

NOTES ON THE BIOLOGY OF *POLISTES SIMILLIMUS* ZIKÁN (HYMENOPTERA, VESPIDAE)

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ABSTRACT

The longevity of the adult social wasps and the duration of the immature stages of *Polistes simillimus* Zikán were studied in field conditions, at the Horto Florestal "Navarro de Andrade", in Rio Claro, SP. The maturation of the egg lasted 10.2 days, the larval development 25.3 days, and the pupal stage 18.7 days (total 51.9 days). The average lifespan of the workers was 29.1 days. A life-table for one colony was provided.

KEY WORDS: Immature stages development, adult lifespan, life table, social wasps.

RESUMO

A duração dos estágios imaturos e a longevidade dos adultos da vespa social *Polistes simillimus* Zikán, foram estudadas em condições de campo, no Horto Florestal "Navarro de Andrade", em Rio Claro, SP. O tempo de maturação dos ovos foi de 10.2 dias, do desenvolvimento

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larval 25.3 dias e do estágio de pupa 18.7 dias (total 51.9 dias). A longevidade média das operárias foi de 29.1 dias. Foi montada uma tabela de vida para uma colônia.

PALAVRAS-CHAVE: Desenvolvimento dos estágios imaturos, longevidade dos adultos, tabela de vida, vespas sociais.

INTRODUCTION

Polistes (Aphanilopterus) simillimus Zikán is a Neotropical primitively eusocial wasp occurring in Brazil (from Bahia to Rio Grande do Sul), Paraguay, parts of Argentina and Bolivia. This is essentially similar to **P. versicolor** (Olivier) (geographic distribution from Costa Rica to Southern Brazil and Argentina), but there is a tendency for the gaster in having yellow marks only on the two first tergites besides other small differences (RICHARDS 1978). Indeed, its latin name **simillimus** refers to the similarity or resemblance to **P. versicolor** and Zikán must have referred to this. The chromosome number and karyotype of these two species are really diverse (POMPOLO & TAKAHASHI, 1986), and GOBBI et al. (1993) find substantial differences in the colonial productivity between both species, so that, **P. simillimus** exhibited a greater number of colony-founding attempts, the nests had greater cell number, produced more adults per colony, and reutilized only a small percentage of brood cells for adult production for up to two generations, while **P. versicolor** had a larger number of mature colonies, the nests had smaller number of cells, produced less adults per colony, and reutilized a larger percentage of brood cells for up to three or four generations (GOBBI & ZUCCHI, 1985). **P. simillimus** in some occasions can build giant nests of 1,000 to 4,000 cells, and those authors suggested this species may demonstrate a paragonous social organization, what may signify an intermediate form between monogynous and polygynous social organization in Vespidae.

In this paper I studied the time of development of the immature stages and life-span of the adult wasps of **P. simillimus**. A life table for one colony was provided.

MATERIAL AND METHODS

This study was carried out in field conditions at the arboretum of the Horto Florestal "Navarro de Andrade", in Rio Claro, SP (22°24'36" S, 47°33'36" W, altitude 612 m), from September 1991 to March 1992. One nest of *P. simillimus* was found on a trunk of *Nectandra rodioei* Hook (Lauraceae), at 2.5 m from the floor. Maps of the nest were made weekly for verification of the developmental time of the immature stages and enlargement of the comb.

The adult wasps were individually marked on the thorax with dots of model airplane enamel for determination of their life-span and verification of their hierarchical position in the nest. A life table of brood and adult wasps was done, according to SILVEIRA-NETO et al. (1976).

RESULTS AND DISCUSSION

The nest of *P. simillimus* was founded in September 20, 1991 by two foundresses (Fig. 1), but only the dominant female survived until the end of the colony cycle (life-span of 186 days on the nest). The subordinate female disappeared from the nest just after the emergence of the workers, in October 31. The pre-emergence stage lasted 42 days, and the foundresses built 32 cells (0.8 cells/day, and probably 0.8 eggs/day). The nest was greatly enlarged after the emergence of the workers, reaching up to 932 cells in the end of the postemergence stage, in March 6, 1992 (lasted 126 days and produced 360 adults). The ratios 7.4 cells built/day, 7.5 eggs laid/day, and 2.9 adults produced/day reveal a high productivity in this period. In February 20, were counted 230 adult wasps (females and males) on the nest. At this time an Ichneumonidae parasitoid of *P. simillimus* pupae was noticed. The decline stage (from March 6 to 31, 1992 = 26 days) probably started due to the death of the foundress in March 4. Neither one cell was built nor an egg was laid in this period, and the nest population was decreasing progressively until the nest abandonment.

