

Culex (Culex) iyengari n. sp., a New Species of Mosquito
(Diptera, Culicidae) from the South Pacific

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THIS IS A MEMBER of the *Culex pipiens* series of Edwards (1932:208) and of a rather well-defined subgroup of that series which may be termed the *Culex trifilatus* subgroup. The species included in this subgroup share with *Culex pipiens* the strongly bent ventral arm of the male phallosome (Fig. 1v.a.) but differ from it in the more strongly developed outer division of the dorsal arm, which is here termed the basal arm (Fig. 1b.a.), and in having the tip of the inner division of the dorsal arm characteristically modified (Fig. 1d.a.). This last modification is, however, less strongly marked in the Pacific species, other than *C. pervigilans*, than in those found elsewhere. *C. pacificus* (Fig. 1b) is remarkable in exhibiting spicules on the ventral arm of the phallosome which are reminiscent of some of the banded-legged members of subgenus *Culex*.

In addition to *C. iyengari* the group includes *C. pervigilans* Bergroth from New Zealand, *C. pacificus* Edwards from New Hebrides, *C. trifilatus* Edwards from East and South Africa and the Cameroons, *C. tamsi* Edwards from the island of Sao Thome in the Gulf of Guinea, the northern Palaearctic *C. torrentium* Martini, and the eastern Palaearctic *C. vagans* Wiedemann. It thus furnishes a good example of a Palaearctic group having a southward extension down the East African highlands into South Africa and another, further east, into the Australasian region. It is entirely absent

from the intervening Oriental region except for some penetration into the northwest corner by *C. vagans* (Barraud, 1934: 418). The occurrence of members of the group in the Cameroons and in the Gulf Islands exemplifies the East African element in the Cameroons fauna which is a familiar feature of many groups.

The occurrence of another member so far south as New Zealand is interesting and there has been an implied suggestion that this is an introduced species. Thus Edwards (1932: 210) tentatively suggested placing the Palaearctic *C. torrentium* in the synonymy of the New Zealand *C. pervigilans*. The idea is given some plausibility by the history of whaling in the New Zealand area during the nineteenth century. A careful examination shows, however, that *C. pervigilans* (Fig. 2c) lacks two of the small modified setae on the subapical lobe of the coxite which are present in *C. torrentium* as in *C. iyengari* and *C. pipiens* (Fig. 2a, d). The style of *C. torrentium* is also distinctly narrower than that of the New Zealand species and it seems best to maintain them as distinct species, especially as the early stages of *C. pervigilans* are not available and have only been inadequately described (Graham, 1929: 221).

C. torrentium breeds readily in barrels and metal tanks and thus certainly gives the impression of a species susceptible to human introduction. There is some reason to believe that it may have been introduced into Great Britain in recent years (Mattingly, 1951: 172). It has previously been thought of as an exclusively northern species but it has recently been found as far south as Devonshire and Dorset (Lever, 1954: 65) and the French Pyrenees (Sicart, 1954: 228).

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² Since this paper was finished Dr. E. N. Marks has informed us that the undescribed male of the banded-legged *Culex (Culex) miraculosus* Bonne-Wepster (1937) from New Guinea also has a phallosome of the *C. trifilatus* type. We are most grateful to her for this interesting piece of information.

