

# **3. The reproduction of aquatic organisms**

# Reproduction

sexual strategies:

females must be 'careful' in mate selection due to cost

- energy investment in eggs
- migration, brooding

male investments in reproduction :

- advertisement, colors, tubercles, kypes, displays
- mate competition
- nest building, territorial defense, migration
- parental care, brood guarding

# Anatomy

hagfish, lamprey: single gonads

no ducts; release gametes into body cavity

sharks: paired gonads

internal fertilization

sperm emitted through cloaca, along grooves in claspers

chimaeras, bony fishes: paired gonads

external and internal fertilization

sperm released through separate opening

most teleosts:

ova maintained in continuous sac from ovary to oviduct

exceptions: Salmonidae, Anguillidae, Galaxidae, non-teleosts

- these release eggs into body cavity when ripe

# Reproduction

bioenergetics:  $C = E + M + G + S + R$

C – consumption

E – excretion

M – metabolism

G – growth

S – storage

R – reproduction

# Timing and location of spawning

strategy:

- avoid competition for spawning habitat
- maximize access to food for offspring
- minimize access to offspring by predators

example: Lake Champlain

- anadromous – salmon

- catadromous – eels

- fall spawners – lake trout, whitefish

- spring spawners – smelt

- littoral spawners – sculpins, sunfishes, basses

- stream spawners – suckers, darters, minnows, sturgeon

- pelagic eggs – burbot

# Reproduction

## onset of reproduction

males typically mature earlier and smaller than females  
mature earlier if survival and growth are low  
stable environment – delayed reproduction

## survivorship

high if egg production is low, and vice versa  
high fecundity fish respond more rapidly to change

# Reproduction

frequency of reproduction

semelparity - spawn and then die

- huge investment in egg production

iteroparity - repeated reproduction

allows compensation for a “bad” year

more common in more unstable environments

may not spawn every year (sturgeon)

# Reproductive strategies

## fertilization

external except livebearers (elasmobranches, Poeciliidae, etc)

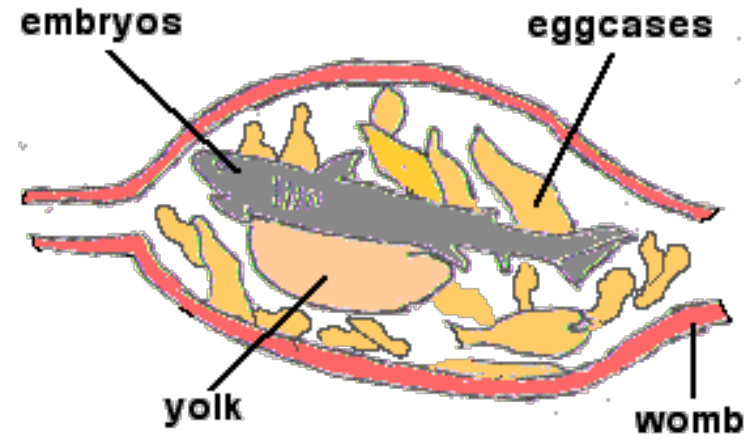
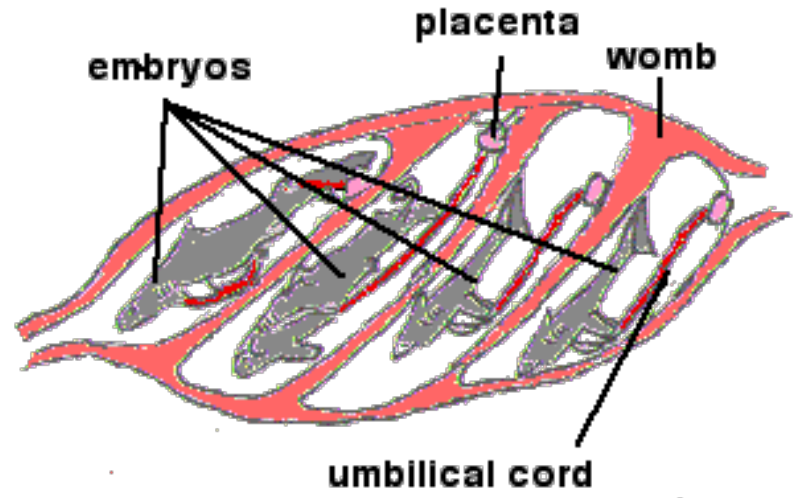
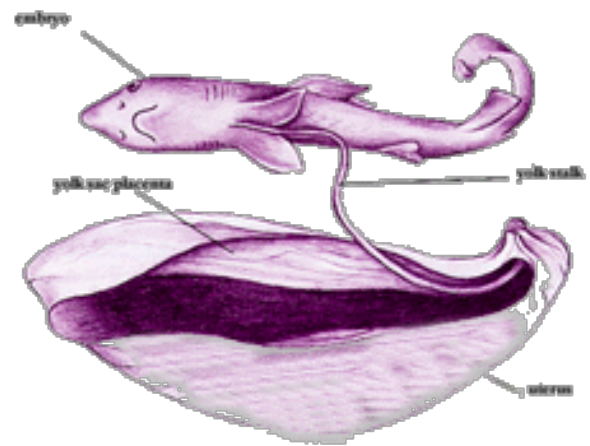
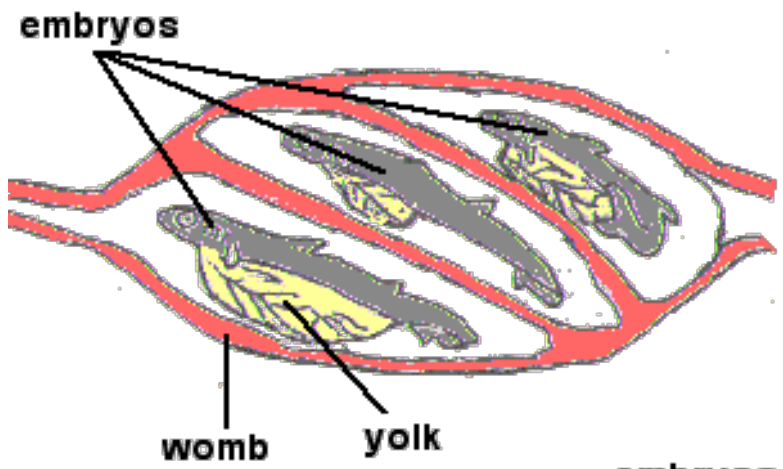
mass spawning events (Clupeiformes, smelt, etc.)

