Definitions

- **Amnesic Shellfish Poisioning** ASP, caused by diatoms, carried by shellfish, → memory loss, upset stomachs, & neurologic firing
- **Amniotic Egg** sea bird adaptation, separate waste and water sacs, eggs can be laid on land without the risk of desiccation
- **Atoll Reefs** found without land component
- **Bar-built** Estuary, formed by the deposition of sediment & wave action, inc. deltas, ex. Cape Hatteras, and Gulf of Mexico
- **Barrier Reefs** surrounding island with a lagoon, has more diversity than fringing reefs
- **benthos** organisms that live on or in the ocean floor
- **Black Rush Zone** #4, *Juncus* (SBlack Rush), ISpartina
- **Blade** leafy part of seaweed
- **Carposporophyte** 2n step in between gametophyte (n) and sporophyte (2n), in 4th seaweed life cycle
- **Chemosynthesis** used by organisms in the Abyssal Plain, harness the energy stored in the chemical bonds of methane (cold seeps) or Hydrogen sulfide (hot vents)
- **Chlorophyll A** absorbed in the UV and IR zones, thus its green in color, ex. Green algae
- **Ciguatera** caused by dinoflagellates, carried by fish, → upset stomaches, diarrhea, & dehydraton
- **Compensation Depth**
- **Cordgrass Zone** #2, *Spartina* (cordgrass)„*Genkensia, Uca*
- **Costal Plain** Estuary, most common, found throughout the Atlantic, ex. Chesapeake Bay
- **Darwin's Atoll Theory** Mountain (Fringing), Sinking Mountain (Barrier), Sunk Mountain (Atoll)
- **Diarrheic Shellfish Poisoning** DSP, caused by dinoflagellates, little else is known
- **Duogland system** glue & glue detacher, a morphological adaptation of meiofauna
- **Ectocarpen** reproductive process in s.w. in which eggs secrete a chemical that attracts sperm
- **El Nino** warming of the ocean surface off the western coast of South America that occurs every 4-12 yrs when upwelling of cold, nutrient-rich water does not occur. It causes die-offs of plankton and fish and affects Pacific jet stream winds, altering storm tracks and creating unusual weather patterns in various parts of the world.
- **Endothermic** can control & maintain their body temperature, ex. Birds, and mammals
- **epifauna** animals that live on the surface of the sea floor
- **Epitokyposterior** **Syllids,** ½ of the worms transform, breakfree, float to the surface & release their gametes, they all do this at the same time, this increases survival by changing a 3D environment into a 2D one and there's always strength in numbers

Definitions

- **Errant** — crawling organisms
- **Estuary** — low diversity, high productivity, fresh water & terrestrial input (inc. pollutants); 4 types (Costal Plaine, Tectonic, Bar-Built, Fjord); 4 Habitats [Mudflat, Salt Marsh (5 zones), Mangrove, Sandy Shore]
- **Eulittoral** — zone of the marine environment between high and low tide levels
- **Euryhaline** — can live in a broad range of salinities, ex. Blue crab, mussels, *Nereis*
- **Exothermic** — can't control their body temperature, ex. Metaoans; Jawless, Cartilaginous, Bony Fish; Amphibians, & Reptiles
- **Fjord** — Estuary, sharp, narrow channel through which a river goes to the ocean, ex. Norway
- **Fringing Reefs** — often found flanking volcanic islands, go right up to shore line
- **Fucoxanthin** — captures light in the UV & blue zones & passes it to Chlorophyll A (Brown Algae)
- **Haptera** — branching of holdfast
- **Hermatypic** — reef building corals, order Scleractinia
- **Holdfast** — root-like extensions anchoring seaweed, create complex habitats for organisms
- **Holoplankton** — spend their whole life in the pelagic realm, exclusively planktonic; ex. Cnidaria (Jellyfish), Annelids (Polychetes), Mollusks (Pteropods), Ctenophores, Chaetognatha, Radiolarians, Thaliaceans (salps)
- **Hypertonic** — high ionic concentration
- **Hypotonic** — low ionic concentration
- **infauna** — animals that live in the seafloor
- **Infralittoral** — Sandy Shore, *Polinicies* (Moon snail), Clams, San Dollar
- **Interstitial** — water between grains, in mudflats this space is minimal b/c of grain size → anoxia
- **intertidal** — zone of the marine environment between high and low tide levels
- **Iron Hypothesis** — John Martin, boost productivity by dumping Fe into Fe limited areas, could combat global warming, often critics call it the "geritol solution"
- **Isotonic** — equal ionic environments (eg. == salinity concentrations), marine environments
- **John Ryder** — studied MSY in the Peruvian fishery in 1969, see MYS for more info.
- **Keystone spp.** — Organism that has a profound affect on the ecology of a habitat or community Ex. Bob Paine's study: remove *Pisaster* (keystone) & *Mytilus* goes further down
- **Lower lower IT. Z.** — subtidal zone, Rhodophyta, snails, seastars, Anemones, Urchins

