

With kind regards,  
P. B. Mearns

of Agriculture

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## NOTES ON SOME ORIENTAL MOSQUITOES.

By P. F. MATTINGLY.

*(Department of Entomology, British Museum (Natural History)).*Genus *Heizmannia* Ludlow.

THE following descriptions of pupae were made at the request of Lt.-Cdr. K. L. Knight and Dr. R. W. Chamberlain who were unable to include *Heizmannia* in their new system of nomenclature for the chaetotaxy of the mosquito pupa (1948) owing to lack of material. I am indebted to Lt.-Cdr. Knight for reading and criticizing the manuscript.

*H. pilosa* Brug.

The descriptions which follow are based on the pelts of the type male and a paratype male referred to by Brug in his original description (1931). The type male is the specimen referred to by Brug as "a" and the paratype that referred to as "b." As Brug pointed out, there are marked differences between the two pelts although the adults, and, in particular the male genitalia, appear to be indistinguishable. In view, however, of the extreme paucity of the available material it is not proposed at the present time to discuss the taxonomic status of the two forms. Fig. 1 is based entirely on the pelt of the type male, except for the setal rings (O) on segments IV and V which were drawn from the paratype pelt. In general, the arrangement of setae is much as in *Aedes*. The majority of setae, with the exception of the float-hair, seta 5 on segment VI (and almost certainly on IV and V as well) and seta 8 on VII and VIII, are very small and inconspicuous, but setae 10, 11 and 12 of the metanotum, 3 and 4 of I, 3 and 4 of II and 4 of III, although short are stout, dark and relatively conspicuous. The narrow paddle with conspicuous fringe and darkly pigmented mid-rib, taken in conjunction with the small number of branches in seta 8 of segments VII and VIII, is probably diagnostic of the genus. The well developed seta 3 on the anterior segments of the abdomen is an unusual feature. Details of the pelt of the type male are as follows :

*Trumpets* narrow, cylindrical with the meatus occupying almost the entire length and the aperture short and almost circular. *Cephalothorax* with setae 1, 2 and 3 single, 3 about one-third the length of the paddle, 2 rather less, 4 bifid, 5 single or bifid, 6 and 7 single, 8 single or trifold, 9 single, these six setae each about one-fifth to a quarter the length of the paddle. Metanotal setae relatively stout and dark, 10 4-branched, 11 single, 12 bifid, 11 about a quarter the length of the paddle. *Abdomen* with seta 2 of segment I modified to form a strongly developed float-hair, 3 and 4 stout, dark and single, the former about one-fifth, the latter rather over one-third the length of the paddle, 5 and 6 minute, bifid to trifold and 4 to 5-branched respectively, 7, 8 and 10 very delicate, 7 single, about a quarter the length of the paddle, 8 single, minute, 10 bifid, about one-fifth the length of the paddle. Segment II with 2 small and tuft-like with numerous branches, 3 and 4 stout, dark and single, 3 about one-sixth and 4 about one-fifth the length of the paddle, 5 and 6 minute, 5-branched and bifid respectively, 7 slender, delicate, about the same length as

3, 8 minute, single, curved, 10 small with about 5 very delicate branches. Segment III with 3 very short, but still relatively stout, 2 minute, delicate, 4-branched, 4 much as on segment II, 5 short, delicate, single, 6 minute, trifid, 7 and 8 much as on II, 9 and 10 minute,

