Issue no 4 - Spring 2009

"To explain all nature is too difficult a task for any one man or even for any one age."
- Sir Isaac Newton -

NEWSLETTER

SPECIAL ISSUE

This issue is dedicated to the student independent research projects conducted this semester.

SPECIAL ISSUE: INDEPENDENT RESEARCH PROJECTS

INDEPENDENT RESEARCH PROJECTS

Each semester our students carry out an independent research project in a topic of their choice in coral reef ecology, marine biology, conservation biology or marine resource management. The project culminates in a public presentation of the projects and a research paper that is published in the CIEE journal *Physis: Journal of Marine Science*.

Students learn the basic steps of the independent research process: finding a topic, formulating a research question and seeking answers, developing research tools and methods, collecting and analyzing data, presenting their findings to the public, and writing a scientific paper.

The independent research project presentation by our students is part of our public lecture series and thus the public of Bonaire is invited to attend. Getting up in front of a 50+ audience is a nerve-wracking experience for most people and although our students were nervous - they did a fantastic job!

The presentations were a succes and afterwards students and faculty went out for dessert and drinks to celebrate!

- Laughter and relief after the presentations -

- Students, interns and faculty celebrate after the presentations -

Next week they'll be busy with publication of their research projects in the CIEE journal *Physis.* Previous issues of *Physis* can be downloaded from our website, and you can expect this semesters journal online by the end of April!

Alissa Rickborn studied the interactions between sponges and the non-native ascidian *Trididemnum solidum* (Tri-D) on the coral reefs of Bonaire.

The purpose of Alissa's study was three-fold: to provide estimates of abundance and diversity of native sponges, to quantify the abundance and distribution of Tri-D, and to investigate the role of competition and chemical interactions between sponges and Tri-D on Bonaire. Abundance, species diversity, and sponge-Tri-D interactions were quantified along transects at varying depths at the dive site Karpata. The transect data showed that

sponge abundance increased with depth and Tri-D abundance peaked at 11-15m. Tri-D was found interacting with and overgrowing sponges frequently, but was never overgrown by a sponge, suggesting that Tri-D has a competitive advantage over sponges. Alissa identified 22 different species of sponges, the two most common being the Green Star Encrusting Sponge and the Orange Lumpy Sponge. These two sponges became the focus of the experimental portion of her project. Several instances of these two sponge species interacting with Tri-D were identified and marked.

- Tri-D overgrowing orange lumpy sponge -

The Tri-D was cut back from the sponges and both were allowed to grow. After two weeks these sites were revisited. Tri-D grew back in most instances and there was evidence that Tri-D had interfered with the growth of the sponges, suggesting that Tri-D may interact chemically with its sponge competitors in addition to having a growth-rate advantage when competing for space.

Julie Sickels studied the impact of birds on the organisms inhabiting the water's edge in the Salinas of Bonaire.

Through observation, Julie identified and quantified the organisms living in the sediments along the water's edge as well as the bird species that utilize this habitat in three Salinas around the island.

The observations showed that the Salina community varied by site. Fiddler crabs were found in the sediments at one site, snails at another, and two different plants species were found among the three sites. In total seven species of birds including

flamingo, egrets, and herons were recorded in the Salinas. Sediment particle sizes was determined through microscopy and compared among the sites. This revealed significant differences between the Salinas helping to explain the differences in the community organisms. Food assays were set up based

on the sediment observations to determine how the bird population is affecting the organisms present. Fiddler crabs and snails were tethered and placed in plots at each Salina along with naturally occurring plants. The plots were left alone and then consumption was assessed at two and four days. Although, there was considerable crab and snail mortality due to desiccation, these food assays showed that fiddler crabs are being consumed in the Salinas.

This suggests that the birds living in the Salinas of Bonaire have a top-down effect on the community by controlling the fiddler crab population through consumption.

Katie Kirschbaum studied the factors that attract juvenile fish to the mangroves of Bonaire.

Katie hypothesized that fish are attracted to the mangroves for both protection from predators provided by the complex structure of the mangrove

prop roots and food in the form of other organisms inhabiting the area. Initial observations of fish species occupying the mangroves and the percent cover of organisms growing on the mangrove root system were made.

Observations showed that several species of herbivores and several species of predators inhabit the mangrove system and that the prop roots are primarily covered in red algae with smaller quantities of green algae and other organisms. This data was used as a baseline for the experimental portion of the project. Six set of three prop roots were chosen for a caging experiment. One prop root out of the three was caged to keep out consumers, a partial cage was placed on a second root to account for any unwanted effects of the cages, and one root was left without alteration.

After a week and a half the cages were removed to reveal that the cages had a significant effect on the prop root community. Percent cover of red algae was less inside the cages compared to the controls whereas percent cover of green algae was greater. This demonstrates that herbivorous fish are utilizing the prop root communities as a food source.

A second experiment was employed to test whether fish are attached to the structure of prop roots. Artificial Mangrove Units (AMUs) were constructed out

of PVC and garden hoses and set in the water about one meter from the mangroves. Observations of the fish around these units revealed that fewer, but similar species were attracted to the structures compared to the actual mangrove roots.

