

SEASONAL DISTRIBUTION AND SEX RATIO OF *MESAPAMEA STORAI* (REBEL), *PHLOGOPHORA METICULOSA* (L.) AND *SESAMIA NONAGRIOIDES* (LEFEBVRE) (LEPIDOPTERA: NOCTUIDAE) FROM SÃO MIGUEL (AZORES)

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The adult flight periods of *Mesapamea storai* (Rebel, 1940), *Phlogophora meticulosa* (Linnaeus, 1758) and *Sesamia nonagrioides* (Lefebvre, 1827) (Lepidoptera, Noctuidae) were studied between July of 1988 and December of 1989, at Ribeira Grande, Arribanas and Lagoa do Congro on the island of São Miguel, using Pennsylvania blacklight traps. While there was evidence of considerable fluctuations in density, two species were present continuously (*P. meticulosa*) or between September and December (*S. nonagrioides*) at the three locations. In contrast *M. storai* was only captured at the end of the Summer of 1988 and in the next Spring at Lagoa do Congro. For any given species both sexes were captured simultaneously, and in no case did the sex ratio deviate significantly from 1:1.

SILVA, MICHAEL, JOÃO TAVARES & VIRGÍLIO VIEIRA 1994. Distribuição sazonal e sex-ratio de *Mesapamea storai* (Rebel), *Phlogophora meticulosa* (L.) e *Sesamia nonagrioides* (Lefebvre) (Lepidoptera: Noctuidae) em São Miguel (Açores). *Arquipélago. Ciências Biológicas e Marinhas* 12A:57-62. Ponta Delgada. ISSN 0870-6581.

A curva de voo dos adultos de *Mesapamea storai* (Rebel, 1940), *Phlogophora meticulosa* (Linnaeus, 1758) e *Sesamia nonagrioides* (Lefebvre, 1827) (Lep., Noctuidae) foi estudada através de armadilhas luminosas do tipo Pensilvânia, instaladas em três localidades da ilha de São Miguel (Ribeira Grande, Arribanas e Lagoa do Congro), entre Julho de 1988 e Dezembro de 1989. Para as três localidades, foram evidenciadas flutuações de densidade consideráveis, sendo as espécies observadas continuamente (*P. meticulosa*) ou entre Setembro e Dezembro (*S. nonagrioides*). Contrariamente, *M. storai* foi capturada somente no fim do Verão de 1988 e na Primavera seguinte, isto na Lagoa do Congro. Para qualquer das espécies, ambos os sexos foram capturados simultaneamente, não se tendo verificado que o sex-ratio se desviasse significativamente de 1:1.

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INTRODUCTION

This paper is the second of a study of the family Noctuidae from São Miguel island (SILVA et al. in press).

This family includes numerous agricultural pest species (TAVARES 1989), which damages can be predicted indirectly by the study of the adult flight curve, obtained using the light or sexual trap technique (see VIEIRA et al. 1993).

The present paper is a contribution to the adult dynamics of *M. storai*, *P. meticulosa* and *S. nonagrioides* (subfamily Amphipyrinae). *P. meticulosa* and *S. nonagrioides* can present various generations per year and both are largely poliphagic species, with an Asiatic-Mediterranean and subtropical distribution, respectively (BALACHOWSKY 1972; CALLE 1982). The three species are reported for all the islands of the Azorean Arquipelago except *M. storai* which has not been recorded for Santa Maria and Graciosa and *S. nonagrioides* which is missing in Santa Maria (VIEIRA & TAVARES in press).

In order to evaluate the potential impact of these species on the regional agrosystem, a list of their host plants is also presented. The present work is a small contribution to a more global project: biological control program.

MATERIAL AND METHODS

According to the material and methods used by SILVA et al. (in press), the adult population dynamics of *M. storai*, *P. meticulosa* and *S. nonagrioides* were studied from July 1988 to December 1989 (i.e. 76 weeks), using Pennsylvania light traps placed at three locations in São Miguel island: Ribeira Grande (altitude 100 m, north coast), Arribanas (250 m, interior south-southwest) and Lagoa do Congro (550 m, interior south-southeast).