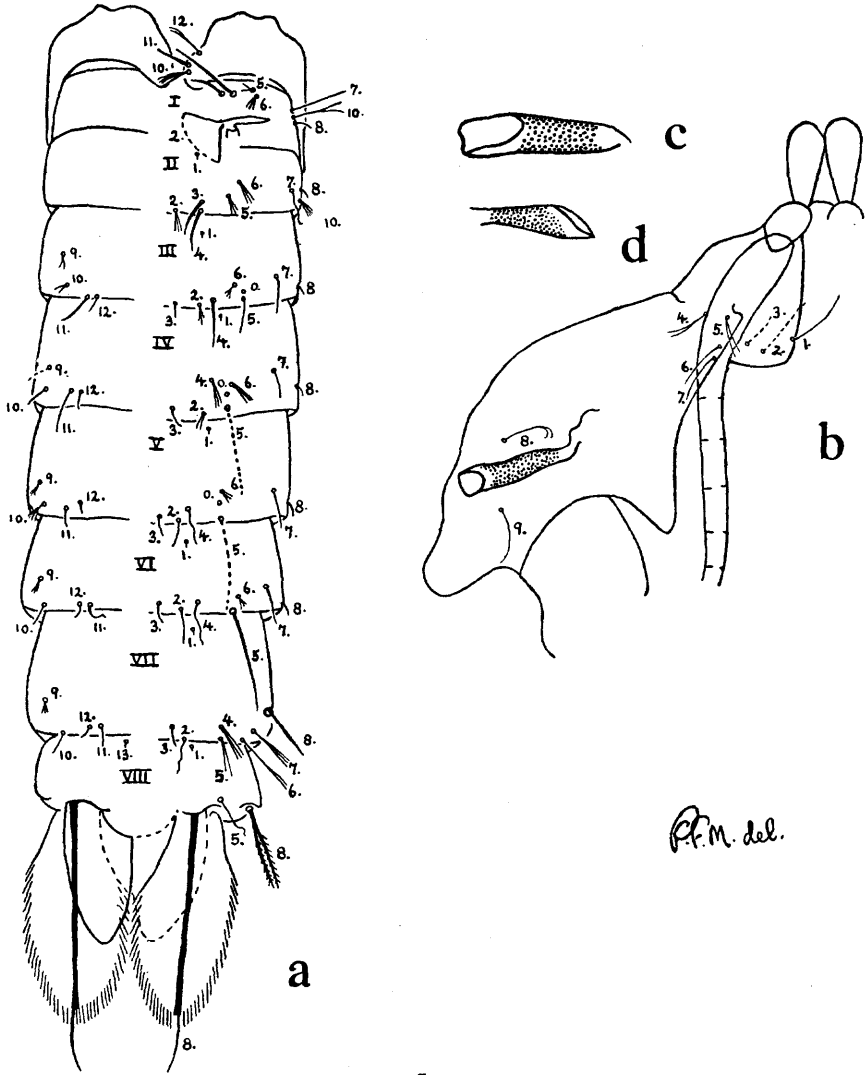


FIG. 1.—*Heizzmannia* spp. Pupae. (a) *H. pilosa*. Metanotum and abdomen. (Dorsal surface on the right, ventral on the left.) (b) *H. pilosa*. Cephalothorax. (c) *H. himalayensis*. Respiratory trumpet. (d) *H. pilosa*. Respiratory trumpet.

trifid or 10 may be 4-branched, 11 single or bifid, relatively stout, about one-seventh the length of the paddle, 12 minute, single. IV with all those setae which are present very small, 2 delicate, bifid, 3 simple, much as on III, 4 with about 5 delicate branches, 5 missing

but apparently stout and conspicuous to judge from the size of the base, 6 minute, trifid, 7 very delicate, single, about one-eighth the length of the paddle, 8 much as on III, 9 not seen, 10 minute, bifid, 11 short, delicate, bifid, 12 minute, single. Segment V with 3 minute, single, 2 and 4 small, delicate, 2 single, 4 bifid, 5 missing, the base large and conspicuous, 6 minute with 5 delicate branches, 7 short and very delicate, single, 8 as on IV, 9 small and delicate, split distally, 10 minute with 5 branches, 11 very delicate with slight fraying, about one-sixth the length of the paddle, 12 minute, simple. VI with 2, 3 and 4 all single, 3 minute, 2 and 4 small and very delicate, 5 stout, dark, just over half the length of the paddle, single (split distally on one side into 2-3 very fine, short branches), 6 minute with about 5 branches, 7 small and very delicate, 8 as on V, 9 minute with 4 branches, 10 short, very delicate, single or bifid, 11 and 12 much as on V, VII with 2 and 3 much as on VI, 4 trifid, 5 short, delicate, bifid or trifid, 6 very delicate, about one-fifth the length of the paddle, split distally into 2-3 delicate branches, 7 very delicate, trifid, 8 stout, dark, straight, spinelike, about a quarter the length of the paddle, 9 small, delicate, trifid, 10, 11, 12 delicate, single. Segment VIII with seta 5 delicate, single, about a quarter the length of the paddle, seta 8 stout, dark, plumose, bifid, a little less than two-fifths the length of the paddle. Paddles long and narrow, their length about  $2.5 \times$  their greatest breadth. A fringe of delicate hairs extends from about one-third the distance from base to seta 8 on the outer edge to half-way down the inner edge. Proximal to this on the outer edge are a few very inconspicuous, rudimentary spines. The mid-rib is darkly pigmented. Seta 8 is slender but conspicuous. It arises just before the tip of the paddle and is about one-third the paddle length.

