



Physiological Ecology of Drift Algae in The Indian River Lagoon System

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Introduction

The Indian River Lagoon system (IRL) is a shallow, wind-driven estuary with wide annual ranges of temperature and salinity along the east coast of central Florida. Despite seasonal high abundances of drift algae in this system, little is known about the ecology and physiology of these macrophytes that are important as primary producers, refuges for invertebrates, and as transport vectors for associated epifauna. The purpose of this research is to explore the ecology of drift macroalgae in the IRL and to provide insight about the physiological changes that take place when individuals enter the drift. We addressed the following 3 questions for two macroalgae commonly found in the IRL:

1. What is the composition and rate of accumulation of drift algae?
2. Is there movement or turnover within drift accumulations?
3. Do growth rates differ for drift versus attached algae?

Study Sites

In the IRL, composition, rate of accumulation, and turnover trials were conducted at two sites, 1) Mosquito Lagoon in Canaveral National Seashore Park (CANA) and 2) Indian River in Titusville.



A: Collecting algae in Mosquito Lagoon



B: Shoreline in Mosquito Lagoon, CANA

Study Organisms

Gracilaria tikvahiae

- ♦ Rhodophyta
- ♦ Commercially important
- ♦ Prevalent in winter



Codium decorticum

- ♦ Chlorophyta
- ♦ Giant unicellular alga
- ♦ Prevalent in spring



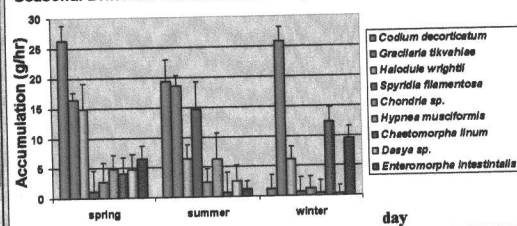
1. What is the composition and rate of accumulation of drift algae?

- ♦ 10 collections were made during each of 3 sampling seasons for 1 year, beginning in summer 2002.
- ♦ At each site, nets were placed at 6 and 21 m from the shoreline and were checked every 10 min for one hr.
- ♦ On each collection date, water motion was measured by plaster-of-Paris dissolution and wind speed was recorded using a Kestrel 2000 hand-held wind meter.
- ♦ Net contents were collected, sorted to species, and weighed. Composition and rate of accumulation were calculated in g/hr.



Net used to collect drift algae.

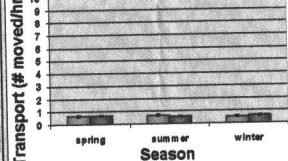
Seasonal Drift Accumulation and Composition in Mosquito Lagoon



2a. Do drift accumulations move?

- ♦ Naturally occurring drift clumps were marked by placing numbered orange flags near each individual. (n=10/season/site)
- ♦ Each flag was revisited and the presence or absence of individuals recorded at 12 and 24 hr.
- ♦ Water motion and mean wind speed were recorded during each visit.
- ♦ Transport was expressed as the number of individuals moved after 24 hr.

Seasonal Drift Transport

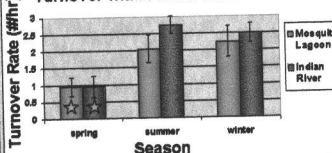


Transport was extremely low at both sites; less than 1 individual moved per hour. There were no significant differences between seasons or sites.

2b. Is there turnover within drift accumulations?

- ♦ Naturally occurring drift was collected in a 5-gal bucket and then transferred into a 0.25 m² quadrat in <1.0 m of water.
- ♦ 15 individuals were tagged with a 0.5 x 2.0 cm piece of flagging tape and placed on top of the clump.
- ♦ Clumps were checked every 15 min for 2 hr. Water motion and wind speed were recorded at the beginning and end of each trial.
- ♦ Turnover was expressed as number of visible tags/hr.

Turnover within Drift Accumulations

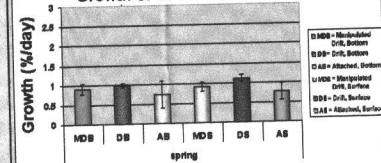


Turnover occurred at both sites and was significantly less prevalent in spring (☆) with low flow rates (mean 6.6 vs. 11.9 cm/s in summer).

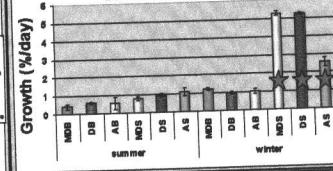
3. Do growth rates differ for drift versus attached algae?

- ♦ Growth experiments included 3 treatments and 2 water depths:
- ♦ **Treatments:** Drift (D), Attached (A), and Manipulated Drift (MD) = attached algae removed from its substrate.
- ♦ **Depths:** Surface (S), Bottom (B)
- ♦ Each individual was weighed, labeled, and placed in a mesh bag (mesh diameter 3 mm). Bags were attached to a PVC pole at the water surface or the sediment surface.
- ♦ After 45 d, wet weights were recorded and pigment levels were quantified using N, N-Dimethyl Formamide (DMF).

Growth of *C. decorticum*

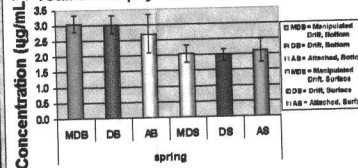


Growth of *G. tikvahiae*

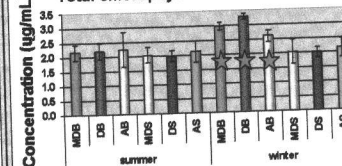


There were no significant differences in growth between drift (D), attached (A), or manipulated drift (MD) treatments for *C. decorticum* or *G. tikvahiae*. Growth was significantly higher (p=0.002) in surface (S) individuals in winter for *G. tikvahiae* (☆).

Total chlorophyll for *C. decorticum*



Total chlorophyll for *G. tikvahiae*



There were no significant differences in chlorophyll levels between treatments for *G. tikvahiae* or *C. decorticum*. Total chlorophyll was significantly higher (p<0.001) in bottom (B) individuals of *C. decorticum* in spring (☆) and *G. tikvahiae* in winter (☆).

Conclusions

- ♦ Drift accumulation and composition varied greatly between seasons at both sites.
- ♦ Turnover of drift occurs continuously and is dependent on flow.
- ♦ There were no differences in growth rate across treatments. Thus, entering the drift does not alter the growth of *C. decorticum* or *G. tikvahiae*.
- ♦ Differences in growth and total chlorophyll were dependent on water depth.

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