

Biological Control of Aquatic Weeds in Southwest Florida

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INTRODUCTION

Aquatic weed management plays an integral part in managing the fresh water resources throughout Florida. Recent trends in population growth indicate that southwest Florida is one of the fastest growing areas in the United States. This region of the state, has for many years been promoted as a tourist and retirement area, where such recreational activities as boating and fishing attract thousands of visitors who increase greatly the demand on aquatic resources.

Aquatic weed control agencies in southwest Florida and elsewhere, assume a large and growing responsibility for managing the aquatic environment. The Lee County Hyacinth Control District (LCHCD), begun in 1961, is one of several aquatic weed control agencies in Florida and has attempted to meet the challenge of providing environmentally safe aquatic weed management by establishing a program of research and operation directed toward biological control of aquatic weeds.

The intent of this paper is to discuss the ongoing biological control program undertaken in Lee and surrounding counties of southwest Florida. The three major groups of biotic agents being utilized or investigated in this region are phytophagous arthropods, herbivorous fish and phytopathogens and are discussed as follows.

PHYTOPHAGOUS ARTHROPODS

A survey of arthropods associated with aquatic and wetland plants in Lee and surrounding counties has been in progress since 1976. Over 50 species of plants have been surveyed for their arthropod fauna on a periodic basis. In general, the associated arthropods are collected in the field or whole plant samples are returned to the laboratory for cage rearing, Berlese funnel extraction or hand sorting. The objectives of this survey are to provide host plant lists for phytophagous arthropods and associated parasites and predators, information on seasonal distribution and abundance and evaluation of those species having potential as biological control agents.

Domestic surveys may reveal that exotic organisms with control potential are already present as was the case with *Parapoynx diminutalis* (Lepidoptera: Pyralidae), a native of southeast Asia that damages hydrilla, and was discovered

in Fort Lauderdale, Florida in 1976 (4). Domestic surveys may also demonstrate the potential that native arthropods might have as biological control agents. Center (1) suggests that indigenous organisms could be used as biological control agents, however this may require manipulation of biotic and environmental factors that are currently keeping the native organism from controlling the weed.

Three insect species introduced into the U.S. for the control of alligatorweed (*Agasicles hygrophila* Selman and Vogt (Coleoptera: Chrysomelidae), *Amylothrips andersoni* O'Neill (Thysanoptera: Phlaeothripidae) and *Vogtia malloi* Pastrana (Lepidoptera: Pyralidae)) were unknown species prior to the host plant survey (6). Domestic surveys will not only improve the existing knowledge of native insect-aquatic plant associations but will benefit researchers from other countries seeking potential biological control agents for exotic weeds in their own countries. More intensive domestic studies of arthropods associated with *Hydrilla verticillata* (L.f.) Casparay, *Schinus terebinthefolius* Raddi and *Ludwigia* spp. are now being conducted.

The mottled waterhyacinth weevil, *Neochetina eichhornia* Warner was first released in southwest Florida on uninfested waterhyacinth sites in Glades and Lee Counties in 1974. A related species, *N. bruchi* was released for the first time in this region in October, 1975 near the junction of the Orange and Caloosahatchee Rivers. Populations of *N. eichhorniae* have become well distributed in southwest Florida although population build-up is often hampered by herbicide treatments, especially in urban areas. One of the best examples of *Neochetina* damaged waterhyacinth in this region is at Lake Trafford in Collier County. Periodic herbicide treatments are conducted at Lake Trafford, but the effect of these treatments on *Neochetina* populations is not fully understood and further studies are warranted in this regard to better integrate biological and chemical control methodologies. Populations of *N. bruchi* have not become distributed as well as those of *N. eichhorniae* in southwest Florida.

Sameodes albiguttalis Warner (Lepidoptera: Pyralidae) is becoming progressively more abundant in this region (Fig. 1). The build-up of *Sameodes* populations in Lee and surrounding counties to the north is probably due in large part to transportation of infested waterhyacinth