Definitions

- **Lower Middle IT.Z.** "Mussel Zone" or "Blue Zone," ex. *Mytilus, L. obtusata, Fucus, Postelsia*
- **Macrofauna** > 1mm (determined first by Petterson in the early 1800s)
- **Mash Elder Zone** #5, Marsh elder, birds
- **Maximum Sustainable Yield** MSY, the max level of fishing effort that a stock can withstand before causing major upsets in the stock abundance, determined by 1) primary productivity, 2) length of food chain, 3) Efficiency of the Energy Transfer between the links (usually 10% efficiency rate)
- **Meiofauna** < 1mm, interstitial fauna
- **Meroplankton** spend part of their life in the pelagic realm and the rest of their life in the benthic realm; ex. Crustaceans (Copepods, Krill), Urochordates (*Ascidiacea, Larvacea*), Annelids (syllids)
- **Mesopelagic** b/w 200 & 1,000 m deep, small, sharp teeth, large mouths, extenable jaws, black or silver colored sides, bioluminescent, large eyes, both migrating and non-migrating types
- **Michael Rex** deep sea diversity in NW Atlantic, highest diversity @ intermediate depths (2,000-3,000m)
- **Midlittoral** Sandy Shore, *Cirolanid copepod* (benthic or pelagic)
- **Migrating Mesopelagic** migrate w/ their gas bladder @ night, deep scattering layer, well developed musculature & strong bones
- **Muddy Substrate** predominantly infaunal, with a small % of epifaunal errant organisms
- **Mudflat Zone** #1 **(**most marine), ex. *Zostera, Phyllospadix, Thallasia, Arenicola, &* clams
- **nekton** organisms that are strong swimmers, & can determine their horizontal position in the water
- **neritic** marine zone corresponding to the area above the continental shelf
- **Neurotoxic Shellfish Poisioning** NSP, caused by dinoflagellates, all the nerves fire at once → respiratory distress & eye irritation
- **Non-migrating Mesopelagic** close to the bathypelagic, weak mussels, no gas bladder, weak bones
- **Oceanic** marine zone extending from the continental ridge seawards
- **Osmoconformers** adjusts internal ionic concentration to the external environment, seeking equilibrium Ex. Anemones, sea squirts, spider crabs, sponges
- **Osmoregulators** maintains internal ionic concentration despite external environment ex. *Nereis,* Sallylightfoot crab, mussels
- **Paedomorphosis** change from larvae to adults (C. Larvacea)
- **Paralytic Shellfish Poisoning** PSP, caused by *Saxidomus* (clam) which eats *Gonyaulax* (Dinoflagellates), 1g of saxitoxins can kill 1,000 people, its 50x more powerful than strychnine
- **pelagic** region of the marine environment between the ocean floor & surface
- **Phycoerythin** found in the green spectrum, ex. Red algae

