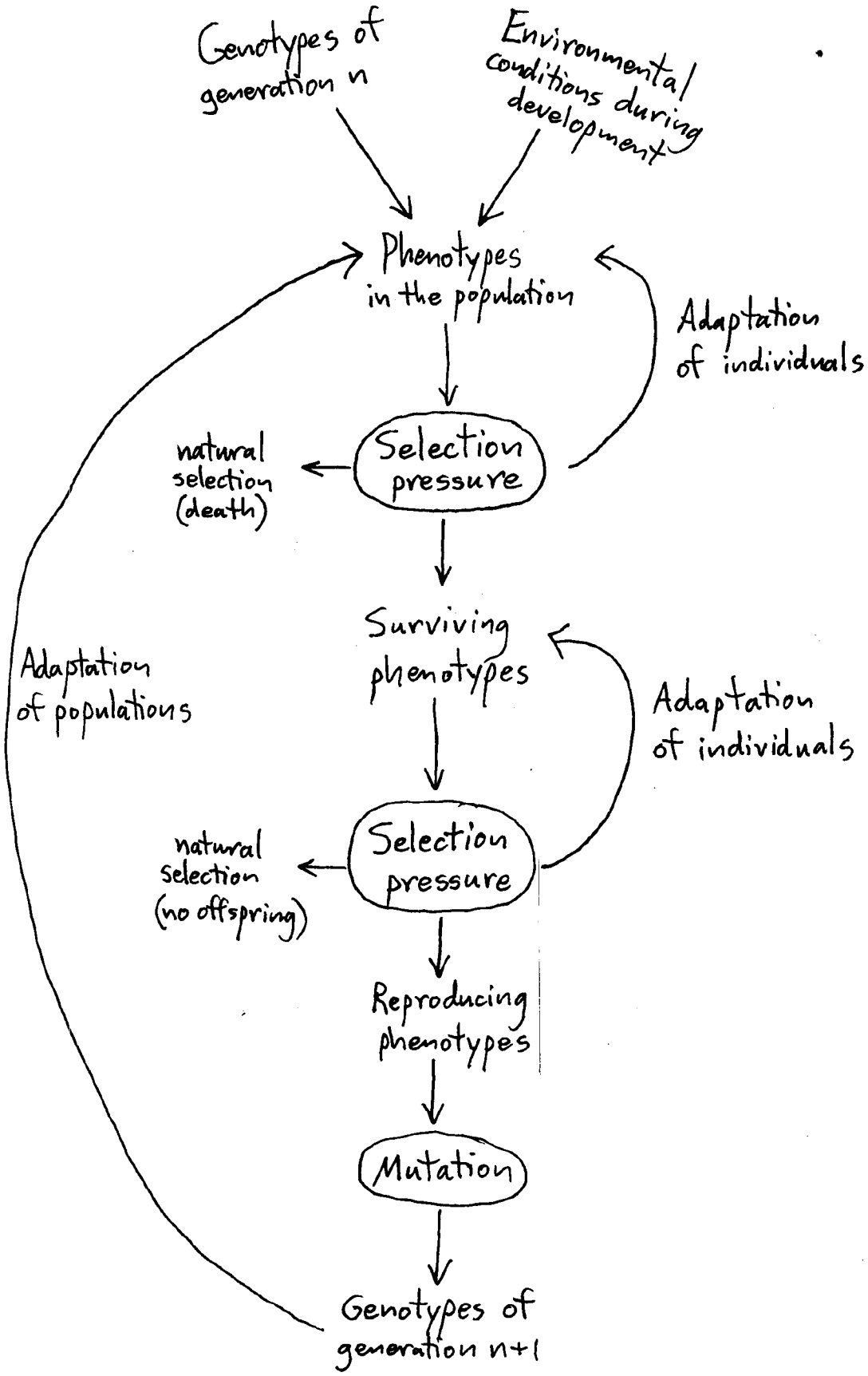
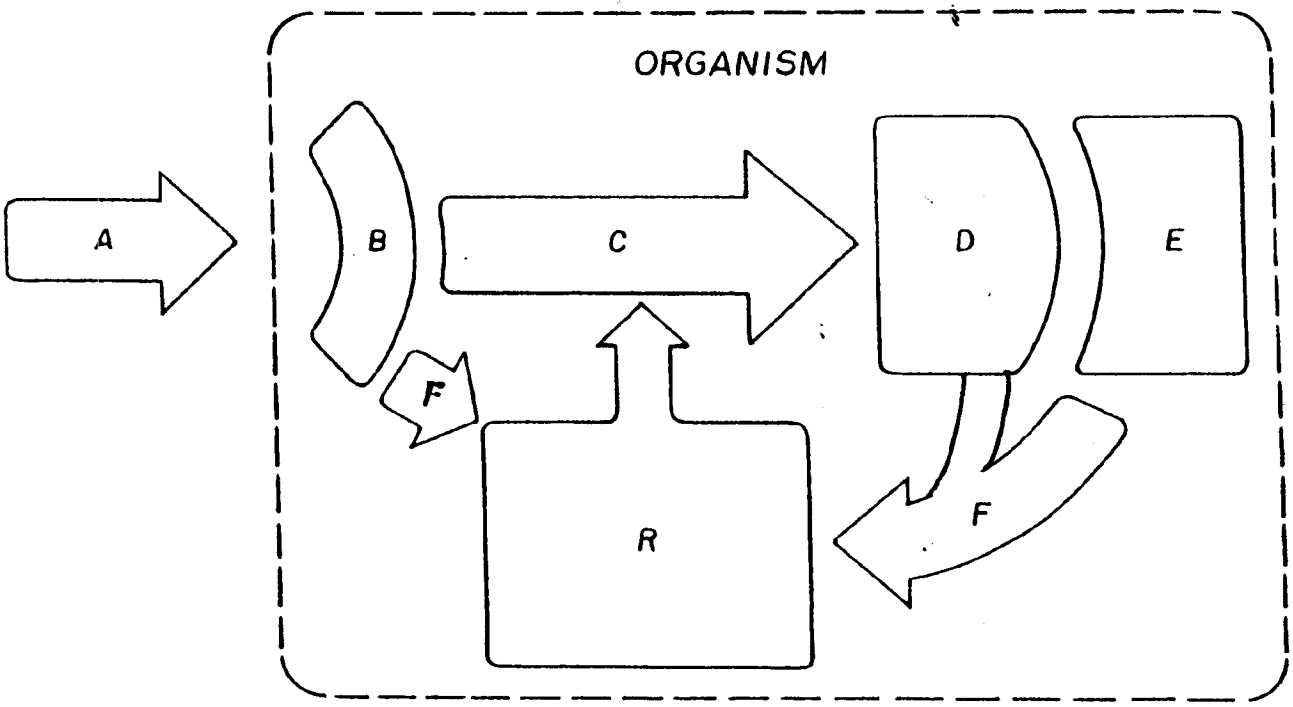

