Observations on the Biology of the Moth, Samea multiplicalis,

on Waterlettuce in Argentina

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ABSTRACT

Samea multipticalis (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 99.5% of the eggs on waterlettuce (Pistia stratiotes L.)
and medium to large larvae fed on 6 of 15 plant species
tested, although S. multipticalis 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 (15), 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 Pliny refers to its use
in Egypt in A.D. 77 (13). However, the occurrence of in-
sects 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 Neohy-
dromonous pulchellus Hustace and Argentinorhyynchus
bruchi Hustace were previously studied by our group (4,
8). The pyralid moth, Samea multipticalis (Guenée), that
apparently is also of South American origin, damages the
plant in South America and in Florida. Silveira-Guido
mentioned the moth in Uruguay and Bennett (1, 2, 3) ob-
served 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 (Lemma sp.) and waterhyacinth (Eichhornia
crassipes [Mart.] Solms) (1). Knopf and Habeck (11) re-
ported the detailed life history and compared ovipositional
preference and larval development on Pistia, Salvinia, and
Asolla in Florida. The moth is under consideration for bi-
ological control of Salvinia and waterlettuce in Africa and
Asia (3).

The following biological observations were made in
Argentina during the course of the waterhyacinth investiga-
tions to evaluate the potential of S. multipticalis for bi-
ological control of waterlettuce.

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 popula-
tions were found during 1973-74 and 1974-75 to be mean-
ingful. In each sample, 10 or 20 plants were dissected and
the number of larval and pupal 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 specificit 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 bot-
tom into hydroponic solution. The floating plants (Lemma)
were held in a petri dish on wet filter paper. Two replica-
cations 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

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1Lepidoptera: Pyralidae, Pyraustinae.
2Part 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.
3Present address: USDA, Science and Education Administration,
Agricultural Research, Grassland, Soil and Water Research Laboratory,
P.O. Box 746, Temple, TX 76501.
4Silveira-Guido, A. 1969. Natural enemies of weed plants. Final re-
port, Unpubl. Report, Dept. Sanidad Vegetal, Univ. de la Republica,
Montevideo, Uruguay, 128 pp.
Cham. & Schlecht. (arrowhead); Graminae—Oryza sativa L. (rice); Aracée—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); Dicotyledonae: Amaranthaceae—Alternanthera philoxeroides (Mart.) Griseb. (alligatorweed); Cruciferae—Brassica oleracea 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 these plants except day flower, but some of the larger larvae used might have pupated without feeding, especially those on cabbage that became prepupa 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 *Podagaster* sp.* 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

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*Identified by Luis DeSantis, Universidad Nacional de la Plata, Argentina.


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

<table>
<thead>
<tr>
<th>Test plant</th>
<th>Larval days in test</th>
<th>Total feeding (mm²)</th>
<th>Feeding/ larva per day (mm²)</th>
<th>Number of eggs laid (♀)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattail</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>0</td>
</tr>
<tr>
<td>Arrowhead</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rice</td>
<td>8</td>
<td>—</td>
<td>—</td>
<td>0</td>
</tr>
<tr>
<td>Waterlettuce</td>
<td>8</td>
<td>2025</td>
<td>253</td>
<td>284</td>
</tr>
<tr>
<td>Duckweed</td>
<td>3</td>
<td>288</td>
<td>96</td>
<td>—</td>
</tr>
<tr>
<td>Day flower</td>
<td>1</td>
<td>50</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Wandering jew</td>
<td>3</td>
<td>—</td>
<td>—</td>
<td>0</td>
</tr>
<tr>
<td>Pickerelweed</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tropical Pickerelweed</td>
<td>5</td>
<td>200</td>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>Waterhyacinth</td>
<td>4</td>
<td>202</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Anchored waterhyacinth</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Alligatorweed</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cabbage</td>
<td>4</td>
<td>80</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Water pennywort</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Lettuce</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

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

♀ 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.
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. multiplicitas 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. multiplicitas 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.

ACKNOWLEDGMENTS

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LITERATURE CITED