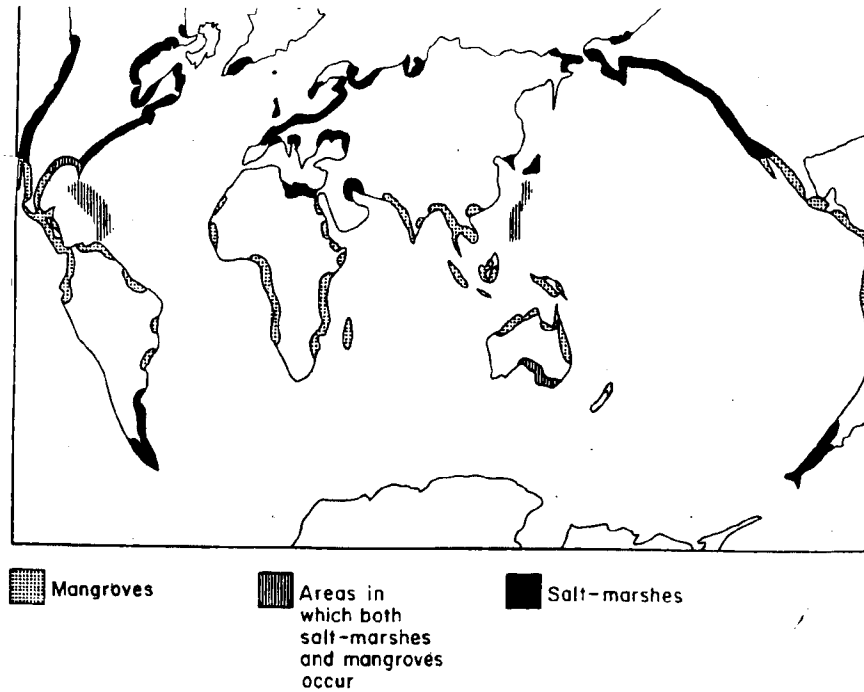
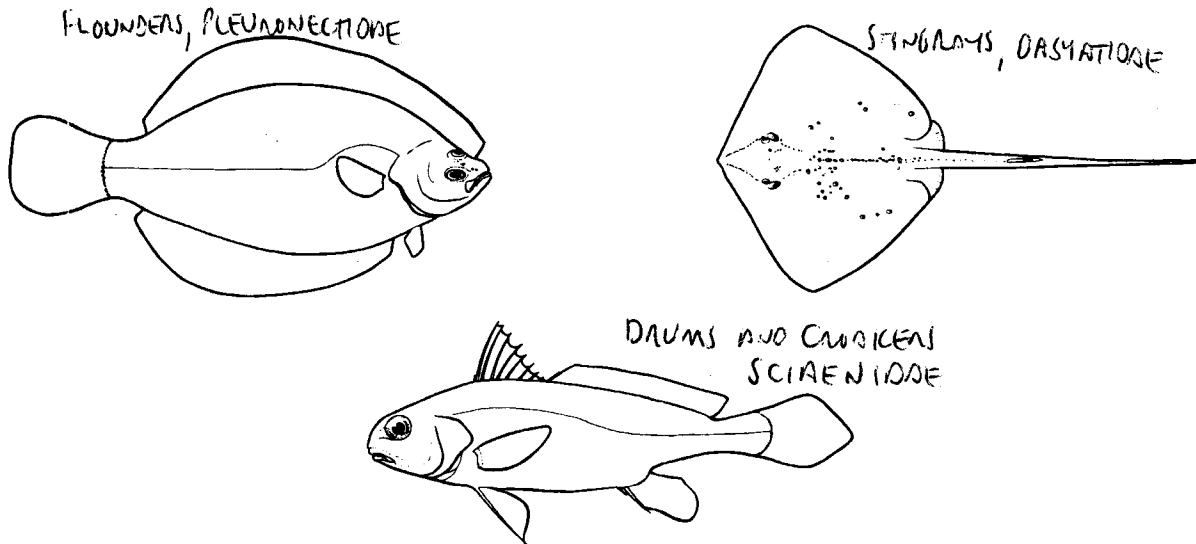