Genotypes of generation n
Environmental conditions during development
Phenotypes in the population
Adaptation of individuals
natural selection (death)
Selection pressure
Surviving phenotypes
Adaptation of populations
Adaptation of individuals
natural selection (no offspring)
Selection pressure
Reproducing phenotypes
Mutation
Genotypes of generation n+1

COMPONENTS OF ADAPTIVE RESPONSE



A = Affector - An environmental change requiring a response.

B = Receptor - Sensory system that perceives change in environment.

C = Transmitter - Nervous system sending message that change in environment has been perceived.

D = Effector - Part of organism actually responding to change in environment.

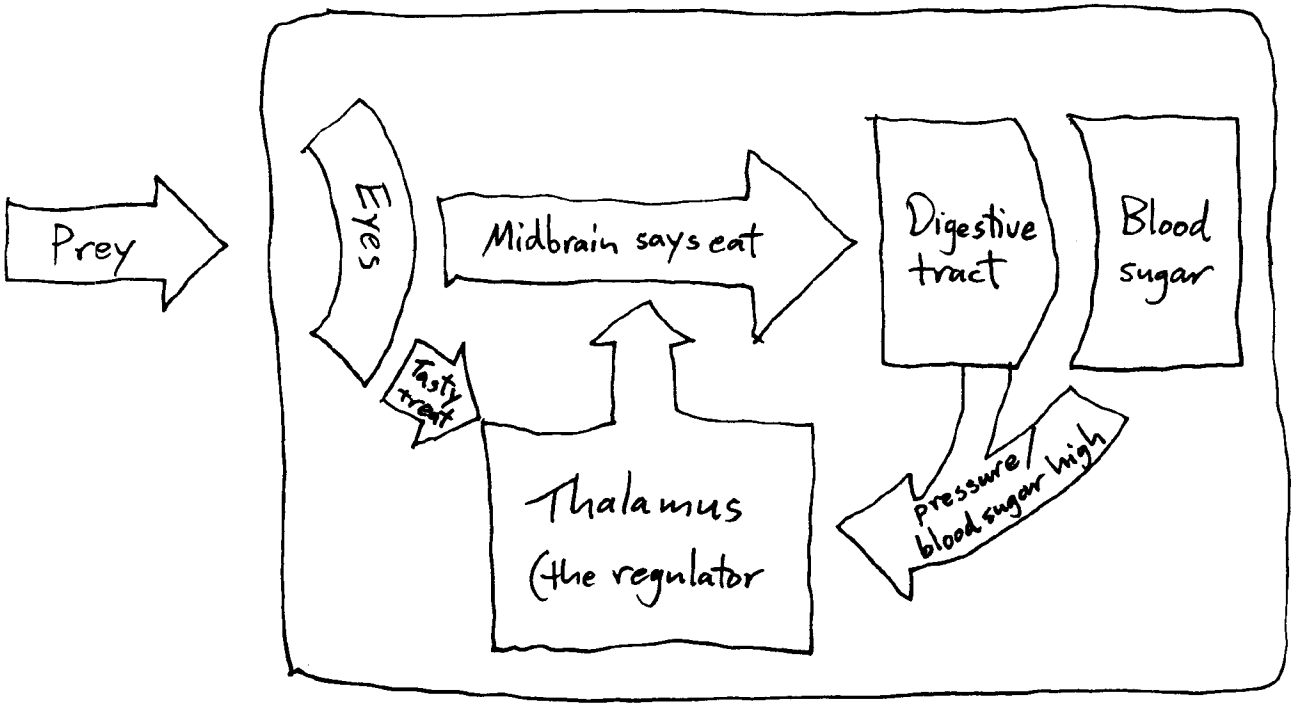
E = Output - The result of the effector's response.