*Variation.*—The pelt of the paratype male (Brug's specimen "b") differs from that of the type as follows:

*Trumpets* broader apically, conical. *Cephalothorax* with seta 4 4-branched, 7 split distally, 8 bifid, 10 about a third the length of the paddle, 11 a little more than a quarter, 12 rather less. *Abdomen* with setae 3 and 4 of segment II about a fifth and a quarter the length of the paddle respectively, seta 5 4-branched, 6 single. The relative position of these two setae differs somewhat from that encountered in the type, 6 being on a level with 5 and making a straight line with this and 7. Seta 10 is single. Segment III with seta 2 bifid or trifid, 4 missing, 6 apparently single but may be split distally, 10 apparently single. Segment IV with 6 bifid, 9 short, delicate, single, 11 single. Segment VI with 5 just under two-thirds the length of the paddle, 6 bifid. VII with 2 bifid, 4 bifid, 5 single, 6 single, 7 single on one side, bifid on the other. Segment VIII with seta 8 trifid. Paddles about  $2.1 \times$  as long as their greatest breadth, the fringe somewhat better developed than in the type.

It will be seen that the differences in chaetotaxy are very slight. The difference in shape of the trumpets and the broader paddles are quite striking characters. The difference in the relative positions of setae 5 and 6 on segment II is of doubtful significance.

#### *H. himalayensis* Barraud.

A single pelt with associated larval pelt and female adult from Koti, Western Himalayas (*P. J. Barraud*) differs from that of the type male of *pilosa* as follows:

*Trumpets* larger, similar in shape, but with the aperture more elongated and the meatus correspondingly shorter. *Cephalothorax* with seta 1 trifid, 2 bifid, 3 single on one side, bifid on the other, 4 single, 6 single or bifid and one-third to three-eighths the length of the paddle, 7 a little more than two-fifths the length of the paddle, all these setae considerably stouter than in *pilosa* except for 3 which is relatively slender, 8 and 9 both single, a little over one-third the length of the paddle, 10, 11 and 12 single, 11 considerably stouter

