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Observations on the Biology of the Moth, *Samea multiplicalis*,[1] on Waterlettuce in Argentina[2]

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ABSTRACT

Samea multiplicalis (Guenée) had 3 generations in the field in Argentina, with population peaks in December, February, and May. Populations reached a maximum of 5.0 larvae and 1.2 pupae per plant. In laboratory tests, adults laid 99.3% of the eggs on waterlettuce (*Pistia stratiotes* L.) and medium to large larvae fed on 6 of 15 plant species tested, although *S. multiplicalis* has never been reported as a pest of cultivated plants in Argentina. Larvae caused heavy but sporadic damage to waterlettuce in the field; in most years larval populations were held at low levels, apparently by parasites.

INTRODUCTION

Waterlettuce (*Pistia stratiotes* L.), an aquatic weed of considerable importance in many tropical and subtropical areas of the world (13), can possibly be controlled with insects that attack it in South America (3). The site of origin of waterlettuce is unconfirmed. The plant has been distributed widely since antiquity and Pliney refers to its use in Egypt in A.D. 77 (13). However, the occurrence of insects in South America that appear to have waterlettuce as their only host points to a probable South American origin for the plant. Two of these insects, the weevils *Neohydronomus pulchellus* Hustache and *Argentinorhynchus bruchi* Hustache were previously studied by our group (4, 8). The pyralid moth, *Samea multiplicalis* (Guenée), that apparently is also of South American origin, damages the plant in South America and in Florida. Silveira-Guido[4] mentioned the moth in Uruguay and Bennett (1, 2, 3) observed it damaging *Salvinia* and waterlettuce in the southern United States and throughout northern South America and Trinidad. In the laboratory, it fed to a lesser extent on duckweed (*Lemna* sp.) and waterhyacinth (*Eichhornia crassipes* [Mart.] Solms) (1). Knopf and Habeck (11) reported the detailed life history and compared ovipositional preference and larval development on *Pistia, Salvinia,* and *Azolla* in Florida. The moth is under consideration for biological control of *Salvinia* and waterlettuce in Africa and Asia (3).

The following biological observations were made in Argentina during the course of the waterhyacinth investigations to evaluate the potential of *S. multiplicalis* for biological control of waterlettuce.

[1]Lepidoptera: Pyralidae, Pyraustinae.

[2]Part of this research was done by the 2nd author as a school science project. The remainder of the work was supported by funds from the Office of the Chief Engineer, Water Resources Div., District of Civil Works, Washington, D.C.

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[4]Silveira-Guido, A. 1965. Natural enemies of weed plants. Final report. Unpubl. Report, Dept. Sanidad Vegetal, Univ. de la Republica, Montevideo, Uruguay. 128 pp.

METHODS AND MATERIALS

Field populations were measured in a drainage canal completely covered with waterlettuce near the town of Dique Luján on the Río Paraná, 46 km NW of Buenos Aires. Samples were taken occasionally during 1972-73 and once or twice monthly during 1975-76; insufficient populations were found during 1973-74 and 1974-75 to be meaningful. In each sample, 10 or 20 plants were dissected and the number of larvae and pupae were counted. Ovipositional specificity was measured in a test in which 25 newly emerged to one-day-old adults (unknown numbers of each sex), reared from larvae and pupae collected in the field, had a choice of 14 plant species for 3 days. The adults emerged in a common container and mated before the tests began. The test was made in an inverted glass aquarium 36 X 28 X 35 cm in the laboratory at room temperature; the cage was placed in front of a window for natural photophase. The stems of the plants extended through holes in the wooden bottom into a pan of hydroponic solution (described by DeLoach 1976).

The larval host specificity test was conducted in 5 cm diam X 20 cm high clear acrylic tubes with screen tops. The stems of the test plants extended through holes in the bottom into hydroponic solution. The floating plants (*Lemna*) were held in a petri dish on wet filter paper. Two replications were made, each with one medium-sized larva that was held on one test plant until it pupated or died. The test was made in a cabinet at 25° ± 2° C and 14 hr photophase. The larvae and plants were examined daily and the amount of feeding was measured on a 1-mm² grid.

