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Ecology of Intertidal Organisms and their Role in the Food Chain

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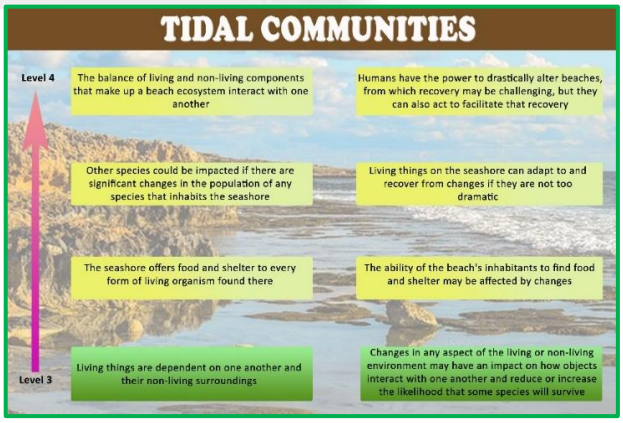
Abstract
To comprehend the dynamics and stability of communities, studying food webs is crucial. Ecology places a great deal of emphasis on dominant species. Such species are essential for maintaining ecological stability, structure, and productivity by controlling resource distribution among trophic levels. Although relationships between dominant and subordinate species are frequently believed to harm the latter, dominant species can also have positive effects. By providing habitat for other species, these organisms frequently play the role of ecosystem engineers and contribute to biodiversity. The dominating species along rocky beaches are often sessile suspension-feeding organisms that can dominate every accessible substrate. This is especially apparent in intertidal and shallow subtidal regions, where relatively few species become ecologically dominant.

Keywords: Ecology, Intertidal, Macrofauna, Food chain

Introduction
Ecologists investigate how animals and their environment interact. It includes biotic elements (such as temperature and salinity) and physical and chemical aspects of marine life (such as the influence of predators and prey). Individual creatures are impacted both directly and indirectly, and as a result, they could thrive under less-than-ideal physicochemical circumstances. The intertidal zone, as defined by British ecologist A. J. Southward, is "the region of the beach between the highest level washed by the waves and the lowest level uncovered by the tide," and communities in intertidal areas are therefore primarily determined by the tides and the existence of hard or soft surfaces.



A particular intertidal community's physical characteristics, the availability of resources, the availability of food and larvae from underlying water and the biological interactions among the species

all play a role in the varieties of organisms, number of species, distribution and abundance of individual species (Hall-Spencer, 2020).

A diverse benthic biodiversity characterizes the highly fertile intertidal zones. The amount of wave exposure on a sandy shore can also play a significant role in controlling dispersal. Because most species cannot survive in habitats made highly unstable by wave disturbance, species richness and abundance and the biomass of macrofaunal communities generally rise along the gradient of sheltered coastlines. So, the species that live along exposed shorelines have developed morphologies and behaviors that are wave turbulence-adaptive. When disturbed by the surf, some species, such as *Donax* bivalves, amphipods, and polychaetes, adapt to the turbulence by rapidly burrowing (Branch and Branch, 1981).

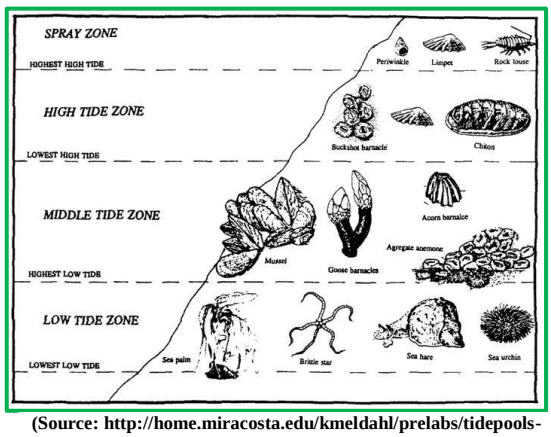
Intertidal zone

The intertidal region is where the land and the water converge. Because of the fluctuating water levels, coastal areas are continually altering. Many organisms have evolved as a result of these mutations. The organisms that live in the intertidal zone may be terrestrial, somewhat aquatic, or both. According to Enchanted Learning (Col, 2000), this zone is further separated into four vertical zones: the Splash zone, high tide zone, middle zone, and low tide zone.

1. **Splash Zone:** The zone is also known as the Barnacle Belt, the Upper Littoral, the Supralittoral Fringe, and the Spray Zone. This area is usually dry but gets sprayed with salt water during high tides. Only during storms and extraordinarily high tides does it flood. This limited habitat is the habitat of an array of organisms, including barnacles, isopods, lichens, lice, limpets, periwinkles and whelks. In this location, very little vegetation develops.
2. **High Tide Zone:** It is also known as the high intertidal zone and the Upper Mid-littoral Zone. It only floods during high tide. This area is a habitat for anemones, barnacles, brittle stars, chitons, crabs, isopods, limpets, mussels, sea stars, snails, whelks and some marine flora.
3. **Middle Tide Zone:** This zone is also recognized by the Lower Mid-littoral Zone. The tides bring salt water every two hours to cover and reveal this turbulent region. There are a variety of organisms in this region, such as anemones, barnacles, chitons, crabs, green algae, isopods, limpets, mussels, sea lettuce, sea palms, sea stars, snails, sponges, and whelks.
4. **Low Tide Zone:** Normally, this place is submerged; only when the tide is shallow does it become visible. Extreme heat or protracted dry spells are unfavorable for the organisms in this zone. Abalone, anemones, brown seaweed, chitons, crabs, green algae, hydroids, isopods, limpets, mussels, nudibranchs, sculpin, sea cucumber, sea lettuce, sea palms, sea stars, sea urchins, shrimp, snails, sponges, surf grass, tube worms and whelks are the organisms that can be found in this area.