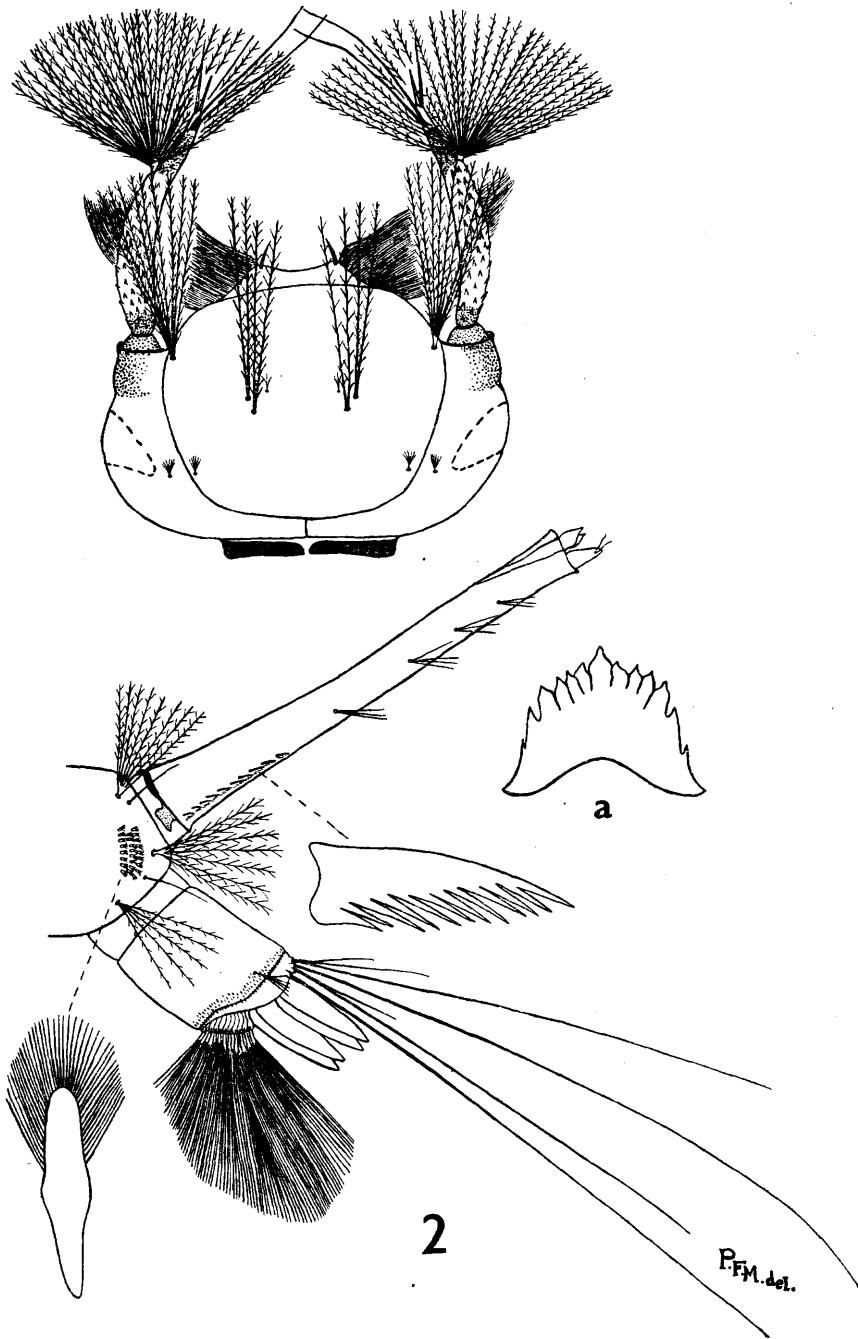


FIG. 2.—*Culex rubithoracis*. Head and terminal segments of fourth instar larva. (a) Mentum.

than the others and slightly longer, being about two-fifths the length of the paddle. *Abdomen* with seta 3 of segment I paler and rather more slender than seta 4, the latter slightly less than half the length of the paddle, 7 and 10 stout and dark, between one-third

