

Crane Flies (*Diptera: Tipulidae*) in Trinidad Caves

Johanna P.E.C. Darlington¹ and Jon K. Gelhaus²

1. Zoology Department, University of the West Indies, St. Augustine, Trinidad, West Indies.

2. Dep. of Entomology, Academy of Natural Sciences, 1900 Benjamin Franklin Parkway, Philadelphia, PA 19103-1195, U.S.A.

Abstract

Seven species of crane flies were collected in three Trinidad caves (Oropouche, Aripo Main and Aripo Soho). Four of them represent new generic records for Trinidad (*Cryptolabis*, *Gnophomyia*, *Helius*, *Teucholabis*), and one species, *Erioptera* (*Mesocycphona*) *troglogyta* Edwards, is recorded for the first time since its description in 1918. Species in the genera *Cryptolabis* and *Helius* appear to be true troglobites, with the remaining crane fly species probably troglaphiles or troglonexes.

Introduction

Crane flies (family Tipulidae) are among the more primitive of the Diptera (two-winged or true flies). They have long slender bodies and wings, and often have a slow, blundering flight. Most characteristic are their elongated legs (giving rise to their common name of "daddy-long-legs") which are usually held outstretched when in flight.

Crane flies are the largest family of the true flies with over 3000 species described from Latin America and the Caribbean alone (Alexander and Alexander 1970). However, the crane flies of Trinidad and Tobago are almost unknown. Only ten species have been recorded from Trinidad (Table 1) and none from Tobago, although 75-100 species or more might be expected to inhabit the islands. Adult crane flies typically favour moist shady sites, including the mouths of caves. The larvae may be terrestrial, living in soil, leaf litter, rotting wood, etc. or aquatic, living in swamps, ponds or the edges and bottoms of streams (Alexander and Byers, 1981; Byers, 1981). The immature stages of less than a dozen species of Neotropical crane flies are described (Gelhaus and Young, 1991) and very little is known about their habits.

One of the few species previously known from Trinidad was collected in Oropouche Cave by F. W. Urich and described as *Erioptera troglodyta* by F. W. Edwards (1918). However, not a single crane fly was found among the tens of thousands of flies that were collected in Tamana caves in the Central Range during the 1960s and 1980s (JPECD, unpubl.). Samples of flies collected in several caves in the Northern Range in 1989-1991 did include small numbers of crane flies. Preliminary results are presented in this paper.

The samples were collected by the first author (JPECD), with the help of many field naturalists and other

Table 1. List of species of crane flies recorded from Trinidad (compiled mostly from Alexander and Alexander 1970).

Order	DIPTERA
Sub-order	Nematocera
Family	Tipulidae
Sub-family	Tipulinae
	<i>Brachypremna dispellens</i> (Walker) 1861
	<i>Megistocera longipennis</i> (Macquart) 1838
	<i>Tripula</i> (<i>Microtipula</i>) <i>trinidadensis</i> (Alexander) 1912
	<i>Tripula</i> (<i>Microtipula</i>) <i>trinitatis</i> Alexander 1941
Sub-family	Limoniinae
Tribe	Limoniini
	<i>Limonia</i> (<i>Geranomyia</i>) <i>lycaon</i> Alexander 1952
	<i>Limonia</i> (<i>Geranomyia</i>) <i>plumbeipleura</i> (Alexander) 1916
Tribe	Eriopterini
	<i>Erioptera</i> (<i>Mesocycphona</i>) <i>troglogyta</i> Edwards 1918
	<i>Erioptera</i> (<i>Mesocycphona</i>) <i>withycombei</i> Alexander 1929
	<i>Gonomyia</i> (<i>Lipophleps</i>) <i>extensa</i> Alexander 1914
	<i>Neognophomyia trinitatis</i> Alexander 1927

friends; the identifications of the crane flies and life history information were provided by the second author (JKG). We thank Margot Livingston for the excellent line drawings of crane fly wing venation.

Methods

Samples were taken in six caves (Oropouche, Aripo Main, Aripo Soho, Guanapo, Tamana Main and Tamana Dry caves) with a Hausherr portable light trap powered by a 6V powerpack or by four torch batteries. The trap was suspended at a height between two and five feet above the floor and run for approximately one hour. The manufacturer's original gauze cage was used for one sample (Aripo Main Cave near the entrance) but proved most unsatisfactory because some flies were small enough to wriggle through the mesh, and many others became entangled and were damaged. In all the other samples the flies were collected in a dish of water (with a dash of detergent) suspended beneath the trap (Jennings and Darlington, 1990). The water was later poured off through plankton mesh and the catch was preserved in 70% alcohol. This method is good for robust species but is not recommended for delicate flies like crane flies.

Table 2. Summary of distribution data for crane flies collected in Trinidad caves in 1989-1991.

