

ARBOREAL TABANIDAE IN PANAMA

(DIPTERA)

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The intensive studies of forest mosquitoes carried on during the last few years in Panamá by staff members of this Laboratory (Galindo *et al.*, 1950, 1951) have yielded a good deal of incidental information on the distribution and habits of other bloodsucking insects, especially Tabanidae and *Phlebotomus* sandflies. Although the main purpose of the work was the collection of mosquitoes, the collectors were also instructed to secure any other insects which came to bite them. Stations were set up in various parts of Panamá and run for varying periods, from a few months to a year. Each station consisted of one or more platforms built in large trees at elevations of from 20 to 84 feet above ground level. Collections were made at more or less regular intervals at each station, collectors working simultaneously at ground level and on the platforms. Nearly all the collections were made during daylight hours, from about 8 A.M. to about 4 P.M.

Since the collection of Tabanidae was quite a secondary consideration, there was considerable variation in the regularity and enthusiasm with which the field collectors took these insects, and the detailed information as to times of biting and other factors secured in conjunction with the mosquito catches was usually omitted. Enough information on preference for ground level versus forest canopy was, however, secured to seem worth reporting. The following stations are those from which Tabanidae in significant numbers were secured. The names and designations of the stations are those used by Galindo *et al.* in their papers and in work in progress. All the stations are in heavy forest.

La Victoria.—Three stations, B, C and D, located at 400, 1200 and 2100 ft. above sea level on the slopes of Cerro La Victoria. This area is about 20 miles east of Panamá City, on the Pacific slope of the continental divide, between the Rio Juan Diaz and the Rio Cabra. Although these stations were operated from February 1949 through January 1950 on a weekly basis, and some of them have been operated more or less regularly to date, the catching of Tabanidae has been rather inconsistent, only the period from February 1949 to June 1949 yielding much in the way of information.

Cerro Campana.—Five stations were operated at various altitudes from June into December 1950, or somewhat over 6 months. Collecting of Tabanidae was fairly consistent. The area is a rather isolated mountain mass about 40 miles west of Panamá City, reaching an altitude of nearly 4000 ft., though the highest collecting stations were at 2800 ft.

Progreso.—One station, located at about 300-400 ft. elevation, was operated from June through December 1950 on a weekly basis, with platforms at 64 and 83 ft. above ground level as well as at ground level. The area is in western Chiriqui province, near the Costa Rican border, on the Pacific side of the continental divide.

Santa Fe.—Three stations, each with a ground level and a single forest canopy platform were operated from May through August 1950. The area is on the Pacific slope of Cerro Tuti, near the town of Santa Fe, in Veraguas Province. The stations were at about 2000 ft. elevation and were operated on a weekly basis. The collection of Tabanidae was quite consistent.

Almirante.—Four stations, each with a single canopy platform, have been operated nearly continuously on a weekly basis from May 1951 to May 1953. The collecting of Tabanidae has been very consistent, and the work here has been expanded to include a number of night collections and the use of a Shannon trap at certain stations. The area is about 12 miles northwest of the town of Almirante, Bocas del Toro Province, on the Atlantic side of the continental divide at about 600 ft. elevation. The area is one of very heavy wet forest with about 100 inches annual rainfall.

Recent work in Africa (Gordon *et al.*, 1950, Haddow *et al.*, 1948, 1950, 1952, Lumsden, 1952) has shown that a number of species of Tabanidae are more or less arboreal, probably feeding mainly on monkeys. With the establishment of tree stations in Panamá in 1949 it quickly became evident that several species also showed a marked preference for an arboreal habitat here. Although no observations on the feeding of these Neotropical species on hosts other than man have been made, it is hardly surprising, in view of the pronounced arboreal element in the Neotropical mammal fauna, that such a development has taken place. The forests of the New World tropics probably harbor more kinds of mammals strictly adapted to an arboreal life than do all other areas of the world combined. In Panamá, aside from Primates of 5 genera, most of which are strictly arboreal, there are sloths of two genera, anteaters of two genera, several marsupial opossums, one genus of prehensile-tailed carnivores (*Potos*), a prehensile-tailed porcupine, and numerous rodents, which are quite strictly arboreal. Quite a number of other forms, although not showing such marked physical adaptations, spend a great part of their lives in the trees. Furthermore, as sources of food for Tabanidae, reptiles and birds should probably not be overlooked.

The 54 species of Tabanidae taken at these various stations may be grouped arbitrarily into three categories in respect to their arboreal habits. Group 1 consists of species of which 75% or more of the specimens secured have been taken at

platforms in the forest canopy. These are the truly arboreal species. Group 2 consists of those species of which from 25 to 74% were taken at canopy platforms, the indifferent group. Group 3 are those of which less than 25% were taken at canopy platforms, the terrestrial group. The accompanying table lists the mainly arboreal species and the more abundant terrestrial species taken, in the order of their arboreal preferences. The species included in the table account for 26 of those taken in this study; the remaining 28 species are represented by single specimens or are less than 1% arboreal.