F = Feedback - Information on the results of the response, sent to the regulator. May come from effector, output or even receptor.

R = Regulator - Component that governs the nature and strength of the message transmitted from receptor to effector. Can block out or change the message.

***** The Feedback and Regulator components assure that the response is **adaptive**, not merely a one-direction reflex. Helps maintain **homeostasis.**

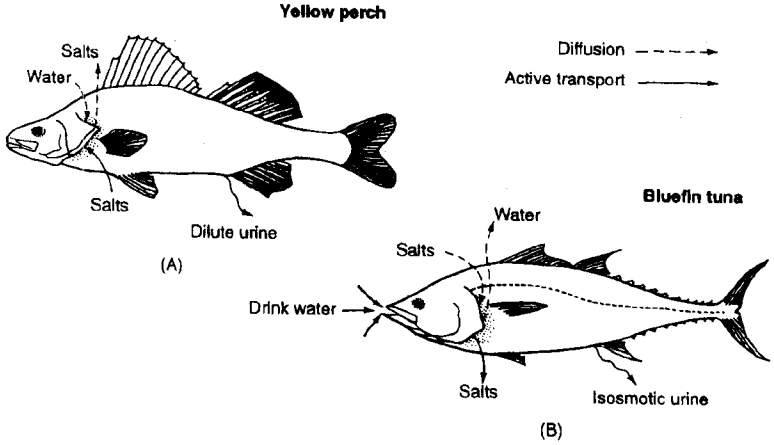
Why fish don't overeat...



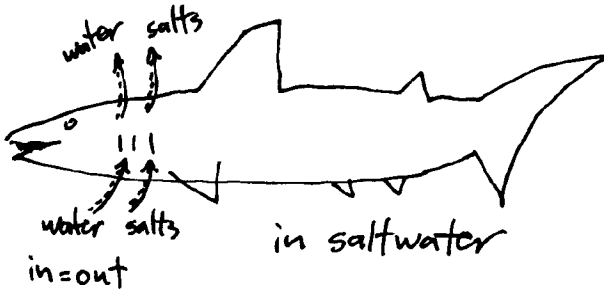
Osmosis in...