142

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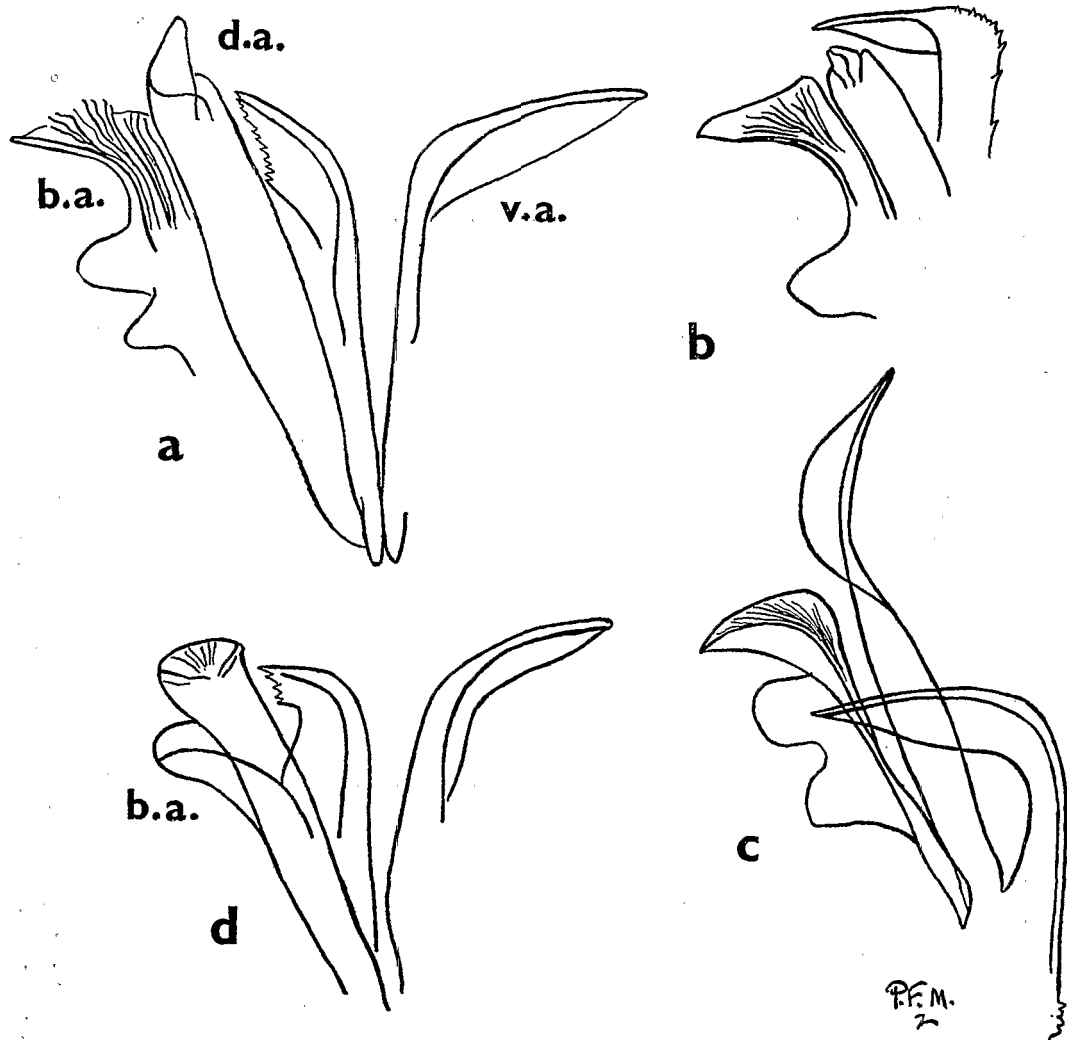


FIG. 1. Male phallosome. a, *Culex iyengari* n. sp.; b, *Culex pacificus*; c, *Culex pervigilans*; d, *Culex pipiens*.

The Devonshire form is unique in possessing postspiracular scales. *C. trifilatus* has appeared previously as an aberrant member of the group in that its larva exhibits supernumerary spines on the siphon distal to the pecten (Hopkins, 1952: 309). Recently, however, a form has been found at Orange Kloof in western Cape Province in which these spines are absent (Muspratt, 1955: 188). On grounds both of morphology and of distribution it seems likely that this is the most primitive of

the Ethiopian forms. An even more southerly *Culex* than *C. pervigilans* has recently been recorded from Auckland Island (Harrison, 1955: 211). It is, however, undescribed and it is not known whether it belongs to the present group.

A comparable distribution to that of the *C. trifilatus* group has been described by Mattingly and Marks (1955) for some members of the subgenus *Neoculex*. Certain of the Mediterranean elements in this subgenus are again

