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LIFE TABLE AND BEHAVIOR OF *SCELIPHRON ASIATICUM* (HYMENOPTERA:SPHECIDAE)

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RESUMO- Dados para calcular a tabela de vida da vespa solitaria *Sceliphron asiaticum* demonstram que a mortalidade durante o seu desenvolvimento é baixa e semelhante a mortalidade já descrita para outras espécies de *Sceliphron* no Caribe e na Australia. Os principais parasitoides são vespas das famílias Chrysididae e Eulophoridae, e moscas da família Bombyliidae. Uma proporção significativa da mortalidade não depende do ataque dos parasitoides.

ABSTRACT Preliminary data used to construct a life table for the solitary wasp, *Sceliphron asiaticum*, revealed a low developmental mortality, similar to that described for Caribbean and Australian species of *Sceliphron*. Principal parasitoids were wasps of the families Chrysididae and Eulophoridae, and flies of the family Bombyliidae. A significant portion of mortality could not be ascribed to the action of parasitoids.

INTRODUCTION

The small mud-dauber wasp, *Sceliphron asiaticum* (L.), is common throughtout the southern Neotropics (Van der Vecht and van

Braugel, 1968). This wasp commonly builds large multi-celled nests on human structures, or on natural rock outcrops.

The present study was conducted while censusing and monitoring nest survivorship of synanthropic wasps in Rio Claro, São Paulo, Brazil. The mud nests constructed by *S. asiaticum* entail a tremendous energetic investment. A normal 5 to 9 cell nest may require several weeks to complete, and prey capture of spiders to supply cells with provisions also is undoubtedly energetically costly.

S. asiaticum, as other members of the genus, provision their nests with spiders of the family Araneidae. These spiders are paralyzed and stocked in individual nest cells, with the egg placed on the first spider of the provisioned cell, with up to 10 spiders provisioned for each cell. Cells are provisioned one at a time. Completed cell provisioning terminates when the cell is capped. After hatching, which is less than 5 days after oviposition,the larvae feeds directly on the spider prey in a sequental manner until all the provisioned prey are consumed, during 7 to 10 days. At this time, the larvae constructs a cocoon with silk, and remains 8 to 10 months in this prepupal stage. The following summer, the prepupae molts into the pupae, and after several weeks, the adult emerges from the cocoon and chews its way out of the mud cell. The data suggest that this species is univoltine.

Previous studies in Argentina by Bruch (1930) and by Orfila and Salles (1928) have described the nesting behavior and certain ecological aspects of the wasp. The object of this study is to determine the mortality factors which attack each stage, following methodology developed by Danks (1971) and Freeman (1973).

MATERIAL AND METHODS

A total of 93 nests, containing a sum of 826 cells, of *S. asiaticum* were collected in the municipalities of Rio Claro, São Carlos, Araras,

Piracicaba, Ipeuna, Itiripina and Charqueada, state of São Paulo. Nests were generally collected from human structures, especially in rural areas.

Table 1. Life table for *Sceliphron asiaticum* in São Paulo, Brazil, givin causes of mortality and their impact at different life cycle stages.

Life cycle stage	Number entering each x (1x)	Mortality factors (dxF)	Number dying per x (dx)	(dx) as a% of (1x) (100qx)	1-(qx) (Sx)
Eggs	826	Chrysidid	57	6.90	0.931
		no egg	8	0.97	0.990
		other	49	5.93	0.941
		TOTAL	114	13.80	0.862
Larvae	712	prey shortage	6	0.84	0.991
		other	42	5.90	0.941
		TOTAL	48	6.74	0.932
Prepupae	664	Eulophoridae	53	7.98	0.920
		Bombyliidae	7	1.05	0.989
		other	79	11.89	0.881
		TOTAL	139	20.93	0.790
Pupae	525	Eulophoridae	39	7.43	0.925
		other	18	3.42	0.966
		TOTAL	57	10.86	0.891
Pre emergence adults	468	escape failure	5	1.07	0.989
		other	9	1.92	0.981
		TOTAL	14	2.88	0.971
Adults emerged		TOTAL	454		

Each cell of each nest was opened to determine the success or cause of mortality. This proved to be a useful technique as individuals which died during the course of their development, often from several generations, would be identified. Successfully emerging adults could be determined by the number of emergence holes and empty pupal cocoons which remained. The types of parasitoids present could also be determined by the type of puparia or cocoon and the size and number of emergence holes present. By other studies on other species of *Sceliphron*, it was also possible to determine the stage that a particular parasite attacked.

Based upon the collections made, only two, large parasites were documented, a chrysidid wasp and a bombylid fly, both of which left

emergence holes only half the size of emerging *S. asiaticum* adults. An extremely small eulorhid wasp was the only other parasite recorded. This wasp bores its way into the mud cells, and developing larvae often bore their way through adjacent cells. The small diameters of these borings give an accurate identification of the presence of this parasitoid.

A large fraction of observed mortality was not associated with parasite presence. This categori of mortality probably included disease as well as developmental failues, and no attemp was made to assess these non-parasitoid induced deaths.

RESULTS

The 826 cells used for the construction of the preliminary life table (Table 1), revealed that the causes of mortality varied with developmental stage. For all developmental stages, non- parasitoid mortality was important. This category includes developmental mortality as well as pathogens. For each stage, chrysidid mortality was the heaviest. While, for the prepupal stage bombyliid and eulophorid parasitism were important, and only eulophorid parasitism was important for the pupal stage (Table 1).

Overall developmental mortality was 54.96%, with each developmental stage contributing about equally to overall mortality (Table 1).

DISCUSSION

The results of this study compare favorably with the reported mortality during development for *Sceliphron assimile* in Jamaica (Freeman, 1973) and for the Australian *Sceliphron laetum* (Smith, 1979), which were 40% and 38.8% respectively. Danks (1971) reported

developmental mortality that varied from 50 to 60% for solitary acuelate wasps in England. Here, the 93 nests, presumably the labor of 93 females, produced 372 adults wasps, or a preliminary net reproductive rate of 4. If the sex ration is 1:1, then each female would produce 2 females, and assuming that the populations are stable, adult post-emergence mortality would be near 50%. The eulophorid parasite, although a strong mortality factor, was higly restricted, occurring in only 22 of the examined nests. No paterning of clumping was observed in the other parasites.

Smith (1979) argues that parasitism that is highly clustered should select for dispersal in *Sceliphron.* No proper dispersal strategy, however, can presently be postulated to minimize pathogen death. In all cases "other" causes of mortality were important, and probably were mostly pathogens. Whether these deaths were induced by pathogens of the provisioned prey or contimination by the provisioning female remains to be evaluated. This as well as a lack of suitable nesting sites and nest destruction by humans probably limit the population dynamics of this wasp in Southeastern Brazil.

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