

Fish Reproduction – Anything Goes! Chap 20

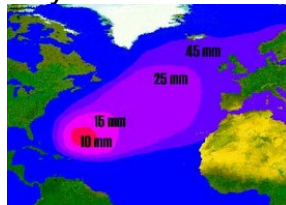
- Male vs. female reproductive effort:
- Female gametes costly - female reproductive success limited by # gametes she produces
- Male reproductive success - limited by number of available mates
- When is it better to be male or female?
- What type of males are likely to be monogamous?
- When are males likely to give parental care?
- Why do female fishes give less parental care?

Fish Reproduction – Breeding Opportunities



- Lifetime Reproductive Opportunities
- Iteroparous - most fish
- Semelparous – salmon (*Oncorhynchus*), lampreys, anguillid eels, galaxiids, etc.
- American shad - semelparous (30-33 N) and iteroparous (41-47 and variable inbetween)

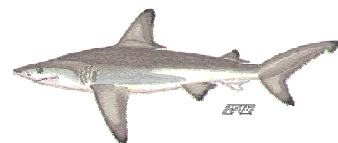
Case Study



- *Anguilla anguilla*- Males mature 3-6 years - restricted distribution. Females - mature quickly at low latitudes 4-13 years & slowly at high latitudes 6-43 years but produce more eggs females have a wider distribution
- All go to Sargasso sea to mate and die
- Young eels return to the correct continent

Gender Roles in Fishes

- 1) Most Fish = Gonochoristic (sex fixed at maturation) – elasmobranchs, lungfish, sturgeons, clupeiforms, cyprinids, salmonids



Mating Systems

- Promiscuous – herring, damselfish, wrasses, surgeonfish, sticklebacks – no mate choice

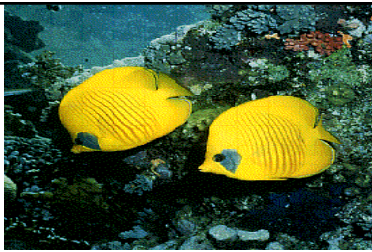


Mating Systems

- Polygamous – 3 types
- A) Polygyny – sculpins, sunfish, darters, cichlids, anglefish, damselfish, wrasses, etc.
 - 1) males defend territories/nests damselfishes, some cichlids
 - 2) males have harem of females- bluehead wrasse
 - 3) leks- display areas *Cyrtocara eucinostomus*



Mating Systems



- Polygamous – 3 types
 - B) Polyandry – anemone fish (sometimes)
 - C) Monogamy – bullheads, pipefish, jawfishes, damselfishes, butterflyfishes, blennies, etc.

Gender Roles in Fishes



- 2) Hermaphroditic
 - Simultaneous – Rivulus, Serranus, hamlets

Gender Roles in Fishes



- 2) Hermaphroditic
 - Sequential
 - Protandrous – male-female – anemonefish, Lates, moray eels
 - Protogynous – female-male – Anthias, wrasses

Gender Roles in Fishes

Why Sequential hermaphrodites:

Protandrous- size advantage hypothesis - indeterminate growth, greater fecundity with size therefore females should be larger

- Example = anemonefish- small males which are psycho-physiologically castrated

Protogynous - more common, competition gives a size advantage: expect large territorial males

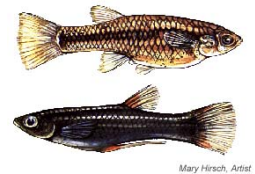
CASE STUDY: Caribbean bluehead wrasse *Thalassoma bifasciatum*

- Initial phase coloration - mostly yellow female
- Terminal males = distinct coloration, territorial, get 40-100 spawns/day
- Sneaker males rush females in group aggregations typically get 1-2 dilute matings/day;
- Small vs large reefs



Gender Roles in Fishes

- 3) Parthenogenic- Mexican livebearers, *Poeciliopsis spp.* need sperm to activate fertilization, some sperm incorporated, others the male genes are lost in the next generation



Mary Hirsch, Artist

Gender Roles in Fishes

- 3) Parthenogenic - Mexican livebearers, *Poeciliopsis* spp.- *P. monacha* and *lucida*
- Gynogenesis = Triploid female (MLL) – sperm from L - activates – offspring = MLL
- Hybridogenesis – Diploid ML produces only haploid M eggs (with maternal only) BUT sperm from L produces ML offspring

Secondary Sexual Characteristics

- Monomorphic
- Sexually Dimorphic
- Permanent
- Seasonal
- Polymorphic

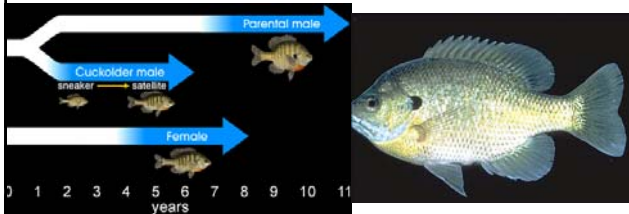
SPAWNING Site

- Water column- often in large groups, many eggs released
- Substrate- males territorial
- Sperm released immediately-paternity assured
- Lots of sites for nests: hard substrate, algae, shells, grunion, spraying characin

Parental Care

- Parental care in 90 of 420 bony fish families - includes: making a nest, burying eggs, chasing predators, oxygenating, cleaning, carrying eggs inc. live birth and oral brooding, trophic provisioning (some catfishes and cichlids)
- Males are often primary caregivers
- No paternal care when internal fertilization
- How does external fertilization promote paternal care? Paternity assurance, males can get multiple mates, females prefer males with eggs, caring is costly-less foraging, predatory attacks, fewer eggs

Alternative Tactics



- CASE STUDY- male reproductive strategy in bluegill sunfish *Lepomis macrochirus*
- Large old males make nests, guard eggs
- Sneaker males - small dart though nest depositing sperm, become satellite males which are female mimics;

Alternative Tactics

- CASE STUDY- similar pattern in Coho salmon *Oncorhynchus kisutch* with conservation consequences

