NAS - Nonindigenous Aquatic Species

Cryptocoryne beckettii Thw. ex R. Trim.

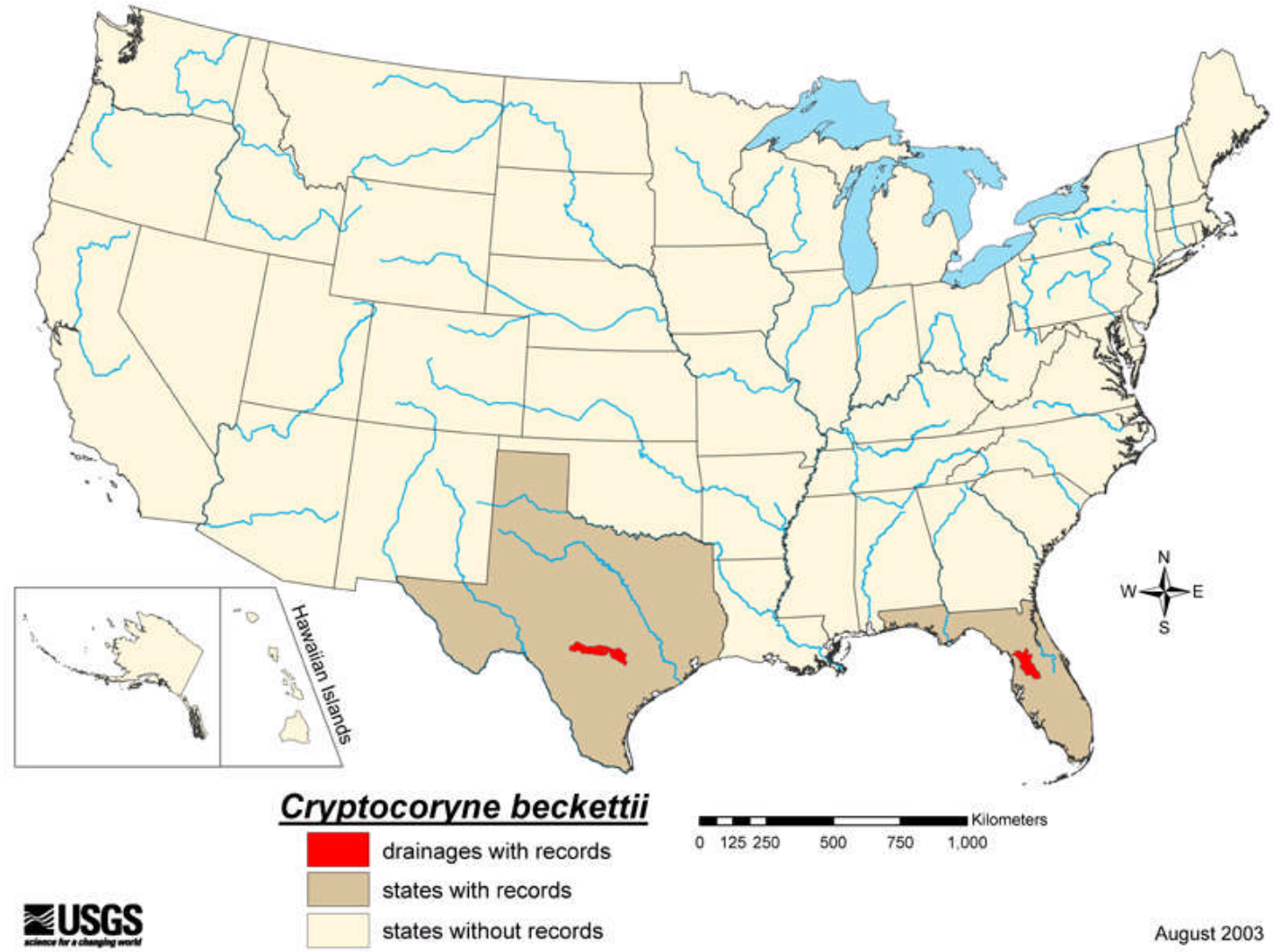
Common name: watertrumpet

Taxonomy: Division-Magnoliophyta (Angiosperms); Class-Liliopsida (Monocots); Subclass-Arecidae; Order-Arales; Family-Araceae (Arum Family).

Identification: Perennial aquatic herb growing submersed under constant water levels, emerging with water recession. Leaves attached at the crown by sheathed petioles as long as or longer than the leaf. Leaves ovate to lanceolate, tapering at the tips and rounded at the bases. Leaf surfaces smooth, margins entire, commonly wavy. Submersed leaves 4 - 10 cm long, 1 - 4 cm wide. Upper surfaces pink to green to brown, often marbled in darker brown or patterned with prominent venation. Lower surfaces nearly green to brown and tinted with a glistening violet. Inflorescence enclosed within a spathe, a fleshy ornate bract. Immature spathes are sometimes present on submersed plants and appear as tightly rolled tubes. Mature spathes will unfold only when emersed from the water. Several features of mature spathes, specifically the color of the collar and the twist of the terminal limb, are used in species identification.

Native Range: Endemic to Sri Lanka (Jacobsen 1977; Jacobsen 1987; de Graaf & Arends 1986).

Habitat: Rooted directly in limestone substrate or in the sand and silty sediment overlaying rocky streambeds in clear, fast-moving water of springs and spring-fed streams. U.S. sites are karstic systems receiving artesian groundwater that is high in clarity, rich in soluble carbonates and moderate in temperature (USGS 1999; USGS 2000).



Map indicates recorded presence in at least one site within the drainage (USGS Hydrologic Unit 8), but does not necessarily imply occurrence throughout that drainage.