Definitions

- **plankton** — pelagic organisms that can't control their horizontal position in the water
- **Pnematocysts** — bladders, helps seaweed float
- **Preen glands** — a heat preserving adaptation in sea birds, oil is secreted from the gland onto their feathers to make them water proof, ex. Cormants preen their core
- **Primary Sea Birds** — all of life is associated with marine habitats, ex. Penguines, Gulls, Pelicans, Tubenoses
- **Red Tides** — often occur with spring and fall blooms of Diatoms, Dinoflagellates, & Cyanobacteria, can also be caused through biological invasions, concentrations build up in high food chain organisms
- **Rex** — 1981, trophic diversity drives diversification
- **Rhizomes** — attach *Zostera* it to the substrate, give substrate stability, true rootlets, provide habitats
- **Rocky Substrate** — predominantly epifaunal organisms, with a small % of infaunal organisms, hard substrate, high energy, tides
- **Salt Hay Zone** — #3, *Spartina* (marsh grass), *Salicronia, Juncus* (Spikegrass)*, Distichlis*
- **Salt Marsh** — has a tendency to advance outward into the mudflat zone, following terrigional sedimentation; 5 zones (Mudflat, Cordgrass, Salt Hay, Black Rush, Marsh Elder)
- **Salt water wedge** — deals with the amount of salt water in the system, where s.w. dissipates into f.w.
- **Sandy Substrate** — very unstable, b/c: large grain size the substrate if always moving→ low diversity
- **Secondary Sea Birds** — ½ their life on shore, tend to breed inland in the summer & go along the coastline in the winter; ex. Lunes and Scooters
- **Southern Oscillation** — atp conditions corresponding to the periodic warming of El Niño and cooling of La Niña
- **Stability Hypothesis** — Saunders, 1968, deep sea is highly stable environment with high specialization → part sediment particle size
- **Statocyst** — balance organ, statoliths bump into the silia & then know which way is up, a morphological adaptation of meiofauna
- **Stenohaline** — can only live in a narrow salinity range, ex. Echinoderms, anemones, spider crab
- **Stipe** — no transport, helps elevate seaweed blade, often hollow in larger seaweeds
- **Stromatolites** — formations made from the build up of Cyanobacteria (*Calothrix*) mats
- **Supralittoral Fringe** — Sandy Shore, *Talitrid amphipods* ("sand hoppers, Temperate); Ghost Crab (Tropical)
- **Tectonic** — Estuary, created by the subsistence (sinking) of land, ex. San Francisco Bay
- **Tertiary Sea Birds** — mostly wait on shore, low degree of marine activity, nest inland; ex. Osprey, Terns, Sand Pipers, Oyster Catchers

Definitions

- **Thermocyline** ocean layer, ~ the bottom of the photic zone, marked by a sharp change in temperature
- **Transition Zone** ~ 200m,
- **Upper Intertidal Zone** "Splash zone," ex. *Calothrix, Verrucaria,* ice plant
- **Upper Lower ITZ.** "Starfish zone," ex. *Asterias, Pisaster,* sea squirts, sponges, compound ascidians
- **Upper Middle IT.Z.** "Barnacle Zone," ex. *Ulva, Enteromorpha, Chthalamus, Balanus, L. littorea, Acmaea*

Taxonomy

- ***Acmaea*** — limpets, found in the Upper Middle Intertidal
- ***Asterias/Pisaster*** — *Pisaster* preys heavily on *Mytilus* → *M* lives higher on shore where *P.*cant go (Bob Paine)
- C. **Bacillariophycea** (diatoms) — 50% marine, external skeleton of CaCO3called a frustule; radially (centric) or bilaterally (pinate) symmetrical
- C. **Chrysophyceae** (silicofalgellates) — unicellular eukaryotes, benthic and pelagic forms; fix nitrogen, long whip-like flagellum for locomotion, tar shaped skeleton
- C. **Prymnesiophyceae** (coccolithophorids) — 20% marine, unicellular, photosynthetic, major contributor to primary productivity external skeleton of CaCO3 composed of many small, circular plates
- ***Chondrus crispus*** — Rhodophyte, "Irish Moss," harvested for caragenan
- P. **Ciliophora** — "ciliates," protozoans with a ciliated surface, some have an external test of sandgrains, ex. Trichodines (not pelagic), Tintinnids (pelagic)
- ***Coralline reds*** — Rhodophyte, similar to *Halimeda* in its CaCO3 uptake, important builder of reefs
- D. **Cholorphyta** — Green algae, 7,000 spp., mostly freshwater, 20% marine, unicellular & multicellular Ex. *Enterpmorpha, Ulva, Halimeda*
- D. **Cyanobacteria** — prokaryotes, benthic and pelagic forms, unicellular algae 75% marine, major contributor to marine primary productivity, photosynthetic, red tides; fix nitrogen, ex. *Calothrix*
- ***Calothrix*** — Cyanobacteria, unicellular algae
- D. **Phaeophyta** — Brown Algae, 1,500 spp., found deeper, greater form variety than chlorophyta
- D. **Pyrrophyta** (dinoflagellates) — 93% marine**,** posses 2 flagellae, one which lies in a transverse groove, creates red tides
- D. **Rhodophyta** — Red Algae, more diverse than green or brown algae, very deep in water column
- ***Ectocarpus*** — Phaeophyte, **Ectocarpen** reproductive process
- ***Enterpmorpha*** — Chlorophyte, cosmopolitan, tolerant to fresh water, shallow water, long-tube s.w.
- P. **Sarcomastigophora** — Protists, Forams and Radiolarians
- **Foraminifera** — protozoans (heterotrophs) with a CaCO3 shell, "shelled amebas," long pseudopodia
- ***Fucus*** — Phaeophyte, resistant to desiccation, pnematocysts are filled with air
- ***Halimeda*** — Chlorophyte, takes up CaCO3 which makes it stiff
- ***Halosaccion*** — Phaeophyte, "condom seaweed," looks like sacs of water
- ***Laminaria*** — Phaeophyte, "oar weed," used in seaweed, has lots of iodine, used as fertilizer
- ***Littorina littorea*** — snail, coiled shell, found in the Upper middle Intertidal Zone

