

A NEW SPECIES OF MALAYA FROM WEST MALAYSIA

(DIPTERA: CULICIDAE)^{1, 2}

SHIVAJI RAMALINGAM and A. GANAPATHI PILLAI,

*Department of Parasitology, Faculty of Medicine, University of Malaya,
Kuala Lumpur, Malaysia*

ABSTRACT—A new species, *Malaya incomptas* is described from West Malaysia. Comments are made on how to distinguish it from other species of *Malaya* in Southeast Asia. The distribution of the genus *Malaya* in West Malaysia is given.

The genus *Malaya* is a relatively small one comprising 11 species distributed over the Ethiopian, Oriental and Australasian regions. Two species of *Malaya* have been reported to occur in West Malaysia, *Malaya genurostris* Leicester, 1908 and *Malaya jacobsoni* (Edwards, 1930). *Malaya genurostris* was designated by Leicester, as the type species of the genus *Malaya*. The only other species of this genus recorded from Southeast Asia is *Malaya splendens* (Meijere, 1909). Since 1966, in connection with the Mosquitoes of Malaysia Project organized by the senior author, more than 3,600 collections of mosquitoes have been made throughout West Malaysia and Singapore. Preliminary studies of the material indicate a new species of *Malaya* occurring in West Malaysia.

The terminology used in describing the adult and pupal stage, is from the recent series "A Mosquito Taxonomic Glossary" by Knight and Laffoon (1970-1971), except for the larval stage where Belkin's (1962) terminology is used. In the description of the immature stages, the following system is used to enumerate seta branching: if only one numeral is given in parentheses following the seta number, it represents the only number of branches encountered in the sample; if two sets of figures are given, the first represents the mean number of branches and the second, the range encountered in the sample.

***Malaya incomptas*, n. sp.**

Adults are readily identified by the complete absence of the median line of broad, flat, round, silvery scales on the scutum. The pupa can be recognised from the other two *Malaya* species in Malaysia by seta 6-VII, which is weak and has an average of 2 branches arising about half-way from the base.

¹This work was supported by Research Grant No. DADA-17-G-9296 from the U. S. Army Medical Research and Development Command, Office of the Surgeon General.

²Immediate publication secured by full payment of page charges—Editor.

FEMALE.—Wing, 2.46 mm. Proboscis, 1.15 mm. Fore femur, 1.88 mm. Abdomen: About 1.5 mm. Small to medium in size; brown with silvery-white markings on head, thorax and abdomen.

Head: A broad patch of flat silvery scales on vertex, extending cephalad between the eyes (thus separating the eyes) and slightly broadening out before terminating at the frons: similar silvery patch on side of head below eyes. Remainder of head covered with broad, decumbent, brown scales, with metallic-green lustre from certain angles. Erect scales absent. Intercular and ocular setae present. Clypeus narrow, about $2.5 \times$ as long as broad; pale yellow in colour, with silvery sheen. Maxillary palpus small and composed of two segments; about the same length and colour as the clypeus. Proboscis hairy, with a joint at about two-thirds from base, with apical one-third swollen. Basal two-thirds pale cream or yellow in colour, with two rows of long setae pointed forward and upwards. Apical one-third brown to dark brown in colour, with many setae; inserted at the tip of the labium are two pairs of long setae curved upwards at the tip; the ventral pair slightly longer than dorsal pair. Pedicel (torus) of antenna with gold-brown integument; two to three minute setae present on the inner side. Flagellum of antenna pilose; approximately 1.25 mm long.

Thorax: Integument brown. Scutum covered with narrow, curved, light brown scales, without a median line of broad, flat, silvery scales. Acrostichal and dorsocentral setae absent. Scutal fossal, supra-alar and prescutellar setae present. Scutellum trilobed, with a large median and two smaller lateral lobes, each covered with a patch of broad, flat scales. Most of the scales on the scutellum are brown coloured, rarely a few pale scales may be present in the midline. Setae arising in three groups. Mesopostnotum bare, integument brown. All scales on pleurae are flat, rounded and silvery. Anteprenotal lobes well-developed, but not meeting each other at midline behind head; dorsal aspect covered with silvery scales; row of long setae on anterior side. Postpronotum covered with similar scales, except for the narrow posterior, basal aspect, which is bare; single seta present on posterior border. Single prespiracular seta present. Postspiracular setae absent. Propleuron and upper part of postprocoxal membrane covered with silvery scales. Paratergite bare. A large patch of silvery scales present involving the lower part of postspiracular, entire subspiracular area, immediately adjacent upper posterior half of mesepisternum and anterior third of mesepimeron. Upper mesepimeron with group of 6–8 setae on posterior margin. Setae absent on following sclerites: prealar, mesepisternum, mesomeron and metepisternum. Base of mesomeron slightly higher than base of hind coxa.

