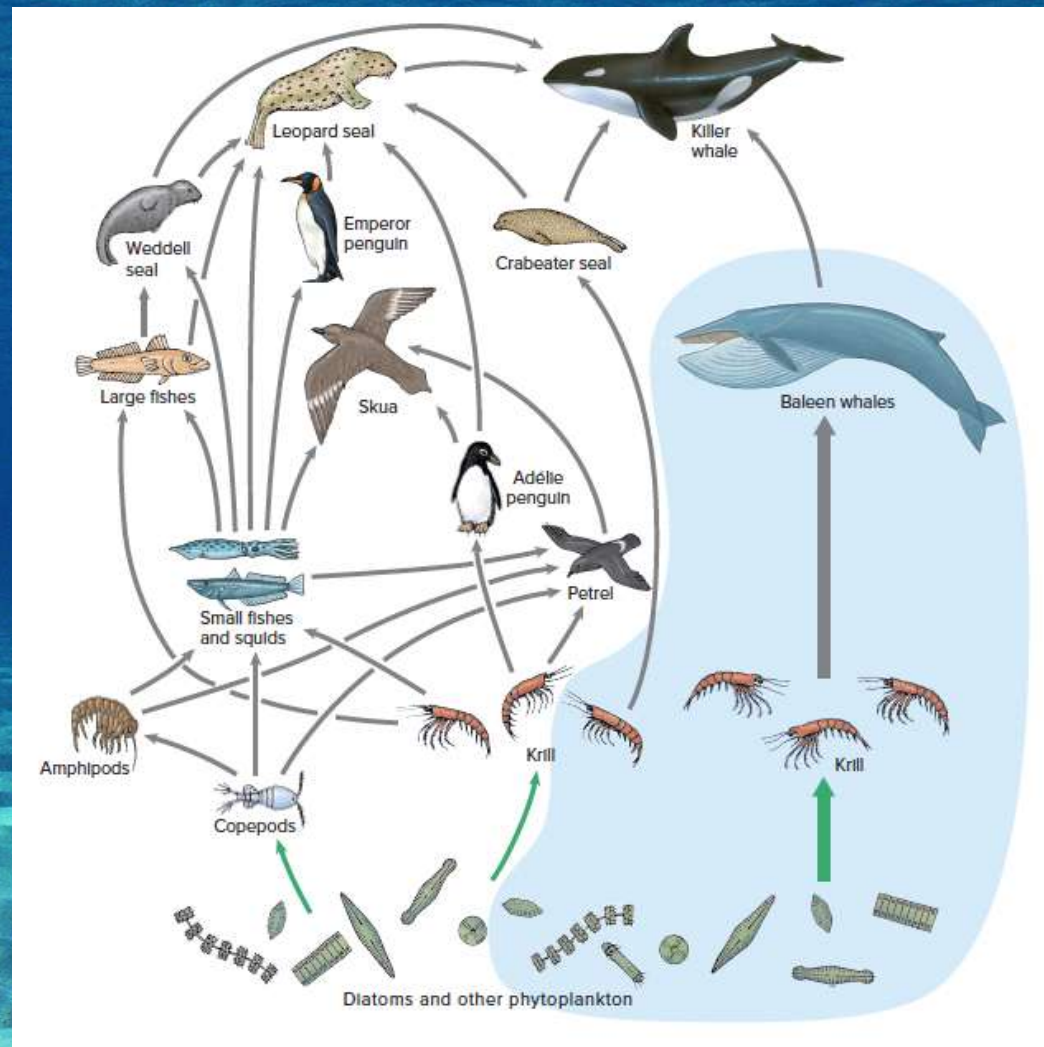


Trophic Structure

- The transfer of energy through the system usually takes place in several steps known as a food chain.
- Each of the steps in the food chain is known as a trophic level.
- An ecosystem's trophic structure is usually a complex, interwoven food web.

