INVASIVE SEAGRASS- MEGA-HERBIVORE INTERACTIONS

a study on the invasion of seagrass *Halophila stipulacea* in a Southern Caribbean lagoon affected by *C. mydas* grazing

Photo by Dr. R. van Dam

Master of Science Research Biology (specialization ecology)

European Credit: 30

MSc. student: Tineke C.J.M. van Bussel (1864165)

Supervisors:

Developing research project and report: Dr. Ir. P.M. van Bodegom
VU University Amsterdam
Faculty of Earth and Life Sciences (Section Systems Ecology)
De Boelelaan 1085, 1081 HV Amsterdam, The Netherlands
p.m.van.bodegom@vu.nl

Developing research project and field work : Dr. S. Willis, M. Nava, MSc., S. Engel, MSc.
Sea Turtle Conservation Bonaire
PO Box 492 Kralendijk, Bonaire
program.assistant@bonaireturtles.org, Stcb@bonaireturtles.org,
lacbay.conch@gmail.com

Publication date: April 25th 2014

VU UNIVERSITY AMSTERDAM

SEA TURTLE CONSERVATION BONAIRE

IMARES WAGENINGEN UR

STINAPA BONAIRE NATIONAL PARKS FOUNDATION

Abstract

In the Caribbean, the recent invasion of the seagrass species *Halophila stipulacea* has raised concerns regarding its impact on the invaded seagrass ecosystem and its associated flora and fauna. The main purpose of the experimental set-up was to understand the mechanisms and impacts of invasive species on a native seagrass in interaction with grazing impacts by the green sea turtle (*C. mydas*). The aims of the study were i.) to determine the colonization capacity of native seagrass species *T. testudinum* as affected by the presence of the invasive species (*Halophila stipulacea*) and vice-versa in a Caribbean lagoon (Lac Bay, Bonaire); ii.) To determine whether sexually and/or vegetatively colonization is affected by turtle grazing. and iii) to determine whether architectural properties of *T.testudinum* and *H. stipulacea* are affected by presence of other species and whether these are related to *C. mydas* grazing.

For this study, four seagrass bed types were selected that naturally occur in the bay: (1) monoculture of *T. testudinum*, (2) monoculture of *H. stipulacea* , (3) mixed bed of *H. stipulacea* and *T. testudinum* and (4) mixed bed containing *H. stipulacea, T. testudinum* and *S. filiforme*. In each seagrass bed type, 12 experimental units were created divided over three experimental periods of six weeks. Within each unit, two patches of 150 x 150 mm were cleared of above and below ground biomass. Cages were placed over half of the cleared patches to prevent turtle grazing. After six weeks, recolonization of the patches by native species and invasive species were measured by resampling biomass. To assess whether turtle grazing changed architectural properties, measurements on length and width with and without grazing were taken. Lastly, lines around two *T. testudinum* turtle grazing plots were placed to measure the lateral expansion rate of the surrounding *H. stipulacea* patches.

Our results indicate that *H. stipulacea* is a ~11 times faster colonizer than *T. testudinum.* Effects of grazing on their colonization rate were different with *T. testudinum* colonization rate under *C. mydas* grazing being lower and *H. stipulacea's* colonization rate being higher. These effects were not statistically proven, but strong trends were observed. The presence of other seagrass species did not seem to influence competitive abilities (colonization capacity and architectural properties). *C. mydas* grazing, on the other hand, clearly influenced *T. testudinum's* architectural properties. Regarding *T. testudinum's* grazing plots, an average lateral expansion of 0.35 cm day^{-1} by *H. stipulacea* was detected. This study demonstrates that there is no direct competition between *T. testudinum* and *H. stipulacea*. It seems that *H. stipulacea* is colonizing areas unsuitable to *T. testudinum*. Sea turtle grazing creates less dense seagrass beds and therefore might further stimulate the expansion of *H. stipulacea*. The impact of the establishment of *H. stipulacea* on *C. mydas* is not yet clear: Even though it seems not to be the preferred seagrass species, *C. mydas* does graze on the invasive species in Lac Bay. It is, however, unknown how this new food resource will affect their fitness. Though the invasive may alter

abiotic conditions in their habitat, the sea turtles may benefit from an extended cover of seagrass beds as the invasive seagrass is able to grow in places where native seagrass species currently cannot survive. It is recommended to keep monitoring changes and investigating the impact of *H. stipulacea* on the whole ecosystem.