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BIOLOGY OF *SIMYRA HENRICI* (LEPIDOPTERA: NOCTUIDAE) IN SOUTHWEST FLORIDA

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ABSTRACT

Field and laboratory studies on the life history of *Simyra henrici* were conducted to determine some aspects of its population dynamics, host specificity and associated parasites in southwest Florida. The seasonal occurrence of immature *S. henrici* feeding on *Typha* at three sites in Lee County Florida was monitored for a two year period. Eight species of parasites representing six families were reared from field collected eggs, larvae and pupae of which four represent new parasite records for *S. henrici*. The seasonal occurrence of the parasites and other behavioral associations with the host *S. henrici* were also determined. Tests with second and fifth instar larvae on five species of plants indicated that *S. henrici* can complete development on *Polygonum hydropiperoides* and *Salix caroliniana* in addition to its more common host plant *Typha* spp. The duration of the immature life stages for *S. henrici* reared on *Typha* was determined in the laboratory and head capsule width and body length measurements were made on larvae. The number of eggs oviposited in the laboratory ranged from 326-1703 per female. The potential for manipulating *Typha* density by a mass release of *S. henrici* is considered minimal.

RESUMEN

Se hicieron estudios de campo y de laboratorio sobre la historia de la vida de *Simyra henrici* para determinar algunos aspectos del dinamismo de su población, especificidad de su hospedero, y sus asociados parásitos en el suroeste de la Florida. La incidencia estacional de inmaduros de *S. henrici* alimentandose de *Typha* en 3 lugares del condado de Lee en la Florida, fue observado por un período de 2 años. Ocho especies de parásitos representando a 6 familias, fueron criadas de huevos, larvas, y pupas colectadas del

campo, de las cuales 4 representan nuevos records de parásitos de *S. henrici*. También se determinó la incidencia estacional de los parásitos y otras asociaciones de comportamiento con el hospedero *S. henrici*. Pruebas con larvas en el segundo y quinto estadío con cinco especies de plantas, indicaron que *S. henrici* puede completar su desarrollo en *Polygonum hydropiperoides* y *Salix caroliniana*, además de su mas común planta hospedera, *Typha* spp. Se determinó en el laboratorio la duración de las etapas de la vida de los inmaduros de *S. henrici* criados en *Typha*, y también se tomaron medidas de las cabezas y del largo del cuerpo de las larvas. En el laboratorio, el número de huevos por hembras varió de 326 a 1703. Se considera mínimo el potencial de manipular la densidad de *Typha* con liberaciones masivas de *S. henrici*.

The noctuid moth *Simyra henrici* (Grt.), previously referred to as *Arsilonche albovenosa* Goeze, is widely distributed in North America and is a common member of the insect fauna on *Typha* spp. Brief descriptions of all life stages can be found in the early literature but very little information exists on the ecology or life history of *S. henrici*. Damage to *Typha* by *S. henrici* feeding, mostly at the distal leaf margin, gives the plants a ragged appearance. Observations of extensive feeding by *S. henrici* larvae on *Typha* in and around certain central Florida lakes have also been made. Larvae of *S. henrici* were identified as being responsible for a dramatic elimination of emersed *Typha* leaves covering at least two hectares during late summer on Lake Parker (Mr. Paul Myers, Pers. Comm.).

The genus *Typha* is a common wetland plant native to all of North America and is composed of four species, *angustifolia*, *domingensis*, *glauca* and *latifolia*. They are referred to collectively as cattails. Cattails serve as food and habitat for wildlife and play an important part in the energy and nutrient budgets in many types of aquatic systems. However, extensive cattail growths cause problems in such situations as irrigation ditches and canals where water flow can be impeded (Cary 1982, Davis 1984). Despite reports of *S. henrici* as a general feeder (Smith & Dyar 1898, Claassen 1921, and Crumb 1956), I have never observed it on plants other than *Typha* spp. The purpose of this study was to determine the laboratory biology of *S. henrici*, host specificity, seasonal occurrence, and parasitism. The potential of *S. henrici* as a biological control agent of *Typha* is also considered.

Materials and Methods

Immature stages of *S. henrici* were collected from *Typha* every other week during 1980 and 1981 at three canal sites located in western Lee County. Larvae and pupae collected by hand during a 5 minute period along the same narrow stand of *Typha* (100-150m in length) at each site were taken to the laboratory in plastic bags and placed individually in clear plastic petri dishes (100 X 20 mm). Larvae in petri dishes were reared on fresh *Typha* until pupation. Parasites emerging from larvae and pupae were stored for later identification.