What is a food chain?

The wild food chain explains who consumes whom. From single-celled algae to enormous blue whales, all living things require food to thrive. Each food chain represents a potential route for nutrients and energy to travel through the environment. In feeding chains, organisms are categorized into trophic levels. The first trophic level is classified as a producer, followed by the second, third, and fourth trophic levels as consumers, and finally, the decomposers. Autotrophs are also referred to as producers who

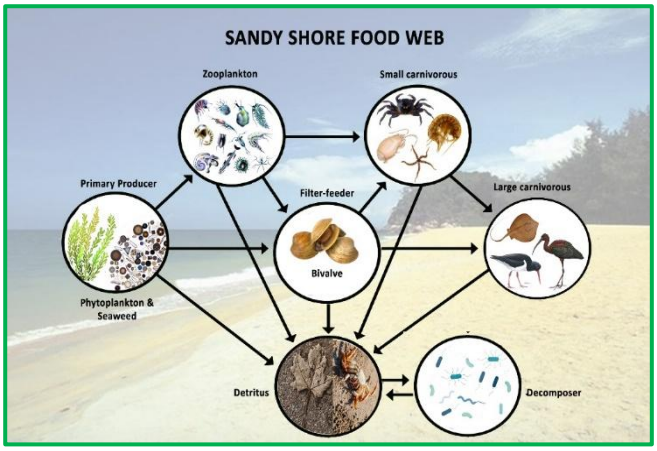


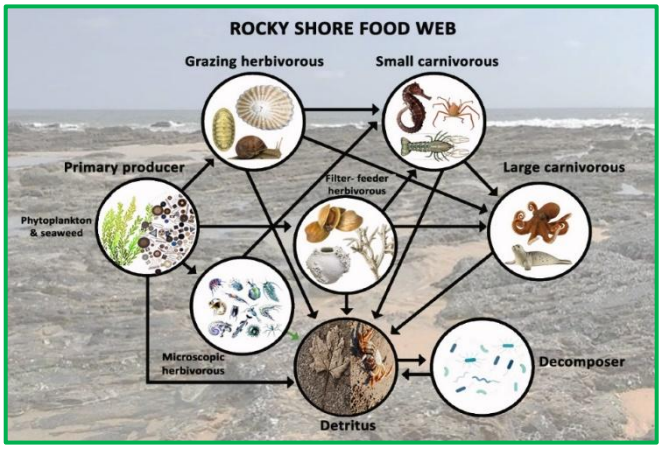
(Source: http://home.miracosta.edu/kmeldahl/prelabs/tidepools-prelab.htm)

produce their nourishment. Every food chain starts with them as its first component. Plants or single-celled organisms are the majority of autotrophs. Almost all autotrophs use a process known as photosynthesis to convert sunlight, carbon dioxide, and water into "food" (a nutrient known as glucose).

Food chains in various intertidal regions

Various habitats and ecosystems provide many potential food chains to make up a food web. Krill, a type of microscopic shrimp, are fed on phytoplankton, single-celled organisms that are part of one marine food chain. The blue whale is a third trophic-level species whose primary food source is krill. In the intertidal region, seaweeds use solar energy to produce food through photosynthesis. The species groups such as amphipods, isopods, and brital stars used this seaweed for nourishment and growth. Later, these species are consumed by other predatory species, such as crabs. After these carnivorous organisms die, decomposers such as bacteria and worms exhilarate decomposition. Later, decomposed organic matter is mixed in the soil, and the nutrient enrichment process starts.





Rocky intertidal ecosystems have long been a proving ground for developing and testing ecological theory. Their alternating exposure to marine and terrestrial conditions creates steep environmental gradients that help explain the striking distribution patterns and abundance seen on most rocky shores. Several features combine to make rocky shores ideal outdoor laboratories, including variable physical conditions over short distances and the presence of tiny organisms that are primarily sessile or sedentary, often reach high densities, have short generation times, and are readily experimentally manipulated.

Role of an intertidal organism in the marine food chain

A community's food web structure can show dynamic traits like resilience, nutrient recycling, and resistance, in addition to describing the relationships between organisms that feed on one another. The topological approach and the energetic technique are the two main methods applied in field investigations of food webs. The topological regularities in the food web are discussed first. The second method considers energy flows and losses at each web component.

In the intertidal zone, the food chain begins with phytoplankton, microorganisms that use photosynthesis to create energy from the sun. These are usually consumed by zooplankton and eaten by mussels, barnacles, or other invertebrates. Seagulls or sea otters can still eat sea stars; even if they are near the top of the food chain, they can still be gobbled up by a seagull or a sea otter. When the highest predator, such as a gull or a sea otter, dies, its body is consumed by decomposers. These animals break down organisms that disintegrate dead

tissues and wastes. Sea Since sea stars can consume sea urchins, which are common and frequently intertidal zone decomposers, and as sea stars can eat them, the food chain can be linked to the food web, which can be connected. In this manner, the food web displays not just the "only "who eats what" but highlights the complex interactions and interconnectedness of the intricate relationships between all living things and their environment.

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