

Anopheles (Nyssorhynchus) trinkae,
a New Species in the Albimanus Section
(Diptera: Culicidae)¹

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ABSTRACT. A new species, *Anopheles (Nys.) trinkae* Faran, in the Oswaldoi Complex of the Albimanus Section is described and illustrated. *Anopheles trinkae* has been collected along the eastern slope of the Andes from Villavicencio, Colombia, south to Puyo, Ecuador, in a variety of ground pool-lake-stream margin habitats. *Anopheles trinkae* is most closely allied to *An. nuneztovari* and together these 2 species form the sister group of *An. rangeli*.

This paper is part of a revision of the Albimanus Section of the subgenus *Nyssorhynchus*. Due to unforeseen delays in the publication of the revision and the similarity of this species to *Anopheles (Nyssorhynchus) nuneztovari* Gabaldon 1940, an important vector of malaria, I believe that *An. (Nys.) trinkae* should be described at this time. A more detailed account of the taxonomy, phylogeny, and keys to the larva, pupa, adult female and male genitalia, will appear elsewhere. It is a great pleasure to dedicate this species to my wife, Trinkia.

The terminology and abbreviations are essentially those of Belkin (1962) with the modifications of Belkin (1968:49). The descriptions and illustrations of the various life stages are composites based upon all the available specimens. The chaetotaxy of the immatures is based on at least 10 individuals and is listed as 2 sets of figures for all the setae that are considered to be taxonomically important. The first set of numbers after the seta is the modal condition representing the frequency of at least 75% of the observations. The set of numbers in parentheses following the modal condition is the entire range of all observations.

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Anopheles (Nyssorhynchus) trinkae n. sp.
(Figs. 1,2,3)

Anopheles (Nyssorhynchus) nuneztovari in part? of Simmons and Aitken 1942: 39,46,53,95; Galvao 1943:146; Galvis 1943:88-89; Gabaldon and Cova Garcia 1952:193; Lane 1949:403; 1953:268-269; Stone, Knight and Starcke 1959:33; Vargas 1959:376,382; Forattini 1962:396-400; Morales-Ayala 1971:139; Kitzmiller, Kreutzer and Tallaferro 1973:435-455; Kreutzer, Kitzmiller and Rabbani 1975:363-364; Knight and Stone 1977:63.

Anopheles nuneztovari in part? of Russell, Rozeboom and Stone 1943:37,47; Foote and Cook 1959:24,26,29,32; Stojanovich, Gorham and Scott 1966: 22,30,43; Gorham, Stojanovich and Scott 1967:15,47,58; 1973:111,138, 147-148; Elliott 1968:248-252; 1972:756-763.

FEMALE (Fig. 1). Wing: 3.4 mm. Proboscis: 2.2 mm. Palpus: 2.1 mm. Forefemur: 1.5 mm. Abdomen: about 3.0 mm. *Head*: Integument reddish brown to dark brown. Vertex with long, white, spatulate or setiform scales, becoming shorter, more cuneate and darker, caudolateral on occiput. Occipital scales golden, post occipital scales reddish brown to brownish black. Proboscis about 1.4 length of forefemur. Apex of palpal segment 2 with a small, white band; apex of 3 with a large, white band; 2 with a few erect, cream to white, scales; 3 with a cream to white, dorsal or dorsolateral stripe; penultimate segment with moderately large, dark, basal band and a smaller, dark, apical band, and usually a single row of dark scales on the ventral surface, not always visible; 5 white, occasionally with few dark, basal scales extending from apex of 4. Antennal flagellomere 1 with numerous, long, oblongate scales on dorsomesal and mesal surfaces, in apical 0.5; shorter scales on dorsolateral surface, and small, obovate scales at base; flagellomeres 2-13 each with a basal whorl of about 8,9 long, silver setae. *Thorax*: Integument of scutum reddish tan to dark brown and extensively pruinose. Anterior promontory area with setiform scales extending a short distance dorsad onto acrostichal line. Prescutellar space moderately large, horseshoe or subtriangular in shape. Pleuron light brown to brown. *Sp* with 7 (3-9) light setae. Upper *stp* with 4 (2-4) long, dark setae in horizontal arc and about 6-15 cream, obovate scales. Lower *stp* with 1-3 long setae and a diagonal patch of 5-11 cream, obovate scales. Upper *mep* with 7-9 long, cream setae and occasionally one or 2 cream, obovate scales. *Legs*: Dark pattern reddish brown. Light scales on coxae white. Foretarsomeres 2 and 3 with a white band in apical 0.4 (0.31-0.46) and 0.75 (0.6-0.9) respectively, usually longer than in *nuneztovari*; 4 golden to white in apical 0.3 (0.1-0.5); 5 cream to white in about apical 0.5. Midfemur with a distinct anteroapical spot and knee spot. Dorsal surface of midtibia and midtarsomeres 1,2 and usually 3 with a cream stripe. Midtarsomeres 1-3 with a small, cream, apical band, largest and most distinct on 2; 4 all dark; 5 cream in apical 0.3-0.7. Hindtarsomere 2 with a dark band in basal 0.3-0.4 (0.30-0.43); 5 light cream to white in about apical 0.5. *Wing*: Dark spots not usually as extensive as in *nuneztovari*. Light spots of wing white or ivory. Vein C humeral light spot

