

***Betrequia ocellata* Oldroyd (Diptera, Tabanidae, Rhinomyzini)
blood feeding on *Caiman crocodilus* (Linnaeus)
(Crocodylia, Alligatoridae) in Manaus, Brazil**

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ABSTRACT. In Central Amazonia the tabanid *Betrequia ocellata* Oldroyd, 1970 was recorded for the first time blood feeding on caimans during an experiment in September/October 1996 at Ducke Reserve, Manaus, Brazil. Among different available hosts (Caiman, horse, duck and human) *B. ocellata* was observed only on *Caiman crocodilus* (Linnaeus, 1758), suggesting specific blood feeding on crocodylians. The adult flight season, diurnal blood feeding period and flight stratification are presented. Other tabanid species feeding or landing on caimans are also recorded.

KEY WORDS. Diptera, Tabanidae, Chrysopsinae, Rhinomyzini, *Betrequia ocellata*, Amazon basin, hematophagy, Caiman, Alligatoridae

It is very well known that blood is usually obtained from large mammalian hosts, although some tropical tabanid species feed on reptiles. In the Neotropical Region some studies have been done using horses as bait RAFAEL & CHARLWOOD (1980). Besides mammals as bait there are rare records of reptiles as hosts of tabanids. PHILIP (1976) recorded sea and terrestrial turtles in the Galapagos Islands, a snake and crocodiles in Colombia and a snake in a zoo in Panama. MEDEM (1981) presented notable results using crocodylian in the Colombian Amazon Basin and PHILIP (1986) recorded other tabanid species attacking a snake in the Peruvian Amazon Basin.

Under the current classification of Tabanidae (FAIRCHILD & BURGER 1994) *Betrequia ocellata* Oldroyd, 1970 is the only representative of the tribe Rhinomyzini in the New World. This tribe is well represented in tropical Africa and India.

Betrequia ocellata was described from two female specimens collected in Paracuru, Pará, Brazil in August (OLDROYD 1970). The collection method was not specified, but probably was netting. PHILIP (1975) recorded a third female from Letícia, Colombia, captured near the ground, in August.

COSCARÓN & PHILIP (1977) compared the terminalia of *Betrequia* with species of Rhinomyzini from the Old World, confirming its systematic position in the tribe. GORAYEB & RAFAEL (1985) presented a historical review, described a male from Juruti-Mirim, Pará, collected in July and recorded a female from Manaus, Amazonas collected in October. The Manaus specimen was netted near the ground

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according to information from the collector, Dr. Lindalva Paes Albuquerque (Universidade do Amazonas). HENRIQUES & GORAYEB (1993) recorded another male from Ananindeua, Pará, netted over a bush in September. These records indicate a wide distribution of *B. ocellata* in the Amazon Basin, from the extreme East to the extreme West, all along the Amazon River. According to OLDROYD (1957) the hematophagous habit does not occur in most Rhinomyzini species from the Old World. COSCARÓN & PHILIP (1977), looking for hematophagous characters of the proboscis, observed a short proboscis and undeveloped jaws (the specimen was not dissected) in the female studied. GORAYEB & RAFAEL (1985), based on these two papers wrote: "if the hematophagy occurs in *B. ocellata*, its host-range can be restricted, what would explain its rarity in the nature".

Flight stratification has also been discussed. PHILIP (1975) suggested that the two type-specimens were collected above the canopy of the forest, which probably explain the rarity of this species in collections. However, GORAYEB & RAFAEL (1985), did not record this species in suspended trap collections.

MATERIALS AND METHODS

The experiment was conducted at Ducke Reserve located 20 Km east of Manaus (02°55'S, 59°59'W), Amazonas, Brazil, in September and October 1996. The following animals were made available every week during two consecutive days: a "jacaré-tinga" (*Caiman crocodilus* (Linnaeus, 1758) (Crocodylia: Alligatoridae), a horse and two ducks (*Cairina moschata* (Linnaeus, 1758) (Aves, Anatidae), besides the human as a host. The hosts were distributed in an anthropic open area crossed by a small stream "Barro Branco", close to the restaurant of the reserve.

Some tabanids were collected as voucher specimens and deposited at Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Museu Paraense Emílio Goeldi (MPEG), Belém and Museu de Zoologia de São Paulo (MZSP), São Paulo. Other specimens were observed for behavior and time to obtain the blood meal.

RESULTS

Betrequia ocellata was observed for the first time feeding on blood of *Caiman crocodilus*. Ten female specimens were observed and six were collected. The feeding activity was observed between 9:00 and 14:35 a.m. with higher frequency after 12:00 a.m.. Landing took place on the head and the biting and feeding region was just above the eye, which is a more membranous and thinner area. In the beginning the female tabanid stays in a vertical position, perpendicular to the caiman's body (Fig. 1A) and then, after it gorge itself, it turns parallel to the caiman's body (Fig. 1B). The host attempted to defend itself by closing and opening its eye at the moment of biting. The feeding time was around three minutes (n=4).

Material (all females) [information as stated in the labels]: BRASIL, Amazonas, Manaus [Reserva Ducke, Arm. Malaise, [open area], 20-24.IX.1996, F.L. Oliveira (INPA); Reserva Ducke, on *Caiman crocodilus*, 25.IX.1996, 9:00 h, A.L. Henriques, R.L.M. Ferreira & J.F. Vidal cols. (INPA); idem, 09:45 h (MPEG); idem, 12:22 h. (MPEG); idem, 13:22 h. (INPA); idem, 01.X.1996, 10:34 h (INPA); idem, 12:45 h (MZSP).