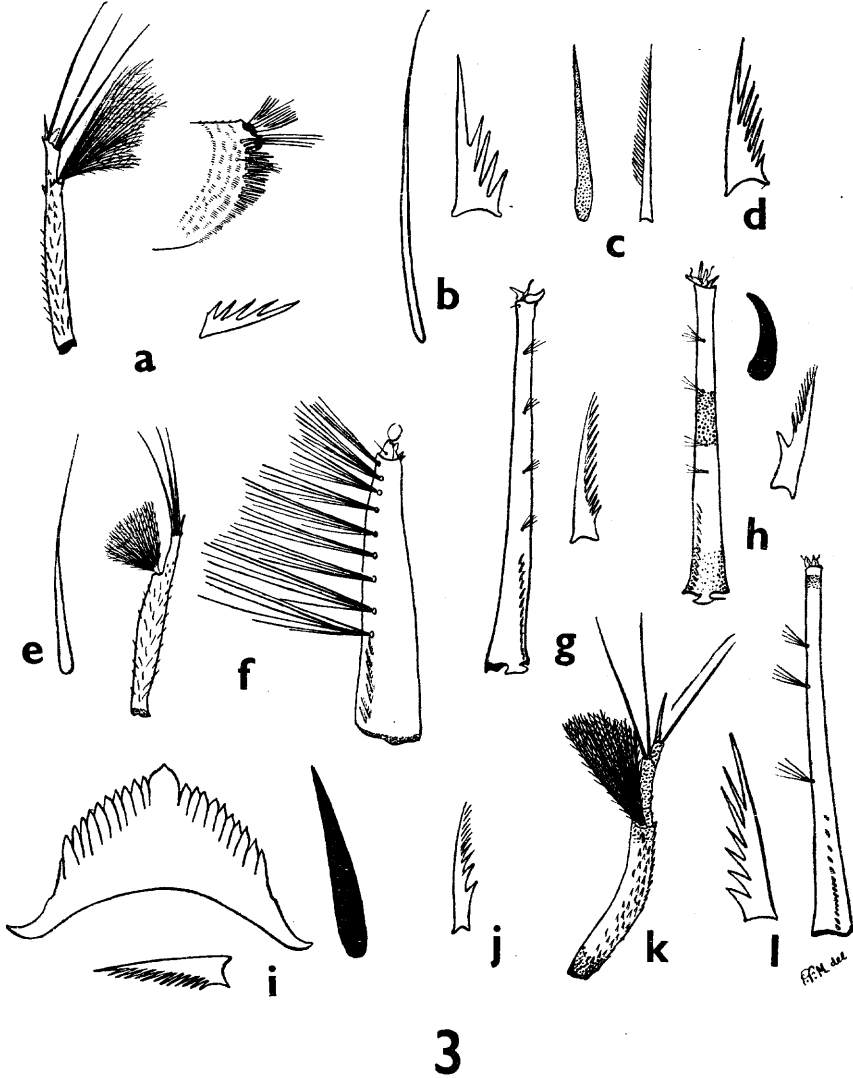


FIG. 3.—Details of larvae of subgenus *Lophoceraomyia*. (a) *C. (L.) uniformis*. Antenna, pecten spine and distal edge of saddle. (b) *C. (L.) ? cinctellus*. Preclypeal spine and pecten spine. (c) *C. (L.) hewitti*. Preclypeal spine and pecten spine. (d) *C. (L.) carolinensis*. Pecten spine. (e) *C. (L.) eminentia*. Preclypeal spine. (f) *C. (L.) navalis*. Antenna and siphon. (g) *C. (L.) hilli* var. *buxtoni*. Siphon and pecten spine. (h) *C. (L.) quadripalpis*. Siphon, pecten spine and preclypeal spine. (i) *C. (L.) fraudatrix*. Mentum, preclypeal spine and pecten spine. (j) *C. (L.) fraudatrix* var. *solomonis*. Pecten spine. (k) *C. (L.) minutissimus*. Antenna. (l) *C. (L.) minor*. Siphon and pecten spine.

and two-fifths the length of the paddle. Segment II with seta 2 only lightly dendritic, 3 comparatively stout, but paler than 4 which is about one-third the length of the paddle, 6 single, about one-fifth the length of the paddle and lying only very slightly anterior to 5, 10 single, slightly less than one-third the length of the paddle, 9 single, the same distance from the posterior edge of the segment as 10 which is closer to the mid-line, 10 with 5 branches, 11 rather less than one-third the length of the paddle. Segment IV with 2 single and set considerably posterior to 3, 4 single, about a quarter the length of the paddle, 5 single, stout, dark and conspicuous, a little less than three-quarters the length of the paddle, 6 bifid, lying nearer the mid-line than 5, between this and 4, 7 rather more than a quarter the length of the paddle, 9 trifid, 10 4-branched, 11 about a quarter the length of the paddle. Segment V with 2 bifid, 4 single, 5 much as on IV, 6 trifid, 7 rather over a quarter the length of the paddle, 9 4-branched, 10 trifid, 11 about one-third the length of the paddle. Segment VI with 5 single, a little less than three-fifths the length of the paddle, 6 single, 10 single, about a fifth the length of the paddle, 11 rather less than a third of the length of the paddle. VII with all dorsal setae single except 8, which is bifid on one side, this seta a little less than one-third the length of the paddle, 10 bifid. Segment VIII with 5 rather more than a third the length of the paddle, 8 trifid on one side, 4-branched on the other, between two-fifths and a half the length of the paddle. Paddles broadly oval, about  $1\frac{1}{2} \times$  as long as their greatest breadth. Seta 8 just over a quarter the length of the paddle.

Genus *Culex* L.