about 1.3-2.5 (1.3-4.0) of basal dark spot; usually 2.0 or less of basal dark spot; basal dark spot usually not reaching humeral cross vein; sub-basal dark spot equal to or longer than subbasal light spot, often 2.0 of subbasal light spot; subcostal light spot 0.25-0.43 (0.25-0.65) of subcostal dark spot; preapical light spot about 0.31-0.46 of preapical dark spot; apical dark spot moderate and distinct. R presectoral dark spot moderately large and sectoral dark spot relatively small, rarely absent. R_2 preapical dark spot about 0.5 of vein. R_{4+5} subcostal and apical dark spots moderately small. M sectoral dark spot variable, small to large, lighter than dark spots on C, often with interspersed light scales. Cu sectoral dark spot moderately large and distinct. *Abdomen*: As that of *nuneztovari*, with small, caudolateral and sternomedian scale tufts.

MALE. Wing: 3.2 mm. Proboscis: 2.5 mm. Forefemur: 1.45 mm. Abdomen: 2.45 mm. Essentially as in female except for sexual characters. *Head*: Palpal segments 2 and 3 with a conspicuous, cream, dorsal stripe; apex of 2 and base of 3 with a small, white band; apex of 3 with a moderately broad, white band; 4 with a brown, basal and an apical band, occasionally with white scales interspersed in small, basal band, and usually with a few white, subapical scales; mediolateral surface of 4 predominantly light cream, ventral surface usually with dark scales, difficult to see. Antenna about 0.70-0.75 length of proboscis; flagellomere 1 with numerous long, white ob-lanceolate scales on dorsomesal margin. *Legs*: Forefemur about 0.6 length of proboscis. Basal plantar surface of foretarsomere 5 with about 8 moderately long to long, spiniform setae, longest about 0.3 length of segment. Foretarsal claw moderately large, weakly curved, acuminate; submedian tooth 0.25-0.33 length of claw, moderately thin and apically recurved; basal tooth moderately long, heavy and decurved.

MALE GENITALIA (Fig. 2). *Segment VIII*: Tergite and sternite with narrow to moderately broad, obovate scales. Tergite usually with darker scales on caudal and caudolateral margins. Sternite with median dark scales and lateral cream to white scales. *Segment IX*: Sternite long, subtrapezoidal, about 0.25 length of sidepiece. Anterior apodeme moderately short, subrectangular to subtriangular, extending across anterior border of sternite. *Sidepiece*: Tergal surface with 4-6 long, submedian tergomedial setae and one subapicolateral seta. Setae mesad of tergomedial setae, moderately long. Parabasal spine long at least 2.0 length of tubercle. Basal apodeme moderately thick, long and pointed, about 0.20-0.25 length of sidepiece. More dorsal accessory spine slightly less than 0.5 length of sidepiece; ventral accessory spine about 0.75 of dorsal spine. Internal spine subequal to ventral accessory spine, apically retrorse. *Dorsal Claspette*: Pedicel long, moderately narrow to moderately broad, rounded basally, curving mesally; internal apodeme in pedicel very conspicuous. Leaflets of claspette broad, less than 0.5 (0.37-0.47) length of claspette. *Ventral Claspette*: Moderately long, about 0.4-0.5 length of sidepiece; ratio of length of aedeagus to length of claspette from 1.00-1.21 (1.00-1.33); apex moderately broad, from 0.43-0.50 (0.38-0.54) as wide as length of claspette. Basal lobule slightly expanded laterally, not appreciably wider than apex, with

moderately long setae, slightly longer to 1.5 width of aedeagus but never 2.0 as long, distributed over basal surface, radiating in different directions; no concentration of long setae on inner margin. Ventral and lateral surface with short setae, about 0.5 width of aedeagus. Apex of claspette appearing either truncate or with a variously developed, median sulcus with gradual to steeply sloping sides, with sharply rounded sclerotized, lateral margins and medially extending, sclerotized arms. Preapical plate moderately small, circular or oval, weakly to moderately sclerotized. *Phallosome (PH)*: About 0.5 length of sidepiece, slightly longer than ventral claspette. Apex of aedeagus rounded, about as long as wide; apical leaflets not visible on any specimen examined.