The following 15 plant species were included in the host specificity studies: Monocotyledonae: Typhaceae—*Typha latifolia* L. (cattail); Alismaceae—*Sagittaria montevidensis*

Cham. & Schlecht. (arrowhead); Graminae—*Oryza sativa* L. (rice); Araceae—*Pistia stratiotes* L. (waterlettuce); Lemnaceae—*Lemna* sp. (duckweed); Commelinaceae—*Commelina tuberosa* L. (day flower), *Zebrina pendula* Schnizl. (wandering jew); Pontederiaceae—*Pontederia cordata* L. (pickerelweed), *P. rotundifolia* (L.f.) Castell. (tropical pickerelweed), *Eichhornia crassipes* (Mart.) Solms-Laubach (waterhyacinth), *E. azurea* (Swartz) Kunth (anchored waterhyacinth); Dicotyledoneae: Amaranthaceae—*Alternanthera philoxeroides* (Mart.) Griseb. (alligatorweed); Cruciferae—*Brassica oleraceae* L. (capitata group) (cabbage); Umbelliferae—*Hydrocotyle ranunculoides* L. (water pennywort); and Compositae —*Lactuca sativa* L. (lettuce).

Voucher specimens of *S. multiplicalis* and its parasites were deposited in museums of the Systematic Entomology Laboratory, USDA-SEA-AR, Beltsville, MD, the Florida State Collection of Arthropods, Division of Plant Industry, Gainesville, FL, and the Universidad Nacional de La Plata, Argentina.

RESULTS AND DISCUSSION

The adults of *S. multiplicalis* are tan with dark markings on both the fore and hind wings; the females are lighter than the males, especially on the fore wings. The wingspan is ca. 17 mm (Fig. 1).

Eggs were laid on the leaves; 89 of the 284 total eggs were laid on the lower and 195 on the upper leaf surface. Adults laid all but two of a total 286 eggs on waterlettuce among the 14 plants included in a multiple choice test (Table 1).

The larvae fed inside the spongy leaf tissue and killed the plant bud (Fig. 2). In the no-choice larval feeding test, larvae fed most on waterlettuce, much less on duckweed, day flower, waterhyacinth, tropical pickerelweed, and cabbage, and none on the other six plant species (Table 1). Pupae were obtained from all of thse plants except day flower, but some of the larger larvae used might have pupated without feeding, especially those on cabbage that became prepupae after the first day; emergence of adults was not recorded.

S. multiplicalis had three generations a year in the field. A large population, probably the 1st generation, damaged nearly all of the plants in mid-December 1972 at the Campana lagoon that caused an estimated 75% die-back of the stand. Although we expected a still larger 2nd generation in February, we found only a few larvae and most of them were parasitized by the wasps, *Apanteles* sp. (the more abundant) and *Podogaster* sp.[5] Population measurements were not made at this time. Periodic sampling in the summer of 1975-76 revealed two population peaks, that of the 2nd generation in mid-February and of the 3rd generation in May. Peak populations were 3.4 larvae and 1.7 pupae per plant in the 2nd generation and 5.0 larvae and 1.2 pupae per plant in the 3rd generation.

S. multiplicalis is not listed among insects attacking agricultural plants in Argentina (9, 10, 12) or in Brazil (5). In our tests, it laid all but two of its eggs on waterlettuce, and in the tests of Knopf and Habeck (11) it also oviposited on *Salvinia* and *Azolla,* plants that are also troublesome aquatic

[5]Identified by Luis DeSantis, Universidad Nacional de la Plata, Argentina.