Sub-family	Limoniinae	Cave Location			
		OR	AM	AD	AS
Tribe	Limoniinae				
	<i>Heliopsis</i> sp.		X		X
	<i>Limonia (Rhipidia)</i> sp.A				X
	<i>Limonia (Rhipidia)</i> sp.B				X
Tribe	Eriopterini				
	<i>Cryptolabis</i> sp.			X	
	<i>Erioptera (Mesocycphona) troglodyta</i> Edwards	X	X		
	<i>Gnophomyia</i> sp.		X		X
	<i>Teucholabis (Teucholabis)</i> sp.	X			

Location Key:

OR = Oropouche or Cumaca Cave (1989) • AM = Aripo Main Cave (entrance) (1989, 1991)

AD = Aripo Main Cave (deep) (1990) • AS = Aripo Soho Cave (1990, 1991)

Many of the species belong to large Neotropical genera that are in need of revision and lack keys for identification. With one exception, these cave species can be identified only to genus at the present time, but most probably represent undescribed species. All the specimens are deposited for reference in the collection of the Academy of Natural Sciences of Philadelphia.

Results

All of the six caves sampled yielded large numbers of flies but crane flies were found in only three of them, the Oropouche, Aripo Main and Aripo Soho Caves. All three caves are in forested valleys on the south side of the Northern Range. They are solution caves in limestone, two of them (Oropouche and Aripo Main) containing streams while the third (Aripo Soho) is dry. All three caves contain nests of the oilbird *Steatornis caripensis* (Humbolt) and floor deposits consisting of bird guano and regurgitated palm seeds mixed with some bat guano (although the deep sample site in Aripo Main Cave has only bat guano).

Oropouche or Cumaca Cave

This is a linear cave, large by Trinidad standards, about 200 m long and with an emergent stream running the full length of it. The outer part is occupied by about two hundred nesting oilbirds and small numbers of bats. Guano and regurgitated palm seeds cover the rocky floor wherever it is not washed clean by the stream.

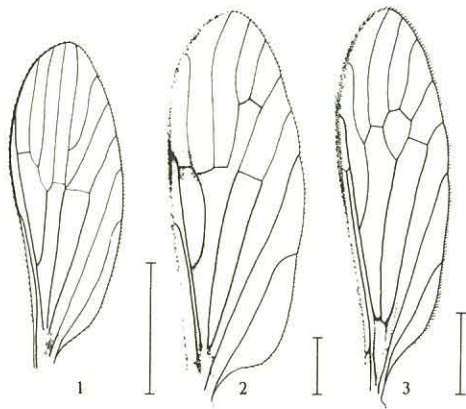
On 7 Oct. 1989 a light trap was set up at the innermost edge of the part occupied by the oilbirds, in complete darkness, beside the stream and near to a large bank of dry guano. Rather small numbers of insects were caught, but the catch included two species of crane flies. One was easily recognisable as *Erioptera troglodyta* Edwards, of which four males and five females were obtained (Fig. 1). Larvae of other species in this genus are semi-aquatic, found in sediments along streams and similar sites (Alexander 1920; Gelhaus, unpubl.), a

habitat represented here. The second species, represented by one male and two females, was rather more robust and had distinctive dark blotches on the wings (Fig. 2). This was identified as *Teucholabis (Teucholabis)* sp. The subgenus contains about 175 species in the Neotropics but none has been previously recorded from Trinidad. The larvae of the North American species occur under the bark of recently fallen logs (Alexander, 1920; Rogers, 1933).

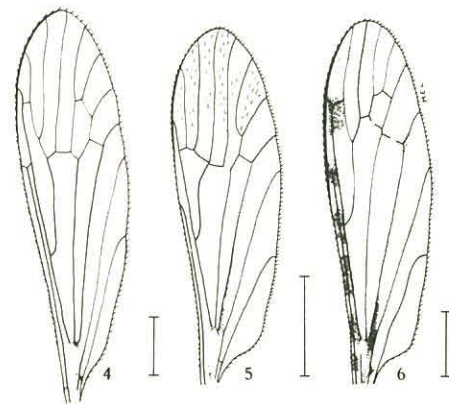
Aripo Main Cave

The Aripo Main Cave, the largest known cave in Trinidad, is also a linear cave but with the stream passage entering it instead of emerging from it. The outer part of the cave is normally dry, but a stream wells up through the floor some 1500 ft in from the mouth. The cave was carefully surveyed by A.E. Gunther and others who found their greatest practicable penetration to be 2800 ft (860 m) from, and 475 ft (150 m) below, the cave mouth (Gunther, 1940).