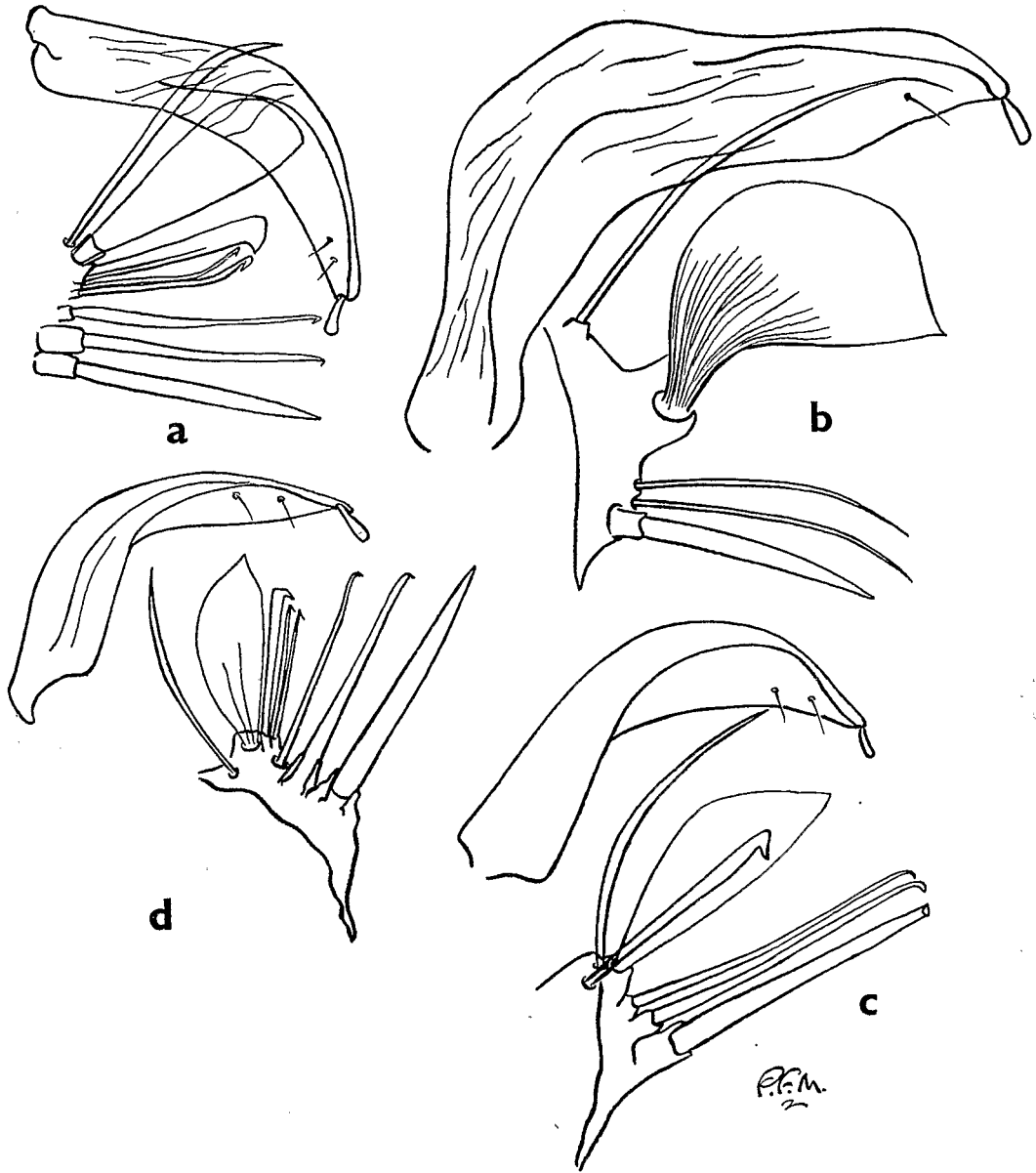


FIG. 2. Male style and subapical lobe of coxite. a, *C. iyengari* n. sp.; b, *C. pacificus*; c, *C. pervigilans*; d, *C. piprens*.

represented in East and South Africa and in parts of the Australasian region although they are entirely absent from the intervening Oriental region. Other examples are not difficult to find. The subgenus *Ochlerotatus* of *Aedes* has been discussed by Mackerras (1927, 1950). Apart from minor penetrations in the north-

west it is represented in the Oriental region by only a single species. Mackerras' ideas appear to receive some support from recent discoveries in South Africa (Muspratt, 1955: 161) and the Malagasy region (Mattingly and Brown, 1955: 90).

Another group which would probably re-

pay study along these lines is the genus *Theobaldia*, especially as the Australian species have been recently revised (Dobrotworsky, 1954).

