24.10.15 Aquatic biomes

Google aquatic biome game

Recall terrestrial biomes are defined by temperature and precipitation (rain)

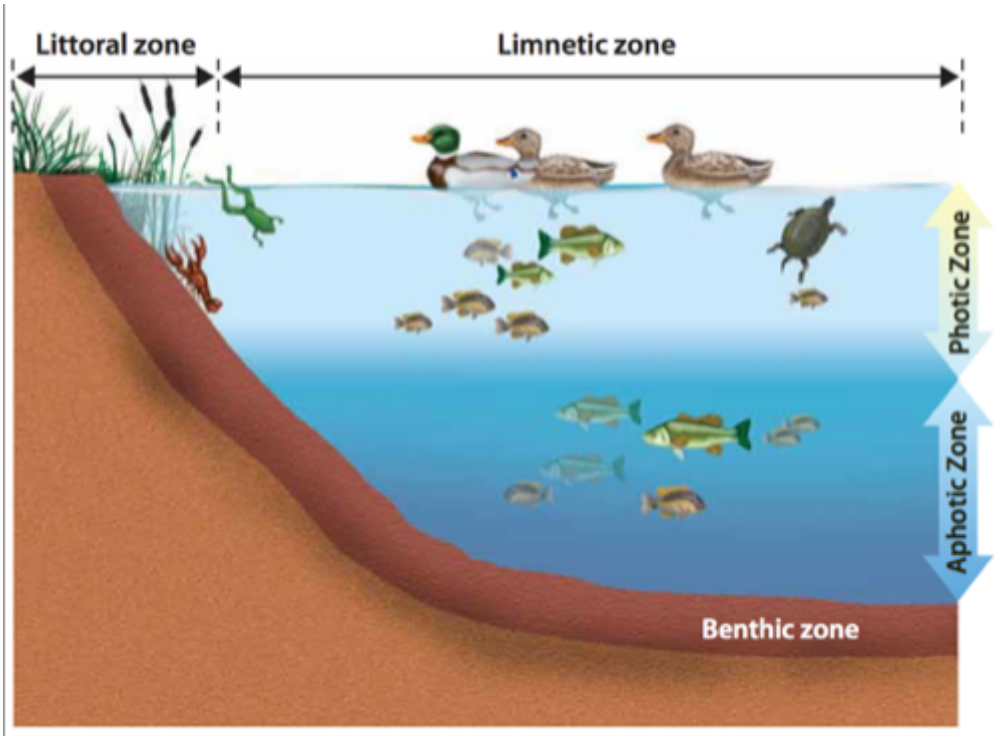
Aquatic biomes are by definition underwater, so they are defined by

- **Depth**: how deep is the deepest part, how much **photosynthesis** is possible
- **Distance from shore:** shallow water has more life, more things to attach to, more **biodiversity**

We separate aquatic biomes into **freshwater** (lakes, rivers, streams) and **saltwater** (oceans, estuaries)
Freshwater biomes:
Riparian=river
Limnotic=lakes

Lakes:

- Shallow shore area=littoral (means shallow), see the "littoral Navy", photosynthesis here (shallow, light shines through)
- Open water area=limnetic zone, no rooted plants (too deep), phytoplankton here, only as deep as sunlight can penetrate
- Deep water=profundal ("profound") or deep zone: no light penetrates, bacterial decomposition.
- Bottom=benthic zone: mud, dark, cloudy



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Ponds are much smaller, and may freeze in the winter, so their dynamics are different

Productivity: see also NPP (net primary productivity)

