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FIRST RECORD OF SISYRIDAE (NEUROPTERA) IN RIO DE JANEIRO STATE, BRAZIL, WITH BIONOMIC NOTES ON *SISYRA PANAMA*N. HAMADA^{1,*}, A. M. O. PES¹ AND L. M. FUSARI²¹Instituto Nacional de Pesquisas da Amazônia (INPA), Coordenação de Biodiversidade, Manaus, CEP 69067-375, AM, Brazil²Universidade de São Paulo, Museu de Zoologia (MZUSP), Laboratório de Díptera, São Paulo, SP, Brazil*Corresponding author, E-mail: nhamada@inpa.gov.br

Sisyridae has a worldwide distribution and in the New World there are 30 species, distributed between 2 genera (*Sisyra* and *Climacia*); 16 species occur in Brazil (Flint 2006). Even though the Brazilian fauna represent about 50% of the Sisyridae fauna in the New World, knowledge of their distribution in the country is poor. Species in this family have only been reported in the states of Amazonas (10 spp.), Pará (3 spp.), Mato Grosso (2 spp), São Paulo (1 sp), Minas Gerais (4 spp), Paraná (1 sp) and Santa Catarina (3 spp) (Flint 1998, 2006; Penny 1981; Penny & Rafael 1982).

Larvae of Sisyridae are associated with colonies of freshwater sponges (Porifera: Haplosclerida: Spongillidae) where they live and obtain their food. They have piercing mouth parts used to suck the fluids of sponge cells. Knowledge of the biology and taxonomy of Sisyridae immature stages is poor and is restricted to the temperate zone (e.g., Pupedis 1986, 1987). In Brazil, taxonomic studies on Sisyridae are based exclusively on adults (e.g., Penny 1981; Penny & Rafael 1982), and information on immatures and on biological aspects is lacking. *Sisyra panama* Parfin & Gurney, 1956 was described from Panama; later on it was reported to Brazil in the state of Amazonas (Penny 1981) and from the northern region of Bolivia (Flint 2006). The objectives of the present study are to report the family Sisyridae for the first time in Rio de Janeiro state and to provide bionomic information on the immature stages of *S. panama*.

Eggs, larvae and pupae of *S. panama* were collected on 25 Aug 2007 in Carapebus Lake (S 22° 15.107' W 41°35.770'), Rio de Janeiro state, where diurnal air temperature was approximately 25 °C and nocturnal air temperature was approximately 15 °C. This lake is included in the Restinga de Jurubatiba National Park (PARNA de Jurubatiba) located in the northern portion of the state in the municipalities of Macaé, Carapebus and Quissamã (<http://www.icmbio.gov.br>). The typical vegetation in this park is restinga, a distinct type of coastal tropical moist broadleaf forest composed of shrubs and trees up to 15 m in height. The park is located on sandy soil on beach ridges and in lagoon ecosystems. Restinga is a vegetation type associated with the Atlantic

