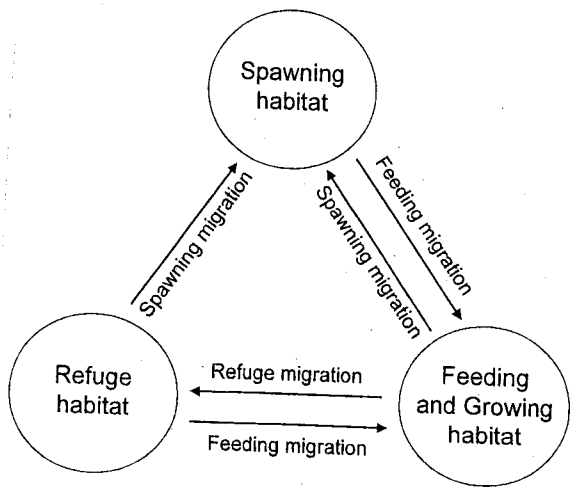
The Migration Lecture

Objectives:
1) Understand role of migration in connecting habitats used by fish
2) Realize diversity of migratory strategies employed by fish in different environments
3) Recognize potential influences of human activities on migratory patterns

I. What is migration?

A. The life-cycle of a fish – putting the pieces together

Generalized life-cycle of a fish



B. Types of movements
1. Movement

2. Migration

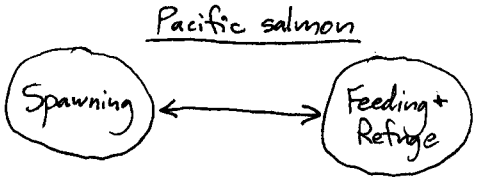
3. Dispersal

C. Million-dollar definition of migration

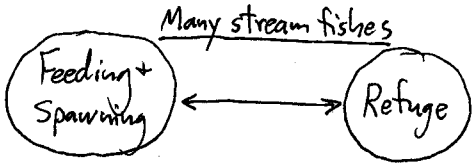
II. Why do fish migrate?
A. Migration is costly

B. Why use different habitats for different purposes?

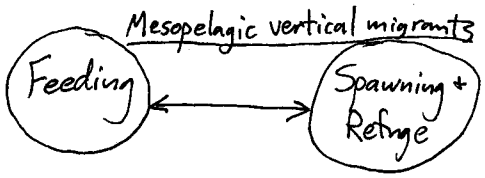
1. Fish don't always



2. Needs change with body size



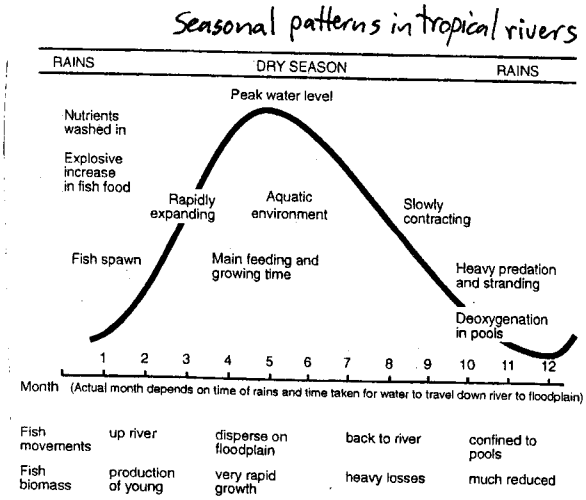
3. Tradeoff between safety and productivity



