

Caterpillars Of *Parapoynx* In Relation To Aquatic Plants In Florida¹

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ABSTRACT

The aquatic caterpillars of *Parapoynx* have been associated with 25 plant species in 17 families in Florida. *P. allionealis* and *P. obscuralis* feed on a wide range of aquatic plants, while caterpillars of *P. maculalis* are restricted to the Nymphaeaceae. *P. seminealis* caterpillars feed only on *Nymphoides*.

INTRODUCTION

The subfamily Nymphulinae of the Pyralidae comprise a group of moths whose larvae are almost all aquatic. Of the 47 species known to occur in the continental U.S. and Canada, 44 are known or presumed to have aquatic larvae (11). The subfamily consists of three tribes, of which one, the Ambiini are terrestrial. The biology of only one of the three species is known and its larvae bore into the stems of leather-leaf fern *Polystichum adiantiforme* Forster (7). The Nymphulini (23 species) are plant feeders which generally occur in still or slow moving waters. The Argyractini (21 species) feed on algae or diatoms and may be found in very fast moving streams (11).

About 25 species of Nymphulinae have been recorded in Florida. Except for the ubiquitous *Synclita oblitalis* (Walker), the species most frequently encountered in Florida belong to the genus *Parapoynx*. Kimball (6) listed four species from Florida and Munroe (11) listed six species. Four common *Parapoynx* species have been reared and associated with larvae and food plants in Florida, including *P. maculalis* (Clemens), *P. obscuralis* (Grote), *P. seminealis* (Walker), and *P. allionealis* Walker. *P. badiusalis* (Walker) and *P. curviferalis* (Walker) have not been reared in Florida, although the former has been reared elsewhere.

Parapoynx larvae are creamy white to yellow and may be up to 25 mm long when mature. *Parapoynx* caterpillars can be recognized and separated from all other aquatic lepidopterous larvae by the presence of branched gills on all body segments except the prothorax (Figure 1). All other known Nymphulinae larvae either have no gills or have simple unbranched filamentous gills except in the genus *Eoparargyractis*, where a few branched gills may occur on the last two abdominal segments.

Parapoynx caterpillars do not have gills when they emerge from the egg, but these are acquired at the first molt. The number of gill filaments increases with each



Figure 1. *Parapoynx seminealis* larvae showing branched gills characteristic of the genus.

successive molt and the mature caterpillar may have more than 400 gill filaments (10). Forbes (4) separated the species of *Parapoynx* by the number of branches in the gills on certain body segments, but Berg (2) showed that the number of gill branches may vary from stage to stage, specimen to specimen and even from side to side on the same specimen. No reliable characteristics have been found for separating species of *Parapoynx* caterpillars, therefore, they must be reared for positive identification. However, some species show a strong preference for certain host plants and construct a typical case which may aid in identification.

The family, scientific name, and common name for all plants from which *Parapoynx* have been reared are given in Table 1. The common names which are used in the text are those adapted by the Weed Society of America (1). All identifications were made or verified by Mr. David Hall or Dr. Dan Ward of the University of Florida Herbarium.

PARAPOYNX MACULALIS (Clemens)

Caterpillars of *P. maculalis* apparently feed only on plants of Nymphaeaceae (Table 1). Although it was reared from watershield, the primary food plant in Florida is white waterlily. Elsewhere it has been reared from spatterdock as well as from white waterlily (9) and watershield (4). The first two larval stages apparently feed only on the reddish submerged leaves of *Nymphaea* (14). These small larvae will starve rather than feed on the floating leaves

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TABLE 1. THE KNOWN FOOD PLANTS OF CATERpillARS *Parapoynx*. FLORIDA RECORDS ARE INDICATED BY AN ASTERISK.

