

## NOTES ON AUSTRALIAN MOSQUITOES (DIPTERA, CULICIDAE).

## PART VII. THE GENUS HARPAGOMYIA.\*

By R. H. WHARTON, B.Sc.

(Twelve Text-figures.)

[Read 30th April, 1947.]

*Contents.*

	Page.
Introduction .. .. .	58
Genus <i>Harpagomyia</i> .. .. .	58
Characters of the genus .. .. .	59
Relation to other genera .. .. .	60
Australasian species .. .. .	60
Oriental species .. .. .	65
Keys to Australasian and Oriental species of <i>Harpagomyia</i> .. .. .	67
Acknowledgements .. .. .	68
References .. .. .	68
Index to species of <i>Harpagomyia</i> mentioned in the text .. .. .	68

## INTRODUCTION.

The present paper records for the first time the occurrence of the genus *Harpagomyia* de Meijere in the Australasian Region. *H. genurostris* (Leicester) is recorded from northern Australia and southern New Guinea, one new species is described from northern New Guinea and another from the Solomon Islands. The previous known range of the genus embraced the Ethiopian and Oriental Regions. In the latter region it extended eastwards to the Philippine Islands in the north and to Java in the south.

Although a complete revision of the Oriental species is not at present possible, comparative notes on the Oriental and Australasian species are included in an attempt to facilitate their identification.

*Harpagomyia* is one of the most remarkable of mosquito genera because of the association of at least some species with ants belonging to the genus *Cremastogaster*. The adults obtain food from these ants by inserting the proboscis between the ants' jaws and absorbing any food offered. This association was first observed by Jacobson (1909a) in Java and was subsequently confirmed by James (1914) in Ceylon, and Farquharson (1918) in Tropical Africa. However, no such relationship has been observed in the Australasian species as, so far, the only adults examined have been bred through from larvae.

## Genus HARPAGOMYIA de Meijere.

DE MEIJERE, J. C. H., 1909.—*Tijdschr. Ent.*, 52: 165.

EDWARDS, F. W., 1921.—*Trans. ent. Soc. Lond.*, 1921: 496.

———, 1932.—*Culicidae in Wytzman's Genera Insectorum*. Fasc. 194: 92.

## SYNONYMY.

MALAYA Leicester, 1908 (nec *Malala* Heller, 1893). Culicidae of Malaya in *Stud. Inst. Fed. Malay States*. 3: 258. Genotype: *M. genurostris*.

GRAHAMIA Theobald, 1909. Colonial Office Miscell. Publ. No. 237: 23. Genotype: *G. trichorostris*.

\* Continued from these PROCEEDINGS, lxx (5-6), 1945, 219.

## CHARACTERS OF THE GENUS.

*Adult.*

The most distinctive character of *Harpagomyia* is the proboscis (Text-figs. 1 and 2), which is stout and hairy with a flexible joint at about two-thirds from the base, beyond which it is swollen. On each side of the basal two-thirds is a row of upwardly-directed bristles, and inserted near the base of the labella are four long, curled hairs. Mandibles and maxillae are absent in both sexes.

All species are relatively small, dark coloured mosquitoes with patches of silvery scales on the head, thorax and abdomen. The head is clothed with broad, flat scales, there being a silvery patch on the vertex and similar patches laterally. No upright forked scales are present. The clypeus is elongated and rather pointed, and is in close contact with the proboscis, as are the two-segmented palpi, which are scarcely longer than the clypeus and alike in both sexes. The antennae are alike in both sexes, those of the male lacking distinct plumes.

The prothoracic lobes are well defined and clothed with flat, metallic-silvery scales. Dorsocentral bristles are present on the scutum, which is clothed with narrow, curved scales and often a median line of flat, silvery scales. The scutellar scales are broad and flat. There are one or two posterior pronotal bristles, one to three spiracular, six to ten upper mesepimeral, but no sternopleural, lower mesepimeral or prealar bristles. The pleural scaling is metallic-silvery and extends over the posterior pronota, sternopleura and the upper part of the mesepimera. The postnotum is bare.

The legs are normal, uniformly dark scaled, with simple tarsal claws, those of the front pair in the male being slightly unequal. There are no pulvilli.

The wing scales are moderately broad and pointed, and the wing membrane bears distinct microtrichia.  $Cu_2^*$  is well developed, almost reaching the wing margin, and the anal vein ends immediately below or a little beyond the junction of  $Cu_1$  and m-cu.

The abdomen is dark brown to black with large silvery spots laterally. The eighth sternite is small and inconspicuous, as are the stout and broad cerci in the female.

