



347

No 1267.

53

XXXVI.

Deutsche Limnologische Sunda-Expedition. The Crane-flies (Tipulidae, Diptera).

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(With 51 Textfigures and Plate II.)

Through the kind interest of Professor AUGUST THIENEMANN, I have been able to study the crane-flies (Tipulidae) collected by the members of the German Limnological Sunda-Expedition, in Sumatra, Java and Bali, between September 1928 and July 1929. The itinerary and general account of the Expedition have been discussed by Dr. THIENEMANN (Tropische Binnengewässer, Vol. 1; Archiv für Hydrobiologie, Suppl.-Bd. 8: 1—20, map, pls. 2—7; 1930, and, more briefly, Die Deutsche Limnologische Sunda-Expedition, „Deutsche Forschung“ Heft 13 pp. 120—136, 7 charts; 1930).

The majority of the specimens collected were larvae that were not reared and the specific identity of which must remain in question. In the cases where these larvae have added novelties of structure to our present knowledge, I have attempted to discuss and figure the species concerned. In very many instances, however, the larvae were so very similar to species previously described in Europe and North America that it was deemed sufficient to merely record the data for the same. Such species fall especially in the extensive genera *Limonia* MEIGEN and *Eriocera* MACQUART. In addition to the larval material submitted there was included a certain number of reared species that have been discussed in greater detail.

Besides the immature stages, a considerable number of adult flies were included, many belonging to genera that have aquatic and subaquatic larvae. A number of these flies were taken at light. As has been discussed in several papers by the present and other writers,

a vast number of Tipulidae in many genera are positively phototropic, the majority of such specimens being females that are evidently attracted to the light at the time of oviposition. When males are taken at light, they are almost invariably associated with their mates. Such flies taken at light, or, indeed, any material taken by any means from any particular locality, are unquestionably derived from larvae occurring in a considerable range of ecological habitats. Thus adult flies taken at the margins of streams or lakes by no means implies that the species concerned have aquatic or subaquatic larvae. This problem has been well discussed by ROGERS (1930: 9), as follows:

„When the adults are at all numerous the situation where they are taken must have included or been adjacent to the larval habitat, but in many cases, particularly in the Limoniinae, conditions suitable for the immature stages are incidental to, or in the nature of a by-product of the general habitat in which the adult occurs, and not one of its invariable features. For example: among the crane-flies swept from the herbage of the stream-margin thickets, some of the species exist as larvae in the coarse damp sand; others in small pockets of saturated silt by the rill margin; another lives, attached to stones, beneath the flowing water; others in wet mosses and liverworts; others in drier mosses; some in water-logged, rotten wood; and still others in fungi or comparatively dry, rotten wood. For some of these species the actual habitat is the wet rotten wood, the fungi, or the flowing brook, and these may be provided by a variety of general habitats that differ markedly in topography and vegetational association from the stream-margin thickets.“

I. THE LARVAL HABITATS OF THE TIPULIDAE.

More than 5500 species of Tipulidae have now been described and of this number the immature stages of only a small percentage have been made known. The description of new species is proceeding much more rapidly than the discovery of the larvae and pupae of the various species. Despite this fact, a great step in advance has been made since the publication of the writer's „Biology of Crane-flies“, in which the then known information on the Tipulidae of the World was briefly summarized (ALEXANDER, 1920). The detailed studies of many workers, among whom should be mentioned especially BANGERTER (1928—1930), CUTHBERTSON (1923—1929) and ROGERS (1926—1930), have added materially to our knowledge of the habitats of the larvae and pupae of many species. Almost our sole information on the marine crane-fly fauna has been gained in this decade, and the beautiful monographic study of one of these, *Limonia (Dicranomyia) monostromia* TOKUNAGA,

deserves special consideration (TOKUNAGA, 1930). The various references to the papers that appeared in the years 1920 to 1930 are cited in the Bibliography that concludes the present report.

The immature stages of Tipulidae are notable lovers of moisture and it seems certain that the great majority of the species will be found to live in an aquatic or subaquatic situation. Until recent years, the classification of larval habitats was very inexact and there still remains much to be done in exactly defining the conditions under which the early stages of the various species are found. Former statements such as „Living in decaying wood, in damp earth“ and the like are now known to be inconclusive and unsatisfactory. ROGERS has done much toward a closer definition of the actual conditions to be found within the larval habitat. Thus in his survey of the species living in decaying wood (ROGERS, 1927 c, 1927 e, 1930), he has not only more exactly noted the moisture conditions required by the different species but has more accurately defined the relations of the species living in wood to fungous growths in the same habitat. This high calibre of work is proceeding in several countries and the conditions and requirements of the early stages of many of our common species are becoming better appreciated.

It seems appropriate at this time to provide a summary of the larval habitats of crane-flies, the more especially so since the great majority of the species require moisture to a varying degree. The various known species are here recorded under rather broad categories that will require more exact limitation and definition in future years. The date in parenthesis following the authority does not necessarily mean that the paper cited is the original source of information but rather provides a beginning from which the information concerning the particular species can be traced. Thus the numerous references to my „Biology of Crane-flies“ are given merely to avoid the duplication of references that would become necessary if all papers earlier than 1920 were to be included, a course that seems unnecessary since the papers are given in full in the work cited (ALEXANDER, 1920).

1. Strictly aquatic species in fresh water.

A. Entirely submerged and usually without functional spiracles.
Tipuline No. 7 (this report).

Antocha saxicola O. S. (ALEXANDER, 1920).

— sp. (this report).

Aphrophila neozelandica (EDWARDS).

B. Aquatic, but coming to the surface for oxygen; usually moving to dryer areas for pupation.

- Tipulodina pedata* (WIED.) (ALEXANDER, 1920; this report).
Tipula caloptera LW. (ALEXANDER, 1920).
 — *iroquois* ALEX. (ALEXANDER, 1920, as Tipuline 1).
 — *lateralis* MG. (CUTHBERTSON, 1926 b).
 — *luteipennis* MG. (CUTHBERTSON, 1926 b).
 — *montium* EGG. (CUTHBERTSON, 1926 b).
 — *tephrocephala* LW. (ALEXANDER, 1920).
Triogma trisulcata SCHUMM. (ALEXANDER, 1920).
Limonia (Limonia) simulans (WALK.) (ALEXANDER, 1920).
 — (*Geranomyia*) *argentiifera* (DE M.) (this report).
 — (*Dicranomyia*) *punctulata* (DE M.) (this report).
Pedicia albivitta WALK. (ALEXANDER, 1920).
 — *rivosa* (L.) (ALEXANDER, 1920).
Hexatoma megacera (O. S.) (ALEXANDER, 1920).
Eriocera cinerea ALEX. (ALEXANDER, 1920).
 — *fultonensis* ALEX. (ALEXANDER, 1920).
 — *longicornis* (WALK.) (ALEXANDER, 1920).
 — *spinosa* (O. S.) (ALEXANDER, 1920).
Ormosia fascipennis (ZETT.) (BANGERTER, 1930).
- C. Aquatic, in algal growth in stagnant water.
Limonia (Limonia) umbrata (DE M.) (ALEXANDER, 1920).
 — (*Dicranomyia*) *punctulata* (DE M.) (this report).
Phalacrocerca replicata (L.) (ALEXANDER, 1920).
2. On vertical cliff and rock faces, in or beneath a scum of algal growth, with percolating or flowing water; in rapid-flowing streams under hygroscopic conditions.
Ctenacroscelis umbrinus (WIED.) (this report).
Tipula brevifurcata ALEX. (ROGERS, 1930).
Limonia (Limonia) simulans (WK.) (ALEXANDER, 1920; ROGERS, 1930).
 — (*Geranomyia*) *canadensis* (WESTW.) (ALEXANDER, 1920; ALEXANDER and MALLOCH, 1920).
 — (*Geranomyia*) *diversa* (O. S.) (ROGERS, 1930).
 — (*Geranomyia*) *fletcheri* (EDW.) (this report).
 — (*Dicranomyia*) *humidicola* (O. S.) (ROGERS, 1930, as *badia*).
 — (*Dicranomyia*) *pudivoides* ALEX. (ROGERS, 1930).
 — (*Dicranomyia*) *punctulata* (DE M.) (this report).
 — (*Dicranomyia*) *stulta* (O. S.) (ROGERS, 1930).
 — (*Dicranomyia*) *tahanensis aphrophila* subsp. n. (this report).
 — (*Dicranomyia*) *trinotata* (MG.) (ALEXANDER, 1920; BANGERTER, 1929).

- Antocha (Orimargula) alpigena* (MIK) (BANGERTER, 1929).
Eliptera illini ALEX. (ROGERS, 1930).
 — *omissa* EGG. (ALEXANDER, 1920).
Dactylolabis denticulata (BERGR.) (ALEXANDER, 1920).
 — *montana* (O. S.) (ALEXANDER, 1920).
 — *wodzickii* (NOW.) (ALEXANDER, 1920).
3. Marine; on rocks or earth, in growths of algae, submerged by the tide.
 This category will probably be found to include all, or virtually all, members of the subgenus *Idioglochina* ALEXANDER, with numerous species on many islands of the Pacific Ocean.
Limonia (Limonia) halophila ALEX. (ALEXANDER, 1929).
 — (*Geranomyia*) *bezzii* (A. & L.) (SEURAT, 1924).
 — (*Geranomyia*) *unicolor* (HAL.) (SAUNDERS, 1930).
 — (*Dicranomyia*) *monostromia* TOKUN. (TOKUNAGA, 1930).
 — (*Dicranomyia*) *signipennis* (COQ.) (SAUNDERS, 1928).
 — (*Dicranomyia*) sp. n. (TOKUNAGA, 1930).
 — (*Idioglochina*) sp. n. (TOKUNAGA, 1930, as *Gonomyia*?).
Trimicra marina (PIERRE) (PIERRE, 1924, as *Psiloconopa*).
4. Inland saline waters.
Limonia (Dicranomyia) modesta (MG.) (SCHMIDT, 1913).
5. In cold springs.
Aeschnosoma rivertonensis JOHNS. (ALEXANDER, 1920).
Thaumastoptera calceata MIK (THIENEMANN, 1918; LENZ, 1920).
Pedicia albivitta WALK. (ALEXANDER, 1920).
 — *rivosa* (L.) (ALEXANDER, 1920).
6. In water gathered in tree-holes.
 Tipulidae, sp. (MACFIE and INGRAM, 1923).
Tipulodina pedata (WIED.) (this report).
Sigmatomera occulta ALEX. (RIEDEL, 1921, as *S. flavipennis*).
 — *shannoniana* ALEX. (ALEXANDER, 1930 a).
7. In water gathered in axils of plants, as Bromeliaceae, Liliaceae (*Astelia* sp.), and similar habitats.
Astelobia rufa (HUDS.) (ALEXANDER, 1920, as *Gnophomyia*).
Trentepohlia (Paramongoma) bromeliadicola (ALEX.) (ALEXANDER, 1920).
 — (*Paramongoma*) *leucoxena* (ALEX.) (ALEXANDER, 1920).
8. In carnivorous pitcher-plants (*Sarracenia*, *Nepenthes* and others).
 No Tipulidae have as yet been discovered.

9. In or beneath wet to saturated mats or cushions of mosses and liverworts, on earth or rocks.
- Tipula collaris* SAY (ALEXANDER, 1920).
 — *dilatata* SCHUMM. (ALEXANDER, 1920).
 — *excisa* SCHUMM. (CUTHBERTSON, 1926 b).
 — *hortulana* MG. (ALEXANDER, 1920).
 — *ignobilis* LW. (ALEXANDER, 1920).
 — *marmorata* MG. (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
 — *nobilis* (LW.) (ALEXANDER, 1920).
 — *oropezoides* JOHNS. (ALEXANDER, 1920).
 — *pagana* MG. (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
 — *pelio stigma* SCHUMM. (ALEXANDER, 1920).
 — *pruinosa* WIED. (ALEXANDER, 1920).
 — *rufina* MG. (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
 — *signata* STAEG. (ALEXANDER, 1920).
 — *staegeri* NIELS. (CUTHBERTSON, 1926 b).
 — *subnodicornis* ZETT. (CUTHBERTSON, 1926 b).
 — *truncorum* MG. (ALEXANDER, 1920).
 — *unca* WIED. (ALEXANDER, 1920).
 — *variipennis* MG. (CUTHBERTSON, 1926 b).
Nephrotoma virescens (LW.) (ALEXANDER, 1920).
Dolichozepea (Dolichozepea) albipes (STRØM) (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
 — (*Oropeza*) *albipes* (JOHNSON) (ROGERS, 1930).
 — (*Oropeza*) *subalbipes* (JOHNSON) (ROGERS, 1930).
Limonia (Libnotes) perkinsi (GRIMS.) (ALEXANDER, 1920).
 — (*Geranomyia*) *rostrata* (SAY) (ROGERS, 1927 a, 1930).
 — (*Dicranomyia*) *chorea* (MG.) (CUTHBERTSON, 1926 b).
 — (*Dicranomyia*) *divisa* ALEX. (ROGERS, 1930, as *diversa*).
 — (*Dicranomyia*) *humidicola* (O. S.) (ALEXANDER, 1920; ROGERS, 1930, as *badia*).
 — (*Dicranomyia*) *morioides* (O. S.) (ROGERS, 1930).
 — (*Dicranomyia*) *stulta* (O. S.) (ALEXANDER, 1920).
Pedicia albivitta WALK. (ALEXANDER, 1920).
Tricyphona claripennis VERR. (CUTHBERTSON, 1926 b).
Limnophila bryobia MIK (ALEXANDER, 1920).
Eriocera aurata DOANE (ROGERS, 1930).
10. In sphagnum and other aquatic mosses.
- Phalacrocerca replicata* (L.) (ALEXANDER, 1920).
Triogma trisulcata (SCHUMM.) (ALEXANDER, 1920; HAAKE, 1922).
Pedicia rivosa (L.) (CUTHBERTSON, 1926 b).
Eriocera aurata DOANE (ROGERS, 1930).

11. Sandy, gravelly or loamy soil, with slight humus, at margins of streams or ponds.
- Longurio testaceus* LW. (ALEXANDER, 1920).
Tipula furca WALK. (ALEXANDER, 1920, as *bella*).
 — *caloptera* LW. (ALEXANDER, 1920).
 — *concava* ALEX. (ROGERS, 1930).
 — *maxima* PODA (BANGERTER, 1928).
Limonia (Rhipidia) maculata (MG.) (CUTHBERTSON, 1926 b).
Pedicia rivosa (L.) (BANGERTER, 1928).
Dicranota (Dicranota) bimaculata (SCHUMM.) (CUTHBERTSON, 1926 b).
 — (*Dicranota*) *guerini* (ZETT.) (CUTHBERTSON, 1926 b).
Limnophila (Limnophila) pictipennis (MG.) (ALEXANDER, 1920).
 — *punctata* (SCHUMM.) (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
Hexatoma megacera (O. S.) (ALEXANDER, 1920).
Eriocera cinerea ALEX. (ALEXANDER, 1920).
 — *fultonensis* ALEX. (ALEXANDER, 1920).
 — *longicornis* (WALK.) (ALEXANDER, 1920).
 — *spinosa* (O. S.) (ALEXANDER, 1920).
Gonomyia (Progonomyia) alboscuteolata (RÖSER) (BANGERTER, 1930).
 — (*Progonomyia*) *lateralis* (MACQ.) (BANGERTER, 1928).
 — (*Gonomyia*) *kansensis* ALEX. (ALEXANDER, 1920).
 — (*Gonomyia*) *tenella* (MG.) (ALEXANDER, 1920).
 — (*Lipophleps*) *alexanderi* (JOHNS.) (ALEXANDER, 1920).
 — (*Lipophleps*) *sulphurella* (O.S.) (ALEXANDER, 1920; ROGERS, 1930).
Helobia hybrida (MG.) (ALEXANDER, 1920).
Symplectomorpha stictica (MG.) (CUTHBERTSON, 1926 b).
Ormosia uncinata DE MEIJ. (CUTHBERTSON, 1926 b).
Erioptera (Empeda) flava (SCHUMM.) (CUTHBERTSON, 1926 b).
 — (*Ilisia*) *areolata* SIEBKE (CUTHBERTSON, 1926 b).
 — (*Ilisia*) *maculata* MG. (ALEXANDER, 1920).
 — (*Hoplolabis*) *armata* O. S. (ALEXANDER, 1920; ROGERS, 1930).
 — (*Mesocyphona*) *caloptera* SAY (ROGERS, 1930).
 — (*Mesocyphona*) *needhami* ALEX. (ROGERS, 1930).
 — (*Erioptera*) *chrysocomoides* ALEX. (ROGERS, 1930).
 — (*Erioptera*) *flavescens* (L.) (ALEXANDER, 1920; DETTE, 1916).
 — (*Erioptera*) *sordida* MG. (ALEXANDER, 1920).
12. Rich organic earth or mud, as at margins of rills, streams, lakes or other water-bodies; in swamps and marshes; in leaf-drift at stream-margins; wet spots in woods.
- Holorusia rubiginosa* LW. (ALEXANDER, 1920).
Prionocera fuscipennis (LW.) (ALEXANDER, 1920).
 — *turcica* (F.) (CUTHBERTSON, 1926 b).

