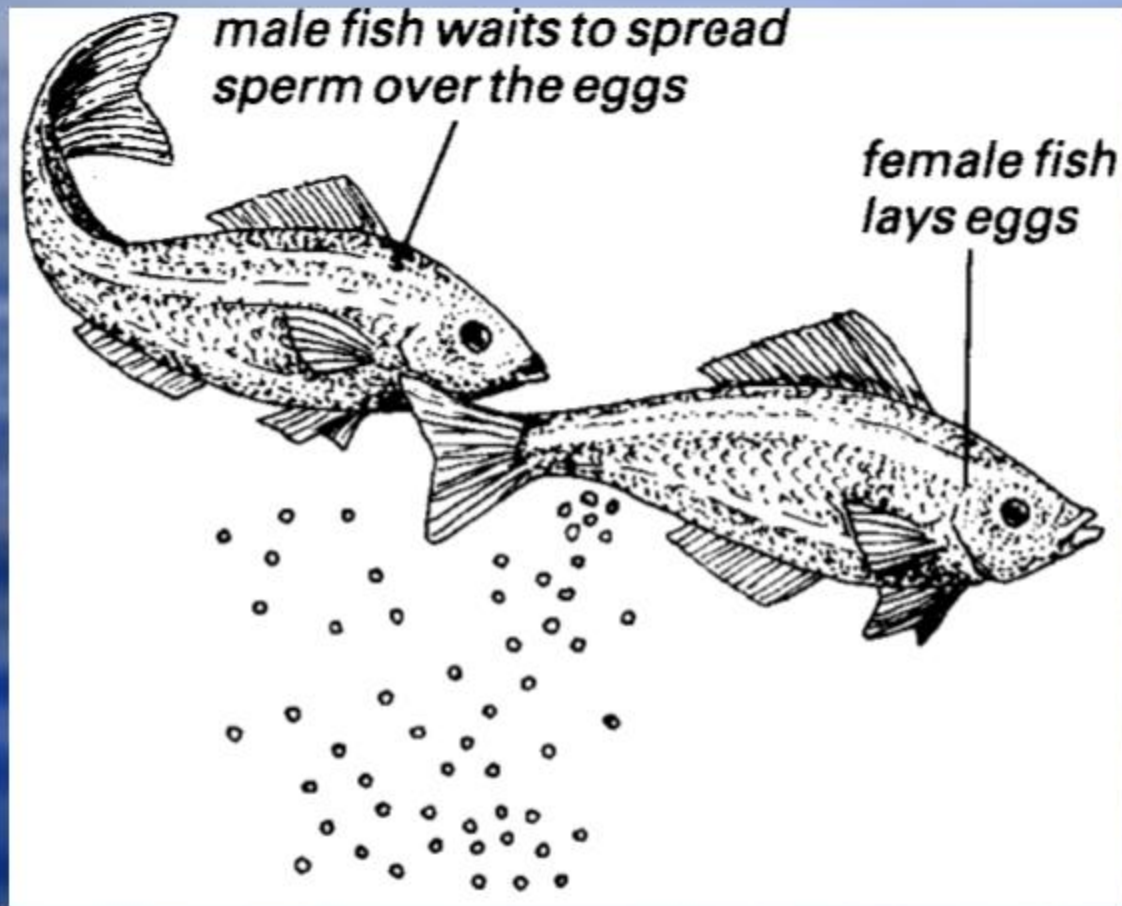


Reproduction in Fishes



Reproduction



Onset of reproduction

- males typically mature earlier and smaller than females
- mature earlier if survival, 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 in livebearers (elasmobranchs, Poeciliidae)
- mass spawning events (Clupeiformes, smelt)
- several males to each female (Salmoniformes, lampreys)
- several females to each male (Gobiidae)
- single-pair matings (guppies)

Reproductive strategies

Non-guarders

- pelagic (broadcast) spawners
 - semi-buoyant eggs
 - high fecundity
 - egg and larval 'migrations'



Reproductive strategies

Non-guarders

- pelagic (broadcast) spawners
- **benthic spawners**
 - on coarse substrates (lake trout)
 - on vegetation (carp, perch)
 - on fine substrates (smelt)



