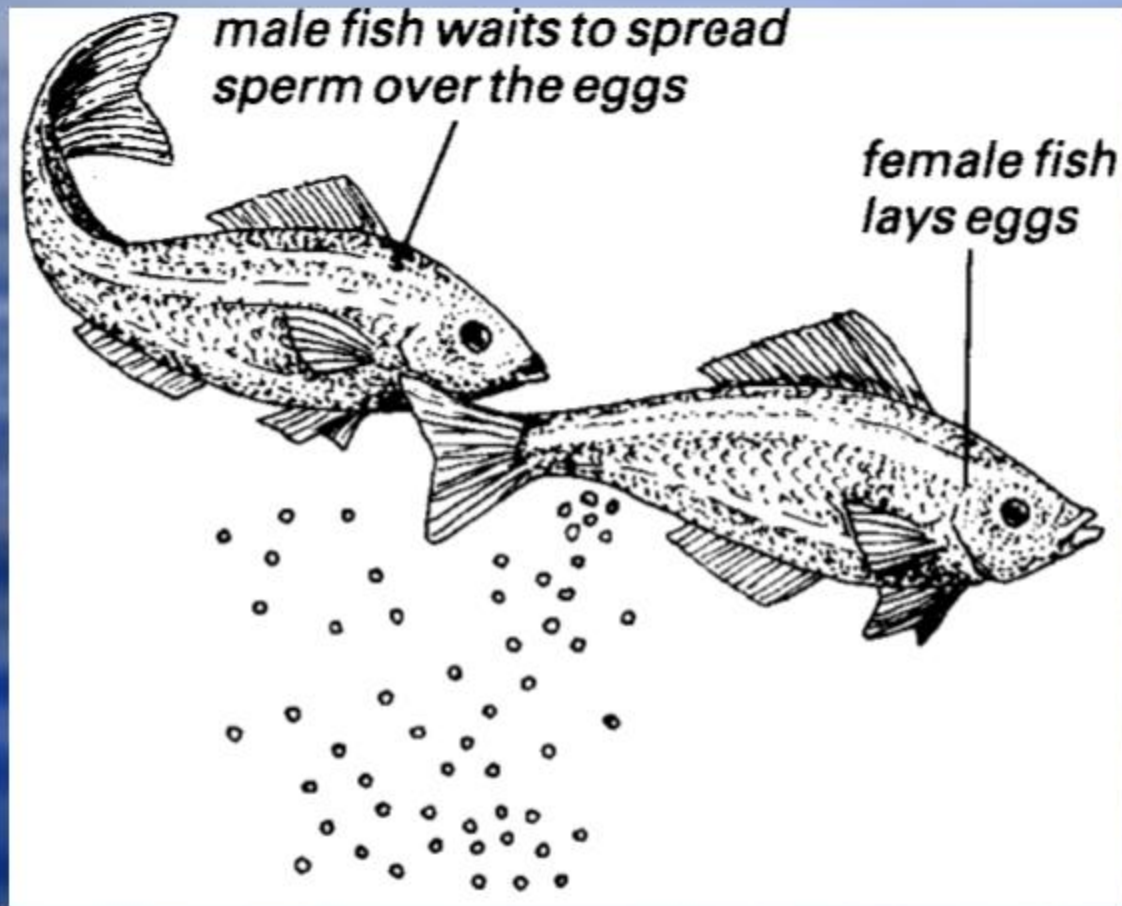


Reproduction in Fishes



Alternative reproductive strategies

Hermaphroditism

- **consecutive** (sequential) **hermaphrodites**

first female (**protogynous**)

Synbranchiformes (swamp eels – only freshwater example)

Perciformes: Serranidae, Maenidae, Labridae

- from 100% female to 100% male

- from 100% female to 50%/50% male/female

- some do not pass through a female stage ("primary males")



Photo Credit: Leo G. Nico, USGS, Gainesville, FL

Alternative reproductive strategies

Unisexual species

Processes of DNA reassortment:

