Anopheles (Nyssorhynchus) trinkae, a putative vector of human malaria parasites in Junin Department, eastern Peru is synonymized with An.(Nys.) dunhami, which is concomitantly removed from synonymy with An.(Nys.) nuneztovari, a well established vector of human malaria parasites in Venezuela and Colombia. The incorrectly designated male holotype of An.dunhami is validated as the lectotype and the male genitalia are redescribed, illustrated, and contrasted with those of An. nuneztovari.
ANOPHELES (NYSSORHYNCHUS) DUNHAMI, RESURRECTED FROM SYNONYMY WITH ANOPHELES NUNEZTOVARI AND VALIDATED AS A SENIOR SYNONYM OF ANOPHELES TRINKAE (DIPTERA: CULICIDAE)

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ABSTRACT. Anopheles (Nyssorhynchus) trinkae, a putative vector of human malaria parasites in Junin Department, eastern Peru, is synonymized with An. (Nys.) dunhami, which is concomitantly removed from synonymy with An. (Nys.) nuneztovari, a well established vector of human malaria parasites in Venezuela and Colombia. The incorrectly designated male holotype of An. dunhami is validated as the lectotype, and the male genitalia are redescribed, illustrated, and contrasted with those of An. nuneztovari.

INTRODUCTION

Anopheles (Nyssorhynchus) dunhami Causey, 1945 was listed arbitrarily in synonymy with An. (Nys.) nuneztovari Gabaldon, 1940 by Lane (1953) without comment, and this has been accepted subsequently by most authors. If we accept this synonymy as a formal act, then by strict interpretation we should also accept Elliott (1972) as having resurrected An. dunhami from synonymy, although this act seems to have been overlooked. In discussing the behavior and distribution of An. nuneztovari, Elliott stated: “Observations suggest that at least two species are confounded under this name,” with each differing in biting behavior, distribution, and size. He concluded: “The name A. dunhami Causey. never formally sunk as a synonym, seems preferable for the widely distributed non-vector, as in the Brazilian type locality [Tefe] it has no vectorial importance.” He repeated this more precisely in summary. Because he attributed this statement on “vectorial importance” to Causey (1945), I think it worthwhile to repeat what Causey said about An. dunhami: “Its relation to malaria is not known, although it is not suspected of being a vector as the region from which it was collected shows one of the lowest malaria rates of any area studied in the Amazon Valley.” I could make an argument against this reasoning, but I think the quote suffices. Beyond the specific reference to the type locality of An. dunhami by Elliott (1972), it is not possible to determine which species might have been involved in the other localities mentioned. Faran (1980) accepted the synonymy of Lane (1953) and stated that he had examined the holotypes of An. dunhami and An. goeldii Rozeboom and Gabaldon, 1941 and “was unable to find any apparently significant differences” between these and numerous other specimens of An. nuneztovari from several countries, including the type localities.

OBSERVATIONS AND DISCUSSION

During the past five or six years I have examined many newly accessioned specimens of An. nuneztovari from various localities in Brazil, Peru, and Venezuela that have served to reinforce my morphological concept of the polytypic species An. nuneztovari and its currently accepted junior synonym
An. goeldii. More recently, I reexamined type material for An. dunhami, An. goeldii, An. nuneztovari, and An. trinkae Faran, 1979 plus many additional specimens of An. nuneztovari and An. trinkae from various countries that were cited in the study of the Albimanus Section by Faran (1980). Based on the examination of these specimens, I am confident that An. dunhami and An. nuneztovari are not conspecific. With this decision, the question remaining to be answered is what taxonomic status should be accorded An. dunhami? Should it be treated as a distinct species unrelated to any other nominal species? Is it a junior synonym of another closely similar species? Is it a senior synonym of a currently recognized species? I have chosen the latter option because I cannot justify the separation of An. dunhami from An. trinkae on morphological grounds. Although An. dunhami has been in synonymy for 40 years, I believe that applying the Principle of Priority in this case does not "disturb stability or universality, or cause confusion." This is a valid nomenclatural act that conforms to the provisions of Articles 23a-b and 79c of the International Code of Zoological Nomenclature (1985). In this instance a prima facie case for the suppression of "an unused senior synonym" (An. dunhami) cannot be presented to the Commission because the circumstances fail to meet the conditions set forth in Article 79c (1-2) of the Code.

