Z. A. Naqvi. 1976. Observations on the diel biting rhythms of some Punjab mosquitoes (Diptera: Culicidae). Biologia 22:67–77.
Roth, L. M. 1948. A study of mosquito behavior. An experimental laboratory study of the sexual behavior of *Aedes aegypti* (Linnaeus). Amer. Mid. Natur. 40:265–352.
Sebastian, A. and B. de Meillon. 1967. Experiments on the mating of *Culex pipiens fatigans* in the laboratory. 36:47–52.
Siddiqui, T. F., Y. Aslam and W. K. Reisen. 1976. The effects of larval density on selected immature and adult attributes in *Culex tritaeniorhynchus* Giles. Trop. Med. (Nagasaki) 18:195–202.
Yajima, T. 1973. Ecological studies on the gonotrophic cycles of the mosquito, *Culex tritaeniorhynchus summorosus* Dyar, in relation to the ovarian condition. Sci. Repts. Tohoku Univ. 4th Ser., Biology, 36:241–253.
Yajima, T., S. Yoshida and T. Watanabe. 1971. Ecological studies on the population of adult mosquito, *Culex tritaeniorhynchus summorosus* Dyar: The diurnal activity in relation to physiological age. Jap. J. Ecology 21:204–214.

DISCOVERY OF *ANOPHELES CRUCIANS* SUBGROUP ON THE PACIFIC COAST OF EL SALVADOR[1]

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ABSTRACT. The *Anopheles crucians* subgroup is reported from the Pacific Coast of El Salvador, Central America, for the first time. Females were captured in a light trap. They are almost certainly either *crucians* Wiedemann or *bradleyi* King since they were taken very near the coast.

Species of the *Anopheles crucians* subgroup have been known to occur in Central America since 1926 when Clark reported its presence in Honduras. Subsequently it was recorded in Nicaragua by Kumm (1942), in Belize by Kumm and Ram (1941), in Guatemala by Brennan (1951), in Mexico by Vargas (1940, 1950) and Vargas and Martínez Palacios (1950, 1953, 1956) and in Costa Rica by Vargas V. (1975). All previous records have indicated a distribution confined to the northern or eastern areas of these countries bordering the Caribbean seacoast, except that from Costa Rica. Its locality was Los Chiles, Department of Alajuela, not close to either Caribbean or Pacific Coasts, but in the center near the western border not far from Lake Nicaragua. To our knowledge there have been no previous reports of the *An. crucians* subgroup occurring along the Pacific coastal areas, except in the Mexican States of Sinaloa and Nayarit, located in the northwestern part of that country (J. N. Belkin, 1973, personal communication). Vargas and Martínez Palacios (1949) did not mention *crucians* in their list of the anophelines of Mexico's southernmost Pacific Coastal State of Chiapas. Furthermore, Kumm and Zúniga (1942) did not include it in their list of the mosquitoes of El Salvador. This article is for the purpose of recording for the first time the discovery of the *An. crucians*

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subgroup in El Salvador and to note its presence on the coast of the Pacific Ocean.

Three adult females were captured in a CDC miniature light trap operated near Estero San Diego, Department of La Libertad, on April 24, 1973. The specimens were taken during the 2-hour period, 1800–2000.

Two females were sent to Dr. J. N. Belkin for confirmation of the identification and the other was retained in the entomologic collections at the Central America Research Station. Belkin (loc. cit) did confirm that the specimens belonged to the *An. crucians* subgroup but did not indicate a species, since the females of the three members, *crucians* Wiedemann, *bradleyi* King and *georgianus* King, are inseparable. Floore et al. (1976) did note that *bradleyi* could be recognized in about 50% of the specimens by the pale-scaled Cu wing vein, basal to the fork, as shown in their figure 7. This section is dark-scaled in the El Salvador specimen, signifying no assurance that it is *bradleyi*. They also explained that some *georgianus* have a dark fringe spot on the wing opposite vein R_3. No such spot is evident in the specimen studied.

King et al. (1960) gave as the preferred habitat for *georgianus* shallow collections of water in seepage areas at headwaters of streams, while distributional data given by Floore et al. (1976) indicated that the species does not breed near the coast within its known range. It would therefore seem reasonable to assume that the El Salvador *crucians* subgroup specimens could not be *georgianus* since they were taken in a trap very near the coast.

Komp (1942) pointed out that *crucians* is the only species of *Anopheles* which has made a substantial penetration of the Central American isthmus from the north, and finding it in El Salvador extends its range along the Pacific coast by some 2000 kilometers. On the contrary several species, e.g., *triannulatus* Neiva & Pinto, *strodei* Root, *darlingi* Root, *argyritarsis* Robineau-Desvoidy and *eiseni* Coquillett, have presumably made intrusions into this region from the south.

Literature Cited

Brennan, J. M. 1951. The occurrence of *Anopheles crucians* in Guatemala. Am. J. Trop. Med. 31:138.

Clark, H. C. 1926. *Anopheles* mosquitoes in our tropical divisions. United Fruit Co., Med. Dept. Ann. Rept. 15:45–47.

Floore, T. G., B. A. Harrison and B. F. Eldridge. 1976. The *Anopheles (Anopheles) crucians* subgroup in the United States (Diptera: Culicidae). Mosquito System. 8(1):1–109.

King, W. V., G. H. Bradley, C. N. Smith and W. C. McDuffie. 1960. A handbook of the mosquitoes of the Southeastern United States. U.S.D.A. Agr. Handb. 173, 188 pp.

Komp, W. H. W. 1942. The anopheline mosquitoes of the Caribbean Region. Natl. Inst. Hlth. Bull. 179, 195 pp.

Kumm, H. W. 1942. *Anopheles crucians* found in northern Nicaragua. Am. J. Trop. Med. 22:511–512.

Kumm, H. W. and L. N. Ram. 1941. Observations on the *Anopheles* of British Honduras. Am. J. Trop. Med. 21:559–566.

Kumm, H. W. and H. Zúniga. 1942. The mosquitoes of El Salvador. Am. J. Trop. Med. 22(4):399–415.

Vargas, L. 1940. Clave para identificar las larvas de *Anopheles* mexicanos. Ciencia (Mexico City) 1:66–68.

Vargas, L. 1950. Malaria along the Mexico-United States border. Bull. WHO 2:611–620.

Vargas, L. and A. Martínez Palacios. 1949. Los anofelinos del sur de Chiapas. Algunos datos sobre biologia y distribución geográfica. Rev. Inst. Salub. Enferm. Trop. 10(3):253–260.

Vargas, L. and A. Martínez Palacios. 1950. Estudio taxonómico de los mosquitos anofelinos de México. Sec. Salub. Asist., México, D. F., 143 pp.

Vargas, L. and A. Martínez Palacios. 1953. Algunas observaciones sobre distribución geográfica y variaciones estacionales de los *Anopheles* del noreste de México. Rev. Inst. Salub. Enferm. Trop. 13(4):321–330.

Vargas, L. and A. Martínez Palacios. 1956. Anofelinos mexicanos taxonomía y distribución. Sec. Salub Asist., México, D.F., 181 pp.

Vargas, V. M. 1975. Clave para anofelinos (hembras) de Costa Rica (Diptera, Culcidae) Brenesia 6:77–80.