Trichoprosopon digitatum - Morphology, Biology, and Potential Medical Importance[1]

by

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ABSTRACT. *Trichoprosopon digitatum* (Rondani) is a common, widespread, and ecologically diverse species of mosquito in the American tropics. Since the species may be abundant in domestic and peridomestic environments, commonly bites humans in some regions, and is known to harbor arboviruses, it should not be ignored as a potential vector of arboviruses to humans. Characters that distinguish this species from other species in the genus are given. The geographic distribution, range of breeding sites, and biological features of the species are reported. The literature reporting virus isolations from *digitatum* or mixed pools of mosquitoes including *digitatum* is reviewed, and information on its biting habits in Brazil is given.

The neotropical sabethine genus *Trichoprosopon* Theobald includes 21 or 22 species, about 1/3 of which are undescribed. A reclassification of the composite genus *Trichoprosopon* and a discussion of species complexes within the redefined genus have been presented earlier (Zavortink 1979a, 1979b, 1981). At this time we wish to draw attention to the single species *Trichoprosopon digitatum* (Rondani) because of its interesting biological features and potential as a vector of arboviruses.

Trichoprosopon digitatum is identified most easily by the male genitalia. It is the only species of *Trichoprosopon* with 3-5 (3-6) pairs of large preapical teeth on the aedeagus, with these teeth becoming progressively

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larger distad of the smallest basal tooth (Fig. 1A). The pupa is the stage next most easily identified, by its normal countershading and the moderately strong to strong, more-or-less rigid seta 6-VI and usually also 6-V (Fig. 1B). The adult of *digitatum* can be identified only by the combination of the densely setose clypeus (Fig. 1C), the presence of setae on the upper calypter of the wing (Fig. 1D), the presence of a small patch of light scales at the base of the first hindtarsal segment (Fig. 1E), and the light integument of the mesepimeron and meron. The larva of *digitatum* is the stage most difficult to identify. It can usually be told by the combination of a strong, long, single or double seta 0-P (Fig. 1F), a single or double seta 7-P (Fig. 1F), only a single ventral abdominal seta (12-II) arising from a sclerotized tubercle (Fig. 1G), and a long seta 6-VI (Fig. 1H).

Trichoprosopon digitatum is geographically widespread (Fig. 2). From its northernmost station near Cordoba, in the state of Veracruz, Mexico, it extends south to the states of El Oro, Ecuador, and Sao Paulo, Brazil (not to Argentina, as erroneously reported by Zavortink 1981).

As for its biological features, *digitatum* is a common mosquito. Nearly 95% of the *Trichoprosopon* assembled for a taxonomic study of the genus is *digitatum*. Moreover, the species has been reported to be abundant in the American tropics, as by Aitken, Hingwan et al. (1968) in Trinidad and Busck (1908) in Panama.

Trichoprosopon digitatum occurs in ecologically diverse breeding sites. Of 135 collections of immatures of this species made for the project "Mosquitoes of Middle America," 47 collections (35%) are from bamboo internodes; 45 collections (33%) are from fallen fruits or nuts, with 34 of these identified as cacao pods or coconuts; 19 collections (14%) are from fallen leaves or spathes; 14 collections (10%) are from artificial containers, such as cans, tires, dishes, and discarded canoes; six collections (4%) are from treeholes; three collections (2%) are from *Heliconia* flower bracts; and one collection (< 1%) is from leaf axils, in this case a terrestrial bromeliad (pineapple). In addition to these habitats, the species has been reported from leaf axils of *Calathea* (Galindo et al. 1951), leaf axils of *Colocasia* and *Aechmea mertensii*, and shells of calabash (Aitken, Hingwan et al. 1968).

The preferred breeding sites of *digitatum* (bamboo internodes, fallen fruits and nuts, fallen leaves and spathes, and artificial containers) are often created directly or indirectly by the activities of humans, and as a result *digitatum* is commonly found in domestic or peridomestic areas. These four classes of habitats comprise 92% of the immature collection sites of *digitatum* made for the project "Mosquitoes of Middle America."