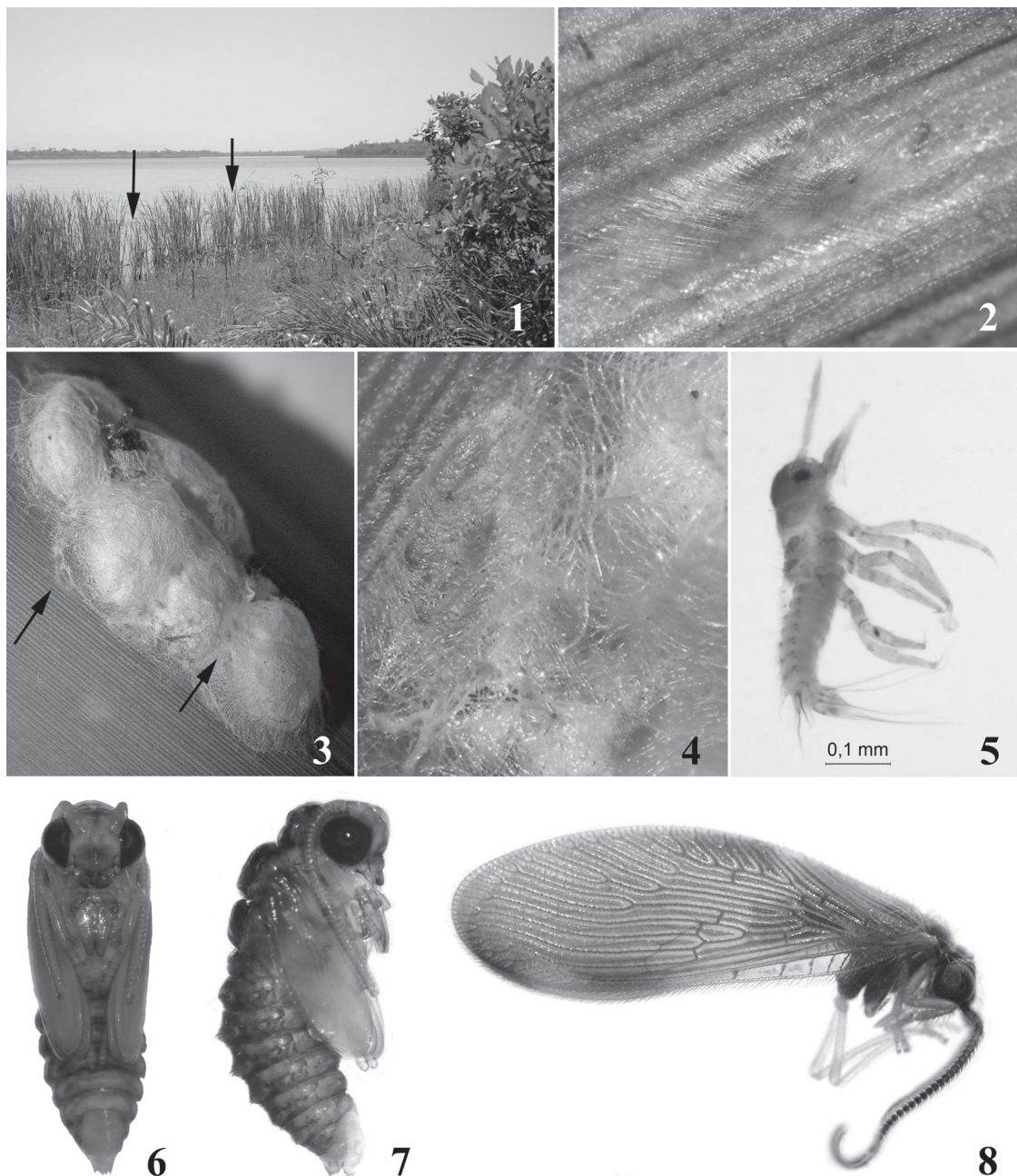
forest biome and is located between the coastal zone and the denser inland forest (<http://www.eoearth.org>).

Nine larvae were collected together with their substrate (freshwater sponge colonies of *Spongilla* sp.; Haplosclerida: Spongillidae) and maintained with a small piece of the sponge colony in water in a plastic cup covered with a fine-mesh tissue. All of the last-instar larvae were allowed to pupate under laboratory conditions at room temperature (22 °C). Six clutches of eggs and three pupae were found on plants surrounding the lake, especially on *Typha domingensis* (Persoon) Steudel (Poales: Typhaceae), known in Brazil as “*taboa*” (Fig. 1). The pupae and eggs were maintained in a plastic cup. After completing the observations, eggs, first-instar larvae, pupal exuviae, pupae and adults were preserved in 80% ethanol and deposited in the Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia (INPA), located in Manaus, Amazonas, Brazil.

Eggs and Hatching. Clutches of eggs occurred on aquatic vegetation (Fig. 2). Five of the six observed clutches were laid on the edges of the silken sisyrid cocoons (Fig. 3); they were covered with a thin layer of silk (Fig. 4). Clutches contained 2-8 eggs (mean \pm SD = 5 ± 2.4 , $n = 6$ clutches).

According to the literature, hatching of larvae in Sisyridae is a nocturnal activity (e.g., Pupedis 1986, 1987). However, we observed that under laboratory conditions *S. panama* larvae hatch in the morning. We did not observe the swimming behavior of the neonates, but, according to studies done in the temperate region (e.g. Pupedis 1986), as soon as larvae fall into the water they start to swim in search of freshwater sponge colonies.

Development of Immatures. Nine of the field-collected larvae spun silken cocoons (Figs. 2-4) within which pupal and adult development occurred. We preserved some pupae (Figs. 6 and 7) and allowed others to develop. Larvae started to spin their cocoons at night, and they were completed by morning. Since we did not observe any movement inside the cocoons in the morning, we assume that pupal stage (Fig. 8) began at this moment; this means that the duration of the pupal stage was approximately 8 days ($n = 2$; 1 male and 1 female).



Figs. 1-8. 1 – Overview of Carapebus Lake (PARNA de Jurubatiba/RJ) with typical “*taboa*” vegetation. 2 – Eggs laid on the aquatic vegetation. 3 – Eggs laid at the edges of the silken cocoons of the pupae. 4 – Eggs covered with a thin layer of silk. 5 – First-instar of *Sisyrta panama*. 6 – Ventral view of the pupa of *S. panama*. 7 – Lateral view of the pupa of *S. panama*. 8 – Lateral view of the imago of *S. panama*.