Lane (1953) described the male mesosome (= aedeagus of Harbach and Knight 1980) of An. nuneztovari as follows: "mesosome as broad as long at apex which is rounded, broad and with a pair of leaflets on each side." This was probably based on the original description of An. nuneztovari. However, Lane's illustration (his Fig. 245) of the "mesosome" (ventral aspect), indicated to be an original for An. nuneztovari, does not show any evidence of "leaflets," and it appears to have been drawn from the only male genitalia of An. dunhami in the U.S. National Museum (USNM), which is illustrated here in dorsal aspect (Fig. 1C). This is possible because Lane (1953) acknowledges that type specimens in the USNM were made available to him for study or comparison. The male genitalia of An. dunhami are partially dissected and mounted on a microscope slide under two separate coverslips. The aedeagus is positioned "ventral aspect up." The aedeagus figured by Lane does not resemble in any respect that shown by Gabaldon (1940), that of the holotype of An. nuneztovari redescribed and illustrated by Savage (1986), or that described and illustrated in Faran (1980), except that Faran said the aedeagus is "with or without very small, membranous, nonserrated, pointed, basolaterally directed leaflets." Obviously in consideration of at least the synonym An. dunhami being without leaflets. Lane's figure, however, does compare quite well with the description and illustrations of An. trinkae in Faran (1979, 1980).

The principal distinguishing morphological features of An. nuneztovari and An. dunhami (An. trinkae) are, in the adult, pale scales on costal vein and usually other veins light yellowish to distinctly yellow in An. nuneztovari, whitish to distinctly white in An. dunhami; aedeagus with a pair of small to prominent lateral leaflets in An. nuneztovari (Fig. 1B), no leaflets present in An. dunhami (Fig. 1C); and in the larva, setae 2,3-C single and noticeably aciculate in apical 0.5-0.7, aciculae more prominent on 3-C, 3-C slightly shorter (0.75-0.90) than 2-C, 4-C single or 2-4 branched, moderately long, 0.3-0.6 length of 3-C, and usually extending to near or beyond base of 2-C in An. nuneztovari; setae 2.3-C single and simple or with fine sparse aciculae, 3-C usually noticeably shorter (0.5-0.8) than 2-C, 4-C single or bifid, long, 0.7-1.0 length of 3-C, and usually extending beyond base of 2-C in An. dunhami. The ranges are taken from Faran (1980). The determination of white- and yellow-colored scales and all the subtle shades in between, as used in descriptions, is often confusing and ambiguous. Light source, intensity, and filtering affect interpretation. In characterizing the color of wing scales above, I followed the technique in Peyton and Ramalingam (1988), except that the white scales on hindtarsomeres 3.4 of Nyssorhynchus species are the preferred standard for bright, pure white for.
Fig. 1. A-B. *Anopheles* (Nys.) nunezovari (holotype), from Savage (1986); C-D. *An. (Nys.) dunhami* (lectotype), original.
comparison with other colors and shades. For complete descriptions, illustrations, and keys of the adult and immature stages of An. nuneztovari and An. dunhami, consult Faran (1980. An. dunhami treated as An. trinkae). For a redescription of the holotype male of An. nuneztovari, see Savage (1986). Savage (1986) stated: "I believe that leaflets are always present [on the aedeagus] and are diagnostic for nuneztovari." I agree with this, except that there is cytological evidence for more than one species involved under the current morphological concept of An. nuneztovari (Conn et al. 1993. Kitzmiller et al. 1973).

