INVENTORY OF PARASITIC ORGANISMS OF THE STRIPED GRASS LOOPER, *MOCIS LATIPES* (LEPIDOPTERA: NOCTUIDAE), IN HONDURAS

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ABSTRACT

An inventory and biological information is given of 31 species parasitizing the four stages of *Mocis latipes* (Guenée) in south-central Honduras from 1988-1991. Twenty-one species are reported from *M. latipes* for the first time. Predominant species were *Sarcodexia sternodontis* Townsend, *Chetogena* sp., *Lespesia parviteres* (Aldrich & Webber), *Patelloa* sp., *Rogas nigristemmaticum* (Enderlein) and *Trichogramma pretiosum* Riley. The hyperparasites *Mesochorus* sp. and *Brachymeria* sp. were also reared. Multiparasitism by 4 primary parasitoids is discussed.

RESUMEN

Se presenta un inventario e informacion biologica de 31 especies que parasitan los cuatro estados de *Mocis latipes* (Guenee) en el sur-centro de Honduras de 1988-1991. Veinte y una especies son reportadas de *M. latipes* por Townsend, *Chetogena* sp., *Lespesia parviteres* (Aldrich & Webber), *Patelloa* sp., *Rogas nigristemmaticum* (Enderlein) y *Trichogramma pretiosum* Riley. Los hiperparasitos *Mesochorus* sp. y *Brachimeria* sp., tambien fueron criados. Se discute multiparasitismo por 4 parasitoides primarios.

The striped grass looper, *Mocis latipes* (Guenée), also known as the Guinea grass moth (Gibbs 1990), is a consumer of a wide range of graminaceous plants (see Dean 1985) from Florida to South America. Although eggs are usually deposited on low grasses (e.g. *Paspalum*, *Cynodon*, *Digitaria*, *Cenchrus*) (Ogonwolu & Habek 1975, pers. obs.), the voracious larvae may move to cultivated grasses (e.g. maize, sorghum, rice) and cause significant defoliation resulting in crop loss. Areas have been seen where graminaceous weeds were nearly eliminated by *M. latipes* and only stalks and midveins of maize plants remained (pers. obs.). In Honduras, eggs and larvae first appear in mid- to late-July. Populations persist through August, September and October, then begin to decrease in November until larvae are nearly non-existent at the beginning of December. After December, pupae can be occasionally seen still attached to host and nonhost plants by their silken cocoon.

Although insecticides are a frequent course of action to protect crops, natural enemies may prevent or retard the buildup and migration of large larval populations of *M. latipes*. Dean (1985) reviewed all the known literature on *M. latipes* parasitoids in the New World up to 1984. De Santis (1979, 1989) and King and Saunders (1984) listed species known to attack *M. latipes* south of the United States. Dos Santos (1989) recently discussed the species from Brazil and Gibbs (1990) noted two species from Barbados. Forty-seven species of parasitic flies and wasps are reported from the following families: Sarcophagidae (4), Tachinidae (16), Braconidae (5), Ichneumonidae (7), Chalcididae (9), Encyrtidae (2) and Eulophidae (4). Since 1989, only the ectoparasitic nematode *Noctuidonema guyanense* Remillet & Silvain, which attacks adults of the host, has been added to the list of organisms parasitizing *M. latipes* in the Americas (Rogers et al. 1990a, 1990b).

A systematic study of the natural enemies of *M. latipes* in Central America has never been done. The purpose of this paper is to report the results of an inventory of organisms parasitizing *M. latipes* in south-central Honduras and provide biological information useful in future studies directed at enhancing the effectiveness of *M. latipes*' natural enemies. Moreover, the data contribute to known species available for classical biological control.

MATERIALS AND METHODS

During 1988-1991, between 100 and 200 eggs, larvae of all instars and pupae of *M. latipes* were collected weekly at El Zamorano, Depto. Francisco Morazán, Honduras. Larvae were reared individually on freshly cut, young maize leaves in 30 ml plastic cups or in groups of 50 in 28 × 13 cm plastic boxes. Fresh food was provided every 2 days. Adult moths were collected on August 13 and 20, 1991 with an aerial net in grasses, the wings removed and the bodies preserved individually in glass vials containing formaldehyde. In the laboratory, the bodies were later sexed and the abdomen was gently massaged with an insect pin, after which the number of *N. guyanense* were counted with a stereoscope at 30X magnification.