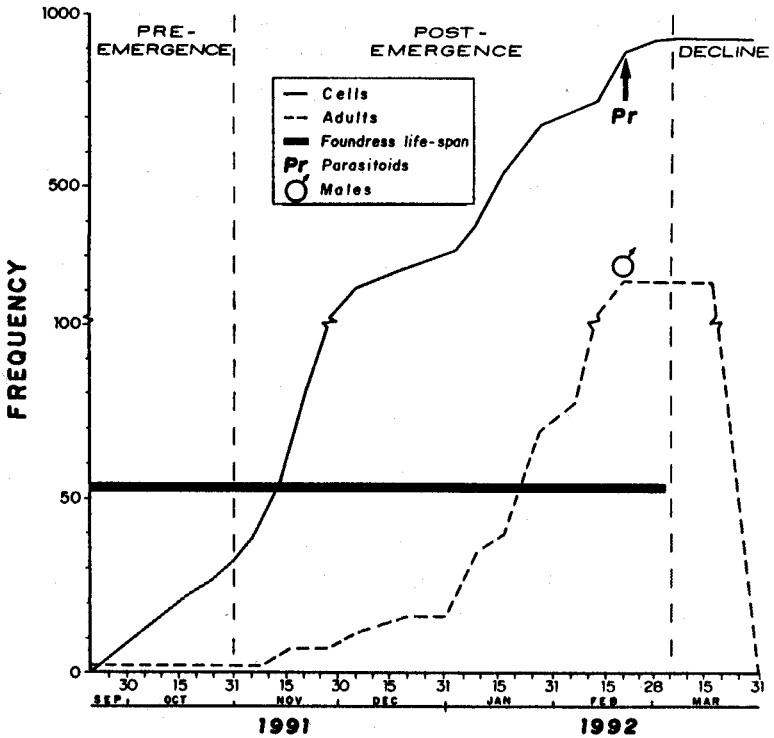


Figure 1 - Colony cycle of *Polistes simillimus* showing the number of cell and of adult wasps, life-span of the foundress and the presence of males and parasitoids.

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The duration of the immature stages was: eggs 10.2 ± 2.4 days (7 - 16, $n = 411$), larvae 25.3 ± 4.8 days (16 - 39, $n = 395$), and pupae 18.7 ± 4.0 days (12 - 29, $n = 406$). The total period, from the oviposition to the adult emergence was 51.9 ± 7.7 days (40 - 91, $n = 395$). These values are very similar to that obtained by GOBBI (1977) for *P. versicolor*, but different of those verified in other two Neotropical species (Table 1). Species of North Hemisphere seemed to have a shorter larval stage than those of Neotropical region probably as an adaptation to the temperate climate, with a short season (Table 1).

Table 1 - Comparative data of the average duration (in days) of immature stages of some *Polistes* species.

SPECIES	EGG	LAR- VA	PU- PA	TO- TAL	REFERENCES
<i>P. simillimus</i> ¹	10.2	25.3	18.7	51.9	This paper
<i>P. versicolor</i> ¹	10.0	20.9	18.4	49.4	GOBBI (1977)
<i>P. lanio lanio</i> ¹	20.8	40.6	22.6	87.5	GIANNOTTI & MACHADO (1994a)
<i>P. erithrocephalus</i> ¹	17.1	26.6	23.8	67.5	WEST-EBERHARD (1969)
<i>P. fuscatus</i> ²	13.0	15.3	22.2	47.8	WEST-EBERHARD (1969)
<i>P. fuscatus</i> ²	14.8	15.5	18.5	48.8	RABB (1960)
<i>P. dorsalis</i> ²	14.0	17.2	17.4	48.6	RABB (1960)
<i>P. exclamans</i> ²	13.4	19.7	14.7	47.8	RABB (1960)
<i>P. dominulus</i> ³	10.0	16.0	13.0	39.0	PARDI (1951)

1. Neotropical species
2. Nearctic species
3. Palearctic species

The life-span of the workers was 29.1 ± 12.8 days (4 - 50, $n = 360$) which is similar to that of *P. lanio* (28.3 days) (GIANNOTTI & MACHADO 1994b). GOBBI (1977) observed from 10.8 to 17.62 days the average life-span of *P. versicolor* in four nests studied.

