Highlighted in yellow were discussed in class.

Kristen W.
1. Caribbean soft coral produce noxious, distasteful compounds to protect themselves against abundant, mobile predators like fish.

2. While these compounds do a good job of defending the coral against the majority of large predators, a few specialist marine consumers are able to 'out smart' their prey by evolving mechanisms to detoxify the coral's chemical defenses. (e.g., co-evolutionary arms race)

3. Kristen Whalen, a recent JP graduate, studies the innovative biochemical machinery in the gut of marine snails that allows them to successfully feed on and cope with the toxins in their coral diet. Research provides insight into nuances of how the food chain works and how developed evolutionarily. Behavior we see can be explained by what workings of enzymes in the gut. How to beat the system. Why doesn't everyone do this?

4. Sea snails, commonly referred to as flamingo tongues, may use three different enzyme families, similar to those found in the human liver involved in drug metabolism, to degrade and excrete coral toxins.

5. Potential to learn about human toxicology because enzymes are the same.

5. Results of this study provide an underlying biochemical explanation for a behavioral observation (e.g., feeding behavior) and hold great significance for understanding patterns of predation and herbivory in the marine environment.

K. Pangallo

Toxic pollutants like DDT and PCBs can reach dangerous concentrations in large predators even when seawater concentrations of these compounds are low and considered 'safe'.

Biomagnification occurs when contaminants that don't easily degrade increase with each step along a food chain.

Some chemicals that are naturally produced in the environment are similar to these pollutants and also may biomagnify.

Biomagnifying natural compounds have been around a long time, with no apparent harm to environment.

By understanding how naturally produced biomagnifying compounds travel through ecosystems, we can better predict what happens to man-made biomagnifying pollutants and where they end up.

Laura

In the ocean, bacteria do not work alone.

Bacteria communicate via “chemical” conversations to swarm, glow, declare war, make biofilms, make enzymes and toxins, in a process which has been dubbed “quorum sensing”.

In the lab, scientists can detect chemicals that produce these behaviors, but so far, scientists have been unable to eavesdrop on natural bacterial communities.

At WHOI, we are using novel analytical approaches to try and hone in on the fleeting chemical “words” used by bacteria in natural marine environments, such as sediments and ship hull biofilms.

These conversations may hold the key to understanding how bacteria “slimes” (biofouls) ship hulls, how disease-causing microbes pass through the ocean, and how carbon is recycled in the ocean (with climate impacts).

Annette

1) In the seemingly uniform environment of the ocean, there is a great diversity of plankton--the “paradox of the plankton.”

2) Trichodesmium, ("sea sawdust") is a ubiquitous blue-green algae in the ocean and an important player in the world's nitrogen and carbon cycles. Why is this important/relevant?

3) There are several species of Trichodesmium in the ocean, which seem similar but could have differences and exploit different ecological niches.

4) Woods Hole maintains an extensive and unique collection of phytoplankton.

5) In the lab, I am looking for how species of Trichodesmium may be different and in the field, I am looking for whether those differences would give them slightly different roles in the environment.

Christine

1) Taking plankton samples in boatyards and yacht clubs on Cape Cod has given me the chance to interact with a wide variety of local characters and an opportunity to see the cultural context of my research.
2) Natural shellfish populations on the Cape have declined from disease, overfishing, and pollution, and managers have to seed adults every year to sustain a recreational fishery for commercial species.
3) Even if the seed do grow to a marketable size, the ability of the populations to sustain themselves depends on the survival and dispersal of the larvae.
4) Shellfish managers often ignore larval stages because they are difficult to study and hard to identify to species.
5) My research introduces a novel way to identify larvae to species that could help determine which larvae are present and how they are being dispersed.

Stacy DeRuiter

Topic: Marine mammals and noise

1. Marine mammals produce a wide variety of sounds to communicate with each other, navigate, and find food, and each species makes unique calls with acoustic features appropriate to their purpose and habitat.
2. Noise pollution in the ocean comes from a wide variety of sources --not only ships (from commercial freighters to jet-skis), but also sonars, echosounders, airguns, construction, and even wind farms – and the amount of noise pollution is continually rising.
3. Noise in the ocean can cause animals to avoid certain noisy areas, prevent them from communicating with one another, or otherwise alter their behavior, and extremely loud noise in the ocean may even injure animals or damage their hearing.
4. One of the biggest challenges for understanding the effects of noise on marine mammals is to determine whether noise effects are actually big enough to change not only short-term behavior or individual fitness, but long-term population health and stability.
5. Each kind of noise has potential to affect different types of marine mammals in different ways, depending on the unique sonic characteristics of the noise and the way the marine mammal species use sound.