Subgenus *Lophoceraomyia* Theobald.

*C. (L.) parainfantulus* Menon.

A comparison between the terminalia of the type male of *C. (L.) infantulus* Edwards and the description and figures of those of *parainfantulus* Menon failed to reveal any significant difference and the latter name is therefore regarded as a synonym of the former. In particular the terms "reticulate" (Menon, 1944), "tubercular" (Edwards, 1922), and "placoid" (Bohart and Ingram, 1946), as applied to the dorsal process of the phallosome, are clearly descriptive, in the present instance, of the same condition. The recorded range of *infantulus* should be extended to include Southern and Eastern India in addition to Java, Siam, Indochina, the Philippines, the Ryuku Islands, China and Japan.

*C. (L.) rubithoracis* Leicester.

A description of the larva of this species was recently prepared in conjunction with Dr. R. B. Jackson, who found it in swampy ground at Hong Kong. As this description was being sent to press we heard from Mr. Baisas, of the Bureau of Health, Manila, that he already had a description in the press. Ours was accordingly withdrawn. As, however, the Hong Kong material differs in some respects from that described by Mr. Baisas (*in* Dantis, 1947), and as the latter has omitted from his description some characters which appear to be necessary for keying the larvae of this subgenus, a comparative description is given below. Details of the larva, which has not previously been figured, are shown in fig. 2. The description of the Hong Kong material is based on nine fourth stage pelts, eight of them with associated adults. Characters differing from or additional to those described by Baisas are as follows:

*Head* broader than long with the integument pale except for small patches of infuscation forming an irregular pattern. *Antennae* stout, curved, spinose, swollen below the point

of attachment of the antennal tuft (fig. 1 shows the appearance in crushed pelts), pale except for well-marked areas of infuscation at the base and beyond the tuft. Apex pale for some distance back. Antennal tuft situated at about two-thirds the distance from the base to the apex. Subterminal bristles situated well behind the apex, much longer and stouter than the terminal bristle. *Pre-clypeal spines* short, dark, stout and sharply pointed. *Mouth-brushes* well developed, the hairs unmodified. Head seta "A" with 8-11 plumose branches, 0.9-1.3 × as long as the antennal tuft. "C" and "d" bifid or trifid, "d" situated inside and in front of "B." "e" with 5-8 branches. Mentum with 6-7 teeth on either side of the large central tooth, the basal ones small and well separated (absent from one specimen which has only 11 teeth in all). *Comb* with about 30 scales. Inner (upper) caudal seta with one long and 1-3 short branches. *Ventral brush* with 12 tufts all in the barred area. *Anal papillae* varying from slightly longer than the saddle to a little over half its length. *Siphon* tapering from the base to about halfway, beyond which the sides are roughly parallel. *Pecten* with 9-10 teeth, those from the middle having a minimum of 12 secondary denticles. *Siphonal index*, in crushed pelts, about 5.

The larva is readily distinguished from all others of the subgenus except *uniformis* by the heavily spiculated thorax. From *uniformis* it can be separated by the reduced spiculation of the abdomen, thicker antenna, position of antennal tuft, lightly spiculated distal edge of saddle and greater number of secondary denticles on typical pecten teeth.

When comparing this larva with others of the sub-genus it was found that some diagnostic characters usually given were quite unreliable, while others, more reliable, were omitted. The accompanying key has been drawn up with a view to embodying the characters which appear most useful in a compact form and drawing attention to those which should be mentioned in future descriptions if these descriptions are to be adequate for separating the species to which they pertain. The key is based on the entire collection of larvae of *Lophoceraomyia* in the British Museum and on all the descriptions so far published. At least one larva or pelt of each species which is included has been seen by the author with the exception of *C. (L.) tuberis* R. Bohart, which appears closely to resemble *C. (L.) minor* Leicester, and may well prove to be inseparable from it when more material is available. The attribution of the larva of *C. (L.) curtialpisi* Edwards is the subject of so much uncertainty (Barraud, 1934) that it has been omitted, and those of *C. (L.) bernardi* Borel, *C. (L.) roubaudi* Borel (Borel, 1930) and *C. (L.) cylindricus* Theobald (Lee, 1944) have been omitted because the published descriptions are inadequate and no material is available to the author. As explained above, *C. (L.) para-infantulus* Menon is regarded as a synonym of *C. (L.) infantulus* Edwards. The larvae of *C. (L.) chaetovenralis* Theobald, *C. (L.) digoelensis* Brug, *C. (L.) flavicornis* Barraud, *C. (L.) fulleri* Ludlow, *C. (L.) hilli* Edwards (t.f.), *C. (L.) lavatae* Stone, *C. (L.) nolledoii* Baisas, *C. (L.) mindanaoensis* Baisas, *C. (L.) pachecoi* Baisas, *C. (L.) niger* Leicester, *C. (L.) plantaginis* Barraud, *C. (L.) seniori* Barraud, *C. (L.) minor* var. *bandoensis* Brug, and *C. (L.) minor* var. *bengalensis* Barraud are unknown or undescribed.

