

# *Hydrilla verticillata* (L.f.) Royle in Guadeloupe, French West Indies

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## INTRODUCTION

Hydrilla (*Hydrilla verticillata* [L.f.] Royle), also known as water thyme, is a widespread invasive aquatic weed present almost worldwide (Cook and Lüönd 1982). In his flora of the Lesser Antilles, Howard (1979) did not report the presence of hydrilla. In 1983, Jérémie collected this plant in Dominica, 75 km south of Guadeloupe (Adjanohoun et al. 1985). In 1991, Vivant and Jérémie found hydrilla in a pond on Marie-Galante (Fournet 2002, Jérémie 2006 pers. comm.). This same year Lemke and Roberts (1993) found the species in the island of Grenada, thinking that it was the “first record” of hydrilla from the Lesser Antilles. According to Fournet (2002), hydrilla is considered a very rare species in the French Lesser Antilles. Since these records, no data have been published about the expansion of this noxious species in this region. The aim of this study was to conduct a brief survey of the presence of hydrilla in Guadeloupe.

## METHODS

The study was performed from 2004 to 2007 in four parts of Guadeloupe: Basse-Terre, Grande-Terre, Marie-Galante, and Les Saintes. Permanent and temporary water bodies ranging from ponds to flowing waters such as canals, streams, and rivers, including estuaries, were assessed using a surface inventory method. Sites to be investigated were chosen at random based on the wide range of potential habitats for hydrilla. Dried water bodies with mats of decayed dried detritus of hydrilla were taken into account. From coastal to inland regions, 57 flowing waters were visited (Basse-Terre (41), Grande-Terre (12), Marie-Galante(4), and 161 ponds (Basse-Terre (29), Grande-Terre (91), Marie-Galante(39), Les Saintes (2). This is not an exhaustive inventory compared to the total number of water bodies on Guadeloupe: 2,682 ponds (Bruyère and Questel 2001) and at least 57 per-

manent rivers, mainly on Basse-Terre (55), only two of which crisscross Grande-Terre and Marie-Galante. These numbers do not take into account the numerous streams, ravines, and canals (Chaperon et al. 1983). A total of 245 sites were sampled (Basse-Terre (94), Grande-Terre (106), Marie-Galante(43), Les Saintes (2); 77% of flowing waters and 100% of ponds were seen one time. When hydrilla was present in a site, 20 voucher specimens of immature male flowers and floating male flowers were randomly sampled and kept in 95% ethanol or dried in herbarium for later morphological analysis, especially for biotype identification.

## RESULTS AND DISCUSSION

Hydrilla was found in four permanent rivers (7% of total) on Basse-Terre (Figure 1): on the leeward coast near Pointe-Noire and the estuary of the Ravine Bleue; and on the northward coast at the Grande Rivière à Goyaves, which is the greatest drainage basin (158 km<sup>2</sup>) of Guadeloupe and two of its tributaries, the Rivière du Premier Bras and the Rivière du Deuxième Bras, which is used for aquaculture. Hydrilla covered around 10 km (25%) of the Grande Rivière à Goyaves in a discontinuous pattern. In sampled rivers, hydrilla was always found downstream of fish and crayfish farms. This observation may be coincidental because there is no evidence that hydrilla was associated in polycultural systems with giant river prawn (*Macrobrachium* spp.) or Tilapia (*Oreochromis* spp.), two species cultivated in Guadeloupe, even if such a practice was encouraged (New 2002). Hydrilla was also observed in four ponds (0.15% of total; Figure 1): one on Basse-Terre at Etang Roland, near the town Vieux-Habitants on the leeward coast; one near Bacquié on the inward coast of Grande-Terre; and two on Marie-Galante near Grand-Bourg at Habitation Murat and the surrounding area. On Basse-Terre, Etang Roland (22500 m<sup>2</sup>) is an important waterfowl habitat made of two ponds flowing into the sea. Its surface and depth are completely invaded by hydrilla. On Grande-Terre, hydrilla was observed in a temporary pond used for agriculture (sugar cane irrigation, water for livestock, but not for recreational purpose), 30 km from the

