MANSONIA (MANSONIOIDES) BONNEWEPSTERAE, SPEC. NOV. (CULICIDAE), WITH NOTES ON HABITS AND BREEDING PLACE

by

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DESCRIPTION

(*a*) MALE. *Head:* Occiput with numerous, dark, erect, forked scales and narrow, curved, grey scales; along the border of the eyes, especially laterally, are flat, white scales; palpi one segment longer than proboscis, dark brown scaled, few lighter scales present, long segment with two white bands, subapical segment with basal white band and white, longitudinal line on under surface, apical segment entirely white; antennae plumose, flagella greyish with short grey hairs, and dark brown whirls at joints; clypeus bare, light brown.

Thorax: Anterior pronotum with narrow, curved, white scales; mesonotum with golden-brown and greyish white scales, the latter concentrated in a variable pattern in which the anterior median spot may be absent; there are often two more-or-less distinct accessory spots near the wing base; the posterior mesonotal spots are more-or-less oval and often indistinct; scutellar white scales identical with those of mesonotum; pleura brown; posterior pronotum with a patch of flat, white scales; caudal border of sternopleuron with a row of similar scales, forming a patch on upper sternopleuron which involves also part of the mesepimeron; hairs on upper mesepimeron and pre-alar hairs golden yellow; wings 3.2–3.5 mm long, with dark and yellowish, broad and asymmetrical scales; front legs: femur with dark and lighter scales intermixed; few white scales at extreme apex; a distinct subapical band, a narrow subbasal band more or less distinct, three patches between, sometimes distinct (in other individuals they are absent); on posterior surface patches distinct; tibia dark scaled, six distinct white patches present, sometimes additional smaller ones between, at the ventral side a yellow and white scaled longitudinal line which is distinct at apex and faint towards base; tarsal segment 1 with few white scales at base and incomplete white band at the middle, t 2 and t 3 with basal, white scaled spot, t 4 and t 5 entirely dark; mid-legs: femur dark and yellow scaled, anterior surface with five distinct spots, posterior surface with two extensive white spots basally, a large spot at the middle and two smaller ones apically, few white scales at extreme apex; tibia with numerous white spots of variable size; tarsus as in front legs, basal white spot of t 1 distinct; hind-legs: anterior surface of femur with five distinct spots, the three most basal ones most extensive and confluent at the caudal border, on posterior surface basal

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half of femur white scaled, extreme base dark, apical part with one or two distinct white spots, few white scales at apex, remaining part dark and yellow scaled; tibia with numerous white spots, apically at the ventral side a conspicuous patch of appressed, golden hairs, which involves also the base of t 1; tarsus with white scaled base, t 1 besides with a white patch at the middle.

Abdomen: Tergites dark brown, I and II with small, median, yellow patches,

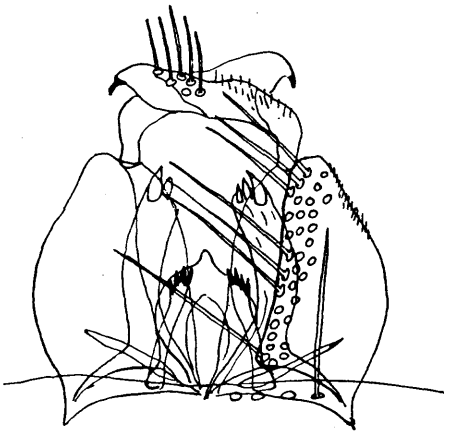

Fig. 1. M. bonnewepsterae, male genitalia

II-VII with more or less hook-shaped, white, lateral spots, especially in the distal tergites, VII almost entirely white; sternites with yellow scales basally, white scales in a transversal, broad band in the middle, dark scales apically.

Genitals: side-piece about 1½ times longer than broad, ventrally covered with numerous, long, golden-yellow, brushlike hairs, especially along the median border; clasp long, rather irregularly shaped; an inwards curved, dark spine at apex; on apical part long and brushlike hairs present, basal region relatively narrow; basal lobes comparatively short, broad and blunt; three or four rounded teeth on top, lateral tooth by far largest, base forked; harpago rather short and straight, ending in

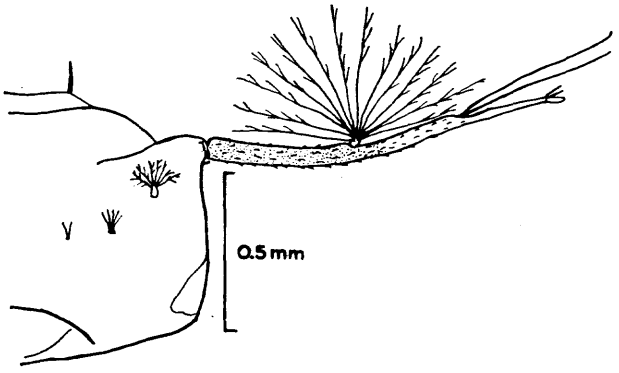

Fig. 2. M. bonnewepsterae, head of larva

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three to five chitinized, dark, sharp spines; phallosome with short and blunt protruding apex and simple, rounded basal part (*Fig. 1*).