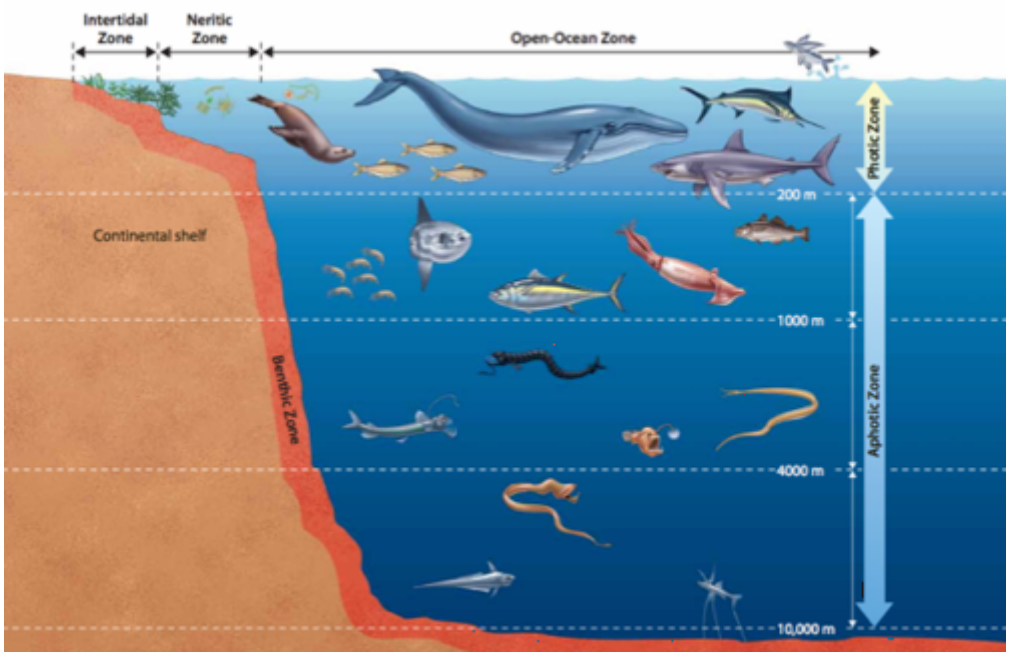
- n.b. usually related to photosynthesis (plants)
- Oligo (few) trophic=low productivity
- Meso (middle) trophic=medium
- Eutrophic (eu=good trephien=food)=lots of productivity (sometimes too much, like in "Poisoned Waters")
- Freshwater wetlands-submerged most of the time (swamps, marshes, bogs) this is the history of all coal and oil we now use

Wetlands:

- Freshwater wetlands-submerged most of the time (swamps, marshes, bogs) this is the history of all coal and oil we now use
- Salt marsh: usually connected to the sea, act as a coastal buffer for Hurricanes, very productive, many nutrients, lots of organic material
- Mangrove swamp: special adapted version of this in Tropical areas (e.g. Florida)
- Intertidal zone: area between high and low tide or seasonal variations

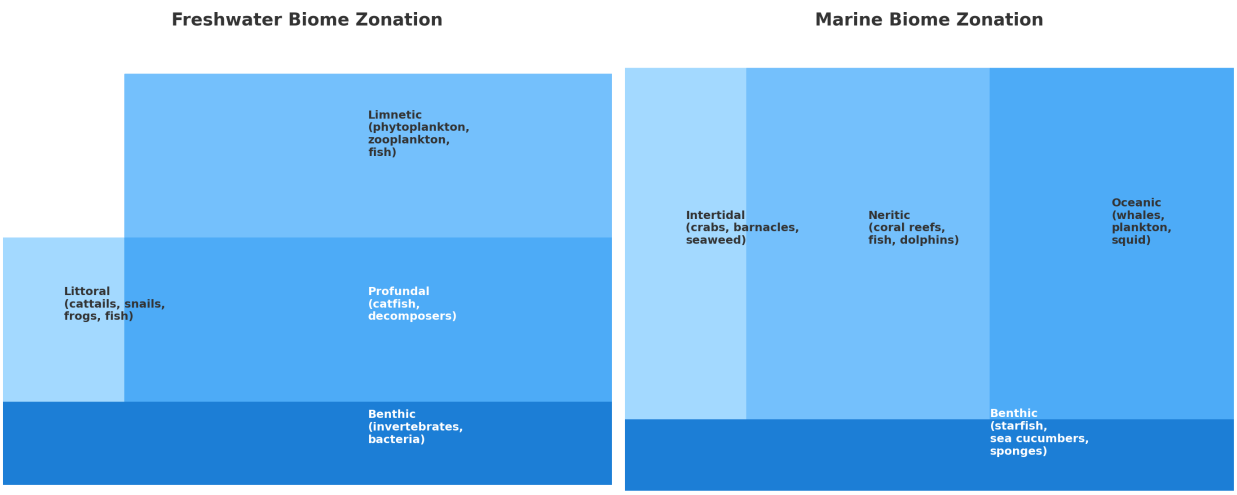
Ocean zones:

- Coral reefs-see coral bleaching, pH, temperature and salinity sensitive (see Hamakua coast vs. Puako)
- Intertidal zone: between high and low tide
- Photic (light) zone-shallow, photosynthesis, kelp, others
- Aphotic (dark) zone-too dark for photosynthesis
- Chemosythesis/thermosynthesis: deepwater steam vents, based on Sulfur instead of Oxygen, bacteria generate energy with methane (CH4) and H2S (instead of H20)
- Benthic=deep ocean
- Pelagic=open ocean (think of big sailing ships, whales, stuff like that)
- Hadal zones: like Hades: deepest, darkest zones. Weird fish, no light...



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Summary: (note open ocean is called Pelagic, and deep ocean zones are called Hadal)



Marine Biome Zonation.png

Biome	Zone	Key Abiotic Conditions	Example Organisms
Freshwater	Littoral	Shallow, lots of sunlight, near shore	Cattails, frogs, snails, small fish
Freshwater	Limnetic	Open surface water, well-lit	Phytoplankton, zooplankton, fish
Freshwater	Profundal	Deep water, little to no light, low oxygen	Catfish, decomposers
Freshwater	Benthic	Bottom sediments, low light	Invertebrates, bacteria
Marine	Intertidal	Shoreline, alternating wet/dry due to tides	Crabs, barnacles, seaweed
Marine	Neritic	Shallow coastal waters, high light, nutrient-rich	Coral reefs, fish, dolphins
Marine	Oceanic	Open deep waters, variable light, nutrient-poor	Whales, plankton, squid
Marine	Benthic	Sea floor, cold, dark in deep areas	Starfish, sea cucumbers, sponges

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Salt stuff:

- salt water = 30-50 ppt (parts per thousand)
- know what these mean, we will see them soon: ppt, ppm, ppb
- fresh water = 0.5 ppt
- in between 0.5-30 ppt = brackish (anchialine ponds in Kona)
- salinity, wind and temperature determine flow

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Terms to know: Review

Zones:
photic zone=light
aphotic=no light
benthic=really no light, never, ever ever. don’t even think about it.
Hadal=too dark to imagine, named after Hades (hell)

Marine animals:

- aquatic mammals must surface for air
- fishies don’t-they have gills
- DO dissolved oxygen (very important) depends on plants (so depth) and temp (cooler water can hold more O2)
- warm water has low O2 generally.
- best place to fish: cool water after a waterfall (why?)

Rivers, ponds and lakes, oh my...

- flowing water: rivers
- standing water: ponds
- lakes can become inland seas (drought lowers level, unable to drain, forms a lake)
- littoral=shore, limentic=away from shore benthic=botttom

Wetlands:

- terms: marshes, swamps, bogs and fens
- marshes marshes marshes!-tall grasses
- swamps-some trees
- bogs-acidic, poor decomposition, floating stuff, decay slowly-ancient cheese story, peat moss
- fens-freshwater spring underneath, less acidic, better nutrients

River stuff:

- rivers-"oxbow" lakes and meander (usually in very flat lands like Nebraska)
- continuity concept: source->tributary->mouth (delta)
- slope exponential as distance from source (one reason dams do not last long)
- deposition rates (rapids vs. plains, think of sedimentation)
- silt carrying capacity, turbidity
- estuaries-like deltas
- tidal estuary: e.g. hudson river: deeper than the body it serves

Oceans——

- 200 ft. of salt if all oceans evaporated
- oceans were red (iron) then ppt out (iron range in WI, MI) (see PBS Nova episode)
- salinity, wind and temperature determine flow

- upwelling (recall Peruvian fisherpersons)
- also downwelling

Photic (light) zones-again

- intertidal zone-makes sense, between tides
- neritic zone-close to shore, less than 200 ft. deep (not in Hawaii, we have no continental shelf-boo hoo)
- open ocean (pelagic) zone
- kelp forests-e.g. california coast
- coral reefs-away from fresh water, coastal, photic
- open ocean-scary stuff

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