- Tipula abdominalis* (SAY) (ALEXANDER, 1920).
 — *dejecta* WALK. (ALEXANDER, 1920).
 — *fulvipennis* DE GEER. (ALEXANDER, 1920).
 — *lateralis* MG. (ALEXANDER, 1920; LÉVY, 1919; CUTHBERTSON, 1926 b).
 — *luna* WESTH. (CUTHBERTSON, 1926 b).
 — *lunata* L. (ALEXANDER, 1920).
 — *luteipennis* MG. (LÉVY, 1919; CUTHBERTSON, 1926 b).
 — *maxima* PODA. (ALEXANDER, 1920; BANGERTER, 1928).
 — *sayi* ALEX. (ALEXANDER, 1920).
 — *tricolor* F. (ALEXANDER, 1920).
 — *varicornis* SCHUMM. (ALEXANDER, 1920).
 — *variipennis* Mg. (ALEXANDER, 1920).
 — *vittata* MG. (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
Limonia (Limonia) fallax (JOHNS.) (ALEXANDER, 1920).
 — (*Limonia*) *flavipes* (F.) (CUTHBERTSON, 1926 b).
 — (*Limonia*) *nubeculosa* MG. (CUTHBERTSON, 1926 b).
 — (*Dicranomyia*) *didyma* (MG.) (CUTHBERTSON, 1926 b).
Helius (Helius) dubius EDW. (EDWARDS, 1921 b; CUTHBERTSON, 1926 b).
 — (*Helius*) *flavipes* (MACQ.) (ALEXANDER, 1920).
 — (*Helius*) *flavus* (WALK.) (EDWARDS, 1921 b).
 — (*Helius*) *longirostris* (MG.) (ALEXANDER, 1920; BANGERTER, 1929).
 — (*Helius*) *mainensis* ALEX. (ALEXANDER, 1920).
 — (*Helius*) *pallirostris* EDW. (EDWARDS, 1921 b).
Pedicia rivosa (L.) (LÉVY, 1919; CUTHBERTSON, 1926 b; BANGERTER 1928).
Tricyphona immaculata (MG.) (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
 — *inconstans* (O. S.) (ALEXANDER, 1920; ROGERS, 1930).
 — *schineri* (KOL.) (ALEXANDER, 1920).
Dicranota (Amalopina) flaveola (O. S.) (ALEXANDER, 1920).
 — (*Dicranota*) *bimaculata* (SCHUMM.) (ALEXANDER, 1920; LÉVY, 1919; CUTHBERTSON, 1926 b).
 — (*Rhaphidolabis*) *cayuga* (ALEX.) (ALEXANDER, 1920).
Adelphomyia americana ALEX. (ALEXANDER, 1920).
 — *cayuga* ALEX. (ALEXANDER, 1920).
 — *minuta* ALEX. (ALEXANDER, 1920).
 — *senilis* (HAL.) (CUTHBERTSON, 1926 b).
Polymera (Polymera) georgiae ALEX. (ROGERS, in litt.).
Pseudolimnophila contempta (O. S.) (ROGERS, 1930).
 — *inornata* (O. S.) (ALEXANDER, 1920).

- Pseudolimnophila luteipennis* (O. S.) (ALEXANDER, 1920; ROGERS, 1930).
 — *ochracea* (MG.) (ALEXANDER, 1920).
Limnophila (Lasiomastix) macrocera (SAY) (ALEXANDER, 1920; ROGERS, 1930).
 — (*Idioptera*) *trimaculata* (ZETT.) (CUTHBERTSON, 1926 b).
 — (*Dicranophragma*) *fuscovaria* O. S. (ALEXANDER, 1920; ROGERS, 1930).
 — (*Ephelia*) *marmorata* (MG.) (BANGERTER, 1928).
 — (*Phylidorea*) *adusta* O. S. (ALEXANDER, 1920).
 — (*Phylidorea*) *ferruginea* (MG.) (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
 — (*Phylidorea*) *lineola* (MG.) (ALEXANDER, 1920; LÉVY, 1919; CUTHBERTSON, 1926 b).
 — (*Limnophila*) *pictipennis* (MG.) (ALEXANDER, 1920).
 — (*Limnophila*) *punctata* (SCHUMM.) (ALEXANDER, 1920).
 — *nemoralis* (MG.) (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
Ulomorpha pilosella (O. S.) (ALEXANDER, 1920; ROGERS, 1930).
Pilaria discicollis (MG.) (ALEXANDER, 1920; LÉVY, 1919; CUTHBERTSON, 1926 b).
 — *fuscipennis* (MG.) (ALEXANDER, 1920; LÉVY, 1919; BANGERTER, 1928).
 — *quadrata* (O. S.) (ALEXANDER, 1920).
 — *recondita* (O. S.) (ALEXANDER, 1920).
 — *tenuipes* (SAY) (ALEXANDER, 1920; ROGERS, 1930).
Pentoptera albatarsis O. S. (ALEXANDER, 1920; ROGERS, 1930).
Gynoplistia (Gynoplistia) pedestris EDW. (MSS.).
Gonomyia (Gonomyia) dentata DE MEIJ. (CUTHBERTSON, 1926 b).
 — (*Gonomyia*) *subcinerea* (O. S.) (ALEXANDER, 1920).
 — (*Lipophleps*) *pleuralis* (WILL.) (ROGERS, 1926 b).
 — (*Lipophleps*) *sulphurella* (O. S.) (ALEXANDER, 1920).
Rhabdomastix (Sacandaga) schistacea (SCHUMM.) (ALEXANDER, 1920).
Trimicra pilipes (F.) (ALEXANDER, 1920).
 ? *Cheilotrichia cinerascens* (MG.) (LÉVY, 1919).
Cheilotrichia imbuta (WIED.) (CUTHBERTSON, 1926 b).
Ormosia fascipennis (ZETT.) (BANGERTER, 1930).
 — *haemorrhoidalis* (ZETT.) (ALEXANDER, 1920).
 — *innocens* (O. S.) (ALEXANDER, 1920).
 — *lineata* (MG.) (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
 — *meigenii* (O. S.) (ALEXANDER, 1920).
 — *nigripila* (O. S.) (ALEXANDER, 1920).
 — *nodulosa* (MACQ.) (ALEXANDER, 1920).

- Ormosia nubila* (O. S.) (ALEXANDER, 1920).
 — *varia* (MG.) (ALEXANDER, 1920).
Erioptera (*Mesocyphona*) *caloptera* (SAY) (ALEXANDER, 1920;
 ROGERS, 1930).
 — (*Erioptera*) *chlorophylla* O. S. (ALEXANDER, 1920).
 — (*Erioptera*) *flavescens* (L.) (CUTHBERTSON, 1926 b).
 — (*Erioptera*) *fuscipennis* MG. (CUTHBERTSON, 1926 b).
 — (*Erioptera*) *lutea* MG. (ALEXANDER, 1920; BANGERTER, 1930).
 — (*Erioptera*) *megophthalma* ALEX. (ALEXANDER, 1920).
 — (*Erioptera*) *septentrionis* O. S. (ALEXANDER, 1920).
 — (*Erioptera*) *taenionota* MG. (CUTHBERTSON, 1926 b).
 — (*Erioptera*) *trivialis* MG. (CUTHBERTSON, 1926 b).
 — (*Erioptera*) *vespertina* O. S. (ALEXANDER, 1920; ROGERS, 1930).
Molophilus hirtipennis (O. S.) (ALEXANDER, 1920).
 — *obscurus* (MG.) (ALEXANDER, 1920).
 — *ochraceus* (MG.) (ALEXANDER, 1920).
13. Beneath leaf-mold, in rich, moist to saturated humus soil in woods.
Tipula cayuga ALEX. (ALEXANDER, 1920).
 — *caesia* SCHUMM. (ALEXANDER, 1920).
 — *dilatata* SCHUMM. (ALEXANDER, 1920).
 — *fulvipennis* DE GEER. (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
 — *hortensis* MG. (ALEXANDER, 1920).
 — *hortulana* MG. (ALEXANDER, 1920).
 — *lunata* L. (CUTHBERTSON, 1926 b).
 — *maxima* PODA (CUTHBERTSON, 1926 b).
 — *nigra* L. (ALEXANDER, 1920).
 — *nobilis* (LW.) (ALEXANDER, 1920).
 — *nubeculosa* MG. (ALEXANDER, 1920).
 — *ochracea* MG. (ALEXANDER, 1920).
 — *pabulina* MG. (ALEXANDER, 1920).
 — *paludosa* MG. (ALEXANDER, 1920).
 — *pruinosa* WIED. (ALEXANDER, 1920).
 — *scripta* MG. (ALEXANDER, 1920).
 — *selene* MG. (ALEXANDER, 1920).
 — *truncorum* MG. (ALEXANDER, 1920).
 — *unca* WIED. (ALEXANDER, 1920).
 — *variipennis* MG. (ALEXANDER, 1920).
 — *vittata* MG. (ALEXANDER, 1920).
Nephrotoma analis (SCHUMM.) (ALEXANDER, 1920).
 — *cornicina* (L.) (ALEXANDER, 1920).
 — *eucera* (LW.) (ALEXANDER, 1920).
 — *lineata* (SCOP.) (ALEXANDER, 1920).

- Nephrotoma lunulicornis* (SCHUMM.) (ALEXANDER, 1920).
 — *maculata* (MG.) (ALEXANDER, 1920).
 — *polymera* (LW.) (ALEXANDER, 1920).
 — *pratensis* (L.) (ALEXANDER, 1920).
Macromastix atridorsum ALEX. (ROGERS, 1927 d).
Limonia (*Limonia*) *flavipes* (F.) (ALEXANDER, 1920).
 — (*Limonia*) *nubeculosa* (MG.) (ALEXANDER, 1920; BARNES, 1924 a;
 CUTHBERTSON, 1926 b).
 — (*Limonia*) *secpunctata* (F.) (ALEXANDER, 1920).
 — (*Limonia*) *tripunctata* (F.) (ALEXANDER, 1920; CUTHBERTSON,
 1926 b).
 — (*Dicranomyia*) *autumnalis* (STAEG.) (CUTHBERTSON, 1926 b).
 — (*Rhipidia*) *maculata* MG. (CUTHBERTSON, 1926 b).
Dicranoptycha winnemana ALEX. (ALEXANDER, 1920).
Pedicia rivosa (L.) (CUTHBERTSON, 1926 b).
Adelphomyia nielsenii (KUNTZE) (CUTHBERTSON, 1926 b).
Pseudolimnophila ochracea (MG.) (CUTHBERTSON, 1926 b).
Limnophila (*Lasiomastix*) *macrocera* (SAY) (ALEXANDER, 1920).
 — (*Dicranophragma*) *fuscovaria* O. S. (ALEXANDER, 1920).
 — *nemorialis* (MG.) (CUTHBERTSON, 1926 b).
Lipsothrix remota (WALK.) (CUTHBERTSON, 1926 b).
Gonomyia (*Gonomyia*) *tenella* (MG.) (CUTHBERTSON, 1926 b).
Ormosia haemorrhoidalis (ZETT.) (CUTHBERTSON, 1926 b).
 — *uncinata* DE MEIJ. (CUTHBERTSON, 1926 b).
Erioptera (*Empeda*) *nubila* (SCHUMM.) (CUTHBERTSON, 1926 b).
 — (*Ilisia*) *maculata* MG. (ALEXANDER, 1920).
14. In wet to saturated decaying wood; in fermenting sap beneath
 bark.
Ctenophora angustipennis LW. (ALEXANDER, 1920).
 — *apicata* O. S. (ALEXANDER, 1920).
 — *festiva* MG. (ALEXANDER, 1920).
 — *flaveolata* F. (ALEXANDER, 1920).
 — *pectinicornis* (L.) (ALEXANDER, 1920).
Malpighia vittata (MG.) (ALEXANDER, 1920).
Dictenidia bimaculata BRULLÉ (ALEXANDER, 1920).
Tanyptera atrata (L.) (ALEXANDER, 1920).
 — *frontalis* (O. S.) (ALEXANDER, 1920).
 — *fumipennis* (O. S.) (ALEXANDER, 1920).
Macromastix (*Chlorotipula*) *albistigma* EDW. (ROGERS, 1927 d).

- Tipula flavolineata* MG. (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
 — *irrorata* MACQ. (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
 — *trivittata* SAY (ALEXANDER, 1920).
 — *truncorum* MG. (ALEXANDER, 1920).
 — *usitata* DOANE (ALEXANDER, 1920).
Brachypremna dispellens (WALK.) (ALEXANDER, 1920).
Limonia (Limonia) cinctipes (SAY) (ALEXANDER, 1920).
 — (*Limonia*) *globithorax* (O. S.) (ROGERS, 1930).
 — (*Limonia*) *macateei* (ALEX.) (ALEXANDER, 1920; ROGERS, 1930).
 — (*Limonia*) *macrostigma* (SCHUMM.) (ALEXANDER, 1920).
 — (*Limonia*) *quadrifasciata* (L.) (ALEXANDER, 1920).
 — (*Limonia*) *rara* (O. S.) (ALEXANDER, 1920; ROGERS, 1930).
 — (*Discobola*) *argus* (SAY) (ALEXANDER, 1920).
 — (*Discobola*) *caesarea* (O. S.) (ALEXANDER, 1920).
 — (*Dicranomyia*) *dumetorum* (MG.) (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
 — (*Rhipidia*) *bryanti* (JOHNS.) (ALEXANDER, 1920).
 — (*Rhipidia*) *ctenophora* (LW.) (LOEW, 1871).
 — (*Rhipidia*) *domestica* (O. S.) (ALEXANDER, 1920).
 — (*Rhipidia*) *fidelis* (O. S.) (ALEXANDER, 1920).
 — (*Rhipidia*) *uniseriata* (SCH.) (ALEXANDER, 1920).
Orimarga (Diotrepha) mirabilis (O. S.) (ROGERS, 1927 e).
Rhamphophila sinistra (HUTT.) (ALEXANDER, 1920).
Epiphragma fascipennis (SAY) (ALEXANDER, 1920).
 — *picta* (F.) (ALEXANDER, 1920).
 — *solatrix* O. S. (ALEXANDER, 1920).
Pseudolimnophila ochracea (MG.) (CUTHBERTSON, 1926 b).
Limnophila pallida BELING (ALEXANDER, 1920).
 — *unica* O. S. (ALEXANDER, 1920).
Alexandrella neozelandica TONN. (TONNOIR, 1926).
Atarba (Atarba) picticornis O. S. (ROGERS, 1927 c, 1930).
 — (*Atarba*) *viridicolor* ALEX. (ROGERS, 1927 c).
Elephantomyia (Elephantomyia) westwoodi O. S. (ALEXANDER, 1920; ROGERS, 1930).
Teucholabis (Teucholabis) complexa O. S. (ALEXANDER, 1920; ROGERS, 1930).
Gnophomyia luctuosa O. S. (ROGERS, 1930).
 — *tripudians* BERGR. (ALEXANDER, 1920).
 — *tristissima* O. S. (ALEXANDER, 1920; ROGERS, 1930).
Styringomyia crassicauda (SPEIS.) (EDWARDS, 1924).

