J. Aquat. Plant Manage. 33: 19-22

Waterbird Abundance and Activity on Waterhyacinth and Egeria in the St. Marks River, Florida

WILLIAM BARTODZIEJ AND G. WEYMOUTH[1]

ABSTRACT

Waterbird densities and activities were quantified on two nonnative plant species, waterhyacinth and egeria, in a north Florida coastal plain river. Individual waterhyacinth mats and egeria plots were marked in three successive river sections, and birds were viewed weekly from 7 July to 20 September 1991. Total bird densities and counts for individual species were similar between plant species on all observation dates ($P>0.05$). The Little blue heron, Common moorhen, and the Tricolored heron were the most common species and foraging was the primary activity on both plant species. Birds stalking in waterhyacinth most often obtained prey located near the perimeter of mats, and rarely hunted for food in the interior of mats.

Key words: coastal river, nonnative plant, Little blue heron, Tricolored heron, Common moorhen, bird foraging.

INTRODUCTION

Bird distributions within water-bodies are often related to prey densities and the ability of individual species, through specialized adaptations, to efficiently capture prey (Jenni 1969, Kushlan 1973, Willard 1977, Kushlan 1978). Aquatic vegetation, which commonly harbors invertebrate and vertebrate prey, is generally considered a more favorable foraging habitat than deep, open-water areas. In terms of waterbird foraging success, certain vegetation communities may provide better hunting grounds than others (Zaffke 1984)[2].

Little if any data exists on waterbird abundance and behavior on river plants found in Florida. The purpose of this study was to quantify bird densities and record bird activities on the nonnative egeria (*Egeria densa* Planchon) and waterhyacinth [*Eichhornia crassipes* (Mart.) Solms].

STUDY SITE

The St. Marks River (30° 16'N, 84° 08'W), located in a karst area of Wakulla County, Florida, is spring-fed and flows for approximately 30 km through flat coastal woodlands. In 1988, the Florida Legislature passed a moratorium on herbicide applications to control aquatic vegetation, primarily waterhyacinth, in this river. That action resulted in an anthropogenically undisturbed, but naturally dynamic plant community in which to observe bird abundance and behavior.

Since 1988, the waterhyacinth population has expanded, with frequency-of-occurrence estimates varying from 5 to 15 percent during the 1989-1992 growing seasons[3]. Although waterhyacinth has the ability to double its biomass (wet weight) in 14 days in unshaded parts of the river, we observed that floods act as a natural control mechanism

[1]Florida Department of Environmental Protection, Bureau of Aquatic Plant Management, 3917 Commonwealth Boulevard, Tallahassee, Florida 32399, USA. Received for publication March 28, 1994 and in revised form January 4, 1995.

[2]Collopy, M. W. and H. L. Jelks. 1989. Distribution of foraging wading birds in relation to the physical and biological characteristics of freshwater wetlands in southwest Florida. Florida Game and Fresh Water Fish Comm. Nongame Wildl. Prog. Final Rep. Tallahassee, FL. 102pp.

flushing waterhyacinth mats out of the river and into the Gulf of Mexico on a regular basis.

Another invasive nonnative plant, egeria was introduced in the early 1980s and has proliferated in the river. In 1989-1992, frequency-of-occurrence ranged from 41 to 76 percent[4]. During summer, egeria grows to the surface and forms dense islands which channelized water flow. Typically, large mats of surfaced egeria effectively hold waterhyacinth in the middle portions of the river during base-flow periods.

Our bird observations focused on the spring head-waters, an unshaded, shallow (1 m) and wide (130 m) area of the river, locally termed the "basin" located approximately 9 km upstream from the U.S. Highway 98 Bridge. Besides waterhyacinth and egeria, strap-leaf sagittaria (*Sagittaria kurziana* Gluck), tapegrass (*Vallisneria americana* Michx.), and duckweed (*Lemna* spp.) were also present in this section of river, but distributions were patchy.

MATERIALS AND METHODS

The basin was divided into three adjacent equal-area (6 ha) sections, where individual waterhyacinth mats located at least 25-m from either bank and larger than a 10-m^2 area were measured and marked. Six waterhyacinth mats from each section were randomly chosen and marked with numbered styrofoam floats. Mean waterhyacinth mat size was 20-m^2 (4-m x 5-m). Also, in each section, six plots of surfaced egeria (each of 20-m^2 area), completely free of waterhyacinth, were marked with floats; these plots were at least 25-m from one another and 25-m from substantial (>0.5-m^2) waterhyacinth mats. Because flooding dislodged some waterhyacinth mats and plant growth redefined some others, mats in each section had to be remeasured and new mats randomly chosen and re-marked twice during the study. Mean mat and plot size stayed relatively constant throughout the observations.

