Biol 541 – Ecology of Fishes and Fisheries Biology
Lecture 9 – Biotic Interactions: Competition & Mutualism

Competition

Competition = interaction between individuals in which one or more of the individuals suffers a negative impact, which may result in a loss of fitness.

For competition to occur, what conditions must apply?

Competition occurs -- within a species (**intraspecific**)

-- between species **(interspecific**).

Competition can occur in two ways:

Exploitative competition:

Interference competition:

Intraspecific competition

Individuals within the same population:

Competition is usually asymmetrical :

All competition is density-dependent:

Interspecific competition

Species don't have to be at same taxonomic level:

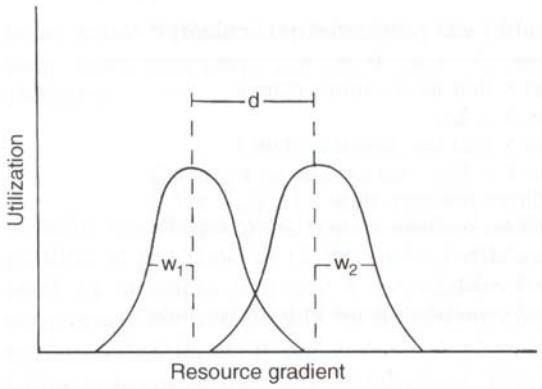


Fig. 9.1 Niches of two species represented along a single niche dimension, approximated by the resource utilization curves for two species along a resource gradient (niche dimension). Possible gradients include food particle size (Chapter 3) or temperature (Chapter 4). Symbols: w_1 and w_2, niche widths for species 1 and 2 measured as standard deviations of resource utilization curve; d, measured difference between niches; niche overlap is shown by region of gradient shared by both curves.

Tests of Interspecific Competition

The concept of the **niche** is often linked with competition (functional role of an animal):

Fundamental niche and realized niche --

Lines of Evidence:

Patterns of resource use when they are living in same area (sympatric) vs. living apart (allopatric)

Interactive segregation -- use of resources differs more when the species are sympatric although it is similar when they are allopatric. Could be caused by competition but may be confounded by environment in allopatry vs. sympatry.

Selective segregation -- patterns of resource use are because of adaptations of different species, not because of current competition. Minimizes contemporary competition but may have competed in the past

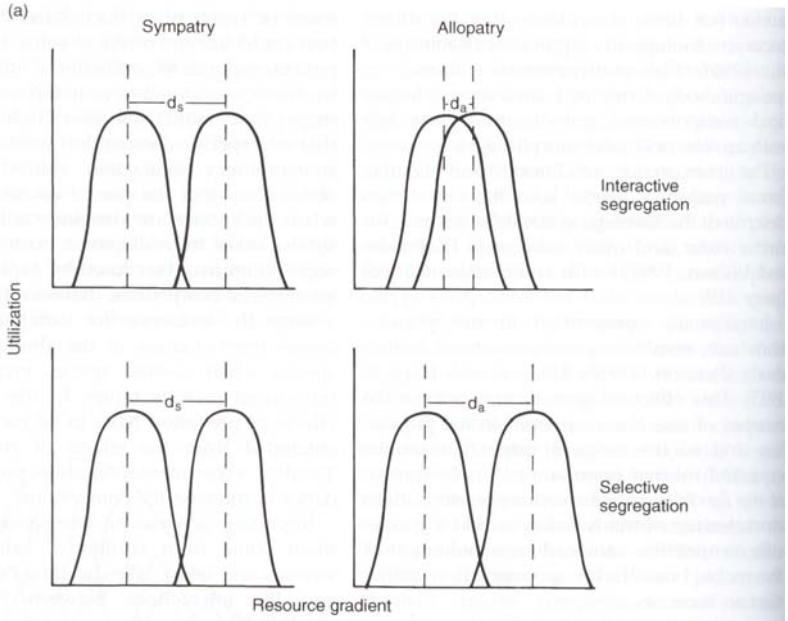


Fig. 9.3 (a) Interactive and selective segregation illustrated by resource utilization curves of species when sympatric and allopatric. (b) (Opposite) Diets of brown trout, *Salmo trutta*, and Arctic charr, *Salvelinus alpinus*, in Scandinavian lakes when sympatric (black bars) and allopatric (open bars), illustrating increase in difference along a diet dimension when species are sympatric. Diet categories: A, fish; B, small crustaceans; C, large crustaceans and molluscs; D, insect larvae; E, terrestrial insects; F, miscellaneous. Redrawn from Giller (1984).

(1) Competitive displacement (shift in resource use in presence of a competitor)

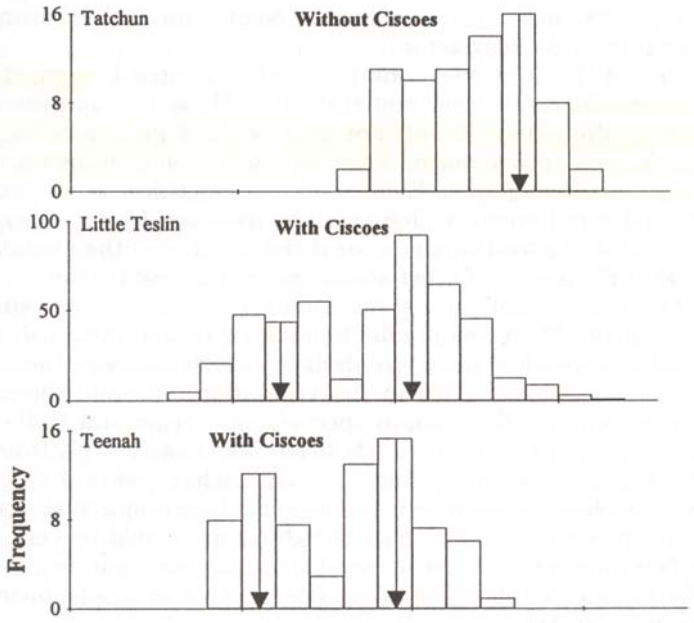
Table 9-1. *Percent contribution of prey categories consumed by each sunfish species in a pond with or without vegetation (from Werner and Hall 1979).*

Species	Pond	Vegetation	Prey Type Benthic	Open Water	Other
Bluegill	Vegetated	15%	15%	33%	37%
	Nonvegetated	3%	23%	33%	42%
Pumpkinseed	Vegetated	5%	34%	6%	55%
	Nonvegetated	4%	37%	3%	56%
Green	Vegetated	40%	12%	4%	44%
	Nonvegetated	14%	24%	13%	49%

Table 9-2. *Average dry weight (SE) at the end of each experiment for each species stocked in ponds with or without vegetation (from Werner and Hall 1979).*

	Pond Type Vegetated	Nonvegetated
Bluegill	1.29 (0.02)	0.89 (0.03)
Pumpkinseed	1.21 (0.03)	1.17 (0.03)
Green	1.34 (0.03)	1.01 (0.04)

(2) Character displacement:



(3) Competitive release (reverse of competitive displacement; expansion of distribution of one species when the other is removed)

Hixon 1980 – removal of each of two species of surfperch in sympatry.