15. In decaying plant material, as stems, fruit, inflorescence, in various stages of putrefaction (as *Musa*, *Colocasia*, *Eugenia*, *Hornstedtia*, etc.).
Limonia (Limonia) indigena (O. S.) (ALEXANDER, 1920).
 — (*Libnotes*) *greenwoodi* ALEX. (ALEXANDER, 1924).
 — (*Libnotes*) *perkinsi* (GRIMS.) (ALEXANDER, 1920).
 — (*Libnotes*) *stantoni* (EDW.) (this report).
 — (*Rhipidia*) *domestica* (O. S.) (ALEXANDER, 1920).
 — (*Rhipidia*) *maculata* (MG.) (ALEXANDER, 1920).
Trentepohlia (Mongoma) pennipes (O. S.) (ALEXANDER, 1920).
Gnophomyia jacobsoni ALEX. (ROGERS, 1927 b).
Styringomyia didyma GRIMS. (ALEXANDER, 1920).
 — *ingrami* EDW. (MACFIE and INGRAM, 1923; EDWARDS, 1924).
 — *obscuricincta* EDW. (MACFIE and INGRAM, 1923; EDWARDS, 1924).
 16. In fungi, woody or fleshy, often in advanced stages of decay; in fungous mycelia permeating wood.
Limonia (Limonia) bifasciata (SCHR.) (ALEXANDER, 1920; CUTHBERTSON, 1926 b).
 — (*Limonia*) *cinctipes* (SAY) (ALEXANDER, 1920).
 — (*Limonia*) *decem-maculata* (LW.) (ALEXANDER, 1920).
 — (*Limonia*) *globithorax* (O. S.) (ROGERS, 1930).
 — (*Limonia*) *macateei* (ALEX.) (ROGERS, 1930).
 — (*Limonia*) *quadrifasciata* (L.) (ALEXANDER, 1920).
 — (*Limonia*) *rara* (O. S.) (ROGERS, 1930).
 — (*Limonia*) *trifasciata* (O. S.) (ROGERS, 1930).
Ula bolitophila LW. (ALEXANDER, 1920).
 — *elegans* O. S. (ALEXANDER, 1920).
 — *macroptera* (MACQ.) (ALEXANDER, 1920).
 17. In organic matter in nests of birds and mammals.
Tipula fuliginosa SAY (ALEXANDER, 1920).
Cheilotrichia imbuta (WIED.) (DE MEIJERE, 1920).
 18. Feeding on the leaves of terrestrial higher plants and mosses.
Cylindrotoma distinctissima (MG.) (ALEXANDER, 1920; LENZ, 1921).
 — *splendens* DOANE (ALEXANDER, 1920).
Liogma glabrata (MG.) (ALEXANDER, 1920).
 — *nodicornis* (O. S.) (ALEXANDER, 1920).
 19. Leaf-miners.
Limonia (Dicranomyia) foliocuniculator (SWEZ.) (ALEXANDER, 1920; IMMS, 1928).

20. In dry moss-cushions.

Dolichozepe (Orozepe) obscura (JOHNS.) (ALEXANDER, 1920; ROGERS, 1930).

21. In relatively dry soil.

Habromastix hilli ALEX. (WILSON, 1929).

Tipula apterogyne PHIL. (REED, 1929).

— *arctica* CURT. (ALEXANDER, 1920).

— *bicornis* FORBES (ALEXANDER, 1920).

— *dorsimacula* WALK. (ALEXANDER, 1920, as *angustipennis*).

— *graminivora* ALEX. (PACKARD and THOMPSON, 1929).

— *luteipennis* MG. (ALEXANDER, 1920).

— *ochracea* MG. (ALEXANDER, 1920).

— *oleracea* L. (ALEXANDER, 1920; CUTHBERTSON, 1926 b).

— *pagana* MG. (CUTHBERTSON, 1926 b).

— *paludosa* MG. (ALEXANDER, 1920; CUTHBERTSON, 1926 b).

— *pruinosa* WIED. (ALEXANDER, 1920).

— *quaylii* DOANE (PACKARD and THOMPSON, 1921, 1929).

— *simplex* DOANE (PACKARD and THOMPSON, 1921, 1929).

— *subnodicornis* ZETT. (ALEXANDER, 1920).

— *truncorum* MG. (ALEXANDER, 1920).

— *umbrosa* LW. (ALEXANDER, 1920).

Nephrotoma ferruginea (F.) (ALEXANDER, 1920).

— *maculata* (MG.) (CUTHBERTSON, 1926 b, as *maculosa*).

Dicranoptycha winnemana ALEX. (ALEXANDER, 1920).

— sp. (ROGERS, 1930).

Cladura flavoferruginea O. S. (ALEXANDER, 1920, 1922).

II. GENERA AND SUBGENERA OF TIPULIDAE IN THE SUNDA FAUNA.

In order to properly appreciate and evaluate the large collections of crane-fly larvae examined at this time, it became necessary to know exactly what genera of Tipulidae were to be found in the area. In the following list are recorded the genera and subgenera so far recorded from Sumatra, Java and Bali, with a smaller supplementary list of the additional groups known from the Malay Peninsula to the west, and from Borneo to the north and east.

Sumatra, Java, Bali.

Tipulinae:

Prionota v. D. W.

Pselliophora O. S.

Ctenacroscelis END.

Tipulodina END.

Tipula L.

Nephrotoma MG.

Sphaerionotus DE MEIJ.

Megistocera WIED.

Scamboneura O. S.

Dolichozepe — *Nesozepe* ALEX.

Cylindrotominae:

Stibadocera END.

Stibadocerella BRUN.

Limoniinae:

Lechriini:

Lechria SKUSE

Limoniini:

Limonia — *Limonia* MG.

— *Libnotes* WESTW.

— *Geranomyia* HAL.

— *Dicranomyia* STEPH.

— *Rhipidia* MG.

— *Alexandriaria* GARRETT

— *Thrypticomomyia* SKUSE

— *Euglochina* ALEX.

— *Pseudoglochina* ALEX.

— *Goniodineura* v. D. W.

— *Idioglochina* ALEX.

Helius — *Helius* ST. F.

— *Eurhamphidia* ALEX.

— *Rhampholimnobia* ALEX.

Orimarga — *Orimarga* O. S.

Antocha — *Antocha* O. S.

— *Orimargula* MIK

Pediciini:

Nipponomyia ALEX.

Hexatomini:

Adelphomyia BERGR. (*Oxydiscus* DE M.)

Ula HAL.

Epiphragma — *Epiphragma* O. S.

Pseudolimnophila ALEX.

Limnophila — *Limnophila* MACQ.

— *Dicranophragma* O. S.

Pilaria SINT.

Eriocera MACQ.
Elephantomyia — *Elephantomyodes* ALEX.
Atarba — *Atarba* O. S.

Eriopterini:

Clydonodozus END.
Conosia v. D. W.
Teucholabis — *Teucholabis* O. S.
Gymnastes BRUN.
Gonomyia — *Gonomyia* MG.
— *Lipophleps* BERGR.
— *Ptilostena* BERGR.
— *Ptilostenodes*, subgen. n.
Trentepohlia — *Trentepohlia* BIG.
— *Paramongoma* BRUN.
— *Anchimongoma* BRUN.
— *Mongoma* WESTW.
— *Plesiomongoma* BRUN.
Gnophomyia O. S.
Rhabdomastix — *Rhabdomastix* SKUSE
Cryptolabis — *Baeoura* ALEX.
Erioptera — *Erioptera* MG.
— *Ilisia* ROND.
— *Empeda* O. S.
Molophilus CURT.
Styringomyia LW.
Toxorhina — *Ceratocheilus* WESCHÉ.

Additional elements in the Malay Peninsula and
Borneo.

Tipulinae:

Prionocera LW.
Dolichopeza — *Mitopeza* EDW.

Limoniinae:

Limoniini:

Limonia — *Discobola* O. S.
— *Laosa* EDW.
Orimarga — *Diotrepha* O. S.

Pediciini:

Dicranota — *Amalopina* BRUN.

Hexatomini:

Epiphragma — *Polyphragma* ALEX.
Troglophila BRUN.
Limnophila — *Ephelia* SCHIN.
Elephantomyia — *Elephantomyia* O. S.

Eriopterini:

Lecteria O. S.
Gonomyia — *Progonomyia* ALEX.
Tasiocera SKUSE
Toxorhina — *Toxorhina* LW.

III. RESULTS OF THE GERMAN SUNDA EXPEDITION.

Tipulidae.

Tipulinae.

Tipulodina pedata (WIED.).

1821. *Tipula pedata* Wiedemann, Dipt. exot., 1: 23.

1915. *Tipula pedata* Alexander, Proc. U. S. Nat. Mus., 49: 183-185.

West Java, Buitenzorg, Botanical Gardens, in tree-holes, pupa, September 19, 1928, No. FBb; at light, adults, September 15, 1928, No. FBd.

Supplementary notes on the pupa: Total length, 30 mm; breathing horns, 7 mm.

DE MEIJERE (Tijdschr. v. Ent., 54: 64; 1911) has described the cast pupal skin of a *Tipulodina*, determined by him as being *pedata*. I feel relatively certain of the identity of the specimen discussed herewith and the explanation of the marked differences found in the DE MEIJERE material would be that a different species is represented, the most conspicuous difference being in the length of the breathing-horns (11 mm).

Pronotal breathing horns relatively short, subterete, gradually narrowed outwardly, the yellow tips expanded. Mesonotum with the surface conspicuously reticulate with blackened lines, these chiefly transverse, connected with small complete cross-lines or spurs. Scutellum and postnotum with a transverse series of small setae, the latter with additional weak spinous tubercles. Abdomen (Fig. 1) with a series of tubercles on posterior ring before the margin, these tubercles chiefly bifid at tips and bearing a small seta; other spines are simple, with additional isolated setae; basal ring unarmed. Pleural region with a single tubercle on each ring. Abdominal sternites with four spinous tubercles on posterior ring, these widely separated in pairs on the third segment, becoming approximated, larger and more powerful

on the outer segments; on the two subgenital segments with an additional tiny spine at mid-distance of the row. More basad on the same ring with a small tubercle, with a delicate seta immediately laterad. Genital segment surmounted by very powerful spines, as figured (Fig. 2).

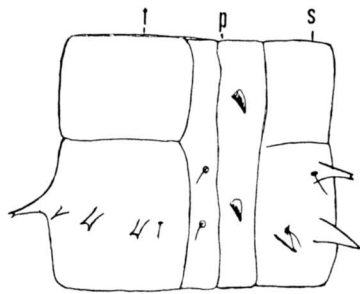


Fig. 1.



Fig. 2.

Tipulini No. 1 *Tipulodina* supposition.

West Java, Tjibodas, 3rd waterfall of Tjibóróm, July 9, 1929, nearly grown larvae, No. Y 11; fully grown larvae, July 10—14, 1929, Nos. Fy 7 f and Fy 7 m, Kali Tjiwalen, between leaves.

Large larvae that are referred to this genus with little question. Length, 50—60 mm. In general appearance not unlike *Tipula abdominalis* (SAY). Spiracular disk (Fig. 3) surrounded by six unequal, nearly cylindrical lobes. Dorsal pair shortest, blunt, the caudal face on basal half with a blackened streak. Lateral lobes stoutest, tipped with a brush of short black setae that extend basad in a longitudinal area and a single long sinuous seta; on dorsal margin at base with a small blackened tubercle, basad of which, between the dorsal and lateral lobes lies a group of two similar black tubercles. Ventral lobes longest, most slender, with two lines of short blackened setae, the tip with a similar brush of short dense setae and about three more elongate bristles; a black tubercle on outer face of lobe near base. Spiracles relatively small, elevated above the floor-level of the chamber, separated by a distance about equal to 3.5 the diameter of one. Anal gills six, paler than the ground-color, all simple, but unequal in size, the most caudad shortest, the outer of the cephalic two longest.

It should be noted that the blackening on the faces of the lateral and ventral lobes of the spiracular disk is caused by short dense setae and not the polished black attachment plates for muscles as in many *Tipula* spp. The corresponding setae of the dorsal lobes are very short and do not form a distinct line as on the other lobes.

The Kali Tjiwalen material included several small larvae with the fully-grown individuals, probably indicating a prolonged period of emergence for the species rather than a long duration of the larval stage.

Other material referred to *Tipulodina*, supposition.

FT 16. North Sumatra, Brook south of Balige on L. Toba, April 16, 1929, waterfall; two cast pupal skins.

FF 4 g West Sumatra, L. Singkarak, littoral on stones, March 4, 1929.

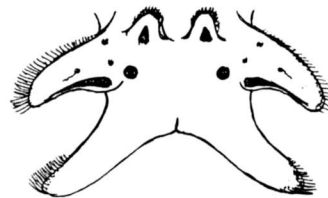


Fig. 3.

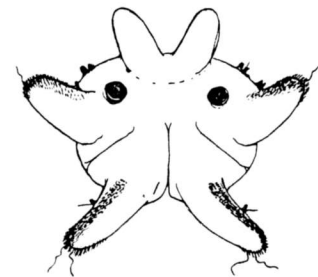


Fig. 4.

Tipulini No. 6.

Almost as in Tipulini No. 1, but with the features of the spiracular disk (Fig. 4) even more accentuated. Dorsal lobes very reduced, the ventral lobes correspondingly lengthened. Mesal face of dorsal and lateral lobes lined with a blackened chitinized plate. Lateral and ventral lobes with conspicuous fringes of setae on outer face, extending from tip basally, more extensive on the lateral lobes; lateral lobes on dorsal and caudal face with three small blackened setiferous areas. Spiracles very small, more widely separated than in Tipulini No. 1, placed at base of lateral lobes. Anal gills very small, simple, placed immediately cephalad of the ventral lobes of the disk.

FF 15 a West Sumatra, chalk wells of Panjinggahan on L. Singkarak, on spattered tufa walls and leaves.

A cast pupal skin in very poor condition.

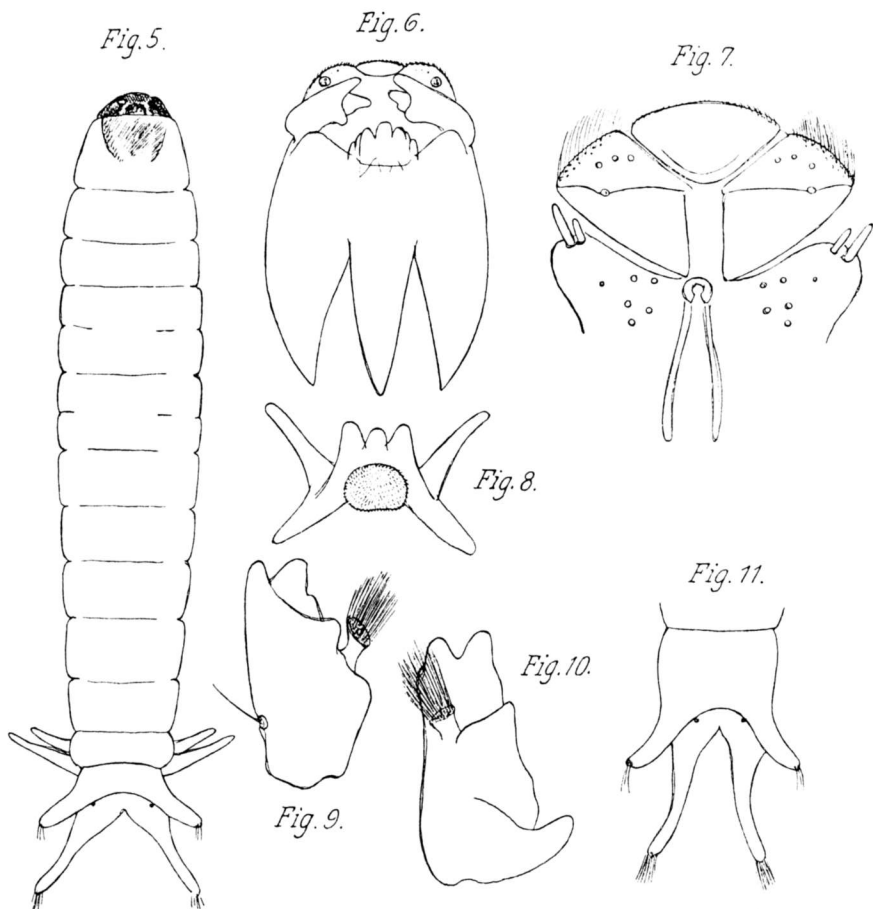
R 25 g South Sumatra, Ranau, woodland brook, January 29, 1929; larva.