- However, heterotrophic overall because lots of allochthonous production inputs from land
- Coastal areas receive the discharge of rivers draining 100,000,000 km² of land
- Such water has about twice as much nutrients per volume as SW and from what washes in from open ocean (detritus and plankton)
- (SEE FIGURE) for map of distribution of salt marshes and mangrove swamps



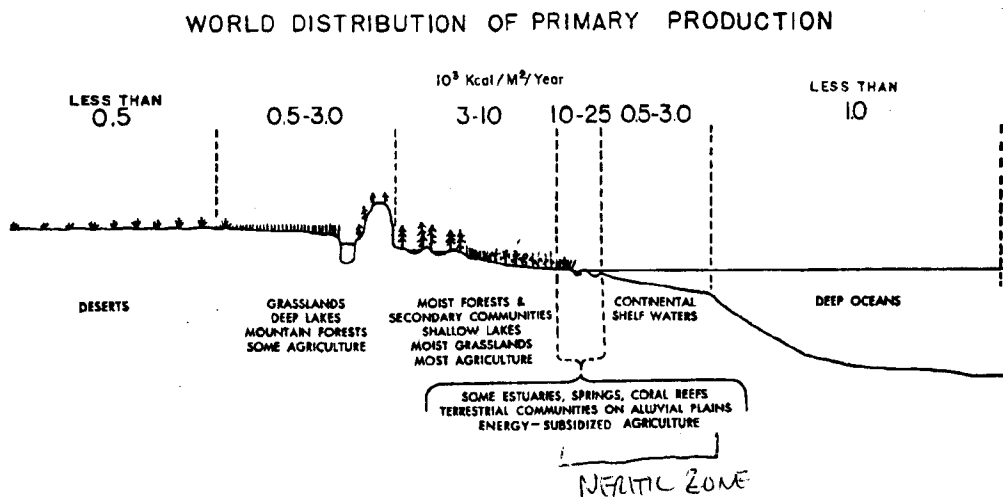
2. Consumers

- Supports a number of benthic burrowing detritivores (crabs, various worms, mollusks, and crustaceans)
- Fishes (e.g., flatfishes, drums, rays) move in with tide to feed, move out again
- **Bottom line:** community regulation = abiotic by water movement and bottom-up by nutrient/organic additions



B. Neritic zone

- Region between low tide and edge of continental shelf
- Out to boundaries of continental shelf, up to 1500km from shore
- Examples include Hudson Bay, North, Baltic, Bering, South China Seas
- Some of the most productive ecosystems and fisheries in the world, like estuaries, mangrove swamps, coral reefs (SEE FIGURE)



- Euphotic part (i.e., where light can penetrate directly to the sea bed and $P/R > 1$) increases in depth as you move away from shore b/c less land-based turbidity and algal blooms
- Wind can mix water down to depth of 200m, keeps nutrients and productivity well-mixed in this zone
- Very commonly used as nursery area for fishes

1. Producers

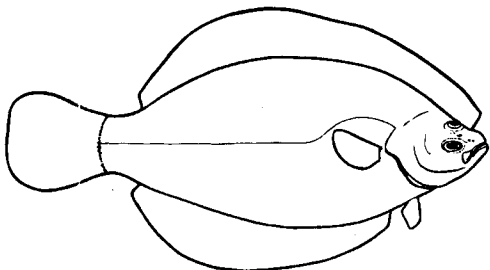
- Most primary production from phytoplankton (diatoms and dinoflagellates), though in some cases, there are macrophytes (e.g., kelp, eelgrass)

2. Consumers

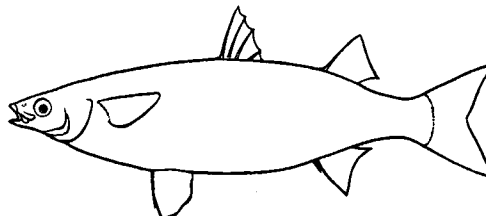
- Just about everything forms part of the plankton
- Most are meroplankton, planktonic as larvae (e.g., fish, jellyfish, mollusks, shrimps)
- Also, limited amounts of holoplankton, which are planktonic throughout life, like the “traditional” zooplankton we think about (e.g., copepods)

