

A Study of *Anopheles ludlowae* Theobald Siblings,
Leading to New Synonymy (Diptera, Culicidae)

Richard F. Darsie, Jr.^{1/} and Adela Cagampang-Ramos^{2/}

ABSTRACT. An investigation of the validity of the recently described subspecies, *Anopheles ludlowae cabrerai* Darsie and Ramos, 1969, was completed. Rearings of siblings from females of *An. 1. ludlowae* Theobald demonstrated that 37.3 percent of 351 progeny had the *cabrerai* character. With no definitive reproductive isolation, subspecies *cabrerai* is designated a synonym of the nominate subspecies.

In 1969, the authors unintentionally described a new subspecies, *Anopheles ludlowae cabrerai* Darsie and Ramos. It was included in an identification key to Philippine anophelines with the understanding that its original description would be in print prior to the key's publication. Unfortunately, the description was not published until 1974 by Baisas.

King (1932, footnote on p. 323) was the first to call attention to a variant of *An. ludlowae*, in which the anal wing vein possesses three dark-scaled spots, with the rest of the vein pale-scaled. This character is the principal distinguishing feature of the subspecies *cabrerai*. The nominate subspecies of *ludlowae* has only two dark-scaled spots on the anal vein, one at about the middle and the other at the apex near the wing margin, while *cabrerai* has an additional dark spot at the base of the vein. Subsequently it was reported as a possible new form by Baisas (1965), Dowell et al., (1965), and Baisas and Dowell (1967). Reid (1968) also pointed out that some *ludlowae* had three dark marks on vein 6 (anal vein). Ramos and Darsie (1970) included the subspecies in illustrated keys, Stone (1970, p. 140) listed it in Supplement IV of the *Synoptic Catalog of the Mosquitoes of the World*, Basio (1971) gave bionomics and distribution and Delfinado and Hardy (1973) have it in their Diptera Catalogue.

After its creation the authors searched for a population of *An. 1. cabrerai* which could be used to validate its status and describe the immature stages. Heavy breeding of *An. ludlowae* (s. lat.) was located in

^{1/}Research Entomologist, Central America Research Station, Center for Disease Control, Public Health Service, U. S. Department of Health Education and Welfare, c/o American Embassy, APO New York 09889.

^{2/}Entomologist, Vector Taxonomy Unit, First Medical Service Wing, PACAF, USAF, APO San Francisco 96528.

the Montalban River, a tributary of the Marikina River, Municipality of Montalban, Rizal Province, Luzon Island, Republic of the Philippines. Subsequently mass, individual and sibling rearings were completed from collections made on February 9, 1971. This paper contains part of our study of this population.

The methods used for the rearing of specimens were similar to those given by Belkin et al. (1965), while mounting procedures employed in the study were those contained in Darsie and Ramos (loc. cit.). In addition the collections of *An. ludlowae* in the U. S. National Museum were checked for the presence of the *An. 1. cabrerai* character.

Morphological variants among the sibling rearings are recorded in Table 1. Individuals with 2-spotted and with 3-spotted anal veins were produced by each of the five, 2-spotted females whose progeny was studied closely. Of the 351 siblings reared, an overall 37.3 percent possessed the anal vein with three dark spots. From this data it appears that there is no reproductive isolation on which the subspecies *cabrerai* Darsie and Ramos could be based; therefore, it is hereby designated a synonym of the nominate subspecies, *Anopheles ludlowae ludlowae* Theobald.

The frequency of occurrence of this morphological variant is interesting. It is definitely more prevalent in the males than the females. Among all the siblings, 61.1 percent of the males, while only 12.2 percent of the females, exhibited the character. A total of 115 individual rearings of the Montalban River population was completed. Of these, 48.7 percent had the 3-spotted anal vein, with 37.4 percent males and 11.3 percent females.

The other data gathered with regard to this anal vein character, a survey of the *An. ludlowae* adults seen in the U. S. National Museum collection, can be found in Table 2. Altogether 436 adults were examined, and it was found that 16 percent bore the 3-spotted anal vein. The results reveal that the morphological variant is widely distributed in the Philippine Islands and also occurs in Taiwan.

During the study the question arose as to whether subspecies *cabrerai* was similar to either of the varieties listed as valid taxa by Stone et al. (1959), i.e., var. *flavescens* (Swellengrebel) and var. *torokala* Stoker and Waktoedi. According to Reid (loc. cit., p. 347) *flavescens* could not have been a variety of *An. ludlowae*, since it was found on the Island of

TABLE 1. Analysis of Frequency of Anal Vein with 3 Dark Spots Occurring in Sibling Rearings of *Anopheles ludlowae*, Philippines 1971

Rearing Lot. No.	Total Reared	MALES		FEMALES		Total with 3 spots No.	Total with 3 spots %
		Total	With 3 spots No.	Total	With 3 spots No.		
A	97	40	39	57	8	47	48.5
B	69	39	7	30	2	9	13.0
C	44	22	22	22	9	31	70.5
E	70	43	20	27	1	21	31.8
H	71	36	22	35	1	23	31.9
TOTAL	351	180	110	171	21	131	37.3

TABLE 2. Record of Specimens of *Anopheles ludlowae* in U. S. National Museum Collection with 3 Dark Spots on Anal Vein

Location	Total Examined	With 3 dark spots	
		Males	Females
Luzon Island*	159	7	16
Cebu Island*	69	4	--
Negros Island*	68	11	4
Mindinao Island*	76	11	2
Taiwan**	64	7	8
TOTAL	436	40	30

* Republic of Philippines

** Republic of China

Java, and *ludlowae* is not known to occur there. Stoker and Waktoedi (1949) show only two dark spots on the anal vein in their wing illustration (fig. 59), thus it could not be *cabrerai*.

Based on the evidence presented, subspecies *cabrerai* cannot constitute a distinct population worthy of its own taxon name. It now represents normal variation within a species, but may indeed also exemplify the beginning of the formation of sibling species, as discussed by Cain (1954).

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