



Communities

A group of potentially interacting species living in the same location



Outline: Community Ecology

1. Community Structure
 - Biodiversity
 - Dominance
 - Keystone species
2. Community Interactions
 - Food web
 - Functional groups
3. Physical structure
 - Zonation
 - Succession

Community Structure

- Biodiversity
- Ecological dominants
- Keystone species



Biodiversity



- Species richness
- Relative abundance
- Types/Guilds



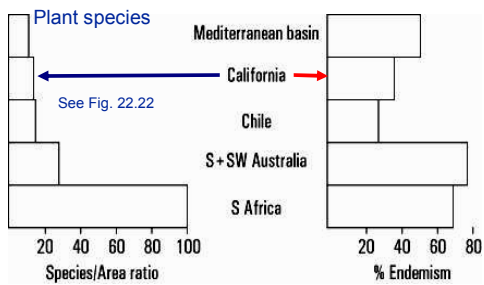
Relative Abundance

Table 16.1 Structure of One Mature Deciduous Forest Stand in Northern West Virginia

Species	Number of Individuals	Relative Abundance (Percentage of Total Individuals)
Yellow poplar (<i>Liriodendron tulipifera</i>)	76	29.7
White oak (<i>Quercus alba</i>)	36	14.1
Black oak (<i>Quercus rubra</i>)	17	6.6
Sugar maple (<i>Acer saccharum</i>)	14	5.4
Red maple (<i>Acer rubrum</i>)	14	5.4
American beech (<i>Fagus grandifolia</i>)	13	5.1
Sassafras (<i>Sassafras albidum</i>)	12	4.7
Red oak (<i>Quercus rubra</i>)	12	4.7
Mockernut hickory (<i>Carya amara</i>)	11	4.3
Black cherry (<i>Prunus serotina</i>)	11	4.3
Slippery elm (<i>Ulmus rubra</i>)	10	3.9
Shagbark hickory (<i>Carya ovata</i>)	7	2.7
Bitternut hickory (<i>Carya cordiformis</i>)	5	2.0
Pignut hickory (<i>Carya glabra</i>)	3	1.2
Flowering dogwood (<i>Cornus florida</i>)	3	1.2
White ash (<i>Fraxinus americana</i>)	2	0.8
Hornbeam (<i>Carpinus caroliniana</i>)	2	0.8
Cucumber magnolia (<i>Magnolia acuminata</i>)	2	0.8
American elm (<i>Ulmus americana</i>)	1	0.39
Black walnut (<i>Juglans nigra</i>)	1	0.39
Black maple (<i>Acer nigra</i>)	1	0.39
Black locust (<i>Robinia pseudoacacia</i>)	1	0.39
Sourwood (<i>Ostrya virginiana</i>)	1	0.39
Tree of heaven (<i>Ailanthus altissima</i>)	1	0.39
	256	100.00

Patterns in Community Structure

Number of species = **species richness** \propto biodiversity



EG of "types" of species ENDEMIC = found nowhere else

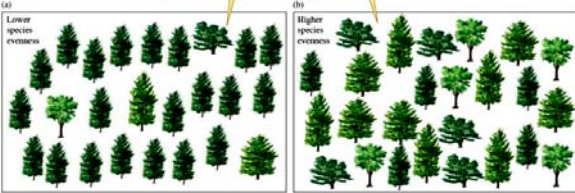
Species Richness v. Evenness

Which community would you consider more diverse?

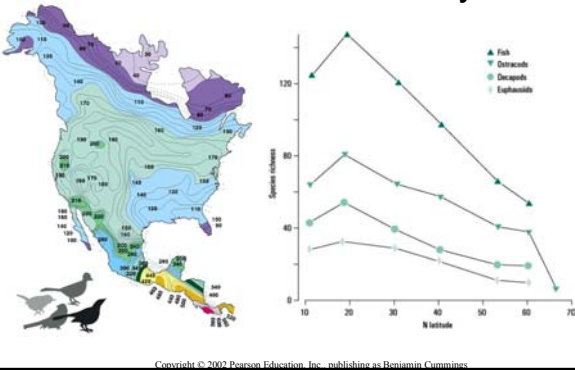
Communities a and b both contain five tree species. However, because community b has greater species evenness, it has higher species diversity.

Community a is dominated by one of its five species and so has lower species diversity than...

