

# NOTES ON THE BIOLOGY OF *Polistes (Epicnemius) subsericeus* SAUSSURE, 1854 (HYMENOPTERA, VESPIDAE).

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## ABSTRACT

Nine nests of *Polistes subsericeus* were studied in field conditions from July 1988 to November 1989, in Rio Claro, São Paulo State, southeastern Brazil. Their little nests (maximum of 106 cells) were built under the thorny leaves of *Pandanus veitchi* (Pandanaceae), in hidden sites, and have only some few individuals (maximum 16 wasps). The nest architecture was particularly described. Colonial productivity and aggressive behavior seemed more to *Mischocyttarus* species than those of *Polistes* already studied.

KEYWORDS: *Polistes*, Vespidae, nesting, nest architecture, colonial productivity.

## RESUMO

Notas sobre a biologia de *Polistes (Epicnemius) subsericeus* Saussure, 1854

(Hymenoptera, Vespidae)

Foram estudadas nove colônias de *Polistes subsericeus* no período de julho de 1988 a novembro de 1989, em condições de campo, em Rio Claro, SP, sudeste do Brasil. Seus ninhos pequenos (máximo 106 células), foram construídos sob as folhas espinhentas de *Pandanus veitchi* (Pandanaceae), a cerca de um metro do solo, em locais de difícil acesso e continham poucos indivíduos (máximo 16 vespas). A arquitetura de seus ninhos foi descrita detalhadamente. Sua produtividade colonial e comportamento agressivo aproximou-se mais de

espécies de *Mischocyttarus* do que de outras *Polistes* já estudadas.

UNITERMOS: *Polistes*, Vespidae, nidificação, arquitetura de ninho, produtividade colonial.

## INTRODUCTION

*Polistes (Epicnemius) subsericeus* Saussure, 1854 is a social neotropical wasp with a large geographic distribution: Venezuela, Guyana, Surinam, Brazil (from Amazon to São Paulo), Paraguay, Bolivia (Santa Cruz) e Colombia (Boyaca) (RICHARDS, 1978), typically occurring at opened fields (DUCKE, 1904). It is similar to the aggressive Epiponini *Polybia sericea*, mainly concerning to morphology, color pattern (black head and gaster, and red thorax) and nesting habits (the nests are built near the ground, hung on graminean or ciperacean leaves, at hidden sites). ROCHA *et. al.* (1989) did the first description of a *P. subsericeus* nest, which was not known since this time. DINIZ & KITAYAMA (1994) find only four nests of this species in their studies conducted in cerrado vegetation in Southern Mato Grosso State in Central Brazil. Thus, *P. subsericeus* is a rare occurrence species of social wasps, and the objective of this study is provide some data on biology, nesting habits, nest architecture, lifespan of immatures and adults, and colonial productivity of this species.

## MATERIAL AND METHODS

Field studies were carried out in the campus of the Universidade Estadual Paulista, at Rio Claro (22°24'S,

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47°33' W, altitude 612 m), São Paulo State, Southeastern Brazil, from July 1988 to November 1989. Nine nests of *P. subsericeus* were found in *Pandanus veitchi* (Pandaceae) a plant with hard thorny leaves, in hidden sites, becoming difficult the cells observations. Even so, the nests were mapped daily (as it was possible) in different colonial stages of development (pre-, post-emergence, and decline) with the purpose of studying the development of immature stages and of determining the colonial duration. Some adults were individually marked on the thorax with dots of model airplane enamel for determining their lifespan.

Abandoned nests were collected, dissected and measured (using a caliper) in the following structures: length and thickness (at the widest and narrowest points) of the peduncle, length and width of the comb, height and width (space between two parallel walls) of the complete cells, and the height of the meconial layers in the floor of the cells.

The nests 1, 4, 5 and 9 were deposited in the vespidean nests collection of the Departamento de Zoologia, UNESP, Rio Claro.

The data for individual colony productivity were measured by colonial duration in days (the comprehensive period from nest foundation to nest abandonment), number of cells built, number of adults produced, percentage of productive cells, maximal number of cell reutilization, and the adults/cell, adults/day and cells/day ratios.

The terminology of colony stages suggested by JEANNE (1972) was adopted.