*Male Terminalia:* The coxites, which are scaled ventrally,† are about twice as long as broad and bear ill-defined basal lobes, each with several simple spines. The claspers are curved and simple, with a short, thick terminal spine. The harpagones are simple, bare and pointed, while the phallosome is weakly chitinized, divided or entire.

*Larva.*

The antennae are short and smooth, with a small, simple shaft hair. The arrangement of the head hairs (Text-fig. 5) is unusual in that hairs A, B and d form a convex row around the anterior margin of the head, with hair C usually much smaller, posterior to B and d, and at or about the level of the bases of the antennae. The mouth parts are unmodified. The clypeal and epicranial sutures are indistinct.

The dorsolateral and ventrolateral thoracic hair tufts are well developed, particularly on the prothorax, where two large fan-shaped tufts arise from a dorsolateral chitinized plate.

The lateral hair tufts on the first two segments of the abdomen are well developed and the individual hairs rather long. The tufts on the following segments consist of fewer and finer hairs, though the individual hairs are still long. On the siphon there is one pair of true ventrolateral hair tufts distal to which is an irregular row of unpaired smaller tufts extending to the apex of the siphon. Dorsolateral hair tufts are present, variable in number and relative position. There is no acus and the pecten is extremely variable. The saddle, from which arises a very long saddle hair, is weakly chitinized and bears laterally a patch of relatively large scales. The ventral brush is reduced to two or three fine hairs which may be single or branched.

\* In conformity with the terminology proposed by Lee and Woodhill (1944, p. 22). Other authors either do not name, or merely refer to, this vein as an accessory vein or thickening.

† Edwards (1941) states that the coxite bears "scales on its dorsal surface", but the scales are on the ventral surface before the tip of the abdomen rotates.

## RELATION TO OTHER GENERA.

The genus *Harpagomyia* resembles the Oriental genus *Topomyia*\* (Theobald) in many details, and apart from the modified mouth parts in *Harpagomyia*, there is little to separate the adults of the two. When larval characters are examined it is found that no constant differences between the two genera can as yet be established. Within the Australasian Region the only genus with which the larva could be confused is the genus *Tripteroides* Giles. In both genera the ventral brush is much reduced, but *Harpagomyia* differs in the complete absence of stellate hair tufts, large spines on the thorax, or any modification of the maxillae.

## AUSTRALASIAN SPECIES.

## HARPAGOMYIA LEEI, n. sp.

*Types*: Holotype female, allotype male, and two female paratypes deposited in the Museum of the Division of Economic Entomology, Council for Scientific and Industrial Research, Canberra, A.C.T., and two female paratypes in the Macleay Museum, University of Sydney.

*Type Locality*: Madang, New Guinea. (M. M. H. Wallace, January, 1946.)