To determine the duration of the immature stages, several adults reared from field collected pupae were allowed to mate and oviposit on *Typha* in a 1 ft^3 cage. Shortly after eclosion, 30 larvae were placed individually on fresh *Typha* in separate plastic petri dishes (100 X 20 mm) and observed daily until adult emergence. Fresh *Typha* was provided daily. Mean maximum and minimum temperatures in the laboratory were 27.7°C and 26.4°C, respectively. The photoperiod was maintained at 12 hours for the duration of the study. Measurements of freshly molted head capsules were made with the ocular micrometer of a dissecting microscope. Larval length measurements were made on field and laboratory reared larvae killed in boiling water.

In a separate study dealing with larval host specificity, field collected second and fifth instar larvae were placed on one of five different plant species (*Typha* sp., *Polygonum hydropiperoides* Michx., *Cephalanthus occidentalis* L., *Panicum repens* L. and *Salix caroliniana* Michx.) reported as food plants in the early literature on *S. henrici*. The second instar larvae were selected from an aggregated group probably resulting from a single egg mass. Fifth instar larvae were selected from individuals scattered along a 200m long stand of *Typha* probably resulting from numerous egg masses. Two second instar larvae were placed in a 6 oz. wax-lined paper cup with a fresh apical portion of plant material which was changed daily. Each cup was loosely covered with a plastic lid. There were five replicates for each plant species. The same procedure was used for fifth instar larvae except that only one individual was used per cup. Observations were made daily to determine the number of larvae starving or completing development. A 12 hour photoperiod was maintained for this segment of the study and the temperature ranged from 22-26°C. To determine the number of eggs oviposited, four pairs of adults were isolated in separate aluminum pie pans with fresh *Typha* and covered with a glass plate. Eggs were removed and counted daily.

Results and Discussion

Data for seasonal occurrence of *S. henrici* larvae, pupae, and their parasites collected during 1980 and 1981 are illustrated in Figures 1 and 2. Larvae can generally be found on *Typha* every month of the year in soutwest Florida. Based on the fluctuations in the number of larvae collected monthly, it appears that at least three and possibly four generations occurred during 1980. During January 1981, the relatively cold temperatures, frequency of frost, and resulting host plant deterioration was probably responsible for the low population compared to 1980 levels. Subsequent population buildup with a pattern of peaks associated with multiple generations was not evidenced during 1981.

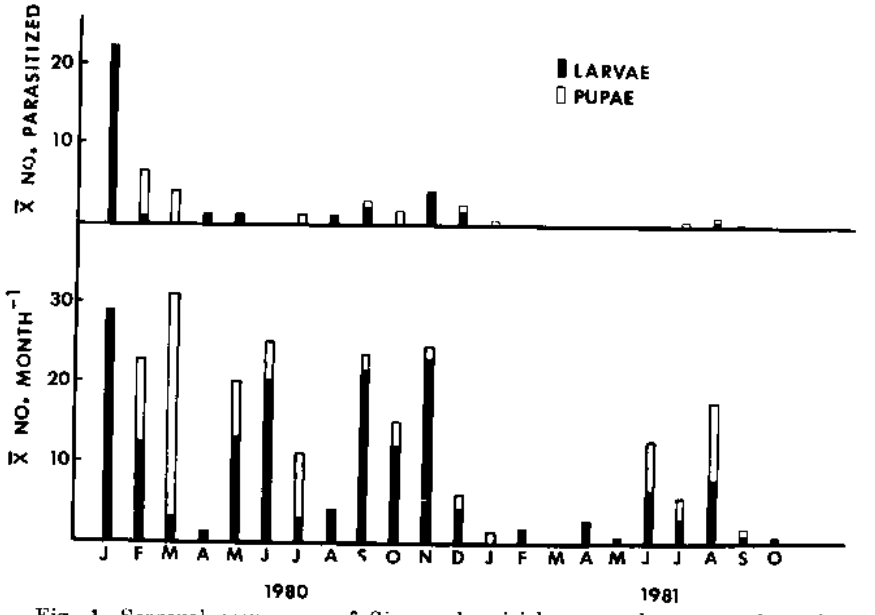

Fig. 1. Seasonal occurrence of *Simyra henrici* larvae and pupae and number parasitized during 1980 and 1981 at three sites in Lee County, Florida.