(*b*) FEMALE. If not stated otherwise, the description confines to the homologous parts of the male, except for the genitals.

Head: Antennae not plumose, torus yellowish; palpi shorter than 1/3 proboscis, dark scaled with white tip; proboscis dark scaled at base, towards apex with gradually more golden scales intermixed, at 1/3 apically another region with many dark scales present.

Thorax: Ppn with small patch of white scales, also a patch on lower sternopleuron.

Abdomen: Comb on eighth abdominal segment consisting of a central group of nine teeth, close to each other, the central one boldest, and a lateral group at each side of six to nine hook-shaped teeth, the most distal ones smallest, the third one from median boldest.

(*c*) LARVA. *Head:* twice, or slightly more, broader than long, conspicuously rectangular-shaped; hair A fairly small, 9 to 11 broadbased, frayed branches, inplanted on a tubercle; hair B smaller, up to seven branches, bare; hair C very small, two to four branches, bare, about as far caudally as hair B; preclypeal spines large and prominent; antennae distinctly longer than the head, slightly curved inwards, basal half smoky (in some specimens two smoky bands, one at base and one at insertion of antennal hair), covered with spicules up to base of subapical hairs, antennal hair many-branched, distinctly frayed, about 1/2 to 3/4 times the length of antenna, subapical hairs long and bare, antennal apex blunt, two tiny hairs and a flat, leaflike structure on top.

Abdomen: Comb on eighth segment with two, $2^1/_2$ or three, rather long teeth; siphon index less than two, siphon broad cone-shaped, apical part modified for piercing into and attaching to vegetable tissue, apical part completely black, saw-edged, a pair of spine-like long hairs on a protruding base just under saw structure, more apically a pair of long hairs, at extreme apex two inwards-curved short spines; anal segment as long as siphon, about twice as long as wide, laterally four pairs of hairs as long as width of segment, dorsal and ventral subcaudal tufts with 11 branches, bare, about as long as anal segment; lateral hair very small, inserted well away from the apical margin; anal gills slightly shorter than segment, rather blunt *(Figs. 2* and *3)*.

(*d*) PUPA. A couple of oval shaped, finely toothed, asymmetrical paddles and conspicuously elongated, pointed breathing tubes present.

The species is named in honour of Dr. J. BONNE-WEPSTER who contributed much to the knowledge of Culicidae of this territory. Type material is deposited in the State Museum of Natural History, Leyden, the Netherlands; the source of the type series, all reared from larvae, is Sentani Lake, July 1957.

TAXONOMICAL DISCUSSION

Mansonia bonnewepsterae takes a position near *M. dives**, *M. bonneae* and *M.*

* STONE (1956) showed the invalidity of the familiar name *longipalpis* van der Wulp; it should be replaced by *dives* Schiner.

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indiana. In the material available there are several characters which separate *bonnewepsterae* from the related species. Generally *bonnewepsterae* seems to me slightly larger and a few shades lighter than *dives* and *bonneae*. Concerning the ornamentation of the legs, there are no confluent patches on the posterior surface of femora, and the front femur is dark scaled with distinct band and patches in *dives* and *bonneae;* in *indiana* all femora exhibit extensive white scaling and clear white scaling also occurs on the ventral side of front tibia. The ornamentation of the front tibia in *bonnewep-*