## DESCRIPTION.

*Female.*

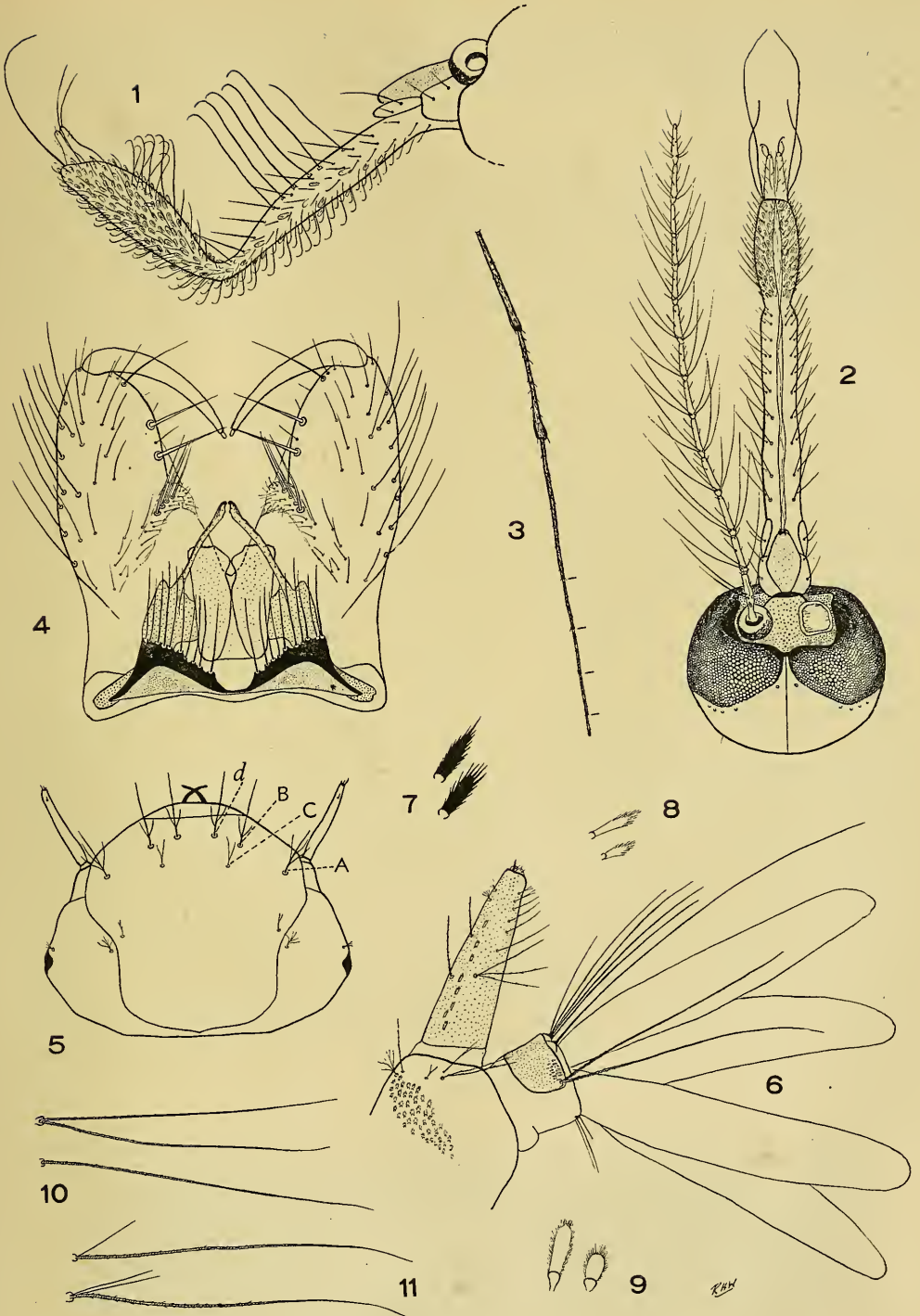
*Head*: The head is clothed with broad, flat scales—a large triangular patch of silvery scales on the vertex continued anteriorly for a short distance between the eyes, a patch of similar scales laterally on either side, and the remainder of the head covered with dark-brown to black scales. The antennae are slightly longer than the proboscis, the pedicels and flagella dark brown, the former with a greyish sheen. The first flagellar segment is longer than the remaining segments which are all about equal, with dark brown clothing and verticillate hairs. The clypeus is elongated, only slightly shorter than the palpi, both clypeus and palpi being light brown with silvery-grey sheen. The basal two-thirds of the proboscis is light brown, darker underneath than on top, with scattered spatulate creamy scales, light brown clothing hairs, and a row of upwardly-directed, dark brown, long hairs on each side. The apical third is dark brown with dark brown to black flat scales and hairs.

*Thorax*: The integument is dark, reddish-brown, the mesonotum being uniformly covered with narrow-curved, light brown scales except for a median, longitudinal line of flat, white, silvery scales extending from the front margin to about the level of the wing roots. There are further patches of flat, white, silvery scales on the prothoracic lobes, a small patch on the propleuron, a very large continuous covering to the sternopleuron and upper mesepimeron, and a large patch on the middle lobe and inner margins of each lateral lobe of the scutellum. The large, almost circular, flat scales on the proepimeron appear quite black in some lights but in others show metallic, golden-brown reflections. The outer edges of the lateral lobes of the scutellum are clothed with broad, flat, dark brown to black scales. The postnotum is brown and bare, the stems of the halteres are light brown, the knobs being covered with dark brown flat scales.

*Legs*: On the anterior surface of the fore coxae and lateral surfaces of the mid and hind coxae there is a patch of silvery, flat scales. The rest of the legs are entirely dark scaled except for the undersurface of the femora and to some extent the tibiae. The tibiae of all legs, particularly those of the hind legs (Text-fig. 3), are enlarged apically, and in the latter, the first tarsal segment is distinctly longer than the tibia.

*Wings* (Text-fig. 12): The wings are entirely clothed with dark brown scales which are rather broader and more numerous on the basal sections of the costa, subcosta and radius. The upper fork cell is 2:3 times as long as its stem, with its base nearer the base of the wing than that of the lower fork cell, which is approximately equal in length to its stem. The posterior cross-vein is its own length from the anterior cross-vein.

\* The genus *Topomyia* has been recorded by Brug (1939) as far east as the Celebes, breeding in leaf axils of *Colocasia*, but has not yet been found in the Australasian Region.



Text-figs. 1-10.—*Harpagomyia leei*, n. sp.