The mean number of larvae parasitized is likely an underestimate since larvae collected at early and mid-instar stages haven't had the same length of exposure to parasitism as those larvae left to continue development in the field. Pupal parasitism mostly by *Brachymeria robusta* (Cresson), was relatively high ranging from 13 to 66% during 1980. Parasitism of both larvae and pupae was relatively low during 1981, possibly resulting from relatively low host density and irregular population fluctuations. Eight species of parasites representing six families were found to be associated with either the egg, larval or pupal stage of *S. henrici* in this area (Table 1). Four of the parasite species are new records for *S. henrici*. A summary of previously reported parasite species associated with *S. henrici* are listed in Table 2. Obviously *S. henrici* is susceptible to a broad range of parasites (16 species representing 6 families and 2 orders) over most of its range. For this reason, *S. henrici* probably could not be used for biological control of *Typha*. A mass release of laboratory reared moths or larvae into a target area in south Florida during May to July when parasitism of *S. henrici* is minimal (Figure 2) might have a chance of reducing *Typha* density, but the response of associated parasites would probably prohibit any further increase in the *S. henrici* population, especially from August through December (Figure 2). Such a short term reduction of *Typha* by *S. henrici* may not be as economical as more conventional approaches (e.g. aquatic herbicides) where areas to be controlled can be more accurately treated and beneficial areas spared. However, *S. henrici* might be valuable for *Typha* control in countries where it does not now occur and its parasites are not present.

On *Polygonum* and *Salix* at least 20% of the 2nd and 5th instar larvae completed development through pupation (Table 3). Larval mortality was 100% on both *Cephalanthus occidentalis* and *Panicum repens* which contradicts reports that *C. occidentalis* and grasses are host plants of *S. henrici* (Thaxter 1877, Smith and Dyar 1898, Claassen 1921, Crumb 1956). *Typha* is probably the preferred host plant but the host range of *S. henrici* is not narrow enough to warrant its manipulation for control of *Typha* at least in south Florida. Further host range research should be conducted with *S. henrici* from other geographic locations before any attempt is made to manipulate *S. henrici* as a

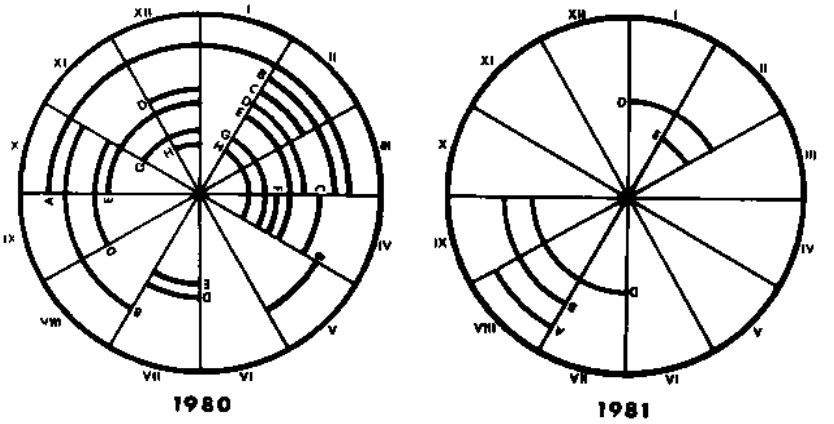

Fig. 2. Seasonal occurrence of parasites reared from *Simyra henrici* during 1980 and 1981. A. Tachinidae, *Spoggosia floridensis* (Townsend); B. Braconidae, *Rogas stigmator* (Say); C. Braconidae, *Cotesia scitula* (Riley); D. Chalcidae, *Brachymeria robusta* (Cresson); E. Pteromalidae, *Pteromalus* sp.; F. Scelionidae, *Telenomus* sp.; G. Ichneumonidae, *Itoplectis conquisitor* (Say); H. Ichneumonidae, *Gambrus ultimus* (Cresson).

TABLE 1. PARASITE ASSOCIATIONS WITH *Simyra henrici* IN SOUTHWEST FLORIDA.

Parasite Species	Host Stage Parasitized	No. Individuals Per Host	Site of Parasite Pupation	$\bar{x}$ No. Days (range) For Parasite Emerg. From Date Collected	Other Species of Parasites in Same Host	Occurrence
Tachinidae						
Spoggosia floridensis[b]	larva	1-2	external	26.5 (15-51)	—	Common
Braconidae						
Rogas stigmator	larva	to 29	internal[a]	14.9 (5-25)	*Pteromalus* sp.	Common
Cotesia scitula	larva	to 93	external	39.5 (34-45)	—	Common
Chalcidae						
Brachymeria robusta[b]	pupa	1	internal	22.5 (14-37)	—	Common
Pteromalidae						
Pteromalus sp.[b]	larva	to 120	internal	10.4 (3-23)	*Rogas stigmator*	Common
Scelionidae						
Telenomus sp.[b]	egg	1	internal	—	—	Rare
Ichneumonidae						
Itoplectis conquisitor	pupa	1	internal	12.5 (8-17)	—	Occasional
Gambrus ultimus	pupa	1	internal	10.0 (7-13)	—	Rare

[a]Within the host
[b]New parasite record for *S. henrici*

TABLE 2. PARASITES OF *Simyra henrici* REPORTED FROM OTHER LOCATIONS.