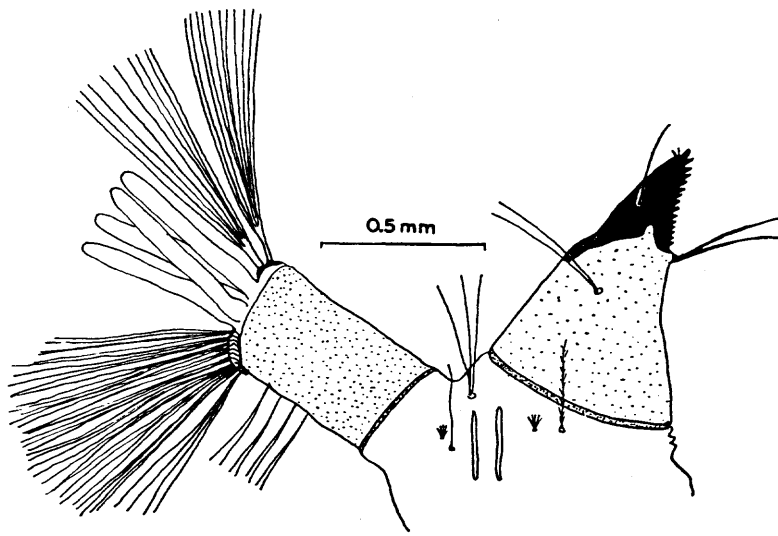

Fig. 3. M. bonnewepsterae, larval terminalia

sterae is mainly as in *dives*. The abdominal sternites bear many white and yellow scales, like those that occur in *indiana;* the comb on the eighth abdominal segment in the female *bonnewepsterae* is identical with that of *indiana*, pictured by BONNE-WEPSTER (1930). The genitalia of the male, however, differ considerably from *indiana*, resembling more those of *dives*.

Larval characters in which *bonnewepsterae* differs from *dives*, *bonneae* and *indiana* are: the shape of the head, head hair A more numerously branched, the siphon relatively shorter and conspicuously broad at base, the anal segment shorter, the dorsal and ventral subcaudal hairs both 11-branched and the anal gills shorter than the anal segment.

DISTRIBUTION AND EVIDENCE OF MEDICAL IMPORTANCE

M. bonnewepsterae is widely distributed in this territory. Specimens were seen from Sentani Lake (North New-Guinea), Mimika coast (Southwest New-Guinea), Mappi, Bamgi-Ia and Merauke districts (South New-Guinea). In the latter locality it is very abundant in places and is a real pest. The species most probably also occurs on the Upper-Digul river (South New-Guinea), quoted under *T. africanus* by BONNE-WEPSTER (1930).

VAN DIJK (1958) caught specimens of *M. bonnewepsterae* (in his paper recorded

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as *M. longipalpis*) on a microfilaria carrier and kept them alive afterwards in test tubes, dissecting the dead ones. In 22 specimens thus kept he estimated an infection rate of 87 per cent; he could not, however, trace infective instars. The development of the microfilariae within the mosquito seemed inhibited in the presausage stage and a subsequent degeneration was noted. Further investigation is needed to decide whether this species is a possible vector of bancroftian filariasis; both *M. dives* and *M. indiana* are recorded as important vectors.

Fig. 4. Breeding place of *M. bonnewepsterae*. Left: terminal house in village row; in front: zone of *Myriophyllum* spec.; right: *Pistia-Hydrocharis* zone; in the background: grassy shore of lake with sago palms.

BREEDING PLACE AND LARVAL HABITS

Larvae of *M. bonnewepsterae* were collected in the field from the roots of *Pistia stratiotes* (Araceae) and *Hydrocharis asiatica* (Hydrocharitaceae). They were easily secured by washing the waterweeds thoroughly one by one in a large, enamel pan. The larvae once detached, immediately hide in the debris on the bottom and, unlike most other Culicine larvae which reascend to the surface rather quickly, are able under these circumstances to stay under water for a long time.

A breeding place of this species was found on the shore of Sentani Lake, about 20 km west of Hollandia, in the native village of Ifar Baberonko *(Fig. 4)*.

The village consists of a double row of sago-thatched huts, built on poles over the water about 20 metres off the shore; this is an extensive sago swamp. Behind the huts, on the shore side, is an abundant waterweed vegetation of *Myriophyllum* (Haloragaceae) and *Lemna* (Lemnaceae), some metres more to the shore dominated by *Pistia* and *Hydrocharis*, mixed with *Ipomoea*

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aquatica (Convolvulaceae), *Monochoria hastata* (Pontederiaceae) and several Cyperaceae. This floating vegetation is most extensive just behind the village in the lee of the houses, and to far up a narrow creek which runs into the swamp at right angles to the village. Further along the lake shore the *Pistia* vegetation is scarce, occurring in patches in small creeks.

The local distribution of the *Mansonia* larvae is not identical with that of the weeds which can serve as larval host plants; in fact the larval distribution is sharply restricted to an area just behind the village where the water gives a heavily polluted impression, carrying floating debris and receiving all kinds of waste from the houses in front; here most roots were found laden with debris. No larvae, however, were found in the extensive *Pistia* fields at the creek's margin or further along the shore, in the relatively clean water.

IYENGAR (1935, 1938) proved the importance of organic contamination for *Mansonioides (annuliferus)* breeding places. He induced breeding in *Pistia*-grown ponds, previously negative for *Mansonioides* larvae, by adding cow dung or coconut husks to the water.

A similar relationship between breeding and organic pollution was found in Sentani Lake. The $KMnO_4$ uptake of the water was used as a measure for the oxydable organic material present. A high uptake was found in the breeding place in contrast to a low uptake in waters free from larvae although covered with *Pistia*. A few analytical data, comparing site A—just behind the village, positive for larvae—, site B— further along the shore, negative for larvae—and site C—at the creek's margin, also negative for larvae—are condensed in the *Table*.