## RESULTS AND DISCUSSION

Nests of *P. subsericeus* were observed at  $1,11 \pm 0,27$  m (0,71-1,48) from the ground. ROCHA et al. (1989) reported that two nests of this species were found at 30 and 40 cm from the ground, in an area of "campo úmido", Chapada dos Guimarães, MT. Probably, this species try to avoid the predators nesting in hidden sites, due to the observed lack of aggressivity of these wasps (MANZOLI-PALMA, 1992). Thus, the height of the plant in which the nests are built appears to be less important than the protection that it offer to the wasps, and maybe the little number of colonies of *P. subsericeus* observed

during the studies might be due to the nesting habits of this species. Other characteristic against predators is the mimicry with the aggressive wasp *Polybia sericea*. MANZOLI-PALMA (1992) studied the aggressive behavior and sting apparatus morphology of 31 species of social wasps, and classified *P. subsericeus* near to the *Mischocyttarus* species, apart from other three more aggressive *Polistes* species (*P. versicolor*, *P. simillimus* e *P. lanio*). On the other hand, the model *P. sericea* was classified together other aggressive *Polybia* species.

The nests of *P. subsericeus* are stelocittarous gimnodomous, with a central peduncle (Figs. 1-2), or some dislocated, but never eccentric. The comb is horizontal, like those two nests described by ROCHA et al. (1989) and similar to those of *P. (Epicnemius) davillae* (ROCHA, 1990), *P. (Onerarius) carnifex* (CORN, 1972) e *P. (Aphanilopterus) lanio* (GIANNOTTI, 1992). The average peduncle height is  $8,1 \pm 0,7$  mm (7,0-9,0, n = 6), the thickness at the widest point is  $1,3 \pm 0,9$  mm (0,5-3,0) and  $0,9 \pm 0,3$  mm (0,5-1,5) at the narrowest point. The size of the comb of the nest 1 (Figs. 1-2) was 57,0 mm long and 49,0 mm width, 25,5 mm tall; the nest 4: 21,0 x 19,0 x 21,0 mm; the nest 5: 19,0 x 16,0 x 19,0 mm; and the nest 6: 49,0 x 48,0 x 27,0 mm. The nest 9, was abandoned in the pre-emergence stage had only six cells (9,5 x 8,0 x 7,5 mm). The small size of the nests of *P. subsericeus* also is an important characteristic for their hiding into the vegetation. The two nests described by ROCHA et al. (1989) were further smaller: sized 15,2 and 22,0 mm in diameter, with 11 and 36 cells, respectively; The peduncle length varied from 9 to 13 mm, and the cells length from 16 to 25 mm. DOWNING & JEANNE (1986) reported three nests of *P. (E.) pacificus* with only 35,0 x 45,0 mm in diameter (mean 29,3 cells per nest). GIANNOTTI (in press) described the nests of *P. (E.) cinerascens* that can be greater than these species of the subgenus *Epicnemius*, and they have eccentric peduncle and vertical combs which are built mainly under leaves of palm trees.

The nest cells of *P. subsericeus* were  $5,0 \pm 0,3$  mm (4,5-5,75, n = 145) in width, and  $20,0 \pm 3,2$  mm (14-27, n = 99) height, and they were utilized up to four times. Each time one cell is used for production of one adult a layer of meconium is accumulated on the floor,