Key to the known fourth instar larvae of *Culex* subgenus *Lophoceraomyia*.

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|---|----|
| 1. Integument of thorax with numerous fine spicules (visible under a magnification of 80 ×) . . . . . | 2. |
| Integument smooth . . . . .   | 3. |

2. Thorax and abdomen both heavily spiculated; antenna slender, tuft at about three-quarters the distance from the base to the apex; distal edge of saddle strongly spinose; pecten teeth with a small number of coarse lateral denticles (fig. 3a). . . . . *uniformis* Theobald.  
 Only the thorax strongly spiculated, integument of abdomen smooth except for some very fine spicules on the 8th segment; antenna somewhat swollen, tuft at about two-thirds the distance from the base to the apex; distal edge of saddle lightly spiculated; pecten teeth with secondary denticles very fine and numerous (fig. 2) . . . . . *rubithoracis* Leicester.
3. Head seta "C" with 5-8 branches . . . . . 4.  
 This seta with at most 3 branches, usually single or double . . . . . 6.
4. Preclypeal spines long, pale and slender; typical pecten spines each with 4 relatively coarse secondary denticles; distal edge of saddle with conspicuous spines (fig. 3b) . . . . . ? *cinctellus* Edwards.<sup>1</sup>  
 Preclypeal spines stouter and darker; pecten teeth otherwise (somewhat similar in *carolinensis* but with secondary denticles more numerous); distal edge of saddle with small, inconspicuous spicules (figs. 3 c, d) . . . . . 5.
5. Head seta "B" with 3-5 branches; inner (upper, dorsal) submedian caudal bristles with 3-5 branches; siphonal index about 5; siphon with 4 pairs of subventral hair tufts *carolinensis* R. Bohart and Ingram.  
 Head seta "B" single or double; l.s.c. single; siphon with 7 pairs of subventral hair tufts . . . . . *hewitti* Edwards.
6. Preclypeal spines relatively slender, often pale; pecten with 1-3 teeth (fig 3 e) . . . . . *eminentia* Leicester.  
 Preclypeal spines stouter and darker; pecten teeth more numerous (except sometimes in *jenseni*) (figs. 3 h, i) . . . . . 7.
7. All antennal bristles, other than the antennal tuft, apical; proximal subventral tufts of siphon at least three-fifths the length of the siphon (fig. 3 f) . . . . . 8.  
 Subterminal bristles of antenna situated well behind tip; subventral tufts of siphon not more than one-fifth the length of the siphon, usually much less (figs. 3 g, h, k, l) . . . . . 10.
8. Body, in life, with a strong bluish tinge; appendages strongly sclerotized, antennae and siphon dark . . . . . *coerulescens* Edwards.  
 Body without such coloration; head and siphon paler, less heavily sclerotized . . . . . 9.
9. Siphon with at most 7 pairs of subventral tufts; head setae "B" and "C" each with 2-3 branches; comb of about 20 scales arranged in a double row . . . . . *jenseni* De Meijere.  
 Siphon normally with at least 8 pairs of subventral tufts; head setae "B" and "C" single; comb scales more numerous arranged in a patch (fig. 3 f) . . . . . *navalis* Edwards.
10. Pecten with 17 teeth; siphon distinctly upcurved . . . . . *tuberis* R. Bohart.  
 Pecten with at most 16 teeth; frequently less; siphon normally straight<sup>2</sup> . . . . . 11.
11. Pecten teeth with the secondary denticles fine and numerous (figs. 3 g, i) . . . . . 12.  
 Pecten teeth each with at most 6 (very occasionally 7) stout secondary denticles (fig. 3 l) . . . . . 15.

