UTILIZATION OF HYDRILLA BY DUCKS AND COOTS IN CENTRAL FLORIDA

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Abstract: Foods consumed by 115 ducks and coots (*Fulica americana*) collected from 2 central Florida study sites were analyzed to assess the importance of the exotic pest species hydrilla (*Hydrilla verticillata*) as a food plant. Contents of esophagi or gizzards were identified and measured by volumetric displacement. Hydrilla was the most important identifiable food on both study sites in terms of mean of volumetric percentages (aggregate percentage) and frequency of occurrence. Implications of findings with respect to waterfowl habitat and aquatic weed control are discussed.

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Hydrilla, an introduced, submersed, vascular aquatic plant (Blackburn et al 1969), is regarded as one of the most troublesome aquatic pests in Florida (Blackburn et al. 1969, Blackburn 1975, Burkhalter 1975, Hestand and Carter 1975, Gasaway 1976, Haller 1977, Gasaway and Drda 1977). The plant was reportedly first cultivated in the state as an aquarium specimen in 1958, and was first observed growing in the wild in 1960 (Blackburn et al 1969: 20, Haller 1977:1). By the late 1960's it had spread throughout the state, and was regarded as an important pest plant (Blackburn et al 1969:17, 20). Haller (1977:13) reported its occurrence in Florida, Georgia, Alabama, Mississippi, Louisiana, Texas, and Iowa.

A number of problems are associated with the proliferation of hydrilla. Dense mats of the vegetation develop in a variety of aquatic habitats, impeding water flow and interfering with recreational use for water skiing (Blackburn et al 1969:21), fishing, boating, and swimming (Blackburn et al 1969:21, Haller 1977:7). It is considered unsightly by lakefront property owners and a detriment to agricultural water use (Gasaway et al 1979). Its capacity to spread very rapidly over a short period of time and dominate a body of water (Hestand and Carter 1975, 1977) is particularly distressing.

Certain aquatic plants frequently categorized as pest species may be beneficial for wildlife. Florschutz (1973) cited apparent improvements in waterfowl habitat quality associated with the proliferation of the exotic Eurasian milfoil (*Myriophyllum spicatum*) in Back Bay, Virginia and Currituck Sound, North Carolina, and documented extensive utilization of this species as a waterfowl food. Gasaway et al (1979) suggested that waterfowl utilize hydrilla as a food, and attributed declines in numbers of some waterfowl species in Lake Wales, Florida to reductions in hydrilla abundance. Montalbano et al (1978) reported the occurrence of hydrilla as a duck food in phosphate settling ponds, but its relative importance is obscured because it occurred in only 1 of 4 collection sites.

This report presents results from 2 separate studies in an effort to quantify and document the importance of hydrilla as a duck and coot food in central Florida. Studies of duck food habits in phosphate settling areas were funded under Federal Aid in Wildlife Restoration Project W-41-R. Food habits of waterfowl from Lake Conway were analyzed as a portion of the U.S. Army Engineers, Waterways Experiment Station Large Scale Operations Management Test of Grass Carp to Control Aquatic Vegetation, contract no.DACW-39-76-C-0081. We gratefully acknowledge the assistance provided by R.D. Hestand III, T.C. Hines, T.S. Taylor, M.W. Olinde, and L.S. Perrin in critical review of the manuscript.

MATERIALS AND METHODS

Two study areas were selected based upon the presence of extensive hydrilla coverage and substantial concentrations of ducks and coots.