Parapoynx Species	Common Name	Food Plant Scientific Name	Family
<i>maculalis</i>	white waterlily	* <i>Nymphaea odorata</i> Ait. (9)	Nymphaeaceae
	watershield	* <i>Brasenia schreberi</i> Gmel. (4)	"
	spatter dock	<i>Nuphar luteum</i> (L.) Sibth. & Smith as <i>N. variegatum</i> Engelm. (9, 10) as <i>Nymphaea americana</i> Provancher (13)	"
<i>seminealis</i> <i>obscuralis</i>	floating-heart	* <i>Nymphoides aquatica</i> (Walt.) Fernald	Menyanthaceae
	vallisneria	* <i>Callisneria neotropicalis</i> Marie-Vict as <i>V. spiralis</i> (5) as <i>V. americana</i> Michx. (10)	Hydrocharitaceae
<i>allioncalis</i>	spatterdock	* <i>Nuphar luteum</i> (L.) Sibth. & Smith as <i>N. adcockii</i> Ait. (3) as <i>N. variegatum</i> Engelm. (9)	Nymphaeaceae
	common arrowhead	* <i>Sagittaria latifolia</i> Willd. * <i>S. stagnorum</i> Small	Alismataceae
	dotted smartweed	* <i>Polygonum</i> sp. prob. <i>punctatum</i> Ell.	Polygonaceae
	floatingleaf pondweed	<i>Potamogeton natans</i> L. (2, 3, 5)	Potamogetonaceae
	largeleaf pondweed	<i>P. amplifolius</i> Tuckerm. (2, 3)	"
	whitestem pondweed	<i>P. praelongus</i> Wulfen. (2, 3)	Potamogetonaceae
	Richardson pondweed	<i>P. richardsonii</i> (Ar. Benn.) Rydb. (2, 3)	"
	white waterlily	<i>Nymphaea odorata</i> Ait. (1, 10)	Nymphaeaceae
	floating pondweed	<i>Potamogeton natans</i> L. (2, 3)	Potamogetonaceae
	small pondweed	* <i>P. pusillus</i> L.	"
	curasian watermilfoil	* <i>Myriophyllum spicatum</i> L. (12)	Haloragidaceae
	broadleaf watermilfoil	* <i>M. heterophyllum</i> Michx.	"
	southern watergrass	* <i>Hydrochloa carolinensis</i> Beauv. * <i>Eleocharis vivipara</i> Link	Gramineae Cyperaceae
<i>badiusalis</i>	floating bladderwort	* <i>Utricularia inflata</i> Walt.	Lentibulariaceae
	salvinia	* <i>Salvinia rotundifolia</i> Willd.	Salviniaceae
	largeleaf pondweed	<i>Potamogeton amplifolius</i> Tuckerm. (2, 3)	Potamogetonaceae
	whitestem pondweed	<i>P. praelongus</i> Wulfen. (2, 3)	"
	Richardson pondweed	<i>P. richardsonii</i> (Ar. Benn.) Rydb. (2, 3)	"
	flatstem pondweed	<i>P. zosteriformis</i> Fernald (1, 2)	"
	northern watermilfoil	<i>Myriophyllum exalbescentis</i> Fernald (9, 10)	Haloragidaceae
spp. (collected from these plants but not reared).	threesquare burreed	* <i>Sparganium americanum</i> Nutt.	Sparganiaceae
	goldenclub	* <i>Orontium aquaticum</i> L. * <i>Sagittaria graminea</i> Michx. * <i>Potamogeton capillaceus</i> Poiret.	Araceae Alismataceae Potamogetonaceae
	parrotfeather	* <i>Myriophyllum brasiliense</i> Comb. * <i>Mayaca fluviatilis</i> Aubl.	Haloragidaceae Macaaceae
	southern naiad	* <i>Najas quadalupensis</i> (Spreng) Morong * <i>Eleocharis microcarpa?</i> Torr. * <i>Ludwigia</i> sp.	Najadaceae Cyperaceae Onograceae
	watercress	* <i>Nasturtium officinale</i> R. Brown	Cruciferaeae

or other aquatic plants. Larger larvae cut large pieces from floating leaves (Figure 2) and tie two pieces together to form a portable case which is found on the underside of the floating leaf and the caterpillar remains within the shelter except when it feeds. This species may be a serious pest in nurseries where waterlilies are grown commercially.

PARAPOYNX SEMINEALIS (Walker)

P. seminealis caterpillars (Figure 1) have been found only on floating-heart in Florida. Forbes (4) lists *Limnathemum* sp. as the food plant but this is a synonym of *Nymphoides*. Caterpillars cut large pieces of leaf and attach them to a floating leaf usually on the upper side (Figure 3). Sometimes they tie overlapping leaves together and live between them. Young larvae feed as miners on the floating leaves (1). Forbes also indicated that the pupae are found in floating cases. In Florida, most pupae are found in the cases still attached to the leaves. This species is very common and seems to be present in large numbers throughout most of the year. The caterpillars often cause

severe injury to floating-heart and may be a factor limiting the importance of floating-heart as an aquatic weed.



Figure 2. *Nymphaea odorata* leaves showing typical feeding damage by *Parapoynx maculalis* caterpillars.

