnometra fluviorum* (Fabr.)

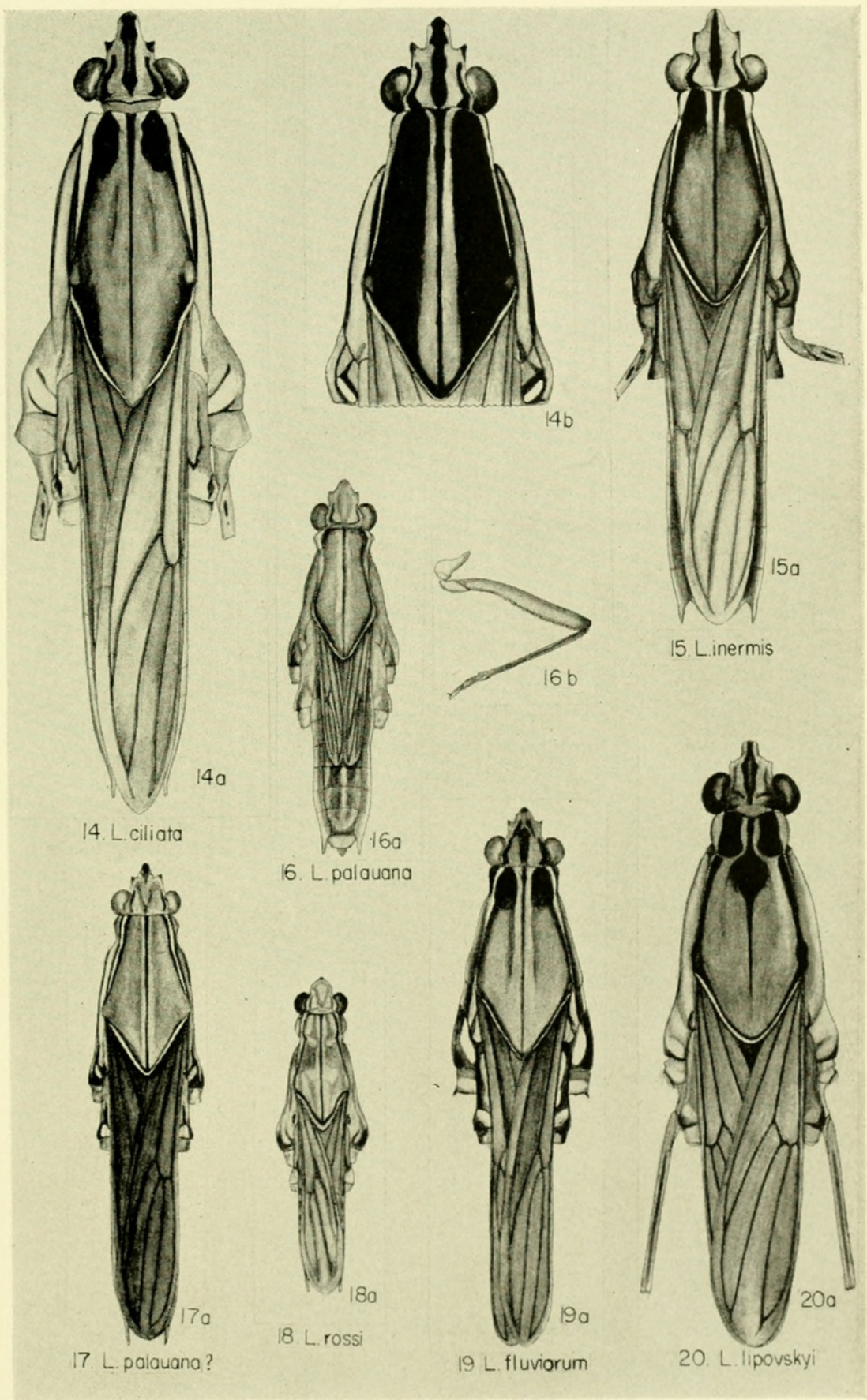
- a. Winged male. Tanjore Dist. Nedungadu, India. Mar. 12, 1938, P. Susai Nathan

FIG. 20. *Limnometra lipovskyi* Hungerford and Matsuda

- a. Winged male. Guadalcanal. 1944, L. T. Lipovsky (type series)



PLATE III



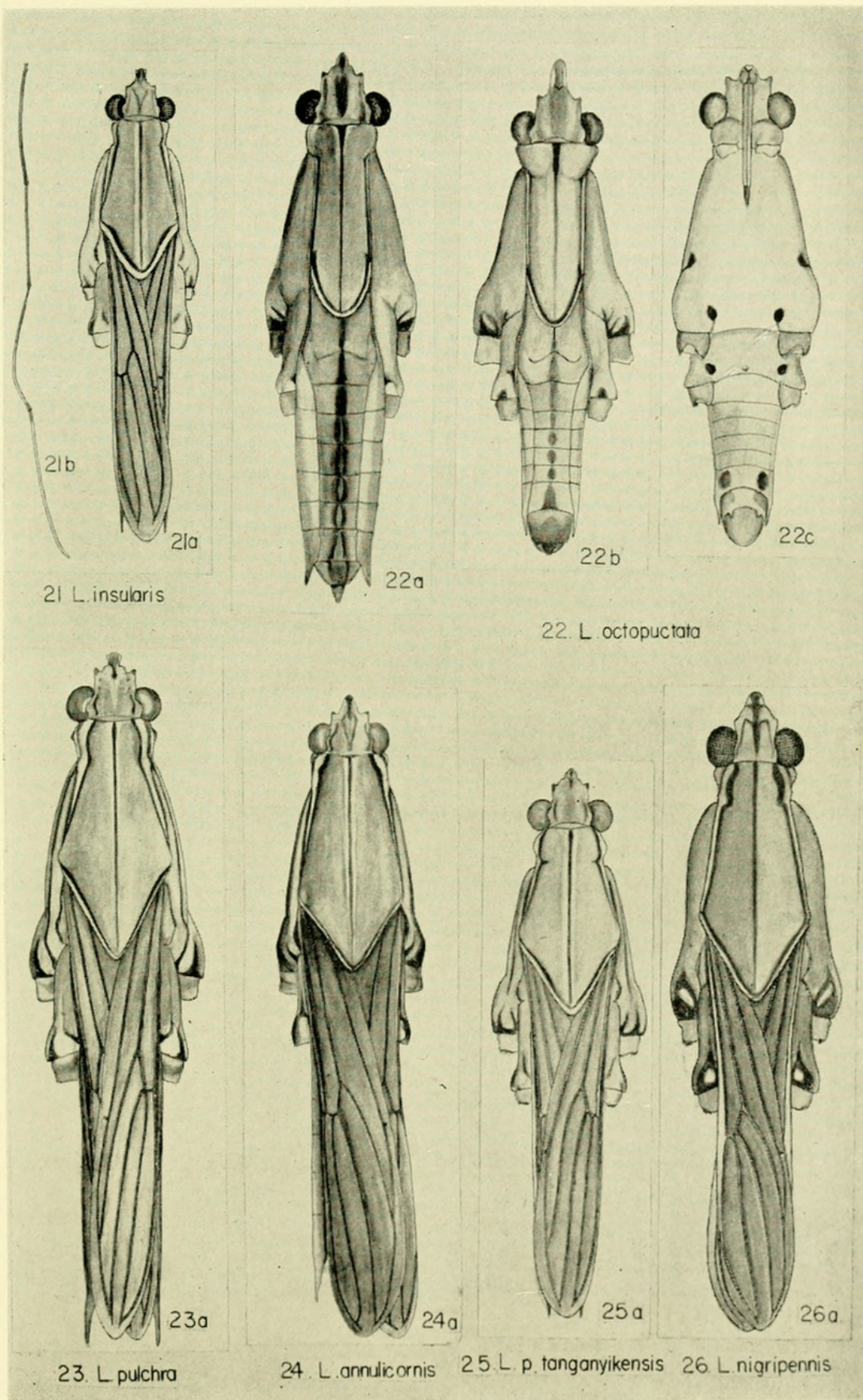


## PLATE IV

- FIG. 21. *Limnometra insularis* Hungerford and Matsuda  
a. Winged male. Tandjong Morawa, Serdang, N. O. Sumatra. Dr. B. Hagen (holotype)  
b. Antenna of winged male. The same data as above.
- FIG. 22. *Limnometra octopunctata* Hungerford  
a. Wingless female. Tandjong Morawa, Serdang, N. O. Sumatra. Dr. B. Hagen (allotype)  
b. Wingless male. The same data as above. (holotype)  
c. Wingless male. The same data as above. (holotype). Ventral side.
- FIG. 23. *Limnometra pulchra* Mayr  
a. Amboina. May, 1909, E. Muir (type)
- FIG. 24. *Limnometra annulicornis* Breddin  
a. Winged female. Kratet Tümpel der Mararang, Celebes. Breddin (type series)
- FIG. 25. *Limnometra pulchra tanganyikensis* Hungerford and Matsuda  
a. Winged male. Tanganyika (type)
- FIG. 26. *Limnometra nigripennis* Mayr  
a. Winged male. Samar Island. Baker



## PLATE IV





## PLATE V

FIG. 27. *Limnometra femorata* Mayr

- a. Winged female. E. slope, Mt. McKinley, Davao prov., Mindanao, Philippine Islands. 1946-47, F. G. Werner
- b. Middle femur of female. The same data as above.