The reference of the above unreaired larvae and pupae to *Tipulodina* is provisional. The general appearance is much as in *Longurio* LOEW and allies, except that the anal gills are simple.

Tipulini No. 7.

FY 7 e West Java, Tjibodas, Kali Tjiwalen, in moss, July 10, 1929. Several small larvae, possibly not fully grown. Length 6 mm.

Form (Fig. 5) stout. General coloration dirty-white, with a relatively heavy microscopic pubescence. Head capsule (Fig. 6) compact. Mandibles (Figs. 9, 10) of the herbivorous type, with two subequal obtuse teeth, in addition to other smaller denticles; prosthecal lobe long and conspicuous, capitate at apex and here with a brush of long



setae that are much longer than the lobe itself. Mental plate with about seven low and obtuse teeth. Hypopharynx (Fig. 8) tridentate. Spiracular disk (Fig. 11) with only four lobes, the lateral pair much shorter, (approximately one-half the length of the ventral pair), with a few short setae at apex; ventral lobes similarly tipped with relatively short setae. Spiracles reduced to microscopic points, non-functional, placed at base of each lateral lobe and hence widely separated. Anal gills four in number, simple, without constrictions, the caudal pair a trifle longer than the cephalic ones.

The identity of this remarkable larva is still in question. It is very probably an aberrant Tipuline form and would run to this subfamily by my key to the larvae of the subfamilies of Tipulidae (ALEXANDER, 1920: 792). However, the general features of the lobes surrounding the spiracular disk are very peculiar and quite different from any described Tipuline form, being closer to the type found in the Hexatomini, as *Eriocera*. The only Tipulini known to me which could possibly lead to this particular type of structure is the present group that is tentatively referred to *Tipulodina* and I am therefore considering this larva at this point of the report. The great reduction in size of the spiracles is most noteworthy and presages the total disappearance of these organs in other allied species. Such a condition would approximate that found in *Antocha* where an unknown species from western North America was described by MALLOCH (Illinois St. Nat. Hist. Bull. 12: 236—237; 1917) as having vestigial spiracles, while all other allied species in both the typical subgenus and in *Orimargula*, where the larva has been discovered, entirely lack these organs.

Ctenacroscelis umbrinus (WIED.).

1828. *Tipula umbrina* Wiedemann, Aussereur. zweifl. Ins., 1: 49.

West Sumatra, Huta Nopan, between Fort de Kock and Sibolga, April 28, 1929, at light, an adult ♀; FT 20.

South Sumatra, Musi Region, Tjurup, May 6, 1929, at light, three females; FM 7 f. Ranau Region, January 1929, one male, flying.

East Java, Ranau Lamongan, mossy walls of a principal inlet to lake, a male, with cast pupal skin; L 6 a.

Ctenacroscelis supposition.

Several larvae of various sizes were taken that are referred with much confidence to various species of *Ctenacroscelis*. Brief accounts of these are given:

Tipulini No. 2. *Ctenacroscelis* supposition.

North Bali, waterfall at Ljemampoh on Batur, altitude about 1100 meters, in moss, June 22, 1929; FZ 6.

A large larva (Length 25 mm). Body covered with long appressed black hairs that almost conceal the grayish yellow integument. Spiracular disk (Fig. 12) with the six lobes relatively slender, the dorsal pair a little shorter; all lobes light yellow, with a capillary black line, on the dorsal and ventral lobes lying near the mesal margin, on the lateral lobes occupying the ventral margin. In addition, the ventral lobe has a small circular blackened area at apex, surrounding small

sensory setae, with a brown line extending down the central portion of the lobe for about one-half the length. A small, hour-glass shaped mark ventrad of each spiracle. Spiracles very large, separated from one another by a distance about equal to the central nuclear portion of each; margin paler than this central or nuclear portion, very wide. Anal gills six, widely separated on either side into groups of three, of which the median one is shorter than the others.

Tipulini No. 3. *Ctenacroscelis* supposition.

Central Java, Dieng Plateau, altitude about 2000 meters, Spring run into Seraju Brook, June 6, 1929; FD 8.

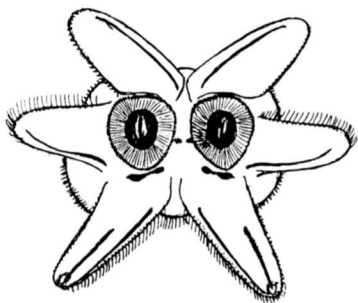


Fig. 12.

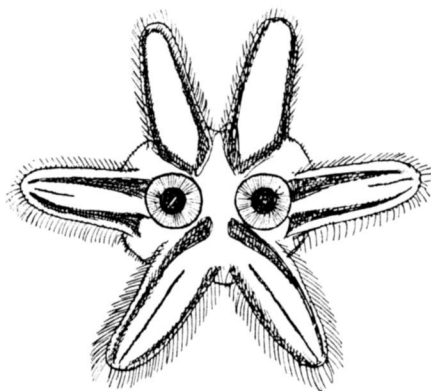


Fig. 13.

A medium-sized to large larva, very similar in general appearance to Tipulini 2, differing as follows:

Hairy covering of the integument much shorter and less conspicuous. Lobes surrounding the spiracular disk generally similar, lined with narrow black streaks. Spiracles large, but smaller than in No. 2, separated from one another by a distance about equal to the width of one.

Tipulini No. 4. *Ctenacroscelis* supposition.

South Sumatra, Ranau, bamboo tops in forest, January 28, 1929; FR 11 a, pupa, apparently of a *Ctenacroscelis*, very poorly preserved. FR 11 b, two larvae, one nearly grown.

Larva. The fully-grown larva measures about 25 mm. when fully extended. Body-integument nearly smooth, provided with very delicate, suberect setulae, with a few additional elongate setae. Spiracular disk (Fig. 13) with the six lobes relatively long and slender, the ventral pair a little longer, the others subequal. All lobes with a brown clouding along margins, on dorsal pair converging and confluent on each end

and so encircling the lobe; lateral lobes with the areas more expanded at proximal ends adjoining the spiracles, but not approximated; in addition, there is a small line down central portion of lobe back from tip. Ventral lobes with the lines heavier, especially the lateral line which is expanded ventrad of the spiracle; an additional central line extends almost the whole length of the lobe. All lobes with fringes of long delicate setae on both margins. Spiracles relatively large, separated from one another by a distance a little less than their diameter, the central portion black, the ring pale chestnut-brown. Gills only four in number, small and simple, the caudal pair of gills a little more elongate.

Other specimens referred to *Ctenacroscelis*, supposition.

East Java, Ranu Lamongan, on damp walls of outlet from lake, October 16, 1928; FL 17. Very much like Tipulini No. 4 but with a rudimentary trace of a third pair of gills.

Central Java, near L. Ngebel, December 23, 1928; N 12.

Close to Tipulini No. 4, but probably representing a distinct species, the black lined pattern of the spiracular disk being heavier and more conspicuous.

East Java, Sarangan, on Lawu, waterfall of Kali Pagergede, altitude about 1410 meters, December 9, 1928; S 8.

East Java, Ranu Lamongan, on mossy walls of chief inlet of lake; October 21, 1928; L 6 a.

West Sumatra, Padang Bovenland, Singkarak, woodland brook on Subangpass, March 4, 1929; F 20.

Nephrotoma scurroides (DE MEIJ.).

1904. *Pachyrrhina scurroides* de Meijere, Bijd. tot de Dierkunde, 17: 90; Tijd. voor Ent., 54: 75-76, 1911.

Central Java, Sarangan, at light, adult female, December 18, 1928; FS 12. Dieng Plateau, altitude about 2000 meters, along Seraju brook, June 2, 1929; FD 1.

Dolichopeza (Nesopeza) gracilis DE MEIJ.

1911. *Dolichopeza gracilis* de Meijere; Tijd. voor Ent., 54: 60-61.

North Sumatra, Toba, brook south of Balige, April 1, 1929; a few adult flies of both sexes.

Miscellaneous Tipulini Larvae, not further determinable.

Tipulini No. 5.

South Sumatra, Wai Negri, a woodland brook, January 22, 1929; R 5.

Body subglabrous but with definitely arranged black setae on the segments. Lobes surrounding the spiracular disk elongate, especially the ventral pair, all lobes delicately lined with brown, the dorsal pair with two such lines, the ventral lobes with a single evident capillary black vitta. Two black dots ventrad of each spiracle. Spiracles small, separated from one another by a distance nearly equal to twice the diameter of one. Anal gills simple, apparently only four in number but very large and conspicuous.

South Sumatra, Ranau, Ajer Pisuap, woodland brook, on damp tufa walls, January 22, 1929; FR 4.

East Java, Ranu Pakis, a young larva in spring moss on north bank, November 15, 1928; L 15 h. A cast pupal skin, without the emerged adult, from water-filled bamboo-trunk in woods, October 22, 1928; L 13.

Bali, Baturiti brook, a half-grown *Tipula* larva of normal appearance, June 14, 1929; FZ 3 a.

Limoniinae.

Limoniini.

Genus *Limonia* MEIGEN.

The present writer (ALEXANDER, Philippine Journ. Sci. 40: 239—246; 1929) has indicated the necessity of reducing in value many of the genera that center about *Limonia*. As a result, about a score of the names formerly held as valid genera are now considered as being of not greater than subgeneric value. The plasticity of the characters available for separation of the adult flies has been discussed in the paper cited and it may be here affirmed that it is even more difficult to find suitable characters for the definition of these groups in the larvae and pupae. In the present collection, in addition to a number of reared species in the subgenera *Libnotes*, *Geranomyia* and *Dicranomyia*, there was included a large number of unreared larvae whose position in subgenera can be only surmised. These are discussed at the end of the section on the genus *Limonia*.

Subgenus *Libnotes* WESTWOOD.

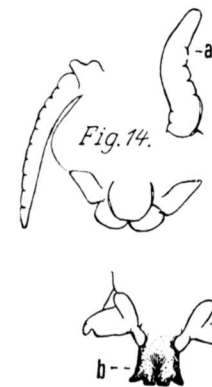
Limonia (Libnotes) stantoni (EDW.).

1916. *Libnotes stantoni* EDWARDS, Ann. Mag. Nat. Hist., (8) 17: 354—355.

Bali, Padangombo brook, above Tamantanda at Baturiti, altitude about 1100 meters, on wild Pisang, June 14, 1929; FZ 1 b.

One bred female that I am referring to *stantoni* as a variety.

Pupa. The cast skin shows the following characters: Pronotal breathing horns (Fig. 14 a) dark chestnut-brown, elongate, curved, gradually narrowed to the obtuse tips. Intermediate abdominal segments with transverse bands of microscopic setae, narrowly bordered by a clear line, the areas becoming smaller in size on the outer segments. On the sternites, these areas are somewhat similarly developed but the first is interrupted by the leg-sheaths, appearing as a small area on either side opposite the ends of the basitarsi. Leg-sheaths with the tips of the tarsi forming the usual blunt V in outline, the fore tarsi longest, the others gradually shortened. Genital sheaths as figured (Fig. 14 b), the tergal valves shorter than the sternal valves, the latter with conspicuous lateral lobules; on sides of the genital sheaths with conspicuous pale brown lobes, directed laterad.



One further adult male of this species, Central Java, Sarangan on Lawu, December 1928, at light (THIENEMANN).

What I consider to be the larvae of a *Libnotes*, presumably of this same or an allied species, is here discussed.

Bali, Baturiti, in and on *Colocasia antiquorum* (Araceae), June 4, 1929; Z 4, including several larvae of different sizes.

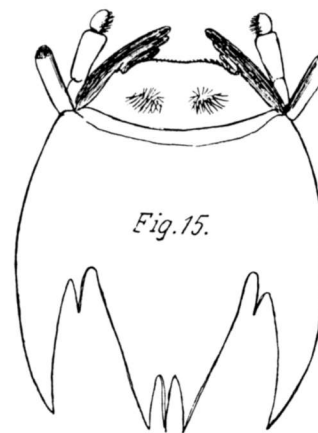


Fig. 16.

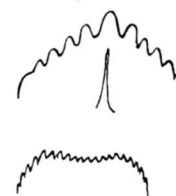


Fig. 17.



Fig. 18.

Length, when fully grown, 20 mm. Body terete, color in preserved specimens, white. Dorsal surface of abdomen with eight median creeping welts. Ventral surface with similar areas, the posterior six more protuberant. Head-capsule (Fig. 15) massive. Mentum (Fig. 16) deeply

split behind, with about nine teeth, the outermost pair broad and representing two subobsolete denticles. Hypopharynx with the caudal margin of the plate (Fig. 17) gently convex, the margin with twenty teeth, those along the concave median portion a little broader. Anal gills forming a protuberant mass, without distinct lobes. Spiracular disk (Fig. 18) with four evident blunt lobes, all bearing a small triangular dark spot near apex. Spiracles irregular in outline, the dorsal end narrower than the ventral end, the central nuclear portion small, the margin correspondingly widened; spiracles obliquely placed in the disk, at the narrowest point separated by a distance a little less than the long diameter of one.

I have little doubt of the correctness of this reference to *Libnotes*. The other species whose larval habits are at all known are *L. (L.) perkinsi* (GRIMS.), living in damp moss, in decaying vegetation, and in the accumulation of debris behind the old leaf-sheaths of banana plants (*Musa*, Scitamineae). *L. (L.) greenwoodi* (ALEX.) has been reared in Fiji from fruits of *Eugenia malaccensis* (Myrtaceae), presumably in an advanced stage of decay, the total length of the larval and pupal stages from egg to emergence of adult being not less than 17 days.

The presence of four blunt but distinct lobes surrounding the spiracular disk makes it impossible to run the present species to the tribe Limoniini in the author's key to the tribes of crane-fly larvae (ALEXANDER, 1920: 795, couplet 20). All other members of *Limonia*, s. l., known to me have the spiracular disk without distinct lobes or with three more or less developed blunt lobes.

Limonia (Libnotes) immaculipennis (S.-W.).

1911. *Libnotes nervosa* de Meijere; Tijds. voor Ent., 54: 36—37 [nec *Limonia (Libnotes) nervosa* de Meij.] Ibid., 54: 26, 1911.

1922. *Libnotes immaculipennis* Sen.-Wh., Mem. Dept. Agr. India, 7: 132—133.

South Sumatra, Wadi Kuala, outlet of L. Ranau, January 19, 1929, on drift wood; FR 1 h, one adult male.

There has been an unfortunate confusion in the synonymy of this and related flies. DE MEIJERE (1911) applied the same specific name, *nervosa*, to two species of Tipulidae that are now known to fall in *Libnotes*. EDWARDS recognized this homonymy (Journ. Fed. Malay St. Mus., 14: 78; 1928) but through an error re-named the first of these species (*Dicranomyia nervosa* DE MEIJ., 1911: 26) instead of the second and preoccupied name. I am therefore using the term *immaculipennis* S.-W. for this second species as being the next name that is certainly available. EDWARDS (l. c., p. 85) would also place *L. (L.) parvistigma* (ALEX.) in this synonymy but this fly, which would

furnish the available name for the species, has nothing in common with this particular group of *Libnotes*.