Because *digitatum* is collected frequently and has been colonized in Trinidad (Aitken, Hingwan et al. 1968) much is known about its biology. Eggs are usually laid in a raft (Howard et al. 1915; Pawan 1922; Aitken, Hingwan et al. 1968; Mattingly 1974). Only one other species of sabethine mosquito, an undescribed species closely related to *digitatum*, is also known to lay its eggs in a raft (Mattingly 1974). The egg raft is loose, flat, fragile, and comprised of 60-85 eggs. It is formed in 2-4 hours (Pawan 1922), usually in the late evening or night (Aitken, Hingwan et al. 1968). The eggs hatch in 26-30 hours, each larva escaping through a longitudinal slit in the side of the egg which extends about half the length of the egg. Females have been

observed to stand over their rafts, holding them with their midlegs, for about 24 hours (Aitken, Hingwan et al. 1968). The adaptive significance of laying eggs in a raft and standing over them is not known, but Mattingly (1972; in litt.) has hypothesized that these behaviors decrease predation and parasitism.

Larvae of *digitatum* flutter their four large anal gills rapidly (Howard et al. 1915; Aitken, Hingwan et al. 1968). The significance of this behavior is not known. Larvae survive for several months in the absence of adequate food (Busck 1908) and several days drying of their breeding sites (Galindo et al. 1951). They are predaceous and cannibalistic (Arnett 1949), particularly upon younger instars (Seifert and Barrera 1981). The biological feature of the larvae that has received the most attention in the literature is their ability to survive in very foul water. Almost all authors reporting larval collections stress that the water in the breeding site was thick, fermenting, ill-smelling, opaque, or too foul for other mosquito larvae (Busck 1908; Galindo et al. 1951; Howard et al. 1915).

As reported by Aitken, Hingwan et al. (1968), under laboratory conditions adults of *digitatum* live about four to six weeks. They are active both day and night, but especially at dusk. Females feed on various mammals, such as rabbits, day-old mice, or humans, but refuse to take blood from toads or chicks. Males swarm. Copulation is momentary and occurs in flight when females enter the swarm. In the laboratory, the life cycle is 13 to 14 days.

Field studies conducted in various parts of Latin America have shown that females of *digitatum* are attracted to human hosts, sometimes in fairly large numbers (Barreto-Reyes and Lee 1969; Causey et al. 1961; Trapido and Galindo 1957). These studies also indicate that the species is diurnal and more prevalent at ground level than in the canopy. In studies carried out in Panama by Trapido et al. (1955) and Trapido and Galindo (1957), 84-98% of *digitatum* taken in biting-landing collections with human hosts were at ground level. These same studies showed the peak in biting activity to occur between 1300 and 1400 hours, but collections were conducted only from 0900 until 1500 hours.

Recent studies by Roberts et al. (1981) along the Transamazon Highway in Brazil have shown that *digitatum* is one of three codominant mosquito species in daytime biting-landing collections on the forest floor. The other two species are *Psorophora albipes* (Theobald) and *Wyeomyia aporonoma* Dyar and Knab. Diurnal collections between 0700 and 1800 hours indicate a major peak in activity near 1700 hours and a secondary peak after 1300 hours (Fig. 3A). An interesting and as yet unexplained aspect of the biting behavior of *digitatum* is that it arrives at human hosts at a rate lower than that of other species early in a one-hour collecting period, and at a rate higher than that of the other species later in the same period (Fig. 3B). Possible explanations are that females do not respond to the presence of hosts immediately, or that they are not sensitive to movement of their hosts, or that *digitatum* is not primarily a large animal feeder.

As for the matter of involvement in the transmission of arboviruses, several arboviruses have been isolated from *digitatum* or mixed pools of species of *Trichoprosopon* and related genera that include *digitatum*. These are: Pixuna virus, isolated from *digitatum* in Brazil (Shope et al. 1964);

Wyeomyia virus, isolated from *digitatum* in Trinidad (Aitken, Spence et al. 1968) and Brazil (Causey et al. 1961); Bussuquara virus (Galindo et al. 1966), Ilheus encephalitis virus (de Rodaniche and Galindo 1961), and St. Louis encephalitis virus (Galindo et al. 1964), isolated from mixed pools including *digitatum* in Panama; and Triniti virus, isolated from a mixed pool including *digitatum* in Trinidad (Spence et al. 1964). In addition, Aruac virus has been reported from another species of mosquito formerly included in *Trichoprosopon*, *Runchomyia theobaldi* (Lane and Cerqueira) (Zavortink 1979a), in Trinidad (Spence et al. 1966).

In conclusion, it should be emphasized that *Trichoprosopon digitatum* is a common, widespread and ecologically diverse species of mosquito in the American tropics. Since the species may be abundant in domestic and peridomestic environments, commonly bites humans in some regions, and is known to harbor arboviruses, it should not be ignored as a potential vector of arboviruses to humans.