Leg: Integument brown, except for trochanter and part of coxae which are pale. All three legs are uniformly covered with small brown scales; except for the coxae which has silvery white scales on the anterior side. Fore femur much longer than proboscis. Mid and hind femur slightly smaller than the fore femur. Unguis (claws) of all legs simple and equal, that of hind legs slightly smaller than the other two.

Wing: Brown scaled. Squame scales brown and closely covering wing veins. Cell R2 about two and one half times the length of its stem. Anal vein ending about level of fork of Cu. Alula with 2–3 narrow scales. Upper calypter bare.

Halter: Base and pedicel light coloured; capitellum covered with dark brown scales.

Abdomen: The terga are covered with rounded dark brown scales, with patches of silvery scales laterally. Terga I and II with lateral silvery patches covering the entire side. Tergum III entirely dark scaled, no lateral silvery patch. Tergum IV with large, lateral silvery patch except for the basal band of dark scales. Tergum V with lateral silvery patch less than half of the segment. The lateral silvery patch becomes progressively smaller in terga VI and VII. Sterna II and III with silvery scales. Sternum IV with narrow basal band of brown scales; rest of sternum covered with silvery scales. Sterna V and VI with basal half covered with brown scales and apical half with silvery scales. Sternum VII mostly covered with brown scales, except for apical band of silvery scales.

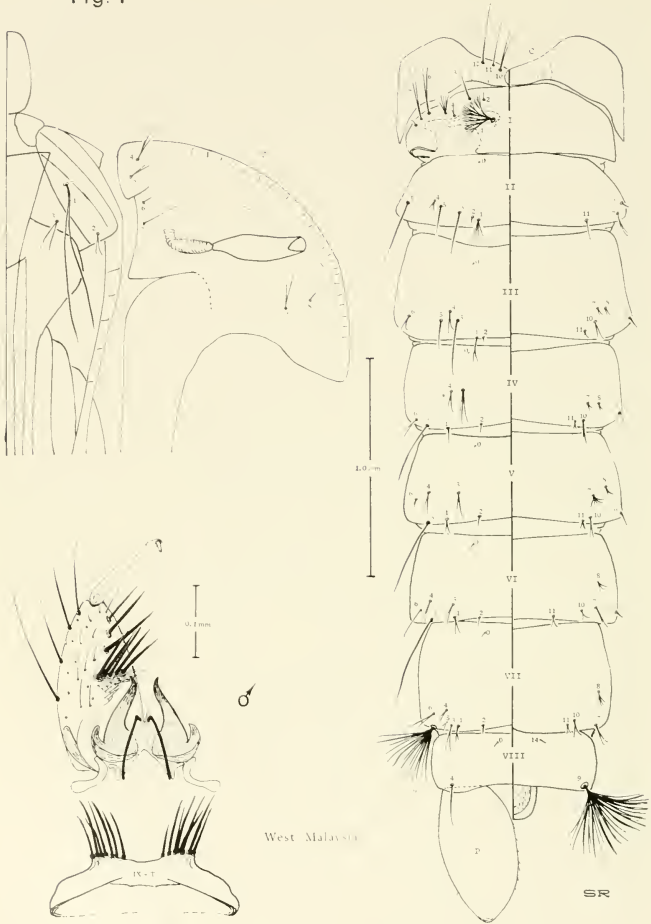
MALE.—Wing, 2.4 mm. Proboscis, 1.1 mm. Palpi, 0.17 mm. Fore femur, 1.85 mm. Resembles the female except for the male genitalia and the absence of pale scales in the central patch of the scutellum. Head: Maxillary palpus about the same length as in the female; approximately 0.15 the length of the proboscis. Antenna 1.2 mm long; pilose. Unguis same as in the female.