1. Proboscis, palpus and clypeus, lateral view,  $\times 70$  approx. 2. Head, dorsal view,  $\times 50$ .  
 3. Hind leg,  $\times 15$ . 4. Genitalia,  $\times 200$ . 5. Head of larva,  $\times 200$ . 6. Terminal segments of larva,  
 $\times 50$ . 7. Pecten teeth,  $\times 200$ . 8. Saddle scales,  $\times 200$ . 9. Lateral comb scales,  $\times 200$ .  
 10. Variations in saddle hair,  $\times 54$ .

Text-fig. 11.—Variations in saddle hair of *H. genurostris*,  $\times 54$ .

*Abdomen*: The abdomen has a complete covering of broad, overlapping, flat scales. Apart from large triangular silvery-white patches apically on the lateral margins of segments I, II, IV and V, and a minute patch on segment VI, the scales on the tergites are all dark.

*Male.*

Essentially the male is similar to the female except that the large, flat scales on the posterior pronotum show more brilliant reflections than in the female, though still not as brilliant as is found on the metallic scaling elsewhere.

*Genitalia* (Text-fig. 4): The lobes of the ninth tergites are strongly chitinized and have nine or ten spines on each lobe. The basal lobes of the coxites are small and bear four strong bristles, above which, on the inner surface of each coxite, are two similar bristles. The phallosome is partly divided, with small projections on the apex.

*Larva.*

The larva of *H. leei* is rather inconspicuous when alive because of the general light brown colouration.

*Head* (Text-fig. 5): The clypeal spines are rather long and moderately stout; head hairs A, B and d are approximately equal in size, C is much shorter and finer; A has three to five branches and occasionally six; B is normally trifid, but may be bifid; d has from three to five branches; C is normally bifid but may be single or trifid; e has about three fine branches, and f is weak, with five or six branches.

*Terminal Segments* (Text-figs. 6-9): The lateral comb consists of from thirty to sixty fringed scales arranged in a large subtriangular patch. The pentad hairs are weak and located more towards the siphon than is usual; the first pentad hair has six or seven finely frayed branches; the second is single and similarly frayed; the third is small and smooth and has from one to four branches; the fourth is frayed and has from one to three branches; and the fifth has normally two, but occasionally three, frayed branches. The siphon is weakly chitinized, particularly towards the base, and the siphonal index is about 3. The ventrolateral hair tuft has three or four slightly plumose branches, the following row of tufts consists of from two to four single, frayed hairs, followed by one or two smooth hairs with two to four branches. The dorsolateral hair tufts consist of from two to four normally single, occasionally bifid, frayed hairs followed by one to three smooth, smaller hairs with six or seven branches on the apex of the siphon. The pecten is extremely variable; in some specimens it is composed of an irregular group of small transparent fringed teeth near the base followed by a widely spaced row of four or five larger fringed teeth. In other specimens the pecten is reduced to three or four fringed teeth which form an irregular row on the siphon, and all types of gradation between these two extremes have been seen. The saddle normally covers between one-half and two-thirds of the anal segment, the saddle hair (Text-fig. 10) is very long, pilose at its base, and usually with two approximately equal branches, but sometimes it is single.



Text-fig. 12.—*Harpagomyia leei*, n. sp. Wing of female,  $\times 43$ .

The dorsal subcaudal hair tuft has four or five branches, and the ventral subcaudal tuft is single. The ventral brush is reduced to two fine hairs and in one specimen an additional small hair is present. The anal papillae are extremely large, moderately wide and at least three times the length of the anal segment.

*Breeding Habitat:* Leaf axils of *Colocasia* sp.

*Distribution:* Madang, New Guinea.

*Note.*—Lieut.-Col. W. V. King obtained larvae of an undetermined species of *Harpagomyia* from the leaf axils of taro plants, *Colocasia* sp., in the Dobodura-Cape Sudest area, New Guinea, in 1943. His brief description of the adults reared from these larvae (in "Keys to the Culicine Mosquitoes of the New Guinea Region", a roneoed document prepared for the U.S. Army, Third Medical Laboratory, October, 1944) indicates that they may have been *H. leei*, but the specimens were not available for examination.

#### HARPAGOMYIA SOLOMONIS, n. sp.

*Types:* Holotype male, allotype female, one male paratype in the University of Queensland Collection. Holotype and allotype with associated larval and pupal skins.

*Type Locality:* Bougainville (J. R. Covell, December, 1944).

#### DISTINCTIVE CHARACTERS.

*H. solomonis*, although closely related to *H. leei*, is distinct in both the male and the larva. In the adult male the scutellum has broad, flat, dark brown scales on all lobes, but no silver scales on the mid-lobe as in *H. leei*. The larva differs in head hair C being much longer and stouter, almost as well developed as A, B and d. The saddle hair consists of three or four equal branches and the hairs of the ventral brush are almost as long as the saddle hair.

