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AQUATIC VASCULAR PLANTS OF TWO COSTA RICAN PONDS

GARRETT E. CROW

Department of Botany and Plant Pathology, University of New Hampshire, Durham, New Hampshire 03824

DORA INGRID RIVERA

Escuela de Ciencias Biológicas, Universidad Nacional, Heredia, Costa Rica

CLAUDIA CHARPENTIER

Directora Académica, Facultad de Ciencias Exactas y Naturales, Universidad Nacional, Heredia, Costa Rica

ABSTRACT. A study of the aquatic flora of two ponds in the coastal region of Puntarenas Province, Costa Rica, was undertaken in the rainy season of 1984. A floristic enumeration of 33 species, representing 20 families of vascular plants, is reported. One species, *Ceratophyllum muricatum,* represents a new record for Costa Rica.

Relatively little has been published in the botanical literature dealing with aquatic ecosystems in Costa Rica (Cole, 1963; Hartshorn, 1983). Bumby (1982) correlated the presence of aquatic macrophytes with physico-chemical parameters at several sites across climatic zones in Costa Rica. Gómez (1984) recently published a manual for the identification of aquatic vascular plants of Costa Rica and Central America (monocotyledons). Nevertheless, aquatic plants remain poorly collected in Costa Rica and there is much field work yet to be done in order to give us a clearer understanding of the aquatic flora of the country.

During the rainy season of 1984, while the senior author served as a Visiting Professor at Universidad Nacional, Heredia, field work was conducted on aquatic plants, chiefly on the western side of the country. Results from a study at Palo Verde National Park, Guanacaste Province, is presented elsewhere (Crow & Rivera, 1987). For this study two small ponds were examined at Playa Doña Ana, near Barranca, Puntarenas Province. The study area represents two coastal pond habitats of the Pacific slope in a region which experiences a rainy season from mid April to mid November, followed by a five month dry season. In contrast to many of the transitory ponds in adjacent Guanacaste Province, these ponds retain some water, even in the dry season, although the water level drops greatly.

MATERIALS AND METHODS

Collections were made in 1984 during the months of September, October, and November. Voucher specimens are deposited in the herbaria of Museo Nacional de Costa Rica (CR), University of New Hampshire (NHA), the Missouri Botanical Garden (MO), and the Field Museum of Natural History (F). Collection numbers cited in TABLE 1 are those of Crow.

The first site (FIGURE 1) was a shallow pond which occurred directly behind the beach at a government operated public beach (on south side of the Barranca River). The pond was shaded by trees around the entire margin, with one large, spreading tree with branches that extended out over about one-quarter of the pond. The pond received direct sunlight only during the middle part of the day. The water depth was approximately 1.5–2(–2.5) m in early August and had dropped about 1 m by mid October.

The second site (FIGURE 1) was an elongate pond, located on the north side of the Barranca River, approximately 500 m from the beach and oriented parallel to the shore. The pond was an open, sunny site. The water was approximately 1.5–2(–2.5) m deep in early August and dropped about 1 m by mid October.

RESULTS

The floristic account of the two ponds is presented in TABLE 1. An enumeration of 33 species, representing 20 families of vascular plants is reported. Presence of a species in either pond is indicated by a plus sign (+). Information regarding the life form of each species, as well as relative abundance, is also presented in the table.