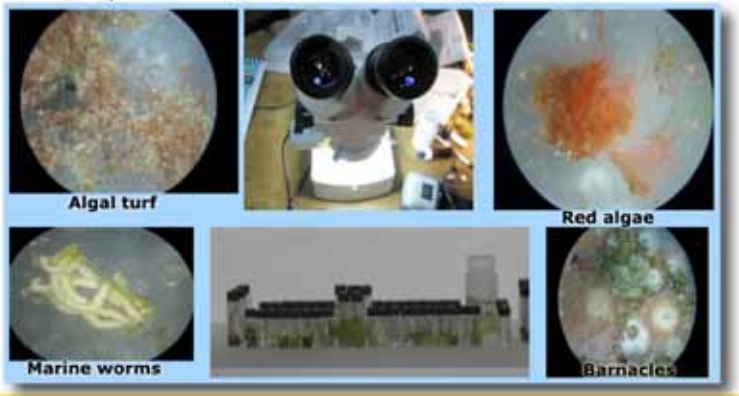
Marylou Hildebrand, hailing from the University of California San Diego, came to Bonaire with a passion for sea turtles.

- Checking the turtle for epibionts -

Marylou chose to pursue this passion during her independent study, conducting research on the unique community of organisms that reside on the shell and skin of Green and Hawksbill sea turtles. These organisms, called epibionts, range from red and green alga to marine segmented worms and barnacles. Marylou worked with Sea Turtle Conservation Bonaire for seven weeks, collecting epibiont samples as well as size and weight data from sea turtles around Bonaire. Her sampling efforts paid off almost immediately as she identified a barnacle (*Platylepas coriacea*) that had never before been found on a Green or Hawksbill turtle! Marylou also found that the total number of barnacles as well as the biodiversity of epibionts was greater on Hawksbill turtles than on Greens. This difference may be explained by the contrast in carapace structure between Hawksbill and Green turtles. Hawksbill turtles are characterized by jagged, overlapping scutes, which provide a more favorable habitat for epibionts than the smooth, level scutes of Green turtles.

Marylou also found that as the size of the turtle increased, the number of barnacles residing on their skin and carapace also increased. This pattern can be explained by the fact that larger, older turtles have had more time to accumulate barnacles on their bodies. Also, the larger turtles simply have more surface area for barnacles to settle on.

Marylou hopes to continue her research on sea turtle epibionts, providing valuable insight into the life history of these charismatic creatures.



Michelle Von Sternberg, from Eckerd College, noticed the unique behavior of the bar jack during her first dives on Bonaire. Michelle followed up on these initial curiosities during her independent study, conducting research on the feeding strategies of the bar jack and how they effect foraging success.

Bar jacks, whose diet consists of small fish and invertebrates, exhibit a variety of feeding strategies such as multispecies associations, color alternation as well as habitat selection. In order to investigate the different feeding strategies of the bar jack, Michelle conducted 60 minute research dives, following individual bar jacks for 5 minutes.

During her observations, Michelle recorded the bites

per minute of each bar jack as well as its color (black/silver), location (reef slope/reef flat) and feeding association (solitary, conspecific or multispecies).

After hours of underwater observation, Michelle found

- barjack in multispecies feeding association with hogfish and goatfish -

that bar jacks have greater foraging success when feeding alone and in multispecies associations as opposed to when feeding in conspecific groups.

While bar jacks clearly benefit from the lack of competition when feeding alone, the benefits of multispecies foraging associations are also apparent. Perhaps the associated species (eg. octopus, eel, goatfish) flush prey out of the sediments that bar jacks would not otherwise be able to access.

Michelle also found that black bar jacks have double the feeding rates as that of silver, potentially indicating an increased crypsis from prey. Finally, Michelle's research indicates that habitat type does not effect the foraging success of the bar jack, suggesting the use of similar feeding strategies and the presence of similar prey abundances on the reef slope and reef flat.

On one of his first days in Bonaire, **Nathan Landry** witnessed an osprey swoop down upon a brightly

colored parrotfish feeding in the shallow subtidal. Nate chose to investigate the driving factors of the parrotfishes' risky behavior for his independent research. Specifically, Nate's research focused on the species and age of parrotfish utilizing the shallow subtidal habitat, the algal composition in the shallow subtidal as compared to the reef flat and the effect of tide and time of day on the parrotfishes' behavior.

By snorkling along the outskirts of the shallow subtidal, Nate recorded the number, species and age of the parrotfish feeding in the shallow subtidal during the morning, noon and afternoon. He also noted the type of algae that the parrotfish appeared to be consuming. In order to assess algal distribution, Nate conducted transects in the shallow subtidal and reef flat, noting the type of algae at each centimeter.

After weeks of work, Nate found that young yellowtail parrotfish are most abundant in the shallow subtidal, possibly due to their cryptic coloring. Further, parrotfish appear to utilize the shallow subtidal most often during high tide, due to the increased water cover and, therefore, easy access to shallow algae. As per algal distribution, Nate found that that total percent cover of algae is greater in the shallow subtidal zone than on the reef flat. Furthermore, the species of algae in the shallow subtidal have higher

- flying the model osprey over the water -

nutritional value than those on the reef flat.

These findings indicate that parrotfish feed in the shallow subtidal due to the greater availability of more nutritious food which allows them to maintain their daily energy needs.