Food Web



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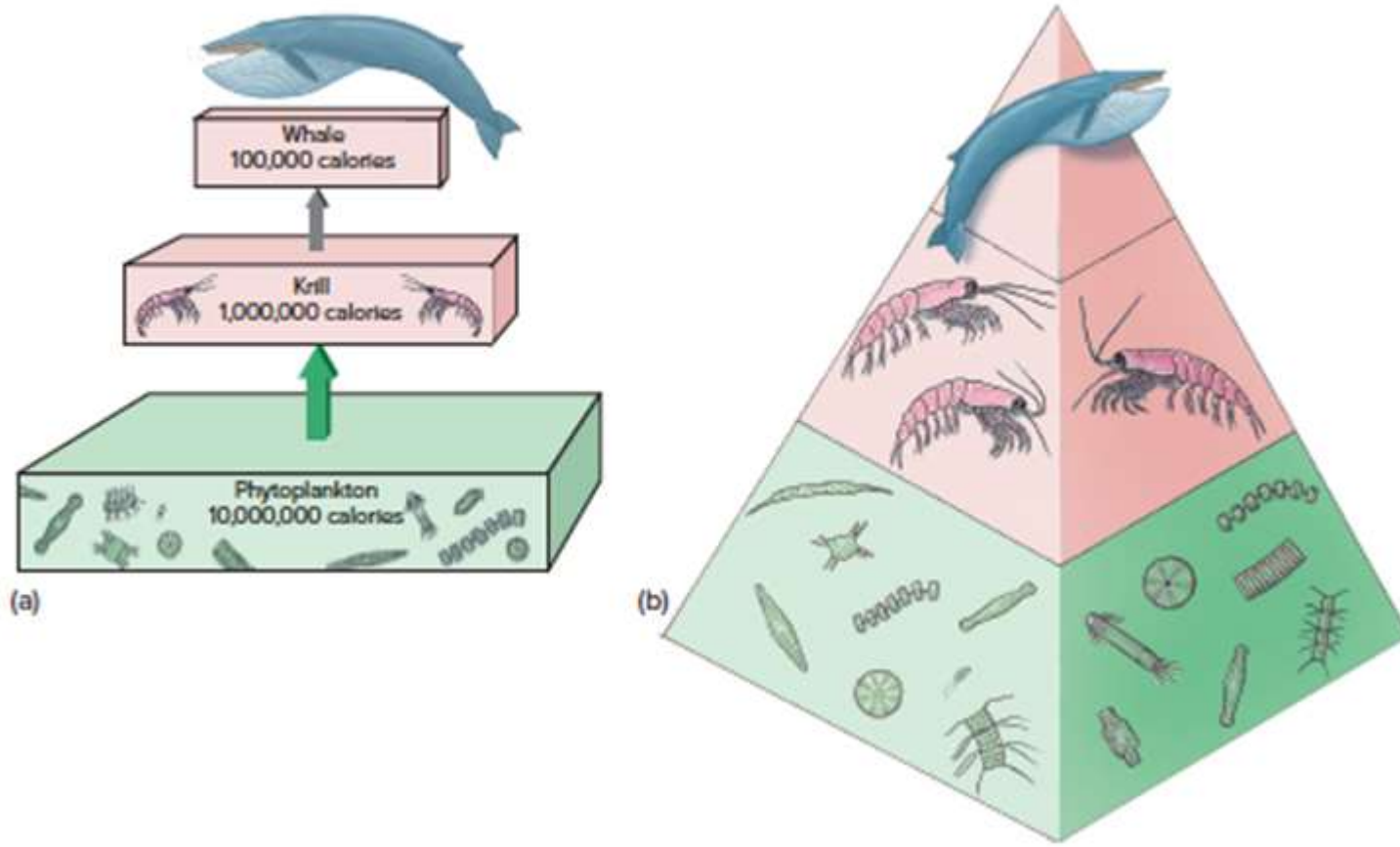
Trophic Levels

- First step in the flow of energy – primary producers – autotrophs that make food
- Second step in the flow of energy – primary consumers – heterotrophs that feed on the primary producers
- Third step and above in the flow of energy – heterotrophs that feed on the previous level consumers

The Trophic Pyramid

- Most of the energy at a particular level is used by the organism at that level for activities of the organism or is waste created by that organism.
- On average, about 10% (5-20%) of energy is transferred to the next level of the food chain, which is illustrated in a pyramid of energy.

The Trophic Pyramid



Measuring Primary Productivity

- Primary Production – the organic matter left over after the primary producers meet their own needs – base of the trophic pyramid
- In the ocean, the amount of primary production varies from one environment to the other.