MALE TERMINALIA (Fig. 1).—As figured. Tergum of segment IX distinctly lobed; each lobe bearing 7 to 16 large setae. IX sterna membranous. Gonocoxite broad; basal mesal lobe fairly prominent, bearing 4 to 5 thickened setae and one slightly less thickened. Gonostylus tapering slightly from base towards apex; slightly longer than half of gonocoxite; gonostylar claw small and blunt. Paraproct fairly long and slender; tip pointed and slightly curved; apical half with stronger sclerotization.

PUPA (Fig. 1).—Abdomen, 2.88 mm. Trumpet, 0.28 mm. Paddle, 0.53 mm. Integument of cephalothorax and abdomen pale yellow except for the dorsal parts of the cephalothorax, segments I to IV and small areas of the metanotum which are brown. Chaetotaxy as figured; setae light with only slight pigmentation.

Cephalothorax: Trumpet: Light brown in colour with a sculptured appearance; slight bulge at the centre. Index about 2.6 to 3.3; pinna about 0.15 of trumpet length. Setae lightly pigmented and inconspicuous. Seta 1 long and two branched, 2(2,2-3), 3(2,1-3), 4(3,2-3), 5(2,2-3), 6(1,1-3), 7(1,1-2), 8(1,1-2), 9(2,1-3), 10(2,2-3), 11(1), 12(1,1-2). **Abdomen:** The more conspicuous setae in the abdominal segments are the float hair (1) in segment I; hair 5 in segments V and VI and hair 9 in segments VII and VIII. **Segment I:** Float hair with 5(3-7) main branches, each with several secondary branches; lightly pigmented; slightly longer than half the length of the segments; 2(1), 3(1), 4(2,1-2), 5(5,4-6), 6(2), 7(2), 9(1). **Segment II:** 1(5,2-5), 2(1), 3(1), 4(3,3-4), 5(1), 6(1), 7(3,1-3), 9(1), 11(1). **Segment III:** 1(2,2-3), 2(1), 3(1,1-2), 4(2,1-2), 5(1), 6(2), 7(2,2-3), 8(2,1-2), 9(1), 10(2,1-3), 11(2,1-2). **Segment IV:** 1(2,2-3), 2(1), 3(3,2-4), 4(2,2-3), 5(1,1-2), 6(2), 7(2,2-4), 8(2,1-2), 9(1), 10(2), 11(2,2-3). **Segment V:** 1(2,1-2), 2(1), 3(2,2-3), 4(4,2-6), 5(1), 6(2,1-4), 7(5,2-6), 8(2,1-3), 9(1), 10(2,2-3), 11(2,2-3). **Segment VI:** 1(2,1-3), 2(1), 3(2,1-2), 4(2,2-3), 5(1), 6(2,1-2), 7(2,1-2), 8(3,3-5), 9(1), 10(2,1-3), 11(2). **Segment VII:** 1(2), 2(1), 3(2,1-2), 4(2), 5(2,2-4), 6(2,2-4), 7(2), 8(4,3-5), 9(15,13-17), 10(2,2-3), 11(2). **Segment VIII:** 4(1,1-2), 9(24,22-26). **Paddle:** Uniformly

Fig. 1



Malaya incomptas

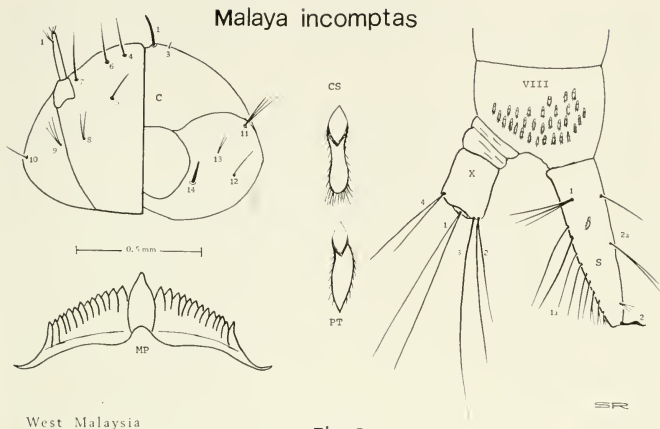


Fig. 2

lightly pigmented; midrib inconspicuous; length about 1.6 times breadth; margin minutely serrated along edges and without fringe. Seta 1 inconspicuous.