Reproductive strategies

Non-guarders

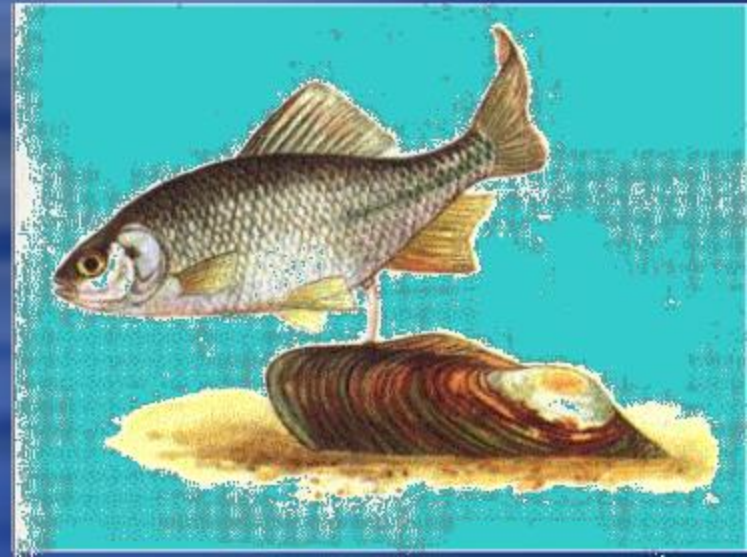
- pelagic (broadcast) spawners
- benthic spawners
- **brood hiders**
 - build redd on coarse substrates (salmon, lamprey)



Reproductive strategies

Non-guarders

- pelagic (broadcast) spawners
- benthic spawners
- **brood hiders**
 - build redd on coarse substrates
 - beach spawners (grunion)
 - use another species (bitterling)



Reproductive strategies

Guarders

- choose substrate (largemouth bass)



Reproductive strategies

Guarders

- choose substrate (largemouth bass)
- nest builders
 - rock and gravel (like a lentic redd - sunfishes)
 - plant material (sticklebacks)
 - holes, crevices, cavities (gobies, sculpin, blennies)
 - froth (bettas)
 - anemones (clown fish)



Reproductive strategies



Bearers - carry eggs and/or fry with them
- external bearers

- transfer: Gasterosteidae, Sygnathidae
(pipefishes, seahorses)

- grade from attachment to skin, to
open pouch, to closed pouch

- gill chambers, forehead

- mouth: males or females

- some cichlids and bonytongues

- obstetrical catfish carry eggs on
ventral surface



After the female
seahorse has placed
her eggs inside her
male's brood pouch,
he provides the blood
to them. The embryo
is the only one
attached to the
parent seahorse in
any fish.