Each light trap, equipped with a TLD 18W lightbulb, was installed at the edge of a permanent pasture Poaceae field, lifted one metre from the ground. The captured specimens would fall into a container with 5 % formaldehyde to preserve the material. Adults were collected from trap-containers once a week. The biological material was washed, and the species of each adult examined. Records were made of species name, sex and date of capture for each specimen.

The number of captured adults per week for each species and location was determined, the sex ratio was computed as per week, and all the percentages of females and males were transformed by the arc-sin function, before applying a two factor analysis of variance.

Also, a bibliographic survey of the host plants of each studied Lepidoptera was undertaken.

RESULTS AND DISCUSSION

Mesapamea storai (Rebel)

During the studied period, *M. storai* only appeared at Lagoa do Congro (Fig. 1), with a maximum of 18 captured adults at the end of the Summer of 1988 and 3 in the next Spring.

The sex ratio was favourable to males in September of 1988 (55.6%) and in the next Spring (66.7%).

Its presence is more characteristic in the natural forest, specially of the central group of the Azorean islands (MEYER 1991). Moreover, it shows a preference for Poaceae (Table 1), and probably its small variety of preferred host plants is the reason for such a low frequency, as well as an indicator of little economic importance.

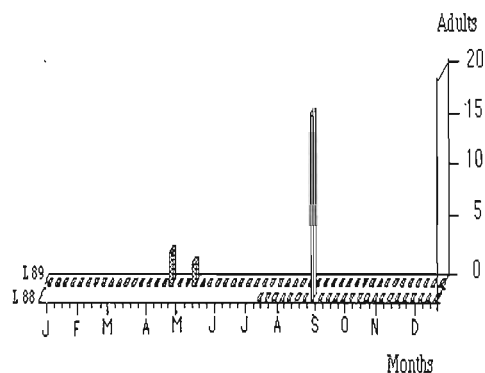


Fig. 1. Number of *M. storai* adults captured at Lagoa do Congro (L) from July of 1988 to December of 1989.

Phlogophora meticulosa (L.)

The total number of *P. meticulosa* adults captured in the light traps (Fig. 2) was relatively low, i.e. 14 adults at Ribeira Grande, 58 at Arribanas and 193 at Lagoa do Congro.

This species was present during the whole year at Arribanas and Lagoa do Congro, the major numbers being recorded from August to September. At Ribeira Grande the captures revealed lower numbers appearing more frequently from February to May and in September. A maximum of 30 adults appeared at Arribanas (Fig. 2).

Table 1

Host plants of *M. storai*, *P. meticulosa* and *S. nonagrioides* (according to PALHINHA 1966; BUES 1971; BALACHOWSKY 1972; OLIVEIRA & TAVARES 1981; CARNEIRO 1982; SILVA 1992). * Found on many species of this taxon; (#) Crops of cultural or economic interest cultivated in the archipelago; (+) Crops not cultivated in the region.