C. Frame
1. Nitrous oxide (N2O) is a potent greenhouse gas, produced primarily by microbial activity.

2. Although coastal zones are thought to be sources of N2O to the atmosphere, we don't understand how much N2O is produced by microbes, how much is released to the atmosphere or what controls it.

3. Humans are adding lots more nitrogen to coastal waters, possibly fueling more N2O production.

4. As part of a larger effort to constrain coastal greenhouse gas emissions, USGS and WHOI scientists are collaborating to fill in this missing information.

5. How are you doing this?

Fern
1) The Indian Ocean is particularly volatile, with dramatic changes in circulation and temperature that happen on both a yearly and a multiyear cycle.
2) These changes are caused by three major climate systems: El Nino-Southern Oscillation, the Indian Ocean Dipole, and the monsoons.
3) El Nino-Southern Oscillation, the Indian Ocean Dipole, and the monsoons are all hard to predict, and their interactions make climate predictions in this region especially challenging.

Circulation reverses, winds patterns shift, changes evaporation and rainfall patterns
Back-and-froth, seesaw.
Two oceans interacting, along with ocean and atmosphere (monsoons), all interrelated.

Affects billions of people –agriculture and catastrophic flooding and drought. (why, societally relevant)

4) By studying the climate of the past, we hope to improve our understanding of these systems and our ability to predict their future behavior—(leave a clue about how).

5) Better predictions could help this densely populated region better prepare for future climate change.

Kelton McMahon

Where the coral reef fish play: Protecting juvenile nurseries.

1) The ecological integrity of coastal tropical habitats, including mangroves, seagrass beds and coral reefs, is coming under increasing pressure from human activities.

2) Many commercially and ecologically important coral reef species are believed to use mangroves and seagrass beds as juvenile nursery areas before migrating to coral reefs as adults.

3) The ability to track the movement of juvenile coral reef fish is critically important for successful long-term management and conservation of highly migratory or elusive species.

4) Recent scientific advances in tracking devices and analytical chemistry have allowed scientists to overcome previous challenges associated with tracking the movement of small fish like juvenile coral reef fish.

5) Marine protected areas and fishery reserves are essential to protect coral reef fish from over exploitation and promote biodiversity.

Elizabeth

1) Bacteria that wouldn't normally be found at the beach end up in bathing waters by leaking out of sewage pipes, flowing in with stormwater, or falling into the water with bird droppings.

2) These bacteria are tenacious and make a living any way they can under their new circumstances –clinging to available surfaces, growing in the sand, or by getting into a swimmer's body and making them sick.

3) Once a week, the amount of a particular "indicator" bacteria is measured in beach water to determine whether water quality meets the standards for safe swimming.

4) Different methods are used to measure the amount of the indicator bacteria, and it isn't always clear how the results should be interpreted.

5) Understanding how to measure bacteria on short time scales in an environment like the beach, where conditions can quickly change, is important for protecting human health and also for tracking and interpreting human impacts on marine ecosystems

How bacteria get there? How do we find out if they are there? How long do they stay?

Problem: Current detection methods are flawed. What they can detect and what they can't detect.
Are we sampling the wrong things, or in the wrong way? Are there better ways?
Solution: Try to learn more about how bacteria get there, how long they stay, how we detect them. What are knowledge gaps?

Jordan Stanway
1] Fish, turtles, penguins, and seals are all much more maneuverable than any man-made underwater vehicle.
2] The field of biomimetics involves observing nature's solution to a problem, distilling it to achieve a basic understanding of the underlying physics, and applying that understanding to improve engineered solutions to similar problems.
3] One recent WHOI JP graduate has studied the way sea turtles move to teach a robotic turtle how to swim better.
4] The robot uses a rolling and twisting flipper to generate an elegant wake of vortex rings that provides vectored thrust.
5] This research moves toward vehicles with much greater maneuverability and agility, enabling operation in chaotic environments like the near surf zone.