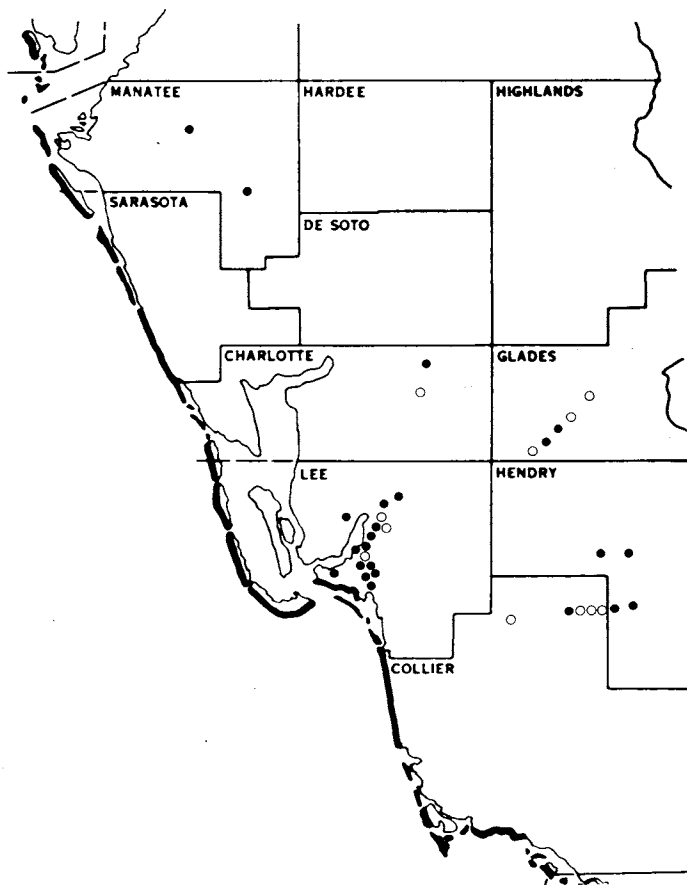


Figure 1. Distribution of *Sameodes albiguttalis* on waterhyacinth in southwest Florida. Observations were made between August 1979 and April 1980. Waterhyacinth sites positive for *S. albiguttalis* = ●; negative = ○.

flowing southwesterly in the Caloosahatchee, Peace and Manatee Rivers from previously infested regions in central Florida. The most severe infestation by this insect on waterhyacinth was observed in January, 1980 on a fringe of plants growing in the Manatee River at State Road 675. The continued spread of *S. albiguttalis* on waterhyacinth will be a significant contribution to the existing complex of arthropods already attacking this weed in Florida.

Alligatorweed (*Alternanthera philoxeroides* (Mart.) Griesb.), occurs sporadically throughout southwest Florida and attains pest status in several slow-flowing tributaries and oxbows associated with the Caloosahatchee River, as well as several canals in this region. Periodic herbicide treatments of alligatorweed are made in this region although much of its suppression is due to feeding damage by the alligatorweed flea beetle (*A. hygrophila*). General observations of *A. hygrophila* populations in southwest Florida between 1978 and 1980 indicate that populations are usually highest between the months of December and April. Coulson (3) suggests that *Agasicles* is most effective in the eastern U. S. in an area extending from Tampa and Orlando, Florida, north to Savannah, Georgia. Climatic conditions within this zone permit populations to peak annually by early June and again in October or November. The warmer summer months produce a dormancy period and in areas

south of this zone, *Agasicles* populations are thought to be continually depressed due to the extended warm season.

HERBIVOROUS FISH

The grass carp (*Ctenopharyngodon idella* Val.) became an operational biological control agent in Florida during 1978 after statutes were established by the state for its use. Recent action by the state legislature and the Florida Game and Fresh Water Fish Commission has changed the status of the grass carp in Florida from an operational biological control agent to one for research purposes only.

In southwest Florida, at least 16 sites have been stocked with grass carp, 10 of which occur in Lee County. In the past, LCHCD has provided grass carp for stocking in areas where permits were granted by the state. Those sites stocked with grass carp in Lee County are monitored with respect to several water quality parameters on a quarterly basis. Also, aerial pictures are taken quarterly to determine the general extent of control by grass carp feeding. This information is then discussed with the permittee which provides input for better management of the lake or pond, good public relations and effective communication with state agencies administering the program. In general, the program has been partially successful in reducing the dependence on herbicide treatments.

A recent rule of the Florida Game and Fresh Water Fish Commission provides for the operational use of a hybrid grass carp. The hybrid grass carp is the result of a cross between a female grass carp and a male bighead carp (*Hypophthalmichthys nobilis* Rich.). The F_1 hybrid has a somatic chromosome number of $2N=72$ compared to $2N=48$ for both parent species rendering it triploid and reducing its potential for reproduction.

In Lee County, several sites have been stocked with hybrid grass carp on the same basis as grass carp were stocked in previous years.

PATHOGENS

The potential of bacterial and fungal pathogens of certain aquatic weed species has been successfully demonstrated (2, 5). Research on this topic is being conducted at LCHCD on a limited scale. Aquatic weeds showing probable disease symptoms are returned to the laboratory for isolation of the causative agent, efficacy on the host and eventual host range determinations.

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