In the twilight zone near the mouth is a large, high-roofed chamber with a small number of oilbirds nesting high up on the walls, and large numbers of bats, *Glossophaga s. soricina*, roosting under an overhang on one side. The steep, rock-piled floor is covered in places by deep beds of mixed bat and bird guano and the usual regurgitated seeds. A light trap run in this zone on 18 June 1989 caught a great number and variety of flies and small non-social wasps, including two species of crane flies. One is a striking species of *Heliopsis* with each antenna consisting of only three segments; typically there are 16 segments in other species of *Heliopsis*. Five males were caught (Fig. 3). An additional five males were collected at a trap set on 24 February 1991. There are about 45 described Neotropical species of *Heliopsis*, but none previously recorded from Trinidad. Larvae of the few species known are semi-aquatic, in decaying vegetation or sediments of marshes (Alexander 1920). No such habitats seemed to be available in this rather dry part of the cave,



Figs. 1-3. Wing venation of adult Tipulidae. 1, *Erioptera (Mesocypfona) troglodyta* (34x); 2, *Teucholabis (Teucholabis) sp.* (20x); 3, *Helius sp.* (22x)



Figs. 4-6. Wing venation of adult Tipulidae. 4, *Gnophomyia sp.* (20x); 5, *Cryptolabis sp.* (26x); 6, *Limonia (Rhipidia) sp. B* (17x)

but the floor of hugh tumbled rocks may well have concealed inaccessible damp pockets of mud underneath.

The second species found here in both 1989 and 1991 is *Gnophomyia sp.* (Fig. 4), represented by five specimens of each sex; this is also a new record for Trinidad, although there are 91 known species in the Neotropics. Larvae of the few known species are found under bark of moist decaying wood or decaying flower bracts (Alexander 1920; Rogers, 1927), a possible but minor habitat here since only a small amount of vegetable debris falls into the cave.

The 1991 trap also yielded a single female of *Erioptera troglodyta*, the first record for this species away from the type locality cave.

Below the entrance chamber the cave narrows and plunges steeply down over rocky floors and two near-vertical drops requiring ropes and/or ladders. This part of the cave is dry and clean, with no bat roosts or guano beds. Where the stream rises through the cave floor there are clusters of bats, *Anoura g. geoffroyi* (Ordway 1953), roosting on the walls and ceiling, and small accumulations of guano on the floor. This part of the cave is very humid. The light-trap here on 25 March 1990 caught two males and five females of a small, pale, delicate species of *Cryptolabis* (Fig. 5). The subgenus includes nearly fifty species, none recorded from Trinidad, and only one from Venezuela. Known larvae are fully aquatic, living in bottom sediments of rapid streams (Hynes 1963), a habitat well represented here.

Aripo Soho Cave

The exact position of this cave is uncertain, but it is probably within a mile or two of Aripo Main Cave and somewhat lower. It is a non-linear cave consisting of a long domed chamber that has collapsed at one end providing easy access down a steep soil slope. The whole of this large chamber is twilight, and only a few bats roost in its darkest corners. At its inner end the entrance chamber

connects to a 16 m high vertical shaft that opens to daylight by a small hole only about 1.5 m across and flush with the forest floor (forming a natural pitfall trap, and a very good reason not to blunder around in the forest at night). By way of a low passage it also connects downwards into a small but high-roofed dark chamber where several pairs of oilbirds nest on ledges. There is no running or standing water anywhere in the cave, but seepage water keeps the floor of the dark chamber moist. Light traps run in this chamber on 22 April 1990 and 3 March 1991 each caught three species of crane flies. Two of them were the same species as those caught near the mouth of the Aripo Main Cave, namely *Helius sp.* (three males in 1990; seventeen males and one female in 1991) and *Gnophomyia sp.* (one female each trap). The remaining flies were of two different species in the subgenus *Limonia (Rhipidia)*, species A represented by one male in 1990, and species B by a female specimen in 1991 (Fig. 6). The larvae are reported to live in decaying vegetation (Alexander 1920), in this case presumably the bird guano and seed debris. There are about 110 species described in the subgenus *Rhipidia* in the Neotropics but none from Trinidad.

Discussion

Animals found in caves are divided into three categories. Troglonexes (= cave strangers) enter caves only occasionally or accidentally. Troglophiles (= cave lovers) seek out caves and may pass their whole lives in them, but they also live in the surrounding area. Troglobites (= animals confined to caves) have become adapted to living in caves and do not live outside them.

The results of this simple survey cannot clearly distinguish which category the crane flies belong to, particularly since no juvenile stages were found nor were adults collected in the surrounding forest. The characteristics of the sampling sites do give clues to probable categories. The entrance chamber of Aripo Main Cave was the only site sampled that was not completely dark, nor was the chamber deep within the cave. Even so,

two of the species of crane flies caught there, *Erioptera troglodyta* and *Gnophomyia* sp., were also found in the Aripo Soho Cave or Oropouche Cave. Thus these species are at least troglaphiles, preferring (at least as adults) to inhabit caves.

