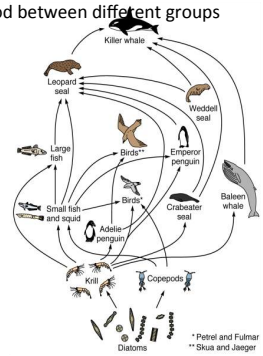
Food webs

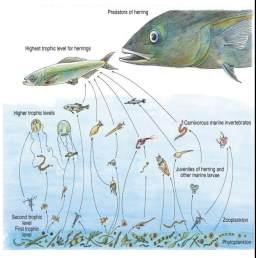
Flow of nutrients & food between different groups

- What is at the base of this food web?
- What is at the top of this food web?
- What might happen if baleen whales went extinct?
- What is missing in this food web?



Trophic levels

- Nutrients, organic matter, and energy move through food chains
- *Trophic levels* establish the links in the food chains
- Have to identify feeding relationships and energy transfer pathways

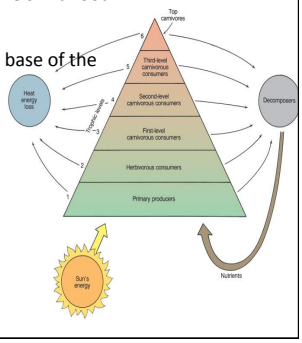


Biomass

- Biomass decreases moving from the first trophic level with the primary producers up to higher trophic levels
- Why does biomass decrease moving through a food chain?
- We may add 1 kg of weight after eating 10 kg of fish; why don't we gain exactly 10 kg?

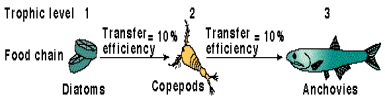
Trophic pyramid

- *Trophic pyramid* tracks the levels in a food chain
- Primary producers are at the base of the trophic pyramid
- Going up a trophic pyramid:
  - Biomass decreases
  - Energy is lost
  - Nutrients are recycled



Trophic efficiency

- **Trophic efficiency measures how much energy and mass is transferred to each successive level**



- **For this simple food chain example:**
  - **Phytoplankton (diatoms): 100 g C/m²/year**
  - **Zooplankton (copepods): 10 g C/m²/year**
  - **Fish (anchovies): 1 g C/m²/year**

Trophic efficiency

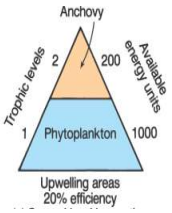
- Only 10% to 20% of energy and mass is transferred from one trophic level to the next
- Upwelling areas are smaller in size, but have higher trophic efficiency, and fewer trophic levels than open ocean trophic pyramids
- Which area will have the highest fish production?

Open ocean:

- Primary productivity = 81% of total
- Fish production = < 1% of total
- Large area for increased productivity, but more trophic levels with lower transfer efficiency

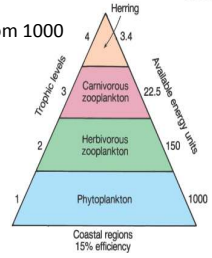
Upwelling:

- Primary production = 0.5% of total
- Fish production = 50% of total
- Small area, but few trophic levels, high transfer efficiency



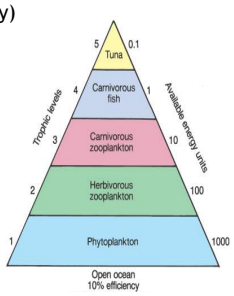
Coastal food web

- More trophic levels and moderate trophic efficiency (15% efficiency)
- 3.4 g C of herring are produced from 1000 g of phytoplankton



Open ocean food web

- Many trophic levels and low trophic efficiency (10% efficiency)
- 0.1 g C of tuna produced from 1000 g C of phytoplankton
- Population densities are low so more effort expended in searching for food



Where would you fish?