<sup>1</sup> See Edwards and Given (1928).<sup>2</sup> But see Borel (1930 : 359).

12. Mentum with 15-17 teeth; siphonal index either less than 7 or more than 8 (figs. 2 *g*, *h*) . . . . . 13.  
 Mentum with 19-25 teeth<sup>3</sup>; siphonal index about 7.5-8.0 (fig. 3 *h*) . . . . . 14.
13. Siphon unicolorous; comb of about 50 scales; siphonal index about 9 (fig. 3 *g*) . . . . . *hilli* var. *buxtoni* Edwards.  
 Siphon with a dark ring in the middle; comb of less than 40 scales; siphonal index not more than 7 (fig. 3 *h*) . . . . . *quadripalpis* Edwards.
14. Head seta "d" bifid or trifid; mentum with 21-25 teeth; pecten teeth with all the secondary denticles very fine (fig. 3 *i*)  
*fraudatrix* Theobald.  
 Head seta "d" single; mentum with 19 teeth; pecten teeth with basal denticles more strongly developed (fig. 3 *j*)  
*fraudatrix* var. *solomonis* Edwards.
15. Antenna unicolorous or with the apex only dark, no basal infuscation apart from the usual narrow sclerotized ring; siphon either unicolorous or with a dark ring at the apex (fig. 3 *l*) . . . . . 16.  
 Antenna infuscated at the base as well as beyond the antennal tuft; siphon sometimes unicolorous, generally with a dark ring in the middle (fig. 3 *k*) . . . . . *infantulus* Edwards, *minutissimus* Theobald
16. Anal papillae generally more than twice the length of the saddle; siphonal index 9-10; siphon occasionally with a dark apical ring (fig. 3 *l*) . . . . . *minor* Leicester.  
 Anal papillae not much longer than the saddle; siphonal index about 10.5; antenna and siphon pale. . . . . *mammilifer* Leicester.

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<sup>3</sup> Two larvae of Given's from Singapore, labelled "Lopho: fraudator" have only 15 teeth in the mentum. Edwards and Given ignored them in their description of the larva of *fraudatrix* and, as there are no associated adults, their identity remains in doubt. It is improbable that the forms included in couplets 13 and 14 will prove to be separable over their entire range.

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#### BOOK NOTICES.

*The Bee Craftsman: A Short Guide to the Life Story and Management of the Honey-bee.* By H. J. WADEY. 8vo. Petts Wood (Bee Craft Ltd.), 1949. Pp. 117, 6 half-tone plates. Price 4s. 6d.

This book is in four sections: Part I describes the inhabitants of a hive and details the story of a colony throughout the year. Part II deals with the basic principles of siting the apiary and handling the bees, controlling swarms and feeding. Part III covers management of the colony, extracting and processing honey, moving and uniting stocks, and queen-rearing. Part IV deals with special topics: other creatures in the hive; wintering bees; sickness in the hive; diseases of the brood.

The book concludes with a bibliography and an index.

*Coleoptera of Tristan da Cunha.* Results of the Norwegian Scientific Expedition to Tristan da Cunha, 1937-1938, No. 17. By PER BRINK. 8vo. Oslo (Det Norske Videnskaps-Akademi), 1948. Pp. 121. 1 pl., 1 map, text illustr. Price Kr. 10.00.

After summarizing the very scanty earlier records from Tristan da Cunha, the author gives a systematic account of the present collection, which includes eight families of Coleoptera: Dytiscidae, Hydrophilidae, Ptiliidae, Staphylinidae, Cucujidae, Lathridiidae, Oedemeridae, Curculionidae.

Other topics discussed comprise: Reduction of wings and eyes, distribution of species on the islands of the group, ecological and sociological remarks, distribution of the beetle fauna by food-source groups, origin of the fauna, and classification of the Dytiscid subfamily Colymbetinae. There is a long bibliography.