#### DESCRIPTION.

##### Male.

*Head:* The scales of the head are broad and flat, the silver patch on the vertex not continued anteriorly between the eyes. The pedicels and first flagellar segments are light brown with a greyish sheen. The base of the proboscis, palpi and clypeus are cream, the remainder of the basal two-thirds of the proboscis light brown with scattered cream scales on the upper surface and darker brown scales underneath.

*Thorax:* The integument is reddish-brown, the mesonotum with narrow, curved, dark brown scales and a median line of flat, almost circular, silver scales. Pronotal lobes are silver scaled and proepimeral scales appear dark brown, bronze or silver according to the direction of light. At most only two fine spiracular bristles are present. The scales on all three lobes of the scutellum are flat and dark brown in colour.

*Legs:* The coxae are very light brown, each with a patch of silvery, flat scales, the remainder of the legs uniformly dark scaled.

*Wings:* The scales on the wing and the position of the fork cells are as in *H. leei* (Text-fig. 12).

*Abdomen:* The dorsum is entirely dark scaled, the anterior, lateral margins of tergites I, II, IV and V with patches of silver scales. Tergites VI, VII and VIII are completely dark scaled.

*Genitalia:* The genitalia are similar to those figured for *H. leei* but the harpagones are less pointed and have much stouter stems.

##### Female.

The clypeus, except for the tip, is dark brown in colour, the palpi and basal two-thirds of the proboscis slightly darker than in the male.

The scutellum, though partly denuded, bears a number of broad, flat silver scales on the mid-lobe and dark brown, flat scales on the lateral lobes.

The legs, wings and abdomen agree in all essentials with those of the male.

##### Larva.

*Head:* Head hairs A, B, C and d are approximately equal in length; A has six branches; B has from three to five branches; C has two or three branches and d has

five or six branches. Head hair C normally has only one branch which is approximately equal in length to the longest branches of hairs A, B and d, the remaining branches of C being much shorter.

*Terminal Segments:* The ventrolateral hair tuft on the siphon has about five finely frayed branches; the row of hairs on the ventral surface consists of eight or nine single or bifid finely frayed hairs. The pecten is variable.

The saddle is well developed and covers the upper two-thirds of the anal segment; saddle hair very long with three or four pilose branches which are approximately equal in length. The dorsal subcaudal hair tuft has four to six branches, all simple, while the ventral subcaudal tuft is an extremely long single hair. The ventral brush consists of two long, single, or bifid hairs about the same length as the saddle hair.

*Breeding Habitat:* According to J. R. Covell, larvae were found "breeding in axils of a lily-like plant with long narrow leaves, grows 3-7 feet high". A botanist reported on specimens, "That as far as can be ascertained, its family is Pandanaceae and genus *Sararanga*."

*Distribution:* Bougainville Island.

*Note.*—The colour of the clypeus in the female is distinctive but may not be a constant character and could only be verified by the examination of further specimens.

The description of the larva was made from correlated larval skins which were, unfortunately, poor preparations. No larval material was available and further collections are required before a fuller description and figures can be attempted.

#### HARPAGOMYIA GENUROSTRIS (Leicester).

- LEICESTER, G. F., 1908.—Culicidae of Malaya in *Stud. Inst. Med. Res. Fed. Malay States*, 3:258.  
 EDWARDS, F. W., 1913.—*Bull. ent. Res.*, 4:230.  
 ———, 1921.—*Trans. ent. Soc. Lond.*, 1921:498.  
 ———, 1930.—*Bull. ent. Res.*, 21:543.  
 BARRAUD, P. J., 1926.—*Ind. J. Med. Res.*, 14:349.  
 ———, 1934.—*Fauna Brit. Ind., Dipt.*, 5:48.  
 BOHART, R. M., and INGRAM, R. L., 1946.—Navmed 1055. Bur. Med. and Surgery, Navy Dept., Wash.: 54.  
*Types:* Type male in the British Museum.  
*Type Locality:* Kuala Lumpur, Malay Peninsula.  
*Material Examined:* I have examined a series of specimens collected from Darwin and Cairns (Australia), and Merauke (Dutch New Guinea).

#### DISTINCTIVE FEATURES.

The adult may be distinguished by the cream to light brown colour of the basal two-thirds of the proboscis, clypeus and palpi, by the presence of a line of silver scales between the eyes, and the presence of large apical lateral patches of silver scales on tergites VI and VII.

Larval differences are discussed in the description below.