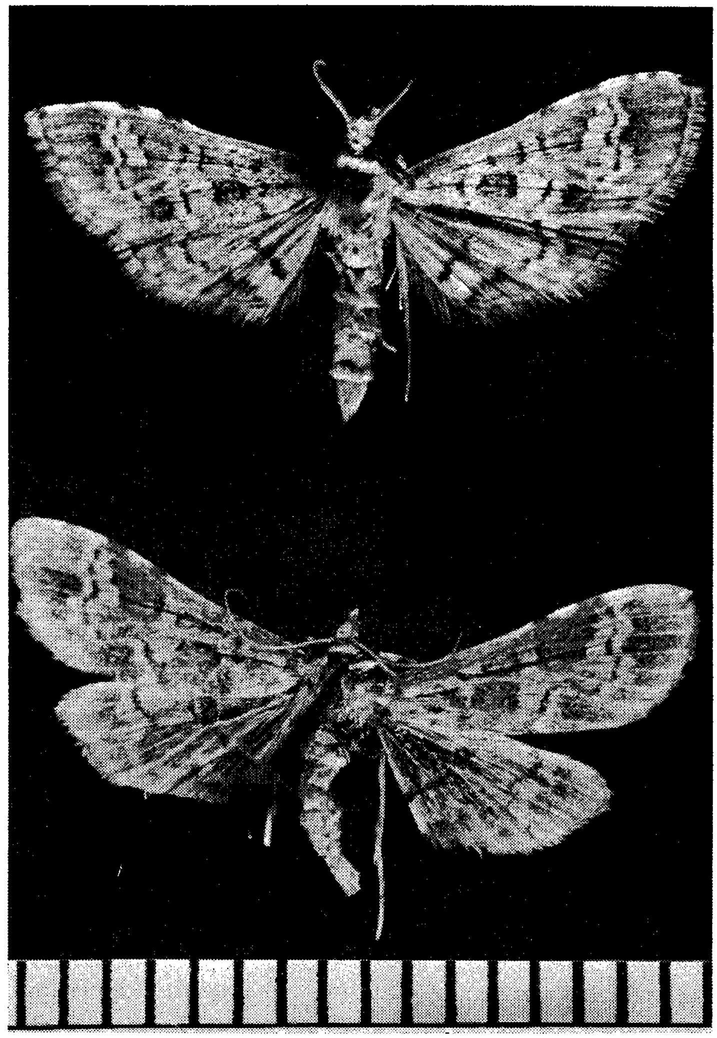

Figure 1. Adult male (top) and female (bottom) of *Samea multiplicalis* (scale in mm).

TABLE 1. LARVAL FEEDING AND OVIPOSITIONAL PREFERENCE OF *Samea multiplicalis* ON VARIOUS TEST PLANTS.

Test plant	Larval feeding[a] Larval days in test	Total feeding (mm^2)	Feeding/ larva per day (mm^2)	Number eggs laid[b]
Cattail	—	—	—	0
Arrowhead	2	0	0	0
Rice	—	—	—	0
Waterlettuce	8	2025	253	284
Duckweed	3	288	96	—
Day flower	1	50	50	0
Wandering jew	3	0	0	0
Pickerelweed	2	0	0	0
Tropical Pickerelweed	5	200	40	0
Waterhyacinth	4	202	50	0
Anchored waterhyacinth	2	0	0	0
Alligatorweed	6	0	0	0
Cabbage	4	80	20	0
Water pennywort	1	0	0	2
Lettuce	—	—	—	0

[a] Two replications, each with one medium sized larva on one plant species until it died or pupated. Plants labed (—) were not included in indicated tests.

[b] Total eggs laid by 25 newly emerged to one-day-old moths (mixed ♂ and ♀) in a cage together with all test plants for three days.

Figure 2. Full-grown larva of *Samea multiplicalis* and damage caused to the bud of a waterlettuce plant.

weeds in many areas (13). In our tests, larvae fed on six plants other than waterlettuce. The medium to large larvae that we used probably fed a limited amount on several plants on which they would be unable to complete their entire life cycle, and day flower and cabbage probably are not host plants in nature. Also, the small size and the physical structure of duckweed probably prevent it from being a natural host plant. However, further tests should be made to measure larval feeding and survival on different host plants before introducing *S. multiplicalis* outside its native range.

The field populations we found appear to have reached an equilibrium in which the insect population is usually controlled at a low level by parasitoids and only sporadically can sufficient numbers escape them to produce populations large enough to cause heavy damage to the plant. The observations also indicate that *S. multiplicalis* has the potential to greatly reduce stands of waterlettuce in the field, and if introduced into other areas of the world where it would not be attacked by parasites, it probably would give good control of the plant.

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