Voucher specimens representative of all species are deposited in the Agroecological Inventory of the Crop Protection Department, Escuela Agrícola Panamericana.

Means of parasites per host were analyzed statistically with a one-way analysis of variance (ANOVA-1) using the MSTAT (1990) software program. Sex ratios were compared statistically using a pairwise comparison for test of homogeneity (Marascuilo & Serlin 1988).

RESULTS AND DISCUSSION

Species Composition/Relative Abundance

Twenty-nine primary insect parasitoids from 6 families and 2 parasitic nematodes from 2 families were found parasitizing all stages of *M. latipes*, including adults (Table 1). Four species parasitize the egg stage, 14 species parasitize and emerge from the larval stage, 11 species parasitize the larva but emerge from the host pupa, 1 species parasitizes the pupal stage and 1 species parasitizes the adult stage. The following are new records for this host: *Hexamermis* sp., *Campylochaeta* sp., *Chetogena* sp., *Eucelatoria* spp., *Linnaemya comta* (Fallen), *Cotesia marginiventris* (Cresson), *Diolcogaster* sp., *Homolobus truncator* (Say), *Rogas nigristemmaticum* (Enderlein), *Snellenius* sp., *Zelomorpha* sp., *Hyposoter* sp., *Corsoncus magus* (Cresson), *Microcharops anticarsiae* Gupta, *Scambus albitibia* (Morley), *Tricholabus lepidus* (Brullé), *Trichogramma atopovirilia* Oatman & Platner, *Trichogramma pretiosum* Riley, *Telenomus solitus* Johnson and *Telenomus* sp. *dalmanni* group. The predominant species, as determined by appearing in over 75% of the weekly samples, were *Sarcodexia sternodontis* (Townsend), *Chetogena* sp., *Lespesia parviteres* (Aldrich & Webber), *Patelloa* sp., *R. nigristemmaticum* and *T. pretiosum*. *Scambus albitibia* and *Pediobius* sp. appeared in over half the weekly samples in 1990, when *M. latipes* populations were exceptionally high, but were reared in only one or two samples in other years.

The ectoparasitic *N. guyanense* parasitized more moths on August 13 than on August 20. On the first date, 94% (n = 68) of female moths and 93% (n = 30) of male moths were infested, whereas on the second date, 51% (n=76) of female moths and 55% (n=22) of male moths were infested. No significant differences ($\alpha = 0.05$) in percent parasitism between sexes were detected. Mean ± SEM numbers of nematodes per infested moth on August 13 were not significantly ($F = 0.001$, df=1, $P > 0.05$) different for female (9.9 ± 1.3, maximum=54) and male (9.9 ± 1.9, maximum=39) moths. However, on August 20, mean ± SEM number of nematodes per infested male moth (14.4 ± 5.3, maximum=28) was significantly ($F = 5.283$, df=1, $P < 0.05$) greater than per infested female moth (6.4 ± 1.1, maximum=56). The biology of *N. guyanense* and its relationship with the host is not sufficiently understood in order to explain why this difference between sexes might occur. The parasitization rates found in this study are higher than what Rogers et al. (1990a) and Rogers et al. (1990b) found on *M. latipes* in French Guiana (9.1%, n=11) and the southeastern United States (37.8%, n=296), respectively. However, the mean number of nematodes per infested moth is considerably lower than the average of 69 nematodes per infested moth reported by Rogers et al. (1990b).

Alternate Hosts

Some of the parasitoids infrequently reared from *M. latipes* are common parasitoids of other hosts found in the same region. *Archytas marmoratus* (Townsend) is a common parasitoid of the fall armyworm, *Spodoptera frugiperda* (Smith) (Cave in press). Because this species larviposits, its infrequent parasitization of *M. latipes* may be due to reduced larviposition or larval survivorship on the drier, thinner leaves of low grasses where *M. latipes* lives, in contrast to the moister maize or sorghum whorl which the fall armyworm inhabits. *Cotesia marginiventris* is also a common larval parasitoid of the fall armyworm in the region. *Corsoncus magus* and *M. anticarsiae* frequently parasitize the velvetbean caterpillar, *Anticarsia gemmatalis* Hubner, on soybean during the same period of the year in which *M. latipes* larval populations exist (pers. obs.). *Brachymeria ovata* (Say) is a polyphagous species, parasitizing over 15 host species in the Neotropics (De Santis 1979, 1989). *Euplectrus* sp. is a common ectoparasitoid of many noctuid larvae inhabiting a wide range of host plants (pers. obs.).

