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ATLANTIC CITY AQUARIUM

Fish Tales

Beach Ecology

As you walk along the beach, it often appears as if it is lacking obvious signs of life. However, beaches are one of the most dynamic and changeable environments, with inhabitants enduring constantly shifting sands that are moved and shaped by the wind. They are also exposed to sun and rain that beat down on open ground due to the lack to large rooted plants. However, in spite of this, a remarkable variety of life does thrive on our beaches.

What Lives at the Beach?

After careful examination of the beach, you will be introduced to an unseen world of amazing life. We don't see many of the organisms that live there because most are rather small and are hidden by the sand. However, beaches provide a habitat and support for a vast diversity of living organisms. They are crucial ecosystems that link the sand dunes with the surf zone through a constant exchange of sand, organic matter, and nutrients. The surf zones of beaches are an important nursery area, as well as a perfect location for fish that rely on the smaller invertebrates as a supply of food. Beaches are also an important habitat to a great diversity of shorebirds, as well as an essential nesting habitat for turtles.

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Sanderlings search for food while retreating from incoming waves.

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Created by Kelly Hunt for the Atlantic City Aquarium, 2007

What Lives at the Beach (continued from pg. 1)

Residents of beaches include organisms from all the major groups in the food web. There, you find decomposers such as bacteria and fungi, plants and small algae who are producers, as well as consumers such as clams and ghost crabs, to name a few. These organisms are fed when the ocean carries plankton to the beaches' consumers. It also provides other organisms such as dead fish, jellyfish, (bottom right) and other invertebrates that are, in turn, eaten by the scavengers like ghost crabs and birds.

Some beaches naturally accumulate large amounts of seaweeds on the upper portions of the beach near the dunes. This organic material may not look like much, but it is a vital food source and habitat to many animals.

Because of the extremes that exist in the beach environment, beach organisms are extremely well adapted to their environment. Many show great mobility, which is seen with those inhabitants that can burrow quickly into the sand when dislodged, while others gauge their activity in relation to tides and waves.

A Ghost Crab easily blends into the sand. This beach scavenger uses this camouflage to its advantage when searching for food and avoiding predators.

Created by Kelly Hunt for the Atlantic City Aquarium, 2007

Birds of the Beach

The beach is home to many species of birds. From the common scavenger of the air, the seagull, to the tiny plover, the beach offers food, nesting opportunities, and a place to rest.

One common species of shore bird in our area is the Black Skimmer. These striking birds, seen below, fly low over the water, skimming the surface with their lower bill, which is longer than their upper bill, to catch their prey. Though they are active throughout the day, they are more prone to search for small fish, crustaceans and shrimp at dawn and dusk.

Another uniquely marked shore bird in our area is the American Oyster Catcher (below). This bird has a primarily blackish-brown and white body, with a long, thick, orange beak. It uses its beak to probe the mud, looking for bivalves such as clams, mussels, and oysters. It will then pry open the shell to acquire its food.

The Ruddy Turnstone (bottom, right) is a small stocky bird that is found along the shore, as well as around jetties. It usually forages in flocks, turning over stones or other objects to get at its prey. The Ruddy Turnstone mainly feeds on invertebrates, but will also eat insects, plant material and carrion.

The Wrack Line

The wrack line runs the length of the beach and marks the place where the tide reaches its highest point. When sand is picked up and blown around by the wind, it falls out of the air and begins to accumulate around the wrack line. As sand continues to accumulate, a dune begins to form.

Seeds that have been trapped in the wrack line have the perfect place to germinate because it's moist and contains a lot of nutrients. As the plants grow, their roots keep them steady in the shifting sands. The continued accumulation of sand provides a more stable zone for growth. Because of this, the wrack line could eventually become a primary dune.

In the wrack line, you can find a variety of materials, including seaweeds, shells, dead organisms, (like the remains of this spider crab) as well as a mermaid's purse which is the egg case of a dogfish, ray, shark, or skate.

Created by Kelly Hunt for the Atlantic City Aquarium, 2007

Did You Know…?

Seaweeds, which are actually algae, are a very primitive type of plant, but they do not have stems, roots, or leaves. They are free-floating, though some do anchor themselves in place, and they absorb nutrients from the ocean.

There are several types of seaweeds, with the primary colors being green, brown, and red. Common seaweeds in our area include sea lettuce, eel grass, and bladder wrack. Uses for this marine algae are varied, including being used in making lipstick, fertilizer, rubber, linoleum, paint, and ice cream.