...community b, which has the same five species but in equal proportions.



Patterns in Biodiversity



Dominance : Coastal Live Oak Community



California bay



Western Scrub-Jay



Coast live oak (*Quercus agrifolia*)



Hedge-nettle



Western Gray Squirrel



Creeping snowberry

<http://www.sfbaywildlife.info>

<http://polyland.calpoly.edu/overview/Archives/derome/>

Keystone Species

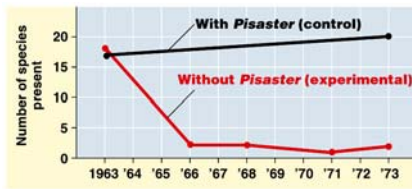
Species that have a disproportionate impact on community structure and biodiversity.



- create or modify habitats
- influence interactions with others



Keystone Species



Copyright © 2002 Pearson Education, Inc., publishing as Benjamin Cummings

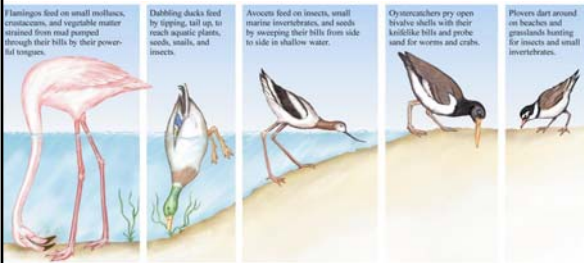
Community Interactions

- Habitat
- Niche
- Functional groups
- Food webs

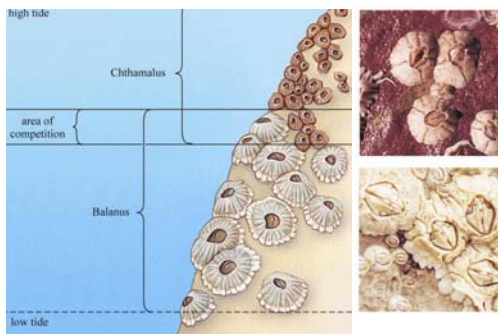


Figure 46.4 © 2002 Pearson Education, Inc., publishing as Benjamin Cummings

Feeding Niches for Wading Birds



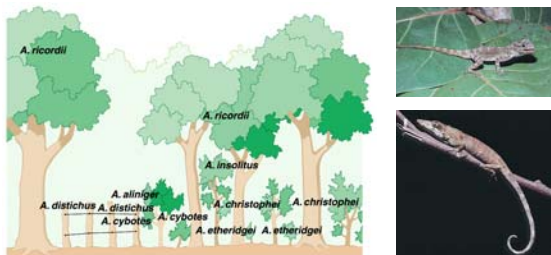
Competitive Exclusion Principle



Copyright © 2002 Pearson Education, Inc., publishing as Benjamin Cummings

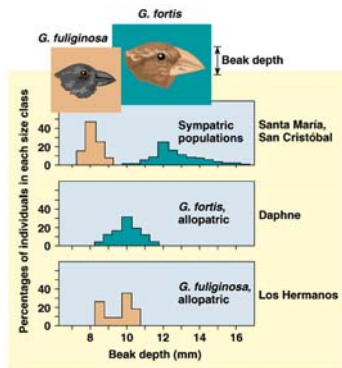
Resource Partitioning

differentiation of niches that enables two similar species to coexist in a community.



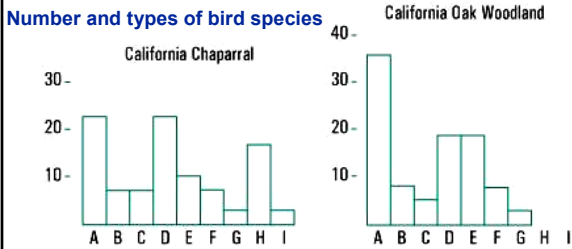
Copyright © 2002 Pearson Education, Inc., publishing as Benjamin Cummings

Character Displacement



Copyright © 2002 Pearson Education, Inc., publishing as Benjamin Cummings

Community "Composition"



- A = foliage gleaner (eats insects)
 - B = sallying flycatcher
 - C = nectar feeder
 - D = ground foragers
 - E = seed/fruit eaters
 - F = trunk/bark feeders
 - G = aerial feeders
 - H = raptors/scavengers
 - I = crepuscular insectivores
- GUILDS**