#### DESCRIPTION.

##### *Female.*

The basal two-thirds of the proboscis, the clypeus and palpi vary from yellow to light brown, the apical third dark with a complete covering of dark brown to black scales. The patch of silver scales on the vertex is continued anteriorly as a narrow silver line between the eyes.

The integument of the mesonotum ranges from light to dark reddish-brown and the median line of metallic scales may appear silver or bluish according to the angle and intensity of the illuminating light. The silvery metallic scales on the prothoracic lobes and proepimera can also vary, the former from pearly-white to azure-blue, the latter from white to yellow, but the reflections from these are never as brilliant as those from the prothoracic scales.

There are large apical patches of silver scales on the lateral margins of all the abdominal tergites except the third, the patches on tergites IV and VII being the largest and almost covering the sides of the tergites.

*Male.*

Only the tip of the apical third of the proboscis is definitely dark, the remainder cream to light brown. The original description, based on a single male, states that the scutellar scales are "small, dark brown, and racquet-shaped". Specimens from Darwin have broad, flat, dark brown scales on all lobes, but specimens from Cairns have flat, silver scales on the mid-lobe and flat brown scales on the lateral lobes as in the female. The Merauke material is badly rubbed and the only specimen with any scaling has two broad, flat, dark brown scales on the apex of the mid-lobe and scattered similar scales at the base of all lobes. Neither Barraud (1926, 1934) nor Edwards (1913, 1922, and 1930) deals clearly with the scutellum, though Barraud (1926) mentions that the "scutellar scales are silvery", but he does not disclose any sexual differences. In the type male, according to information received from the British Museum, the scutellum is denuded and the examination of further specimens points to the conclusion that the scaling of the scutellum in male *H. genurostris* is a variable character.

The male is similar to the female in all other essential details, and the genitalia show no marked differences from those figured for *H. leei*.

*Larva.*

The larva has been figured by Barraud (1934, Fig. 12, g-j) and is very similar to *H. leei*. The only points of difference may be in the dorsolateral hair tufts on the siphon, which are smaller and have two or three smooth branches instead of the frayed, normally single, hair tufts in *H. leei*. Again, the saddle hair (Text-fig. 11) consists of one very long branch and one, in rare cases two, much finer and shorter branches. However, *Harpagomyia* larvae are, as a group, extremely variable, and it is likely that the above characters would break down if a larger series of larvae from both species were examined.

*Breeding Habitat:* The larvae have been found breeding in the leaf axils of large *Arum* (Barraud, 1934), in *cunjevoi*, probably taro (Wassell, 1944), in *Colocasia* (Wharton, 1945), and in *Colocasia antiquorum* and *Rhynchospora aurea* (Cyperaceae) (Marks, 1946).

*Distribution:* Previously known in India, Ceylon, Assam, Malaya, Philippines, Ryukyus, Okinawa and possibly Formosa. New Guinea (Cameron, 1945), Australia, Cairns (Wassell, 1944, and Marks, 1946) and Darwin (Wharton, 1945) are new records.

Credit for the first discovery of *H. genurostris* in Australia belongs to J. C. Wassell, who collected larvae at Cairns in June, 1944.

The presence of *H. genurostris* in Java and Sumatra has been recorded by several authors, but the evidence on which this is based is not known to me. Edwards (1921), in a revision of the genus, reduced the number of Oriental species to one, namely, *H. genurostris*, which was then regarded as having a distribution which included Java and Sumatra. In a subsequent paper (1930), Edwards restored the original species, and by virtue of this restoration and the absence of new records, the distribution of *H. genurostris* at present appears to exclude Java and Sumatra.

## ORIENTAL SPECIES.

*Harpagomyia genurostris* was originally described from Malaya in the Oriental Region but its distribution now includes parts of the Australasian Region. The distinctive features of *H. genurostris* have been set out above, notes on the remaining Oriental species follow.

## HARPAGOMYIA COERULEOVITTATA Ludlow.

LUDLOW, C. S., 1911.—*Psyche*, 18: 131.

EDWARDS, F. W., 1913.—*Bull. ent. Res.*, 4: 240.

———, 1930.—*Ibid.*, 21: 543.

*Types:* Type female in the United States National Museum, Washington.

*Type Locality:* Philippine Islands.

*Material Examined:* No specimens were available for examination, but Lieut.-Col. W. V. King, of the United States Army, kindly examined the type female and forwarded a description.

## DESCRIPTION.

Because Ludlow described the clypeus as having a "rather long, white fuzzy tomentum", Edwards (1930) regards this species as distinct. Lieut.-Col. King formed



the opinion that there is definitely no tomentum, but that the clypeus is "shiny dark brown, appearing frosted in some lights". King further mentioned that the specimen has apparently darkened in colour, and, as the remainder of the description follows that for *H. genurostris* it appears likely that *H. coeruleovittata* is a synonym of *H. genurostris*.

