

MOSQUITOES OF THE PAPUAN SUBREGION (DIPTERA: CULICIDAE)
TOXORHYNCHITES (TOXORHYNCHITES) AMBOINENSIS
(DOLESCHALL)¹

By **Wallace A. Steffan²**

Abstract: The ♂ and ♀ of *Toxorhynchites (Toxorhynchites) amboinensis* (Doleschall, 1857) are redescribed from topotypic material from Ambon (Amboina) Island, Indonesia, and compared with the Philippine *T. amboinensis* introduced into Hawaii.

The status of *Toxorhynchites (Toxorhynchites) amboinensis* (Doleschall) has been confused ever since Doleschall (1857: 381-83) described the male and female as distinct species—the male as *Culex amboinensis* and the female as *Culex subulifer*. This was due to the sexual dimorphism displayed by this species; in the male, the caudal tuft of the 8th abdominal segment is black and in the female is yellow or golden; other characters are involved, but this is apparently the one that misled Doleschall and others. Doleschall (1859: 78) recognized his mistake and stated that his *Culex subulifer* was the female of *amboinensis*. Subsequently, others (except Dyar & Shannon 1925: 66) have failed to recognize this synonymy.

Edwards (1932: 62) considered *subulifer* a variety of *T. splendens* (Wiedemann). Previously (1917: 202), he synonymized *Megarhinus immisericos* Walker (1860) under *subulifer*. Knight et al. (1944: 12) elevated *subulifer* to subspecies of *T. splendens*. Stone et al. (1959: 65) accepted this placement.

Osten Sacken (1882: 96) first mentioned the possible occurrence of *T. amboinensis* in the Philippines. Edwards (1922: 432) synonymized the Philippine species *Megarhinus lewaldii* Ludlow (1904) under *T. amboinensis*. Dyar & Shannon (1925: 66) synonymized *Megarhinus argenteotarsis* Ludlow (1906) and *Worcesteria grata* Banks (1906) under *T. amboinensis*. Edwards (1929: 2 and 4) mentioned that Dyar & Shannon had confused *splendens* and *amboinensis*—"Ludlow's type ♀ of *M. argenteotarsis* is *M. splendens*; Banks' series (all labelled type) of *M. grata* include some specimens of *M.*

splendens and some of *M. amboinensis*." Edwards' synonymy was accepted by Thurman (1959: 18), but was not accepted by Stone et al. (1959) nor myself (1966), as we considered *argenteotarsis* and *grata* as synonyms of *amboinensis*.

I have a series of 22 males and 3 females of *T. amboinensis* from Amboina I. and have compared them with the *T. amboinensis* introduced into Hawaii from the Philippines and find they are similar. Dr Alan Stone provided me with his notes on the type material of *T. amboinensis* so I am certain that the above specimens are identical. There are slight differences between the topotypic material and the Philippine *amboinensis* but not enough to warrant separation as distinct taxa. This species needs to be studied throughout its range before further action, if any, is taken.

In the following description terminology is essentially as in Belkin (1962). Measurements were made with the Wild M5 stereomicroscope using a 10× measuring eyepiece. Measurements and percentage of white scaling on the tarsomeres given in the description include the mean and the range. The number of specimens measured is given also. The amount of white scaling on certain tarsomeres is indicated by the percentage of the area covered by the white scales measured from the anterodorsal or posterodorsal aspect. Measurements made of the ventral scale pattern are not as accurate since a narrow line of white scales frequently extends to the apices of some tarsal joints.

In the synonymy below, only those references dealing with *T. amboinensis* from the type locality are given.

Toxorhynchites (Toxorhynchites) amboinensis
 (Doleschall, 1857)

Culex amboinensis Doleschall 1857, Natuurk. Tijdschr. Ned.-Ind. **14**: 381-82.

Type ♂♂. Type-locality: Amboina I., Indonesia. Types at Naturhistorisches Museum, Vienna, Austria.—Doleschall 1857 *ibid.*, **17**: 78.

Culex subulifer Doleschall 1857, Natuurk. Tijdschr. Ned.-Ind. **14**: 382-83.