1. crossing-over during first meiotic division
2. random segregation of chromosomes in second meiotic division
3. addition of male and female chromosomes after fertilization

Alternative reproductive strategies

Parthenogenesis:

- females produce diploid eggs, no sperm used
- premeiotic endomitosis - mitotic division without cytokinesis

Gynogenesis:

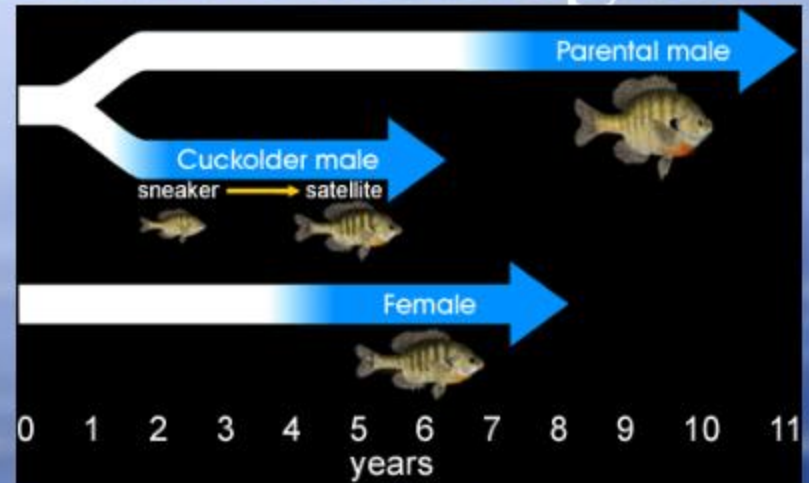
- females produce diploid eggs, use sperm to stimulate development
- male genome not used
- congeneric species are used for sperm

- Hybridogenesis:** one genome from female in egg,
male genome discarded - then uses sperm to restore ploidy
- no crossing over
- example: *Poeciliopsis monacha-lucida*

Alternative reproductive strategies

Alternative male strategies

- jacks (salmon and trout)



- sneakers in bluegills, wrasses, other sunfishes

- evolutionarily stable strategy - if small, become sneaker, avoid stress of being parental male

