Little Cayman Herbivores

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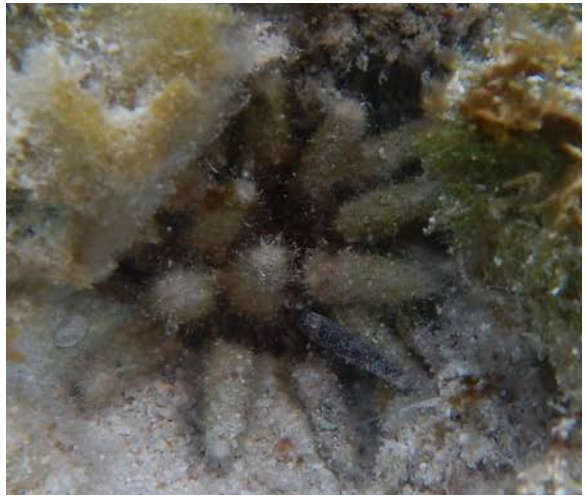
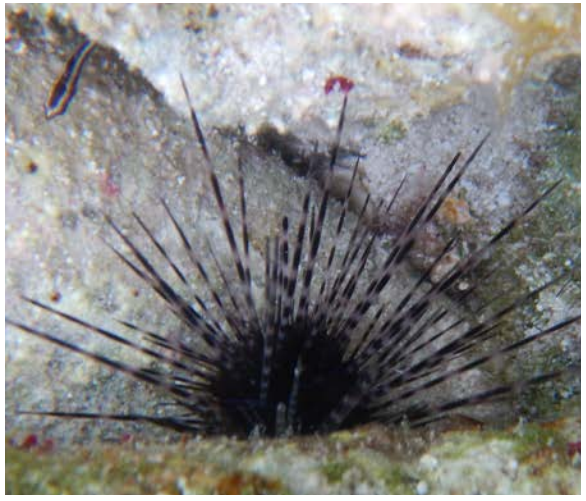
Sea Urchins

Echinometra lucunter
Rock boring urchin

Echinometra viridis
Reef urchin

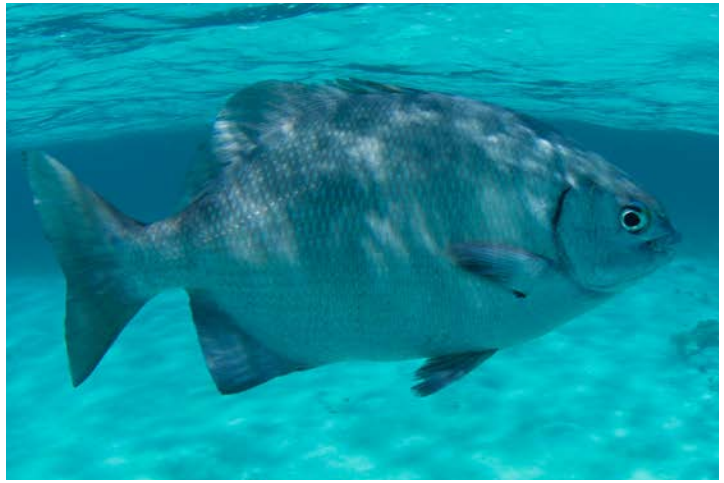


Eucidaris tribuloides
Slate-pencil urchin



Diadema antillarum
Long-spined
sea urchin

Herbivorous Fishes



Kyphosidae
Bermuda Chubs

Acanthuridae
Surgeonfish

Scaridae
Parrotfish

… and others!

Herbivores vs. Algae

- Algae and herbivores have co-evolved over time
  - Algae have evolved defenses against herbivores
- Two main techniques….

  Chemical (secondary metabolite):

  - Influenced by abiotic factors (salinity/nutrient levels)
  - Can increase after algae is damaged by herbivores

  Structural:

  - Structural toughness and calcification
  - Minerals are more concentrated near the base where they can also provide structural support

Herbivores vs. Algae

- HOWEVER, herbivores have evolved ways to combat these defenses
- The gut anatomy, stomach pH and pharyngeal morphology of herbivores influences what algae they can eat...