Borden-Teneroc Site

This study area is located in a phosphatic clay settling area, hereafter referred to as a slime pond, in Polk County, Florida (Fig. 1). The 219 ha area was..."developed on strip

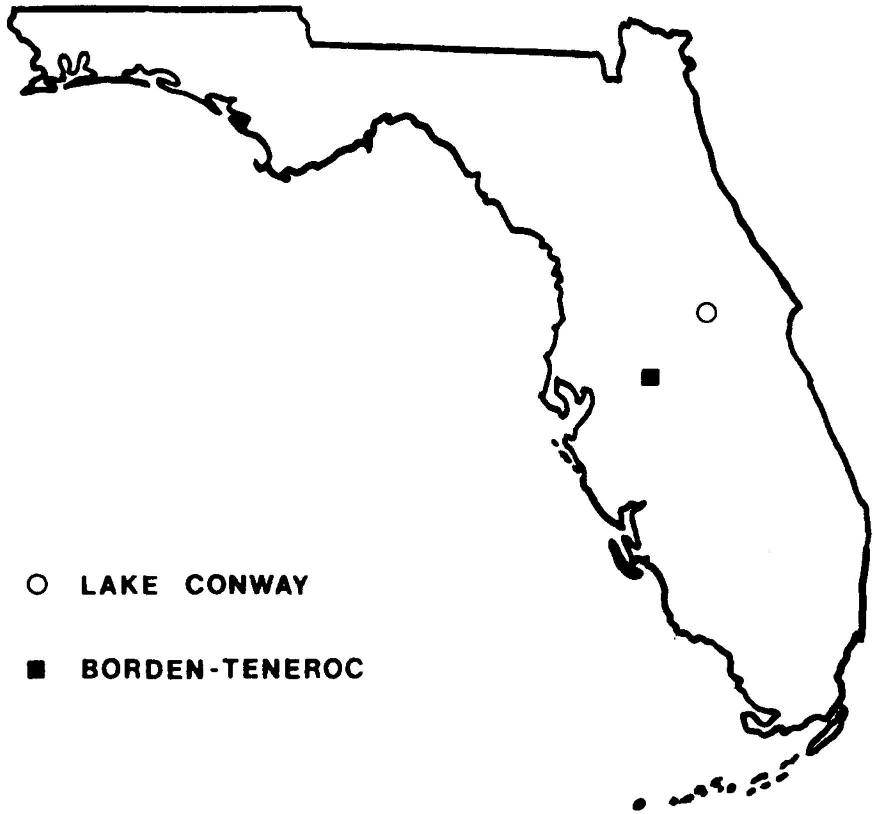

Fig. 1. Location of Borden Teneroc and Lake Conway study sites.

mined lands for the settling and retention of phosphatic clays generaged in the processing of ore" (Montalbano et al 1978:249). Following construction, a water/clay slurry is pumped into ponds for gradual dewatering. As clays settle, water is decanted from the surface utilizing flash board riser water control structures (Montalbano et al 1978:249). Water depths over slime substrates ranged from zero to approximately 1.8 m.

Emergent vegetation covers approximately 98% of the site, with cattail (*Typha* sp.) and primrose willow (*Ludwigia* sp.) dominating. Hydrilla is dominant where emergent vegetation does not occur, covering approximately 5 ha. More detailed descriptions of slime ponds are found in Montalbano et al (1978) and Moudgil and Bunch (1976).

Lake Conway Site

Lake Conway is a complex of 5 small natural lakes totaling 737 ha. The system lies in the uppermost portion of the Kissimmee River drainage (Fig. 1), emptying via Little Mare Prairie and Boggy Creek to the lower lakes region. Vegetation removal resulting from urbanization and associated development has noticeably altered the shoreline, but a narrow fringe of emergent maidencane (*Panicum hemitomon*), torpedo grass (*P. repens*), cattail (*Typha latifolia*) or lake rush (*Fuirena scirpoides*) persist in some areas. Dominant submergent vegetation includes Nitella (*Nitella megacarpa*), Illinois pondweed (*Potamogeton illinoensis*), hydrilla, and eelgrass (*Vallisneria americana*). A layer of organic detritus is associated with areas of extremely thick vegetation; the remaining substrate is primarily sandy (Guillory et al 1979:113-114).