LARVA (Fig. 2).—Since the available material are two somewhat damaged, associated larval skins, only the head and the terminal segments are being described. Head, 0.69 mm long. Siphon, 0.7 mm. Anal saddle, 0.16 mm. Chaetotaxy of head and terminal segments as figured. Setae very lightly pigmented. Stellate setae and spicules absent. Head: width about 1.36 of length. Integument smooth, pale yellow in colour. Mouth brushes well-developed, brown in colour. Maxillary horn absent. Mental plate with a prominent middle tooth with 12 to 13 small regular teeth on either side. Seta 1 single, prominent, thick and slightly curved, with blunt end; 3(1, minute), 4(1), 5(1,1-2, inconspicuous, placed well behind setae 4 and 6), 6(1), 7(1), 8(2), 9(3), 10(1), 11(3,2-4, prominent seta), 12(1,1-2), 13(1-3), 14(1, stout).

Antenna: Length about 0.33 of head. Shaft with very slight narrowing of width from base to tip. Integument smooth, without spicules; pale yellow in colour. Seta 1, 2-3 branched, about 0.87 from base, other setae single.

Abdominal Segment VIII: Combscales approximately 25-38, in 3-5 rows; very lightly pigmented; free portion finely fringed and rounded at tip. Setae 1-5 are displaced in the 2 specimens and hence are not included in the drawing and description. Siphon: Index 5.2 (4.9-5.5). (The siphon index used here is that of Belkin's (1962): "Ratio of dorsal length to median width.") Pale yellow pigmentation; smooth integument. Pecten extending to 3.9 of siphon; teeth 3(4-5), in number, pointed towards tip and fringed. Seta 1 of siphon large; 3 branched; seta 2 flattened, broad at center, hooked at tip; accessory ventral setae (1a-S) as figured, about 11 setae very close to the midventral line; from 1-3 branched. Accessory subdorsal setae (2a-S) as figured. Three

setae on either side. Anal segment: Saddle incomplete, same colour as siphon; spicules present on caudolateral border. Gills as figured, about 3 times the length of the anal segment, with rounded ends. Seta 1(2-3), 2(2,1-2), 3(1), 4(1-2).

This species is named *incomptas* as it is the only species of *Malaya* in Southeast Asia, whose scutum is unadorned with a conspicuous median line of silvery scales.

TYPE DATA.—Holotype male (653.100), with slides of associated pupal skin and genitalia, Limau Kasturi, Kelantan, West Malaysia, elevation 200 feet above sea level, from leaf axil of Pandanus in secondary rain forest, 23 April 1967, Samuel Wilson James and Sulaiman bin Omar (USNM). Allotype female (653.15) with slide of associated larval and pupal skins, same data as holotype (USNM). Paratypes: 11 females, 5 males, 1 slide associated larval and pupal skins, 1 slide associated pupal skin, all from the same collection (653) as holotype 6 female (one with associated skin 653.12), and 2 male (USNM). Three female (one with associated pupal skin 653.104), 1 male and 1 slide male genitalia (BM). Two female, 2 male and 1 slide male genitalia (Ramalingam).

SPECIMENS EXAMINED.—12 female, 6 male, 4 associated skins and 3 male genitalia slides from type collection (653).

TAXONOMIC DISCUSSION.—Adults: *Malaya incomptas* can be easily recognised from the five other species of *Malaya* from Southeast Asia and the Australasian region, by the absence of a median line of flat, round, silvery scales on the scutum. This line is very distinct in the other species, including the two species (*genurostris* and *jacobsoni*) occurring in Malaysia. In addition, the mid lobe of the scutellum in *incomptas* is covered with dark scales, rarely with a few pale scales; instead of a conspicuous, large patch of silvery scales in both *genurostris* and *jacobsoni*. The eyes of both *incomptas* and *genurostris* are separated by a line of silvery scales. This line broadens out below the eyes of *incomptas* and ends abruptly in *genurostris*. Adults of *incomptas* can be separated from *jacobsoni* by several characters: (a) *Malaya jacobsoni* is slightly larger and darker than *incomptas*. (b) The eyes are not separated by a silver line of scales in *jacobsoni* as they are in *incomptas*. (c) The patches of silvery scales on the head and thorax of *jacobsoni* have a blue-green tint, whereas they are silvery-white in *incomptas*. (d) The clypeus and basal part of the proboscis are brown coloured in *jacobsoni* and pale yellow or cream coloured in *incomptas*.