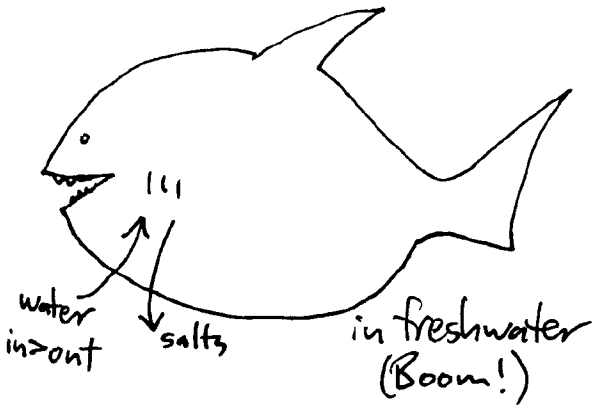
Bony fish

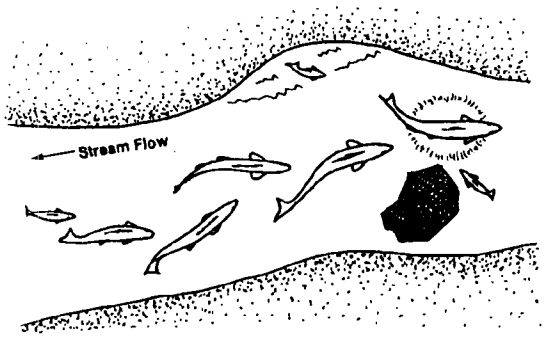
FIGURE 7.3. *Maintaining osmotic balance in fresh- versus seawater. (A) Freshwater teleosts must produce a large volume of dilute urine to offset the passive uptake of water across their gills. They must also actively transport ions into the blood at the gills to compensate for the loss of these ions to the dilute freshwater environment. (B) Marine teleosts passively lose water to their environment and gain salts by diffusion across their gills. They must, therefore, take in water through their food and by drinking seawater. Monovalent ions are actively transported out of the blood at the gills. Magnesium and sulfate ions, which are abundant in seawater, are excreted in the urine. Marine fishes conserve water by producing urine that is isosmotic to their blood.*