PUPA (Fig. 2). Abdomen: about 2.5 mm. Trumpet: 0.5 mm. Paddle: 0.75 x 0.55 mm. Only exuviae examined. *Cephalothorax*: Wing cases with moderately pigmented, longitudinal stripes. Seta 1-C 2-4 branched; 2,3-C with 2,3 branches. Setae 4,5-C 2-5 forked; 4-C slightly shorter than 5-C. Seta 6-C 2,3 (1-3) forked usually length of, or slightly longer than, short branches of 7-C. Seta 7-C 2-4 branched, with one branch about 1.5 length of shorter branch(es). *Trumpet*: Pinna long, moderately pigmented, about 3.6-4.0 (3.5-4.1) length of meatus; not appearing to taper appreciably toward apex. Base of meatal cleft rounded. *Metanotum*: Seta 10-C single or double, subequal to 11-C. Seta 11-C 2,3 branched. Seta 12-C with 1-3 (1-4) branches, about 1.5-2.0 of seta 10. *Abdomen*: Seta 2-I moderately long to long, 4-6 (2-6) branched. Seta 3-I single, about 0.5-0.9 of 2-I. Seta 4-I moderately long, 4-6 (3-6) branched. Seta 5-I 1-3 branched. Seta 6-I single, long, about 2.0 of 7-I. Seta 7-I 4-7 (3-7) branched. Seta 9-I single, about 0.7 of 6-I. Seta 0-II small, 1-3 (1-4) branched; 0-III-VII moderately developed; 0-III 3-6 branched; 0-IV 4,5 (2-5) branched; 0-V 2-5 branched; 0-VI 2,3 (2-4) branched; 0-VII 1-3 branched. Seta 1-II, III strongly developed; 1-II with 6-10 (4-13) branches; 1-III 3-9 (1-10) branched; 1-IV-VII long and single, 1.75-2.00 length of segment. Seta 3-IV moderately developed, dendritic, 3-6 (1-6) branched; 3-V 3-5 (1-5) forked. Seta 5-III strongly developed, 5-7 (5-9) branched; 5-IV moderately long, with 2-5 (1-5) branches, median branch often longer than lateral; 5-V-VII long and single (1-3), subequal to length of segment. Seta 6-II long, single or double, about 2.0 of 7-II. Seta 7-II with 3-7 (3-8) branches; 7-III, IV short, 3-5 branched; 7-V forked, longer than 7-III, IV, with 2-4 branches; 7-VI, VII long, single or double. Seta 8-III, IV 2-6 (2-7) branched; 8-V, VI about 2-4 (1-4) branched; 8-VII moderately small, slightly longer than 8-III-VI, with 2-4 branches. Seta 9-II small, unpigmented; 9-III small, less than, occasionally equal to 2.0 of 9-II; 9-II thinner and more pointed than 9-III; 9-IV about 1.6-3.6 of 9-III, strongly pigmented and heavy; 9-V long, moderately thin, acuminate, 2.5-4.5 (2.5-4.9) of 9-IV; 9-VI equal to or slightly longer (1.0-1.3) than 9-V; 9-VII 1.05-1.25 (1.05-1.30) of 9-VI; 9-VIII subequal to 9-VII, usually straighter than 9-V-VII; 9-V-VIII about 0.5 length of segment. Seta 10-III long, 3,4 (2-6) forked. Seta 4-VIII 3-5 (2-5) forked, about 0.65-0.70 of 9-VIII. *Terminal Segments*: Male genital lobe large, heavy, with a very prominent mammilliform protuberance. *Paddle*: Large, obovate, emarginate at seta 1-P. Buttress 0.6 (0.53-0.68) length of

paddle, serrated apically. External margin beyond buttress with fine, short, filamentous spicules extending around apex of paddle to 0.5-0.7 from base, shorter and fewer along inner margin. Seta 1-P moderately long; 2-P subequal to 1-P.