FIG. 28. *Limnometra cursitans*

- a. Wingless female. Merauke, Dutch New Guinea. Mar. 27, 1939, K. G. Wind

FIG. 29. *Tenagogonus grandiusculus* Poisson

- a. Wingless female. Sangmelina, Cameroon, W. Africa. Apr. 16, 1932, A. I. Good (Determined by Poisson)
- b. Antenna of wingless female. The same data as above.

FIG. 30. *Limnometra anadyomene* (Kirkaldy)

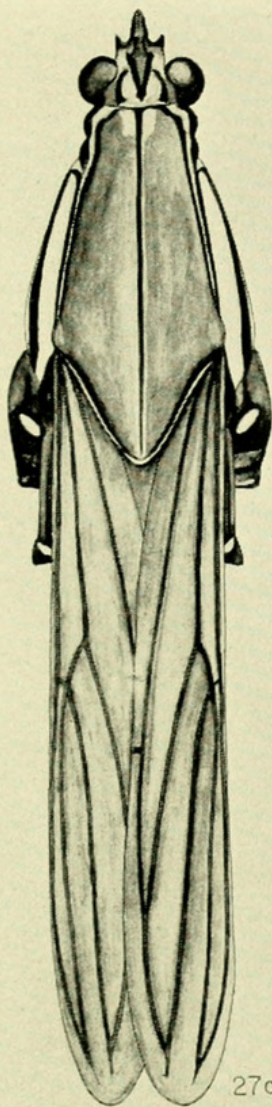
- a. Wingless male. Suduganga River, Matale, Ceylon. R. A. Senior-White (type series)
- b. Wingless female. Punduloya, Ceylon. E. E. Green (type series)

FIG. 31. *Limnometra kallisto* (Kirkaldy)

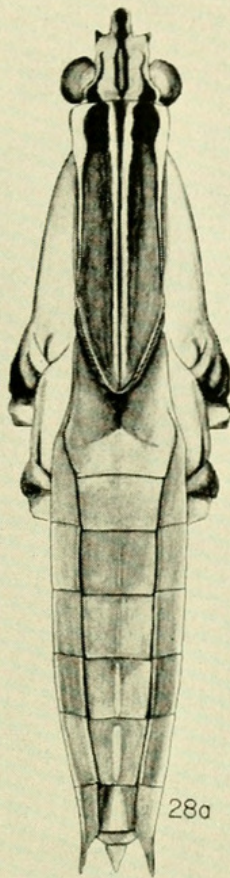
- a. Winged male. Moroka, 1300 m., New Guinea. July to November, Loria (our determination)



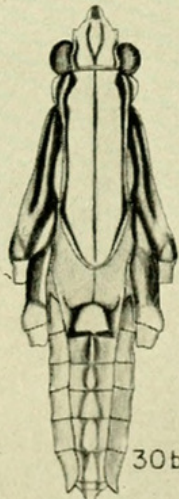
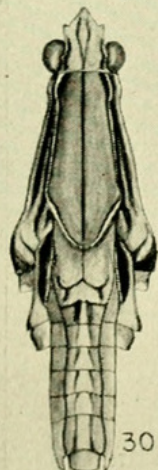
PLATE V



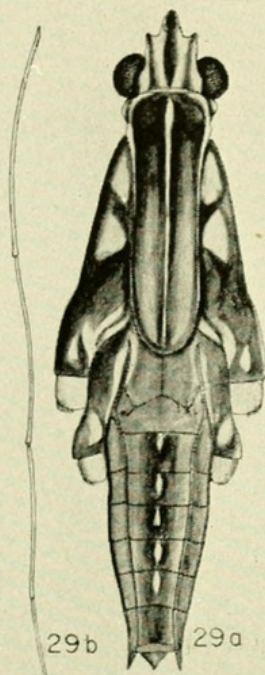
27. *L. femorata*



28. *L. cursitans*

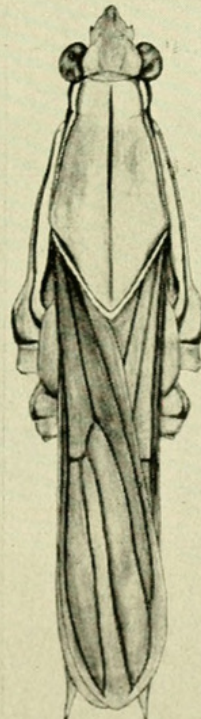


30. *L. anadyomene*



29b

29. *T. longicornis*



31. *L. kallisto*



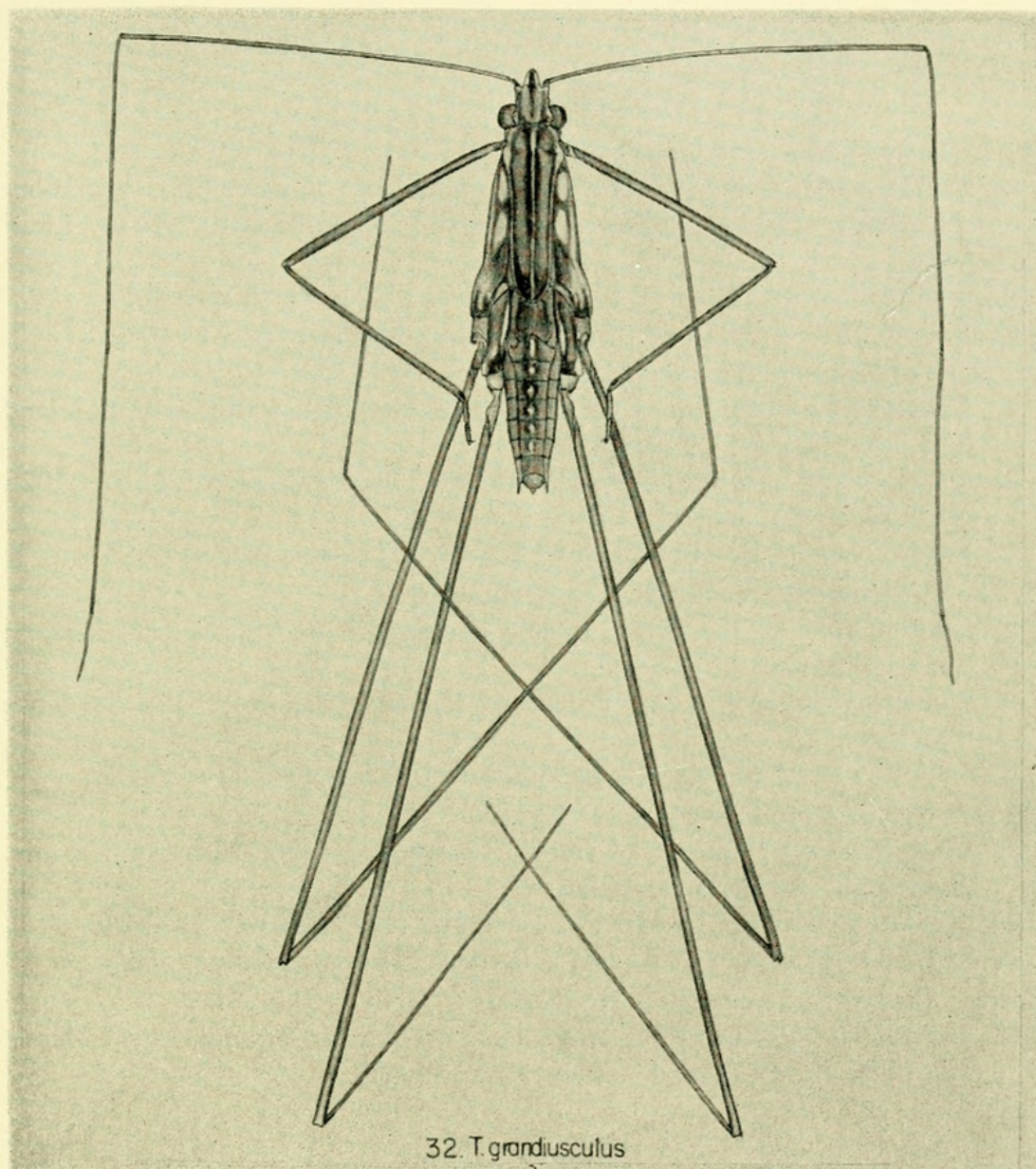
## PLATE VI

FIG. 32. *Tenagogonus grandiusculus* Poisson

Wingless male. Sangmelina, Cameroons, W. Africa. Apr. 16, 1932, A. I. Good. This male was determined by us as *T. longicornis* Poisson. However, the female accompanying this specimen was determined by Poisson as *T. grandiusculus* Poisson.