A description of the new species follows.

Culex (Culex) iyengari n. sp.

The description which follows is based on holotype male from We, Lifu, Loyalty Islands, 7:x:1955, bred out by one of us (J.R.) from a native canoe, allotype female and 4 male and 1 female paratypes with data as for the holotype; 12 male and 4 female paratypes with similar data but bred from a barrel and a tank on 11:x:1955; 5 male paratypes from Baie de la Corbeille, Ile des Pins, New Caledonia, bred out by J.R. from native canoe on 14:xii:1955; 1 male and 1 female paratype from Poncrihuen, New Caledonia, bred out from rainwater in a metal cistern by M. O. T. Iyengar in ii:1956; 2 whole larvae from the same batch as these last 2 adults and a large number of whole larvae from We, Lifu, 8:x:1955 (native canoe) and 9:x:1955 (old barrel and tank), Ba River, near Houailou, 9:vi:1955 (rock pool in stream bed), Hnanemuhaetra, Lifu, 9:x:1955 (hole in coconut trunk), Joj, Lifu, 9:x:1955 (rock pool in coral), Kedany, Lifu (well 38 m. deep) and Kuto, Ile des Pins, 14:xii:1955 (all collect. J. R.). The larvae from We (9:x:1955) were associated with larvae of *Culex pipiens fatigans* (Wied.), *Aedes notoscriptus* Skuse and *Tripoteroides melanesiensis* Belkin, those from Hnanemuhaetra and Joj with larvae of *Ae. notoscriptus* and *T. melanesiensis*, and those from Ba River with larvae of *Culex cheesmanae* Mattingly and Marks and *Culex pipiens australicus* Dobr. and Dr. The holotype and allotype and the bulk of the paratypes will be deposited in the British Museum (Natural History) but some paratypes will be sent to the U. S. National Museum, the Department of Entomology, University of Brisbane and the Institut d'Enseignements et des Recherches Tropicales, Bondy, France.

ADULT MALE: Palps upturned at tip, exceeding the proboscis by about the length of the

terminal segment, the hairs on the under surface rather short (Fig. 3a), very much more so than in *C. pervigilans* (Fig. 3c) or *C. pipiens* (Fig. 3d). A narrow ventral line of broad, flat, pale scales present on the subapical segment and the extreme base of the apical segment. A small subapical pale patch below on shaft. Tori dark brown with a few small dark scales. Vertex with numerous creamy, narrow, curved, decumbent scales and pale- to dark-brown upright forked scales. Proboscis mainly dark but pale below to a variable extent about the middle. Central area of mesonotum covered with narrow, curved, bronze-coloured scales, extreme edges with similar scales, intervening lateral areas with dark-brown scales which are separated into anterior and posterior patches by an intervening whitish spot halfway between the wing root and the scutal angle. This spot produced backwards to fuse with an indefinite area of whitish scales round the prescutellar bare space.

All scutellar scales whitish and very narrow. Some broader, creamy, curved scales on anterior border of mesonotum. Anterior and posterior pronota with narrow, curved, whitish scales. A few scales apparently present on the postspiracular area and the knob of the sternopleura but these areas rubbed. The usual upper and lower sternopleural and the mesepimeral scale patch well developed. A single well-developed lower mesepimeral bristle present in the usual position. Wings dark. Alula with a fringe of narrow scales. Squama with a strongly developed fringe of slender hairs. Anterior fork cell a little less than two and a half times the length of its stem. Haltere with stem pale and knob only slightly darkened. Legs mainly dark. Hind femur with a narrow, incomplete, dark dorsal line which does not reach base and which expands onto the anterior and posterior surfaces only at extreme tip. Hind tibia with a small pale spot at tip scarcely as long as broad. Fore tibial claw absent. First abdominal tergite wholly or largely dark, remainder with pale basal bands which are shallower on the more posterior segments

