

## AN ETHNO-ENTOMOLOGICAL STUDY OF ROVE BEETLES OF THE GENUS *PAEDERUS* (COLEOPTERA, STAPHYLINIDAE) IN THE MUNICIPALITY OF CHAPADINHA, MARANHÃO STATE, NORTHEASTERN BRAZIL

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**Abstract:** Little beetles of the genus *Paederus* are found worldwide and many species are of great medical and dermatological importance, because they release a skin-irritating substance when disturbed or crushed on the human skin, causing an acute irritant contact dermatitis. This work assesses the ethno-entomological knowledge of *Paederus* beetles in the municipality of Chapadinda, northeastern area of Maranhão State, northeastern Brazil, between September and October 2010. In total, 174 men and 268 women participated in the survey, mostly represented by students, housewives and teachers. The majority of the interviewees had a good knowledge of the animal's habitat, such as the seasonality and the places where *Paederus* species are commonly found. The community is familiar with the fact that the beetles release a chemical substance when crushed against human skin, mainly on uncovered body parts, but they do not know the irritant agent. No specific treatment was associated with *Paederus* dermatitis in view of the non-aggressive aspects of the lesions. The inhabitants of this area avoid contact with the insect as soon as they recognize the beetle and this may explain the absence of severe cases of dermatitis in the population.

**Key words:** Coleoptera, Staphylinidae, *Paederus*, pederin, potó, dermatitis, pederism, ethno-entomology, Chapadinda, Maranhão, Brazil.

### Estudio etnoentomológico de los estafilínidos del género *Paederus* (Coleoptera, Staphylinidae) en el municipio de Chapadinda, estado de Maranhão, noreste de Brasil

**Resumen:** Los pequeños escarabajos del género *Paederus* se encuentran por todo el mundo, y muchas especies son de gran importancia médica y dermatológica porque si se les molesta o se les aplasta contra la piel humana segregan una sustancia irritante que causa una aguda e irritante dermatitis de contacto. Evaluamos el conocimiento etnoentomológico sobre los escarabajos *Paederus* en el municipio de Chapadinda, nordeste del estado de Maranhão, Brasil nororiental, entre septiembre y octubre de 2010. En total participaron en la encuesta 174 hombres y 268 mujeres, principalmente estudiantes, amas de casa y profesores. La mayoría de los encuestados conocía bien el hábitat del animal, en lo referente a la época del año y los sitios en que se encuentran habitualmente las especies de *Paederus*. La comunidad está familiarizada con el hecho de que estos escarabajos emiten una sustancia química cuando se aplastan contra la piel humana, principalmente en partes del cuerpo descubiertas, pero no sabe cuál es el agente irritante. No había ningún tratamiento específico asociado con la dermatitis causada por *Paederus*, debido al carácter poco agresivo de las lesiones. Los habitantes de la zona evitan el contacto con el insecto en cuanto lo reconocen, y esto puede explicar la ausencia de casos graves de dermatitis entre la población.

**Palabras clave:** Coleoptera, Staphylinidae, *Paederus*, pederín, potó, dermatitis, pederismo, etnoentomología, Chapadinda, Maranhão, Brasil.

## Introduction

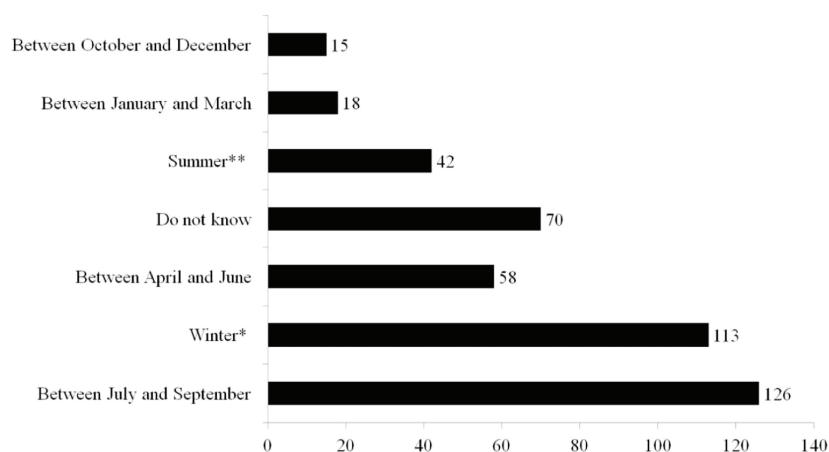
Popular knowledge about a harmful animal can determine the degree of contact between a population and this kind of animal, thus contributing to the well being of the community. In this context, ethnozoology has great importance as it focuses directly on the human/animal relationship. Ethnozoological research in Brazil has been increasing in recent years (Alves and Souto, 2011), and ethnoentomology, which investigates human interaction with insect fauna (Costa-Neto, 2004), has contributed greatly to ethnozoology.