Birds were observed approximately weekly from 7 July to 20 September 1991. Sections were viewed for one-half hour intervals starting at sunrise and continuing to approximately noon; the sequence of viewing was determined randomly for each date. Each section was separately viewed a total of 1.5 hours during each observation day. Observations were conducted with binoculars and a spotting scope from a fixed location adjacent to each section along the unpopulated east bank of the basin. All birds within vegetation mats and plots were identified and counted, and descriptions of their activities (i.e., feeding, perching, swimming) were recorded. Birds that moved from one experimental plot to another of the same species (e.g., egeria to egeria) were not double-counted. Activities of individual birds were not timed due to the large area being viewed. Data were whispered into a hand-held tape-recorder.

Because of low bird counts, data from one-half hour segments were pooled, and observations from individual mats and plots were also pooled for each section (see following discussion). Densities were thus expressed as the total number of birds in each section during a one and one-half hour period for each date. Bird densities on egeria and waterhyacinth were compared by paired t-tests; log-transformations of counts were sometimes necessary because of unequal variances.

RESULTS AND DISCUSSION

The plot scale originally incorporated into the study design (where the experimental unit equalled a 20-m^2 area of vegetation) proved to be inadequate. During the course of the observations, relatively low bird abundance in the basin suggested the need for a larger experimental unit. Since birds that entered same-species plots were not double-counted in each section, data from individual mats and plots were summed. Aggregates for each section (sum of counts from six waterhyacinth mats or six egeria plots, total area of 120-m^2) provided better estimates of bird density. Variances around estimates were high (with coefficients of variation sometimes near 100%), but were not unusually high for biological field investigations (Zar 1984).

Waterbird densities were similar (P>0.05) between waterhyacinth mats and egeria plots during each of the observation dates (Table 1). On both plant species, more birds were

Table 1. Counts of bird species observed on waterhyacinth mats and egeria plots in the St. Marks River. Numbers reported are means (and 1 SD) from aggregates of mats and plots (total area per plant species = 120-m^2) in three river sections. Viewing time was 1.5 hours per section. Common species were the Little blue heron, Tricolored heron, and Common moorhen. Other species that were uncommon but summed in "Total #" include Great blue heron, Wood duck, Snowy egret, Pied-billed grebe, and Blue-winged teal.

Date	Plant	L. B. Heron	T. Heron	C. Moorhen	Total #
7-07	Waterhyacinth	4.7(1.5)	1.0(1.0)	5.0(4.6)	10.7(4.6)
	Egeria	17.7(19.3)	1.0(1.7)	1.0(1.0)	19.7(18.6)
7-11	Waterhyacinth	13.0(4.6)	0.7(1.2)	2.3(2.5)	16.0(3.5)
	Egeria	21.3(19.7)	0.3(0.6)	0.7(0.6)	22.3(19.6)
7-17	Waterhyacinth	3.7(2.5)	0	1.7(1.5)	5.3(2.1)
	Egeria	16.0(11.0)	0	4.3(4.0)	19.3(12.9)
7-26	Waterhyacinth	6.3(3.8)	0	7.3(10.2)	14.0(6.6)
	Egeria	6.0(3.5)	0	1.7(1.5)	7.7(2.5)
8-02	Waterhyacinth	3.7(2.9)	1.3(2.3)	8.3(3.5)	16.7(8.7)
	Egeria	4.3(3.8)	0	5.3(2.5)	12.0(7.6)
8-09	Waterhyacinth	3.3(3.1)	1.7(1.5)	1.7(2.1)	7.0(4.6)
	Egeria	1.0(1.0)	0.7(0.6)	1.7(2.9)	3.3(2.3)
8-16	Waterhyacinth	2.5(0.7)	1.0(1.4)	2.5(0.7)	6.5(2.1)
	Egeria	1.0(1.4)	0	3.5(4.9)	4.5(3.5)
8-23	Waterhyacinth	2.0(2.6)	0.3(0.6)	4.7(3.8)	7.0(3.0)
	Egeria	0.3(0.6)	0.7(1.2)	1.3(2.3)	3.0(3.0)
8-30	Waterhyacinth	2.7(2.1)	0	3.3(4.9)	5.7(5.0)
	Egeria	2.0(1.7)	0.7(1.2)	0	2.7(1.5)
9-06	Waterhyacinth	3.3(1.5)	1.0(1.7)	2.7(3.8)	7.0(4.4)
	Egeria	2.0(2.6)	0.3(0.6)	0	2.7(2.1)
9-13	Waterhyacinth	1.0(1.7)	1.0(1.7)	6.0(7.9)	8.0(8.7)
	Egeria	1.0(1.7)	0.7(1.2)	0.3(0.6)	3.0(1.0)
9-20	Waterhyacinth	0	1.3(0.6)	8.3(7.0)	9.7(6.5)
	Egeria	0	0.7(1.2)	1.3(1.5)	2.0(2.7)

[3]Bartodziej, W. and A. J. Leslie. 1991. Aquatic vegetation monitoring in the St. Marks River. Annual Report 1990-91. Bureau of Aquatic Plant Management. FL Dept. of Nat. Res., Tallahassee, FL. 18pp.