Relatively tolerant of chemical defences but deterred from feeding by $CaCO_3$

Deterred from feeing by chemical defences but are tolerant of or stimulated to feed by $CaCO_3$

Feeding Choices of Herbivores

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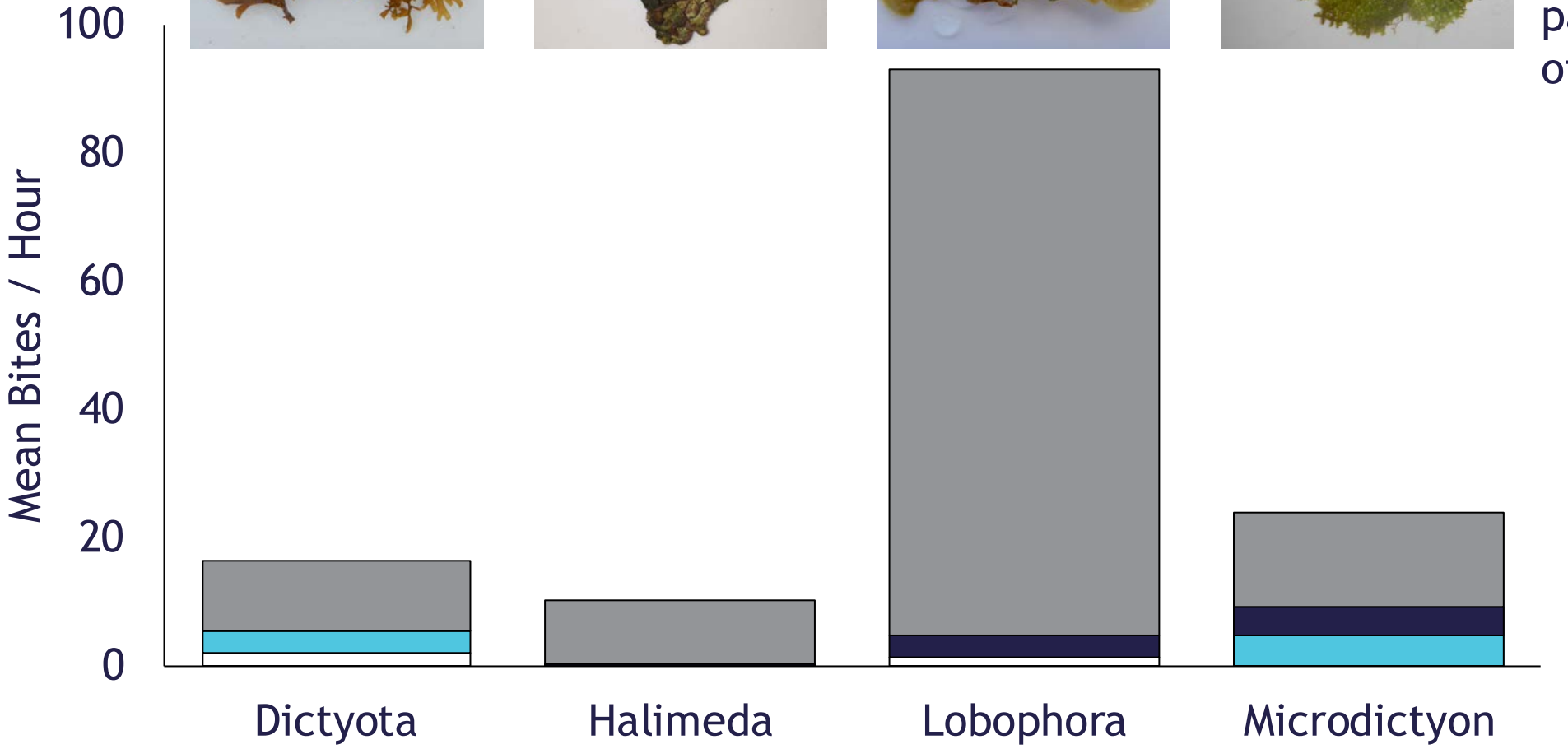


Palatability:
The preference a consumer has for a particular food when offered a choice

