Life Onboard the R/V Western Flyer: Musings of a Graduate Student

By Jesse Bausell

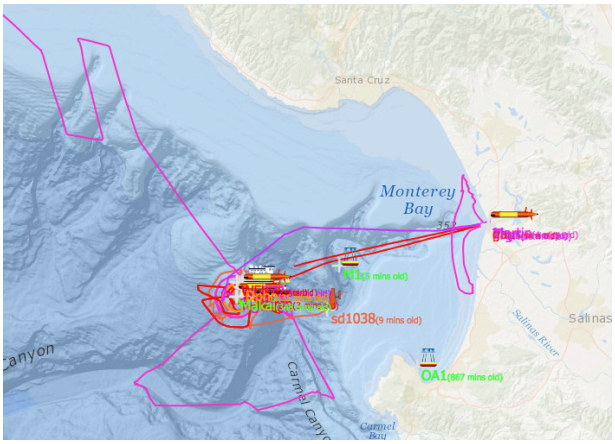
It is June 3, 2019 17:55 Pacific Standard Time and I have officially logged my fourth day aboard the MBARI Research Vessel 'Western Flyer' (R/V Western Flyer). Geographically we are only 55 km southwest of my home in Santa Cruz, CA, however the moment I stepped aboard R/V Western Flyer four days ago in Moss Landing Harbor, I truly crossed into a different world.

My name is Jesse Bausell. I am an oceanography Ph.D. candidate at UC Santa Cruz in Santa Cruz, CA, a college town nestled between the mountains and the seashore of California's central coast. Prior to R/V Western Flyer my life as a graduate student consisted of writing in coffee shops, bench work in my faculty advisor's laboratory, daily swim workouts, and weekly lab meetings. Santa Cruz's traditional surf culture, which defines sandals as business casual and dictates that every important meeting should begin 15 minutes late, does not extend to R/V Western Flyer! Here punctuality is paramount, rules are obeyed to a t, personal space is limited, and everyday activities including as working, eating, and sleeping are tightly scheduled; ship operations run 24-7 – literally! After four days however, I can now say that I have acclimated to this unique way of life and that I am enjoying it.

On behalf of my fellow crewmembers and my inquisitive landlubber friends and family, I would be remiss in not explaining my motivation for trading the relative comfort of Santa Cruz for R/V Western Flyer. We all came to sea in support of *Controlled, Agile, and Novel Ocean Network* (CANON), an ongoing MBARI-sponsored scientific research study under the leadership of Dr. Francisco Chavez. This particular cruise seeks to expand our understanding of the diurnal zooplankton migration. In order to increase their odds of survival, zooplankton commonly spend their daylight hours hiding in the darkness of the deep ocean, ascending thousands of meters to the ocean surface at night to graze on phytoplankton. If all goes according to plan (they are not discovered and eaten by something larger than themselves), they return undetected to the abyss before daybreak. In terms of

cumulative distance traveled, this is the largest animal migration on the planet; due to the indispensability of these tiny critters marine to food web as a whole, it is arguably the most important. Despite all this however, we know surprisingly little about the diurnal zooplankton migration or how our activities may be impacting it.

To date, most of our time at sea has been spent circling around Monterey Accelerated Research System (MARS), a seafloor observatory built by MBARI. An elaborate (and very expensive) electrical outlet, MARS is a game changer for ocean research. It significantly extends the duration for which scientific instruments can take deep-water measurements by eliminating their dependence on short-lived batteries. As we orbit MARS (*yes, I said orbit MARS*), most of my shifts have been spent deploying, recovering, and analyzing the contents of the R/V Western Flyer's rosette, a metal frame lowered off ship's stern that is equipped with a CTD to measure temperature and salinity, a fluorometer for gauging photosynthesis, and 12 Niskin bottles for retrieving ocean water at different ocean depths. While most of us think of it as an amorphous, homogeneous blob, the ocean is in fact a complex 3D mosaic of water parcels circulating around the globe. The CTD can fingerprint and shed light on origin of water parcels because temperature and salinity remain relatively constant over time. Indeed some of these water parcels have been in circulation long enough to have witnessed the ancient Mayans and Egyptians come and go! As the CTD delineates water parcels, the fluorometer detects the presence of phytoplankton, the food source for migrating zooplankton inside of them. Niskin bottles enable us to collect the water samples from these parcels for analyses in our onboard laboratory. One of the most cutting edge of these analyses is environmental, or eDNA. Analogous to a forensic crime lab, eDNA enables us to detect the recent presence of ocean life in our vicinity, ranging in size from marine microbes to blue whales.