Staphylinid beetles (Insecta, Coleoptera) (Costa Lima, 1953) are represented by about 20,000 species distributed worldwide (Frank and Thomas, 1991). *Paederus* is the only vesicating genus belonging to the family Staphylinidae (Frank and Kanamitsu, 1987). About 622 *Paederus* species are known in the world, of which 30 are vesicating (Asenjo *et al.*, 2013; Silva, 2014), causing dermatological lesions in man.

Pirajá da Silva recorded *Paederus* species for the first time in Brazil in 1912 in the state of Bahia (Pirajá da Silva,

1912). In Brazil, seven species implicated in human lesions are known: *P. amazonicus* Sharp 1876, *P. brasiliensis* Erichson 1940, *P. columbinus* Laporte de Castelnau 1835, *P. ferus* Erichson 1940, *P. mutans* Sharp 1876, *P. protensus* Sharp 1876 and *P. rutilicornis* Erichson 1940 (Vieira, 2013; Silva, 2014). These species are mainly found in the North, Northeast and Central-West regions of the country.

The vesicating *Paederus* species releases a skin-irritating amide, known as pederin, involuntarily when disturbed, as part of the natural aggressive defense behavior, or when crushed against human skin (Frank and Thomas, 1991; Iserson *et al.*, 2012; Ghoneim, 2013). Pederin is a potent toxin that leads to dermal changes characterized by irritant contact dermatitis (Piel, 2002; Chaul *et al.*, 2004). Pederin can be found in the hemolymph of adults, eggs, larvae and pupae. The victim's skin presents a red itchy burning lesion with blisters, erythema and pain (Banney *et al.*, 2000; Uslular *et al.*, 2002; Zargari *et al.*, 2003; Qadir *et al.*, 2006; Huang *et*



**Fig. 1** Occurrence of rove beetle according to the participants in the ethno-entomological study carried out in the municipality of Chapadinha, Maranhão State, Brazil. \*dry season; \*\*rainy season

*al.*, 2009; Senanayake *et al.*, 2011; Taneja *et al.*, 2013). The blistering reactions can vary from mild, with a discrete or moderate erythema together with itching and pain, to severe cases showing systemic symptoms such as fever, headache, joint pain and vomiting (Kamaladasa *et al.*, 1997; Cressey *et al.*, 2013; Panta and Pudyai, 2014). Well-defined erythematous plaques with pustules or vesicles clinically characterize the main aspects of *Paederus* dermatitis (Kamaladasa *et al.*, 1997; Uslular *et al.*, 2002; Qadir *et al.*, 2006; Gnanaraj *et al.*, 2007; Assaf *et al.*, 2010; Ali *et al.*, 2013; Taneja *et al.*, 2013). An oral or topically corticosteroid treatment is needed in the worst cases (Vanhecke *et al.*, 2010; Senanayake *et al.*, 2011; Iserson *et al.*, 2012; Crassey *et al.*, 2013; Panta and Pudyai, 2014).

In Brazil, there have been some reports of blister dermatitis (Dallas, 1935; Fain, 1966; Diógenes, 1994; Chaul *et al.*, 2004; Amado *et al.*, 2010; Fonseca *et al.*, 2012; Vieira, 2013). In the Northeast of the country, *Paederus* spp. are commonly found inside human dwellings mainly in the rainy season (Silva, 2014). The regional populations are aware of the blistering lesions, but there has been no research on the biological and epidemiological aspects of rove beetle dermatitis.