Measuring Primary Productivity

Table 12.1 Typical Rates of Primary Production in Various Marine Environments

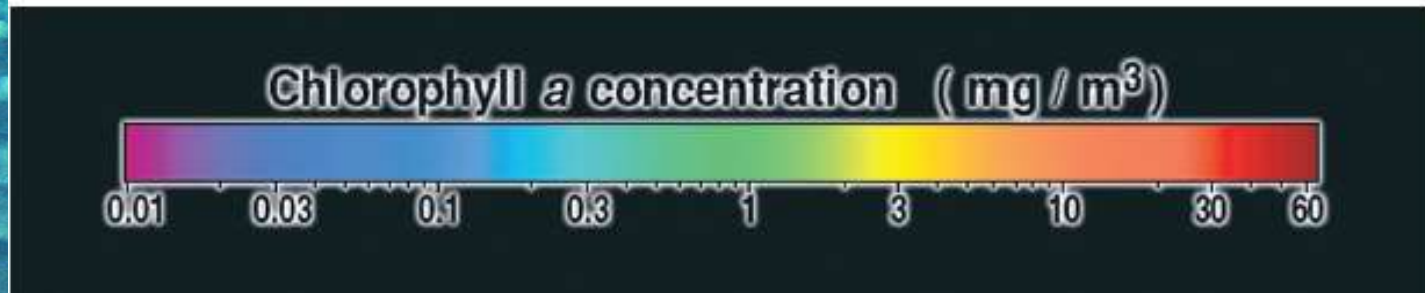
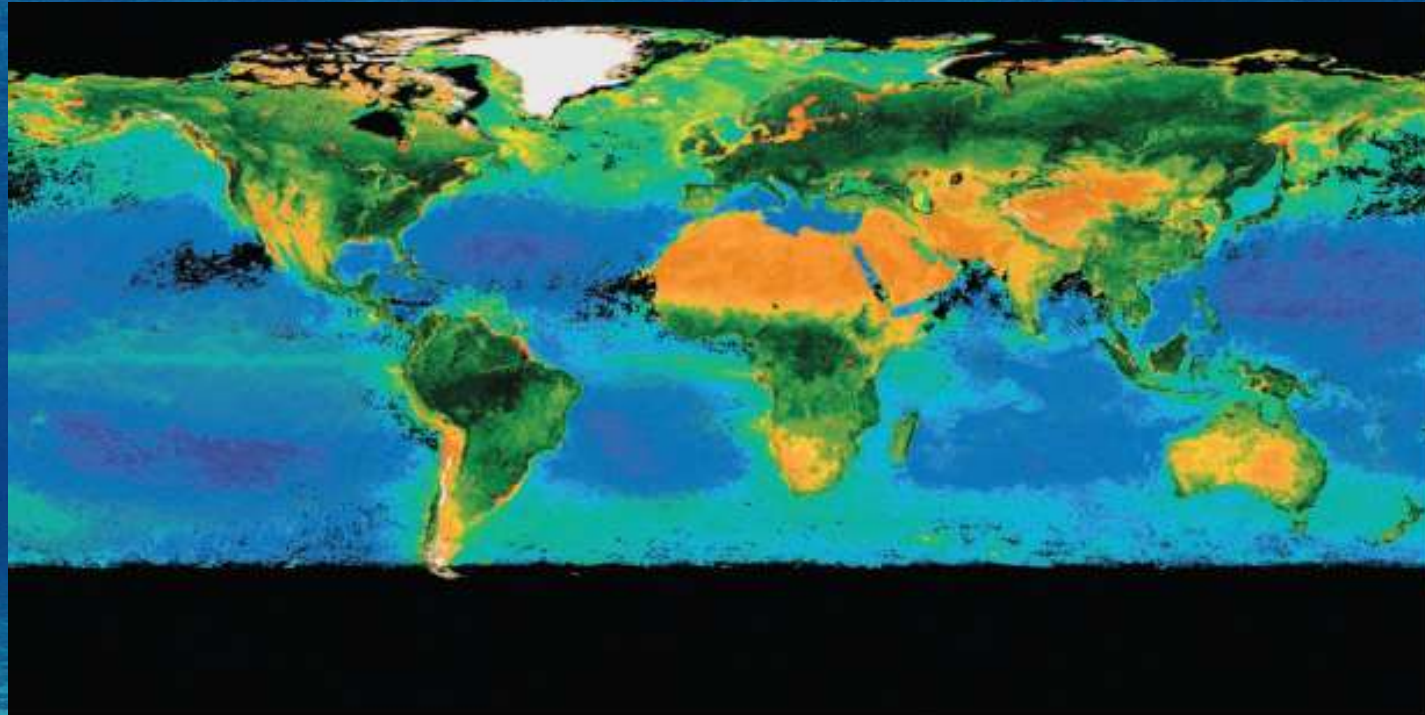
Environment	Rate of Production (Grams of Carbon Fixed/m ² /yr)
Pelagic Environments	
Arctic Ocean	<1-100
Southern Ocean (Antarctica)	40-260
Subpolar seas	50-110
Temperate seas (oceanic)	70-180
Temperate seas (coastal)	110-220
Central ocean gyres	4-40
Equatorial upwelling areas	70-180
Coastal upwelling areas	110-370
Benthic Environments	
Salt marshes	250-2,000
Mangrove forests	370-450
Seagrass beds	550-1,100
Kelp beds	640-1,800
Coral reefs	1,500-3,700
Terrestrial Environments	
Extreme deserts	0-4
Temperate farmlands	550-700
Tropical rain forests	460-1,600

Note: Production rates can be much higher at certain times or in specific locations, especially at high latitudes. Values for some selected terrestrial environments are given for comparison.

Standing Stock

- Standing stock – the total amount of phytoplankton – the main primary producers in the water
- The amount of chlorophyll in the water is a good indication of phytoplankton abundance.

Standing Stock



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