PLATE VI





## PLATE VII

FIG. 1. *Tenagogonus albovittatus* Stål

- a. Dorsal view of the tip of female abdomen. Sangmelina, Cameroons, W. Africa. Oct. 14, 1934. A. I. Good (Compared with type by Lundblad.)
- b. Ventral view of the tip of male abdomen. The same data as above.
- c. Lateral view of the tip of male abdomen. The same data as above.

FIG. 2. *Tenagogonus zambezinus* Poisson?

- a. Ventral view of the tip of female abdomen. Nagana Res. Lab. Zululand. Apr. 22, 1922, H. H. Curson
- b. Lateral view of the tip of male abdomen. S. Rhodesia, S. Africa. 1928-1935, G. E. Hutchinson
- c. Ventral view of the tip of male abdomen. The same data as b.

FIG. 3. *Tenagogonus madagascariensis* Hoberlandt

- a. Ventral view of the tip of female abdomen. Tananarive, Madagascar 1937 (paratype)
- b. Ventral view of the tip of male abdomen. The same data as above. (paratype)
- c. Lateral view of the tip of male abdomen. The same data as above.

FIG. 4. *Tenagogonus kampaspe* (Kirkaldy)

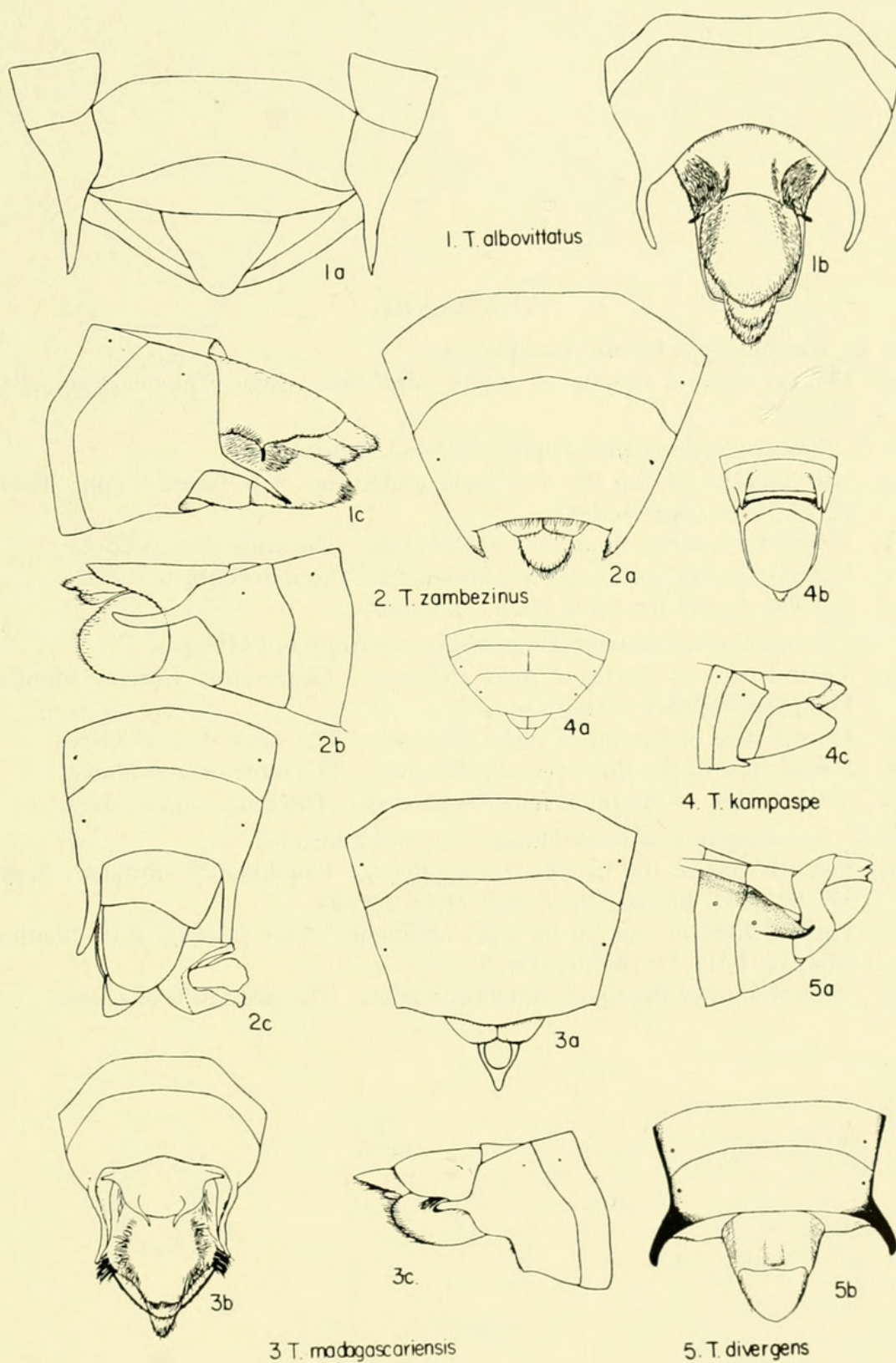
- a. Ventral view of the tip of female abdomen. Rigo, New Guinea mer., July, 1889. L. Loria (type series)
- b. Ventral view of the tip of male abdomen. The same data as above.
- c. Lateral view of the tip of male abdomen. The same data as above.

FIG. 5. *Tenagogonus divergens* Hungerford

- a. Lateral view of the tip of abdomen. Brook near Bawomataluwo, Sumatra. Dec. 9, 1931, v. d. Meer Mohr (type)



## PLATE VII





## PLATE VIII

FIG. 6. *Tenagobius brevis* (Lundblad)

- a. Ventral view of the tip of female abdomen. Java, Thienemann (allotype)

FIG. 7. *Tenagobius fijiensis* Hungerford and Matsuda

- a. Lateral view of the tip of female abdomen. Fiji Island. July, 1934, R. W. Paine (type series)
- b. Dorsal view of the tip of female abdomen. The same data as above.
- c. Ventral view of the tip of male abdomen. The same data as above.
- d. Lateral view of the tip of male abdomen.

FIG. 8. *Tenagobius pravipes bergrothi* Hungerford and Matsuda

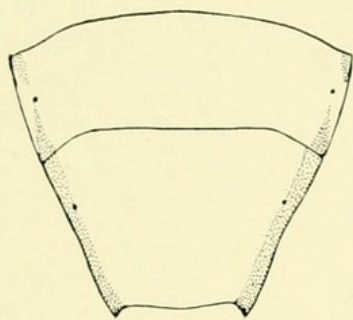
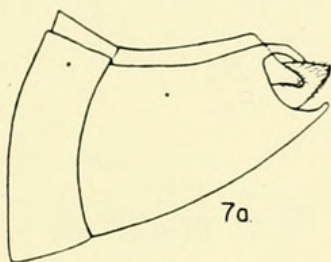
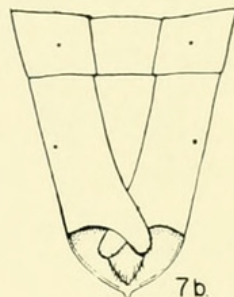
- a. Ventral view of the tip of male abdomen. Observatory Garden, Manila, Philippine Islands. (type series)
- b. Dorsal view of the tip of male abdomen. The same data as above.
- c. Dorsal view of the tip of female abdomen. The same data as above.
- d. Ventral view of the tip of female abdomen. The same data as above.

FIG. 9. *Tenagobius robustus* Hungerford and Matsuda

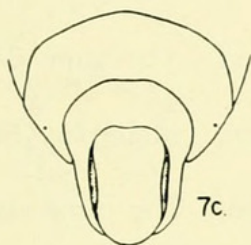
- a. Ventral view of the tip of male abdomen. Pogobina, W. Sumba. Sept. 17, 1949, D. Bühler, Dr. Sutter (type series)
- b. Lateral view of the tip of male abdomen. Prai Jawang, East Sumba. June 14, 1949, Dr. Bühler, Dr. Sutter.
- c. Ventral view of the tip of female abdomen. The same data as above.