As part of a study dealing with the composition and seasonality of *Paederus* species in Northeastern Brazil, the present work assesses the ethno-entomological knowledge of these insects and the consequences of their close contact with man.

## Material and Methods

**STUDY AREA:** The study area is in the Northeastern part of Maranhão State, Brazil (3°44'17" S and 43°20'29" W), about 300 km from São Luis, the capital of the state. The biome Cerrado of Maranhão state occupies a large transitional area positioned between three Brazilian regions: North, Northeast and Central-West. In the region, the climate is hot and semi-humid with an annual average temperature ranging from 28°C to 30°C. The rainfall is 1.600-2.000mm/year. The region undergoes a dry season from July to December and a wet season, from January to June, according to the Instituto Brasileiro de Geografia e Estatística (IBGE, 1984).

The municipality of Chapadinha has a population of 73.281 inhabitants (IBGE – Census, 2010) and covers an area of 3.165 km<sup>2</sup> (IBGE, 2010).

**DATA COLLECTION:** A survey was carried out between September and October 2010. The ethno-entomological data were

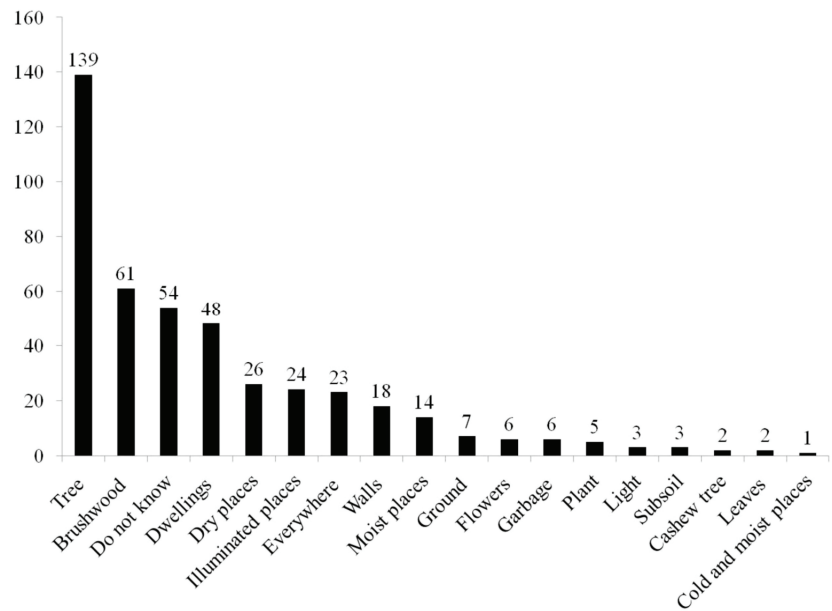
obtained from a sample of 442 individuals, derived from open and closed questions concerning the biology of *Paederus* species and the consequences of contact between human and the vesicating beetles. In addition, data on gender, age, level of education and occupation were also taken into account. A simple random sampling technique was used in order to provide a representative cross-section of the community (Martin, 1995). The interviewees were selected from different locations in the urban setting, such as schools, hospitals, dwellings and squares, and they were invited to participate in the research. The ethno-entomological data presented herein has no access to any kind of genetic heritage, and so it does not constitute a threat to the local biodiversity. With regard to the preservation of the local biodiversity, in this paper, no specific hunting and fishing techniques, natural resource management, data about ecological systems or species of pharmaceutical, agricultural and food interest are shown. Also, the protection of the intellectual and cultural integrity of the community is guaranteed based on the ethno-entomological content exhibited in the present study. After the consent of the interviewee, the questionnaire was filled out. The study goals were explained in detail before the interview. All ethno-entomological data are deposited in the Laboratory of Medical Entomology at the Center for Agrarian and Environmental Sciences of the Federal University of Maranhão, Chapadinha, Maranhão State, Brazil.

## Results and discussion

The ethno-entomological data sample is composed of 174 men and 268 women. The age varied between 10 and 80 years and the 10-20-year interval was the most representative, accounting for 39.65% for males and 32.46% for females. The most frequent occupation reported was student (40.3%), followed by housewife (9.3%) and teacher (8.1%). The results were no different according to gender, age, occupation and the education level of the interviewees.

