Predation and Community Structure

- Predation increases diversity through reduced intraspecific (fewer density dependent effects) and interspecific (less competitive exclusion) competition
- Pisaster starfish, one of the first documented keystone species.

Food Webs and Ecological Networks

- Communities feature numerous species with the potential for a large number of interactions.
- Taxonomic bias
- Species sometimes grouped into functional categories or guilds
- Very few examples well documented
- Historically, arrows represent prey $\rightarrow$ predator with most important species (keystone) viewed as top predators.
Maximal food chains

- Attempt to quantify the “length” of food webs
- Average number of links between a consumer and top predator
- Generally, more productive systems support longer chains

Energy Flow and Functional Webs

- Paine suggested connectedness webs (A) missed too many pertinent biological functions.
- Energy flow (B) estimates the flow of biomass (energy) between components
- Functional webs (C)—connections represent the strength of interactions

Interaction Strength

- Strong vs. weak interactors
- Keystone species
- Largely determined through removal experiments
- Metrics (table 10.1)
  - Raw: $R = \frac{N}{D}$
  - Paine's Index: $P = \frac{Y}{P_y}$
  - Comm. Importance: $I = \frac{N}{D}$
  - Dynamic Index: $D = \frac{N}{Y}$
- Where
  - $N$ = prey abundance with predators
  - $D$ = prey abundance without predators
  - $Y$ = predator abundance
  - $P_y$ = proportional abundance of predator
  - $t$ = time

Keystones and Trophic Cascade

- Minnows
- Bass
- Algae
- Daphnia
- Keystones

- Bass
- Minnows
- Daphnia
- Algae