Lespesia archippivora (Riley) is the most common larval parasitoid of the fall armyworm in Honduras (Cave In Press) and is reported by Labrador (1964) and King & Saunders (1984) to attack *M. latipes* in Venezuela and Central America, respectively. However, in the 4 years of my study not a single *L. archippivora* was reared, but a similar species, *L. parviteres*, was regularly encountered. Provided the previous records from Venezuela and Central America were not misidentifications, host habitat location and host finding studies may reveal why this species does not utilize *M. latipes* as a host resource.

Hyperparasites

Two hyperparasites were reared from *M. latipes* during the course of this study (Table 1). Hyperparasitism by *Mesochorus* sp. was rare as only 1 specimen was reared during the study. *Brachymeria* sp. parasitizes larvae of *L. parviteres* while the primary parasitoid feeds internally on its host; the hyperparasite emerges from the fly pupa. This species was collected only in 1990 and 1991. Approximately 10% of the *L. parviteres* pupae were parasitized by this chalcid wasp.

Multiparasitism

Multiparasitism is the phenomenon by which 2 or more parasitoids of different species simultaneously parasitize a host individual, often with only 1 parasitoid individ-

TABLE 1. INVENTORY OF NEMATODES, FLIES AND WASPS PARASITIZING *MOCIS LATIPES* (GUENÉE) IN HONDURAS.

Natural Enemy	Stage(s) Attacked[1]	Host Plants	Seasonality
Secernentea			
Mermithida			
Mermithidae			
Hexamermis sp.	L	*Digitaria* sp.	Jul-Sep
Aphelenchida			
Aphelenchoididae			
Noctuidonema guyanensis Remillet & Silvain	A		Aug-Sep
Insecta			
Diptera			
Sarcophagidae			
Sarcodexia sternodontis Townsend	L-P	*Eclipta alba* *Digitaria* sp. *Cynodon dactylon*	Jul-Sep
Tachinidae			
Archytas marmoratus (Townsend)	L-P	*Zea mays*	Oct
Atacta brasiliensis Schiner	L-P	*Sorghum bicolor* *Panicum maximum* *Zea mays*	Aug-Sep
Campylochaeta sp.	L	*Zea mays*	Aug
Chetogena sp.	L or L-P	*Sorghum bicolor* *Oryza sativa* *Cynodon plectostachyus* *Cynodon dactylon* *Panicum maximum* *Digitaria* sp.	Aug-Oct
Eucelatoria sp. 1	L	*Oryza sativa* *Digitaria* sp. *Cynodon dactylon*	Aug-Sep
Eucelatoria sp. 2	L	*Oryza sativa* *Digitaria* sp.	Aug-Sep
Lespesia parviteres (Aldrich & Webber)	L or L-P	*Sorghumbicolor* *Oryza sativa* *Zea mays* *Panicum maximum* *Paspalum* sp. *Digitaria* sp. *Cynodon dactylon*	Jul-Jan
Linnaemya comta (Fallen)	L-P	*Sorghum bicolor*	Aug
Patelloa sp.	L-P	*Sorghum bicolor* *Oryza sativa* *Panicummaximum* *Paspalum* sp. *Digitaria* sp.	Jul-Nov
Hymenoptera			
Braconidae			
Cotesia marginiventris (Cresson)	L	*Digitaria* sp.	Jul-Aug

TABLE 1. (Continued).