Subgenus *Geranomyia* HALIDAY.

At the date of publication of my summary of crane-fly biology (ALEXANDER, 1920), the life-history of a single species of this abundant and wide-spread group of crane-flies had been made known. *L. (G.) canadensis* (WESTW.) was found living on the face of rock exposures, crawling about among the growth of algae and diatoms (ALEXANDER and MALLOCH, 1920). Since that date, a number of additional species have been discussed, these being eminently characteristic of the hygropetric association.

L. (G.) rostrata (SAY) has been described in detail by ROGERS (1927 a). The immature stages occur in great numbers living in wet mosses, among the thalli of liverworts, and in mats of filamentous algae on wet rocks and shaded seepage areas. Other individuals were found breeding in thin mats of algae and among diatomaceous sludge on limestone rocks over which trickle small rills and cascades. BANGERTER (1929) found the larvae of *L. (G.) maculipennis* (MIK) living among saturated mosses on wet banks of streams, associated with *L. (Dicranomyia) trinotata* (MG.). ROGERS (1930) found larvae and pupae of *L. (G.) diversa* (O. S.) in and beneath thick mats of dripping algae that grow on wet spots of shaded cliffs. The larvae inhabit rather thick, slimy, gelatinous tubes that are buried in the algae and sludge. Two species of the subgenus, *L. (G.) bezzii* (A. & L.) (SEURAT, 1924) and *L. (G.) unicolor* (HAL.) (SAUNDERS, 1930) are marine. *L. (G.) argentiifera* (DE M.) and *L. (G.) fletcheri* (EDW.) have habits that are generally similar to the above and it may be confidently expected that the majority of all species of *Geranomyia* will be found to spend their early stages in habitats such as above described.

Limonia (Geranomyia) argentiifera (DE MEIJ.).

1911. *Geranomyia argentiifera* de Meijere; Tijds. voor Ent., 54: 29.

Central Sumatra, Danau di Atas, south of Singkarak, altitude about 1520 meters, March 17, 1929, on stones of a spring; FF 20 i, one adult male with fragments of cast pupal skin; larva in moss of the same situation.

The cast pupal skin is in very poor condition, consisting only of the head and thorax, badly disrupted. The pronotal breathing horns are peculiar and apparently distinctive (Fig. 19). They are relatively long, subcylindrical to flattened, the surface dusky, with abundant transverse wrinkles, at apex with a paler glabrous head, shaped about as figured.

It is virtually certain that this fly is the one to which WIEDEMANN applied the name *sorbillans* (Aussereur. zweifl. Ins., 1: 551; 1828). Through the kind interest of Dr. HANS ZERNY I was able to examine the unique type of *sorbillans* in 1921. A few additional notes on this specimen may be given:



Fig. 19.

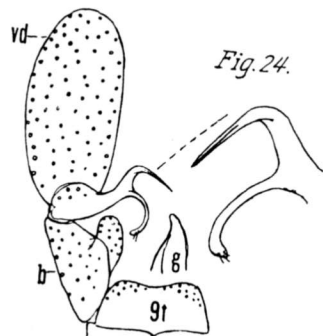


Fig. 24.



Fig. 20.

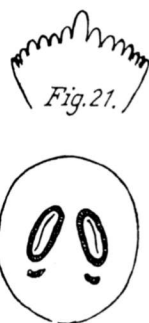


Fig. 21.



Fig. 23.



Fig. 22.

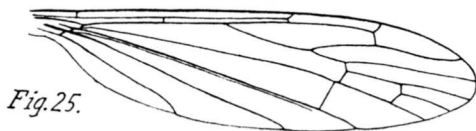


Fig. 25.

Sex female. One wing and the apex of the rostrum lost; thorax badly eaten by insect pests. Rostrum dark brown, the part that remains longer than the combined head and thorax. Head with the anterior part of vertex with a silvery white appressed pubescence. Legs with the femora light brown, tibiae and tarsi darker brown. Wings subhyaline, the brown stigma small and ill-defined; veins dark brown. Venation: Sc long, Sc_1 ending almost opposite the end of Rs , Sc_2 some distance from its tip, Sc_1 alone about twice $r-m$; Rs straight, in alignment

with the basal section of R_{4+5} , the latter about one-half Rs ; R_2 and free tip of Sc_2 in approximate alignment; cell 1st M_2 closed, long and narrow, slightly widened distally; m about one-half the outer deflection of M_3 ; $m-cu$ at two-fifths the length of cell 1st M_2 . Abdominal tergites light brown, the sternites paler; ovipositor yellowish horn-color.

By DE MEIJERE's key to the species of *Geranomyia* of the East Indian islands (1911), *sorbillans* runs directly to *argentiifera* and it is almost certain that the two are the same. However, since the type is a female in such poor condition, it does not seem advisable to change a well-established name in a group of the subgenus that is now known to include several species in the Oriental Region.

Limonia (Geranomyia) feuerborni sp. n.

Size and general appearance much as in *fletcheri* (Edw.) but the male hypopygium very different.

Rostrum elongate, black. Mesonotum chiefly dark brown, the humeral and lateral regions of the praescutum brightened. Pleura variegated yellow and brown. Halteres darkened. Wings (Fig. 25) strongly suffused with brown, cells C and Sc darker brown, nearly as intense in color as the stigma; a very small brown spot at origin of Rs and narrow, scarcely evident dark clouds along the cord; wing-tip narrowly darkened. Venation: Sc long, Sc_1 ending at about four-fifths the length of Rs , Sc_2 at its tip; a supernumerary crossvein in cell Sc at near two-thirds the length of R ; $m-cu$ before the fork of M .

Abdominal tergites dark brown, the sternites paler. Male hypopygium (Fig. 24) with the ninth tergite, $9t$, transverse, the caudal margin gently emarginate, each lateral portion with about a dozen setae. Basistyle, b , small, the ventro-mesal lobe small, directed chiefly caudad. Dorsal dististyle lacking. Ventral dististyle, vd , a very large fleshy lobe; rostral prolongation long and slender, the outer margin of the basal half produced into a flattened yellowish tubercle that gradually narrows into a long apical spine, this with indications of a suture down its face and so presumably representing a fusion of the two normal spines.

Hab. Sumatra, Java.

Holotype, alcoholic ♂, Sarangan, Mt. Lawu, Central Java, altitude about 1410 meters, December 8, 1928.

Allotype, alcoholic ♀, Lake Toba, south of Balige, North Sumatra, April 1-4, 1929; FT 3 b, FT 16.

Paratypes, numerous specimens of both sexes, with the allotype.

The type of this and other novelties discussed in the present report are preserved in my collection.

The same insect is represented in material before me by a female from Soempoer, Sumatra, collected by Dr. S. L. BRUG, and kindly sent to me by Mr. EDWARDS as *sorbillans*. The identity of this species is discussed under the account of the preceding species. I take great pleasure in naming this fly in honor of the collector of most of the specimens, Dr. H. J. FEUERBORN. The most distinctive single feature of the species is the loss of the dorsal dististyle.

Limonia (Geranomyia) fletcheri (EDW.).

1911. *Geranomyia fletcheri* EDWARDS, Ann. Mag. Nat. Hist., (8) 8: 60–61.

1911. *Geranomyia genitalis* BRUNETTI, Rec. Indian Mus., 6: 275.

North Sumatra, Toba, brook southeast of Balige, at waterfall, April 8, 1929; FT 13.

East Java, Ranu Lamongan, on damp walls of outlet to lake, October 11, 1928; FL A 7.

Larva. Fully-grown, length 15 mm. General coloration dirty white, the dorsal surface with a scurfy arrangement of microscopic setae that form delicate transverse lines. Ventral creeping welts conspicuous. Cephalic margin of sternal region of both mesothorax and metathorax with a transverse band of microscopic recurved setae, these bands twice interrupted to form a broad median area and somewhat shorter and narrower lateral ones. First abdominal segment with a shorter and narrower but otherwise similar transverse area. Abdominal segments two to seven with large welt-like areas of setulae at the incisures. Subterminal segment with a narrower but longer similar welt that extends across the dorsum as a delicate transverse line. The larger ventral welts are discontinuous with similar lines on the tergites.

Mandibles (Fig. 22) broadly flattened, with about five major denticles. Mentum (Fig. 21) with seven lateral teeth on either side of the large median tooth.

Spiracular disk (Fig. 23) without lobes, the long-oval spiracles placed longitudinally and slightly obliquely in the chamber, their dorsal portions closest together. As frequent in this tribe, the spiracles are evidently capable of being applied to one another when the chamber is closed. Immediately ventrad of each spiracle a small brown spot. Anal gills four, pale, indistinctly three-segmented.

Pupa. Described briefly from the cast pupal skin. The breathing-horns (Fig. 20) are generally as in *argentiifera* differing in the details, being generally club-shaped, the base narrow, the apex subtruncated and more or less divided. A longitudinal series of pale papillae along the dorsal surface of the horn.

Limonia (Geranomyia), sp.

A species not further identifiable, from Sarangan, Central Java, December 11, 1929, taken at the waterfall above Telogo Wurung; FS 10; one female. What appears to be still another species but not further identifiable is from Ranu Lamongan, East Java, October 18, 1928; FL Zbm, from the hygropetric association.

Subgenus *Dicranomyia* STEPHENS.

As was the case with the last subgenus, *Geranomyia*, the known members of *Dicranomyia* are chiefly subaquatic, with several species in the hygropetric association, including two species discussed at this time.

Limonia (Dicranomyia) punctulata (DE MEIJ.).

1911. *Dicranomyia punctulata* DE MEIJERE; Tijds. voor Ent., 54: 26.

Central Sumatra, Padang Bovenland, chalk springs on Panjinggahan, Lake Singkarak, on sprayed tufa walls and leaves, March 6, 1929; FF 15 a. Lake Singkarak, littoral on stones, March 4, 1929; FF 4 g.

South Sumatra, Musi, Tjurup, at light, May 26, 1929.

West Java, Tjibodas, cold damp walls below the hot springs, July 13, 1929; FY 11 d.

East Java, Ranu Bedali, hygropetric and on sprayed leaves at the great waterfall, October 29, 1928; FL 16 g.

Larva. Fully-grown, length 10–11 mm. General coloration pale yellow, meso- and meta-sterna and the first abdominal sternite with a narrow median black line on cephalic part of sclerite; succeeding six incisures with a tumid creeping welt, this pale and not conspicuously differentiated from the remainder of the integument.

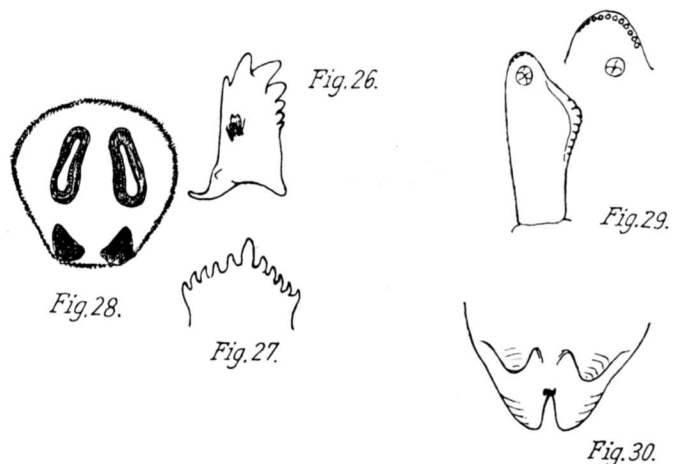
Head-capsule yellow, very conspicuously patterned dorsally with black on each lateral plate. Mandible (Fig. 26) with the teeth blunt, six or seven in number, decreasing in size basally. Mental plate (Fig. 27) with five teeth on either side of the larger median tooth.

Spiracular disk (Fig. 28) very reduced, as usual in the genus *Limonia*; spiracles elongate-oval to feebly constricted at near midlength. Ventrad of each spiracle with a dusky triangular line. Margin of spiracular disk bordered by a narrow dusky line.

Pupa. The cast pupal skin shows a few distinctive features, more especially in the structure of the pronotal breathing horns (Fig. 29). These latter are more or less ear-shaped, about twice as long as their greatest width, slightly expanded on ventral margin at just beyond midlength; apex of horns obtusely rounded. Near outer end of horn

with an oval area, apparently sensory in function; along margin of horn with a series of about ten circular hyaline areas, as figured. Sheaths of male genitalia as figured (Fig. 30).

The species is common and widely-distributed in the Greater Sunda islands but many records from elsewhere attributed to this species now appear to represent some one or another of several closely allied forms.



Limonia (Dicranomyia) sordida (BRUN.).

1912. *Dicranomyia sordida* Brunetti, Fauna Brit. India, Dipt. Nemat., pp. 382—383.

Described from the Himalayas of British India, now known to have a wide distribution in Eastern Asia, including the Malayan islands.

North Sumatra, Toba, springs at Balige, altitude 1200 meters, April 12, 1929; T 21.

Central Java, Sarangan, Lawu, at light, December 1928, also on the summit of Lawu, altitude 3300 meters, December 18, 1928; FS 13.

Limonia (Dicranomyia) tahanensis aphrophila subsp. n.

Differs from typical *tahanensis* (EDW.) (Journ. Fed. Malay St. Mus., 14: 67—68; 1928), described from Pahang, in the structure of the male hypopygium.

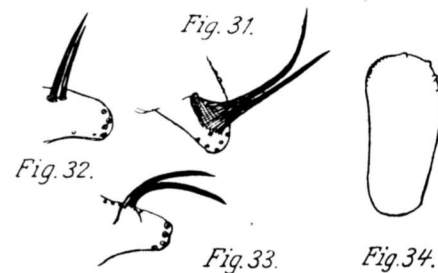
Rostral prolongation of ventral dististyle (Fig. 32) short and stout, the apex very obtuse, the two rostral spines relatively short, only a trifle longer than the apex of the prolongation beyond it; spines very close together to appear almost as a single spine, the more basal a trifle longer than the outer spine.

Typical *tahanensis* has the spines of the rostral prolongation much longer (Fig. 31) from a common sclerotized base, the spines much exceeding the entire prolongation.

Hab. Java.

Holotype, alcoholic ♂, Waterfall of Tjibóróm, Mt. Gedeh, altitude 1700 meters, July 9, 1929; FY 3a.

Allotype, alcoholic ♀, brook below the waterfall of Tjibóróm, Tjibodas, July 9, 1929; FY 3 b.



Paratopotype, a ♀, with the allotype; *paratype*, a ♀, Sarangan, on Mt. Lawu, altitude 1410 meters, December 8, 1928.

One cast pupal skin, showing the following characters:

The pronotal breathing horns (Fig. 34) are flattened, gently widened outwardly, the tips subtruncate to very obtuse, with a few marginal sensory papillae. Genital sheaths of female produced into acute dorsally-directed reddish spines.

Limonia (Dicranomyia) tahanensis diengensis subsp. n.

Agrees entirely with the typical form except in the structure of the male hypopygium, especially the rostral prolongation of the ventral dististyle and the shape and position of the spines thereon. These are strongly curved outward, subequal, from a common basal tubercle (Fig. 33).

Hab. Central Java.

Holotype, alcoholic ♂, Dieng Plateau, Seraju spring, altitude about 2090 meters, June 5, 1929; D 16.

Limonia (Alexandriaria) diengana sp. n.

Mesonotal praescutum yellow, with three confluent dark brown stripes; scutal lobes dark brown; postnotal mediotergite dark brown; halteres pale; wings subhyaline, the stigma pale brown; Sc_1 ending a distance before origin of R_s about equal to twice the length of the latter; R_s shorter than the basal section of R_{4+5} .

Female. — Length, about 7 mm; wing, 6 mm.

Described from an alcoholic specimen.