Immature stages: In the pupal stage, the three species found in West Malaysia can be easily recognised by the examination of seta 6 on abdominal segment VII: In *incomptas* this seta is weak with an average of 2 branches and a range of 2 to 4 branches; the branches

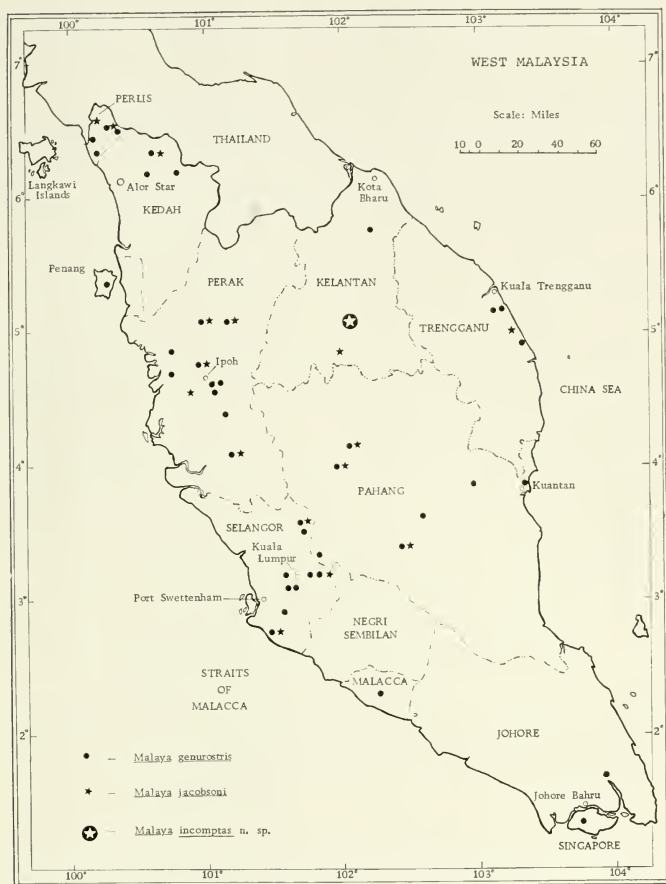


Fig. 3. Distribution of *Malaya* species within West Malaysia.

arising about half way from the base. In *genurostris* seta 6-VII is more stout with an average of 5 branches and a range of 3-5 branches; the branches arising at the base of the seta. In *jacobsoni* seta 6-VII is very stout and in fact resembles seta 9 on the same segment, although it is slightly smaller; the average number of branches is

10 with a range of 8–11 branches. The branches arise from the base of the seta. No attempt is being made to characterise the larval stages of the 3 species of *Malaya*, although a few differences are apparent, because of the paucity of *incomptas* larval specimens.

DISTRIBUTION (Fig. 3).—West Malaysia, Kelantan State, Limau Kasturi. Known only from the type locality, situated in the interior of W. Malaysia, just east of the central mountain ridge.

BIOLOGY.—Only one collection was made of *incomptas* from the rain forest in the state of Kelantan. The locality is accessible only by the north-south rail link. The breeding site was the leaf axil of *Pandanus* plants. The type collection (653) includes immature instars collected from several axils of *Pandanus*. Other mosquitoes identified from this collection are *Aedes* (*Finlaya*) *poicillius*, *Aedes* (*Stegomyia*) *albopictus* and *Topomyia gracilis*. Nothing is known as yet about the interesting association between the adults of *incomptas* and *Crematogaster* ants, as observed in other species of *Malaya*. The probability of some such association is suggested by the proboscis of *incomptas*, which is typical of *Malaya*.