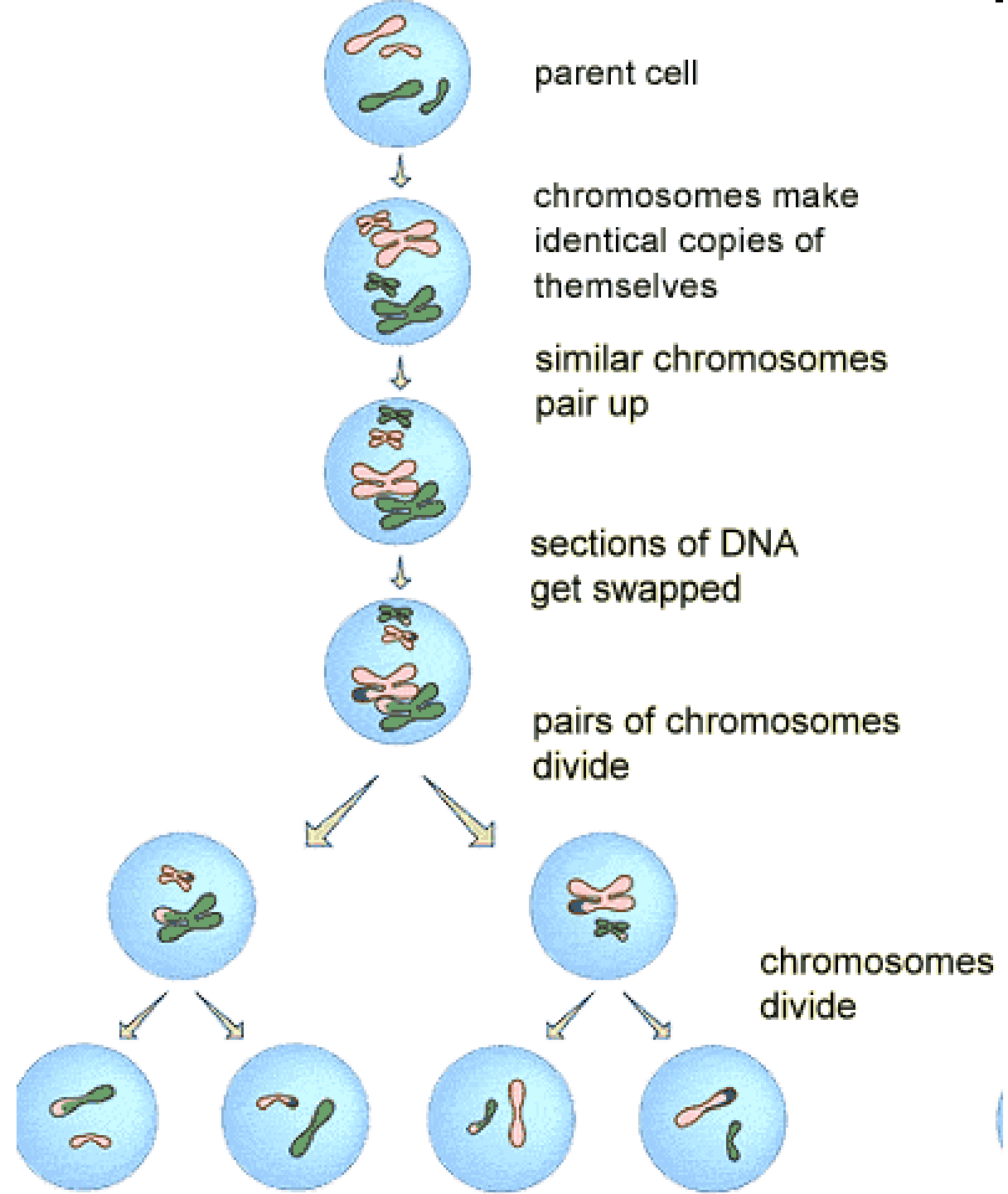
several males to each female (Salmoniformes, lampreys)

several females to each male (Gobiidae)

single-pair matings (guppies)







# Alternative reproductive strategies

## parthenogenesis:

females produce diploid eggs, no sperm used

premeiotic endomitosis - mitotic division without cytokinesis

## gynogenesis:

females produce diploid eggs, use sperm to stimulate development

male genome not used

congeneric species are used for sperm

## hybridogenesis: one genome from female in egg,

male genome discarded - then uses sperm to restore ploidy

- no crossing over

example: *Poeciliopsis monacha-lucida*