Rostrum yellow; basal segments of palpi obscure yellow, the outer segments more infuscated. Antennae with the basal segment of scape yellow, the second segment and all flagellar segments brownish black, the latter with pale incisures; flagellar segments oval, the

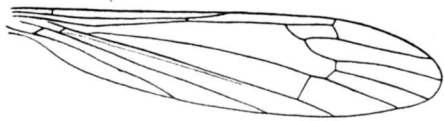


Fig. 35.

verticils not or scarcely exceeding the segments; terminal segment a little longer than the penultimate. Head infuscated on vertex, paling to yellow on anterior vertex and genae.

Pronotum yellow. Mesonotal praescutum yellow, with three dark brown stripes that are confluent to form a dorsal shield, the humeral and lateral portions broadly yellow; scutal lobes similarly dark brown; median area of scutum and the scutellum yellow; postnotal mediotergite dark brown. Pleura and pleurotergite yellow, the anepisternum and ventral sternopleurite vaguely darkened. Halteres pale. Legs with the coxae and trochanters pale yellow; femoral bases pale; remainder of legs passing into brown. Wings (Fig. 35) grayish subhyaline, the oval stigma slightly darker brown; veins pale brown. Venation: Sc_1 ending far before origin of Rs , Sc_2 removed from its tip, Sc_1 alone longer than $m-cu$; distance between tip of Sc_1 and origin of Rs exceeding twice the length of the latter, which is shorter than the basal section of R_{4+5} ; $m-cu$ about one-third its length before the fork of M .

Abdominal tergites brown, the sternites paler.

Hab. Central Java.

Holotype, alcoholic ♀, Dieng Plateau, Seraju spring, altitude about 2090 meters, June 5, 1929.

Limonia (Alexandriaria) diengana is quite distinct from *L. (A.) tenella* (DE MEIJ.), likewise from the Javanese Mountains, in the large size, venation and color of the mesonotum. *L. (A.) simplissima* (ALEX.), also from Java, and *L. (A.) argyrata* ALEX. of Formosa and Luzon, have a distinct pattern of the mesonotum.

Limonia (Pseudoglochina) kobusi (DE MEIJ.).

1904. *Dicranomyia Kobusi* de Meijere; Bijdr. tot de Dierkunde, 18: 91–92.

Central Sumatra, Singkarak, chalk springs of Panjinggahan, on sprayed tufa walls and leaves; FF 15 a. One male, associated with *Limonia (Dicranomyia) punctulata* (DE MEIJ.), larvae and pupae.

Miscellaneous *Limonia* larvae of uncertain identity.

I. North Sumatra, Toba, brook south of Balige, in moss, March 30, 1929; FT 2. — Presumably a *Dicranomyia* or *Geranomyia*. Toba, same as FT 2, on wet banks, April 1, 1929; FT 3 b. Toba, same as last; TF 3 c. Toba, spring at Balige, altitude 1200 meters, April 12, 1929; T 12. *Dicranomyia*, supposition.

III. Central Sumatra, Padang Bovenland, Fort de Kock, Lake of Manindjau, March 11, 1929; FF 18. *Libnotes* supposition.

IV–VI. South Sumatra, Musi, waterfall, Kapala Tjurup, May 5, 1929, among saturated leaves; M 2, FM 2. *Dicranomyia* supposition.

Musi, same locality, on *Colocasia*; FM 5. *Libnotes* supposition.

Musi, same locality, on wild banana; FM 6. *Libnotes*?

Musi, warm spring, Subanajam at Tjurup, from moss in normal brook, May 7, 1929; FM 8 d. *Dicranomyia*?

Musi, Subanajan, on banana on bank of brook; FM 8 e. *Libnotes*?

VII. South Sumatra, Ranau, Outlet of Lake, on *Colocasia*, February 2, 1929; FR 1 c, FR 1 b. *Libnotes*?

Ranau, forest brook, January 20, 1929; FR 2.

Ranau, ajer Pisaup, woodland brook; FR 4. *Geranomyia*?

Ranau, bamboo tops in woods, January 28, 1929; FR 11 a. *Libnotes*?

Ranau, in water gathered in leafaxils of *Colocasia indica*, January 29, 1929; R 21 c. *Libnotes*?

Ranau, on decaying stems of *Colocasia*, January 29, 1929; R 22. *Libnotes*?

Ranau, in a blossom stand of *Zingiber*, January 24, 1929; R 24. *Libnotes*?

Ranau, margin of lake; R 35. *Dicranomyia* or *Geranomyia*?

VIII. West Java, Buitenzorg, swampy area, Botanical Gardens, September 12, 1928; B 1. *Dicranomyia* or *Geranomyia*?

Buitenzorg, marsh, September 13, 1928; B 2. The same.

Buitenzorg, outlet of acid pocket, September 15, 1928; B 6. The same.

Tjibodas, waterfall of Tjibóróm, July 9, 1929; FY 2 i. *Dicranomyia*?

- Tjibodas, the same, on wild bananas, July 9, 1929; FY 4. *Libnotes* or *Limonia*?
- Tjibodas, warm spring of Kandang Bedak, in moss (temp. 34.5—35.5° C = 95° F.), July 13, 1929; Y 11 c. *Dicranomyia*?
- IX. Central Java, Dieng Plateau, side springs at Seraju, June 6, 1929; FD 5 b. *Dicranomyia*?
- X. Central Java, Sarangan, spring run to L. Pasir, December 3—5, 1928; S 1. *Dicranomyia*?
- Sarangan, springy inlet to Telogo Pasir, December 5, 1928; FS 1. *Geranomyia*, near *fletcheri*.
- Sarangan, Kali Djumok, altitude 1400 meters, December 4, 1928; S 2. *Dicranomyia*?
- Sarangan, springs at Tsemorosewu, in moss, December 8, 1928; FS 4. *Dicranomyia*?
- Sarangan, Kali Djumok, altitude 1780 meters, December 9, 1928; FS 5. *Dicranomyia*?
- Sarangan, waterfall of Kali Pagergede, altitude 1410 meters, December 6, 1928; S 8. *Dicranomyia*?
- XV. East Java, Ranu Lamongan, mossy walls of a chief inlet to lake, October 21, 1928; L 6 a. *Geranomyia*?
- Ranu Bedali, nymph springs, October 29, 1928; L 5. *Geranomyia*?
- Lamongan, inlet to R. Lamongan, October 16, 1928; L 10 d.
- Lamongan, rheokrene in brook flowing into the R. Lamongan, October 20, 1928; L 11 a. *Dicranomyia*?
- Ranu Bedali, in moss and sprayed nettle leaves, October 29, 1928; L 16 a. *Libnotes*?
- Ranu Bedali, at the great waterfall, on nettle leaves, October 31, 1928; FL 20. *Libnotes*?
- Great waterfall of R. Bedali, on *Colocasia*, November 21, 1928; FL 22.
- XVI. Bali, Baturiti, in moss of springs below Tamantanda, June 14, 1929; FZ 12. *Dicranomyia* or *Geranomyia*?

Subtribe Antocharia.

Genus *Antocha* OSTEN SACKEN.

South Sumatra, inlet to L. Ranau, on floating log, January 25, 1929; FR 5 c.

Ranau, in outlet in strong current, January 25, 1929; R 1 c.

Ranau, chief inlet to lake, sifted from plants on bank, February 3, 1929; FR 17.

Ranau, in Brandungs bank, February 2, 1929; R 35.

Central Java, Sarangan, Kali Djumok, on Lawu, altitude 1780 meters, December 9, 1928; FS 5 c.

All the above include un-reared larvae of *Antocha* in various stages of growth. The larvae and pupae are almost exactly like those of the genotype, *Antocha saxicola* OSTEN SACKEN, of eastern North America (ALEXANDER, 1920). The present larvae (Fig. 36) have the body slender, narrowed posteriorly, terminating in two elongate ventral lobes (Fig. 37), these more nearly glabrous than in *saxicola*. Abdomen with six median creeping welts on both the dorsal and ventral surfaces of abdominal segments two to seven, inclusive. Anal gills four, telescopic by weak constrictions. Pupa with branched breathing-horns, there being eight branches that are longer and more delicate than in *saxicola*.

Antocha saxicola lives within silken, mud-covered cases, fastened to the sides of submerged rocks in rapid-flowing streams. Pupation takes place within the cases. Larvae of the allied *Antocha (Orimargula) alpigena* (MIK) were found by BANGERTER (1929:

5—7) in the European Alps. This species is a member of the hygropetric association, living in moss and slime on dripping perpendicular rocky walls, where it is associated with *Limonia (Dicranomyia) trinotata* (MG.), the most characteristic member of this association in the European fauna. This type of habitat is quite different from the totally submerged one of most species of typical *Antocha*. The pupa of *alpigena* differs conspicuously from the known species of *Antocha* in having only six branches

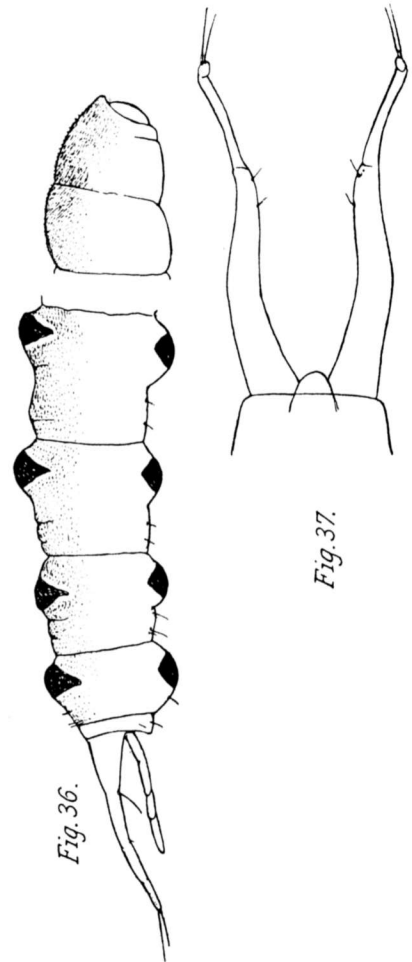


Fig. 36.

Fig. 37.

to the pronotal breathing horns, there being one principal branch bearing five more slender lateral branches. This decrease in number of branches of the pronotal breathing horns from eight to six is of great interest. It may be further noted that a recently discovered Japanese crane-fly [*Limonia (Dicranomyia) trifilamentosa* ALEX.] has three-branched breathing horns and so serves more completely to bridge the gap between *Antocha* and the normal unbranched horns of the remaining Tipulidae.

Antocha (Antocha) thienemanni sp. n.

General coloration pale yellow, the praescutum with four extensive pale brown stripes; scutal lobes each with two brown areas; legs and halteres yellow; wings whitish, the stigma brown; *m-cu* nearly its own length before the fork of *M*.

Female. — Length, about 4 mm; wing, 4 mm.

Described from alcoholic material.

Rostrum yellow; palpi brown. Antennae with the scape yellow, the flagellum pale brown; basal flagellar segments subglobular, the outer segments passing into oval. Head yellow.

Mesonotal praescutum yellow, with four extensive pale brown stripes, these much wider than the interspaces; scutal lobes yellow, each with two triangular brown areas, the more caudal slightly larger; scutellum pale yellow; postnotal mediotergite darkened. Pleura yellow, the ventral sternopleurite dark brown. Halteres yellow. Legs with the coxae and trochanters pale yellow; remainder of legs pale yellow. Wings whitish; stigma relatively conspicuous, brown; veins very pale. Numerous macrotrichia on outer section of vein R_{4+5} except on basal fifth. Venation: R_{2+3} a little longer than R_2 ; basal section of R_{4+5} nearly three times as long as R_{2+3} ; *m-cu* nearly its own length before the fork of *M*; distal section of Cu_1 more than twice *m-cu*.

Abdomen yellow. Valves of ovipositor with the long slender cerci yellowish horn-color.

Hab. Central Java.

Holotype, alcoholic ♀, Sarangan, on Mt. Lawu, altitude 1410 meters, December 6, 1928.

I take very great pleasure in naming this interesting *Antocha* in honor of Dr. AUGUST THIENEMANN. *Antocha thienemanni* is most closely allied to *A. (A.) flavella* EDW. (Pahang), differing especially in the conspicuously patterned mesonotal praescutum and the details of venation.

Antocha (Orimargula) mesocera sp. n.

General coloration pale brown; antennae (♂) about as long as the combined head and thorax; wings with a faint brownish tinge; *Rs* about one-fifth longer than the basal section of R_{4+5} .

Male. — Length, about 4.5 mm; wing, about 4.5 mm; antenna, 1.5 mm.

Female. — Length, about 5 mm; wing, 4.5 mm.

Described from alcoholic material.

Rostrum and palpi pale brown. Antennae (♂) of moderate length, approximately one-third the length of the body or subequal to the combined head and thorax; flagellar segments cylindrical, the longest setae about one and one-half times the diameter of the segment, evenly distributed over the entire length of the segment. Anterior vertex narrow.

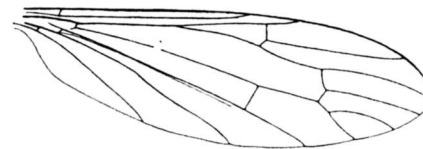


Fig. 38.

Pronotum whitish. Mesonotum dark brown, deeper medially, the lateral portions paling to yellow. Pleura with the sternopleurite dark brown, the dorsal pleurites paler. Halteres brown. Legs with the coxae pale, the middle coxae a little darker; remainder of legs long and slender, dark brown. Wings (Fig. 38) with a faint brown tinge, the stigma not darkened; veins darker brown. Venation: *Rs* about one-fifth longer than the basal section of R_{4+5} ; R_2 one-half longer than R_{2+3} ; petiole of cell M_3 subequal to the basal section of M_{1+2} ; *m-cu* opposite the fork of *Rs*.

Abdominal tergites brown, the sternites paler; caudal margins of the segments narrowly pale. Male hypopygium with both dististyles of approximately the same length and size. Gonapophyses appearing as straight yellow rods that are slightly curved at apex and bearing a small sublateral tooth.

Hab. South Sumatra.

Holotype, alcoholic ♂, Musi, Tjurup, May 6, 1929.

Allotype, alcoholic ♀.

Antocha (Orimargula) mesocera is most readily told by the relative length of the male antennae. In the Oriental and Ethiopian faunal regions, a number of species of *Orimargula* are now known in which the male sex has very elongate antennae, such species being *gracilicornis*

(EDW.), *gracilipes* (ALEX.), *brevivena* (EDW.) and *intermedia* (EDW.), where the organ is at least two-thirds as long as the entire body. In the present species, the male antenna is only one-third the length of the body but still greatly longer than in the normal species with short antennae in both sexes. The most marked development of this tendency in the subgenus is in *gracilicornis*, where the flagellar segments tend to become binodulose, with the setae grouping on the enlarged areas, a condition comparable to that found in *Tasiocera* SKUSE, *Polymera* WIEDEMANN, and other genera of Tipulidae having very elongate antennae in the male sex. The other known species of *Orimargula* above listed have the segments simply terete, with the setae evenly distributed upon the surface.

Subtribe Heliaria.

Genus *Helius* ST. FARGEAU.

Helius (Helius) nigriceps (EDW.).

1916. *Rhamphidia nigriceps* EDWARDS; Ann. Mag. Nat. Hist., (8) 17: 358.

South Sumatra, Musi, waterfall at Kapala Tjurup, hygropetric, May 5, 1929; FM 1 + 4.

Musi, Muara Klingi, on banks, May 10, 1929.

The species was described from Siam and is now known to have an extensive range in the Malayan region.

Helius (Helius) kambanganoides sp. n.

General coloration brown; antennae (♂) short; rostrum black; legs brown, the tarsi paling to yellow; wings with a faint brown tinge, cells *C* and *Sc*, together with the stigma, darker brown; cell *R*₂ at margin less than *r-m*; cell 1st *M*₂ small, irregularly hexagonal, with *m-cu* beyond midlength; abdomen dark brown.