Fewer than five published references to An. trinkae have appeared since it was described in 1979. The most significant to date has been Hayes et al. (1987), who stated: "These data are the first to incriminate An. trinkae as a vector of human malaria parasites, and they clearly establish this species as a primary vector of malaria in the Rio Ene Valley, based on mosquito-man contact. . . . In the valleys of eastern Peru surveyed to date, An. trinkae is more abundant in man-biting collections than An. rangeli."

Causey (1945) described An. dunhami from specimens collected in Tefe, Amazonas, Brazil, suggesting that it closely resembled An. goeldii and "The genitalia characteristics distinguish it from both Anopheles goeldii and Anopheles nuneztovari, Gabaldon, 1940." It was collected in large numbers on animal bait. The egg, larva, adult female, and male genitalia are described by Causey, and photographs of eggs and male genitalia are provided on his Plate I. No holotype was designated, and no indication of the number of specimens examined was provided. The only reference to specimens reads: "The type specimens have been forwarded to the National Museum in Washington, D.C." A copy of a brief typewritten letter from Causey to Alan Stone at the USNM dated July 17, 1946 was obtained from the Smithsonian Institution Archives (RU7340, Box 4). The subject of the letter is "Type Specimens" and it reads (in part): "I am sending under separate cover the following mosquito specimens for deposit in the National Museum at Washington, D.C.: (1) Anoph eles galvaoi. male. female, larval skins and mounted male genitalia and eggs; (2) Anopheles dunhami. male and female type and mounted genitalia; (3) Anopheles rozemboom, female type and larval skins [This is an obvious lapsus; the species was described as a species of Chagasia, not Anopheles. Because the species was originally described from eggs only, the female and larval skins cannot be considered as part of the type series.]; (4) Anopheles sawyeri, female type, larval skins and male genitalia."

Stone and Knight (1956) erred in considering "the male [of An. dunhami] with terminalia mounted on a slide, to be the holotype." It is clear from the original publication and the letter that Causey did not state or infer that the male was the holotype and it is equally clear that the type species consisted of more than one specimen. These specimens of An. dunhami were accessioned in the USNM on July 30, 1946 under number 58036. Stone and Knight (1956) stated: "The collection contains a male labeled type and a female labeled paratype, both reared from eggs laid by a female collected in Tefe, Amazonas, Brazil." Actually, the labels referred to are the red accession labels that were placed on the specimens after they arrived at the USNM, not by the author. These specimens should have been treated as syntypes. Of the original labels, the male genitalia slide has the name, author, and year followed by "male terminalia of type specimen" handprinted in ink. The male has a rather large, white, upper paper label with the following handwritten in ink: "Type specimens bred out from eggs laid by female collected in Tefe, Amazonas, Brazil." Neither the male nor female has an original "type" label affixed as inferred by Stone and Knight (1956). The three specimens each have a red accession label with the number 58036. None of the above satisfies the provisions of Article 73a (i-iii) and Recommendation 73F of the Code for fixing the holotype. Because a holotype can only be designated by the author in the original publication (Article 73a (iii) of the Code), the designation of a holotype by the persons re-
ceiving the specimens at the USNM, or by Stone and Knight (1956), is invalid, and I hereby designate the single male in the USNM as a lectotype of *Anopheles dunhami* Causey, 1945. This specimen was listed or discussed previously as the holotype by Stone and Knight (1956), Belkin et al. (1971), and Faran (1980). The general condition of the lectotype male is as follows; abdominal segments II–XI missing, terminal appendages mounted on a microscope slide in Canada balsam under two separate coverslips; right fore- and hindlegs missing, other legs undamaged; both wings present, but apical portions of each appear to have been wet and are somewhat folded; costal spots and scaling on left wing bright and unrubbed to preapical pale spot; spots on right wing clear to subcostal pale spot except prehumeral dark spot, which is slightly rubbed, and prescetor pale spot, which is undeveloped; pale scales on wing all white; humeral pale spots on costa 1.5 and 1.4 length of prehumeral dark spot on left and right wings, respectively. Wing spot terminology follows Wilkerson and Peyton (1990).

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