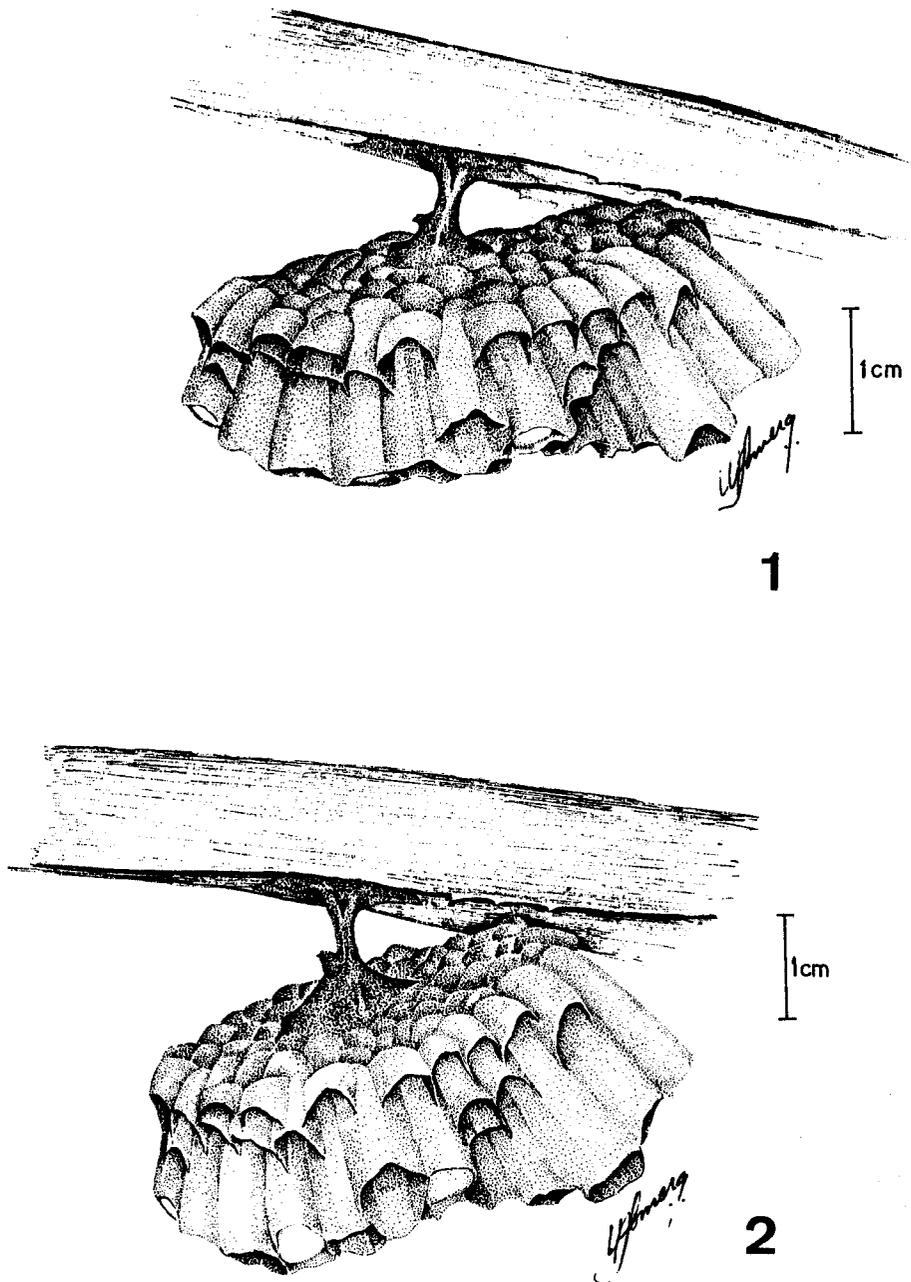


FIGURA 1-2 - Lateral view of the nest 1 of *Polistes subsericeus*, hung under a leaf of *Pandanus veitchi* (Pandanaceae).

defecated by the last instar larva when it became a pupa. The accumulation of the successive meconium layers causes the wasps to lengthen the cell walls. Thus, the mean length of the first generation cells was 18.6 mm, the second 22.6 mm, the third 24.6 mm, and the fourth 27.0 (Table I). This relationship was also

observed by GIANNOTTI (1992; in press) em *P. lanio* and *P. cinerascens*, respectively.

Foundress associations of  $3,3 \pm 1,5$  females (2-6) (Table II) occurred in colonies of *P. subsericeus* in pre-emergence stage. This is an advantageous adaptation for the survivorship of the colonies in the pre-

**Table 1** - Height of the complete cells and the meconial layers of *Polistes subsericeus* nests, according to the number of the cell utilization (mean, standard deviation, range, and number) (data from the nests 1 and 6).

Measurements of height (mm)	Number of cell utilization			
	1	2	31	4
Cells	18.6 ± 2.6 (14.0 - 23.5) n = 70	22.6 ± 1.5 (20.5 - 27.0) n = 22	24.6 ± 1.4 (22.5 - 26.5) n = 8	27.0 - n = 1
Meconium	2.4 ± 0.5 (1.5 - 3.75) n = 38	5.1 ± 0.9 (4.0 - 7.0) n = 21	7.2 ± 0.7 (6.5 - 8.5) n = 8	11.5 - n = 1

emergence stage, when the nests were more exposed to the predators (GAMBOA, 1978). The intranidal populations were not numerous along the colony cycle: from 3 to 12 wasps in the nest 1, from 2 to 5 in the nest 2, from 1 to 3 in the nest 3, from 1 to 2 in the nest 4, from 2 to 4 in the nest 5, from 6 to 16 in the nest 6, from 3 to 6 in the nest 7, and from 2 to 3 in the nest 8.

Only a few data on the individual lifespan were obtained due to the difficulties of mapping the nests. Thus, the duration of the immature stages were: eggs 10,0 ± 1,4 days (9-12, n = 4), larvae 32,7 ± 1,5 days (31-34, n = 3), and pupae 13,0 ± 1,0 days (12-14, n = 3); total 55,7 days. Only two foragers were marked (nest 1) in 02/VIII/88 and were observed to 29/VIII (28 days).