Male. — Length, about 4.5–5.5 mm; wing, 5–6 mm.

Described from alcoholic specimens.

Rostrum about as long as the remainder of head, black; palpi black. Antennae short, scarcely exceeding the combined head and rostrum; scapal segments brown, the flagellum darker; flagellar segments oval, passing into cylindrical outwardly; terminal segment longest; verticils longer than the segments, on the basal segments the most conspicuous being unilaterally arranged. Head black.

Thorax brown, without evident pattern except for a median brightening at the suture. Pleura somewhat paler. Halteres pale, the knobs weakly darkened. Legs long and slender; coxae and trochanters pale brown; remainder of legs dark brown, the tarsal segments paling to yellow. Wings (Fig. 39) with a faint brown tinge, cells *C* and *Sc*,

with the stigma, darker brown; veins brown. Costal fringe short. Venation: *Sc*₁ ending beyond *r-m*, *Sc*₂ at its tip; branches of *Rs* strongly divergent, cell *R*₂ at margin shorter than *r-m*, cell *R*₃ correspondingly widened; cell 1st *M*₂ small, irregularly hexagonal, shorter than any of the veins beyond it, *m-cu* beyond midlength.

Abdomen, including the hypopygium, dark brown.

Hab. West Java.

Holotype, alcoholic ♂, Buitenzorg, on over-flowed banks of the right branch of the Tjiliwong R., Botanical Gardens, September 13, 1928; B 3.

Paratype, ♂.

Helius (Helius) kambanganoides is most closely allied to *H. (H.) kambanganii* (DE MEIJ.), a cave-inhabiting species distributed from Selangor to Java. The present fly is distinguished by the short antennae which are only a little longer than the head. The tarsi are conspicuously paler than the femora. The venation is almost identical in the two species, with *m-cu* even more distad in the present form.

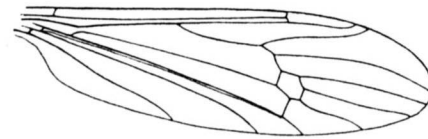


Fig. 39.

Hexatomini.

Adult and larval material in the large tribe Hexatomini was found to pertain almost entirely to the genus *Eriocera*, a large group of medium-sized to very large crane-flies, most of the Malayan species having handsomely banded wings. Two species of *Eriocera* proved to be undescribed.

Eriocera diengensis sp. n.

Belongs to the *nepalensis* group; anterior part of head light ashen-gray; thorax blue-gray; halteres black; femora obscure yellow basally, the tips broadly blackened; tibiae and tarsi black; wings dark brown, the base narrowly yellow; a narrow, incomplete, white crossband before cord; *R*₂₊₃₊₄ and basal section of *R*₅ short, subequal; *R*₂ oblique; cell 1st *M*₂ small, the veins beyond it correspondingly elongated; distal section of *Cu*₁ unusually long, being fully one-half longer than *m-cu*, in alignment with the basal section; abdominal segments plumbeous, their caudal margins black.

Male. — Length, about 18 mm; wing, 13.5 mm; antenna, about 3.5 mm.

Described from an alcoholic specimen.

Rostrum and palpi black. Antennae black throughout, 8-segmented. Dorsum of head in front light ashen-gray, the sides and posterior portion of vertex, with the genae, more blackish gray.

Thorax blue-gray, including the dorso-pleural region. Halteres black. Legs with the coxae and trochanters black, blue-gray pruinose;

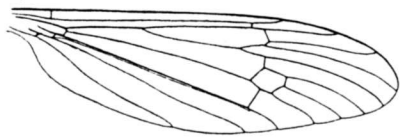


Fig. 40.

femora obscure yellow basally, the tips very broadly blackened; tibiae and tarsi black. Wings (Fig. 40) dark brown, the prearcular region and basal third of cell *2nd A* light yellow; a narrow transverse white crossband extending from vein R_1 to just beyond Cu , crossing cells R_1 , R and M ; vague whitish areas before and beyond origin of R_5 ; veins dark brown, paler in the white and yellow areas. Macrotrichia of costal margin dense, on veins R_3 and distal section of M_{1+2} almost lacking. Venation: Sc_1 ending beyond R_2 , Sc_2 some distance from its tip; R_5 about one-half longer than R ; R_{2+3+4} and basal section of R_5 both short, subequal; R_2 oblique, about three times as long as R_{2+3} ; vein R_3 long, upcurved at end; cell *1st M*₂ small, the veins beyond it long; *m-cu* beyond midlength of the cell; distal section of Cu_1 more than one-half longer than *m-cu*, in alignment with the basal section.

Abdomen relatively long, the bases of the segments shiny plumbeous, the apices velvety-black, the amount of the latter decreasing on the outer segments; hypopygium black.

Hab. Central Java.

Holotype, alcoholic ♂, Dieng Plateau, Seraju brook, altitude about 2000 meters, June 5, 1929.

Eriocera diengensis is well-distinguished by the characters listed above, especially the venation of the wings. The distal section of Cu_1 is of rather an unusual length for a member of this genus of crane-flies.

Eriocera lamonganensis sp. n.

General coloration dark brown; antennal scape black, the basal flagellar segments obscure yellow; halteres dark brown; legs chiefly black, the bases of the femora narrowly obscure yellow; wings brown, including the entire cell *C*; cell *Sc* entirely light yellow; prearcular region light yellow except at extreme base which is dark brown; a relatively narrow yellowish-white crossband from vein Sc to the anal

margin; R_{2+3+4} subequal to R_{2+3} ; R_2 transverse; cell M_1 present; abdomen with segments one and six to seven dark brown, segments two to four and base of five yellow, eight and nine brilliant orange; ovipositor with very long valves.

Female. — Length, about 22 mm; wing, 16 mm; antenna, about 3.5 mm.

Described from an alcoholic specimen.

Rostrum and palpi brownish black. Antennae 11-segmented; scape black; flagellum at base obscure yellow, passing into brown at about the third flagellar segment; flagellar segments gradually decreasing in length, the terminal again elongate, nearly twice the penultimate

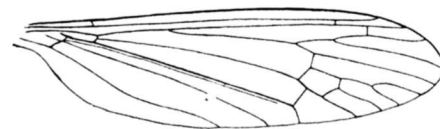


Fig. 41.

Head dark brown; vertical tubercle relatively small, simple, placed relatively far back on the vertex.

Thorax (in alcohol) dark chocolate-brown, the pleura somewhat darker. Halteres short, dark brown. Legs with the coxae and trochanters dark; femora brownish black, their bases narrowly obscure yellow; tibiae and tarsi brown, the terminal segments of the latter blackened. Wings (Fig. 41) with a strong brown tinge, including the entire cell *C*; cell *Sc* entirely light yellow; prearcular region light yellow, excepting the extreme base of wing which is dark brown, the pale coloration extending into the basal half of cell *1st A*; a relatively narrow but conspicuous, transverse, yellowish white fascia extends from vein Sc entirely across the wing, lying chiefly before the cord, crossing the latter in the extreme bases of cells R_4 and *1st M*₂, and in the proximal half of cell M_4 ; veins slightly darker brown than the ground-color, paler in the flavous areas. Macrotrichia of costa abundant. Venation: Sc very long, Sc_1 extending to opposite R_2 , Sc_2 just beyond the fork of R_{2+3+4} ; R_5 very long, nearly twice as long as R ; R_{2+3+4} nearly twice the basal section of R_5 ; R_{2+3} subequal to R_{2+3+4} ; R_2 transverse; cell M_1 present; *m-cu* about two-fifths its length beyond the fork of M ; distal section of Cu_1 gently curved, not in alignment with its basal section, about two-thirds *m-cu*.

Abdomen with the basal tergite dark brown; tergites two to four yellow, the caudal margins vaguely darkened, the segments with transverse darkened lines, a sub-basal pair being more widely separated than a pair on the posterior half; fifth tergite obscure yellow at base,

the remainder darkened; tergites six and seven dark brown; eight and nine brilliant orange, the tenth again dark brown; sternites patterned almost as in the tergites. Ovipositor with the valves very long and slender, especially the tergal valves (cerci), which are blackened, their tips conspicuously light yellow.

Hab. East Java.

Holotype, alcoholic ♀, Ranu Bedali, at waterfall, October 31, 1928; L 16 c.

By EDWARDS' key to the Old World species of *Eriocera* (Ann. Mag. Nat. Hist., (9) 8: 70—78; 1921), the present fly runs to couplet 84, disagreeing with the various species beyond. *E. bicolor* MACQ. and *E. cingulata* DE MEIJ. have the discal yellow crossband of the wings broad and entirely traversing the wing. *E. pyrrhomesa* EDW. has the wing-base dark and the legs entirely black. The fly is amply distinct from the more recently described regional species.

Eriocera larvae, not determinable to species.

A number of specimens of these powerful carnivorous larvae were secured. These were not reared and their specific identity must remain in question since there is a very large number of species of *Eriocera* known from Sumatra and Java. The members of this genus and certain other crane-flies have the ability to extend the subterminal segments of the abdomen into a large subglobular swelling, the purpose of which is for aid in propulsion through the sand and wet earth of the larval habitat. Several of the larvae in the present series had died with these segments so extended.

Hexatomini No. 1. *Eriocera*, sp.

South Sumatra, Tjurup, Kali Djermih, along forest brook, May 7, 1929; M 9.

A fully-grown and an additional immature larva of a large species of *Eriocera*.

General coloration brownish, the anterior segments brightening to orange. Head-capsule much as in *E. spinosa* O. S. (ALEXANDER, 1920) and other species. Mandibles sickle-shaped, without teeth beyond midlength. Spiracular disk (Fig. 42) with the usual four lobes. Spiracles small, separated from one another by a distance equal to between three and four times the short diameter of one. Dorsal lobes of disk with the usual setae few in number, restricted to extreme tip, at base of each lobe with a linear dark area. Ventral lobes each with a large irregular diamond-shaped area at base, these darkenings nearly contiguous on the mid line; apical setae more reduced than on dorsal lobes; a delicate capillary black vitta extends the entire length of all four lobes of the disk.

The restriction of the setae to the apices of the lobes, especially of the dorsal pair, furnishes a rather distinctive character. So many species of *Eriocera* occur or are regional to South Sumatra that any opinion as to the identity of the above larva would be mere surmise (among them, *angustipennis* END., *basilaris* WIED., *bicolor* MACQ., *gamma* END., *klossi* EDW., *mesopyrrha* WIED., *ornata* END., *paenulata* END., *pannosa* END., *pyrrhomesa* EDW., *selene* O. S., *simalurensis* DE MEIJ., *sumatrensis* MACQ., *verticalis* WIED., and others).



Fig. 42.



Fig. 43.

Hexatomini No. 2. *Eriocera*, sp.

Central Java, Sarangan, spring run to L. Pasir, December 12, 1928; S 1.

Very similar in size and general appearance to No. 1 but with the setae at tips of the lobes of the spiracular disk even more reduced, being smaller, more delicate, and fewer in number. As before, a large number of species are regional, and no one can be definitely associated with this larva without rearing. Among such regional species are, *albipunctata* v. d. W., *acrostacta* WIED., *basilaris* WIED., *cingulata* DE MEIJ., *diengensis* sp. n., *ferruginosa* v. d. W., *javensis* DOL., *lunigera* WALK., *nigripennis* DE MEIJ., *xanthopyga* DE MEIJ., and others.

Hexatomini No. 3. *Eriocera*, sp.

Central Java, Sarangan, spring run to L. Pasir, December 3—5, 1928; S 1.

A curious larva, having the ventral lobes of the spiracular disk (Fig. 43) unusually short and unvariegated with black lines. The lobes are clothed externally with the usual appressed setae which likewise involve a part of the caudal aspect of the ventral lobes, the median portion remaining glabrous. Beneath each spiracle a capillary black line that extends laterad. Anal gills small. Total length, apparently

grown, about 18 mm. A list of possible species to which this larva might belong is given under Hexatomini No. 2.

Miscellaneous *Eriocera* larvae without distinctive features.

North Sumatra, Toba, brook at Balige, April 1, 1929; T 8 a.

South Sumatra, Ranau, Wai Negri, in woodland brook, January 22, 1929; R 5 c.

Ranau, woodland brook, February 1, 1929; R 34 b.

West Java, Buitenzorg, right branch of Tjiliwong R., Botanical Gardens, December 13, 1928; B 13 c.

Central Java, Sarangan, on Lawu, spring run to L. Pasir, December 9, 1928; S. 1.

East Java, Lamongan, outlet of R. Pakis, October 24, 1928; L 15 a.

Limnophila (Dicranophragma) remota (DE MEIJ.).

1913. *Dicranophragma remota* de Meijere; Tijds. voor Ent. (suppl.), 56: 1—2.

West Java, Tjibodas, cold wet bank below the hot springs, July 13, 1929; 7 Y 11 d.

The costal fringe of the wings of male is of an unusual length.

Hexatomine larva, near *Dicranophragma*, sp.

Central Sumatra, Singkarak, Sawah, February 27, 1929; F 8.

Central Java, Dieng Plateau, side spring at Seraju, altitude about 2000 meters, June 6, 1929; FD 5 a.

Eriopterini.

Conosia irrorata (WIED.)

1828. *Limnobia irrorata* Wiedemann; Auser. zweifl. Ins., 1: 574.

1848. *Limnobia substituta* Walker; List Dipt. British Mus., 1: 39.

1857. *Limnophila cruz* Doleeschall; Natuurk. Tijdschr. Nederl. Indie, 14: 388.

1880. *Conosia irrorata* vander Wulp, Tijds. voor Ent., 23: 161.

Central Sumatra, Huta Nopan, at light, April 1928; FF 22.

South Sumatra, Musi, Tjurup, at light, May 7, 1929; FM 8 i.

This is one of the commonest and most widely distributed flies in the Old World.

Trentepohlia (Mongoma) pennipes (O. S.).

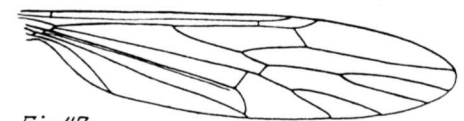
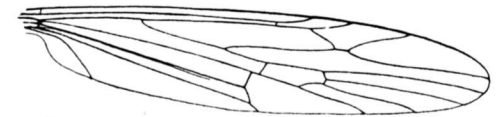
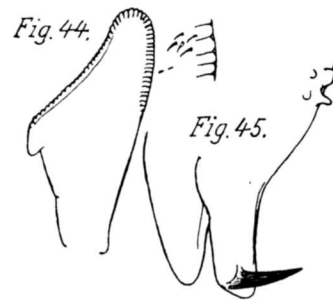
1887. *Mongoma pennipes* Osten Sacken; Berlin. Ent. Zeitschr., 31: 204.

Described from Borneo, now known to have a very wide distribution in Eastern Asia, as far north as Honshu, Japan. The present collection included adults of both sexes, as well as a few fragmentary cast pupal skins.

South Sumatra, Musi, Muara Klingi, at light, May 10, 1929; FM 13 b.

East Java, Lamongan, October 16, 1928; FL 17.

DE MEIJERE (Tijdschr. voor Ent., 54: 50—51; 1911) has briefly described the larva and pupa. His description and figure may be briefly supplemented.



Pronotal breathing-horns (Fig. 44) ear-shaped, being flattened, narrowest at base, expanded outwardly, the apex obliquely truncated with all angles rounded. Margin and surface with microscopic crenulations or squamulations; surface of horn near apex with microscopic pale spines. Genital sheaths of female as figured (Fig. 45), the sternal valves obtusely rounded, the tergal valves terminating in a chitinized spine that is directed dorsad.

Trentepohlia (Mongoma) tenera javanensis subsp. n.

Male. — Length, about 9 mm; wing 6.8 × 1.5 mm.