LARVA (Fig. 3). Head: 0.6 mm. Antenna: 0.27 mm. Anal Saddle: 0.3 mm. *Head*: Heavily pigmented, dull reddish brown. Median tooth of mental plate moderately broad, less than combined width of 2 adjacent teeth from one side, tapering to blunt point. Setae 2,3-C (inner and outer clypeal setae) single or with very minute barbs; 2-C widely spaced, clypeal index about 1.25; 3-C moderately short, 0.6 (0.5-0.8) of 2-C. Seta 4-C single or double, very long, often equal to or slightly shorter (0.7-1.0) than length of 3-C. Seta 8-C 2 (2,3) branched near base, occasionally forked, length about 2.0 of distance separating 2,3-C. Seta 9-C equal to or slightly longer than 8-C, weakly dendritic, with 4-6 (4-7) branches. Seta 12-C moderately long, 2-5 branched. Seta 15-C 2-4 forked. Collar wide dorsomedially, heavily pigmented. *Antenna*: Pigmented as remainder of head. Mesal border with stout, moderately long spicules; ventral surface with fewer and shorter spicules. Seta 1-A short, with 4-6 branches, inserted in basal 0.25 of antennal shaft. *Thorax*: Darkly pigmented, reddish brown. Setae 1-3-P (submedian prothoracic group) with or without 1,2-P sharing a common tubercle; 3-P occasionally arising from the same tubercle as 2-P; 1-P with 11-15 (10-18) moderately narrow to narrow, pointed, pigmented, lanceolate leaflets; 2-P 15-19 (12-20) branched, 3.0-4.0 length of 1-P. Seta 14-P 7-10 (6-11) branched with a moderately short shaft. Seta 1-M with 28-37 (26-37) branches. Seta 2-T single, moderately long but not reaching the posterior margin of thorax. Seta 3-T palmate, semitransparent, with 9-13 (9-17) moderately narrow, pointed, lanceolate leaflets. Pleural group spines as those of *nunestovari*. *Abdomen*: Seta 0-II very small, often indistinct, about 0.5 or less length of leaflets of 1-II, 1-3 branched; 0-III-VII small to moderately small, with 1-3 (1-4) branches. Seta 1-I palmate, moderately small, with 12-16 (10-17) thin, semitransparent, spreading, lanceolate leaflets; 1-II-VII strongly pigmented, with moderately narrow, pointed, lanceolate leaflets; 1-II 23-27 (19-30) branched; 1-III 24-32 branched; 1-IV 22-29 branched; 1-V 23-30 (22-30) branched; 1-VI 21-27 (20-30) branched; 1-VII 20-26 branched; 1-II,III,VII slightly shorter than 1-IV-VI. Seta 2-I very small, with 2 (1-3) branches; 2-II moderately large, with 6,7 (4-9) branches; 2-III large, 3-5 (2-6) branched; 2-IV single, rarely double, about 1.5 length of leaflets of 1-IV; 2-V very long and single. Seta 3-I single (1,2), moderately long. Seta 5-I small, 3,4 (3-5) branched; 5-II small, with 6-11 (5-11) branches. Seta 9-I 5,6 (4-6) branched. Setae 13-I-III small, with 4-6 (3-7), 7-9 (7-10) and 6-8 (6-9) branches respectively; 13-IV moderately large to large, 1.5-2.0 length of leaflets of 1-IV, 3,4 branched; 13-V very large, with 3-5 (2-6) branches; 13-VI moderately small, 8-10 (6-10) branched. *Spiracular Lobe*: Pecten with about 15-17 teeth; median teeth subequal, occasionally alternating short to moderately long, with 2-4 interspersed long; serration on teeth moderately long. Seta 8-S moderately long, subequal to 9-S, 3,4 (3-5) branched; 9-S 3-5 branched. Lateral arm of spiracular apparatus short. *Anal Segment*:

Apically with short, thin spicules. Saddle reddish brown. Seta 1-X arising near ventral margin of saddle, completely enclosed. Anal gills longer than saddle.

TYPE-DATA. *Holotype* male (Ecuador 29-9, Acc. 638) with male genitalia and associated larval and pupal exuviae mounted on 2 slides, 1.5 km S of Puyo, Pastaza, Ecuador, large temporary ground pool, 15 May 1977, Yiau-Min Huang [USNM, 76123]. *Allotype* female (Ecuador 29-12) with associated larval and pupal exuviae on slide, same data as holotype [USNM]. Paratypes: 1 lpM (Ecuador 29-2), 1 lpM (Ecuador 29-4) with genitalia mounted on slide, 1 lpM (Ecuador 29-6), 1 lpF (Ecuador 29-7), 1 lpF (Ecuador 29-11), 1 lpF (Ecuador 29-13), 1 lpF (Ecuador 29-14), 1 pM (Ecuador 29-111), 1 pM (Ecuador 29-113), 1 pF (Ecuador 29-115), 1 M (Ecuador 29-8), same data as holotype [USNM].

DISTRIBUTION. *Anopheles trinkae* occurs along the eastern slope of the Andes from Villavicencio, Colombia south to Puyo, Ecuador. It is not known how much farther north or south the range of this species extends. Cerqueira (1943:19) reports *goeldii* from several localities in Bolivia based on examination of adult females and 2 male genitalia. I do not know if this represents *nuneztovari* or *trinkae*.

DISCUSSION. *Anopheles trinkae* is placed in the Oswaldoi Complex of the Albimanus Section, which presently consists of 9 species. Within this complex 2 separate phyletic lines are discernible based on the structure of the ventral claspette of the male genitalia. One line is composed of *oswaldoi* (Peryassu 1922), *galvaei* Causey, Deane and Deane 1943, *noroestensis* Galvao and Lane 1937, *aquasalis* Curry 1932, *ininii* Senevet and Abonnenc 1938, and possibly the relict *anomallophyllus* Komp 1936; and the other of *rangeli* Gabaldon, Cova Garcia and Lopez 1940, *nuneztovari* Gabaldon 1940, and *trinkae*. *Anopheles nuneztovari* and *trinkae* are sister species based on several shared derived (synapomorphic) characters in the larvae and male genitalia, and together these species form the sister group of *rangeli*. The latter 3 species are limited primarily to the Orinoco and Amazon basins, and the eastern slope of the Andes.