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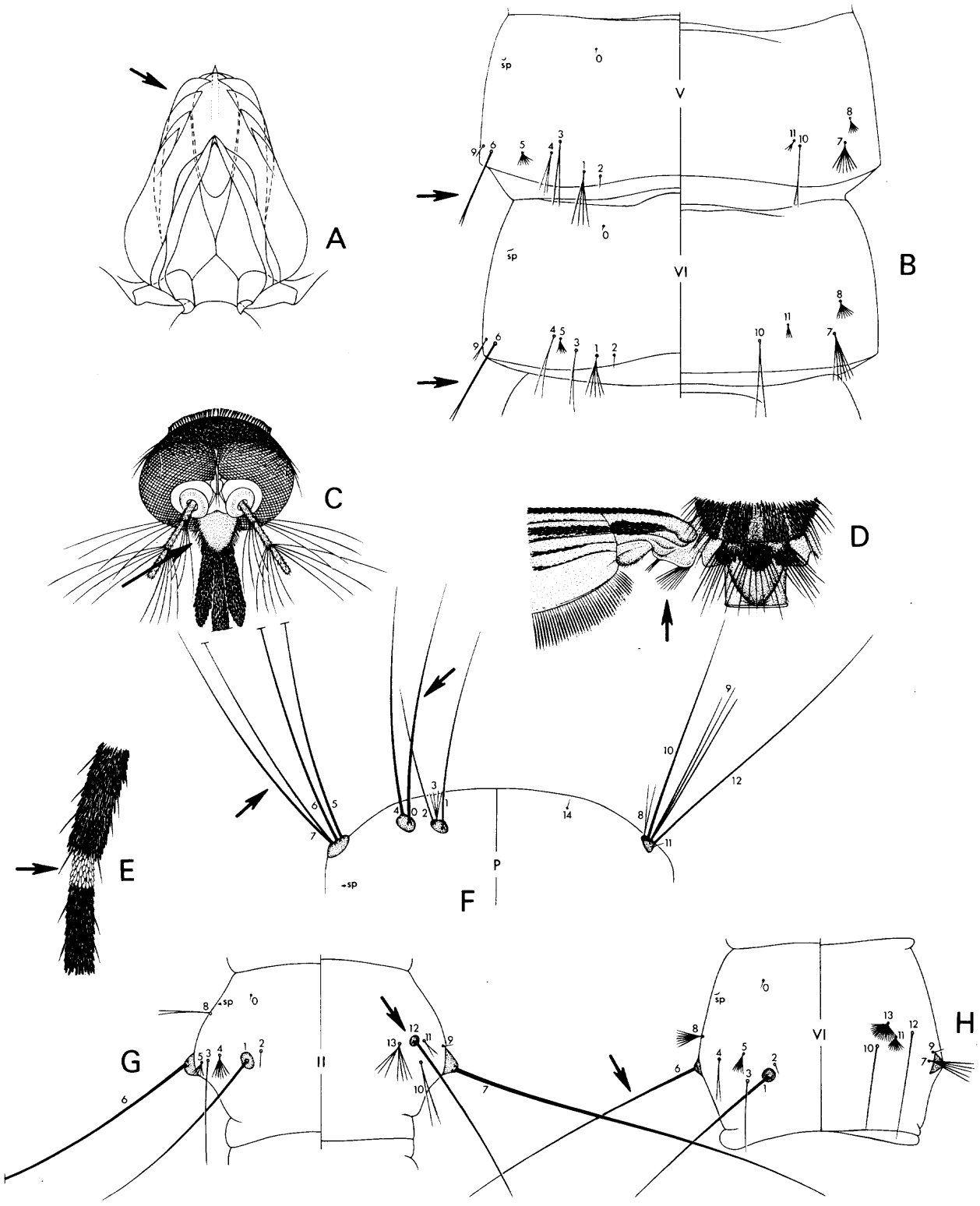


Figure 1. Diagnostic characters of *Trichoprosopon digitatum*. A, aedeagus; B, pupal abdominal segments V,VI; C, adult clypeus; D, base of wing; E, base of hindtarsal segment 1; F, larval prothorax; G, larval abdominal segment II; H, larval abdominal segment VI.