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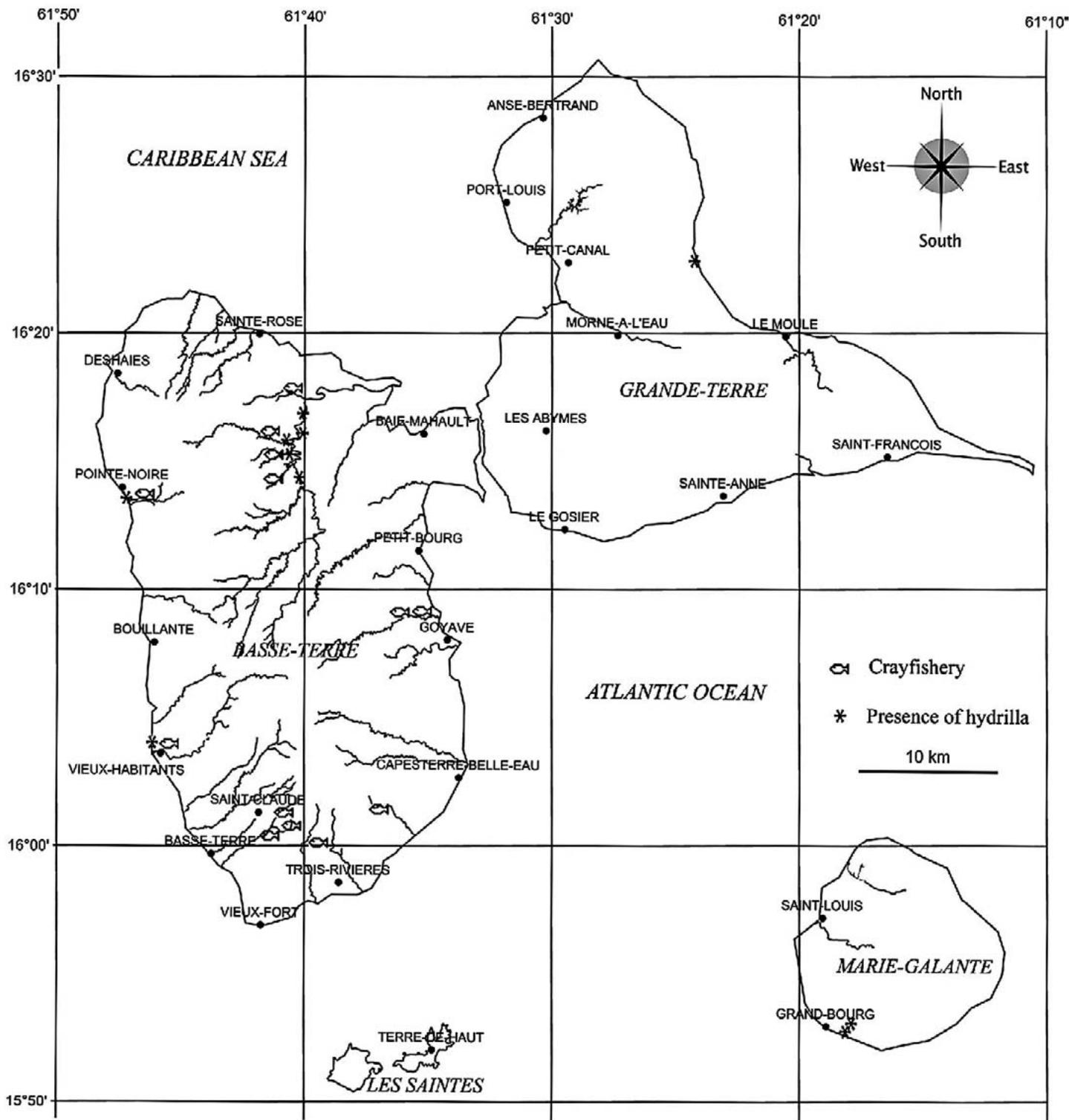


Figure 1. Distribution of hydrilla (*Hydrilla verticillata*) on the islands of Guadeloupe (except Desirade).

nearest known sites on Basse-Terre. However, this presence cannot be attributed to long distance dispersal by birds because introduction from aquariums in surrounding houses is possible. On Marie-Galante during the 1980s, hydrilla was introduced in the pond Murat where a population of Molokoy

tortoise, *Trachemys stejnegeri*, lives (Grandguillotte 2007 pers. comm.). Any of these sources could be the initial source of the invasion, but because the weed spreads locally, the origin of hydrilla in Guadeloupe is not yet clearly identified. Despite reports on the role of water birds in the passive dispers-

al of aquatic plants (Joyce et al. 1980, Figuerola 2002), human vectors may be a plausible explanation. An investigation of the main aquarium-plant importer revealed that the aquarium hobby is well developed in Guadeloupe. Freshwater plants such as Brazilian elodea (*Egeria densa* L.) and South American waterweed (*Elodea callitrichoides* [L.C. Rich.] Casp.), which are often misidentified instead of hydrilla, hornwort (*Ceratophyllum* spp.), fanwort (*Cabomba* spp.), and wild celery (*Vallisneria* spp.) are sold for aquariums and backyard ponds, and some were found released in ponds (Maddi and Meurgey 2006); hydrilla is not imported to Guadeloupe, however.

Both in Basse-Terre and Marie-Galante, hydrilla populations appear to be dioecious female because staminate flowers were not observed in our samples. On Grande-Terre, a sample designated as Maddi 749 collected by F. Meurgey in January 2006 showed both mature female flowers and solitary bud-like organs in the axils of leaves. Dissection of these organs revealed three yellowish white stamens at an early stage of development, so undoubtedly these bud-like organs are immature male flowers. This record establishes the presence of monoecious hydrilla in Guadeloupe and in the Lesser Antilles. However, the lack of rigorous sampling probably leads to an underestimate of the occurrence of the monoecious biotype. Turions and tubers were also observed. Tubers, considered as dispersal and survival elements (Netherland 1997), were found 10 to 20 cm deep in moist mud during the dry-warm season, called "Carême," that runs from April to June. In each station where hydrilla was present, it expressed its invasive character as described by Langeland (1996).

Because of its invasive ability, hydrilla must be studied closely in Guadeloupe where inland waters are crucial for domestic consumption, agriculture, and freshwater activities, especially regarding its geographical dispersion and its impact on aquatic life. This knowledge should be acquired to avoid a large invasion of flowing waters and ponds in Guadeloupe.

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