The nests 1 and 6 were abandoned in the end of the colony cycle, and consequently were the most productive colonies (Table II). On the other hand, the nests 2, 3, 4, and 5 were knocked down or cut by the own thorny leaves of *Pandanus veitchi* (Pandanaeae), substrate of the nests, during storms. The nests 7 and 8 were abandoned in the pre-emergence stage. The duration of the colony cycle of *P. subsericeus* was variable, from 53 to 234 days, and the total mean duration was 132.2 days (Tables II and III). There are four other Brazilian species of *Polistes* that were studied regarding lifespans of colonies: *P. cinerascens* 199.3 days (GIANNOTTI, in press), *P. versicolor* 154.8 days (GOBBI & ZUCCHI, 1985), *P. simillimus* 277,0

**Table II** - Bionomic data and productivity of 8 colonies of *Polistes subsericeus* (\* = colonies abandoned in pre-emergence stage)

Colony	F	Foundation	Abandonment	D (days)	C	PC (%)	A	U	C/D	A/D	A/C
1	?	01/VI/88	20/II/89	234	106	64.1	?	?	0.45	?	?
2	3	01/VI/88	29/VIII/88	90	39	?	?	1	0.43	?	?
3	2	01/VIII/88	22/XII/88	144	42	?	?	2	0.29	?	?
4	2	21/I/89	17/III/89	56	23	17.4	4	1	0.41	0.07	0.17
5	4	01/II/89	25/III/89	53	22	4.5	1	1	0.42	0.02	0.05
6	?	25/I/89	28/VIII/89	216	96	86.4	113	4	0.44	0.52	1.18
7	6	01/VIII/89	13/IX/89*	44	24	0	0	0	0.55	0	0
8	3	12/X/89	20/XI/89*	40	23	0	0	0	0.57	0	0

F = number of foundresses

D = duration of the colonies

C = total number of cells produced

PC = productive cells (%)

A = total number of adults produced

U = maximum number of cell utilization in the nest

C/D = number of cells produced per day

A/D = number of adults produced per day

A/C = number of adults produced per cell

days (GOBBI *et al.* 1993), and *P. lanio*, colonies with single nests 275.2 days, and colonies with polydomic nests 524.1 days (GIANNOTTI, 1992).

Colonies of *P. subsericeus* produced a mean of 54.7 cells, 39.3 adults, 0.41 cells/day, 0.30 adults/day, and 0.72 adults/cell (Tables II and III). Most of these values were smaller than that verified for *P. cinerascens* (GIANNOTTI, in press), *P. versicolor* (GOBBI & ZUCCHI, 1985), *P. simillimus* (GOBBI *et al.*, 1993), and

*P. lanio* (colonies with polydomic nests) (GIANNOTTI, 1992), suggesting those colonies are more productive than *P. subsericeus*. Colonial productivity of this species seemed more to that of *Mischocyttarus cassununga* (GOBBI & SIMÕES, 1988) and *M. cerberus styx* (GIANNOTTI, in press), with a low rate of cell construction throughout the colonial cycle, resulting in the small nest size and in the small number of individuals, typical of the monogynic primitively eusocial organization.

**Table III-** Comparative data of the colonial productivity of some species of *Polistes* and *Mischocyttarus*.

Wasp Species	Duration (days)	Number of cells	Adults produced	Cells/Day	Adults/Day	Adults/Cell	Cell utilization	References
<i>Polistes subsericeus</i>	132.2	54.7	39.3	0.41	0.30	0.72	4	This study
<i>P. cinerascens</i>	199.3	102.9	94.2	0.53	0.43	0.76	4	GIANNOTTI (in press)
<i>P. versicolor</i>	154.8	211.1	148.3	1.40	0.94	0.61	4	GOBBI & ZUCCHI (1985)
<i>P. simillimus</i>	277.0	391.3	?	1.41	?	?	2	GOBBI <i>et al.</i> (1993)
<i>P. lanio</i> (single nests)	275.2	80.2	56.7	0.27	0.16	0.49	5	GIANNOTTI (1992)
<i>P. lanio</i> (polydomic)	524.1	439.0	330.9	1.11	0.82	0.75	5	GIANNOTTI (1992)
<i>Mischocyttarus cassununga</i>	181.7	40.2	18.0	0.25	0.10	0.38	?	GOBBI & SIMÕES (1988)
<i>M. cerberus styx</i>	238.7	42.7	46.9	0.17	0.17	0.87	5	GIANNOTTI (in press)

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