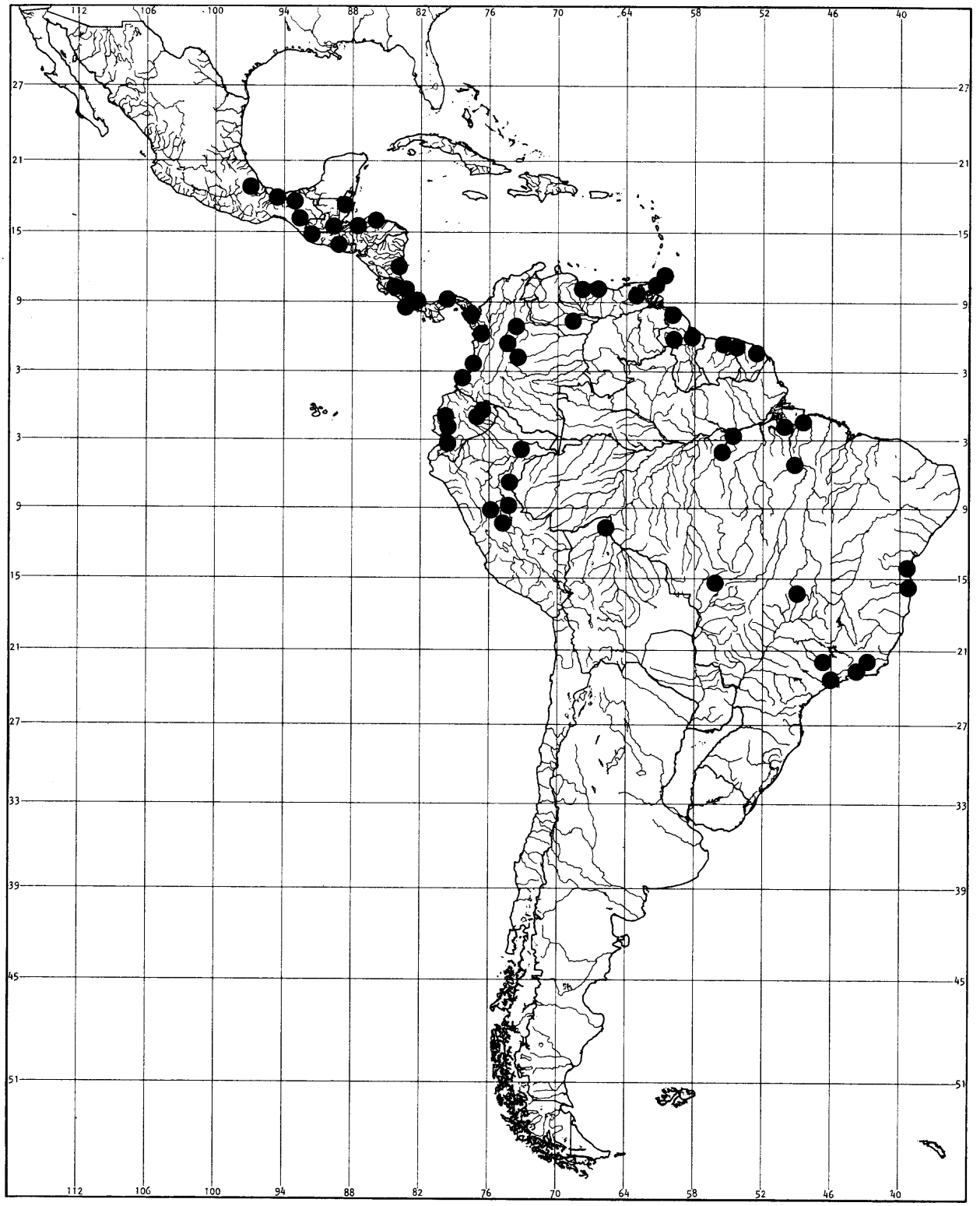
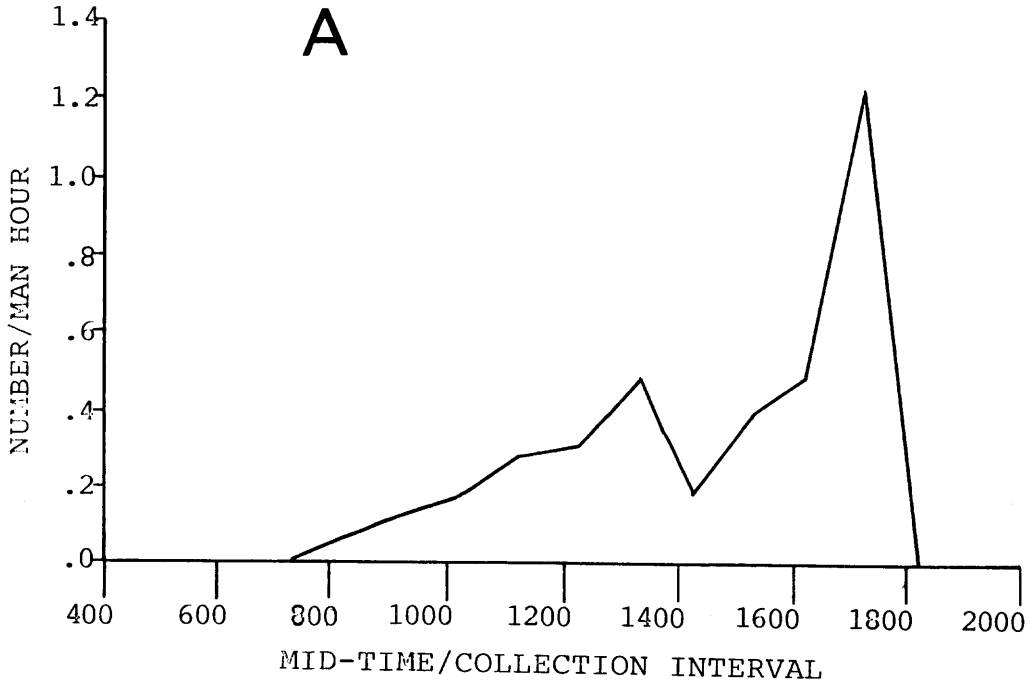