Crop Area	Host Plants	<i>M. storai</i>	<i>P. meticulosa</i>	<i>S. nonagrioides</i>
Vegetable	+ artichoke - <i>Cynara scolymus</i> L.		X	
	# lettuce - <i>Lactuca sativa</i> L.		X	
	+ leek - <i>Allium porrum</i> L.		X	
	# potato - <i>Solanum tuberosum</i> L.		X	X
	# carrot - <i>Datura stramonium</i> L.		X	
	# cale(s) - <i>Brassica oleracea</i> L.(vars, cvs)		X	
	+ spinach - <i>Spinacea oleracea</i> L.		X	
	# fava bean - <i>Vicia faba</i> L.		X	
	+ sunflower - <i>Helianthus annuus</i> L.		X	
	# strawberry - <i>Fragaria chiloensis</i> L.		X	
Industrial	# tomato - <i>Lycopersicum esculentum</i> Mill.		X	X
	# sugar beet - <i>Beta vulgaris</i> L.		X	
	+ sugar cane - <i>Saccharum officinarum</i> L.			X
	# tobacco - <i>Nicotiana tabacum</i> L.		X	
Fruit	# grape - <i>Vitis vinifera</i> L.		X	
	+ cherry - <i>Prunus avium</i> L.		X	
	# citrines - <i>Citrus</i> sp. (sps, vars, cvs)			X
	+ apricot - <i>Prunus armeniaca</i> L.		X	
	+ blackcurrant - <i>Rubus x loganobaccus</i> Bailey		X	
	# apple - <i>Malus domestica</i> L.		X	
	# pear - <i>Pyrus communis</i> L.		X	
Forestry	# grape - <i>Vitis</i> sp. (sps, vars, cvs)		X	
	# oak - * <i>Quercus</i> sp.		X	
Flower	+ * <i>Anemone</i> sp.; * <i>Betula</i> sp.;		X	
	+ * <i>Chrysanthemum</i> sp.; * <i>Dahlia</i> sp.;		X	
	+ * <i>Dianthus</i> sp.; * <i>Geranium</i> sp.;		X	
	+ <i>Helianthus annuus</i> L.; * <i>Primula</i> sp.;		X	
	# <i>Strelitzia reginae</i> Ait.;			X
	# * <i>Rhododendron</i> sp.; * <i>Rosa</i> sp.; * <i>Viola</i> sp.			X
	+ rice - <i>Oryza sativa</i> L.			X
Cereals	# oat - <i>Avena sativa</i> L.	X	X	X
	# barley - <i>Hordeum vulgare</i> L.	X		
	# maize - <i>Zea mays</i> L.			X
	# sorghum - <i>Sorghum italicum</i> L.			X
	# wheat - <i>Triticum aestivum</i> L.	X	X	X
Pastures	# * Poaceae (= Gramineae)	X		X
& Forages	<i>Agropyron repens</i> L.; * <i>Festuca</i> sp.;	X		
Weeds	* <i>Holcus</i> sp.; * <i>Lamium</i> sp.;	X		
	* <i>Azalia</i> sp.; * <i>Ciclamen</i> sp.; * <i>Helianthus</i> sp.;		X	
	* <i>Mercurialis</i> sp.; * <i>Rubus</i> sp.; * <i>Rumex</i> sp.;		X	
	<i>Stellaria media</i> L.; * <i>Urtica</i> sp.;		X	X
	<i>Arundo donax</i> L.; <i>Eluissine coracana</i> L.;			X
	<i>Panicum miliaceum</i> L.; * <i>Pennisetum</i> sp.;			X
	* <i>Phragmites</i> sp.;			X

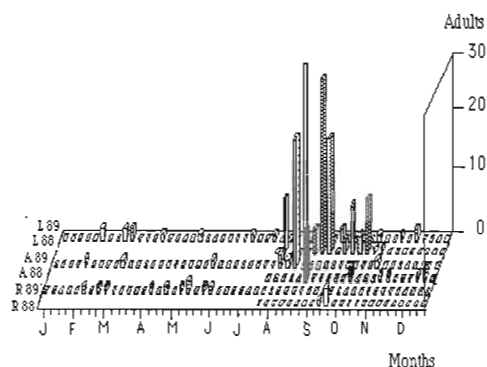


Fig. 2. Number of *P. meticulosa* adults at Ribeira Grande (R), Arribanas (A) and Lagoa do Congo (L), between July of 1988 and December of 1989.

The sex ratio was favourable to females at Arribanas (62.1%), while at Lagoa do Congo it was so for the males (74.1%), and at Ribeira Grande it was equal for the both (50%).

A two factor analysis of variance (capture places and number of males and females) shows significant differences among the three capture places ($F = 5.5$, $p = 0.004$), mainly between Ribeira Grande and Lagoa do Congo. In contrast, it did not happen between the sexes ($F = 0.1$, $p = 0.879$). For males and females of each locality significant differences were not found. The interaction between both factors is not significant ($F = 0.6$, $p = 0.567$).