Most of the participants (94%) stated that they recognize the beetle from its morphological characteristics and from the curvature of the abdomen when disturbed. Indeed, *Paederus* species have a flexible abdomen occasionally curved upward when moving around or mainly when threatened (Frank and Kanamitsu, 1987; Bohac, 1999; Silva, 2014). This behaviour makes staphilinids distinct from other beetle families with short elytra such as Meloidae (*Meloe*) and Nitidulidae (*Conotelus*).

**Fig. 2** Habitat where the rove beetle lives according to the participants in the ethno entomological study carried out in the municipality of Chapadinha, Maranhão State, Brazil.



**Table I.** Body parts, reaction and treatment related to the *Paederus* species in the ethno-entomological study carried out in the municipality of Chapadinha, Maranhão State, Brazil.

Body parts	Participants	Reaction	Participants	Treatment	Participants
Neck	265	It burns	193	Ointment	113
Neck and face	41	It pees	121	Nothing	101
Arms	31	It releases a liquid that harms	23	Do not know	89
Face	26	It releases a substance	20	Water and soap	46
Neck and arms	19	It irritates	18	Specific ointment	24
Do not know	14	It causes wounds	15	Ointment Hipoglos®	11
All over the body	9	It causes lesions	12	Alcohol	7
Arm pit	5	Nothing	9	Talcum	6
Neck, face and groin	5	It releases pile	7	Lipstick	5
Private parts	4	It bursts	5	Ice	5
Arms and legs	3	It inflames	4	Vinegar	5
Eye and neck	3	Do not know	4	Butter	4
Leg	3	It bites	4	Cream or moisturizer	3
Neck, arms and back	3	It releases organic residue	3	Oil	3
Mouth	2	It stains	2	Violet stain	3
Eye	2	It dries the skin	2	To slap on the injured skin	2
Neck, legs and arms	2			Toothpaste	2
Butt and neck	1			Breast milk	2
Superior parts	1			Cold water	1
Uncovered parts	1			Olive oil	1
Neck, belly and armpit	1			Coriander	1
Neck, ear and back	1			Cold compress	1
				Honey	1
				Ointment Minancora®	1
				To rub the hair on lesions	1
				Zinc oxide paste	1
				Sun block	1
				Medicine	1
				Saline	1
	<b>442</b>		<b>442</b>		<b>442</b>

When questioned about the common names for the vesicating *Paederus* species the participants mentioned “potó” as the most prevalent name (91.1%). The name “potó” was followed by “flamenguista” (3.6%), given their colors which remind the interviewees of a Brazilian soccer team (Flamengo), and “mijão” (he who pees a lot) (0.3%), because the population believe that the skin lesions are caused by the rove beetles’ urine. Indeed, “potó” is the widespread name for the vesicating beetles of *Paederus* species in Brazil (Dallas, 1935; Fain, 1966; Diógenes, 1994), but other names are also known in regions where these beetles are common, such as “trepamoleque”, “péla-água” and “fogo-selvagem” (Silva, 2014).

As for the kind of animal, 63% said that “potó” was an insect, without specifying what the kind, and 10% did not know how to answer the question. Other people reported that “potó” was an ant (11%), a mosquito (6%), a beetle (5%) and others (5%) such as scorpion, bee, firefly, centipede, wasp and “muriçoca”, a nocturnal mosquito. It is noteworthy that only 22 participants reported that “potó” was a beetle. The unusual morphological aspects of the coleopteran species may make it difficult for the community to distinguish it from typical beetles. In fact, the *Paederus* species generally has a long, cylindrical narrow body ranging from seven to 13 mm (Frank and Kanamitsu, 1987, Guillen *et al.*, 2004; Silva,

2014). The elytra are short under which the second well-developed pair of wings is appropriately folded, exposing part of abdomen when the insect is at rest (Bohac, 1999; Silva, 2014). Some of the above-mentioned characters may be found in other animals such as the abdomen curved upward (scorpion), the color pattern (bees) and the size and form of the body (ants and centipedes), justifying the information reported.