Map displaying the paths of MBARI assets deployed in support of CANON.

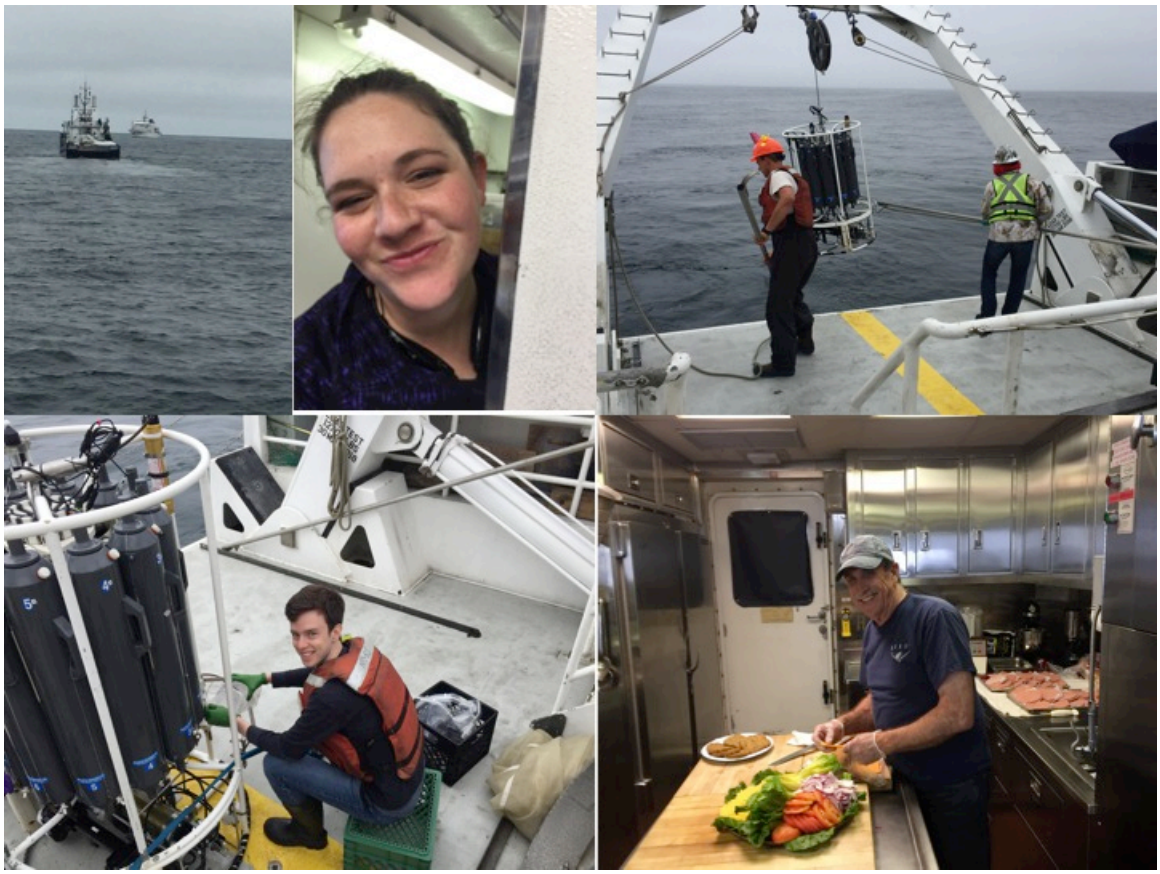
Not withstanding, with all the happenings aboard R/V Western Flyer it is easy to lose track of the fact that we are but a small piece of CANON. As we orbit MARS (*yes, I said orbit MARS a second time!*), DEIMOS a state of the art acoustical