Species	Taken at ground level	Taken in tree tops	Per cent arboreal
<i>Tabanus</i> (<i>Philipotabanus</i>) <i>inauratus</i> Fehld.	—	2	100.0
<i>Stibasoma</i> <i>apicimacula</i> Fehld.	—	4	100.0
<i>S. stilbium</i> Fehld.	—	4	100.0
<i>Stenotabanus</i> <i>jaculator</i> Fehld.	3	60	95.3
<i>S. frondiculus</i> Fehld.	5	89	94.6
<i>Stibasoma</i> <i>fulvohirtum</i> Wied.	4	76	95.0
<i>Tabanus</i> (<i>Lophotabanus</i>) <i>defilippii</i> Bell.	2	28	93.4
<i>Dichelacera</i> <i>crocata</i> Fehld.	7	40	85.2
<i>D.</i> (<i>Catachlorops</i>) <i>umbratus</i> Hine	2	16	88.9
<i>Stibasoma</i> <i>panamensis</i> Curr.	2	7	78.0
<i>Dichelacera</i> <i>regina</i> Fehld.	46	53	53.6
<i>Fidena</i> <i>trapidoi</i> Fehld.	45	33	42.3
<i>F. schildi</i> Hine	20	14	41.1
<i>Chrysops</i> <i>soror</i> Krob.	5	1	16.6
<i>C. melaena</i> Hine	5	1	16.6
<i>Tabanus</i> (<i>Philipotabanus</i>) <i>magnificus</i> Krob.	654	127	16.2
<i>Chrysops</i> <i>mexicana</i> Krob.	13	1	7.1
<i>Dichelacera</i> <i>analisis</i> Hine	400	26	6.1
<i>Psaldia</i> <i>fulminea</i> Hine	111	4	3.4
<i>Dichelacera</i> <i>rex</i> Fehld.	35	1	2.8
<i>Tabanus</i> <i>erebus</i> O.S.	88	1	1.6
<i>T.</i> (<i>Lophotabanus</i>) <i>piraticus</i> Fehld.	252	2	.8
<i>Dichelacera</i> <i>marginata</i> Macq.	234	2	.84
<i>Diachlorus</i> <i>jobbinsi</i> Fehld.	3649	104	.27
<i>Tabanus</i> <i>unistriatus</i> Hine	1010	2	.19
<i>T.</i> (<i>Lophotabanus</i>) <i>alboeirculus</i> Hine	777	1	.12

The arboreal habit appears to have been acquired by several diverse groups in the family. In Africa, the arboreal species seem confined to the genus *Chrysops*, and most of the observations refer to a single species, *C. centurionis* Aust. In Panamá at least four groups have arboreal representatives, *Stibasoma*,

Dichelacera, *Stenotabanus*, and *Tabanus*. Of these *Stibasoma* seems the most definitely arboreal, for of the six species known from Panamá, four have been taken in the forest canopy at least as often as at ground level. The other two species were not taken in this study and are known from only a few scattered specimens. Of the 8 species of *Dichelacera* (including the subgenera *Dichelacera*, *Catachlorops*, and *Psaldia*) known from Panamá, two, *D. (Catachlorops) umbratus* Hine and *D. (Dichelacera) crocata* Fehld., are definitely arboreal, while *D. (Dichelacera) regina* Fehld. is taken in the canopy as often as at ground level. Only 3 of the 16 species of *Stenotabanus* (including *Aegialomyia* and *Brachytabanus*) recorded from Panamá were taken in this study, but two of these, *St. jaculator* Fehld. and *St. frondicolus* Fehld. are definitely arboreal. It is probable that other species of this group will prove arboreal when canopy collections are made in their habitats. Of the 39 species and 5 subgenera of *Tabanus* known in Panamá, only about a dozen were taken in this study, and of these only *T. (Philipotabanus) inauratus* Fehld. and *T. (Lophotabanus) defilippii* Bell. seem arboreal.

Of the indifferent and terrestrial group two species of *Fidena*, three of *Chrysops*, one *Philipotabanus*, and one *Dichelacera* show appreciable numbers taken in the forest canopy. One species of *Fidena* was taken for the first time in this study, the other hitherto known from but a few specimens, so that the data probably indicate a true tendency to invade the upper levels of the forest. The three species of *Chrysops* are mainly forest species fairly common elsewhere at ground level. The species *Tabanus (Philipotabanus) magnificus* Krob. shows crepuscular tendencies and has appeared in the forest canopy catches in fair numbers on the few occasions when night catches, from 6 to 9 p.m., have been made. The remaining species stray into the canopy only occasionally or not at all.

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