

New England Aquarium Visit

Penguins

- we listened to the penguin presentation, asked questions, read posters, observed the penguins in their cage
- Penguins are very well designed for water:
 - o Solid bones (most birds have hollow bones) so they aren't as buoyant and can dive deep.
 - o A bird of flight leans forward and feet are near front. Penguins do not fly and their feet are at the very back.
 - o To swim: penguins use their feet for steering and slowing; and they beat their wings to gain speed.
 - o A layer of fat keeps the penguins warm.
- Penguins are adapted for very cold land:
 - o Penguins can slow down their heart rate.
 - o On land, penguins can keep their feet warm. The body temperature is 101°F but and maintains the blood vessels in feet at 48°F by a complex structure of blood vessels that mix blood from the heart that has been heated by the body.
 - o The area in the throat is designed not to lose heat or moisture to air.
 - o The African penguins can cool off in warm weather by a heat vent that is not feathers but a patch of pink on the side of the head that turns pinker showing the blood from the body rushing to become cooled.
- Penguins have special adaptations for a fish diet:
 - o 50 million years ago penguins could fly in the sky, but today they have adapted to a life at sea.
 - o Of the 8000 bird types, the mouth and beak of the penguin are unique.
 - o They are designed to catch one fish at time and eat it way down underwater while swimming.
 - o The sharp hook on the end of the beak helps them to get the fish.
 - o The fleshy prongs on the tongue help them to swallow the fish.
 - o The eyes can focus underwater because of the third eyelid. These blink (open and close) sideways and is like a pair of swim goggles that protect the eyes.
 - o Penguins dive deeper than any other bird on Earth and stay longer underwater than any bird on Earth.
- There are only three reasons that penguins need land:
 - o Mating
 - o Raising young (oddly, penguins lay 2 eggs but select only one to raise as a chick, the mom and dad work together to keep the egg warm and feed the chick)
 - o Getting a new set of feathers
- Impacts on land:
 - o Sometimes people develop land penguins use.
 - o The unintended consequence of programs to revive fur seal populations is that the fur seals compete with penguins for the same nesting sites.

- Impacts in ocean:
 - o 100% of a penguin's food is in the ocean and consumed in the ocean. On land only, the penguins will starve.
 - o Too much oil on penguin feathers can cause the penguin to drown.
 - o Deadly toxic to them when they clean off oil with their beaks.
 - o In the open ocean, oil spills can make it difficult to surface to breath.
 - o Oil spills kill the fish that penguins eat. Impossible for them to feed.
- Our questions about penguins:
 - o Does man-made noise pollution harm penguins? The penguin lady did not know and did not think anyone had studied the issue.
 - o Do dead zones harm penguins? Are parts of the ecosystem that are impacted by dead zones part of the link in the penguin ecosystem? The penguin lady did not know.
 - o Do penguins dive below 200 m and fish there where there is no light from the sun – how do they fish? How do they fish during Antarctica winter which is total darkness all the time? - didn't know
 - o Do penguins here above water sounds when they are below the water? Do they communicate underwater? Do they respond to alarms or cries from penguins above water? - didn't know

Fish Exhibit

- We learned a lot about fish simply by observing their behavior in the large aquarium.
- We learned about the fins and what they do from the displays and posters:
 - o Pectoral and pelvic fins are used for steering and locomotion.
 - o Vertical fin (dorsal, anal, and caudal – tail) are used for controlling roll and side to side motion.
 - o Rheotaxis – rheo = flow; taxis = movement
 - o Rheotaxis is the response of aquatic organisms to currents.
 - o Fish respond to currents by adjusting wing-like projections called fins.
 - o If they had no fins, fish would roll over and over
- One eel uses electrolocation for navigation and feeding.
 - o The display had sensors that made a static click on the speakers when the eel created an electric field.
 - o When sleeping there were no clicks and the eel rests without using the electrolocation signals.
 - o When eating there were many clicks.
 - o To navigate along the bottom with rocks and plants, the eel creates electric fields and senses their perturbation in the environment.
- The tide pool was a favorite spot and we touched and learned about many New England animals.
 - o Some crabs are affected by dead zone conditions.
 - o The horseshoe crab is more like a scorpion and is not that affected by dead zone conditions.
 - o A sea star can rebuild itself from just a small part.
 - o