Fig. 1. *Betrequia ocellata* feeding on *Caiman crocodilus*. (A) Lateral view, (B) dorsal view.

Additional female specimens collected after the experiment: Amazonas, Coari, Terminal Solimões, Petrobrás, 12.IX.1998, 19:30h, em luz [electric light], S. Keppler (INPA); Iranduba, Catalão, Flutuante [do INPA], 14.IX.1998, R.L.M. Ferreira & J.F. Vidal (INPA); Manaus, Reserva Ducke, 17.IX.1998, na pálpebra [on eyelid of] *Caiman crocodilus*, R.L.M. Ferreira & J.F. Vidal (3, INPA) idem, 17.IX. 1998 (3, INPA).

A few specimens of the following tabanid species were also observed feeding on *C. crocodilus*: *Phaotabanus nigriflavus* (Kröber, 1930), *Tabanus occidentalis* Linnaeus, 1758, both species previously recorded by MEDEM (1981). A new record was *Stenotabanus cretatus* Fairchild, 1961 landing on the head, but blood feeding was not observed.

DISCUSSION

The adult flight activity of *B. ocellata* has been recorded from July to October, the less rainy season in the Central Amazon Basin. In this season the water level of rivers and lakes is lower and the caimans are more easily seen (GORZULA & SEIJAS 1989). The caimans *Paleosuchus trigonatus* (Schneider, 1801), that live in small streams, nest in this season (MAGNUSSON & LIMA 1991). Because of the coincidence between the tabanid flight season and reptile nesting season it is supposed that this species of tabanid has specific association with caimans, biting the host when it is taking care of the nest. The feeding place on the host also suggests that the tabanid can feed when the caiman is at the water surface because the caiman's eyes protrude above the water surface. The landing, near or at the upper area of the crocodile eyes, and the rapid blood meal is a further indication that *B. ocellata* is associated with crocodiles as a food resource. Recent research conducted in the Amazon Basin has shown diversification in host preferences by Amazonian species of tabanids, probably because of the infrequent appearance of herds of large mammals in the Amazon Basin. Flight at or over the canopy level is only speculative and still not observed.

With the commercial raising of crocodylians in the Amazon Basin, *B. ocellata* could become an important vector of pathogenic agents among caiman's individuals.

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REFERENCES

- COSCARÓN, S. & C.B. PHILIP. 1977. Genitalic substantiation of first record in the New World of a representative of the peculiar Old World tabanid tribe Rhinomyzini. *Proc. Ent. Soc. Wash.* 79: 38-40.
- FAIRCHILD, G.B. & J.F. BURGER. 1994. A Catalog of the Tabanidae (Diptera) of the Americas South of the United States. *Mem. Amer. Ent. Inst.* 55: 249p.
- GORAYEB, I.S. & J.A. RAFAEL. 1985. Tabanidae (Diptera) da Amazônia. III. Description of the male of *Betrequia ocellata* Oldroyd with comments on Rhinomyzini in the New World. *Myia* 3: 333-340.
- GORZULA, S. & A.E. SEIJAS. 1989. The common caiman, p. 44-61. *In*: P. HALL & R. BRYANT (Eds.). **Crocodyles – Their Ecology Management, and Conservation**. Gland, IUCN Publication New Series, 308p.
- HENRIQUES A.L. & I.S. GORAYEB. 1993. A Coleção de Tabanidae (Insecta: Diptera) do Museu Paraense Emílio Goeldi, Belém, Pará, Brasil. *Goeldiana Zool.*, Belém, 20: 1-23.
- MAGNUSSON, W.E. & A.P. LIMA. 1991. The ecology of a cryptic predator, *Paleosuchus trigonatus*, in tropical rain forest. *Jour. Herpetol.* 25: 41-48.

- MEDEM, F. 1981. Horse flies (Diptera: Tabanidae) as ectoparasites on caimans (Crocodylia: Alligatoridae) in eastern Colombia. *Cespedesia*, Cali, **10** (37-38): 123-191.
- OLDROYD, H. 1957. **The horseflies (Diptera: Tabanidae) of the Ethiopian Region, vol III. Chrysopinae, Sepsidinae and Pangoniinae.** London, British Mus. (N.H.), 489p.
- . 1970. A new genus of Rhinomyzini (Diptera: Tabanidae), the first from South America. **Jour. Nat. Hist.** **4**: 249-253.
- PHILIP, C.B. 1975. Confirmation of occurrence in Amazonas of the tabanid Tribe Rhinomyzini. **Pan-Pac. Ent.** **51**: 95.
- . 1976. Horse flies, too, take some victims in cold-blood, as on Galapagos Isles. **Pan-Pac. Ent.** **52** (1): 84-88.
- . 1986. A collection of four species of tabanid flies taken from an Anaconda snake in Peru in May 1984. **Pan-Pac. Ent.** **62** (1): 23.
- RAFAEL, J.A. & J.D. CHARLWOOD. 1980. Idade fisiológica, variação sazonal e periodicidade diurna de quatro populações de Tabanidae (Diptera) no Campus Universitário, Manaus, Brasil. **Acta Amazonica**, Manaus, **10** (4): 907-927.

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