Defensive Systems of *Halimeda*

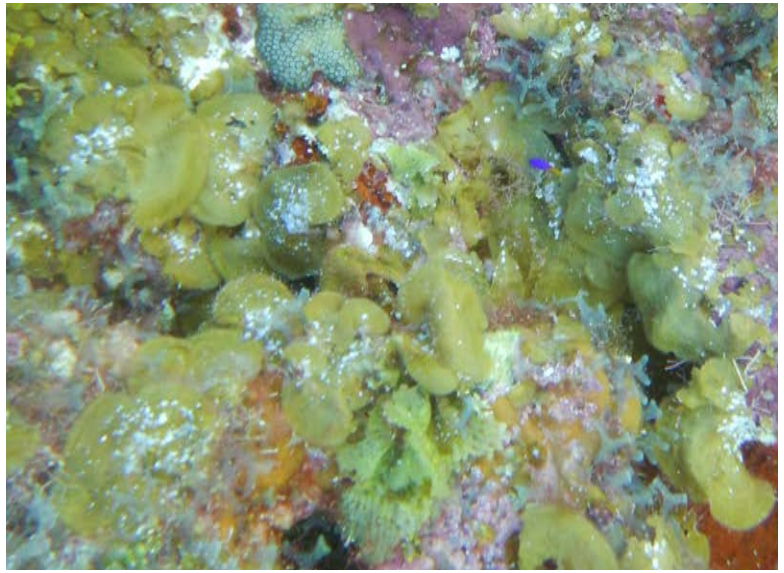
- First report of activated chemical defence in marine plants
- Convert the less-deterrent chemical to the more potent chemical when plants are injured by grinding or crushing
- Also have $CaCO_3$ as a morphological defence.

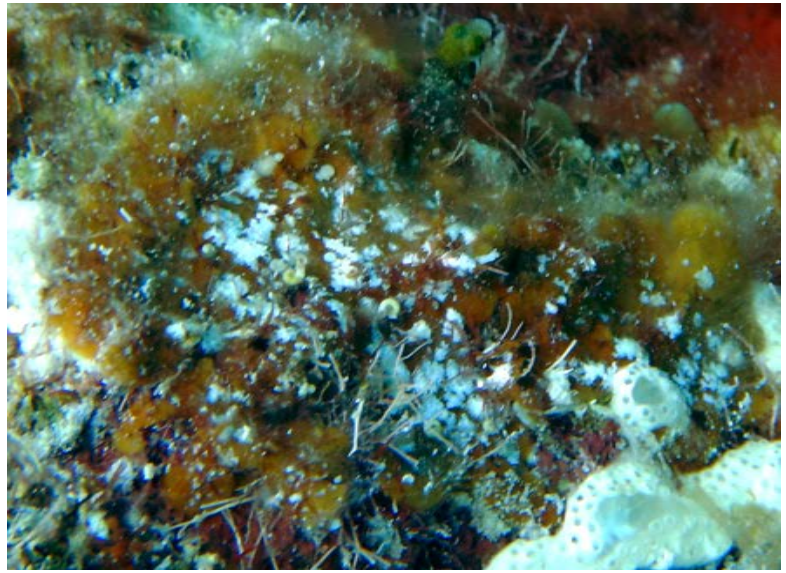
Defensive Systems of *Galaxaura*

- Chemicals used in competition and defence
- When competing with corals for space *Galaxaura* increases production of certain chemicals
- But, this comes at a cost…
  - Increased palatability to fishes
  - Reduced growth

Defensive Systems of *Galaxaura*

- *L. variegata* changes morphology to reduce loss to grazing
- Ruffled, decumbent or encrusting depending on level of fish grazing
- Can also increase content of chemical deterrents





Roles on the Reef

There are four broad functional groups of herbivorous fish which are not mutually exclusive

1. Scrapers
2. Excavators
3. Grazer/detritivores
4. Browsers

Scrapers

- Scrapers include the majority of parrotfish, including most *Scarus* species

- Closely crop or scrape the reef surface removing turf algae and algae propagules

- Clear reef surface

Excavators

- The majority of excavators are *Sparisoma* parrotfish

- Take deep excavating bites on the reef removing turf algae, algal propagules and dead coral (bioerosion)

Grazers/Detritivores

- Grazers include many species of surgeonfish including all *Acanthurus* species (Surgeonfish)
- Intensely graze algal turfs but do not remove substrate
- Many feed on the detritus and animal matter within the turf algae