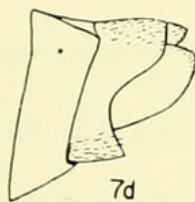
## PLATE VIII

6. *T. brevis*7. *T. fijiensis*

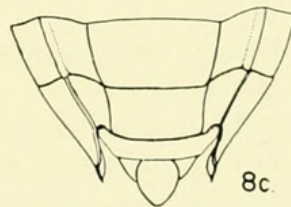
7b



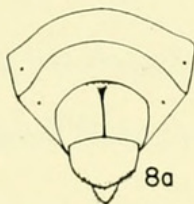
7c



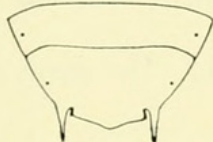
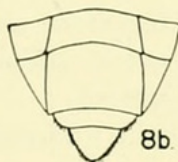
7d



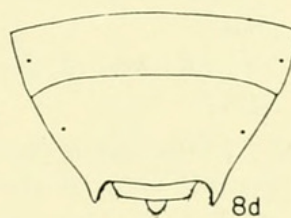
8c

8 *T. pravipes bergrothi*

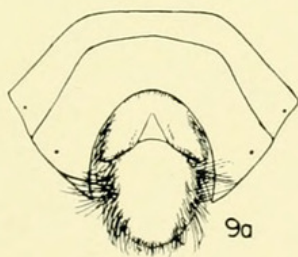
8a

10. *T. r. claggi*

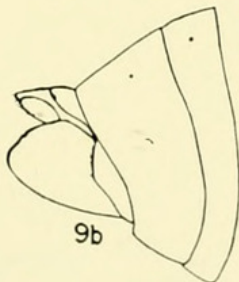
8b



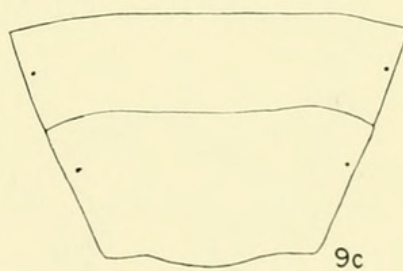
8d



9a



9b



9c

9. *T. robustus*



## PLATE IX

FIG. 11. *Tenagogonus kuiterti* Hungerford and Matsuda

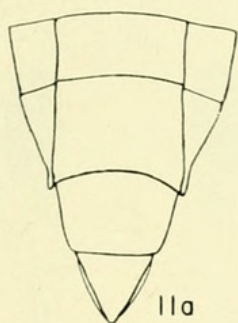
- a. Dorsal view of the tip of wingless male abdomen. Burma. 1944, L. Kuitert (type series)
- b. Ventral view of the tip of wingless male abdomen. The same data as above.
- c. Lateral view of the tip of wingless male abdomen. The same data as above.
- d. Lateral view of the tip of winged male abdomen. Mohnylin, Burma, Oct. 27, 1944, L. Kuitert
- e. Ventral view of the tip of winged male abdomen. The same data as above.
- f. Dorsal view of the tip of wingless female abdomen. The same data as above.
- g. Ventral view of the tip of wingless female abdomen. The same data as above.
- h. Ventral view of the tip of winged female abdomen. The same data as above.

FIG. 12. *Limnometra lipovskyi* Hungerford and Matsuda

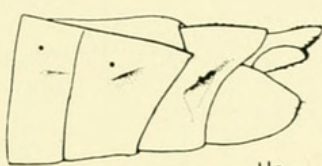
- a. Ventral view of the tip of female abdomen. Guadalcanal Island. Jan. 1945, L. J. Lipovsky (type series)
- b. Lateral view of the tip of male abdomen. The same data as above.
- c. Ventral view of the tip of male abdomen. The same data as above.



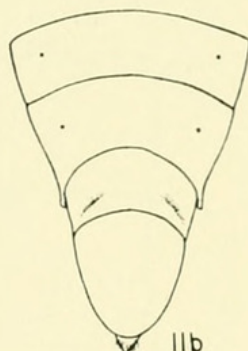
PLATE IX



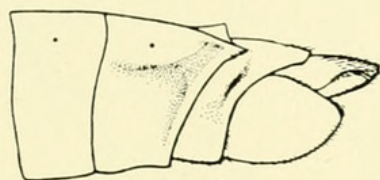
11a



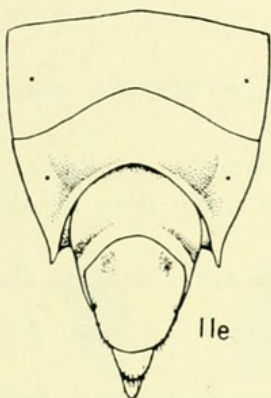
11c



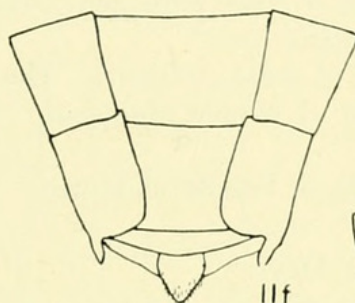
11b



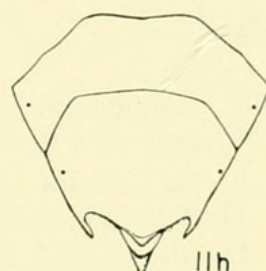
11d



11e

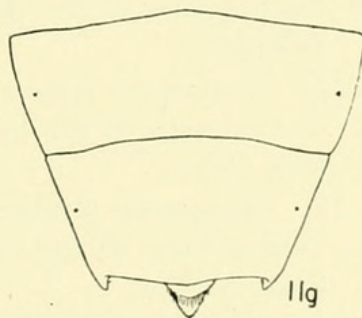


11f

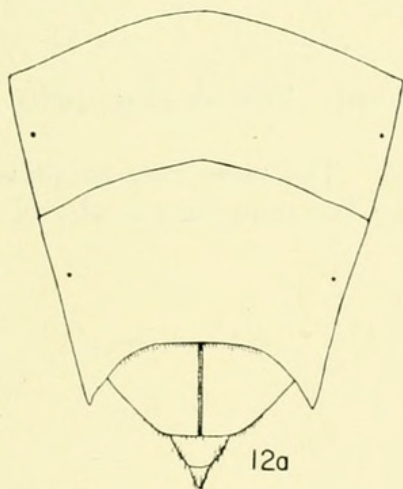


11h

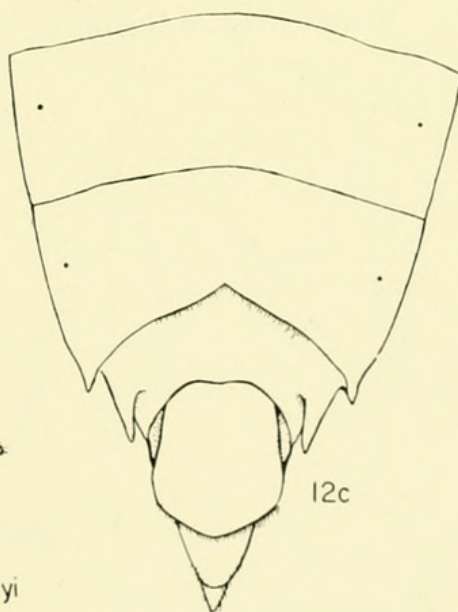
11 *L. kurti*



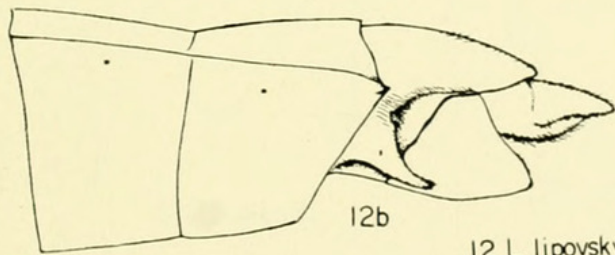
11g



12a



12c



12b

12 *L. lipovskyi*



## PLATE X

FIG. 13. *Limnometra octopunctata* Hungerford

- a. Ventral view of the tip of male abdomen. Tandjong Morawa, Serdang. N. O. Sumatra (holotype)
- b. Dorsal view of the tip of male abdomen. The same data as above.
- c. Dorsal view of the tip of female abdomen. The same data as above. (allotype)
- d. Ventral view of the tip of female abdomen. The same data as above. (allotype)