DISTRIBUTION OF MALAYA IN WEST MALAYSIA.—The first species of *Malaya* reported from West Malaysia was *Malaya genurostris* Leicester, 1908. This species was described from a single male collected at the edge of the rain forest, probably on the outskirts of Kuala Lumpur. Macdonald (1957) gives another locality within Selangor State, where *genurostris* was collected and mentions that it is probably quite widespread within West Malaysia. During our survey, 77 collections of *genurostris* were obtained from almost every state in West Malaysia. The collection sites are indicated on Fig. 3. *Malaya genurostris* has previously been known to occur in many other countries in the Oriental and Australasian regions.

Malaya jacobsoni was described by Edwards in 1930, from the island of Sumatra in Indonesia. It is also known to occur in India, Thailand and Taiwan (Stone, Knight et al. 1957). Macdonald (1960) reported this species as occurring in the rain forest in Ulu Gombak, Selangor State, Malaysia. During this study, 30 collections were made of *jacobsoni* in West Malaysia. From fig. 3 it will be seen that *jacobsoni* also has a fairly wide distribution in West Malaysia. *Malaya incomptas* n. sp. now forms the third species of this genus, from West Malaysia. It appears to be rare and is known only from the type locality.

ACKNOWLEDGMENTS

We are grateful to members of the field team, Mr. Sulaiman bin Omar and Mr. Samuel Wilson James, who made the collections, and to other members of the Mosquitoes of Malaysia Project who assisted with preparation of the material and in various other ways. We wish to thank Dr. Botha de Meillon,

Southeast Asia Mosquito Project, and Dr. P. F. Mattingly, British Museum, for reading the manuscript and for their helpful comments.

REFERENCES

- BELKIN, J. N. 1962. The mosquitoes of the South Pacific (Diptera, Culicidae). 2 vols. 608 and 412 pp., illus. University of California Press.
- EDWARDS, F. W. 1930. Mosquito Notes—IX. Bull. Ent. Res. 21:287–306.
- KNIGHT, K. L. and J. L. LAFFOON. 1970–1971. A mosquito taxonomic glossary. Parts I–VII. Mosq. Syst. Newsletter Vol. 2–3.
- LEICESTER, G. F. 1908. The Culicidae of Malaya. Stud. Inst. Med. Res. F.M.S. 3(3):18–261.
- MACDONALD, W. W. 1957. An Interim Review of the non-anopheline mosquitoes of Malaya. Malaysian Parasites XVI. Stud. Inst. Med. Res. Malaya 28:1–34.
- and R. TRAUB. 1960. An introduction to the ecology of the mosquitoes of the lowland dipterocarp forest of Selangor, Malaya. Malaysian Parasites XXXVIII. Stud. Inst. Med. Res. Malaya 29:79–109.
- MEIJERE, J. C. H. DE. 1909. Drei Myrmecophile Dipteren aus Java. Tijdschr. Ent. 52:165–175.
- STONE, A., K. L. KNIGHT and H. STARCKE. 1959. A synoptic catalogue of the mosquitoes of the world. The Thomas Say Foundation, Ent. Soc. Amer. Vol. 6. 358 pp.

A NEW SPECIES OF ARMIGERES FROM SABAH, BORNEO

(DIPTERA: CULICIDAE)^{1, 2}

SHIVAJI RAMALINGAM, *Department of Parasitology, Faculty of Medicine,
University of Malaya, Kuala Lumpur, Malaysia*

ABSTRACT—A new species, *Armigeres* (*Armigeres*) **kinabaluensis** is described from Sabah, East Malaysia. The adult female and male, pupa and larva are described in detail. Illustrations of the male genitalia, pupa and larva are provided. *Armigeres kinabaluensis* is a mountain species and breeds mostly in tree holes, and artificial containers.

During a recent mosquito survey in Sabah, East Malaysia, a new species of *Armigeres* was discovered on Mount Kinabalu and Tambunan on the Crocker Range. Reference to this species and a drawing of the male genitalia was made by Baisas (1935), from a single specimen sent to him from Mount Kinabalu, at about 4,000 feet elevation. As the specimen was in poor condition, Baisas did not

¹ This work was supported by Research Grant No. DADA-17-69-G-9296 from the U. S. Army Medical Research and Development Command, Office of the Surgeon General.

² Immediate publication secured by full payment of page charges—Editor.