Very close to typical *tenera* O. S., in the general appearance, as the broad whitish femoral tips and the pale tibiae with the tips broadly white; inner end of cell M_3 lying far basad of that of cell R_5 . The chief distinctions are to be found in the venation (Fig. 46). Sc_1 ending opposite or shortly beyond the cephalic end of R_2 ; Sc_1 subequal to the basal section of R_5 ; R_s nearly twice as long as the basal section of R_5 , in *tenera* these two elements being subequal; vein R_3 more extended, cell R_2 at wing-margin thus being wider.

Hab. West Java.

Holotype, alcoholic ♂, Buitenzorg, May 25, 1929; FB 3.

Trentepohlia (Mongoma) sp.

East Java, Ranu Bedali, north fall, October 23, 1928.

Trentepohlia (Plesiomongoma) nigropennata EDW.

1928. *Trentepohlia (Plesiomongoma) nigropennata* Edwards; Journ. Fed. Malav St. Mus., 14: 109; Sarawak Museum Journ. for 1928 3: 264

South Sumatra, Musi, Muara Klingi, at light May 9, 1929, an adult male; FM 13 a.

This conspicuous fly was described from Pahang (one female, Kuala Tahan, February 3, 1925, at light, *Pendlebury*) and was later recorded from Borneo (one female, foot of Mt. Dulit, Sarawak, end of 1922, *Mjöberg*).

The male is herewith characterized as allotype. Characters entirely as in the female, including the striking hair-fringes of the middle tibiae. The venation is as illustrated (Fig. 47), cell M_2 being open by the atrophy of m . Costal fringe of moderate length only. Macrotrichia of veins very small and reduced in number, confined to vein R_1 and the outer two sections of R_{4+5} .

As indicated by EDWARDS, *Plesiomongoma* is a highly artificial group, differing from *Mongoma* solely in the complete loss of vein R_3 .

Trentepohlia (Trentepohlia) mc gregori ALEX.

1927. *Trentepohlia (Trentepohlia) mc gregori* ALEXANDER, Philippine Journ. Sci., 33: 303—304.

1928. *Trentepohlia (Trentepohlia) nigrogeniculata* EDWARDS, Journ. Fed. Malay St. Mus., 14: 115.

South Sumatra, Musi, Muara Klingi, at light, May 10, 1929; FM 13 b. This fly is now known from Sumatra, Java and Luzon.

Genus *Gonomyia* MEIGEN.

Subgenus *Ptilostenodes* subgen. n.

Antennae of male with short verticils. Wings with cell R_3 lacking; cell 1st M_2 open by the atrophy of the basal section of M_3 ; cell 2nd M_2 small; $m-cu$ before the fork of M . Male hypopygium with the basistyle produced into conspicuous lateral and mesal lobes, the two dististyles lying in the notch.

Type of subgenus. — *Gonomyia (Ptilostenodes) ptilostenella* ALEX. (Luzon).

The only other subgenus of *Gonomyia* in which cell R_3 is lost is *Lipophleps* BERGROTH. The reduced verticils of the antennae of the male and the structure of the hypopygium preclude placing the species of this group in *Lipophleps*.

Gonomyia (Ptilostenodes) ptilostenella javanica subsp. n.

General appearance almost as in the typical form, the mesonotum being black with the scutellum pale yellow; pleura pale yellow with a large circular blackened area on the anepisternum; ventral sternopleurite only slightly darkened. Halteres and legs black. Wings with

cell 2nd M_2 larger than in the typical form, the cell being about two-fifths its petiole. Both subspecies have the prearcular cells unusually large and well-defined, more conspicuously so than the only other described species of this subgenus, *G. (P.) ptilostenoides* ALEXANDER (Formosa).

Hab. Central Java.

Holotype, alcoholic ♀, Sarangan, on Lawu, altitude 1410 meters, December 8, 1928.

Gonomyia (Lipophleps) leucomelania sp. n.

Mesonotum dark orange-brown, the praescutum narrowly margined laterally with darker brown; scutellum white; thoracic pleura with a single narrow longitudinal silvery stripe; femora yellow, with a broad black subterminal ring, the tips conspicuously snowy-white; wings dusky, the costal and apical portions conspicuously variegated with china-white; male hypopygium with the apex of basistyle not produced; two dististyles; gonapophyses appearing as sinuous rods that are decussate on the median line.

Male. — Length, about 2.8 mm; wing, 3 mm.

Described from an alcoholic specimen.

Rostrum light brown; palpi dark brown. Antennae with the scapal segments light yellow above, narrowly brown on lower surface; first flagellar segment pale yellow, the remaining segments passing into dark brown. Head pale yellow, with a linear dark brown dash on vertex.

Pronotum and anterior lateral pretergites white. Mesonotal praescutum dark orange-brown, the lateral margin narrowly dark brown; scutum similarly dark orange-brown; scutellum white; postnotal mediotergite light brown, darker medially. Pleura dark brown, the dorso-pleural region more yellowish brown; the dark brown areas enclose a narrow silvery longitudinal stripe that includes the fore coxae, extending back to the base of the abdomen. Halteres pale yellow, the lower face of the club slightly darkened. Legs with the fore coxae white basally, the apices dark brown; middle and hind coxae dark brown at base, the tips broadly white; trochanters white; femora yellow, with a broad black subterminal ring, this broadest on the posterior femora, the tips of all femora conspicuously snowy-white; tibiae and tarsi obscure yellow. Wings (Fig. 48) broad, with a dusky suffusion, conspicuously variegated with china-white areas in costal and apical regions, interrupted by dark clouds at fork of Sc and origin of R_s ; stigma, and tip of vein R_3 ; a paler darkening along cord; prearcular region clouded; vague whitish areas before and beyond the cord; veins pale, darker in the clouded areas; costa chiefly china-white. Venation:

Sc_1 ending opposite origin of R_s , Sc_2 at its tip; anterior branch of R_s sinuous, at tip deflected strongly cephalad; $m-cu$ at fork of M .

Abdomen dark brown. Male hypopygium (Fig. 49) with the dististyle short and stout, not apically produced. Two dististyles, the outer a slender blackened rod, on mesal face on basal third with a small lobe, the slender apical portion of style with the surface microscopically

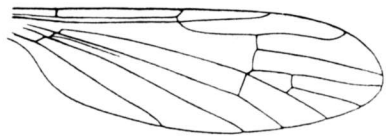


Fig. 48.

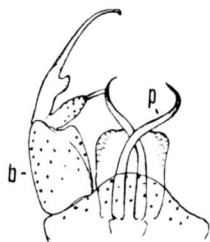


Fig. 49.

roughened, the tip obtuse. Inner dististyle a small oval lobe, the tip narrow bearing two fasciculate setae. Gonapophyses appearing as two sinuous rods that narrow to acute blackened points, decussate on median line.

Hab. South Sumatra.

Holotype, alcoholic ♂, Ranau, January-February 1929, at light.

By EDWARDS' key to the Oriental species of *Lipophleps* (Journ. Fed. Malay St. Mus., 14: 104—105; 1928), the present species runs to couplet 9, disagreeing with both included forms in the conspicuous leg-pattern.

Eriopterine larvae, without distinctive features.

Eriopterini No. 1. *Gonomyia*, supposition.

Central Java, Sarangan, Kali Djumok, December 9, 1928; S 5 a.

Two small larvae (length, 6 and 9 mm., respectively). Form slender, terete. General coloration yellowish gray below, darker above, strongly constricted before the slightly upturned spiracular disk. Spiracular disk (Fig. 50) extensive, plane, surrounded by five very blunt flattened lobes, the dorsal one smallest. Spiracles small, the ring light yellow, contrasting strongly with the discal portion and the darkened area surrounding the stigmata; distance between spiracles about four to five times the diameter of one. Dark areas surrounding the spiracles and extending onto the lateral lobes, with an additional brown cloud between. Ventral lobes and surrounding portion of disk extensively marked with brown, as figured. Gills four, small.

I suspect that this larva belongs to a species of *Gonomyia* of the subgenus *Lipophleps* though this is not certain. The larva has a spirac-

ular disk, mandible and antenna not unlike that of *G. (L.) pleuralis* (WILL.), as described by ROGERS (1926 b). This latter species is nearly aquatic, the larvae living near the surface in marshes where the black mucky soil is submerged during a part of the year and the surface is protected by a scant film of algae and with an abundance of stems and rootlets of *Sphagnum* and other decaying vegetation. The larval food is almost entirely composed of filamentous algae. *G. (L.) alexanderi* (JOHNS.) spends its early stages in coarse sand at the margins of major streams of water (ALEXANDER, 1920).

Other unrecognizable Eriopterine larvae are as follows:

South Sumatra, Musi, Aer Putih, woodland brook at Tjurup, May 8, 1929, M 12.

West Java, Tjibodas, waterfall of Tjibóróm, on wild banana, July 9, 1929; FY 4; *Gnophomyia*, supposition.

Tjibodas, waterfall of Tjibóróm, on *Colocasia*; FY 5 b; *Gnophomyia*, supposition.

Central Java, Sarangan, spring at Tjemorosewu, December 8, 1928; *Molophilus*, supposition.



Fig. 50.

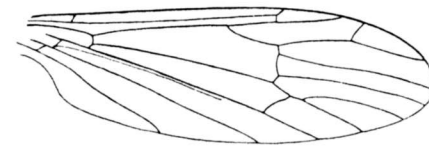


Fig. 51.

Rhabdomastix feuerborni sp. n.

General coloration brown; mouthparts extremely reduced; wings with a brownish tinge; R_3 nearly perpendicular, without macrotrichia; cell M_2 open by the atrophy of m .

Female. — Length, about 5.5 mm; wing, 4.5 mm.

Described from an alcoholic specimen.

Rostrum and palpi extremely reduced in size. Antennae pale brown, the second segment white; flagellar segments long-cylindrical, the entire organ nearly as long as the combined head and thorax. Front white, the dorsum of head brownish yellow.

Mesonotum brown, with four very slightly paler brownish yellow stripes; remainder of dorsum brown. Pleura chiefly brown, the pleural region whitish. Halteres pale. Legs with the coxae and trochanters brown, the fore trochanters as long as the fore coxae, the other trochanters proportionately shorter, especially the posterior pair; femora and tibiae brown, the tarsi paler, more yellowish. Wings (Fig. 51)

with a brownish tinge, cells *C*, *Sc* and a seam along *Cu* darker brown; veins slightly darker than the ground-color. Long, conspicuous macrotrichia on the longitudinal veins, on *M* except at base and distal half of vein 2nd *A*; trichia entirely lacking on *R*₃, *r-m* and *m-cu*. Venation: *Sc*₁ ending just beyond the fork of *Rs*, *Sc*₂ at its tip; *Rs* relatively short, about three-fourths *R*₂₊₃₊₄; *R*₃ nearly perpendicular, the distance on margin between *R*₁₊₂ and *R*₃ about equal to the latter vein; cell *M*₂ open by the atrophy of *m*; *m-cu* long and sinuous, beyond midlength of *M*₃₊₄.

Abdomen dark brown. Ovipositor with the tergal valves elongate, horn-yellow, the sternal valves shorter.

Hab. Central Java.

Holotype, alcoholic ♀, Sarangan, Telogo Wurung, December 11, 1929.

Rhabdomastix feuerborni is named in honor of the collector. The species differs from the two hitherto known Oriental species, *R. flavidula* EDW. (Borneo) and *R. trochanterata* EDW. (Pahang), by the open cell *M*₂ of the wings.

Erioptera (Erioptera) notata DE MEIJ.

1911. *Erioptera notata* de Meijere; Tijdschr. voor Ent., 54: 46.

South Sumatra, Ranau, January and February 1929, at light, several of both sexes.

The types were taken at Semarang, Java, in February, and the fly is now known to have a wide range in the Malayan islands.

IV. BIBLIOGRAPHY OF BIOLOGY AND ECOLOGY OF TIPULIDAE, 1920—1930.

In my "Biology of Crane-flies" (ALEXANDER, 1920) I have given a list of all papers known to me that related to the subject of crane-fly biology. The present time seems opportune to bring this record to date by including the published references for the decade between 1920 and 1930. In addition, a few earlier references that were overlooked in the original list have been included, such papers being preceded by an asterisk (*).

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Erklärung zu Tafel II.

Fig. 1: Kaskaden des Baches im Gebiet der Kalkquellen von Panjinggahan am See von Singkarak, Mittelsumatra. Fundstelle von *Limonia (Dicranomyia) punctulata* (de Meij.), *L. (Pseudoglochina) kobusi* (de Meij.) und *Tipulini* Nr. 6.

Phot. Feuerborn.

Fig. 2: Mittlerer Wasserfall von Tjiböröm, Westjava, Fundstelle von *Limonia (Dicranomyia) tahanensis aphrophila* n. subsp., *Tipulodina* Nr. 1, *Dicranomyia* sp., Eriopterinenlarven.

Leica-Aufnahme von A. Thienemann.

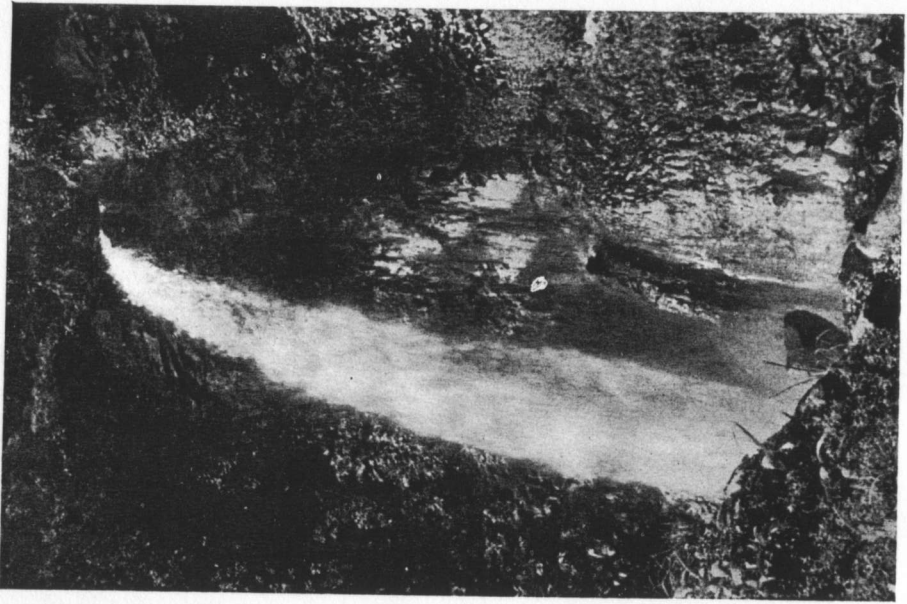


Fig. 2.

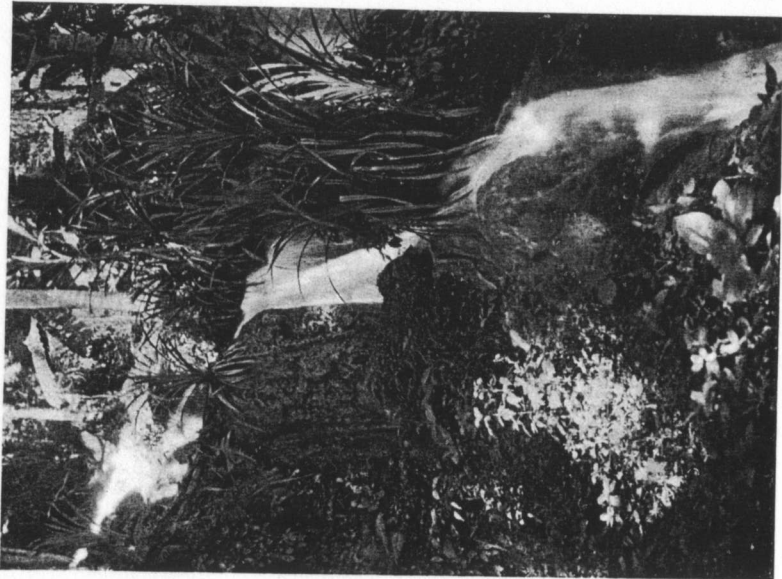


Fig. 1.