Jumping Behavior. After eclosion, first-instar larvae (Fig. 5; $n = 6$) exhibited a peculiar jumping behavior: they curled their bodies, starting from the tip of the abdomen and proceeding to the head; they also withdrew and curved down their

appendages (mouth parts, antennae and legs). To gain propulsion for the jump they straightened these appendages like a catapult (Figs. 9A - D). They continued to jump until they fell into the water (Fig. 9E). Similar behavior occurs in *Sisyrta*

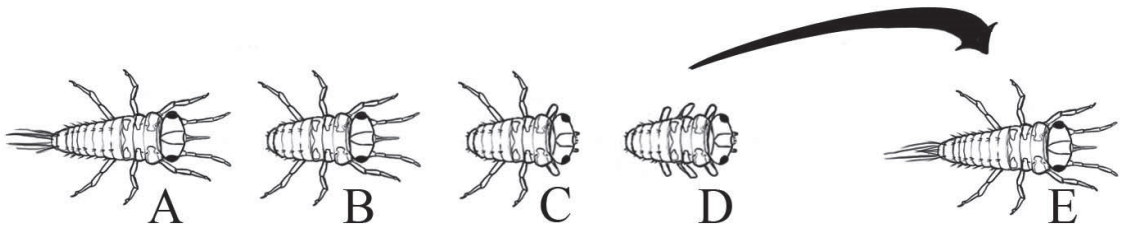


Fig. 9. A – D. First-instar larva of *Sisyra panama* in jumping behavior (dorsal view). A. Larva curving down the tip of the posterior region of the abdomen; B. Larva pushing down its head together with its mouth parts, antennae and forelegs; C. Larvae pushing down their mid and hindlegs; D. Larva jumping until it falls into the water.

fuscata (Fabricius, 1793) (Pupedis 1986). However, first-instar larvae of *Climacia areolaris* (Hagen, 1861), which also jump, do so with a different type of movement (Pupedis 1986). In the latter species, the first-instar larvae curves the tip of its abdomen downward and then gains the force to jump by uncurling the body. The fact that the 2 *Sisyra* species that have been studied exhibit similar patterns of movement, and that this pattern differs from that of *Climacia*, suggests that jumping behavior may be a generic characteristic. Observations of additional species in both genera will be needed to test this hypothesis.

Few studies exist on the biology and distribution of aquatic insects in Brazil. This information is important for understanding the population dynamics of aquatic insects and for understanding the effects of environmental impacts on the biology and the community structure of these organisms. Also, when it is available, biological information can be useful to test hypotheses on the relationships among taxa, as may be the case for larval jumping behavior in Sisyridae.

SUMMARY

Sisyra panama Parfin & Gurney, 1956 as the first species of the family Sisyridae (*Sisyra panama* Parfin & Gurney, 1956) is reported for the first time from Rio de Janeiro state, Brazil. Pupae of *S. panama* developed in 8 days; eggs are covered with a thin layer of silk and, under laboratory conditions, hatch in the morning. After eclosion, first-instars exhibited a peculiar jumping behavior, similar to *S. fuscata* (Fabricius).

Key Words: aquatic insects, first-instar, larval behavior, spongilla-flies.

RESUMO

Os objetivos desse estudo são registrar a família Sisyridae (*Sisyra panama* Parfin & Gurney, 1956) pela primeira vez no Estado do Rio de Janeiro e fornecer informações bionômicas sobre seus estágios imaturos. Ovos, larvas e pupas de *S. panama* foram coletados no dia 25 de

agosto de 2007 na lagoa Carapebus (22°15.107'S 41°35.770'O), no estado do Rio de Janeiro. Pupas obtidas a partir de larvas coletadas no campo e mantidas vivas sob condições de laboratório, levaram aproximadamente oito dias para completar seu desenvolvimento. Ovos foram depositados em grupos de 2 a 8 unidades, sobre a vegetação aquática, em ambiente terrestre, cobertos por uma fina camada de seda. Em condições de laboratório, a eclosão das larvas ocorreu no período matutino, enquanto que há relatos na literatura citando que essa atividade ocorre no período noturno. Depois da eclosão, larvas de *S. panama* de primeiro estágio apresentam um comportamento peculiar, elas se curvam sobre si mesmas para ganhar força e pular, caindo na água. Esse comportamento é similar ao da espécie congênica *S. fuscata* (Fabricius). Embora larvas de primeiro estágio de *Climacia areolaris* (Hagen) apresentem, também, um comportamento de pular, o método utilizado pelas larvas desta espécie é diferente. Uma vez que o comportamento de pular de *S. panama* é similar ao de *S. fuscata* sugerimos que esse comportamento pode ser uma característica genérica, no entanto, observações adicionais sobre diferentes espécies desses dois subgêneros devem ser realizadas para corroborar essa hipótese.

Palavras Chave: insetos aquáticos, larva de primeiro estágio, comportamento larval, sisyrideos

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