Consumption and Secondary Production

Reading: pp. 411-416 (5th)

A. Food chains and food webs
   Grazing
   Detrital (decomposer)

B. Energy budget - flow of energy through an ecosystem

C. Trophic levels and ecological pyramids

D. Efficiency of energy transfer
   Consumption, Assimilation, Growth, Secondary production

E. How can we determine food web relationships?

A. Food chains are simplifications of food webs

B. Energy Budget: Source and fate of energy

Points:
1. GPP > NPP > NEP
2. Energy flow is one-way
   - once used, it is dissipated as heat
C-cycle: the somewhat more detailed version

C. Trophic pyramids

Classic food chain
1. Trophic levels: Primary producers, herbivores, carnivores (predators), omnivores, detritivores
2. Rule of thumb: 10% energy transfer between trophic levels

Consequences for diversity

Production by Trophic Level

D. Efficiencies of energy transfer

Why is biomass of animals so small?
Where does all the energy go?
Why is transfer efficiency so low?
**Availability of energy for growth**

\[ S_0, P = C - R - F - U \]

Assim. | Production | Respiration
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Consumed | Assimilated | Feces

1st Prod | Consumed | Unconsumed

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**Trophic energy losses: a Michigan old-field**

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**Assimilation, production, and growth efficiencies for homeotherms and poikilotherms**

| Efficiency All | All | Grazing | Sap-feeding | Lepidoe- | Smith (1998) Table 11.3, p. 181 |
|----------------|-----|---------|-------------|-------------|
| Assim. A/C     | 77.5+6.4 | 41.9+2.3 | 37.7+3.5 | 48.9+4.3 | 46.2+4 |
| Prod. P/A      | 2.46+0.5 | 44.6+2.1 | 45.0+1.9 | 29.2+4.8 | 30.0+3.0 |
| Growth P/C     | 2.0+0.5 | 17.7+1.0 | 16.6+1.2 | 13.5+1.8 | 22.8+1.8 |

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**Basal metabolic rate – endos &ectos**

**E. How can we determine food web relationships?**

- Observation
- Gut/feces content
- You are what you eat, isotopically speaking.
Fig. 18.20 – Human consumption of corn

Fig. 18.18

Fig. 18.19 – food sources of the ribbed mussel.