- satellite males (mimic females) in bluegills, hover near nest

DEVELOPMENT



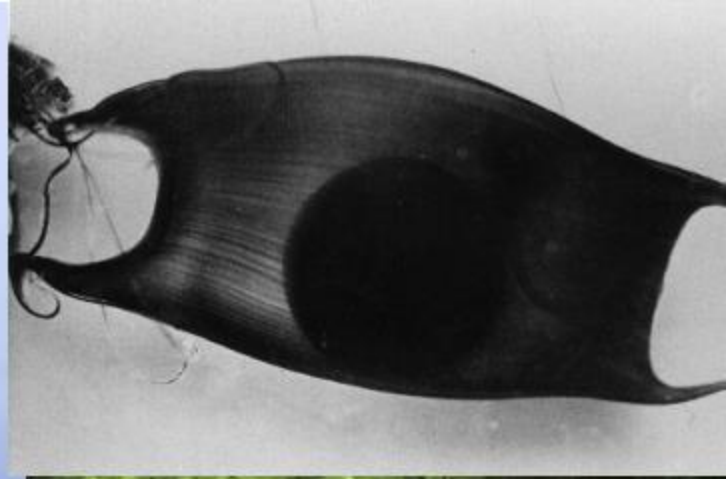
Developmental stages

egg

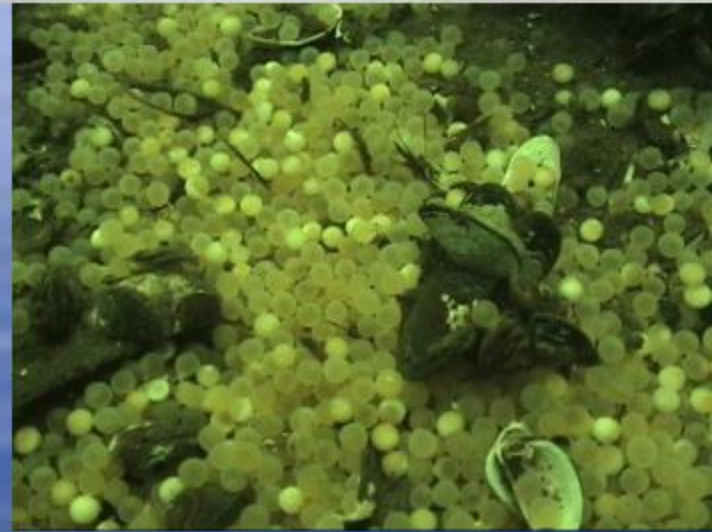
<0.5 mm - 10 cm

- variable shape, attachments
- variable buoyancy
- water hardening

skate
(5 cm)



lake trout
(5 mm)



yellow perch egg mass



round goby
(0.5 mm)



Developmental stages

egg

embryo - dependent on mother or yolk sac for food
(free embryo)



Developmental stages

egg

embryo - dependent on mother or yolk sac for food (free embryo)

larvae - not fully functional, may look totally unlike adult stage ends when axial skeleton is formed



Developmental stages

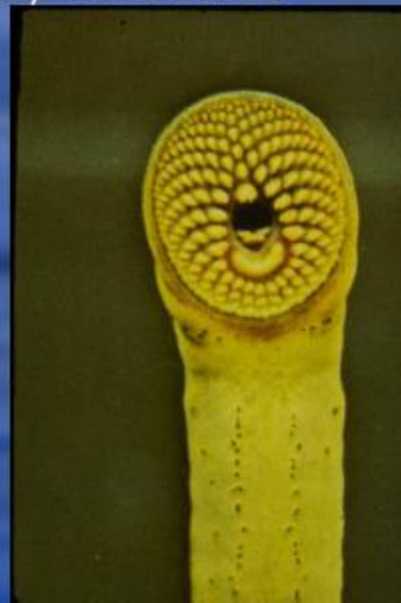
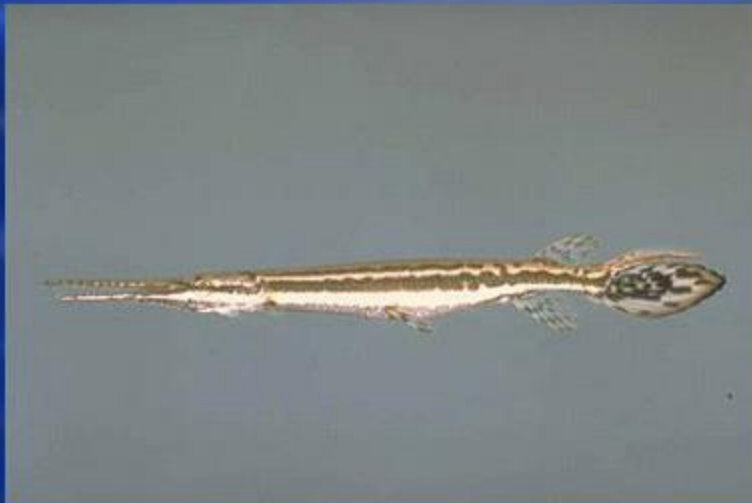
egg

embryo - dependent on mother or yolk sac for food
(free embryo)

larvae - not fully functional, may look totally unlike
adult ends when axial skeleton is formed

juvenile - small functional individual, immature

adult - reproductively mature



Credit: USFWS, GLFC

Indirect development (perch)

- larval stages go through trophic phases different from adults

Intermediate (salmonids)

- embryonic stage with yolk; virtually no larval stage

Direct development (gobies)

- juvenile is fully functional miniature of adults (no larval stage)