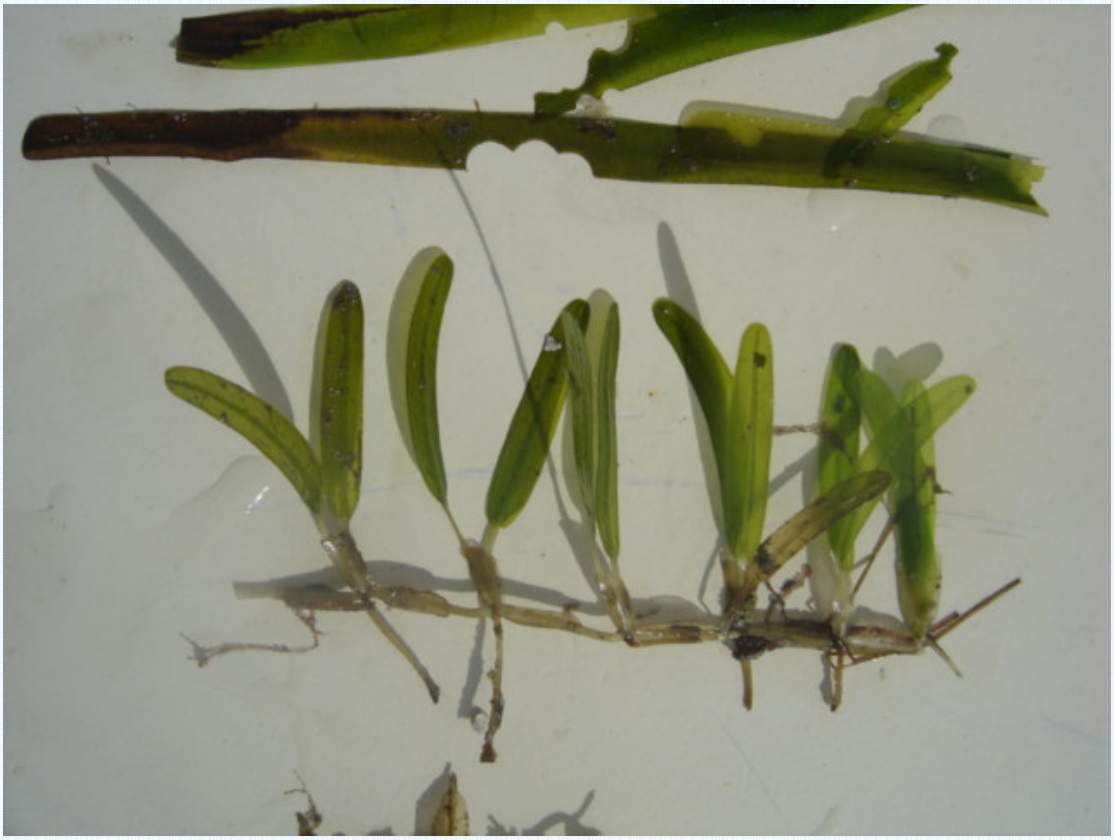
NATURE FOUNDATION ST. MAARTEN

Results of Nature Foundation Research into invasive Seagrass *H. Stipulacea* in the Simpson Bay Lagoon



