Mutualism between frogs
(Chiasmocleis albopunctata, Microhylidae)
and spiders
(Eupalaestrus campestratus, Theraphosidae):
a new example from Paraguay

Sebastien BASCOULÈS1,* & Paul SMITH2

1 Liceo Frances Internacional Marcel Pagnol, 971 Concordia, Asunción, Paraguay
2 FAUNA Paraguay, Encarnación, Paraguay, <www.faunaparaguay.com>; Para La Tierra, Centro IDEAL, Mariscal Estigarribia 321 c/ Tte. Capurro, Pilar, dpto. Ñeembucú, Paraguay, <faunaparaguay@gmail.com>
* Corresponding author <bascoules@hotmail.com>.

Commensal relationships between microhylid frogs and theraphosid spiders have been previously reported for a few species. Here we report the first example of this kind of relationship for two Paraguayan species, Chiasmocleis albopunctata (Microhylidae) and Eupalaestrus campestratus (Theraphosidae). Furthermore, we extend the known Paraguayan range of the former species by providing the first departmental records for Paraguarí and Guairá.

urn:lsid:zoobank.org:pub:52FBED11-A8A2-4A0E-B746-FD847BF94881

The possibility of commensal relationships between certain New World microhylid frogs and predatory ground spiders of the families Thorell, 1869 and Ctenidae Keyserling, 1877 was first alluded to by Blair (1936) who made brief remarks on the burrow-sharing relationship between Gastrophryne olivacea and Aphonopelma hentzi (Theraphosidae) in the southern prairies of North America, and this was further expanded upon by Hunt (1980), Dundee (1999) and Dundee et al. (2012). These authors noted that the frogs clearly benefitted from the presence of the spider with reduced predation, but were unable to determine any benefit for the spider.

The phenomenon was later documented in the Neotropics, with a similar relationship between microhylid frogs (Chiasmocleis ventrimaculata and Hamptophryne boliviana) and the spider Xenesthis immanis reported from Peru (Cocroft & Hambler 1989; Csakany 2002; Miller 2003) and the former with Pamphobeteus sp. (Tomasinelli & Biggi 2013) in the Amazon. These authors noted that chemical defences by the frogs probably play a role in their unpalatability to the spiders,
as observed in certain dendrobatid and leiuperine frogs (Powell et al. 1984; Szetitowski 1985; Grant et al. 2006).

The presence of similar relationships between certain Asian microhylids and mygalomorph spiders (Rao & Ramana 1925; Siliwal & Ravichandran 2008; Karunarathna & Amarasinght 2009; Vyas 2010; Karunarathna et al. 2012) led to the realisation that such relationships may be more widespread than is currently realised. However, ant predation of tarantula cocoons is well known (Baerg 1958; Foelix 1996) and Karunarathna & Amarasinght (2009) (working in Sri Lanka with the ant-eating microhylid *Uperodon nagaoi* and theraphosid spiders *Poecilotheria ornata* and *P. cf. subfusca*) suggested that such relationships were in fact more likely mutualistic. The frogs receive protection from predation with the close proximity to the spiders, and spiders receive protection from the predation of their egg cocoons with the close proximity to the ant-eating frogs.

However, despite this fascinating relationship now being well-known, the number of published reports in the literature remains relatively small (Table 1). In this note we report on a new association between a microhylid frog and a theraphosid spider from Paraguay, involving two species not previously documented as behaving commensally.

During February 2019, a mutualistic association was observed between *Chiasmocleis albopunctata* (MICROHYLIDAE) (SVL 24–35 mm, n = 23) and *Eupalaestrus campestratus* (THERAPHOSIDAE) (TL 110–120 mm) at Balneario Pinamar (25°30’47.8″S, 56°57’24.9″W), Paraguari department, Paraguay. On two consecutive evenings, two holes, separated from each other by a distance of approximately 2 m, were found containing both frogs and a spider. One hole was occupied by an adult spider and three frogs, whilst the other was occupied by one frog and a subadult spider. On approach, the burrow occupants retreated deeper into the hole, but retreating slightly it was possible to capture some images as one spider emerged from the hole (Fig. 1–2). Whilst within the burrow it could be observed that the spider’s legs were in contact with the frogs without an attack taking place.