COURTESY: NELLE

Reproductive strategies

Bearers

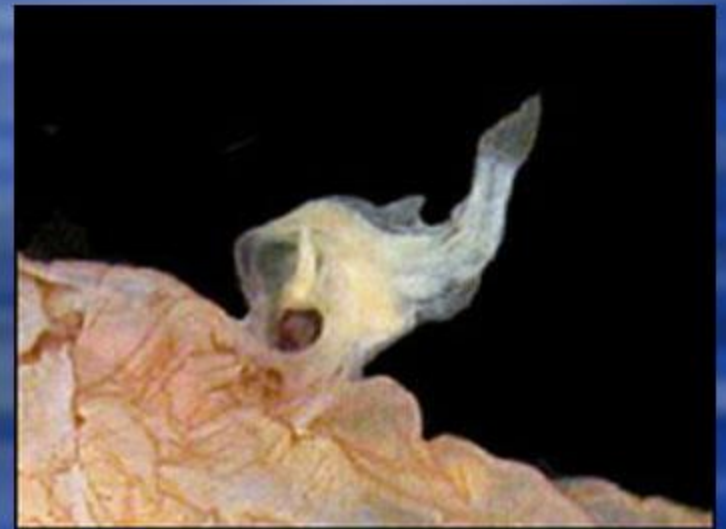
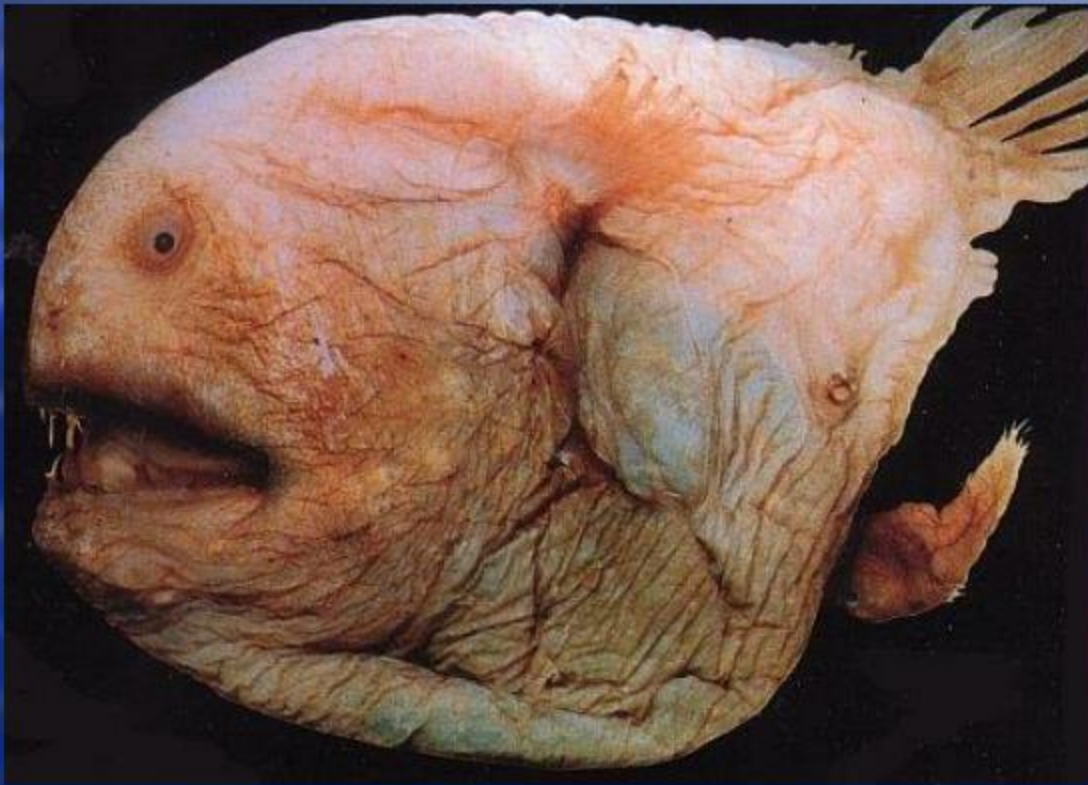
- external bearers
- internal bearers
 - **facultative** - killifishes
 - **obligate (ovoviviparity)**
 - Lake Baikal sculpins,
 - marine rockfishes (Scorpaenidae)
 - livebearers - Poeciliids, many sharks
 - gradient of nutrient supply
 - **superfetation** (multiple developmental stages present all at same time)



Reproductive strategies

The other extreme: minimal male investment

- Lophiiformes: deepsea anglerfishes
- parasitic males



Alternative reproductive strategies

Hermaphroditism

- **synchronous** (or simultaneous) **hermaphrodites**
 - Myctophiformes: (lanternfishes)
 - Atheriniformes: Aplocheilidae, Poeciliidae
 - Perciformes: Serranidae (sea basses, hamlets)
Labridae (wrasses), and others
- "Egg-trading" in black hamlets
Hypoplectrus nigricans (serranid)



Alternative reproductive strategies

Hermaphroditism

- **consecutive** (sequential) **hermaphrodites**
 - first male (**protandrous**) – less common
 - Stomiiformes (lightfish, dragonfish)
 - Scorpaeniformes: Platycephalidae
 - Perciformes: Serranidae, Labridae, and others



Bluntnose minnow