Anopheles trinkae can be distinguished from the other species in the Oswaldoi Complex (except occasionally *nuneztovari* and *rangeli*) in the female by the combination of (1) penultimate palpal segment usually with a single ventral row of dark scales, (2) prescutellar space moderately large and horseshoe shaped, (3) foretarsomere 2 with a large white band in apical 0.4 (0.31-0.46) and 3 with a very large white band in apical 0.75 (0.6-0.9), (4) foretarsomere 4 golden to white in apical 0.3 (0.1-0.5), (5) hindtarsomere 2 with a dark band in basal 0.3-0.4 (0.30-0.43), (6) humeral light spot of vein C 1.3-2.5 (1.3-4.0) length of basal dark spot, and (7) subcostal light spot of vein C less than half (0.25-0.43) length of subcostal dark spot; in the male genitalia by the same characters as in *nuneztovari* except that (1) ventral claspette proportionally long, 0.4-0.5 length of sidepiece and ratio of length of aedeagus to length of claspette from 1.00-

1.21 (1.00-1.33), (2) width of apex of ventral claspette from 0.43-0.50 length of claspette, and (3) apex of aedeagus as long as wide without apparent leaflets; in the *pupa* by the combination of (1) seta 7-C with one long branch; about 1.5 length of shorter branch(es), (2) pinna long, about 3.6-4.0 length of meatus, not tapering toward apex, (3) seta 11-C with 2,3 branches, subequal to 10-C, and seta 12-C 1-3 (1-4) branched, about 1.5-2.0 length of seta 10-C, (4) seta 2-I moderately long to long, forked, with 4-6 (2-6) branches, and 3-I about 0.5-0.9 length of 2-I, (5) seta 0-II small with 1-3 (1-4) branches, (6) the sum of branches of setae 0-II and 0-III ranging from 4-7 (3-11) and, (7) seta 9-III usually less than or equal to twice 9-II, 9-V 2.5-4.5 length of 9-IV, 9-VI, VII long, 9-VII 1.05-1.25 (1.05-1.30) length of 9-VI and 0.5 or more length of segment; and in the *larva* by the combination of (1) 2,3-C, single or with very minute barbs, 2-C widely spaced, clypeal index about 1.25, and 3-C much shorter, 0.6 (0.5-0.8) length of 2-C, (2) seta 4-C strong and long, often equal to or slightly less (0.7-1.0) than length of 3-C, (3) seta 1-P with 11-15 (10-18) moderately narrow to narrow, pointed, lanceolate leaflets, (4) seta 0-II very small and indistinct, about 0.5 or less length of leaflets of 1-II, with 1-3 branches, and 0-III-VII small to moderately small, single to 4 branched, (5) seta 13-IV moderately large to large, with branches 1.5-2.0 length of leaflets of 1-IV, and (6) seta 1-X arising near but set back from ventral margin of saddle, usually completely enclosed by saddle.

Superficially, the larva and male genitalia of *trinkae* appear similar to those of *nunextovari*, and the pupa like that of *rangeli*, although these stages can readily be distinguished by the characters in the previous discussion. Unfortunately, the adult females of these three species can often be confused due to the paucity of reliable differentiating characters. Because the adult female is the most unreliable stage for identification, careful attention should be given the male genitalia, larva and pupa for positive species determination.

BIONOMICS. The data on the bionomics of *trinkae* were extracted from the collection records compiled by Y.-M. Huang while she was in Ecuador. Additional information came from field notes on one other collection from Colombia (COB 42).

The immatures of *trinkae* have been collected in temporary and permanent, small to large ground pools (43%), wheel tracks (19%), ponds and lakes (19%), pools along stream margins (14%), and ditches (5%). All collections were from either clear or slightly colored fresh water exposed to the sun. Several collections came from the sides of roads and one was from a sugar-cane plantation. Many of the ground pools were in grassy areas so that emergent and submerged vegetation was abundant. Green, and less commonly brown, algae frequently occurred in the aquatic habitats. Most of the collections were made in close proximity to human habitations, usually within 1,000 m of the nearest house. The Ecuadorian and Colombian collections came from localities ranging in elevation from 82 to 950 m above sea level. All were from the eastern slope of the Andes. Huang characterized the general habitat in Ecuador as "scrub with scattered trees". Hueck and Seibert

(1972) recognize these regions of Colombia and Ecuador where *trinkae* occurs as the "Andes septentrionales y Cordilleras" the "bosques tropicales y subtropicales, deciduos y mesofiticos de Colombia y Venezuela", or the "laderas orientales de los Andes medios."

In Ecuador and Colombia the immatures of *trinkae* occurred with 2 other species in the Albimanus Section, *rangeli* Gabaldon, Cova Garcia and Lopez 1940, and rarely *triannulatus* (Neiva and Pinto 1922). Other species that have been found associated with *trinkae* are *Culex* (*Melanoconion*) *bastagarius* Dyar and Knab 1906, *Cx. (Mel.) chrysonotum* Dyar and Knab 1908, and *Cx. (Mel.) pilosus* (Dyar and Knab 1906).