*Chiasmocleis albopunctata* is an uncommon frog in Paraguay, mainly associated with Pantanal, Humid Chaco and Cerrado ecoregions in the northern half of the Oriental region (Concepción, Amambay, San Pedro, Canindeyú and Central departments) and northern Alto Paraguay department of the Chaco region (Weiler et al. 2013). This is the first report of the species from Paraguari department, and we take the opportunity to also report the species for the first time from Guairá department (fig. 3–4) at Granja Francisca (25°47’57.4″S, 56°13’54.7″W) during October 2017, which extends the distribution of the species further south in the Oriental region.
Table 1. Documented cases of mutualism between microhylid frogs and theraphosid spiders in the scientific literature.

<table>
<thead>
<tr>
<th>Frog</th>
<th>Spider</th>
<th>Country</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiasmocleis albopunctata (Boettger, 1855)</td>
<td>Eupalaestrus campestratus (Simon, 1891)</td>
<td>Paraguay</td>
<td>This note</td>
</tr>
<tr>
<td>Chiasmocleis ventrimaculata (Anderson, 1945)</td>
<td>Xenesthis immanis (Ausserer, 1875)</td>
<td>Peru</td>
<td>Cocroft &amp; Hambler (1989); Csakany (2002)</td>
</tr>
<tr>
<td>Gastrophryne olivacea (Hallowell, 1856)</td>
<td>Aphonopelma hentzi (Girard, 1852)</td>
<td>USA</td>
<td>Blair (1936); Hunt (1980); Dundee (1999); Dundee et al. (2012)</td>
</tr>
<tr>
<td>Hamptophryne boliviana (Parker, 1927)</td>
<td>Xenesthis immanis (Ausserer, 1875)</td>
<td>Bolivia, Peru</td>
<td>Miller (2003)</td>
</tr>
<tr>
<td>Kaloula taprobranica (Parker, 1934)</td>
<td>Poecilotheria hanumavilasumica Smith, 2004</td>
<td>India</td>
<td>Siliwal &amp; Ravichandran (2008)</td>
</tr>
<tr>
<td>Kaloula taprobanica (Parker, 1934)</td>
<td>Poecilotheria fasciata (Latreille, 1804)</td>
<td>Sri Lanka</td>
<td>Karunarathna et al. (2012)</td>
</tr>
<tr>
<td>Uperodon montanus (Jerdon, 1853)</td>
<td>Heterometrus sp.</td>
<td>India</td>
<td>Vyas (2010)</td>
</tr>
<tr>
<td>Uperodon variegatus (Stoliczka, 1872)</td>
<td>Heterometrus sp.</td>
<td>India</td>
<td>Rao &amp; Ramana (1925)</td>
</tr>
</tbody>
</table>
Figure 1. *Eupalaestrus campestratus* emerging from a burrow that contains *Chiasmocleis albopunctata* at Balneario Pinamar, Paraguarí department, Paraguay. (Photo Sebastien Bascoulès).

Figure 2. Three *Chiasmocleis albopunctata* visible inside a burrow from which a spider has recently emerged. (Photo Sebastien Bascoulès).
Figure 3. *Chiasmocleis albopunctata* at Granja Francisca, Guairá department, Paraguay. (Photo Sebastien Bascoulès).

Figure 4. Map of Paraguay showing the localities mentioned in the text. Red circle: Balneario Pinamar, Paraguarí department. Blue circle: Granja Francisca, Guairá department.
Paul Smith is grateful to the Pronii program of CONACyT Paraguay.

LITERATURE CITED


Received: 28 April 2020.
Accepted: 27 January 2021.
Published: 21 July 2021.

Corresponding editor: Annemarie Ohler.