5

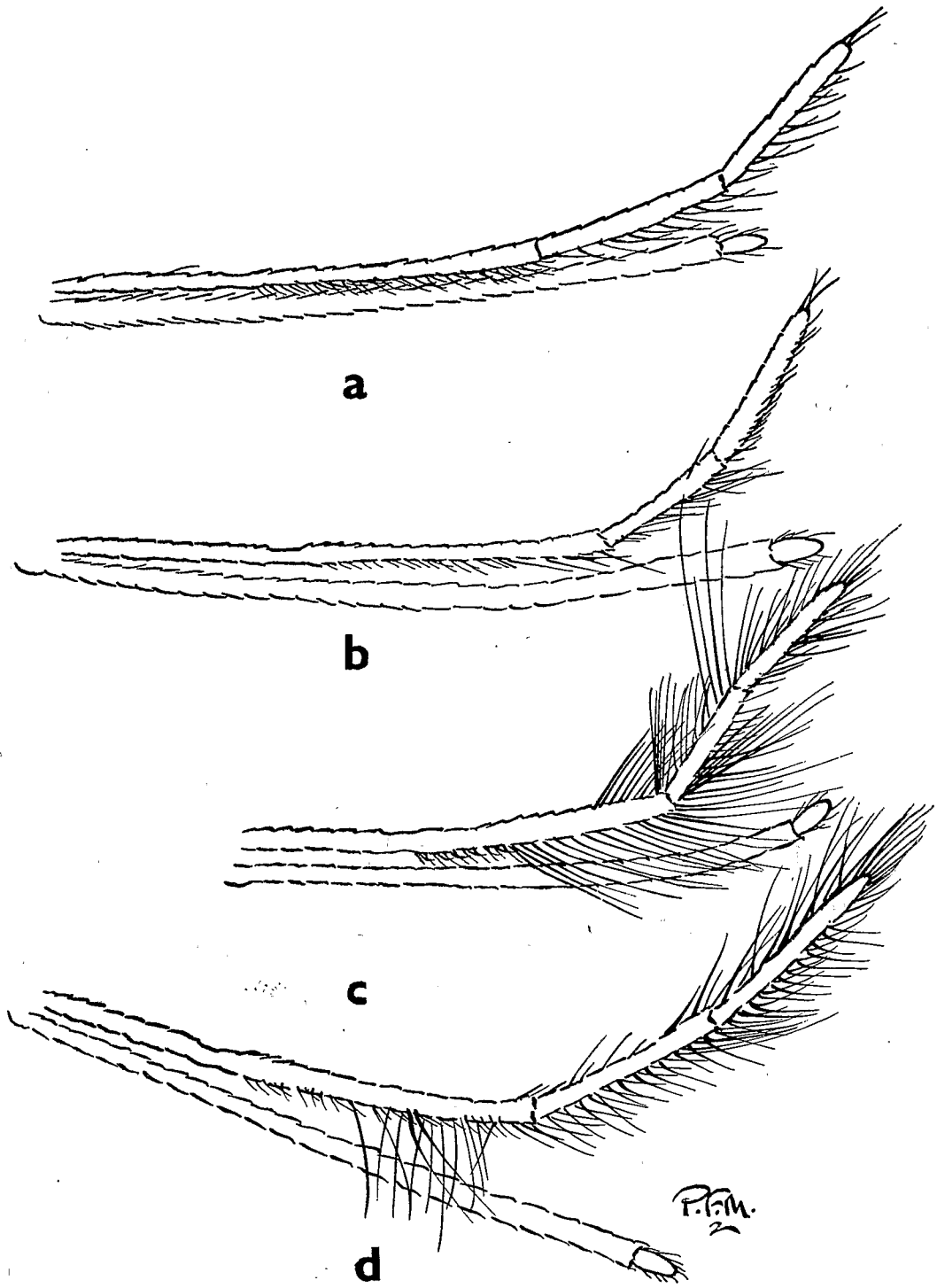


FIG. 3. Male palps. a, *C. iyengari* n. sp.; b, *C. pacificus*; c, *C. pervigilans*; d, *C. pipiens* ssp. *australicus* Dobrotworsky and Drummond.

where they are sometimes, but not always, prolonged backwards at the sides. Sternites with dark apical bands which tend to be prolonged forwards in the midline. These forward prolongations in some cases very broad and conspicuous, in others narrow and inconspicuous or absent.