Sea Lion Exhibit and Presentation

- We learned a lot about how sea lions live in the natural world.
- We learned about how sea lions are trained through rewards for good behavior.
- We asked questions about sea lions and other marine mammals:
 - o How do oil spills impact sea lions? It might decrease food supply, depends on whether the sea lions are migrating or live there. Not sure if the oil is toxic to their skin or if they ingest it.
 - o Do dead zones impact sea lions or other marine mammals? Sea lions and other marine mammals surface to breathe so that isn't a problem for them and they can swim out of the dead zone to find food.
 - o We asked a series of questions about acoustics and echolocation and the impact of noise pollution.
 - o Noise pollution affects bottlenose dolphins when they use sounds for:
 - Communication
 - Hearing over a distance is more difficult if the ambient noise level is higher – noise from sonar or boat propellers.
 - It makes it more difficult for them to stay in a group.
 - The calves might separate from the moms or group.
 - Most likely they are not confusing signals for real signals because the frequencies are different.
 - They feel the vibrations.
 - They are not attracted to boats because of noise.
 - Dr. Randy Wells at the Chicago Zoological Society (Bookdale) is an expert in this field.

Jelly Exhibit

- Global warming, overfertilization, and overfishing are changing the environment for jellyfish – and that is making jelly populations bloom! Jellies thrive in unhealthy oceans.
- Stop Global Warming
 - o Whenever you use less gas or electricity you help stop global warming.
 - o Burning coal to generate electricity or gasoline to power cars produces CO₂ – a greenhouse gas.
 - o Like a blanket over our planet, greenhouse gases trap heat in the atmosphere and cause the Earth to warm.
- Stop Overfertilization
 - o By limiting fertilizer use and preserving wetlands we can help control overfertilization of the oceans.
 - o When too much fertilizer drains into the oceans, the result is overgrown, low O₂ waters. Wetlands slow the high nutrient run-off giving it time to break down before reaching the open water. Without wetlands, run-off goes straight into the sea.
- Stop Overfishing
 - o Buying a variety of fish is one way to ensure that a single species is not overfished.

- Sustainably harvested fish minimizes seafood and without it the oceans can't keep up with the demand.
- Where and how a fish is caught can make a big difference in considering sustainability as fisheries and fishing practices differ from place to place.
- You can help keep the oceans a good place for fish as well as jellies. Actions to take:
 - Use public transportations and fuel efficient cars.
 - Turn off computers, TVs, and lights when not in use.
 - Use a fan or sweater instead of A/C or heater.
 - Use compost instead of fertilizer.
 - Choose organic produce instead of farmed with lots of fertilizer.
 - Work to preserve the wetlands.
 - Chose variety of sustainably harvested fish for your diet.
 - Learn about sustainable fisheries and fish farms.
 - Ask your supermarket to label where and how fish are caught.
- Case Study: Gulf of Mexico
 - Australian Spotted jellies live comfortably in the overfertilized, O₂ deprived waters of the Gulf of Mexico.
 - Shrimp and other animals suffocate or leave.
 - Fertilization, manure, and sewage in the ocean decrease O₂ levels. Fish find hard to breath so they go elsewhere.
 - Fish larvae and other plankton are slowed and can't escape predators. But coastal jellies live comfortably at lower O₂ levels. Jelly predators feast like kings on their stunned and O₂ deprived prey.
 - Jelly larvae and plankton are less likely to be eaten by predators.
 - We are changing the oceans through overfertilization and inadvertently choosing the types of animals that can live in them.
- Gulf of Mexico
 - Fertilizer, manure, sewage, tourist trash and heavy rains result in conditions that encourage phytoplankton growth.
 - Oil platforms are homes for jelly polyps.
 - Overfishing reduces the predators of early stage jellies.
 - Shipping – water is pumped aboard tankers to stabilize them and when this ballast water is dumped in the Gulf of Mexico invasive species are introduced.
- Case Study Narragansett Bay
 - Comb jelly population skyrockets.
 - The tautog fish population plummets.
- Life Cycle of Jelly
 - Fertilized egg - Global warming increases the rate of production of fertilized eggs since jellies like to reproduce in warmer waters.
 - Larva – Overfishing reduces the number of predators of larva.
 - Polyp – Oil platforms are artificial reef homes for polyps.
 - Stobilating Polyp – Each polyp turns into many jellies.
 - Ephyra -
 - Adult Medusa – Can eat weakened O₂ deprived fish.