Because of the uncertainty of the geographical range of *trinkae* and its morphological similarities with *rangeli* and *nuneztovari*, there is some confusion as to which of these 3 species is referred to in much of the literature on bionomics and distribution. For example, Elliott (1968, 1972) studied the adult behavior of "*nuneztovari*" in 5 localities in Colombia and contrasted this with the behavior of *nuneztovari* in Brazil. There is a possibility, although unlikely, that at some of the localities, Elliott worked not on the behavior of *nuneztovari* but on the behavior of *trinkae*. Nevertheless, without voucher specimens it is impossible to be certain. Similarly, the distribution records in part, for Ecuador and certain regions of Colombia, for *nuneztovari* and *rangeli* may really refer to *trinkae*. For these reasons many of the references listed in the synonymy of *trinkae* should be considered tentative.

MEDICAL IMPORTANCE. Nothing is known about the vector potential of *trinkae*. As with the literature on bionomics and distribution, many of the references to either *rangeli* or *nuneztovari* concerning transmission of malaria could refer to *trinkae*. Huang (personal communication) states that in the provinces of Pastaza and Napo, *rangeli* was thought to be the vector of malaria. Likewise, Forattini (1962:393) reports that *rangeli* has been suspected as a carrier of malaria in Ecuador. In no other country has *rangeli* ever been thought to be important as a vector. Since *trinkae* is often easily confused with *rangeli* in the adult female, it is possible that *trinkae* may be transmitting malaria in Ecuador.

Further study of the natural history and medical importance of this species is greatly needed.

Material Examined: 409 specimens; 77 males, 22 male genitalia, 65 females, 133 pupae, 112 larvae; 134 individual rearings (58 larval, 53 pupal, 23 incomplete). Unless designated [JH] for the School of Public Health, Johns Hopkins University, the material is deposited at the U. S. National Museum of Natural History [USNM].

COLOMBIA. *Meta:* Villavicencio, 26 May 1947, L. Rozeboom, CV-P28, 12 M, 6 M gen, 15 F, 2 lp(M), 6 lp(F), 12 L (progeny rearing); same locality, CV 737, 1 lp(M), 2 lp(F), 4 L (progeny rearing); same locality, CV 738, 4 lp(F),

3 L (progeny rearing); same locality, CV 739, 2 lp(M), 3 lp(F), 4 L (progeny rearing); same locality 15 km SW of, San Jose, COB 42, 1 lpM, 2 lpF; same locality, 14 Feb 1948, 1 lp(F) (537.1) [JH]. ~~Department not specified: Acazias~~, 3 Jun 1948, 1 lp(F) (408.1) [JH].

META

ECUADOR. *Napo*: Tena 1.5 km S of, 13 May 1977, Y.-M. Huang, 5 pF, 2 lpF (26); same locality and collector, 11.7 km SW of, 25 May 1977, 2 pM, 1 pF, 2 lpM, 2 lpF (40); same data, 13 km SW of, 1 lpM (43). *Pastaza*: Puyo, 5 May 1977, Y.-M. Huang, 1 M gen, 2 pM, 2 pF (4); same data, 2 L (5); same data 1 lpM (6); same locality and collector, 8 May 1977, 1 M gen, 5 pM, 3 pF, 3 lpF (17); same data, 1 M gen, 3 pM, 1 pF, 1 lpF (18); same locality and collector, 20 km N of, 6 May 1977, 1 M gen, 1 pM, 1 pF, 1 lpM, 1 lpF (8); same data, 39 km N of, 2 pM, 1 pF, 1 lpF, 1 lp (9); same locality and collector, 4 km NE of, 7 May 1977, 1 pF, 1 lpM, 1 lpF, 1 lp, 2 L (11); same data, 16 km NE of, 1 M gen, 1 lpM, 1 lpF (15); same data, 1 M gen, 2 lpM, 1 lpF (16); same locality and collector, 31 km W of, 9 May 1977, 3 L (20); same data, 12 km W of, 1 M, 1 M gen (23); same locality and collector, 1.5 km S of, 15 May 1977, 1 M gen, 2 pM, 1 pF, 4 lpM, 5 lpF (29); same data, 1 M gen, 4 pM, 3 pF, 6 lpM, 2 lpF (30); same locality and collector, 17 May 1977, 4.3 km E of, 1 M gen, 2 pM, 1 lpM, 4 lpF (31); same locality and collector, 19 May 1977, 1 M gen, 5 pM, 7 lpM, 3 lpF (32); same data, 1 M gen, 2 pM, 1 pF (33).