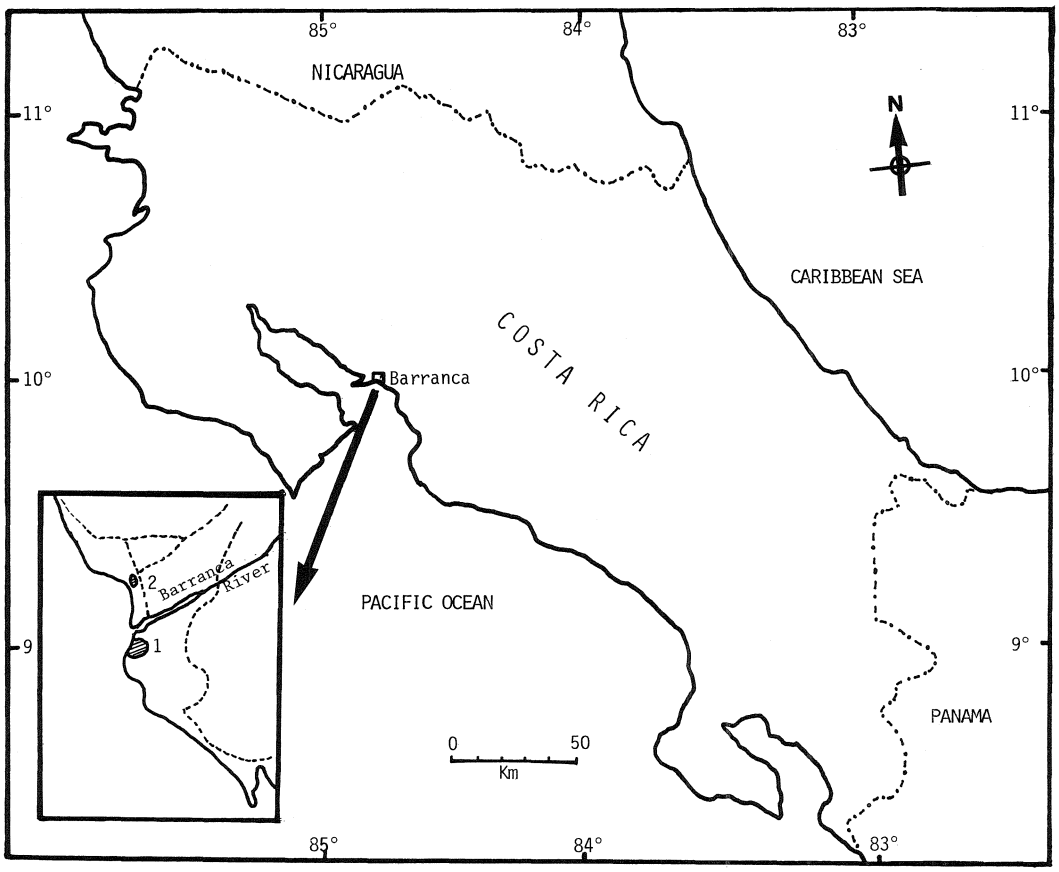

FIGURE 1. Location of study areas in Costa Rica.

DISCUSSION

Site One

The first site was a shaded pond with a conspicuous shrubby growth of *Mimosa pigra* in the water about 2 m from the margin, forming a ring encircling three-quarters of the pond. Numerous floating aquatics covered the water's surface, including *Spirodela polyrhiza, Azolla mexicana* (extremely abundant), *Lemna valdiviana* and *Limnobium laevigatum.* A floating mat of *Pistia stratiodes* covered a large area of the pond. A few individual floating rosettes of *Ceratopteris pteridoides* were also present.

Ceratophyllum muricatum, a submersed species, occurred in great abundance throughout the pond, even thriving beneath a dense carpet of floating *Azolla mexicana* in one area. Fruiting on these underwater plants was abundant. The only other submersed species found was *Utricularia gibba,* growing tangled with *Ceratophyllum muricatum* and the dangling roots of floating plants, especially *Limnobium laevigatum. Utricularia gibba* produced only submersed, cleistogamous flowers.

Site Two

The second site was a sunny pond. In early August there was considerable open water, with large floating mats of *Pistia stratiotes* and *Limnobium laevigatum.* By mid September these two species had multiplied vegetatively to cover nearly all of the open water. Although *Salvinia auriculata,* a plant which often is very vigorous, was present, it was a minor component of the floating vegetation.

The emergent vegetation, especially near the margin, was very important in this habitat. *Thalia geniculata,* a large, very tall herb, was predominant, while the almost equally tall *Typha domingensis* was also important. Several sedges, *Cyperus giganticus, C. flavicomus,* and *C. odoratus* were abundant. *Paspalum repens,* with its

TABLE 1. Floristic account of vascular plant species in the two study sites. Numbers are voucher specimens. Abbreviations for life forms are: e = emergent; f = rooted, with floating stems or leaves; ff = free-floating; s = submerged; sh = shrub.

Taxon and abundance	Life form	Site 1: shaded pond	Site 2: open pond
PTERIDOPHYTA			
Pteridaceae			
Ceratopteris pteridoides (Hook.) Hieron. Occasional. *5939, 6003*	ff, e	+	
Salviniaceae			
Azolla mexicana Presl Abundant. *5935*	ff	+	
Salvinia auriculata Aubl. Infrequent, scattered. *6016, 6206*	ff		+
MAGNOLIOPHYTA			
Magnoliopsida			
Asteraceae			
Eclipta prostrata L. (=*E. alba* var. *prostrata* (L.) Hassk.) Occasional. *6025, 6208*	e		+
Caesalpiniaceae			
Cassia patellaria DC. Occasional. *6209*	sh		+
Ceratophyllaceae			
Ceratophyllum muricatum Cham. Abundant. *5941, 6009*	s	+	
Euphorbiaceae			
Caperonia palustris (L.) St. Hil. Abundant. *5932, 6027*	e, f	+	+
Phyllanthus niruri L. Frequent. *6008*	e, f	+	
Lentibulariaceae			
Utricularia gibba L. Abundant, especially later in season. *5934, 6014, 6215*	s	+	
Mimosaceae			
Mimosa pigra L. Abundant. *5943, 6012*	sh	+	

TABLE 1. Continued.