Examples bird species, by guild



- GUILDS:**
- A = foliage gleaner (eats insects)
 - C = nectar feeder
 - D = ground foragers

Examples of bird species

H = raptor/scavenger guilds



H: California Condor

Examples of bird species in different guilds



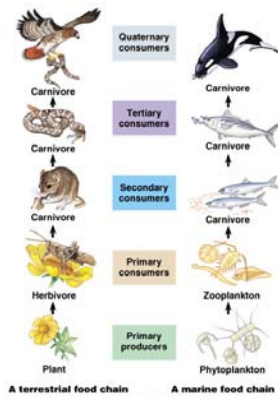
H: Golden Eagle

G: Tree Swallow

F: Brown Creeper

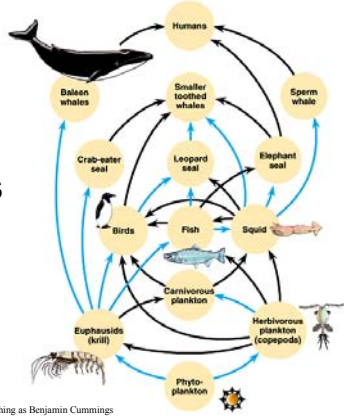
- F = trunk/bark feeders
- G = aerial feeders
- H = raptors/scavengers

Trophic Structure



A terrestrial food chain A marine food chain

Food Webs



Copyright © 2002 Pearson Education, Inc., publishing as Benjamin Cummings

Community Interactions

Table 53.1 Interspecific Interactions

Interaction	Effects on Population Density
Competition (-/-)	The interaction is detrimental to both species.
Predation (+/-) (includes parasitism)	The interaction is beneficial to one species and detrimental to the other.
Mutualism (+/+)	The interaction is beneficial to both species.
Commensalism (+/0)	One species benefits from the interaction but the other is unaffected.



Red-Tailed Hawk with a ground squirrel



Leucochloridium paradoxum infected snail

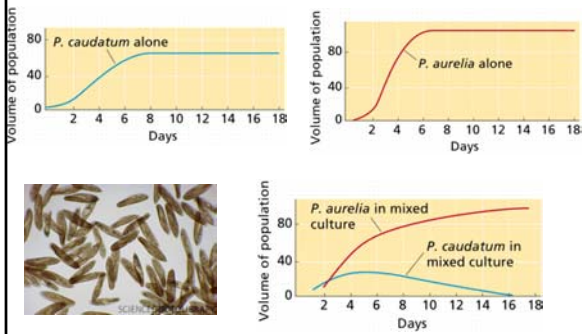


Clownfish and Sea anemones

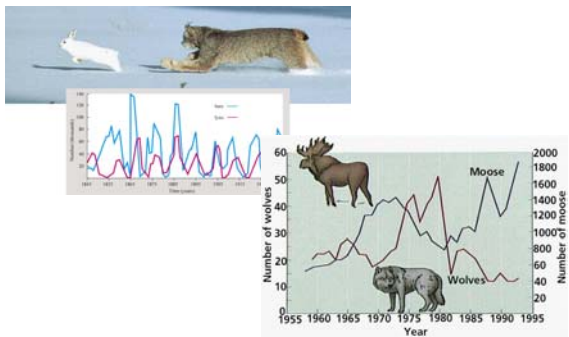
Cleaning Symbiosis



Competition



Predator-Prey Interactions



Prey Defenses



Moth with large "eyes"



Sundew plant with sticky leaves (actually digests the insect)

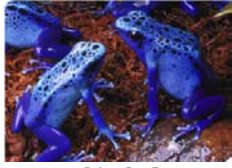


Cryptic Coloration in the Anglerfish

Aposematic Coloration



Stinging Rose Caterpillar



Poison Dart Frogs



Viceroy Butterfly

Copyright © 2002 Pearson Education, Inc., publishing as Benjamin Cummings

Batesian Mimicry

– a harmless species mimics a harmful one.



Deadly Coral Snake



Harmless Scarlet King Snake



Hawkmoth Larva



Green Parrot Snake

Copyright © 2002 Pearson Education, Inc., publishing as Benjamin Cummings

Müllerian Mimicry

- two or more unpalatable/dangerous species resemble each other.