Beach sand varies from place to place, and can be made up of many things from coral to volcanic lava to rocks. Here, in New Jersey, our beaches are primarily made of sand that was once pieces of mountains that, thousands of years ago, were crushed by glaciers. These rocks were then moved by rivers that were formed when the glaciers melted. They were carried to the ocean where they were pounded by waves and crushed after time.

If you carefully examine the sand on the beach, you would likely see a variety of colors. These are from the various minerals that make up the sand. Quartz is the most abundant mineral found here, and it is usually white or clear. You can also find feldspar, a non-metallic mineral with a glassy luster and magnetite, a kind of iron that is dark to black in color.

Waves

Did you ever wonder how **waves** are formed in the ocean? Well, though sometimes it is a geologic event like an earthquake that can form a wave, most are actually formed as a result of the wind. Since wind is really energy, when it blows, it presses against the water, transferring some of that energy to the water.

The size of a wave is determined by three factors: the fetch of the wind, the speed of the wind, and the length of time it blows. The greater these three factors become, the larger the wave.

Depending on the velocity of the wind, as well as its direction and length of time it has been blowing, you can see different types of waves. When a breeze of two knots or less blows over calm water, small ripples form and become larger as the wind speed increases. This causes whitecaps, which are made up of millions of tiny air bubbles, to form. Wave height decreases gradually as the wind dies and the wave gets closer to shore. When it touches bottom, the wave slows and the back overtakes the front which forces it into a peak. It then curves forward and crashes over itself in what is called a breaker.

A wave is made up of two primary parts, the crest and the trough. The crest is the highest part of the wave, and the trough is the lowest. Wave height is found by looking at the distance between the crest and the trough, and the wave length is distance from the crest of one wave to the crest of another.

This sand is made up of a variety of minerals, including bits of quartz, magnetite, and possibly bits of a gemstone like red garnet.

Created by Kelly Hunt for the Atlantic City Aquarium, 2007

Dunes

Primary dunes are often called the deserts of the beach. Plants that grow here must have adaptations to deal with difficult conditions including drying winds, salt spray, rapid water drainage, shifting sands and intense heat from the sun. Some of these adaptations include thick, succulent leaves, deep taproots that penetrate to the ground water, and widespread fibrous root systems that extend through the sand-catching water as it drains through the sand.

A perfect example of a plant that has adapted to this environment is the sea oat. Sea oats have long curly leaves and tall heads that serve to trap sand as it is blown down the beach by the wind. This trapped sand begins burying the sea oats, as well as all of its neighboring plants. Sea oats, however, have adapted to this by growing vertical runners that produce new plants on the surface of the dune, thereby staying ahead of the accumulating sand. The neighboring plants, on the other hand, are buried and die, and the decaying matter provides nutrients for the sea oats. For this reason, it is typical to see a dune covered only by sea oats.

Secondary dunes are located behind the primary dunes. Since the primary dunes are blocking most of the drying winds and salt spray, secondary dunes are more stable. This added stability allows for greater plant diversity. Many shorebirds nest in dunes, and predators such as raccoons, mice, rats, rabbits, snakes, and lizards hunt in the primary and secondary dunes. The Loggerhead sea turtle uses the dunes as a nesting area.

In addition to being an important wildlife habitat, sand dunes serve as the first line of defense for the mainland. Dunes help to absorb the impact of unusually high tides, nor'easters, and storm surges. Sand dunes may be thought of as reservoirs of sand. They, too, suffer erosion during a storm surge; however, the sand is washed offshore and is then available for redeposit on the beach.

(Selected material adapted from, COASTeam Aquatic Workshops: the Coast; a joint effort between the COASTeam Program at the College of Charleston and the South Carolina Aquarium – funded by the SC Sea Grant Consortium.)

Key Vocabulary

Carrion—the rotting flesh of dead animals

Consumer—in an ecological community or food chain, an organism that feeds on other organisms, or on material derived from them

Dune—a mound or ridge of sand formed by wind or water action, typically seen on coasts and in deserts

Erosion - the gradual wearing away of rock or soil as caused by physical means such as water, wind, or ice, or by chemical means

Fetch—the distance the wind blows over open water

Producer—an organism that manufactures its own food from simple inorganic substances, e.g. a green plant