FIG. 14. *Limnometra minuta* Mayr

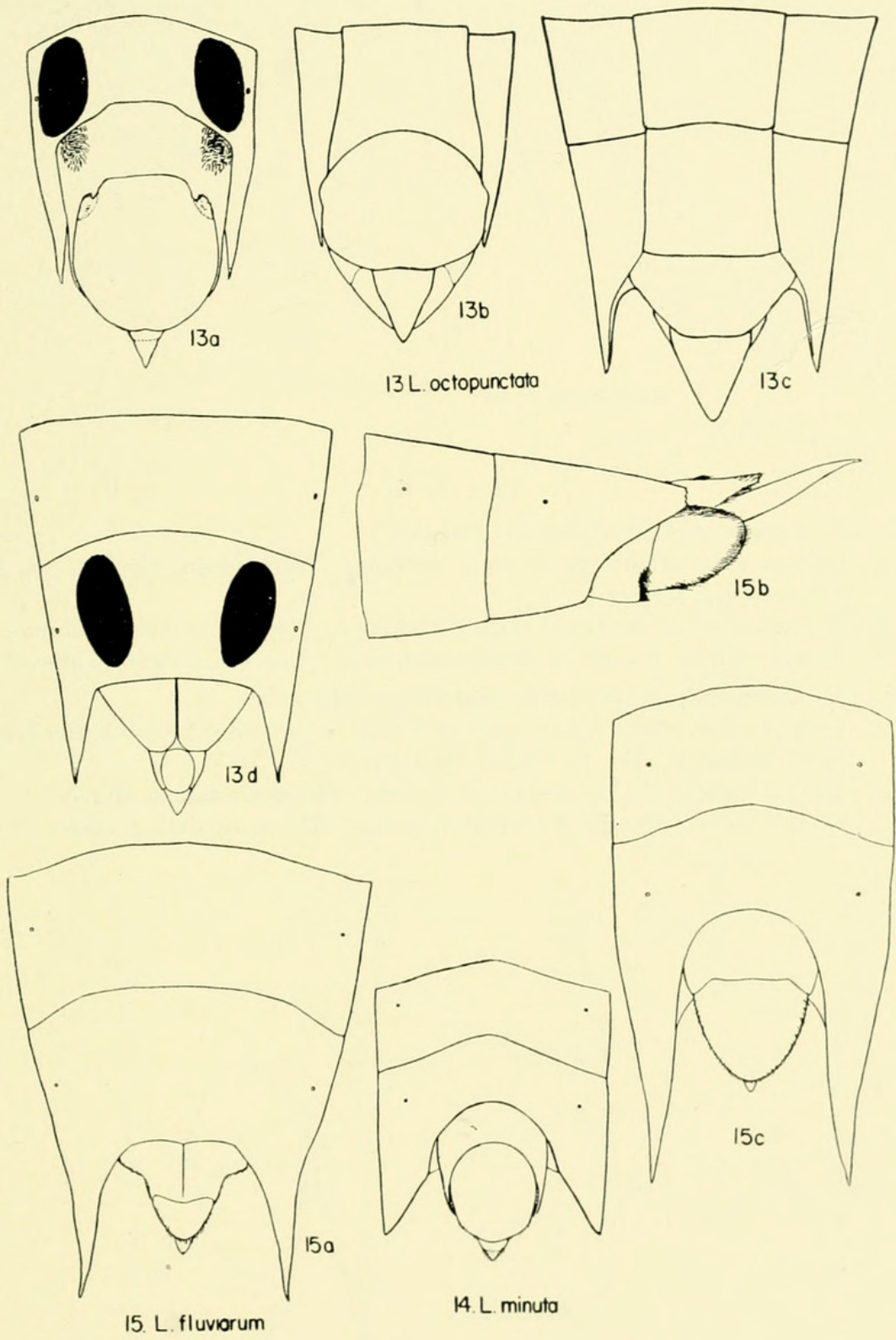
- a. Ventral view of the tip of male abdomen. Novara Expedition, Sambelong (type)

FIG. 15. *Limnometra fluviorum* (Fabricius)

- a. Ventral view of the tip of female abdomen. Tanjore Dist. India. P. Susai Nathan
- b. Lateral view of the tip of male abdomen. The same data as above.
- c. Ventral view of the tip of male abdomen. The same data as above.



PLATE X





## PLATE XI

FIG. 16. *Limnometra anadyomene* (Kirkaldy)

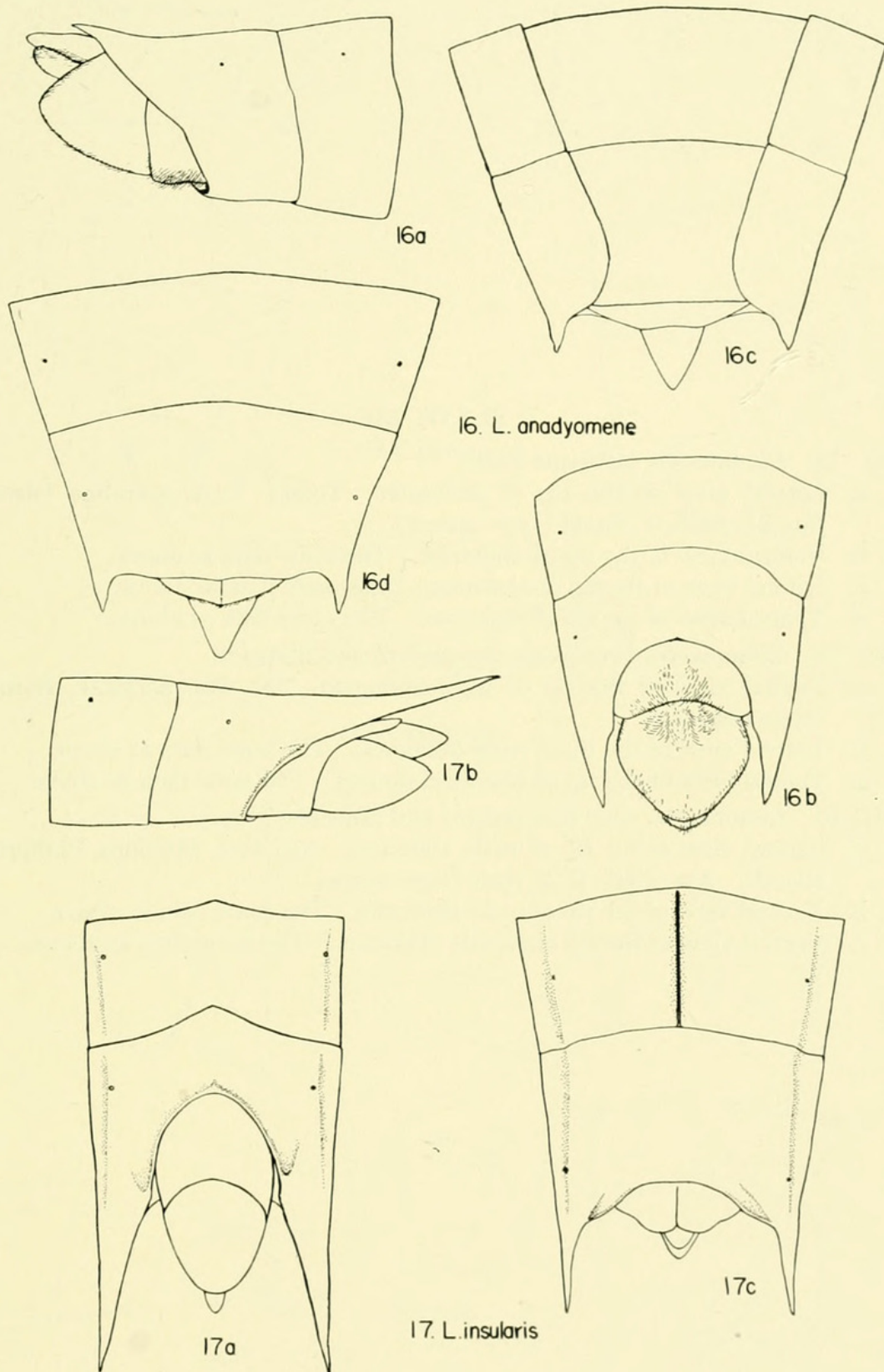
- a. Lateral view of the tip of male abdomen. Punduloya, Ceylon. E. E. Green (type series)
- b. Ventral view of the tip of female abdomen. The same data as above.
- c. Dorsal view of the tip of female abdomen. The same data as above.

FIG. 17. *Limnometra insularis* Hungerford and Matsuda

- a. Ventral view of the tip of male abdomen. Tandjong Morawa, Serdang, N. E. Sumatra. Dr. B. Hagen (holotype)
- b. Lateral view of the tip of male abdomen. The same data as above.
- c. Ventral view of the tip of female abdomen. The same data as above.