The continued presence of *Erioptera troglodyta* in Oropouche Cave more than seventy years after it was first collected there also seems to indicate a stable association with this cave, although no other species in this subgenus have been recorded from caves. Despite its specific name, suggesting an obligate association with caves, this may be a troglaphile rather than a troglobite, as the population sampled is not isolated from the cave entrance.

Two species are probably troglobites and deserve closer study. *Cryptolabis* sp. was collected only from the deep site in Aripo Main Cave. This site, with its bat roost and subterranean stream, is isolated by a long stretch of dry, clean passage from the cave entrance, preventing easy access from comparable habitats outside. However, the flies showed no obvious morphological adaptation to cave life, such as reduction in eye size or paler body coloration, when compared to other species of the genus which do not live in caves such as *C. paradoxa* and *C. pallida*. No other species of this genus have ever been reported from caves.

Unlike *Cryptolabis*, *Helius* sp., a probable troglobite, does show morphological modification when compared to other Neotropical species in the genus, namely, a strong reduction in antennal segmentation; this is possibly related to cave life. In addition, *Helius* sp. was repeatedly found in both the Aripo Main Cave and the more isolated Soho Cave. Other species of *Helius* have been recorded from caves in Southeast Asia (Alexander 1961), and a species in Peru was found aggregated in dark crevices along a dry stream bed (R. Bouchard, personal communication), although these species show no reduction in the antennal structure. The two North American species of *Helius* are not known from caves.

Of some interest is the total lack of the genus *Trentepohlia* from these caves. Species of this genus are commonly found in dark crevices and holes in Peru and Ecuador (Gelhaus, unpubl.), where adults may group in large numbers, all flying in tight circles, with only the outstretched white tarsi of the legs visible in the darkness. The group is widespread in the tropics and probably occurs in Trinidad. Possibly the adults are not attracted to light and so would not have been sampled by the trap used.

Crane flies are common and widespread insects in Trinidad and Tobago. They are so poorly known solely because no-one has ever seriously collected them. The adults are easy enough to catch, but can be fragile. Adults

are best preserved in envelopes in the field and then mounted on their left side on points; alternatively, they can be preserved in alcohol. Larvae can be collected in a great variety of habitats, and reared to the adult stage for identification. Anyone willing to specialise in the group can be assured of many new records, and will probably find a good number of new species as well.

References

- Alexander, C.P. 1920. The crane-flies of New York. Part II. Biology and Phylogeny. Cornell University Agricultural Experiment Station. Memoirs 38: 691-1133.
- Alexander, C.P. 1961. A new cave-inhabiting crane fly from Malaya (Diptera: Tipulidae). Pacific Insects 3(1): 27-29.
- Alexander, C.P. & Alexander, M.M. 1970. Family Tipulidae, fascicle 4:1-259. In: N. Papavero (ed.), Catalogue of the Diptera of the Americas south of the United States. Museu de Zoologia, Universidade Sao Paulo.
- Alexander, C.P. & Byers, G.W. 1981. Tipulidae, pp. 153-190. In: J.F. McAlpine et al., eds., Manual of Nearctic Diptera, Vol. 1. Research Branch Agriculture Canada, Monograph 27, 674 pp.
- Byers, G.W. 1981. Tipulidae, pp. 231-241. In: Hurlbert, S.H. et al., eds., Aquatic Biota of Tropical South America, Part 1. San Diego State University, California.
- Edwards, F.W. 1918. Two new Diptera from Trinidad. Annals Magazine Natural History (9) 1:424-425.
- Gelhaus, J.K. & Young C.W. 1991. The immature instars and biology of the crane fly genus *Brachypremna* Osten Sacken (Diptera: Tipulidae). Proceedings of the Entomological Society of Washington 93(3):613-621.
- Graham, R.E. 1966. Crane-flies (Trichoceridae, Tipulidae) in California caves. Cave Notes 8:41-48.
- Gunther, A.E. 1940. The Aripo Caves. Trinidad Guardian, 26 May 1940, 17. (Published anonymously).
- Hynes, C.D. 1963. Description of the immature stages of *Cryptolabis magnistyla* Alexander (Diptera: Tipulidae). Pan-Pacific Entomologist 39:255-260.
- Jennings, G.M. & Darlington, J.P.E.C., 1990. Flies in Tamana Cave. U.W.I. Biospectrum 2:4-8.
- Ordway, E. 1953. The big Aripo Cave of Trinidad. The Column 1(3), 2.
- Rogers, J.S. 1927. The immature stages of *Gnophomyia jacobsoni* Alexander (Dipt.). Supplementa Entomologica 16:77-80.
- Rogers, J.S. 1933. The ecological distribution of the crane-flies of northern Florida. Ecological Monographs 3:1-74.