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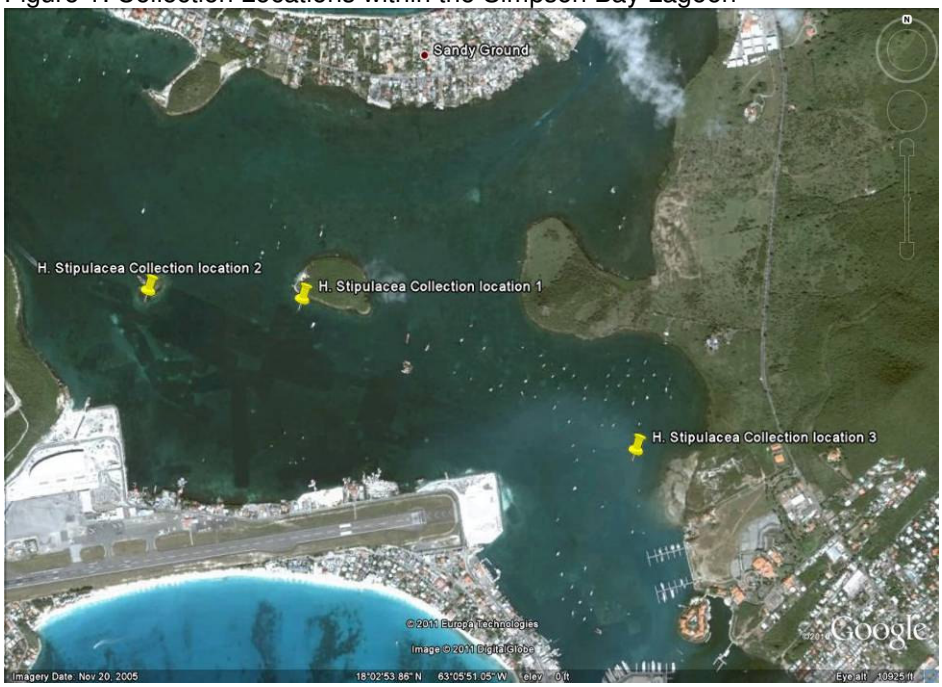
Introduction

On Saturday February 12th, staff of the St. Maarten Nature Foundation conducted research on the possible presence of *H. stipulacea*, an invasive seagrass, in the Simpson Bay Lagoon. The first unconfirmed, anecdotal report of a specimen of *H. stipulacea* being present in the Simpson Bay Lagoon was given by researchers of EcoVision in 2010, who were conducting an EIA on the construction of the Lagoon Causeway. Though no photos or documentation was produced showing the presence of the species, it was decided that based on the disconcerting nature of marine plant invasions, research be conducted on the presence of the species.

During the subsequent research, beds of *H. stipulacea* were found at three different locations: (1) Big Key (18 02 58. 70 N 63 06 15. 05 W) (2) Little Key (18 0259. 79 N 63 06 36.56 W) and in the south eastern part of the Lagoon (18 02 39. 69 N 63 05 28.60 W). It was observed that there were extensive beds of *H. stipulacea* present although a planned mapping project will show the real extent of distribution.

Figure 1: Collection Locations within the Simpson Bay Lagoon



Background H. stipulacea

H. stipulacea is a tropical seagrass with a native range east to India, west to eastern continental Africa, south to Madagascar, and north to the Red Sea and Persian Gulf (Den Hartog, 1970). The seagrass genus *Halophila* is comprised of fourteen species on a worldwide basis (den Hartog, 1970; Sachet and Fosberg, 1973; Eiseman and McMillan, 1980; Kuo and den Hartog, 2001; Green and Short, 2003) and four species are currently known from the warm subtropical and tropical western Atlantic Ocean (den Hartog, 1970; Eiseman and McMillan, 1980). The west Atlantic representatives are: *Halophila decipiens* Ostenf., *Halophila engelmanii* Asch. and *Halophila johnsonii* Eiseman.

Origin of the Invasion

The opening of the Suez Canal in 1869 facilitated the expansion of H. stipulacea into the Mediterranean Sea. From the mid-1800s *H. stipulacea* migrated west through the Mediterranean Sea, reaching Malta in 1970 (Schembri and Lanfranco, 1996), the Ionian Sea in 1992 (Van der Velde and Den Hartog, 1992), and the north coast of Sicily in 1997 (Procaccini et al., 1999). In 2002 *H. stipulacea* became only the second seagrass to make a transoceanic migration with the discovery of a 300 m2 mono-culture of H. stipulacea in a single bay on the Caribbean coast of Grenada, West Indies (Ruiz and Ballantine, 2004).

The success of *H. stipulacea* as an invasive in the Mediterranean Sea can be attributed to its rapid vegetative expansion (Marba´ and Duarte, 1998), habitat flexibility (Coppejans et al., 1992; Pereg et al., 1994), tolerance of a wide salinity range (Por, 1971), adaptation to high irradiance (Schwarz and Hellblom,

2002), and ability to grow at depths from the intertidal zone to greater than 50 m (Beer and Waisel, 1981). The rapid growth and pervasiveness of *H. stipulacea* is similar to another aggressive invasive *macrophyte, Caulerpa taxifolia* (Boudouresque and Verlaque, 2002; Anderson, 2005).