4. Tradeoff between feeding and digestion

5. Tradeoff between dispersion and aggregation

6. Resources are dynamic and/or periodic



C. The adaptive basis for migration

1. Migration requires B > C

2. In some cases, is individual adaptation

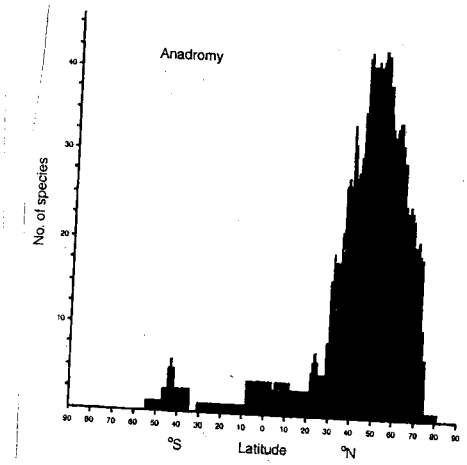
3. See salmon handout

III. Examples of migrations

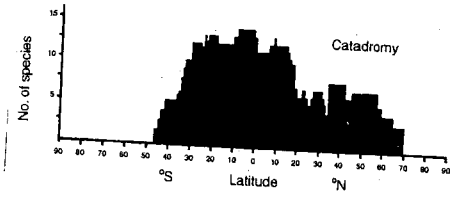
A. Spawning migrations

1. Freshwater

2. Marine



3. Diadromy: special class of migration
   a. Anadromy

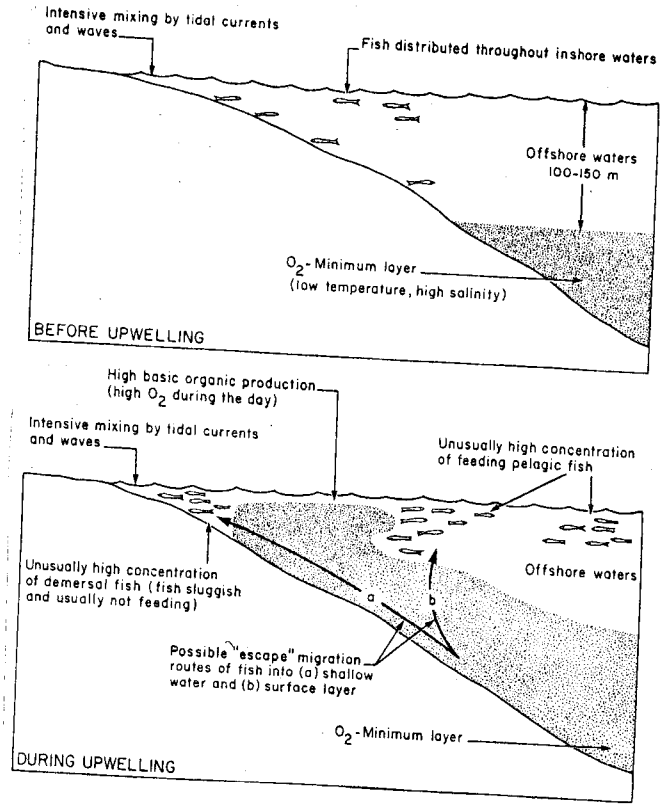


   b. Catadromy

B. Feeding migrations

1. Freshwater

2. Marine



C. Refuge-seeking migrations

1. Freshwater

2. Marine

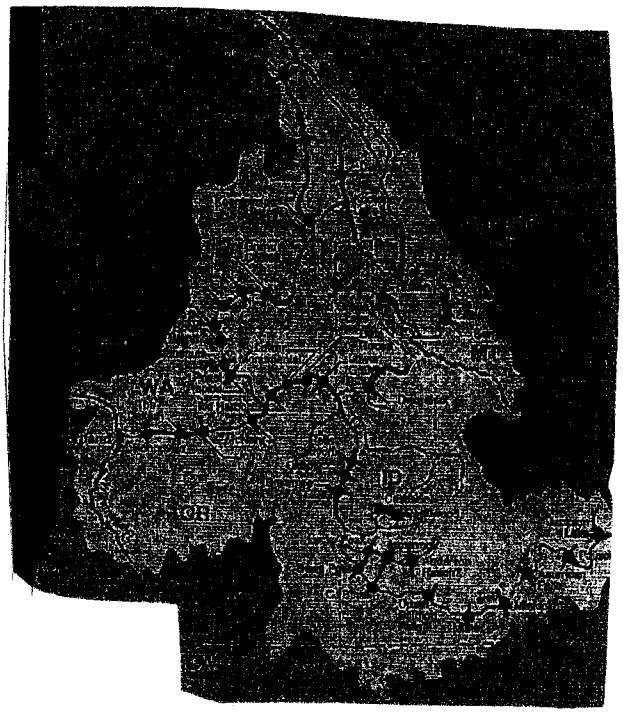
IV. How do fish migrate?
A. Rheotaxis

B. Olfactory cues

C. Visual cues

D. Electromagnetic cues

V. Human activities can affect migration
A. Habitat loss



B. Movement barriers

C. Environmental variability/predictability

D. Selection for homebodies

E. Which species should fare best?

To STAY or GO?

- When should a fish population migrate to improve reproduction?

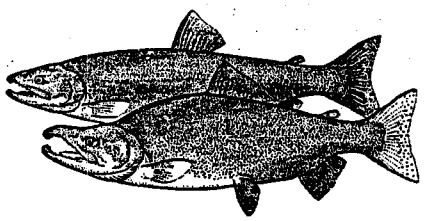
It depends on the trade-off of <u>Costs</u> vs. <u>Benefits</u>

<u>Benefits</u>: Higher fecundity (eggs per female) because fish grow larger at more productive feeding grounds

<u>Costs</u>: Migration lowers the probability of survival to reproduce

<u>So, # of eggs spawned per female = fecundity x probability of survival</u>

KOKANEE AND SOCKEYE SALMON
Oncorhynchus nerka (Walbaum)



<u>Example</u>: Sockeye salmon (anadromous) vs. Kokanee (freshwater), 2 different forms of <u>O. nerka</u>. Kokanee don't go to sea. Instead, they stay in the nursery lake, running upstream to spawn as adults. They don't grow very large (1lb. vs. 10lb. for sockeye), but survival is higher. Whether to stay or go depends on the fecundity vs survival trade-off.

<u>Form</u>	<u>Wt.</u>	<u>Fecundity</u>	<u>Prob. of Survival</u>	<u>Eggs spawned per female</u>
Sockeye	10lb.	5,000 eggs	0.1	500
Kokanee	1lb.	800	0.5	400

In this case, it makes sense to <u>go</u>. But if Kokanee could grow to 2lbs., fecundity would rise to 1,600 eggs with 0.5 survival = 800 eggs spawned per female. Now, <u>O. nerka</u> should <u>stay</u>.

<u>True Story</u>: Salmon biologists have fertilized sockeye nursery lakes to support more young fish. But sometimes, the young salmon grow so well that they stay home, becoming 2lb. Kokanee instead of 10lb. sockeye.

-Nya