TABLE 2. *Parapoynx* FOOD PLANTS BY FAMILY, GENUS, AND SPECIES.

Parapoynx Species	Food Plants		
	Families	Genera	Species
<i>maculalis</i>	1	3	3
<i>seminealis</i>	1	1	1
<i>obscuralis</i>	5	5	9
<i>allionealis</i>	7	7	9
<i>badiusalis</i>	2	2	5
<i>curviferalis</i>	?	?	?
spp.	10	10	10

PARAPOYNX OBSCURALIS (Grote)

The favorite food plant of this species appears to be *vallisneria* (5, 10), but other plants are also fed upon. Caterpillars of this species have a much wider host range than the previous two species. In Florida, *P. obscuralis* has been reared previously from *vallisneria* (5, 10) and spatterdock (3, 9), but *Sagittaria stagnorum* Small, dotted smartweed, and common arrowhead are all new host records. In the midwest *P. obscuralis* has also been reared from floating-leaf pondweed (2, 3, 5) as well as largeleaf pondweed, whitestem pondweed, and Richardson pondweed. (2, 3).

Although cases may be constructed in the same way as those of *P. maculalis* and *P. seminealis*, *P. obscuralis* cases are most often made from many plant pieces and are usually portable. The pupal cases are often found within a floating case made of *vallisneria* leaves (5, 10). *P. obscuralis* has at times been troublesome to growers who provide *vallisneria* for the aquarium trade.

PARAPOYNX ALLIONEALIS Walker

The only food plants previously reported for this species are white waterlily (9, 10) and floatingleaf pondweed (2, 3). McGaha (9) listed *vallisneria* as a food plant but this must have been an error since later (10) he reported that only a single *P. allionealis* was reared from white waterlily and that it obviously was not the normal food plant. This species has been reared in Florida from eurasian



Figure 3. *Nymphoides aquaticum* leaves showing severe injury by *Parapoynx seminealis* caterpillars. Three larvae are under leaf fragments.

watermilfoil (12). Additional new hosts discovered for *P. allionealis* include small pondweed, broadleaf watermilfoil, southern watergrass, floating bladderwort, salvinia, and *Eleocharis vivipara* Link.

The caterpillars live in portable cases made from many pieces of plant material. Although they will feed on many species of aquatic plants, newly hatched larvae exhibit a preference for certain species if given a choice. Larvae given *Sagittaria stagnorum*, *Eleocharis vivipara*, duckweed (*Lemna* sp.) and parrotfeather preferred the latter. First stage larvae mined the leaves of parrotfeather and did not make a case until after the first molt. Duration of the larval and pupal stages combined was 54 days on small pondweed and 48-52 days on *Eleocharis vivipara*. There were six larval instars but other larvae that didn't pupate had up to eight larval stages.

PARAPOYNX BADIUSALIS (Walker) and PARAPOYNX CURVIFERALIS (Walker)

P. curviferalis has not been reared and nothing is known of its biology. *P. badiusalis* has been reared in Michigan on largeleaf pondweed, whitestem pondweed, Richardson pondweed, flatstem pondweed (1, 2), and northern watermilfoil (9, 10). It will probably be reared from other plants as well.

DISCUSSION

Parapoynx caterpillars have also been collected from ten other food plants (Table 1), but since none of the larvae were successfully reared, the species cannot be determined as yet. These ten food plants are from ten different families. It is probable that most of these caterpillars represent *P. obscuralis* or *P. allionealis* since they obviously have a wide host range. In this respect, they are similar to the common European species, *Parapoynx stratiotata* L., which was reared experimentally on 11 plant species. (8).

Although both *P. obscuralis* and *P. allionealis* have been collected and reared from a wide range of plants, it is not known whether these larvae can actually complete their development from hatching to pupation on all of these plants. The fact that cases are made of certain species of plants does not mean that they are necessarily food plants. Numerous instances are known where cases were made of one plant but the larva was feeding on another (3, 10).

A summary of the food plants of *Parapoynx* larvae is given in Table 2. Both *P. maculalis* and *P. seminealis* caterpillars apparently feed on only one family of plants whereas the other species are not as limited. A much clearer picture of the food plants of *Parapoynx* larvae will emerge when identification of the larvae becomes possible. No parasites have been reared from any of the *Parapoynx* larvae or pupae collected during this study. Much work remains to be done before we have a very complete picture of the biology and ecology of *Parapoynx* and other aquatic caterpillars in Florida.

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