Parasite		Life Stage	Location/Month	Reference
Braconidae,	*Rogas stigmator* (Say)	larva	London, Ont./Sept.	Judd 1952
	"	larva	Bozeman, Mont./Aug.	Cole 1931
	"	—	—	Krombein et al. 1979
	Microplitis quadridentalis (Prov.)	larva	London, Ont./Sept.	Judd 1952
	Blacus sp.	larva	Monroe, Mich./July	Cole 1931
	Microbracon sp.	larva	"	"
	Macrocentrus ancylivora Roh.	pupa	"	"
	Apanteles scitulus Riley	—	—	Krombein et al. 1979
	Microplitis quadridentatus (Provancher)	—	—	"
Ichneumonidae,	*Iseropus coelebs* (Walsh.)	pupa	Monroe, Mich./July	Cole 1931
	Iseropus stercorator orgyiae (Ashmead)	—	—	Krombein et al. 1979
	Itoplectis conquisitor (Say)	—	—	"
	Gambrus ultimus (Cresson)	—	—	"
Tachinidae,	*Eutritochaeta* sp.	larva	London, Ont./Sept.	Judd 1952
	Exorista larvarum L.	larva	Roberts, Idaho/Aug.	Cole 1931

TABLE 3. NUMBER PUPATING AND PERCENT EMERGENCE OF *Simyra henrici* LARVAE ON VARIOUS FOOD PLANTS.

Food Plant	Second Instar			Fifth Instar		
	No. and (%) Reaching 7th Instar	No. and (%) Pupating	No. and (%) Emerging	No. and (%) Reaching 7th Istar	No. and (%) Pupating	No. and (%) Emerging
Typha sp.	9(90)	5(50)	2(20)	5(100)	5(100)	4(80)
Polygonum hydropiperoides	3(30)	2(20)	2(20)	5(100)	5(100)	5(100)
Cephalanthus occidentalis	0	0	—	0	0	—
Panicim repens	0	0	—	0	0	—
Salix caroliniana	7(70)	6(60)	4(40)	4(80)	4(80)	1(20)

TABLE 4. DURATION OF LIFE STAGES, HEAD CAPSULE AND LARVAL LENGTH MEASUREMENTS OF LABORATORY REARED *Simyra henrici*.

Life Stage	Duration in Days ♂ x̄	♂ SD	♂ n	♀ x̄	♀ SD	♀ n	Head Capsule measurements (width mm) x̄	Sd	n	Length (mm)	n
Egg[a]	5.0	0	34	5.0	0	34					
Larval Instar 1	3.0	0	7	3.0	0	20	0.37	0.01	20	1.5- 2.3	20
2	2.85	0.37	7	3.45	1.14	20	0.56	0.02	19	3.4- 4.9	12
3	3.85	1.46	7	4.15	1.93	20	0.89	0.04	21	8.9-10.6	7
4	4.71	1.49	7	4.45	1.27	20	1.50	0.16	31	9.0-13.0	7
5	3.42	0.78	7	3.60	0.50	20	2.20	0.11	32	18.0-23.0	4
6	4.28	0.48	7	4.80	1.05	20	2.88	0.16	29	23.0-32.0	10
7	8.71	0.75	7	9.30	3.19	20	4.06	0.42	12	36.0-53.0	12
Pupa	13.50	0.78	7	15.15	6.29	20					
Total Development	49.28	2.56	7	53.40	7.11	20					

[a]Sex was not determined

biological control agent. The possible existence of *S. henrici* biotypes (host races) may account for some of the variability in host records for *S. henrici*.

The duration of life stages, head capsule and larval length measurements are listed in Table 4. Total development times for males and females averaged 49.28 and 53.40 days respectively. These data would indicate that four generations per year would be possible in this area. Claassen 1921 reports that *S. henrici* has one or two generations per year in the northeastern United States. Oviposition by females from isolated pairs in the laboratory occurred during a one or two day period with total eggs oviposited ranging from 326-1703 per female.

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