sensor detects marine animals from 800 meters below the surface as they swim over MARS. We are also working in conjunction with a fleet of MBARI drones, which consist of long range AUVs, wavegliders, and a saildrone. These assets continuously measure the ocean properties with their battery of acoustical and optical sensors as they patrol our study area. Moreover, today we are joined by two additional oceangoing vessels: R/V Rachel Carson (MBARI) and Reuben Lasker (NOAA). Both are here to support CANON.

By deploying a multitude of assets in a well-defined study site, CANON and by extension MBARI, utilizes the ability of different data types to compliment each other. This enables a much more detailed and comprehensive picture of the diurnal zooplankton than would otherwise be possible. However, from my four days aboard R/V Western Flyer it is evident that CANON's greatest advantage by far is its human assets. The crew and scientific staff with whom I've had the privilege of living and working are absolutely stellar. Embarking on an oceangoing vessel is inherently stressful; it is also fraught with potential dangers posed by both the natural elements and the heavy onboard machinery (which is especially hazardous when the ship is rocking back and forth). Nevertheless the Western Flyer's vigilant captain and crew always prioritized our safety and wellbeing, allowing for an enjoyable, and fruitful voyage. In this regard I am especially appreciative of CTD technicians Eric and Erich for their patience and care in teaching me how to prepare, deploy, and retrieve R/V Western Flyer's rosette, as well as Marguerite, Katie, and Gabriela who taught myself and the other first-time science personnel how process Niskin water in Western Flyer's onboard laboratory as it rocks back and forth in the waves; they too did an outstanding job. I give additional kudos to Marguerite for providing much-needed morale boosts in the form of her consistent comic relief, which was key in breaking up the monotonous grind of scientific fieldwork, much of which occurs at odd hours. I would also be remiss if I did not mention the unsung hero of our voyage, Patrick, our cook. Patrick worked tirelessly from sunrise to well after sunset to make sure that we were always well fed with delicious meals, an extremely challenging feat when your kitchen bucks back and forth in the waves. They say that a ship crew operates on its stomach, and Patrick's diligence contributed greatly to crew morale by enabling us to fully concentrate our jobs without being distracted by hunger. It is these people (and others) that have and will continue to make CANON a success.

My personal high point onboard R/V Western Flyer has been interpreting Niskin data with Dr. Francisco Chavez. Francisco is a highly respected and widely published oceanographer who's work I first learned about when I was college student. He is also extremely kind, humble, and fun to converse with. The opportunity to work with him has been a surreal experience for me, and his interpretation of our Niskin data gave me invaluable insight into the ecosystem dynamics of Monterey Bay, a topic which he has dedicated his life to understanding. My conversations with Francisco also drove home for me how far the scientific community has yet to come in order to truly understand this ecological treasure that we call the ocean. Despite its proximity to most of our cities and towns, despite its ubiquity in nearly every aspect of all of our lives, and despite the monumental advances in technology over which the 21st century has presided, the ocean is still

largely a mystery to humanity. Most of its secrets still remain elusive. These secrets however, may hold the key to preserving the ocean for posterity and time to uncover them could be running out. In essence this is our mission, our purpose, and our motivation for going to sea. As I reminisce about my time onboard the Western Flyer, a pod of Pacific white-sided dolphins rides our bow wave as we steam forward. *This is why we're here.*



Counterclockwise from top left: 1. R/V's Rachel Carson (foreground) and Reuben Lasker (background) patrol the study area, 2. Skeptical of my intentions, lab manager extraordinaire Marguerite looks up from her work, 3. R/V Western Flyer's rosette is retrieved following a cast (Erich is on the right), 4. Patrick prepares lunch, and 5. Western Flyer crewmember Robert collects ocean water from a Niskin bottle.