Nonindigenous Occurrences: First recorded in Marion County, Florida, 1989, in a shaded cove of a spring run along the Rainbow River, Rainbow Springs Aquatic Preserve (Wunderlin 1998). The specimen was identified as *Cryptocoryne wendtii* [(*Hinkle s.n.* (FLAS)]. Recollection twelve years later determined that three closely related species were growing there intermixed and plants were vouchered as *C. beckettii*, *C. wendtii* and *C. undulata* (Jacono 2002). The infestation consists of a dense 130-m² stand ranging from 28 to 75 cm deep. Outlying plants emanate from rock crevices as deep as 150 cm (Jacono 2002). *Cryptocoryne beckettii* was subsequently documented in Hays County, Texas, 1996, as large colonies established in shallow riffles and shaded pools of the spring-fed San Marcos River (Rosen 2000). Scattered patches had reportedly been observed since 1993 (Crypt. Info. Meet. 2001). Monitoring studies from 1998 to 2000 detailed its average rate of expansion as an alarming 80% per year within a 1.7 km stretch of the upper San Marcos River (Doyle 2001). The infestation consists of many small and several large colonies. During the 28 month monitoring period the number of individual colonies increased from 11 to 63 and the total area covered increased from 171 to 646 m². Most colonies were located at depths of 30 - 90 cm, none grow deeper than 120 cm (Doyle 2001). Regardless of aggressive removal efforts that employ dredging and bottom barriers, plants continue to spread in the San Marcos River. Where once small patches occurred, now there are stands that extend bank-to-bank. Total infested area in the San Marcos currently exceeds 1,880 m² (P. Power, pers. comm., June 2003). In 2003, a single Cryptocoryne plant was pulled from the headwaters of the Guadalupe River, Kerr Co., Texas. The area was searched but additional plants have not yet been found (P. Power, pers. comm., June 2003).

Means of Introduction: Escape from cultivation or dumping of aquariums has been proposed (Rosen 2000; Jacono 2002). *Cryptocoryne* are highly sought-after as decorative plants for tropical aquariums. Hardy and

vigorous, *C. beckettii* is one of the easiest species to cultivate (Miller 1998; Rataj and Horeman 1977).

Life History Characteristics: The ability of *Cryptocoryne* to selectively use bicarbonate under alkaline conditions (Cheng and Mansor 2000) may contribute to its successful colonization at karstic spring environments in Florida and Texas. Like many aroids, *Cryptocoryne* employ contractile roots to adjust plant level after heaving or flooding (Bown 1988). Tiny rootlets sent deep into the rock use root pressure to contract in length and pull the roots farther into the substrate. This adaptation firmly anchors plants in swift currents and likely accounts for the deep rooting in limestone substrate at Rainbow Springs, Florida. In San Marcos River, Texas, plants root deeply in sediment mounds resulting from streamside erosion. Reproduction in *Cryptocoryne* is primarily accomplished through vegetative structures. Rhizomes and runners (stolons ending in a new plantlet) provide for expansion of apparently well-suited populations in Texas and Florida. Additionally, and perhaps more importantly in dispersal, basal shoots, shortened "bulbil-like" runners, are produced in Florida. Small (< 5mm) and abundant (up to 8-20 per individual) the shoots are loosely associated with the mother plant and readily break away. Promptly forming an initial root and primary leaf, basal shoots are armed and ready to establish as new plants. At Rainbow Springs basal shoots were most abundant in springtime. In cultivated transplants they provide for the flush of new season growth. Disturbances such as wading will dislodge basal shoots. The shoots immediately sink; conversely, dislodged rhizomes usually float to the water surface. Because of their large abundance and small size, basal shoots are difficult to contain and can be carried downstream with bottom currents. They should be more effective than rhizome fragments as propagules for downstream spread and probably occur in Texas as they do in Florida.

Impact of Introduction: The upper San Marcos River supports the greatest known diversity of aquatic organisms in Texas and provides critical habitat for endangered species including the fountain darter (*Etheostoma fonticola*), the San Marcos blind salamander (*Typhlomolge rathbuni*) and Texas wildrice (*Zizania texana*) (see Doyle 2001). Appearing to prefer similar depth and flow velocities as *Z. texana* and having a more rapid rate of expansion, *Cryptocoryne beckettii* poses a threat to the endangered rice by occupying habitat that might otherwise be re-colonized by the rebounding *Z. texana* (Doyle 2001). The Rainbow River is a site of exceptional scenic beauty and a popular destination for recreation. It was designated the Rainbow Springs Aquatic Preserve in1986 (Florida Statute 258.39[32]). *Cryptocoryne beckettii* grows there at 1480 plants / m2, a high density that excludes native macrophytes and encroaches on adjacent stands of the endemic springtape (*Sagittaria kurziana*), twoleaf watermilfoil (*Myriophyllum heterophyllum*) and an unusual population of starrush whitetop (*Rhynchospora colorata*). Several meters downstream annual wild rice (*Zizania aquatica*) and the endemic Florida watercress (*Rorippa floridana*) contribute to one of the few unspoiled plant communities remaining at the Preserve. The potential for dispersal of *Cryptocoryne* at Rainbow Springs Aquatic Preserve is considerable. In the San Marcos River, disturbance caused by wading and sporting activities are suspected to have contributed to the tremendous proliferation of *C. beckettii* downstream (P. Power, pers. comm. 2002). Significant increases in dislodged plant fragments have been documented below high recreational use areas on the San Marcos River (Owens et al. 2001). Likewise in the Rainbow River, recreational activities were found to be responsible for the uprooting of large masses of vegetation (Mumma et al. 1996). The secluded stream harboring *Cryptocoryne* at Rainbow Springs Aquatic Preserve is currently off-limits but under consideration for public use.

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