Terminalia (Figs. 1a, 2a) with style broad, well formed but with a few oblique wrinkles about the middle, with small terminal appendage and two subapical setulae. Subapical lobe of coxite with narrow leaflet accompanied by a markedly flattened seta. Two sets of modified setae, as figured. Coxite not abnormally broad and with no more than the usual complement of long setae on the inner face. Phallosome with tip of inner division of dorsal arm modified as shown (Fig. 1a), outer division ("basal arm") strongly developed,

scooplike. Ventral arm much as in *C. pipiens*. Paraprocts with well-developed crown and basal arm. Xth tergites rather strongly sclerotized, each with 4 small setulae in the usual position. IXth tergite with setigerous lobes very broad and flat, each with about 10 setae.

ADULT FEMALE: Much as male but with palps only a little more than one-fifth the length of the proboscis. Pharynx and terminalia as figured (Fig. 4).

PUPA: Not seen.

LARVA: (Fig. 5). Head broader than long in about the proportion of four to three, in most cases darker than the remainder. Antenna about five-eighths the length of the head, more or less unicolorous except at extreme base, moderately strongly spiculate basad of the insertion of the antennal tuft but with only a few spicules distad of this point. Antennal

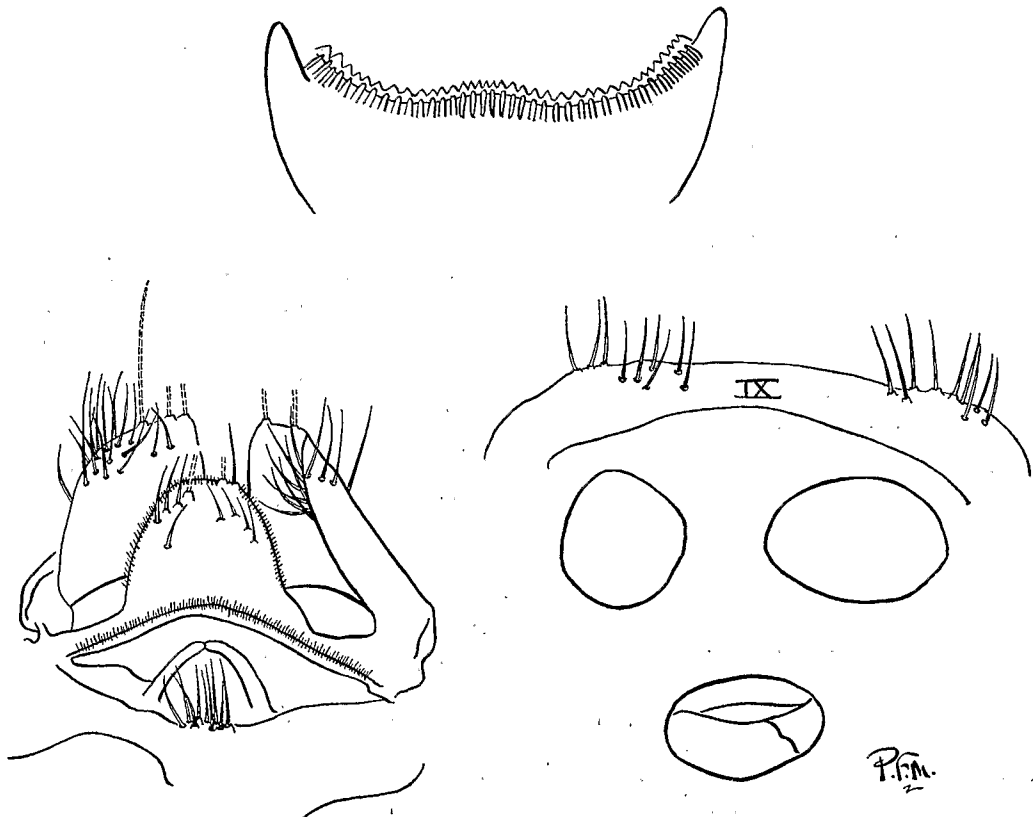


FIG. 4. *C. iyengari* n. sp. Female pharynx and terminalia. IX, ninth tergite.