PLATE XI





## PLATE XII

FIG. 18. *Limnometra palauana* Esaki

- a. Lateral view of the tip of abdomen. Toloas, Truk, Caroline Islands. Jan. 21, 1938, T. Esaki (type series?)
- b. Ventral view of the tip of abdomen. The same data as above.
- c. Lateral view of the tip of abdomen. The same data as above.
- d. Ventral view of the tip of abdomen. The same data as above.

FIG. 19. *Limnometra borneensis* Hungerford and Matsuda

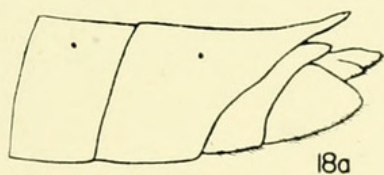
- a. Ventral view of the tip of male abdomen. Mt. Pol. Sarawak, Borneo. (type series)
- b. Lateral view of the tip of male abdomen. The same data as above.
- c. Ventral view of the tip of female abdomen. The same data as above.

FIG. 20. *Limnometra rossi* Hungerford and Matsuda

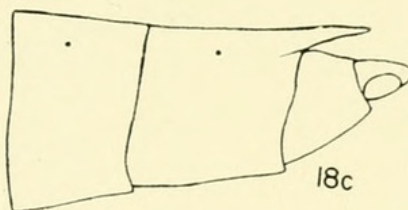
- a. Lateral view of the tip of male abdomen. San José, Mindoro, Philippine Islands. Apr. 1945, E. S. Ross (type series)
- b. Ventral view of the tip of male abdomen. The same data as above.
- c. Ventral view of the tip of female abdomen. The same data as above.



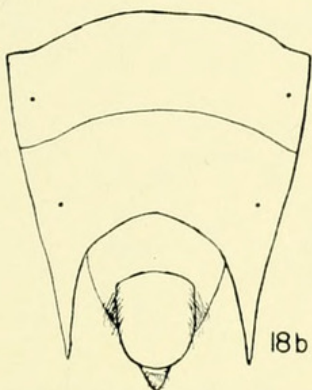
## PLATE XII



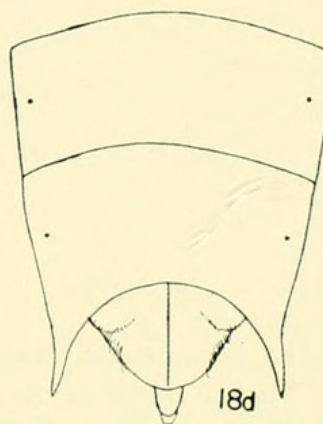
18a



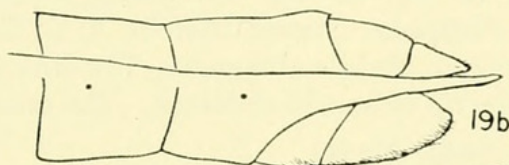
18c



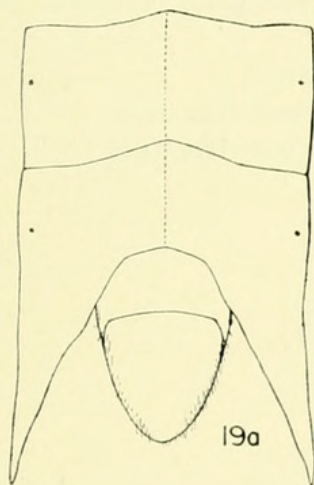
18b

18 *L. palauana*

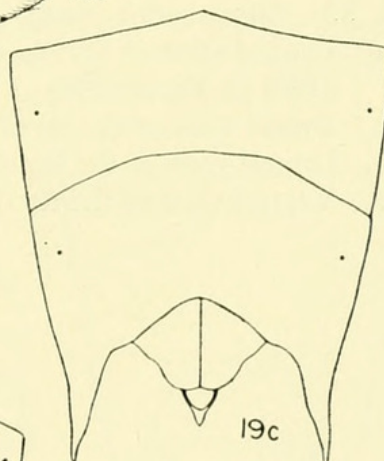
18d



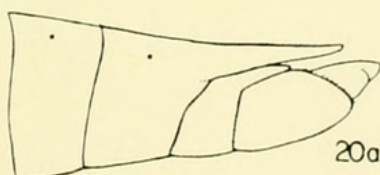
19b

19 *L. borneensis*

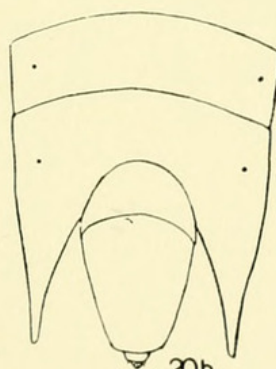
19a



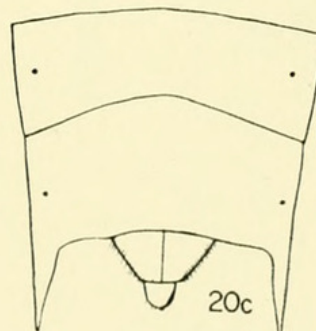
19c



20a



20b

20 *L. rossi*

20c



## PLATE XIII

FIG. 21. *Limnometra femorata* Mayr

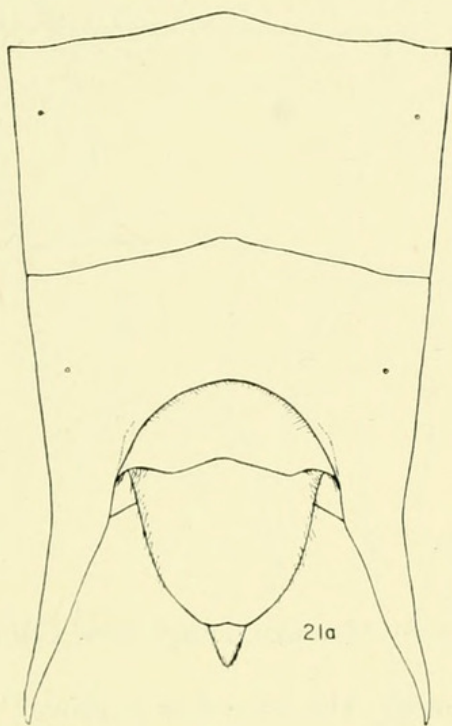
- a. Ventral view of the tip of male abdomen. E. slope, Mt. McKinley, Davao province, Philippine Islands, 1946-47, F. G. Werner
- b. Lateral view of the tip of male abdomen. The same data as above.
- c. Ventral view of the tip of female abdomen. The same data as above.

FIG. 22. *Limnometra ciliata* (Mayr)

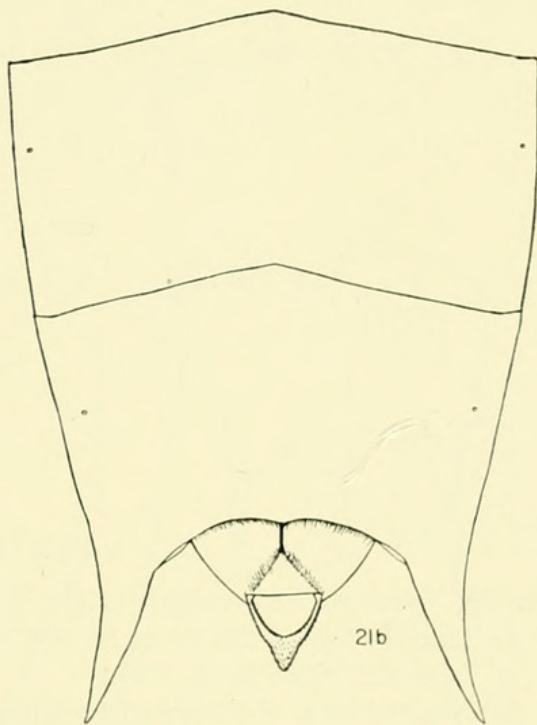
- a. Ventral view of the tip of female abdomen. Samanga, S. Celebes. Nov. 1895, H. Fruhstorfer
- b. Dorsal view of the tip of male abdomen. Sumbawa
- c. Lateral view of the tip of male abdomen. The same data as b.
- d. Ventral view of the tip of male abdomen. The same data as b.