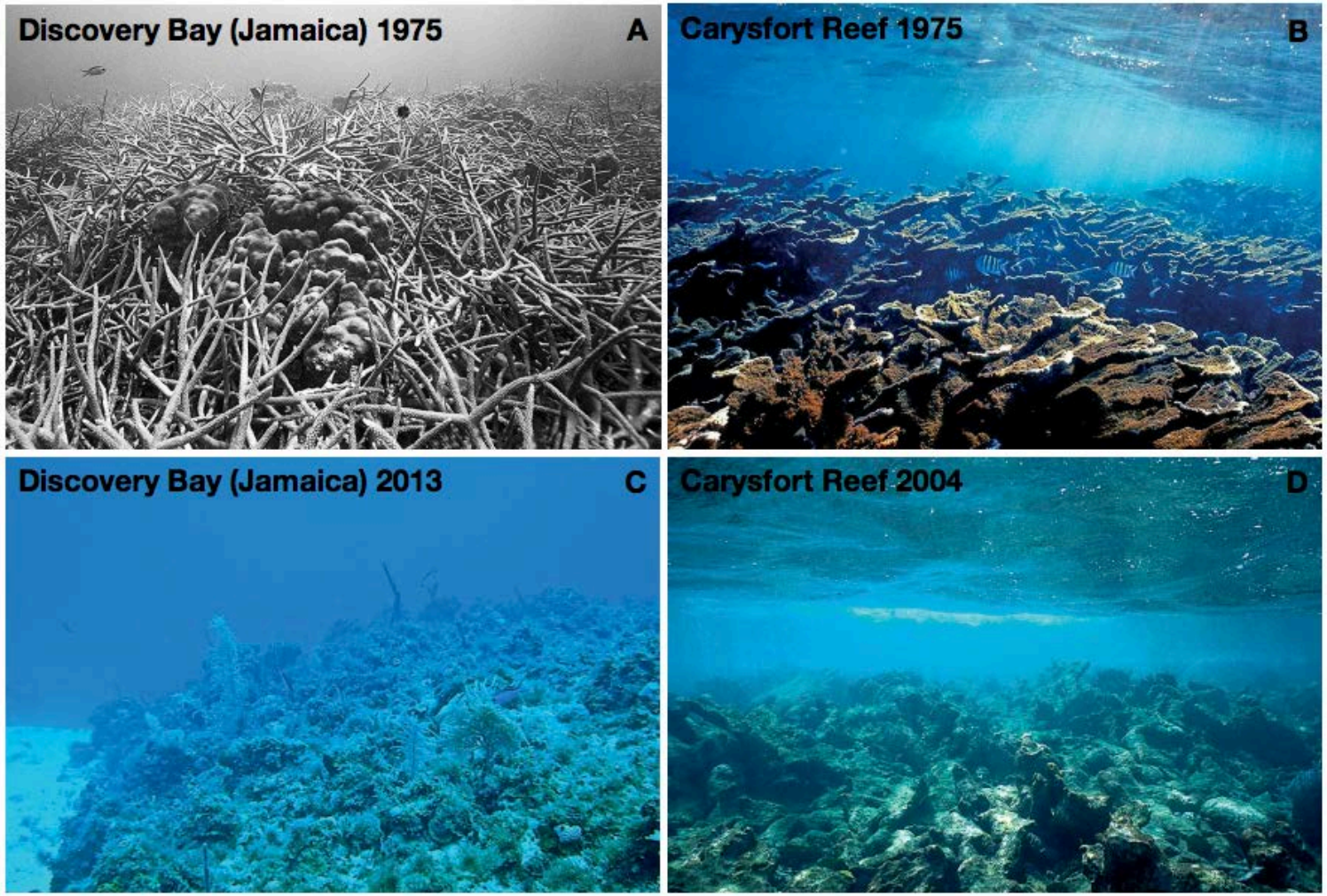
Browsers

- Browsers include some *Kyphosidae* species (Chubs)
- Consistently feed on macroalage
- Play an important role in reducing coral overgrowth and shading by macroalgae

Why Does it Matter?

- Algae populations have increased on Caribbean coral reefs

- This is strongly associated with low herbivore diversity and population size



Jackson JBC, Donovan MK, Cramer KL, Lam VV (editors). (2014) Status and Trends of Caribbean Coral Reefs: 1970-2012. Global Coral Reef Monitoring Network, IUCN, Gland, Switzerland. (A, B, D by Phillip Dustan, and C by Robert Steneck).

Caymans Reefs Today

CCMI

Knowledge is Key!

- Increasing herbivore populations will increase coral resiliency and decrease algae outbreaks
- Knowledge of herbivore diets is important in the management of coral reefs
- We need information on these populations to protect our reefs!

Questions?

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