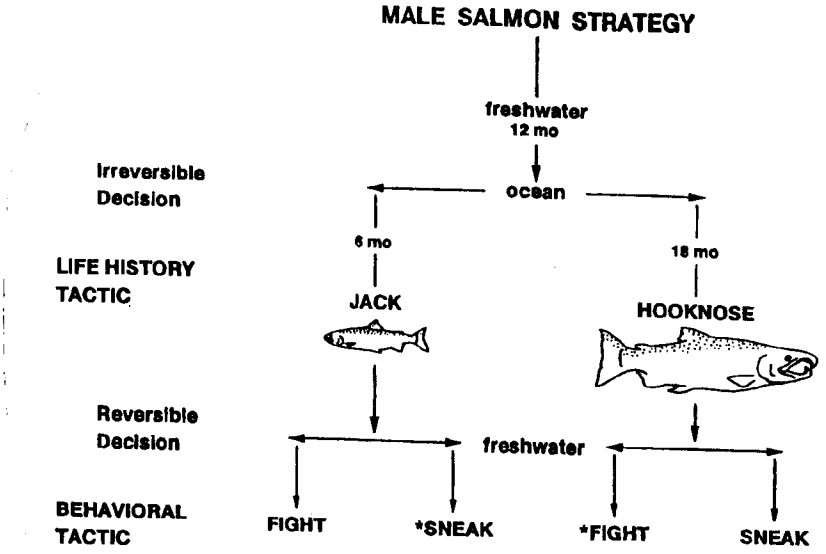


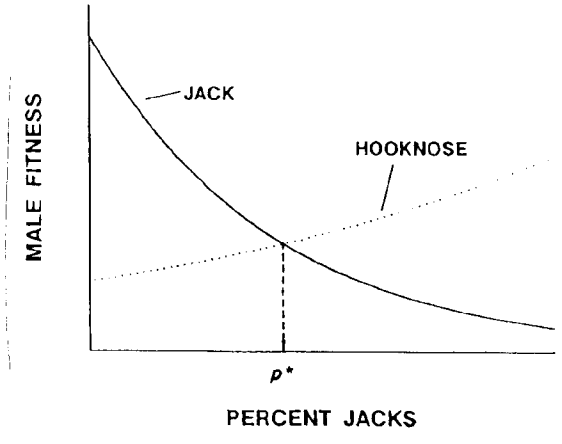
Sharks

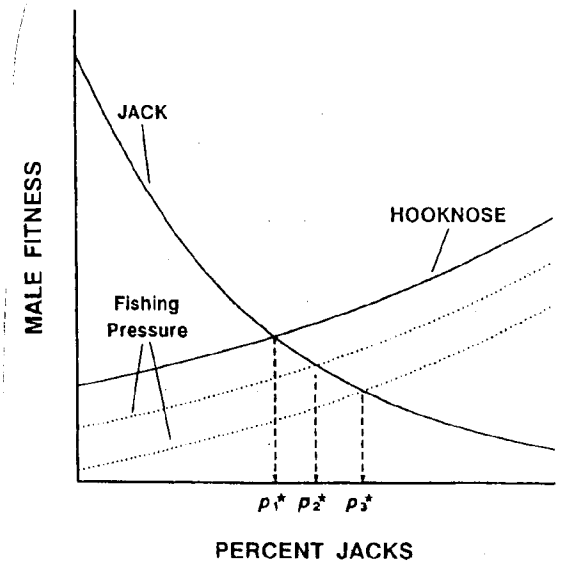


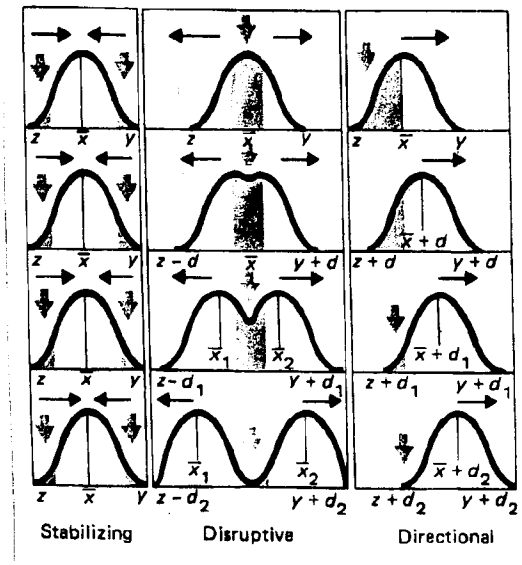



Stream Flow

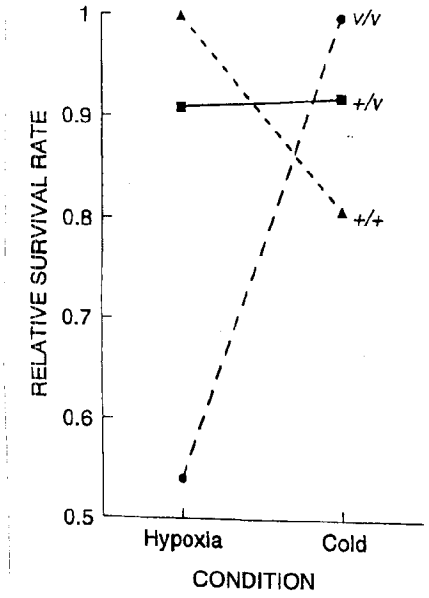

MALE SALMON STRATEGY
freshwater
12 mo
Irreversible
Decision
ocean
6 mo
18 mo
LIFE HISTORY
TACTIC
JACK
HOOKNOSE
Reversible
Decision
freshwater
BEHAVIORAL
TACTIC
FIGHT
*SNEAK
*FIGHT
SNEAK


MALE FITNESS
JACK
HOOKNOSE
p*
PERCENT JACKS

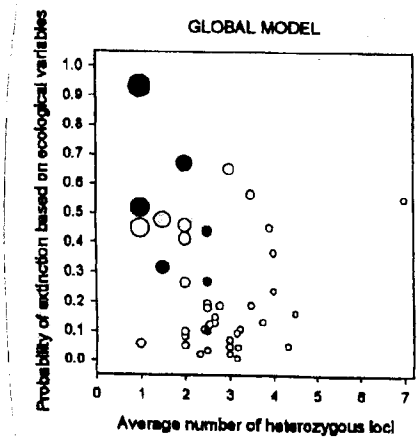

MALE FITNESS
JACK
HOOKNOSE
Fishing
Pressure
p1* p2* p3*
PERCENT JACKS



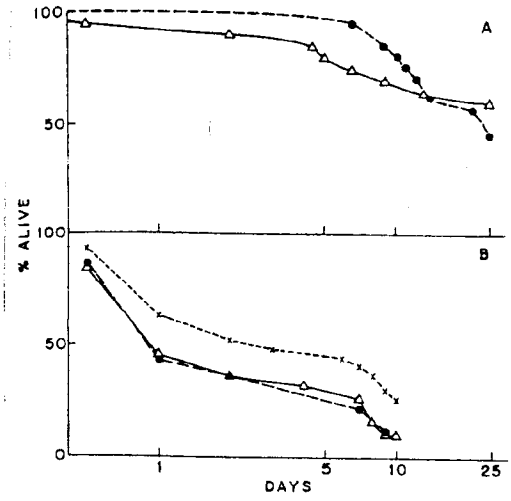
Selection



Individual-level genetic diversity



Population-level genetic diversity



Adaptation for human influences

FIGURE 3.—*Survival of common shiners from zinc-contaminated Furnace Creek (△) and two uncontaminated streams, Mineral Point Branch (●) and Rock Branch (×) when exposed to toxic zinc concentrations. A: zinc = 1.7 mg/liter; N = 20 for Furnace Creek and N = 21 for Mineral Point Branch. B: zinc = 5.0 mg/liter, N = 31 for Furnace Creek, N = 14 for Mineral Point Branch and N = 27 for Rock Branch.*