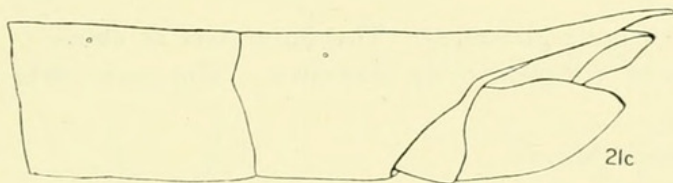
## PLATE XIII



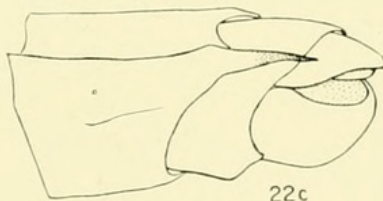
21a



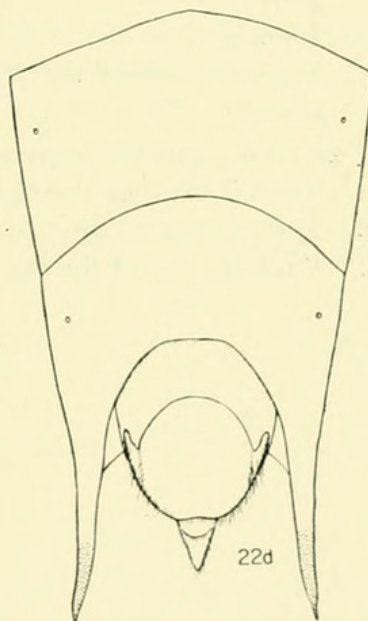
21b



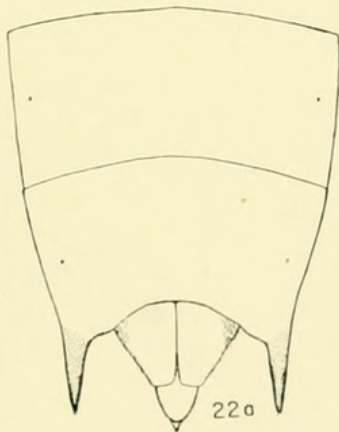
21c

21. *L. femorata*

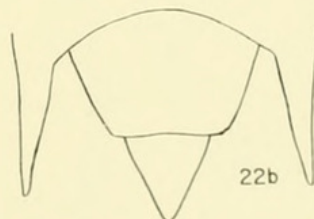
22c



22d



22a



22b

22. *L. ciliata*



## PLATE XIV

FIG. 23. *Limnometra cursitans* (Fabr.)

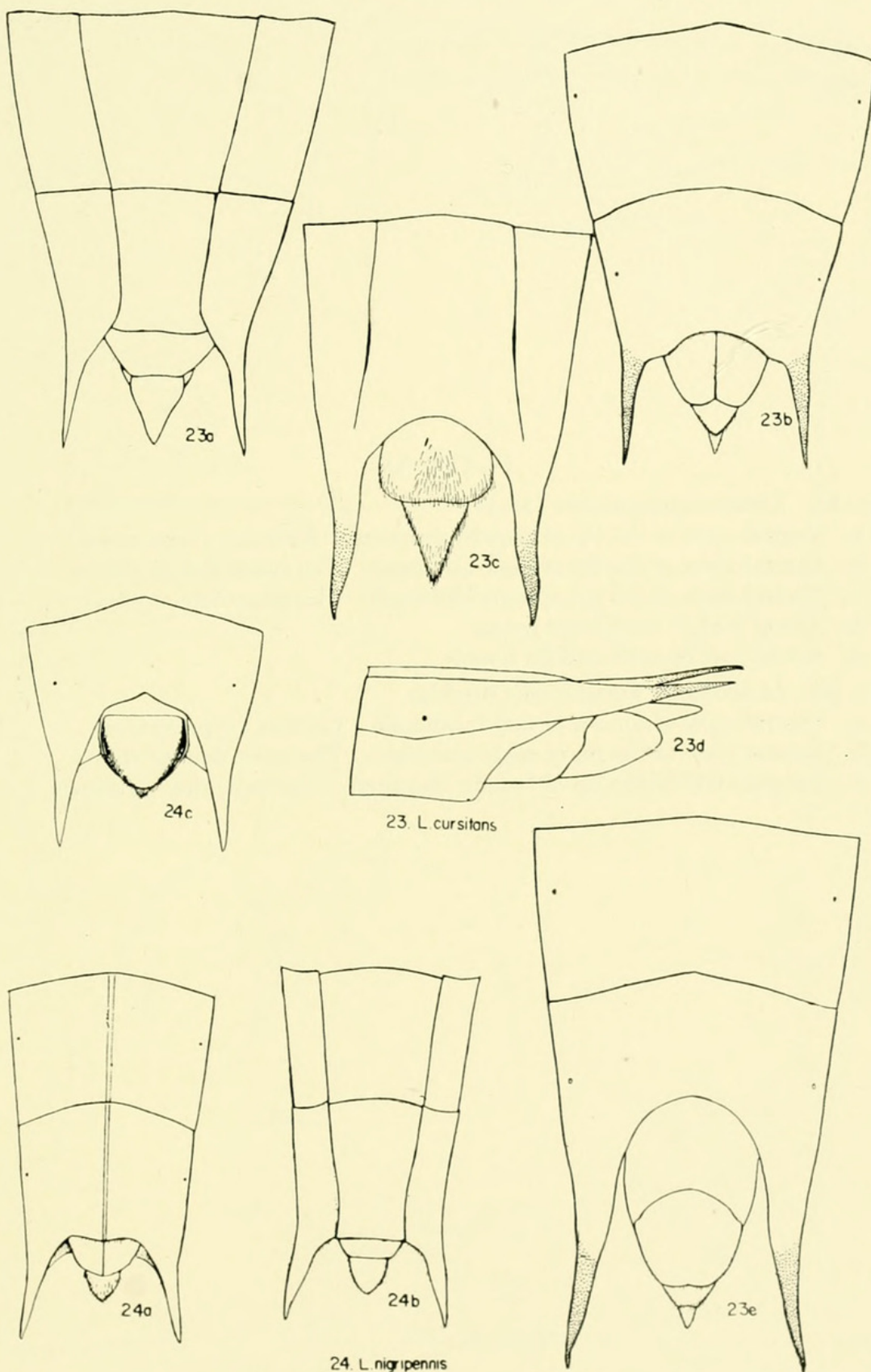
- a. Dorsal view of the tip of female abdomen. Merauke, Dutch New Guinea. Mar. 27, 1939, R. G. Wind
- b. Ventral view of the tip of female abdomen. The same data as above
- c. Ventral view of the tip of winged male abdomen. The same data as above
- d. Lateral view of the tip of male abdomen. The same data as above
- e. Ventral view of the tip of wingless male abdomen. The same data as above

FIG. 24. *Limnometra nigripennis* Mayr

- a. Ventral view of the tip of female abdomen. Samar Island. Baker
- b. Dorsal view of the tip of female abdomen. The same data as above
- c. Ventral view of the tip of male abdomen. Philippine (type)



PLATE XIV





## PLATE XV

FIG. 25. *Limnometra pulchra* (Mayr)