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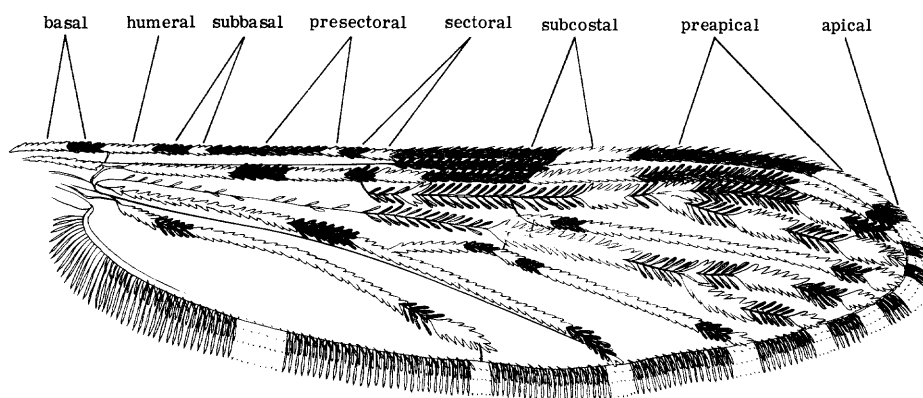
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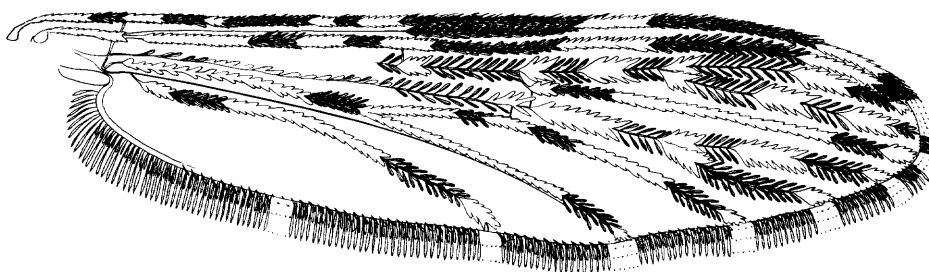
Fig.1