The seasonal distribution of “potó” was pointed out and most participants agreed that *Paederus* species occur in a certain period of the year (Fig. 1), just in the rainy season or at the beginning of the dry one. Only 15 inhabitants reported the occurrence of “potó” late in the dry season. In fact, as the population density grows, the beetles are attracted by light sources and settle down in and around houses increasing the chances of contact with their victims. This is generally triggered by the rainy months (Manley, 1977; Zargari *et al.*, 2003; Al-Dhalimi, 2008; Ghoneim, 2013; Taneja *et al.*, 2013), when the beetle population increases markedly just after the wet season. Weather events, e.g. El Niño, which affects the rain distribution, may be responsible for an increase in the number of beetles and for outbreaks of *Paederus* dermatitis in the population (Tincopa *et al.*, 1999; Alva-Dávalos, 2002). As the occurrence of skin lesions is more frequent immediately after the rainy period, people are able to remember this biological aspect of “potó” and its seasonality easily.

About the habitat, most participants (31.4%) reported that *Paederus* beetles live in trees and 13.8% in brushwood areas (Fig. 2). Of the 442 interviewees, 12.2% did not know how to respond to this question. The names “tree” and “brushwood” were the most mentioned by the participants in relation to the living habitat. It may be concerned with the surroundings from where, according to inhabitants, *Paederus* species live, disperse and enter houses attracted by light (RahMah and Norjaiza, 2008; Davidson *et al.*, 2009). In the surveyed municipality, a variety of habitats suitable for *Paederus* proliferation is found such as tree-lined streets, wooded backyards and vacant lots.

Staphylinid beetles are polyphagous insects and several species have saprophagous larvae and adults, usually living in environments with plenty of rotten organic matter (Guimarães and Mendes, 1998; Ghoneim, 2013; Silva, 2014). Generally, they are nocturnal and hide in dark moist places during the day. Some participants (3.1%) reported that the “potó” lives in moist places.

Regarding the body region where lesions are common, 60% of people mentioned the neck, and up to 79% in combination with other body parts (Table I). The lesions have a slow advancement and are mostly found on uncovered body parts, such as the face, neck and arms, and to a lesser extent in the armpit and groin (Banney *et al.*, 2000; Uslular *et al.*, 2002; Zargari *et al.*, 2003; Qadir *et al.*, 2006; Verma and Agarwal, 2006; Huang *et al.*, 2009; Assaf *et al.*, 2010; Senanayake *et al.*, 2011; Taneja *et al.*, 2013). The toxin pederin can reach other body parts from the hands, for example the eyes, causing conjunctival irritation (Alva-Dávalos *et al.*, 2002; Mbonile, 2011) and irritation in private parts (Rivas *et al.*, 2001).

Most interviewees (88.4%) kill the insect as soon as they recognize it as a “potó”. Only 4.7% did not mention the dermal alterations related to *Paederus* dermatitis (Table I). Bullous dermatitis is caused by contact with pederin, which is

released when the insect is accidentally crushed on the human skin. The inhabitants seem to know how the beetle attacks their victims because 39.3% reported that the insect released a kind of substance or a pile that produce all the lesions. The designation “mija” (it pees) was mentioned by 27.3% of the participants, because they usually think that the “potó” releases the blistering substances on the victim skin through its urine.

Concerning the kind of treatment used for *Paederus* dermatitis, 43% of the participants do not take or did not indicate any kind of medicine (Table I). This may be due to the benign pattern of the lesions (Silva, 2014). The community knows that the dermatitis disappears approximately a month after exfoliation and pigmentation.

An ointment was the most frequent medication used by the participants, accounting for 26% (Table I). It is noteworthy that only 10% mentioned pouring water on the affected area and washing with soap as a health care measure, although this is a safe and effective method when used immediately after contact with the insect (Amado *et al.*, 2010; Iserson *et al.*, 2012; Silva, 2014).

Chapadinha inhabitants are aware of the biology and ecology of the *Paederus* species. The population is also well aware of the consequences of the beetle’s secretion and, maybe for this reason, it is regarded as a harmful animal. No treatment was associated with *Paederus* dermatitis in view of the non-aggressive aspects of lesions and severe cases have not been detected in the local population. Better knowledge about the insect may help to stop people crushing the beetle which is responsible for releasing the substance, causing the lesions.

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