Taxon and abundance	Life form	Site 1: shaded pond	Site 2: open pond
Nymphaeaceae			
Nymphaea ampla (Salisb.) DC. Frequent. *6032*	f		+
Onagraceae			
Ludwigia inclinata (L. f.) Gómez Common on edge. *6026*	e		+
Ludwigia leptocarpa (Nutt.) Hara Frequent at edge. *6026*	e		+
Polygonaceae			
Polygonum segetum H.B.K. Frequent. *5936, 6010, 6031*	e	+	+
Polygonum punctatum Ell. Frequent. *6030*	e		+
Liliopsida			
Araceae			
Pistia stratiotes L. Abundant. *5938, 6011, 6213, 6016*	ff	+	+
Arecaceae			
Bactris guineensis (L.) H.E. Moore (=*B. minor* Jacq.) Several plants. *6218*	sh	+	
Commelinaceae			
Commelina diffusa Burm. f. Occasional. *6024*	e		+
Cyperaceae			
Cyperus giganticus Vahl Abundant. *6035*	e		+
Cyperus flavicomus Michx. (=*C. albomarginatus* Nees) Abundant. *6021*	e		+
Cyperus odoratus L. (=*Torulinium odoratus* (L.) S. Hooper) Abundant. *6019, 6020*	e		+
Mariscus panamensis C.B. Clark Occasional. *5937*	e	+	

TABLE 1. Continued.

Taxon and abundance	Life form	Site 1: shaded pond	Site 2: open pond
Oxycaryum cubense (Poeppig & Kunth) K. Lye Abundant, floating mats. *6212*	e		+
Hydrocharitaceae			
Limnobium laevigatum (Willd.) Heine Abundant. *5933, 5940, 6005, 6017, 6205*	ff	+	+
Lemnaceae			
Lemna valdiviana Philipi Abundant. *6015*	ff	+	
Spirodela polyrhiza (L.) Schleid. Abundant. *6013*	ff	+	
Marantaceae			
Thalia geniculata L. Abundant. *6033*	e		+
Poaceae			
Brachiaria mutica (Forssk.) Stapf Locally abundant. *6211, 6216*	e	+	+
Echinochloa polystachya (H.B.K.) Hitchc. Frequent. *6022*	e		+
Hymenachne amplexicaulis (Rudge) Nees Common at edge. *6006, 6028*	e	+	+
Oryza latifolia Desv. Occasional. *6004*	e	+	+
Paspalum repens Berg. Abundant. *6018*	e, f	+	+
Typhaceae			
Typha domingensis Pers. Abundant. *6034*	e		+

inflated, floating leaf sheaths, was the most important grass species at this site.

By mid October the water level had noticeably dropped; the emergent vegetation had taken over at one end of the pond, while a floating mat of *Pistia stratiotes* and *Limnobium laevigatum* covered most of the area which was formerly open water. Additionally, one sedge, *Oxycaryum cubense,* formed some dense, floating mats. *Thalia geniculata* was also beginning to drop fruits and the plants were beginning to die. The pond nearly dries completely during the dry season.

One species reported in this paper, *Ceratophyllum muricatum,* represents a new record for Costa Rica. According to Donald Les (pers. comm.) these plants represent a New World infraspecific taxon within his most recent taxonomic concept of *C. muricatum* (including *C. australe* and *C. llerenae*) which ranges from Florida south to Argentina, and previously known from El Salvador and Nicaragua in Central America.

A second species, *Spirodela polyrhiza,* has apparently not been collected in Costa Rica since a specimen was collected near the turn of the century by Pittier (cited by Landolt, 1986). We found the species to be abundant at site one but absent from site two. We believe this species serves as an example underscoring the general lack of field work on aquatic plants. Michael Grayum (pers. comm.) informed us that he recently collected specimens of *Spirodela* at Río Grande de Tarcoles in the Carara Reserve. *Spirodela polyrhiza* is a widespread species with a subcosmopolitan distribution and surely occurs more widely in Costa Rica.

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