The larva has not been described.

*Distribution*: Philippine Islands.

#### HARPAGOMYIA JACOBSONI Edwards.

EDWARDS, F. W., 1930.—*Bull. ent. Res.*, 21: 543.

BARRAUD, P. J., 1934.—*Fauna Brit. Ind., Dipt.*, 5: 51.

*Types*: Type female in the British Museum.

*Type Locality*: Fort de Kock, Sumatra.

#### DESCRIPTION.

##### *Adult.*

Apart from being larger than the other described species (wing length 3-3.5 mm. to *H. genurostris* 2.2-2.4 mm.), *H. jacobsoni* is apparently distinct in having a dark clypeus with a slight silvery pruinescence, and in the absence of silver scales between the eyes. The abdominal scaling is similar to *H. genurostris*.

##### *Larva.*

The larva has been figured by Barraud (1934, Fig. 12, c-f) and the most obvious differential characters are the unbranched head hairs, the lateral comb composed of from 16-20 teeth more or less arranged in two rows, the anal papillae more pointed than rounded, and the three fairly long branches to each of two hair tufts of the ventral brush.

*Breeding Habitat*: Leaf axils of a large species of *Arum*, in association with *H. genurostris* (Barraud, 1934).

*Distribution*: India, Sumatra.

#### HARPAGOMYIA SPLENDENS de Meijere.

DE MEIJERE, J. C. H., 1909.—*Tijdschr. Ent.*, 52: 167.

EDWARDS, F. W., 1930.—*Bull. ent. Res.*, 21: 543.

*Types*: If designated as such, presumably in the "Museum der Kgl. Zoolog. Gesellschaft Natura Artis Magistra", in Amsterdam.

*Type Locality*: Java (listed localities are Batavia and Semarang).

*Material Examined*: I have examined a series of adults collected by D. H. Colless from Labuan Island, Borneo, another series collected by R. L. Lehfeldt from the same source, and two specimens from Weltevreden, Java. Larval material from Labuan Island was available for examination.

#### DESCRIPTION.

##### *Adult.*

The characters which serve to distinguish this species are as follows: (i). In the female the basal two-thirds of the proboscis is dark brown to black, the clypeus is cream to light brown with a silvery-grey pruinescence. The thorax and abdomen are darker than in *H. genurostris* but the ornamentation is similar. (ii). In the male the basal two-thirds of the proboscis, clypeus and palpi are cream to light brown and the scutellum has a covering of silver, flat scales on the mid-lobe. The male, then, cannot be distinguished superficially from some male *H. genurostris* specimens, and there are no obvious differences in the genitalia.

##### *Larva.*

The larva cannot be separated from that of *H. genurostris*. Those examined differ from de Meijere's original description in that the lateral comb is composed of from fifty to sixty scales instead of thirty, and the anal papillae are at least twice as long as, instead of being shorter than, the anal segment.

*Breeding Habitat*: Larvae were found breeding in the leaf axils of *Colocasia* sp. on Labuan Island.

*Distribution*: Java and Borneo (Labuan Island).

*Note.*—It is possible that the specimens examined from Labuan Island are not true *H. splendens* but actually a variety of *H. genurostris* in which the basal portion of the proboscis is darker than usual. It does appear to be an intermediate form and some specimens cannot be definitely included in either species, provided, of course, that *H. splendens* is a valid species. The present known distribution of *H. genurostris* supports the above theory in that the presence of *H. genurostris* in the Netherlands East Indies has not been recorded, though it occurs both east and west of those islands.

One female specimen collected by C. Cameron from Merauke, New Guinea, in 1945, is very close to *H. splendens*. The proboscis is dark brown to black in colour, but the clypeus appears to be dark brown with a greyish pruinescence. Further collections from that area will possibly throw light on the complexity of the *H. genurostris* and *H. splendens* problem.

KEYS TO AUSTRALASIAN AND ORIENTAL SPECIES OF HARPAGOMYIA.

When an attempt is made to separate the five, possibly six, species of *Harpagomyia* which occur in the Australasian and Oriental Regions, considerable difficulties are encountered.

The examination of the individual species descriptions shows apparent clear-cut and obvious differences. Each species, however, shows considerable variation, particularly in the larval stage, and intermediate forms are not uncommon when two closely related species are studied. It appears that though the genus is extremely specialized, a number of new species or subspecies are in the process of evolution but have not been isolated for a sufficient period to have reached a static and constant form. By systematic and exhaustive collecting over the whole area an interesting problem in geographic isolation could possibly be elucidated or the number of species curtailed.