Site	A	B	C
Surface temperature (01.30 p.m.)	38° C	37.8° C	25.6° C
pH	6.8	7.3	7.4
NaCl	trace	trace	5 p.p.m.
Amm. N_2	0.3–0.5 p.p.m.	1.0 p.p.m.	0.25 p.p.m.
Alb. N_2	0.6–1.7 p.p.m.	0.6 p.p.m.	0.45 p.p.m.
$KMnO_4$-uptake	43.3 mg/l	18.0 mg/l	11.7 mg/l
HCO_3	122 p.p.m.	not estimated	not estimated

According to IYENGAR (personal communication), the growth of diatoms, primarily the food of *Mansonioides* larvae under those conditions, is especially favoured by concentrations of organic matter such as that derived from excreta or certain types of decaying vegetable material.

The obvious preference for site A cannot be satisfactorily explained as due to minimum distance from the blood source, or to the amount of floating vegetation present, or to the occurrence of quiet water; in these respects parts of site C should be at least as favourable.

The rather extreme surface temperatures recorded on sunny days (38° C) fall rapidly below the surface between the weeds; at 15 cm, 28° C was found. On cloudy days surface temperatures do not rise over 28° C; the minimum temperature recorded at 15 cm is 25° C.

In the breeding place the aquatic fauna among the waterweeds is impressive as regards diversity and numbers: water-skating *Gerridae*, surface-running hunting spiders, swimming bugs such as *Nepidae* and *Belostomatidae*, a variety of *Odonata* larvae, larvae of *Ephemerida* and *Plecoptera*, water beetles, many *Ditiscidae* larvae; also

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small predatory fishes *(Gobiidae)* and numerous fresh water shrimps were noticed. A check was made for the availability of micro-organisms, important as larval food; this proved to be abundant, monocellular green algae and diatoms dominating the scene.

Besides larvae of *M. bonnewepsterae*, larvae of *M. uniformis* and *Ficalbia modesta* were taken, both species also with root piercing habits, collected from *Pistia* and *Hydrocharis*. *M. uniformis* was outnumbered by about ten to one; *F. modesta* was about as numerous as *M. bonnewepsterae*. Surface-dwelling mosquito larvae were scarce; an occasional *Anopheles bancrofti* and a few *Ficalbia minima* were collected.

The preponderant occurrence in this habitat of three mosquito species highly specialized for the siphonal oxygen uptake, and, at the same time, the rarity of surface dwelling species—although ample room and plenty of food seems to be present —justifies the question whether that peculiar specialism has any advantage. From observations in the field and in the laboratory, it seems unlikely that food or temperature play a significant role; the most probable advantage must be the almost sedentary life allowed to the larvae thus specialized. In the laboratory many were observed to remain on the same spot during larval life, the only movements noticeable being the fanning of the mouth brushes for food uptake, which rapidly ceased when the animal was disturbed. Immobility, in the cover of the bulk of waterweeds, must be of great survival value in an environment where the predation pressure must be very high indeed. Experimental evidence for this view was obtained recently (VAN DEN ASSEM, 1958).

In the laboratory, larvae and pupae of *M. bonnewepsterae* were seen attached to the roots of *Pistia* and *Hydrocharis* and to the floating leaflets of a duckweed, *Lemna* spec., that were also very abundant in the breeding place. However, the young roots of several other plants tested for the purpose also gave positive results, as was previously reported for *M. uniformis* (VAN DEN ASSEM & METSELAAR, 1958), *e.g.*, roots of several common garden weeds: *Asclepias*, *Clitoria*, *Passiflora* and several grasses. The larvae succeeded in establishing gas-exchange as they stayed submerged constantly while fanning.

In the laboratory, the larval fourth instar lasted at least ten days at fluctuating day and night temperatures; the pupal stage is three to four days. About half a day before hatching the pupa detaches itself and ascends to the water surface.

SUMMARY

Description of a new mosquito species, *Mansonia (Mansonioides) bonnewepsterae*, its habits and breeding places. The species is very common in Netherlands New-Guinea; perhaps it is a potential vector of *Wuchereria bancrofti*.

RESUMEN

Mansonia (Mansonioides) bonnewepsterae, especie nueva, en la Nueva Guinea holandesa. Descripción de una nueva especie de mosquito, *Mansonia (Mansonioides) bonnewepsterae*, su modo de vivir y de sus criaderos. Esta especie es muy común en la Nueva Guinea holandesa. Quizás ella representa un vector potencial de *W. bancrofti*.

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