Natural Enemy	Stage(s) Attacked[1]	Host Plants	Seasonality
Diolcogaster sp.	L	*Zea mays* *Digitaria* sp.	Jul-Aug
Homolobus truncator (Say)	L	*Cynodon dactylon*	Aug
Microplitis sp.	L	*Oryza sativa* *Cynodon plectostachyus* *Cynodon dactylon* *Panicum maximum* *Digitaria* sp.	Jul-Oct
Rogas nigristemmaticum (Enderlein)	L	*Oryza sativa* *Zea mays* *Digitaria* sp. *Cynodon dactylon*	Aug-Sep
Snellenius sp.	L	*Digitaria* sp.	Jul-Aug
Zelomorpha sp.	L	*Digitaria* sp. *Cynodon dactylon*	Jul-Aug
Ichneumonidae			
Corsoncus magus (Cresson)	L-P	*Cynodon dactylon*	Aug
Hyposoter sp.	L	*Digitaria* sp.	Oct
Mesochorus sp.[2]	L	*Digitaria* sp.	Jul
Microcharops anticarsiae Gupta	L	*Digitaria* sp.	Aug
Scambus albitibia (Morley)	L-P	*Oryza sativa* *Digitaria* sp.	Jul-Sep
Tricholabus lepidus (Brullé)	L-P	*Sorghum bicolor* *Digitaria* sp. *Zea mays* *Oryza sativa* *Paspalum* sp.	Aug-Jan
Chalcididae			
Brachymeria ovata (Say)	P	*Sorghum bicolor* *Digitaria* sp.	Aug-Oct
Brachymeria sp.[2]	L-P	*Digitaria* sp.	Aug
Eulophidae			
Euplectrus sp.	L	*Zea mays*	Nov
Pediobius sp.	L-P	*Sorghum bicolor* *Digitaria* sp.	Sep-Dec
Trichogrammatidae			
Trichogramma atopovirilia Oatman & Platner	E	*Digitaria* sp. *Panicum maximum*	Aug
Trichogramma pretiosum Riley	E	*Digitaria* sp. *Cenchrus echinatus* *Cynodon dactylon*	
Scelionidae			
Telenomus solitus Johnson	E	*Digitaria* sp.	Aug
Telenomus sp. *dalmanni* group	E	*Panicum maximum*	Aug

[1]E = egg, L = larva, P = pupa, L-P = larval-pupal, A = adult.
[2]Hyperparasite.

ual surviving to adulthood. In October 1990, several cases of multiparasitism involving 4 species were observed. Seven larvae collected in the field but which later pupated in the laboratory produced both *S. albitibia* and *L. parviteres*. In all cases, only 1 *L. parviteres* emerged from each host. However, a variable number of *S. albitibia* emerged from each host. The number and sex ratio of *S. albitibia* from hosts with *L. parviteres* were compared with 7 other randomly selected hosts parasitized by *S. albitibia* only. A mean ± SEM of 5.7 ± 2.3 (range 2-10) *S. albitibia* emerged from hosts parasitized also by *L. parviteres*. A mean ± SEM of 9.7 ± 2.3 (range 1-24) *S. albitibia* emerged from hosts not parasitized by *L. parviteres*. Although the hosts parasitized by only *S. albitibia* produced 28 more of the ichneumonids than multiparasitized hosts, no significant difference ($F=1.497$, $df=1$, $P \geq 0.05$) was detected between the means of number of wasps produced per host. This was due to high variability in the number of wasps emerging per host. However, the sex ratio of *S. albitibia* from hosts parasitized by only the ichneumonid favored males 2.2:1.0, which varied significantly ($P \leq 0.05$) from the 0.9:1.0 ratio observed for *S. albitibia* emerging from multiparasitized hosts.

In other cases of multiparastism, a single *L. parviteres* and a single *Chetogena* sp. emerged from each of three host larvae. Additionally, from each of 2 host larvae emerged 2 and 3, respectively, *L. parviteres* and 1 *S. sternodontis*. Frequently 2 to 4 *L. parviteres* emerged from a single larva or pupa. However, it was not ascertained if these were cases of simultaneous parasitization of a host individual by 2 or more parasitoids from the same or different females.

Conclusions

Mocis latipes is attacked by a large complex of parasitic organisms. This diversity may explain in part why this insect is an occasional pest in maize, sorghum, rice (King & Saunders 1984) and pasture grasses (Gibbs 1990). The suitability of *M. latipes* as a host for *T. pretiosum* shows that this insectary-reared egg parasitoid may be useful for effectively controlling the pest in the egg stage. Tachinid flies appear to dominate the larval parasitoid guild as shown in this study and that of Jones & Wolcott (1922), who observed that 90% of the larval parasitism of *M. latipes* in Puerto Rico was accounted for by *Helicobia helicis* Townsend, *Linnaemyia fulvicauda* Walton and *Phorocera claripennis* Macquart. Therefore, in a classical biological control program, tachinid flies may offer the best prospects. However, more information is needed on the host specificity of these organisms and their synchronization with host populations.

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