Do Zooplankton Tow Samples Taken on Different Days Along the Same Transect in Kane‘ohe Bay Vary in Composition?

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“When we try to pick out anything by itself, we find it hitched to everything else in the Universe.”
- John Muir, turn-of-20th-century naturalist who studied glacial movement.

Kapolei Middle School’s 7th grade students began their 4th Quarter Ecology study trying to unravel Muir’s quote: how are things connected?

Once they became familiar with general ecology principles, they explored lively local examples using University of Hawai‘i Center for Microbial Oceanography: Research and Education (C-MORE) Plankton, Marine Debris, and Microscopes in Middle Schools kits, as well as the Aloha ‘Aina Coral Reef Study Project and Hawai‘i Institute of Marine Biology (HIMB) Expedition to Moku o Lo‘e.

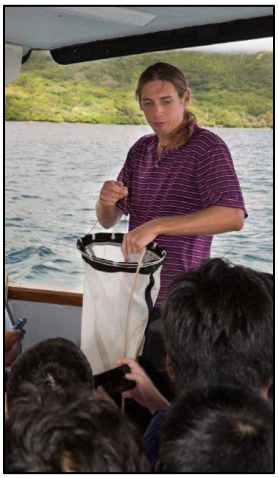
Using the C-MORE plankton kit, students had their first glimpse of plankton (outside of Sponge Bob). Through a succinct presentation, colorful engaging books, and hands-on lessons, they learned of the major kinds of plankton and their vital roles in the ocean ecosystems.

Live zooplankton stole the show! Zooplankton gathered on the leeward side of O‘ahu with the C-MORE plankton net before sunrise were kept in 2 liters of bay water and were viable the entire study day. Through dissecting scope lenses, students viewed zooplankton zipping about and learned to isolate individuals with toothpicks and use the colorful microphotograph zooplankton key (C-MORE Plankton Kit) and the quick reference line drawing section of Deboyd L. Smith’s guide (C-MORE Microscopes to School Kit) to try to establish identities.

Copepods, amphipods, ostracods, crab zoeae, polychaete metatrochs, nematodes, fish larvae and eggs, and mysid shrimp were among creatures they identified. In the beginning, students frequently would call me over to look at something that completely baffled them and ask “What is it!?” More often than not, I had to reply “Got me!” or “Looks like a copepod.” Students elevated a small number of the identified zooplankton to celebrity status by placing these creatures on the digital microscope stage (C-MORE Microscopes in Middle Schools). Photos taken were then uploaded to the web under two Project Noah missions: Plankton of Hawai‘i and Microplankton Biogeography.

Our narrowed focus was to learn about the zooplankton community in Kane‘ohe Bay. We readied for our zooplankton-netting Expeditions to Moku o Lo‘e led by HIMB. We used the Grade 7 Aloha ‘Aina Coral Reefs- Kane‘ohe Bay Curriculum and learned about the bay’s animal community members from 7 different phyla, expecting many to have meroplankton forms. We also researched physical characteristics of the bay, its climate, and surrounding human population. Keeping in mind Muir’s quote, we became aware of a larger question: “How does our population affect the Kane‘ohe Bay Community of which we are a part?

Addressing that larger question through research, we discovered negative impacts: sewage discharge leading explosive algae growth, introduction of the coral stifling invasive gorilla ogo algae, pesticide runoff and more. We were buoyed by the creation of solutions to some of these impacts, noting that identifying a problem’s details opens possibilities to solve it.



On May 28th and 30th we boarded HIMB's vessel, *Honu Kai*, for our Kane'ohe plankton-gathering excursion. Underway scientists from HIMB and C-MORE assisted us in performing plankton tows. We recorded the diameter of the nets, the speed of *Honu Kai* and duration of the tows and later calculated the volume of water we sampled. At the end of our tows, HIMB scientists trained us on equipment to measure the water's physical characteristics. We used the refractometer (to measure salinity), a oxygen meter and probe, and a pH meter and pH strips -- recording multiple measures for each characteristic each day.

On Moku o Lo'e, our HIMB scientists prepared us to inspect our samples and to sort through invasive gorilla ogo for invertebrate inhabitants. At the plankton station, we saw two large abundant plankton predators that we never saw in our leeward samples: chaetognaths and *Lucifer* shrimp. Each day, we took plankton tow samples in preservative back to Kapolei Middle School for analysis of plankton tow composition.

During the week in our lab, students identified zooplankton in our preserved samples under high magnification and estimated numbers of each plankton type using a grid/density measure under low magnification, recording in our C-MORE-prepped data table. During those labs, we also had stations to explore the impacts of Marine Debris through C-MORE's kit.

About 2,000 zooplankton were counted for each tow. Students calculated the percent that each zooplankton type represented of that day's total sample and graphed both days on a single graph for comparison. From our 7,000 gallons of water we sampled each day, students saw that copepods on both days represented more than 80 percent of the zooplankton. Each other zooplankton type represented less than 5 percent.

Students noted in their lab reports' conclusion that the samples for both days were similar in composition, with oyster larvae being an exception. They were present in the 5/28 sample but not in the 5/30 sample. Students also noted that the measured physical characteristics for both days were the same, except for oxygen which was about 15 percent lower than 5/28 on 5/30.

A number of possible errors were discussed. For example, our analyzed samples were but a portion of the original sample and depending how that portion was extracted, some types of zooplankton may have been selected over others based on their density. Our location for tows in Kane'ohe Bay may have been different on the different days. Our identifications and estimations likely have a measure of inaccuracy.

Questions are the fuel that power science. Closing their lab reports, reviewing their experience, observations and their study of Kane'ohe Bay, our students expressed their curiosity:

"Does oxygen content affect the plankton community?" "Are there different plankton between day and night?"
"Will different locations in the bay or more extended time sampling give us changes in species?"
"Do the seasons affect the zooplankton communities?" "Does the weather affect abiotic factors of the bay?"
"Do net depth and the rate of moving affect our sample?" "Do invasive species affect zooplankton?"
"Could the predators affect the appearance of oysters?" "Could marine debris affect zooplankton?"
"Can changes in salinity affect the physical form of zooplankton?" "Does temperature above and below affect where plankton stay?" "Are plankton communities different between reef and open ocean?"

So closed our report about our study in Kane'ohe Bay, but the minds will continue to explore.