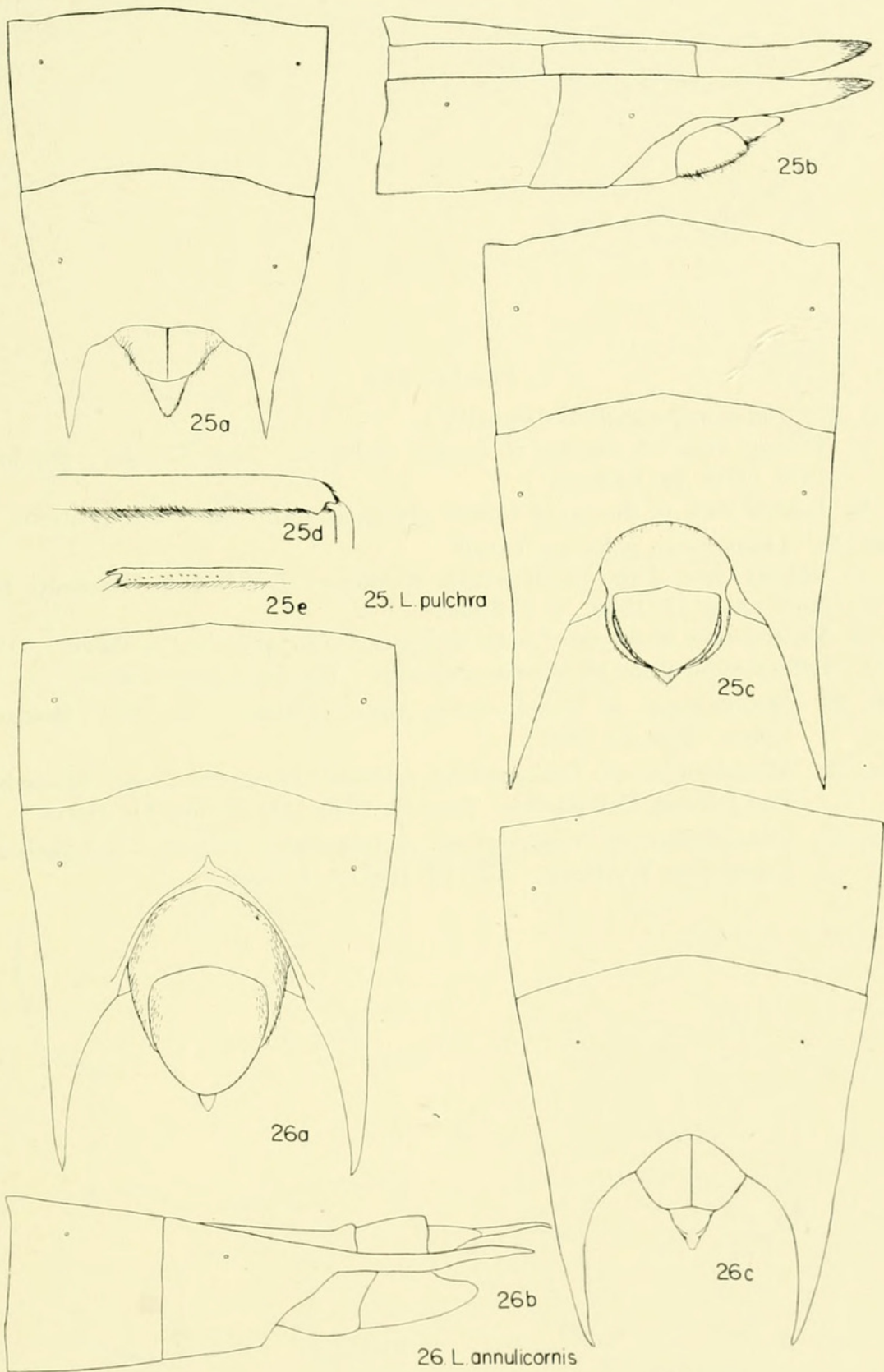
- a. Ventral view of the tip of female abdomen. Amboina (type series)
- b. Lateral view of the tip of male abdomen. The same data as above
- c. Ventral view of the tip of male abdomen. The same data as above
- d. Apical part of male front femur
- e. Apical part of male middle femur

FIG. 26. *Limnometra annulicornis* Breddin

- a. Ventral view of the tip of male abdomen. Celebes (type series)
- b. Lateral view of the tip of male abdomen. The same data as above
- c. Ventral view of the tip of female abdomen. The same data as above



PLATE XV





## PLATE XVI

FIG. 27. *Limnometra kallisto* (Kirkaldy)

- a. Ventral view of the tip of female abdomen. New Guinea. Beccari, 1875 (Det. by Kirkaldy.)
- b. Lateral view of the tip of female abdomen. The same data as above

FIG. 28. *Limnometra palauana* Esaki?

- a. Ventral view of the tip of female abdomen. Los Negros, Admiralty Island. Aug. 11, 1945. P. J. Ribert
- b. Ventral view of the tip of male abdomen. The same data as above
- c. Lateral view of the tip of male abdomen. The same data as above

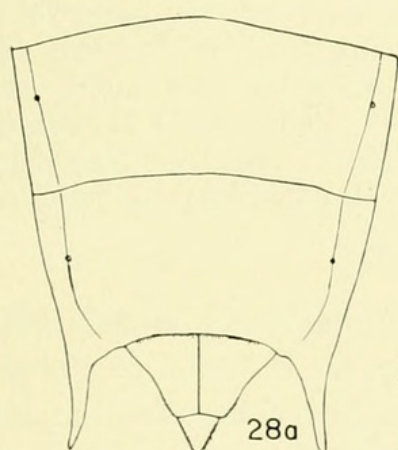
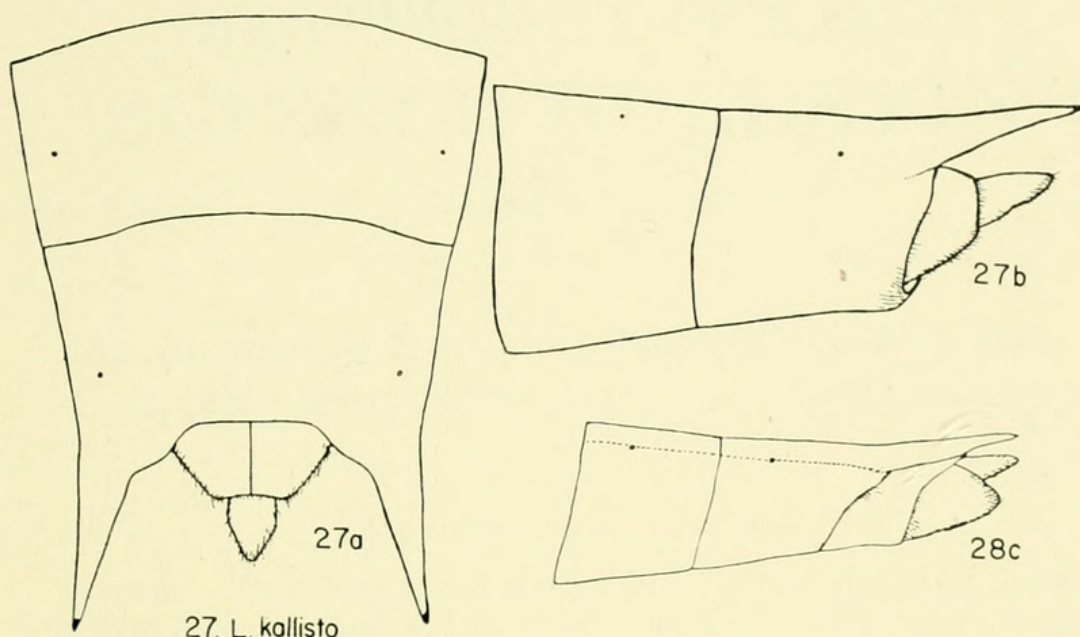
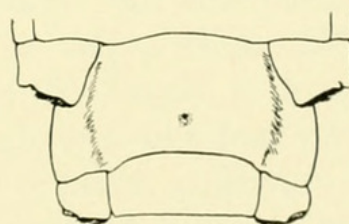
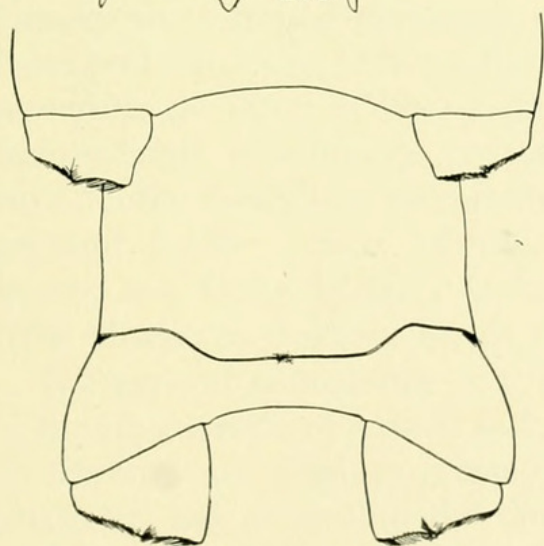
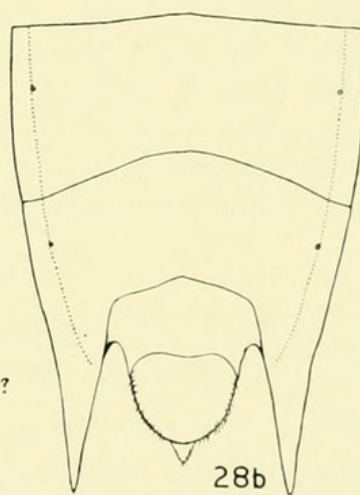
FIG. 29. Metasternum of *Gigantometra gigas* (China). Ta Han, Hainan, China. June 24, 1935

FIG. 30. Metasternum of *Tenagogonus robustus* Hungerford and Matsuda. Prai Jawang, East Sumba. June 14, 1949. Dr. Bühler, Dr. Sutter

FIG. 31. Metasternum of *Tenagogonus grandiusculus* Poisson. Sangmelina, Cameroons, W. Africa. Apr. 16, 1932, A. I. Good



## PLATE XVI

28. *L. paluana*?





Hungerford, Herbert B. and Matsuda, Ryuichi. 1958. "The Tenagogonus-Limnometra complex of the Gerridae." *The University of Kansas science bulletin* 39(9), 371–457.

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