Cuckoo bee



Yellow Jacket

Copyright © 2002 Pearson Education, Inc., publishing as Benjamin Cummings

Parasitism



Symbiotic relationship in which one organism benefits while the other is harmed

Enterobius vermicularis **(Pin Worm)**

- Epidemiology: Worldwide
- Most common helminth in North America
- No vector
- No reservoir
- Treatment: Mebendazole



MALARIA

- Kills 1-2 million/year
- Loss of productivity
- Vaccines slow
- Mosquito abatement
- Swamps



Ringworm (tinea)

- *Trichophyton rubrum* & *tonsurans*
- Dermatophytes
- Keratinophilic filamentous fungus
- also, athletes foot, jock itch
- Contact transmission
- miconazole, (lotrimin, monostat, etc)

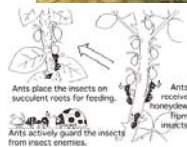


Mutualism

- Symbiosis that is beneficial to both organisms



Pyrrhosomypha spp.



Commensalism

- symbiotic relationship in which one species is benefited and the other is indifferent



Epiphytic plants on a tree



Remora on a shark

Coevolution

- reciprocal evolutionary adaptations of two interacting species



Orchid and its fly pollinator



Pseudomyrmex ants on Acacia trees



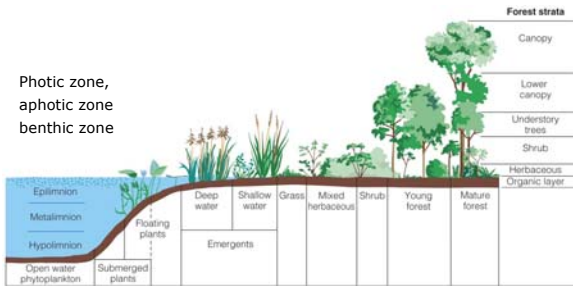
Lion and Zebra need speed

Communities have a definitive physical structure



Physical Structure

Photic zone,
aphotic zone
benthic zone



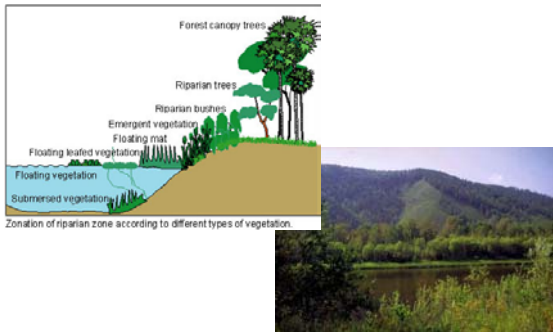
Vertical sectional view of communities from aquatic to terrestrial.

Zonation

- Changes in physical and biological structure of communities as moving across the landscape



Riparian Zonation



Disturbances



Human disturbance

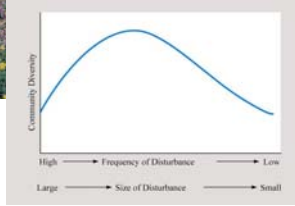


Tornado disturbance



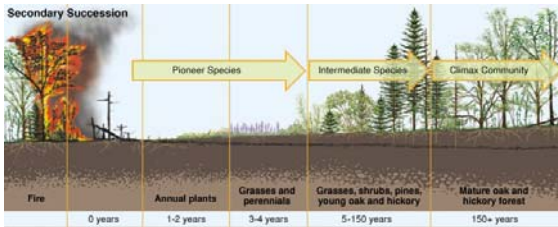
Fire disturbance

Intermediate Disturbance Hypothesis



Succession

- Pioneer species
- Steady increase in biomass
- Climax community



© 2006 Encyclopædia Britannica, Inc.

Glacial Retreat

Table 53.2 The Pattern of Succession on Moraines in Glacier Bay

Years after Deglaciation	Dominant Plant	Other Common Species
0-30	Dryas	Fireweed, willows, mosses, cottonwoods
30-80	Alder	Willows
80-200	Sitka spruce	Alder, willows
200-500	Sitka spruce, western hemlock	Mountain hemlock
> 500	Sphagnum moss (in flat areas)	Bog plants



Secondary Succession



Mount St. Helens erupted on May 18, 1980



[Watch the Movie](#)