Initially an effort was made to collect actively feeding birds on the Borden-Teneroc site to minimize the bias resulting from differential food passage rates and digestibility of hard versus soft food items as described by Swanson and Bartonek (1970:739). Because of the extremely unstable nature of the substrate and density of emergent vegetation it was difficult to maneuver within shotgun range of feeding birds. Therefore, specimens were collected using conventional hunting methods. Specimens were promptly retrieved and an 80% ethyl alcohol solution immediately introduced into esophagi to terminate post-mortum digestion (Swanson and Bartonek 1979:739). Esophagi were later removed from birds, labeled, and transferred to individual specimen jars containing the same preservative. Lake Conway specimens were also collected using conventional hunting methods. Gizzards were removed from Lake Conway birds and frozen. Food items from both study sites were identified and measured by volumetric displacement. Data are presented as aggregate percentage (mean of volumetric percentages) and frequency of occurrence to minimize the bias which results from the substantial differences in capacity between duck esophagi, duck gizzards, and coot gizzards, and to reduce the influence of individual birds feeding in atypical conditions (Swanson et al 1974).

RESULTS

The distribution of specimens by species, year, and collection site is presented (Table 1). Aggregate percentage composition of esophageal contents of 25 ducks from the Borden-Teneroc impoundment (Table 2), and gizzard contents of 45 coots and 20 ducks from Lake Conway (Table 3) are listed.

Borden-Teneroc Site

Average composition of esophageal contents was 77.1±32.9% plant foods, 21,3±33.5% animal foods, and 1.6±5.3% unidentifiable foods. Hydrilla, primrose willow (*Ludwigia* sp.), and flat sedge (*Cyperus* sp.) were the most important foods respectively comprising 32.8, 21.3, and 9.3% of average volume. Hydrilla was the most frequently consumed food, occurring in 26% of the specimens examined.

Lake Conway Site

Average composition of gizzard contents was 58.3±36.4% plant foods, 0.7±4.6% animal foods, and 40.9±36.7% unidentifiable foods. Hydrilla, Illinois pondweed, and nitella (*Nitella* sp.) were the most important identifiable foods comprising 25.5, 14.8, and 8.6%, respectively, of average volume. Again hydrilla was the most frequently consumed identifiable food, occurring in 54% of the specimens.

DISCUSSION

Swanson and Bartonek (1970) and Korschgen (1970:237) cited the advantages of esophagi over gizzards as source organs for food habit studies. The high frequency of occurrence and large volume of unidentifiable foods associated with Lake Conway specimens is likely a result of greater difficulty in identifying foods from gizzard contents

TABLE 1. Distribution by year, species, and collection site of 45 ducks and 45 coots collected November 1975 through April 1978.

SPECIES	1975-76	1976-77	1977-78	Total
Borden-Teneroc Site				
Blue-winged teal (*Anas discors*)	-	-	9	9
American wigeon (*Anas americana*)	-	-	8	8
Ring-necked duck (*Aythya collaris*)	-	3	1	4
Florida duck (*Anas platyrhynchos fulvigula*)	-	-	2	2
Green-winged teal (*Anas crecca carolinensis*)	-	-	1	1
Pintail (*Anas acuta*)	1	-	-	1
SUB TOTAL	1	3	21	25
Lake Conway Site				
Coot (*Fulica americana*)	-	-	45	45
Ring-necked duck	-	-	14	14
Mallard (*Anas platyrhynchos platyrhynchos*)	-	-	4	4
Florida duck	-	-	2.	2
SUB TOTAL	-	-	65	65

as described by Korschgen (1971:237). While more rapid break down of soft food items in the gizzard (Swanson and Bartonek 1970) might somewhat distort the relative importance of the various food items from Lake Conway specimens, it is nevertheless significant that hydrilla was the most important identifiable food on both study sites, both in terms of aggregate percentage and frequency of occurrence.