Type ♀. Type-locality: Amboina I., Indo-

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- nesia. Types at Naturhistorisches Museum, Vienna, Austria.—Doleschall 1859, *ibid.*, **17**: 78 (synonymy).
- Megarhinus lewaldii* Ludlow 1904, *Canad. Ent.* **36**: 233. Type ♂. Type-locality: Salog, Guimaras I., Philippines. Type in the USNM—Edwards 1922, *Indian J. Med. Res.* **10**: 432 (synonymy).
- Megarhinus amboinensis* (Doleschall): Theobald 1901, *Monogr. Culicidae* **1**: 243.—Brug 1934, *Bull. Ent. Res.* **25**: 502.—Brug & Bonne-Wepster 1947, *Chron. Nat.* **103**: 4.—Knight, Bohart & Bohart 1944, *Nat. Res. Counc. Div. Med. Sci.*: 12.
- Megarhina amboinensis* (Doleschall) Giles 1902, *Handbook*: 276.
- Toxorhynchites amboinensis* (Doleschall): Theobald 1910, *Monogr. Culicidae* **5**: 109–10.—de Meijere 1913, *Bijdr. Dierk.* **19**: 46.
- Megarhinus (Toxorhynchites) amboinensis* (Doleschall): Edwards 1932, *Gen. Insec. Cul.* **194**: 60.
- Megarhinus (Toxorhynchites) splendens* var. *subulifer* (Doleschall): Edwards 1932, *Gen. Insec. Cul.* **194**: 62.
- Megarhinus splendens* var. *subulifer* (Doleschall): Bonne-Wepster 1938, *Meded. Dienst. Volksgezoudh. Ned.-Ind.* **27**: 207.
- Toxorhynchites (Toxorhynchites) amboinensis* (Doleschall): Stone, Knight & Starcke 1959, *Synoptic Catalog Mosquitoes of the World*.—Thomas Say Foundation **6**: 62.—Thurman 1959, *Univ. Maryland Agr. Expt. Sta. Bull.* **A-100**: 13–14.—Steffan 1966, *J. Med. Ent.* **3**(2): 194.
- ♂. Wing, 7.90 mm (range: 5.44–10.22 mm); fore femur, 5.09 mm (range: 4.00–6.11 mm); abdomen, 6.30 mm (range: 5.00–7.67 mm)—22 specimens measured. *Head*: vertex with predominantly bluish-black to greenish decumbent scales; antennal torus with very fine white hairs; flagellomere 1 with moderately long hairs and dense, flat, largely dark and translucent scales dorsally, occasionally with scattered white scales mesally; palpus 4-segmented, subequal to or slightly longer than proboscis, largely dark scaled, segment 2 with small patch of apical dorsolateral white scales and with scattered white scales dorsally extending to base; segment 3 with small patch of apical and subbasal dorsal white scales.
- Thorax*: integument dark; mesonotum with small narrow bronzy to greenish scales becoming broader and bluish laterally and along anterior border; scutellum with small broad decumbent greenish and bluish scales; supraalar and scutellar bristles dark; *apn* with predominantly broad bluish scales, occasionally greenish; *ppn* largely covered with small broad white scales with scattered bluish scales; scales of *ppl*, *stp*, *mep* and coxae white; *mep* with 2 lower bristles and a row of long pale posterior bristles bordering scale patch.
- Legs*: largely bluish-purple; fore leg largely dark scaled with scattered pale scales along ventral margin of femur; mid leg largely dark scaled with scattered pale scales along ventral margin of femur; mid tarsomere 1 with subbasal 0.20 pale scaled (range: 0.10–0.28); mid tarsomere 2 with basal 0.40 pale scaled (range: 0.30–0.50); hind leg largely dark scaled, hind femur with broad ventral white stripe; hind tarsomere 2 with basal 0.54 pale scaled (range: 0.34–0.71); *tarsal claws*: fore leg and mid leg, unequal, larger with sub-basal tooth; hind leg, subequal, untoothed.