7

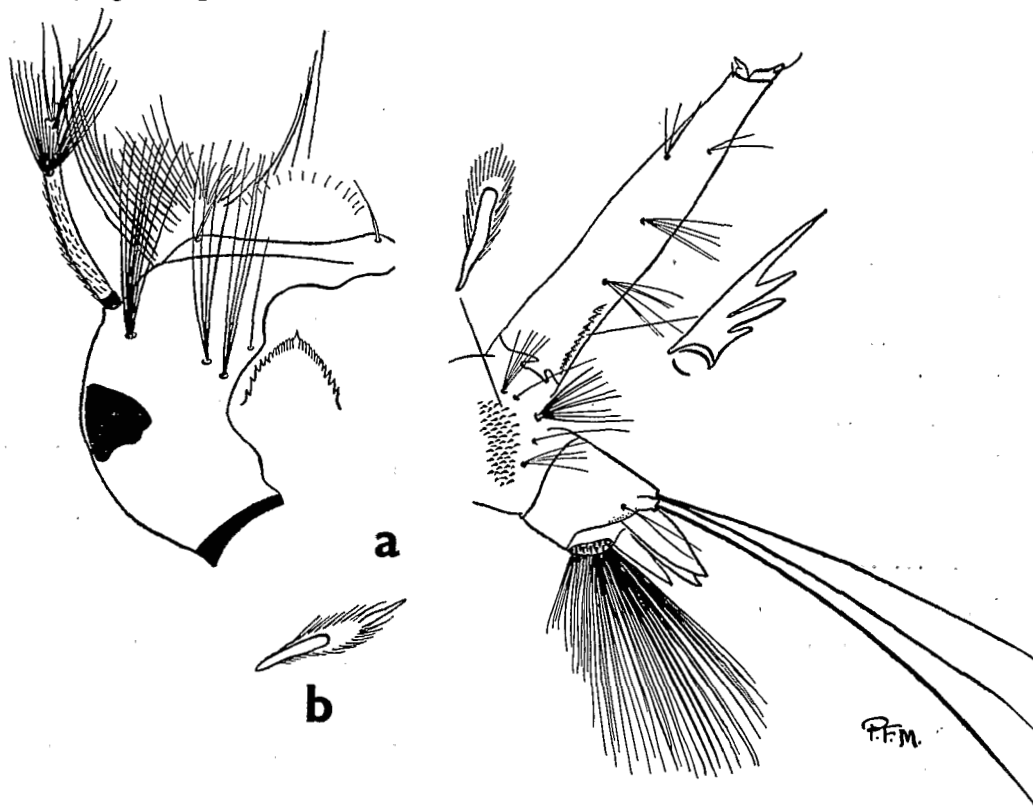


FIG. 5. a, *C. iyengari* n. sp., larva, head and terminal segments; b, comb spine of *C. pacificus*. Mentum somewhat enlarged.

tuft of about 20 rather short branches, inserted at about seven-tenths the distance from base to apex. Clypeal spines rather short, very slender, only slightly curved. Maxillary spine absent. Mentum with about 11-14 teeth on either side of the main central tooth. Head seta A about three-fifths the length of the head, B and C slightly longer, A with about 6-12 branches, B with 3-5, C with 4 or 5, *d* single. Comb of about 25-45 uniformly fringed scales. Siphon with distinct sinusoidal flexure. Index (uncrushed) about five to five and a half. Spine at base of dorsal valves small, straight, simple, recurved at extreme tip. Pecten of about 10-14 teeth, each with 2-5 coarse basal denticles (3 or 4 on the larger teeth). Subventral tufts varying in length from about four-fifths to one and one-fifth the diameter of the siphon at point of attachment. Distal edge of saddle with only very minute

spicules. Ventral brush with 12 tufts in the barred area. No precratal tufts. Saddle hair shorter than saddle, single or bifid. Upper caudal seta bifid or trifid, lower single.

BREEDING PLACES: Barrels, tanks, native canoes, cistern, hole in coconut trunk, rock hole in coral, and a deep well with foul and muddy water.³ From all other known Pacific dark-legged *Culex* of the typical subgenus the present species is markedly distinct in male terminalia. It is readily distinguished from all except *C. pacificus* on the character of the male palps. (*C. atriceps* Edwards has these even more nearly bare and *C. marquesensis* Stone and Rosen (1953: 354) is intermediate between the present species and *C. pipiens*.) Separation of female adults and of larvae can be accomplished by means of the following keys.