- ***Littorina obtusata*** snail, less vertical coiling, found in the Lower middle Intertidal Zone
- ***Macrocystis*** Phaeophyte, "giant algae," exploited in WWI for pot ash, associated with kelp beds
- ***Mytilus*** mussel, found in the Lower Middle Intertidal Zone, uses byssal threads for attachment
- ***Nereis*** Annelid, sand worm, use their motility to avoid desiccation, osmoregulator & euryhaline
- P. **Annelida** segmented worms, in marine realms this is mostly the polychaetes (*Nereis & Serpula)*
- P. **Chordata** seasquirts & tunicates, no exoskeleton → must stay wet, often resemble splashes of paint
- P. **Cnidaria** anemones, found in the Lower lower Intertidial Zone
- P. **Echinodermata** seastars and urchins (note *Pisaster –Mytilius* relationship)
- P. **Mollusca** shells retain water around the gills to avoid desiccation, ex. mollusks, mussels, snails, limpets
- P. **Porifera** sponges, found in the Upper Lower Intertidal Zone
- ***Porphyra*** Rhodophyte, HUGE in Japan, Nori sushi, K.D. Baker figured out life cycle
- ***Postelsia*** Phaeophyte, "palm tree" seaweed, stipes are pikled & eaten in Japan
- **Radiolaria** protozoans (heterotrophs) with a silica shell, entirely pelagic (holoplankton), spines & pseudopodia, lots of pores (larger pores come from warmer water)
- S. P. **Crustacea** P. **Arthropoda,** "Insects of the sea," use their exoskeleton to protect from desiccation
- ***Sargassum*** Phaeophyte, found both pelagically and benthically
- ***Serpula*** Annelid, fan worm, secretes a protective exoskeleton to avoid desiccation
- ***Ulva*** Chlorophyte, "sea lettuce," eaten in salads, resistant to desiccation, ↑ w/nutrients
- ***Callinectes sapidus*** blue crab, euryhaline
- ***Arenicula*** blood worm, non-selective deposit feeder
- ***Maldove*** Bamboo worm
- ***Terebella*** Speghetti worm, a selective deposit feeder
- D. **Chrysophyta** Protists, 3 classes that include the coccolithophorids, silicofalgellates, diatoms
- ***Zostera*** long blades, rhizomes attach it to the substrate, Mudflat zone; ex. Dogwelk, Eelgrass
- ***Phyllospadix*** surf grass, West Coast, found on rocky shores; mudflat zone
- ***Thallasia*** Turtle Grass, Florida and Caribbean Coasts; mudflat zone