The number of adults of *P. meticulosa*, although being rather low, shows differences between places at high and low altitudes. This species shows a large polyphagy, damaging many vegetable, industrial, fruit, flower, and cereal crops, as well as oak (Table 1). We can find a relation between some crops, growing in high altitude localities, and the appearance of adults. Although the larval nocivity is not important (BALACHOWSKY 1972), the relative abundance in its flight curve, joined to the polyphagy, lead to concern about local harm.

Sesamia nonagrioides (Lefebvre)

The total number of *S. nonagrioides* adults captured in the light traps (Fig. 3) was 49 at

Ribeira Grande, 125 at Arribanas and 135 at Lagoa do Congo. There was a maximum of 40 specimens at Lagoa do Congo, the highest numbers were found here and at Arribanas. At the three locations it begins to appear in September, occurring at Ribeira Grande till October, and at the other two till December.

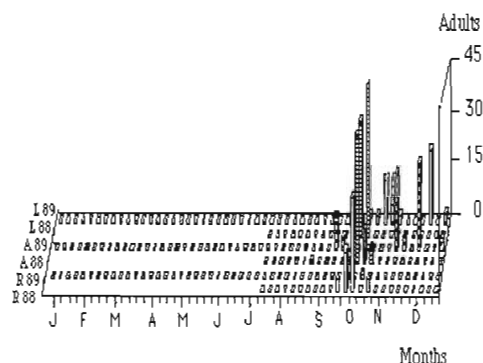


Fig. 3. Number of *S. nonagrioides* adults captured at Ribeira Grande (R), Arribanas (A), and Lagoa do Congo (L) from July of 1988 to December of 1989.

The sex ratio was favourable to females at Ribeira Grande (59.1%) while at Arribanas and Lagoa do Congo it was so for the males (53.6% and 57.8% respectively).

A two factor analysis of variance (capture places and number of males and females) shows no significant differences among the three capture places ($F = 1.8$, $p = 0.171$) or between the sexes ($F = 0.1$, $p = 0.765$). Also, the interaction between both factors is not significant ($F = 0.1$, $p = 0.872$).

The adult populations of *S. nonagrioides* do not show significant differences among the three localities, they show seasonally frequency and abundance centered on the colder period at the end of the year (Fig. 3). It is considered to have a very harmful larval phase (CARNEIRO 1970; BALACHOWSKY 1972; OLIVEIRA & TAVARES 1981) over potatoes, carrots, citrines, flowers, some Poaceae, sugar cane, cereals and pastures

and/or forages (Table 1), that belong to crop areas of regional economic importance.

Reflexion on the potential impact of these species

A study made for the three biotopes (SILVA 1992) reveals climatic values that permit the development of these species, allowing any phase of their life cycle at any place. Anyway, the observation of adult abundance increases in altitude: *M. storai* appears only at Lagoa do Congro; *P. meticulosa*, although with a maximum at Arribanas, shows a bigger relative abundance at Lagoa do Congro. However, *S. nonagrioides* shows decrease of abundance from Lagoa do Congro to Ribeira Grande. This relationship can be related to the plants present at each locality.

Analysing the host plants (Table 1), there is a large number of these present in the Azores. Although validation of the relationship between pests and plants has not been done, there are concrete references for *S. nonagrioides* in the region (OLIVEIRA & TAVARES 1981; CARNEIRO 1982). An observation of Table 1 together with frequency of the specimens (Fig. 1, 2 and 3) both reveal a relation between quantity of plants and number of adults present. The species that show greater adult abundance have a larger number of plants that can act as support, being able to damage the crops or live on the weeds during part of their life cycle. Thus it implies greater concern with their mobility in the agro-ecosystem, towards economical levels of attack, synchronizing the study between harmful phases of the pest and crop cycle and striving for a better management of the ecosystem under the perspective of biological control.

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