³ Some notes on the ecology of *C. iyengari* are included by one of us (J.R.). Assoc. Méd. Nouvelle-Calédonie, Bul. Numero Special, 1956.)

KEYS TO THE DARK-LEGGED *Culex* (*Culex*)
OF THE SOUTH PACIFIC
(EXCLUDING NEW GUINEA)

FEMALE ADULTS

1. Abdominal tergites with well-marked basal pale bands 2
Abdominal tergites with basal lateral pale spots only *C. atriceps* Edw.
2. Abdominal sternites with continuous dark apical bands 3
Abdominal sternites with discontinuous median and apicolateral dark spots only (even these sometimes largely suppressed) 5
3. Anterior surface of hind femur wholly or largely dark 4
Anterior surface of hind femur extensively pale *C. iyengari* n.sp.
4. Scutal integument pale with dark markings; scutal scales very small, more or less unicolorous. *C. marquesensis* St. and R.
Scutal integument very dark; scutal scales coarse, forming a golden or light-brown pattern on a dark ground. *C. pacificus* Edw.
5. New Zealand species only
..... *C. pervigilans* Berggr.
Australia, Tasmania, and New Caledonia
... *C. pipiens australicus* Dobr. and Dr.
Widespread in Pacific area.
..... *C. pipiens fatigans* Wied.

C. pipiens australicus and *C. p. fatigans* are not constantly separable on external characters (Dobrotworsky and Drummond, 1953: 134) though the former is likely to be recognisably darker in general colouration in any particular locality. *C. pervigilans* also appears to be indistinguishable from these two (Edwards, 1924: 396). Its anterior fork cell varies from about 3.2 to 5.2 times the length of its stem. The

colour of its mesonotal scaling is highly variable. The record of *C. p. australicus* from New Caledonia is the first from outside Australia and Tasmania. It is based on one male and three females bred from a batch of larvae collected by J.R. from rock pools in a stream bed near the bridge across the Ba River at Houailou on the east coast of New Caledonia on 9:vi:1955. Further details are to be published elsewhere by Marks and Rageau.

FOURTH-STAGE LARVAE

1. Head setae B and C single
..... *C. marquesensis* St. and R.
These setae each with at least 3 branches. 2
2. Siphonal index about 3.0 to 3.5; antenna about one-third of the length of the head; antennal tuft inserted only a little beyond halfway; upper caudal seta with at least 10 branches *C. atriceps* Edw.
Siphonal index about 3.5 to 6.5; antenna at least half the length of the head; antennal tuft inserted at not less than two-thirds of the distance from base to apex; upper caudal seta with at most 3 branches 3
3. Median denticle of comb teeth greatly hypertrophied, much stouter than the delicate lateral denticles. . *C. pacificus* Edw.
Comb teeth with more or less uniform fringe 4
4. Mentum with 6-9 teeth on either side of the main central tooth; siphonal index about 4.5 to 6.5 5
Mentum with 10-14 teeth on either side of the central tooth; siphonal index about 3.5 to 5.5 6
5. New Zealand only. *C. pervigilans* Berggr.
Australia, Tasmania, and New Caledonia
... *C. pipiens australicus* Dobr. and Dr.
6. Siphonal index about 3.5 to 5.0
..... *C. pipiens fatigans* Wied.

Siphonal index about 5.0-5.5.....
 *C. iyengari* n. sp.

The highly characteristic comb spines of *C. pacificus* (Fig. 5b) appear to have been overlooked by previous authors (Buxton and Hopkins, 1927: 87; Lee, 1944: 108). The description of the larva of *C. p. fatigans* by Woodhill and Pasfield (1941: 212) seems to have been based on mixed material (Dobrotworsky and Drummond, 1953: 132).

For descriptions of the adult of *C. atriceps* the reader is referred to Edwards (1926: 105; 1928: 279), and for *C. pacificus* to Edwards (1916: 360). Iyengar (1955) gives a general account of the distribution of mosquitoes in the area under consideration.

ACKNOWLEDGMENTS

The present species is named after Dr. M. O. T. Iyengar of the South Pacific Commission, Noumea, New Caledonia, in recognition of his many distinguished services to mosquito studies. We are also indebted to him for a part of our material. Dr. E. N. Marks of the University of Brisbane made a preliminary examination of the specimens collected by J.R.

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24