NYSSORHYNCHUS

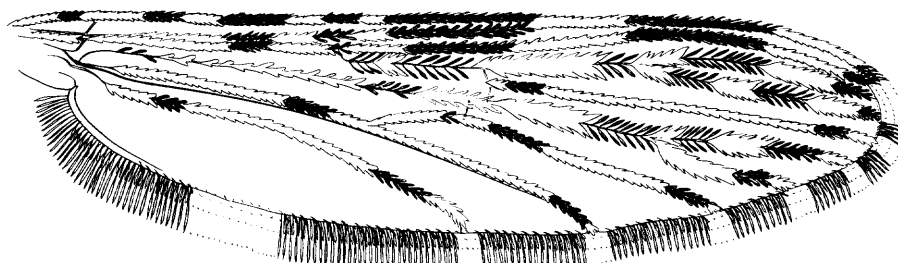
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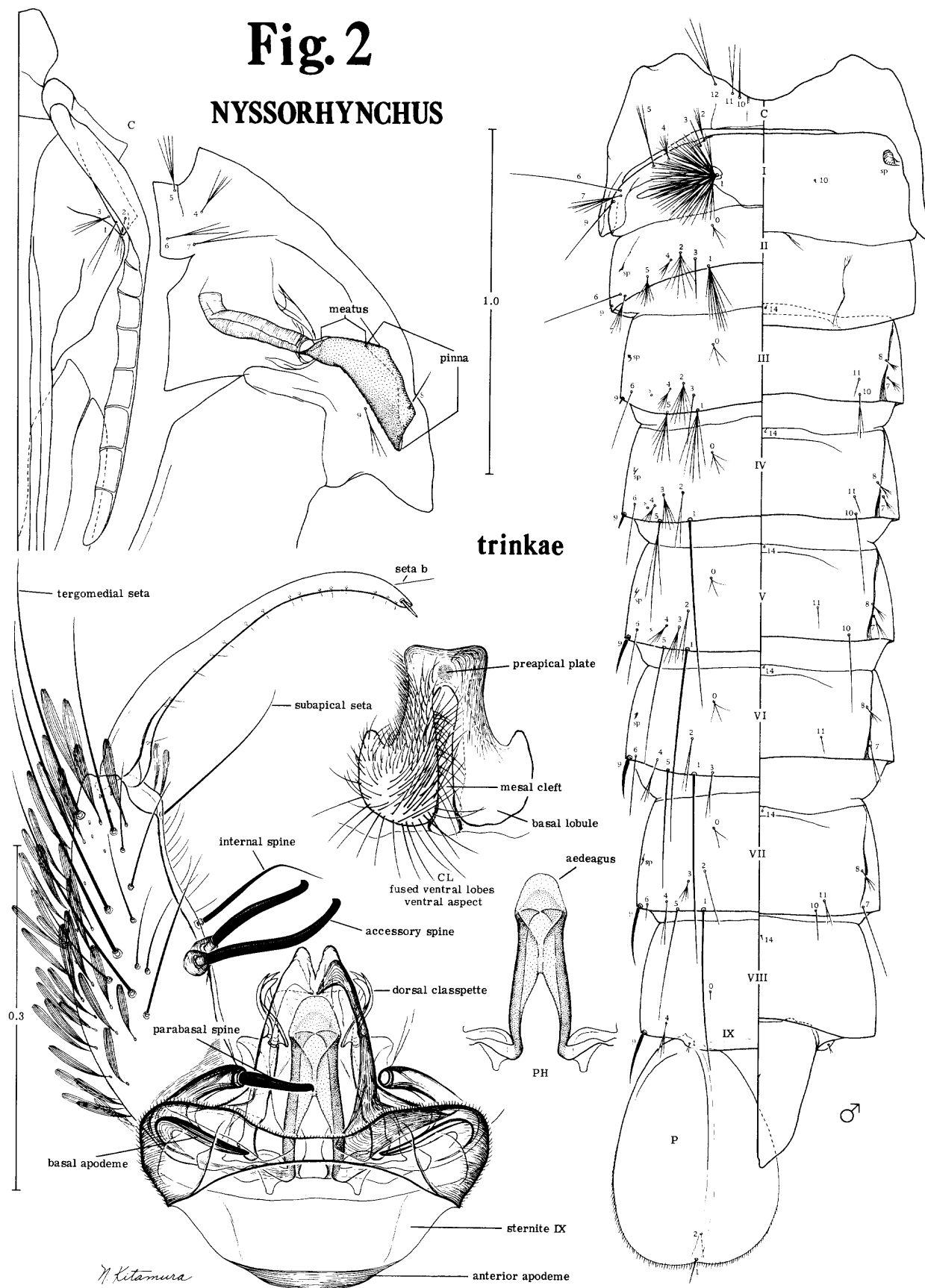
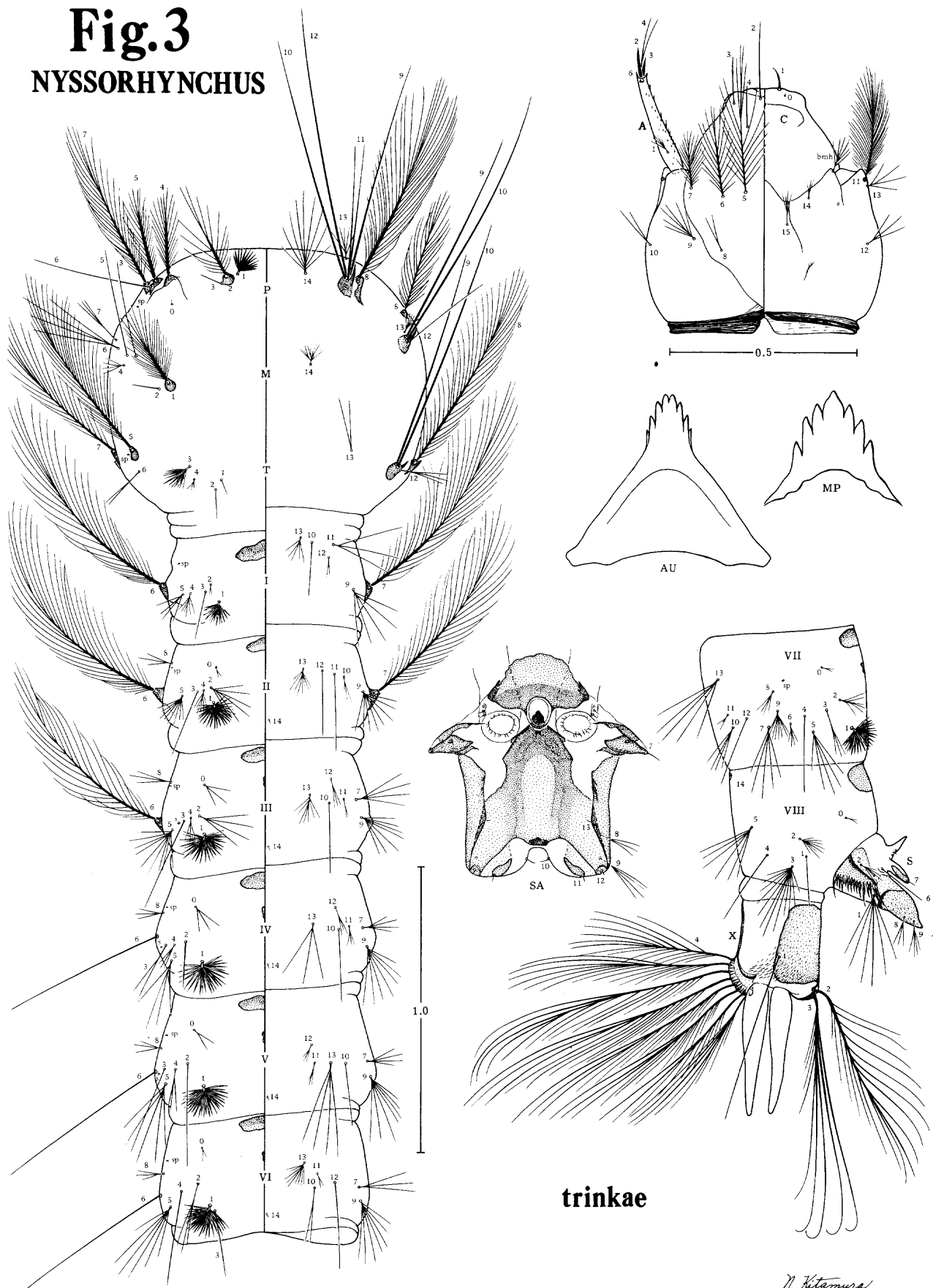


Fig.3
NYSSORHYNCHUS



M. Kitamura