On St. Maarten the most likely vector for transportation is the boating and yachting industry, particularly those vessels originating in the Mediterranean (i.e. Yachts) or vessels travelling from Grenada, St. Lucia and/ or Dominica.

H. stipulacea in the Simpson Bay Lagoon

The presence of *H. stipulacea* in St. Maarten was verified by examining the characteristic features of the species based on the description of Den Hartog (1970). Rhizome diameter measured 1–2 mm with a single root at each node and an internode distance of 7–50 mm (Fig.). Leaf scales were folded and elliptic in shape with a length of 6–18 mm and width of 2–6 mm. Blades were elliptic, oblong to linear, and pale to dark green in color with a length of 22–57 mm and width of 5–9 mm. The surface of each blade had a distinct mid-rib originating at the petiole and ended near the apex of the blade where it merged with the circumventing intramarginal nerve. Serrations were present along the lateral margin and at the apex of the blade. Additionally, the blades had numerous and often paired cross-veins extending from the mid-rib to the intramarginal nerve at a 30–608 angle. Blade dimensions of samples (n = 30) taken from three beds within the Simpson Bay Lagoon (based on Willette, Ambrose 2009).

Figure 2: Collected Specimen showing intramarginal nerve, leaf scales, blades and rhizome diameter

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Specimens post collection: note comparison with native seagrass *H. testudium*

The depths at which specimens were found were pretty consistent throughout, with an average collection depth of 1.5 – 2 meters. The water temperature during collection was a steady 27 degrees.

Effects of the Invasion

It is unclear how the invasion of *H. stipulacea* will influence St. Maarten's near-shore ecosystem. The presence of a seagrass that is tolerant to a wide range of environmental factors could occupy open space and thus re-shape the local marine resources, such as near-shore fisheries. Differences in *H. stipulacea's* structural morphometrics at different depths, and to some degree different patch sizes, highlight the seagrass's plasticity when growing in a broad range of conditions within the Simpson Bay Lagoon. If *H.*

stipulacea expands into existing seagrass beds, it may result in the loss of biodiversity. In hurricane-prone areas like St. Maarten and in biologically depleted zones such as the Simpson Bay Lagoon, the rapid colonization of recently disturbed habitats by *H. stipulacea* could interfere with natural seagrass succession. Likewise, if *H. stipulacea* is displacing native seagrasses on the island, a loss of seagrass diversity may occur. The displacement of an indigenous species may not only compromise that species (for examples, see Race, 1982; Fogarty and Facelli, 1999), but may also having a cascading effect on any organisms supported by that species (for examples, see Spencer et al., 1991; Levin et al., 2006; Khan et al., 2003; Byrnes et al., 2007; Daskalov et al., 2007). Further studies of *H. stipulacea* will be needed to resolve the question of its ecological impacts in the Caribbean basin.

H. stipulacea patches often occurred exclusive of the otherwise dominant seagrasses of the Caribbean (Willette, Ambrose 2009). The potential for the expansion of *H. stipulacea*, combined with its tolerance for a wide spectrum of environmental conditions, positions it as a potential threat to local and regional biodiversity.

It is also possible that intakes and outflow pipes (such as that at the GEBE power plant) can become clogged due to an increase in matter caused by the seagrass. Careful monitoring will be put in place by the Nature Foundation in order to determine spread and threats of the species.

Possible Controlling Methods

One of the areas where the most specimens were found was located in the planned site for the causeway. The dredging of this area will result in a certain reduction of *H. stipulacea* in the near future. However an alternative system has to be found to ensure that the species does not gain too much traction within the ecosystem. Research is currently being conducted as to the possibilities of seeding areas with native grasses in an attempt to control the invasion. St. Maarten is currently one of only four territories where the specimen has been found, thus research on controlling measures in the region are still in its infancy. The Nature Foundation is in constant dialogue on the developments of controlling methods.

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