- Planktivorous fishes include filter-feeding clupeids; invertivores include the drum family, flatfish, rays, which feed on mollusks
- Piscivores include the nearshore varieties, on Atlantic coast, sharks, bluefish, striped bass, tarpon
- As in littoral zone, rich variety of detritivores like crabs, catfish, mullet

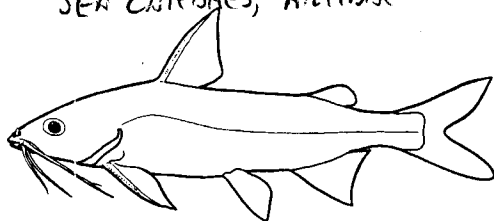
FLOUNDERS, PLEURONECTIDAE



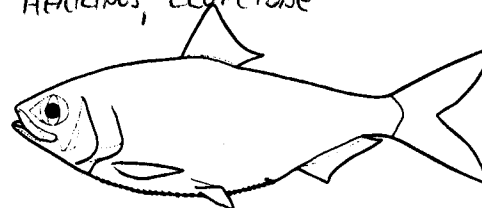
MULLETS, MUGILIDAE



SEA CATFISHES, ARIIDAE



HERRINGS, CLUPEIDAE



- **Bottom line:** community regulation = bottom-up from primary producers and top-down by predators (*based on results of overfishing)
- **Caveat:** in reef fish communities, community regulation appears to have a largely *stochastic* element, wherein the probability of a larva reaching a suitable spot and thriving depends heavily on chance flux in currents and who is already there, which are hard to predict

C. Oceanic zones

- Outward from where continental shelf flattens out
- Main stratification is by productivity, then by light (which are, of course, related).

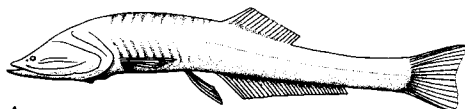
1. Epipelagic

- For example, epipelagic zone (down to 200m or so) is autotrophic and light-filled
- Productivity is not nearly as much as in coastal areas
- But, $P/R > 1$ because of sunlight and phytoplankton growth

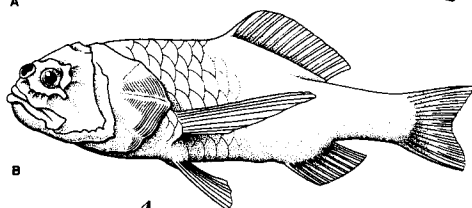
- Most zooplankton here are holoplankton, with notable exception of fish meroplankton (most inverts don't send larvae out into the open ocean), which ride the oceanic currents
- In certain areas where phytoplankton are concentrated, significant populations and assemblages of fish can converge, but such aggregations are unstable in time and space
- See the figures on the following four pages
- **Bottom line:** community regulation = bottom-up from nutrient supply and top-down by from predators upon planktivores

2. Mesopelagic

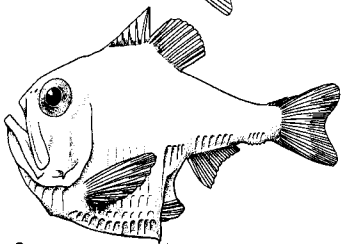
- Below, in the mesopelagic zone (to 1000m), P/R < 1
- There is enough scarce light that many fish have large eyes to collect it and many undergo vertical migrations to take advantage of epipelagic zone



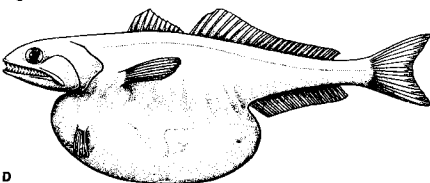
BASSLEMMOUTH, GOMOSTOMATIDAE



BIG EYE FISHES, MELAMPHRIDAE



MARINE HATCHETFINES, STERNOPTYCHIDAE



FAMILY CHIASMODONTIDAE

- **Bottom line:** community regulation = bottom-up from autotrophic productivity higher up and detritus supply

3. Bathypelagic

- In bathypelagic zone, there isn't even enough light to justify investment in eyes; fish are largely cartilaginous and have huge mouths