- Abdomen*: tergum I greenish with white scales laterally, terga II–VI purplish with narrow patch of scattered white scales laterally, lateral long, narrow scales of T-II–V pale, anterior .66–.75 of VI with pale lateral scales, posterior .25–.33 with black scale tuft; T-VII and T-VIII with dense black lateral scale tuft; sterna mostly with purplish-blue scales, S-V and S-VI with caudolateral or broad lateral patch of scattered white scales; S-VII with a few scattered white scales along lateral posterior margin.
- ♂ *genitalia*: (FIG. 1-A) As figured. *Segment IX*: tergum convex to slightly truncate apically with 2 lateral patches of 12–26 bristles. *Basimere*: dorsal and lateral surfaces with mixture of long stout and more numerous short weak bristles; scales numerous laterally and ventrally; basal median lobe with very stout and long apical bristle and numerous shorter ones. *Distimere*: subequal in length to basimere, very slender with slight basal swelling; with short mesal hairs from about middle to apex, variable in some specimens (see remarks); with long subapical spiniform. *Phallosome*: aedeagus narrow, conical; with a lightly sclerotized submedian dorsal bridge, anteriorly with apparent “ridge”. Basal plate with long mesal lobe and shorter lateral lobe. *Proctiger*: well developed, conical with long slender paraproct strongly sclerotized apically; 3–4 subapical cercal setae.
- ♀. Wing, 6.37 mm (range: 6.11–6.67 mm); fore femur, 4.67 mm; abdomen, 5.78 mm—3 specimens measured. Similar to the ♂ except in the following features: *Head*: antennal torus with broad flat scales dorsally and fine white hairs ventrally; flagellomere 1 with broad dark scales; palpus short, about 0.25 × length of proboscis, with bluish-black scales, 1st and 4th segments 0.20–0.30 × length of 2nd and 3rd. *Legs*: fore tarsomere 1 largely white scaled (0.87) except for narrow basal black band, fore tarsomere 2 white scaled about basal 0.50 (range: 0.46–0.88); mid tarsomere 1 white scaled basal 0.50 (range: 0.55–0.64), mid tarsomere 2 completely white scaled, mid tarsomere 3 and 4 white scaled; hind tarsomere 1 dark scaled or with pale subbasal 0.15–0.31, hind tarsomere 2 white scaled distal 0.75. *Abdomen*: lateral and caudal hairs of segment VIII yellow.
- MATERIAL EXAMINED**: 25 specimens collected at Waai, Ambon (Amboina) I., Indonesia; 22 ♂♂, 3 ♀♀, A. M. R. Wegner.
- DISTRIBUTION**: Moluccas (Ambon I., Ceram I.); Philippine Is.; Thailand; Hawaii (introduced). Other reported localities are questionable.
- REMARKS**: The Ambon *T. amboinensis* differs in several aspects from the Philippine *amboinensis* (as studied from the populations introduced into Hawaii). In the Hawaiian population, the scales of the posterior pronotum are entirely white while in the topotypic specimens, the scales are largely white with some scattered bluish scales. The sternal pale scale patches are considerably more developed in the Hawaiian population; also the lateral tuft of black scales of tergum VI is generally distinctly broader in the Hawaiian specimens. The male genitalia are similar; however, the lateral patches of bristles on tergum IX generally are larger in the Ambon specimens (\bar{X} = 17.6, range:

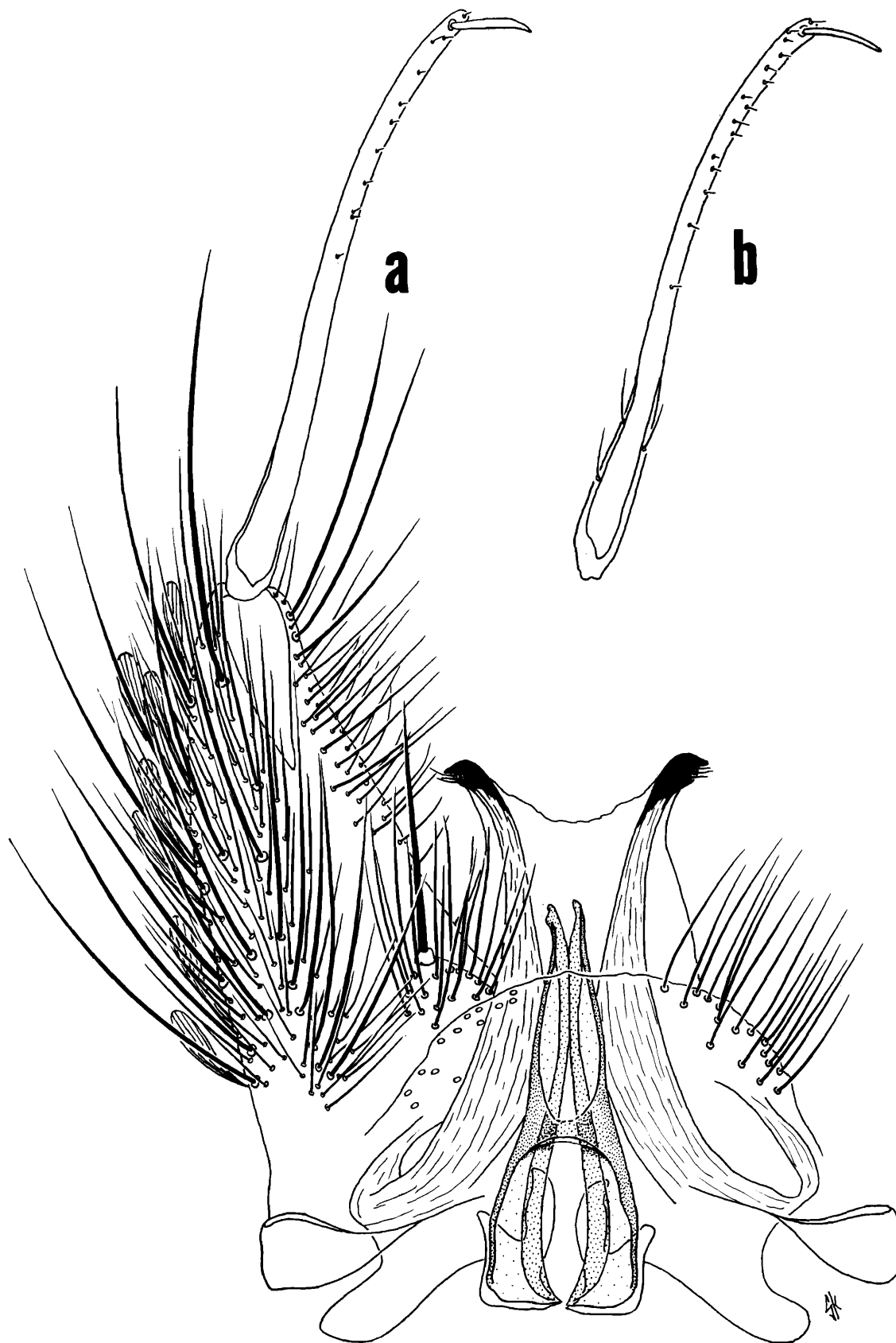


FIG. 1. *Toxorhynchites amboinensis* (Doleschall): (a) ♂ genitalia; (b) ♂ dististyle.

12-26, 11 slide preparations studied VS. $\bar{X} = 9.9$, range: 5-21, 10 slide preparations studied). In some of the Ambon specimens, there are from 1-3 rather stout setae on the basal 0.33 of the distimere (FIG. 1-B); in fact, 1 specimen has the basal portion bare on 1 distimere and with setae on the other. All of the Hawaiian *amboinensis* I have studied have the basal section bare. The variation reported in the Hawaiian *amboinensis* is that of the progeny of a single female. Considering the limited size and geographical distribution of the populations studied, I feel that the above differences are not great enough to warrant separation of these populations as distinct taxa. More material should be studied from the entire range of *T. amboinensis* before its taxonomic status is established. The differences noted may suggest a subspecies complex or merely opposite ends of a highly variable species.

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LITERATURE CITED

- Belkin, J. N.** 1962. The Mosquitoes of the South Pacific. Univ. of Calif. Press, Berkeley, 1: 608 p.
- Doleschall, C. L.** 1857. Tweede Bijdrage tot de Kennis der Dipterologische von Nederlandsch Indië. *Natuurk. Tijdschr. Ned. Ind.* 14: 377-418.
1858. Derde Bijdrage tot der Kennis der Dipteren Fauna von Nederlandsch Indië. *Ibid.* (1858-1859) 17: 73-128.
- Dyar, H. G. & R. C. Shannon.** 1925. The types of Philippine mosquitoes described by Ludlow and other notes on the fauna. *Insec. Inscit. Mens.* 8: 66-89.
- Edwards, F. W.** 1917. Notes on Culicidae, with descriptions of new species. *Bull. Ent. Res.* 7: 201-29.
1922. A synopsis of the adult Oriental Culicine (including Megarhinine and Sabethine) mosquitoes. *Indian J. Med. Res.* 10: 430-75.
1932. Diptera. Fam. Culicidae Fasc. 194, 258 p., 5 pls. In Wytzman, P., ed., *Genera insectorum*. Bruxelles.
- Knight, K. L., R. M. Bohart & G. E. Bohart.** 1944. Keys to the mosquitoes of the Australasian Region, including a synopsis of their distribution and breeding habits. Nat. Res. Council, Div. Med. Sci., Washington. 71 p.
- Osten Sacken, C. R.** 1882. Diptera from the Philippine Islands brought home by Dr. Carl Semper and described by C. R. Osten Sacken. *Berlin Ent. Z.* 26: 83-120.
- Steffan, W. A.** 1966. A checklist and review of the mosquitoes of the Papuan Subregion (Diptera: Culicidae). *J. Med. Ent.* 3(2): 179-237.
- Stone, A., K. L. Knight & H. Starcke.** 1959. A synoptic catalog of the mosquitoes of the World (Diptera, Culicidae). Vol. 6, 358 p. In Ent. Soc. Amer., Thomas Say Foundation, Washington.
- Thurman, E. H. B.** 1959. A contribution to a revision of the Culicidae of Northern Thailand. *Univ. Maryland Agr. Exp. Sta. Bull.* A-100. 182 p.