There are several aspects of these findings which may have significance. Sincock (1965) presented a technique for assessing the total food demands of a wintering waterfowl population. Application of this method to a hypothetical duck and coot population similar to that wintering on the Bordon Teneroc study area during the winter of 1977-78 yields interesting results. Such a population, averaging 1000 coots, 1000 ring-necked ducks, 350 blue-winged teal, 300 wigeon, 100 Florida ducks, 100 green-winged teal, 100 canvasbacks (*Aythya valisineria*), and 50 pintails for 106 days (November 16 through February 28) would consume approximately 6734 kg dry weight hydrilla or 11.9 g/m^2 wet weight daily. This consumption is approximately 39% of the maximum growth rate (30.5g/m^2 daily) reported for hydrilla (Nall and Schardt 1978), indicating considerable hydrilla biomass reduction associated with the food demand of winter waterfowl populations.

TABLE 2. Esophageal contents of 25 ducks collected on Borden-Teneroc settling pond November 1975 through January 1978.

	Food Item			
	Scientific name	Common name	Percentage occurrence	Aggregate Percentage
Plant				
	Hydrilla verticillata	Hydrilla	26	32.8
	Ludwigia sp.	Primrose willow	23	21.3
	Cyperus sp.	Flat sedge	11	9.3
	Potamogeton sp.	Pondweed	3	4.0
	Dulichium sp.	Dulichium	11	3.3
	Panicum sp.	Panic grass	6	2.0
	Scirpus sp.	Bulrush	9	1.4
	Polygonum sp.	Smartweed	3	1.3
		Unidentifiable plant	3	1.6
		Unidentifiable seed	3	T[a]
	Total Plant Material		66	77.0
Animal				
	Chironomidae	Blind mosquito	9	7.7
	Gastropoda	Snails	20	7.4
	Insecta	Unidentified insect	9	4.0
	Diptera	Other flies	3	1.0
	Ephemeridae	Burrowing mayflies	3	1.0
	Libellulidae	Common skimmer	6	0.2
	Nematoda	Round worm	3	T
	Corixidae	Water boatman	3	T
	Total Animal Material		40	21.3
	Unidentifiable Food		40	1.6
	Grand Total			99.9

[a]T<0.1

Data on relative availability of various food items required to compute a selectivity index (Serie and Swanson 1976:71, Ivlev 1961:45) were not collected, and it is unclear whether hydrilla's importance as a food item is related to preference or merely reflects its great abundance and ready availability to feeding ducks and coots. Observations by Gasaway et al (1979) and T.C. Hines (pers. comm.) suggest the consistent occurrence of substantial concentrations of waterfowl and coots in association with hydrilla dominated lakes and wetlands. Whether concentrations of ducks and coots result from preference of hydrilla as a food, its abundance and ready availability, or other habitat related factors, it is never the less clear that a selection of this habitat type by ducks and coots occurs, and that hydrilla has considerable importance as a food items for ducks wintering in Florida.

TABLE 3. Gizzard contents of 45 coots and 20 ducks collected on Lake Conway December 1977 through April 1978.

	Food item			
	Scientific name	Common name	Percentage occurrence	Aggregate percentage
Plant				
	Hydrilla verticillata	Hydrilla	54	25.2
	Potamogeton illinoensis	Pondweed	48	14.8
	Nitella sp.	Nitella	31	8.6
		Unidentifiable vegetation	29	0.5
	Pontederia cordata	Pickerel weed	2	0.5
		Unidentifiable seeds	6	0.3
	Myrica cerifera	Wax myrtle	8	0.2
		Unidentifiable algae	2	0.2
	Ludwigia sp.	Primrose willow	3	T[a]
	Nuphar sp.	Spatter-dock	2	T
	Brasenia schreberi	Water shield	2	T
	Cladium jamaicense	Saw-grass	2	T
	Total Plant Material		100	58.3
Animal				
	Gastropoda	Snails	11	0.6
	Trichoptera	Caddis fly	8	T
	Hymenoptera	Ants	3	T
	Insecta	Unidentified insect	2	T
	Hydracarina	Water mite	2	T
	Crustacea	Clam	2	T
	Gomphus sp.	Clubtail	2	T
	Total Animal Material		25	0.6
	Unidentifiable Food		63	49.0
	Grand Total			99.9

[a]T<0.1

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