(a). ADULTS.

- 1. Basal two-thirds of proboscis and clypeus yellow, cream or light brown ..... 2  
    Basal two-thirds of proboscis and clypeus either yellow to light brown or dark brown to black but never with basal half of proboscis and clypeus both yellowish in the same specimen ..... 3
- 2. Abdomen with apical silvery patches on all tergites except the third; eyes separated completely by a line of silver scales ..... *genurostris*  
    Abdomen with apical silvery patches on all tergites except the third and seventh, and only a small silver spot apically on the sixth; eyes separated for only a short distance by a projection anteriorly from the patch of silver scales on the vertex ..... *leei*
- 3. Basal two-thirds of proboscis dark brown to black; clypeus yellowish .... *splendens*  
    Basal two-thirds of proboscis yellowish; clypeus dark brown to black ..... 4
- 4. Tergites VI and VII completely dark scaled ..... *solomonis*  
    Tergites VI and VII with patches of silver scales apically ..... *jacobsoni*

The above key should be sufficient to determine female specimens of *Harpagomyia* and, except in the case of *H. splendens* and *H. solomonis*, will serve to distinguish males. Since the validity of the specific status of *H. coeruleovittata* is in question, it has not been included.

(b). LARVAE.

- 1. Lateral comb composed of 16–20 scales arranged in two irregular rows; head hairs A, B and d all single ..... *jacobsoni*  
    Lateral comb a patch of thirty or more scales; head hairs A, B and d always branched ..... 2
- 2. Saddle hair with one long branch, and one, occasionally two, much finer and shorter ..... *splendens, genurostris*  
    Saddle hair single, or, if branched, with all branches approximately equal in size and length ..... 3

3. Saddle hair single or with two equal branches ..... *leei*  
 Saddle hair with three or four equal branches ..... *solomonis*

## ACKNOWLEDGEMENTS.

For helpful criticism and advice I particularly desire to thank Mr. D. J. Lee, of the University of Sydney. Miss E. N. Marks, of the Queensland University, has been of great assistance in providing material and suggestions. Lieut.-Col. W. V. King, of the United States Army, and Mr. H. Oldroyd, of the British Museum, assisted by examining type specimens lodged overseas; and my thanks are due to Miss G. Burns, of the Department of Zoology, University of Sydney, for the photograph.

## REFERENCES.

- BOHART, R. M., and INGRAM, R. L., 1946.—Mosquitoes of Okinawa and Islands in the Central Pacific. Navmed 1055, Bur. Med. and Surgery, Navy Dept., Wash.: 54.  
 BRUG, S. L., 1939.—Notes on Dutch East Indian Mosquitoes. *Tijdschr. Ent.*, 82: 96-99.  
 EDWARDS, F. W., 1941.—Mosquitoes of the Ethiopian Region, Part iii. Brit. Mus. (Nat. Hist.), Lond.: 33-37.  
 FARQUHARSON, C. O., 1918.—*Harpagomyia* and other Diptera fed by *Cremastogaster* Ants in S. Nigeria. *Proc. ent. Soc. Lond.*, 1918: xxix-xxxix. (Letter communicated by Professor Poulton.)  
 HOPKINS, G. H., 1936.—Mosquitoes of the Ethiopian Region, Part i. Brit. Mus. (Nat. Hist.), Lond.: 34-36.  
 JACOBSON, E., 1909a.—Notes *Leyden Mus.*, 31: 246.  
 ———, 1909b.—Ein Moskito als Gast. *Tijdschr. Ent.*, 52: 158-164.  
 ———, 1911.—Nähere Mitteilungen über die myrmecophilen Culicide *Harpagomyia splendens* de Meijere. *Ibid.*, 54: 158-161.  
 JAMES, S. P., 1914.—Summary of a Year's Mosquito Work in Ceylon. *Ind. J. Med. Res.*, 2: 233.  
 LEE, D. J., and WOODHILL, A. R., 1944.—The Anopheline Mosquitoes of the Australasian Region. Univ. Sydney, Dept. Zool., Monogr. No. 2.  
 DE MEIJERE, J. C. H., 1911.—Zur Metamorphose der myrmecophilen Culicide *Harpagomyia splendens* de Mejeire. *Tijdschr. Ent.*, 54: 162-67.  
 THEOBALD, F. V., 1910.—Monograph of Culicidae, 5: 547.

## INDEX TO SPECIES OF HARPAGOMYIA MENTIONED IN THE TEXT.

	Page.
coeruleovittata .. .. .	65
genurostris .. .. .	64
jacobsoni .. .. .	66
leei .. .. .	60
solomonis .. .. .	63
splendens .. .. .	66
trichorostris .. .. .	58