- ***Spartina*** Halophytic: excretes salt from its leaves; cordgrass (#1, Mudflat zone) & Marshgrass (#3, Salt Hay Zone, shorter)
- ***Genkesia*** Ribbed Mussel, found in the roots of *Spartina*, byssal threads ↑ substrate's stability, found in #2, Cordgrass Zone
- ***Uca*** Fiddler Crab, burrows in the substrates, male has one large claw for courtship, found in #2, Cordgrass Zone
- ***Salicornia*** Pickleweek, The Slender Glasswort, retains water in its body, found in #3 Salt Hay Zone
- ***Juncus*** Spikegrass (#3, Salt Hay Zone, reddish roots); Black Rush (#4, Black Rush Zone)
- ***Disticlis*** Spike grass, found in the #3 Salt Hay Zone
- ***Rhizophora*** type of mangrove in which the roots are fully immersed in the water
- ***Polychoera*** P. Platyhelminthes, flat worm, broad & flat, they glide along, type of meiofauna
- P. **Loricifera** lorica are the gertile of plates surrouding the organism, throw fresh water on them to release them from the sand grains, type of meiofauna
- P. **Gastrotricha** "Stomach Hair," type of meiofauna
- P. **Kinorhyncha** can pull its nose in, type of meiofauna
- P. **Gnathostomulida** type of meiofauna
- C. **Aplacophora** P. Molluska, Solenogastre, type of meiofauna
- C. **Thaliacea** salps, holoplanktonic, modified sea squirt body form
- C. **Ascidiacea** sea squirts, benthic, meroplanktonic, Urochordates (tadpole like larvae)
- S. P. **Urochordata** P. Cordata, tadpole like larvae, ex. Thalacia, Ascidiacea, Larvacea
- C. **Larvacea** Paedomorphosis, they have a mucus covering which is abandoned when their filters clog
- **Syllids** Epitokyposterior reproduction, a type of meroplanktonic polychete
- P. **Cnidaria** Individual Jelly, or Colonial Jelly (Portuguese Man of War), holoplanktonic
- ***Pteropods*** P. Molluska, have flapping wings instead of a muscle foot, holoplanktonic
- ***Ctenophore*** Comb Jelly, carnivorous, P. Ctenophora, holoplanktonic
- P. **Chaetognatha** "arrow worms," have hair like jas, carnivorous, holoplanktonic
- ***Architeuthis*** Giant Squid, studied by Clyde Roper
- **Jawless Fish** 500 mya, Lampreys and Hagfish

Taxonomy

- **Cartilagenous fish** — have jaws, voraceuos predators, ex. Sharks, Rays, & Skates
- **Bondy Fish** — bony skeleton, non-pointed/flat scales, operculum, no heterceral tail, fin rays, teeth fused to jaw; ex. Surf Perch (generalist); Tuna (Cruising speed Specialist), Barracuda (Acceleration Specialist), Butterfly fish (maneurverability Specialist)
- **Sea Turtles** — 7 types: Loggerhead, Flatback, Green, Leatherback, Hawksbill, Kemp's Ridley, Olive Ridley
- ***Speniciiformes*** — Penguins, 18 spp. 17 arctic, generally form life long pairs, live in colonies, dive a lot when feeding
- ***Chadradriiformes*** — Gulls, mostly found in the Northern Hemisphere, has the most species, ex. Herring Gull,Kittywakes, Terns, Plovers, Skuas, Merlots, Puffins
- ***Pelicaniformes*** — webbed toes, ex. Pelicans, Frigate, Cormants, Boobies, Gannets
- ***Procellariformes*** — tube may be for sencing wind direction, mostly in the southern latitudes at windy altitudes, ex. Albatross, Shearwater, Petrel
- O. **Sirenia** — exclusively marine, feed on sea grass, ex. Manatees (paddle-like tail), Dugons (horizontal fluke tail)
- O. **Carnivora** — not exclusively marine, ex. Sea Otters and Polar Bears
- O. **Pinnipedia** — 3 Families: Phocidae (seals), Otariidae (sea lions & fur seals), Odobenus (Walrus)
- F. **Phocidae** — seals: no external ear, short neck, ungulates b/c cant rotate limbs, reproduces polgamously
- F. **Otariidae** — sea lions & fur seals: external ear, long neck, rotates for & hind limbs, supports body on fore limbs, take longer to wean their young, "fly" with fore limbs
- F. **Odobenus** — Walrus: conserves body heat by concentrating their blood in their core
- O. **Cedacea** — Whales: don't birth on land, migrate like pinnipeds, breech; 2 types: Mysticcti (baleen) & Odontoceti (toothed)
- **Mysticcti** — baleen whales, 11 spp., largest of the whales (Blue Whale =200 tons), chitenous plates (baleen), 2 nostril blowhole, filter feed, less social, no echolocation, ex. Blue Whale (pleated throat), Humpback (bubblentters)
- **Odontoceti** — toothed whales, predators, social groups (pods), smaller-largest is 42 tons (sperm whale), no pleats, 30+ spp., 1 blowhole, diverse in form, ecoloators, ex. Sperm whale, killer whale, dophins
- ***Tridacna*** — Giant Clam, has symbiotic zooanthelli
- ***Ancanthaster planci*** — Crown of thorns star fish, a voracious coral predator