[4]Bartodziej, W. and A. J. Leslie. 1991. Aquatic vegetation monitoring in the St. Marks River. Annual Report 1990-91. Bureau of Aquatic Plant Management. FL Dept. of Nat. Res., Tallahassee, FL. 18pp.

present during July than in August or September. The Little blue heron (*Egretta caerulea* L.) was the most common bird species observed on both vegetation types, and was responsible for higher total bird countsduring the first month of observations (Table 1). Common moorhens (*Gallinula chloropus* Bangs) and Tricolored herons (*Egretta tricolor* Muller) were also relatively common during most dates. Five other waterbird species, the Great blue heron (*Ardea herodias* L.), Wood duck (*Aix sponsa* L.), Snowy egret (*Egretta thula* Molina), Pied-billed grebe (*Podilymbus podiceps* L.), and Blue-winged teal (*Anas discors* L.) were recorded not more than twice, and mean densities were less than one bird per 120-m^2 of vegetation. For all dates, densities of individual bird species did not differ ($P>0.05$) between the plant species.

Although the biology and ecology of waterhyacinth is well studied (Gopal 1987), only one published Florida investigation has referred to waterbirds associated with this plant. Haag et al. (1987) reported that Common moorhens, Boat-tail grackles (*Quiscalus major* L.), and Red-winged blackbirds (*Agelaius phoeniceus* L.) were the three most frequently observed birds on mats of waterhyacinth in Orange Lake, Florida. We did not observe blackbirds or grackles in the basin area of the river, but moorhens were present around both plant species. We observed moorhens nesting in stands of native wild rice (*Zizania aquatica* L.) and in waterhyacinth mats, two of which were randomly chosen as study mats. Waterhyacinth did not directly compete with stands of wild rice. Therefore, the increase of waterhyacinth augmented the available nesting habitat for moorhens.

The primary activity of birds on both plant species was foraging. More than 80% of the birds on waterhyacinth mats and 90% in egeria plots were actively feeding during the observation period. Most of the remaining birds were perching, and rarely did we observe a bird swimming into or out of a mat or plot. During eight of the twelve observation dates, at least one bird was recorded perching on waterhyacinth, while no birds used egeria as a perching site.

Little blue and Tricolored heron hunting strategies differed in egeria. Tricolored herons were more commonly found wading deeper into the water. Sometimes when prey was spotted, Tricolored herons would lower their bodies into the water so that only about 4 to 6 cm of their backs protruded above the water surface. Little blue herons avoided deeper foraging areas where it would have been necessary to submerge belly feathers. Herons were rarely seen foraging on egeria mats covered with filamentous algae (usually *Cladophora* spp. or *Spirogyra* spp.). Herons in the St. Marks River seemed to rely on visual foraging tactics and preferred a clear view of organisms around egeria. Kushlan (1978) reported that visual foraging is the most common means of prey capture for these herons.

Birds that were feeding in waterhyacinth most often obtained prey that were located near the perimeter of the mats (looking down or out). Hunting among interior waterhyacinth leaves and petioles (looking up or in) was only observed during August (16th, 23rd, and 30th), but no more than two birds per date. This was consistent with findings from an ongoing, large-scale Lake Okeechobee study where birds have been repeatedly viewed foraging around the perimeter of healthy waterhyacinth mats[5]. Jenni (1969) was first to report herons feeding from floating and surfaced, rooted vegetation into deep water. And recently, Edelson and Collopy observed wading birds exploiting floating mats of red maple and willow, cattails, and fishing nets as substrates from which to access deeper water[6].

Waterhyacinth roots provide a favorable habitat for bird prey. For instance, invertebrate densities amongst roots can range from 3446 to 138000 individuals per m^2 (O'Hara 1967, Junk 1977). In the St. Marks River, we have found densities of large invertebrates (crayfish, grass shrimp, and snails), to average 161 per m^2 of waterhyacinth during summer; dip-netting in surfaced stands of egeria revealed an abundance of the same taxa[7]. It was apparent that prey was abundant in both plant species. However, while both species attracted comparable densities of birds, it is still unclear whether bird foraging efficiency or feeding success was similar in egeria and waterhyacinth.

In the St. Marks River, it was evident that native birds forage and nest in exotic plant populations. However, study is needed to determine if these exotic species provide a similar quality of habitat to that offered by native plant species. Nevertheless, deliberate management of waterhyacinth and egeria for bird habitat is doubtful, due to their extremely high growth rates and potential to impact other ecosystem components (Lynch et al. 1957, Tabita and Woods 1962, Guscio et al. 1965, Solymosy and Gangstad 1974, McVea and Boyd 1975, Getsinger and Dillon 1984, Gopal 1987)[8].

ACKNOWLEDGEMENTS

We thank Andrew Leslie and Greg Jubinsky for participating in the study design. Kathy Burks, Jeff Smith and many others provided comments that improved this manuscript. Matt Phillips helped with field work. These data were generated from the St. Marks River Biological Monitoring Program, a legislatively mandated study supported by the Florida Aquatic Plant Control Trust Fund.

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