The life table (Table 2) and the survivorship curve (Fig. 2) of immatures and adults of one colony of *P. simillimus* showed a rate of mortality (qx) of 18.2 for the egg stage. Oophagy performed by adults was the main cause of egg losses. These wasps did either differential oophagy (when a wasp ate the eggs newly laid by the other nestmates as a form to maintain its hierarchical position) or nutritional oophagy, for nourishment. The high rate of mortality for the larvae ($qx = 50.7$) probably was due to the adult larviphagy, which generally occurred under unfavorable climatic conditions as a form to substitute the foraging activity of the workers. Eggs and larvae in the peripheric cells of the nest were eaten rather than those in the center of the comb. The rate of mortality of pupae was 11.3, caused mainly by a parasite Ichneumonidae wasp. Because of these high rates of mortality on the immature stages, the percentage of productive cells of this nest was only 31.3. The life table and survivorship curve (Table 2 and Fig. 2) for workers showed a low rate of mortality during the first ten days ($qx = 6.7$). The same situation was verified in *P. lanio lanio* (GIANNOTTI & MACHADO, 1994b) because these wasps were not observed foraging at the first age interval. From the second age interval the workers began to forage and the number of survivors decreased progressively. High rates of mortalities were observed at the second age interval and from 31 days on. The foraging activities expose the workers to the predation or the inclemency of climatological conditions, besides the physiological wasting of the foragers.

Unfortunately, no more colonies of *P. simillimus* were found at the site of studies until March 1993. This species must be better studied about its social organization, because the high colonial productivity at the post-emergence stage could be a consequence of more than one queen ovipositing in the nest, as suggested by GOBBI et al. (1993).

Table 2 - Life table of immatures and workers of one colony of *Polistes simillimus*.

Stage/Age interval (x)	Number of survivors (lx)	Number of dying individuals (dx)	Rate of mortality (qx)	Relative number of survivors (lx')
EGGS	1,008	184	18.3	100.0
LARVAE	0,824	418	50.7	81.7
PUPAE WORKERS (x)	0,406	46	11.3	40.3
0 - 10	0,360	24	6.7	35.7
11 - 20	0,336	80	23.8	33.4
21 - 30	0,256	42	16.4	25.4
31 - 40	0,214	132	61.7	21.2
41 - 50	0,082	75	91.5	8.1
51 - 60	0,007	7	100.0	0.7
61 - 70	0	0	0.0	0.0

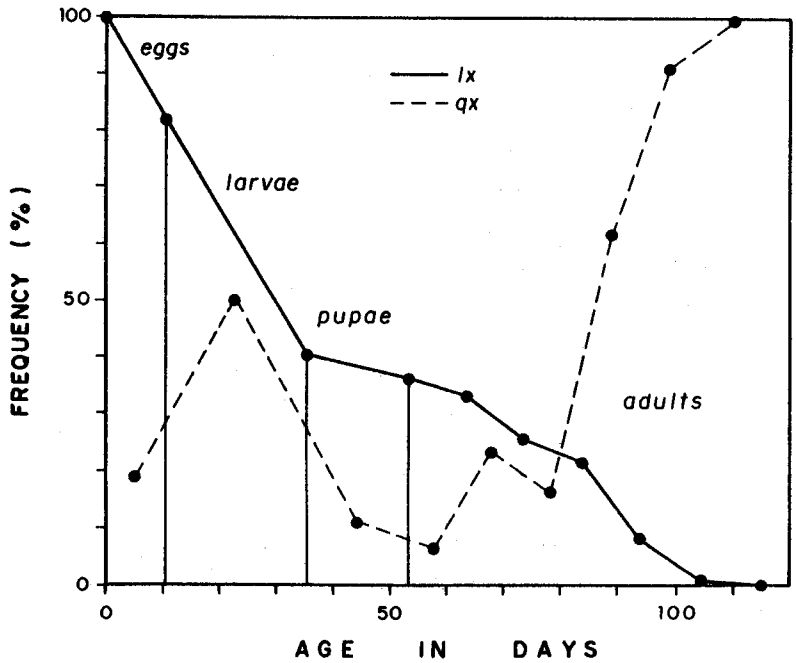


Figure 2 - Survivorship curve (l_x) of immatures and workers of one colony of *Polistes simillimus*, with data on rate of mortality (q_x).

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