Figure 2. Distribution of *Trichoprosopon digitatum*.



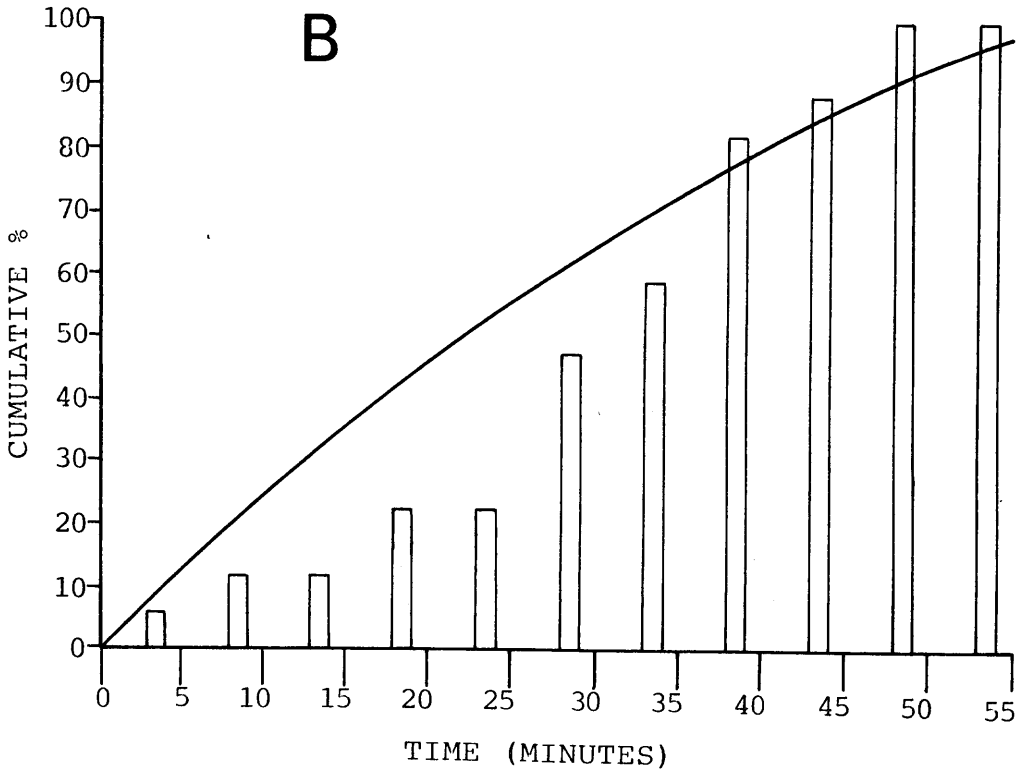


Figure 3. A, diurnal host-seeking activity of *Trichoprosopon digitatum* in Para, Brazil, 1978; B, cumulative percent of *Trichoprosopon digitatum* (bars) and all mosquitoes (approximated by curve) collected at human hosts at 5-minute intervals during a one-hour long collecting period in mid-morning, Para, Brazil, 1978.