Reproduction & Spawning

Reproductive strategies
Sex determination
Spawning behaviors

Reproductive strategies

No general evolutionary trend from primitive to advanced groups

All strategies are valid and evolutionary adaptive

Reproductive strategies-1

- **Nonguarders** (of eggs and young)
  - **Open Substrate Spawners**
    - **Pelagic Scatterers (pelagic spawners)**
      - Pair spawners and Group spawners
      - This is the **most common** marine fish strategy
      - Pelagic fishes and even benthic fishes rise up into water to spawn (spawning rush)
      - The placement of spawning is not necessarily haphazard;
      - Eggs tend to be very small, numerous, and very high offspring mortality
    - **Benthic Scatterers**
      - Common in many freshwater species
      - Lay sticky eggs on the substrate

Reproductive strategies-2

No general evolutionary trend from primitive to advanced groups

- **Nonguarders** (of *eggs* and young)
  - **Brood Hiders**
    - Gravel diggers
      - Salmon, Lampreys
    - Cave spawners
      - Channel catfish
    - Beach spawners
      - Grunion, capelin
    - Annual Cyprinodonts
      - Certain pupfish

Reproductive strategies-3

- **Guarders** (protect eggs and/or larvae)
  - Fan eggs, remove dead eggs
  - Guarding commonly done by males
  - 20% of fishes are guarders
  - **Substratum choosers** (just clean substratum)
    - Damselfishes, gobies, blennies, cichlids…
  - **Nest Spawners**
    - cavity diggers (centrarchids)
    - tubular nest (sticklebacks)
    - bubble nest (gouramies)
    - mound builders (cichlids)
    - pre-existing cavities or structures

Reproductive strategies-4

- **Bearers** (carry eggs and/or young)
  - **External bearers**
    - Transfer bearers (Cichlids)
    - Mouth brooders (Jawfishes, Apogonids)
    - Skin brooders (Cichlids, pipefishes, seahorses)
  - **Internal bearers**
    - Oviparous (sharks and rays)
    - Ovoviviparous (sharks, Coelacanth, rockfishes)
    - Viviparous (surfperches, poeciliids, sharks)

Mating scars on female blue shark

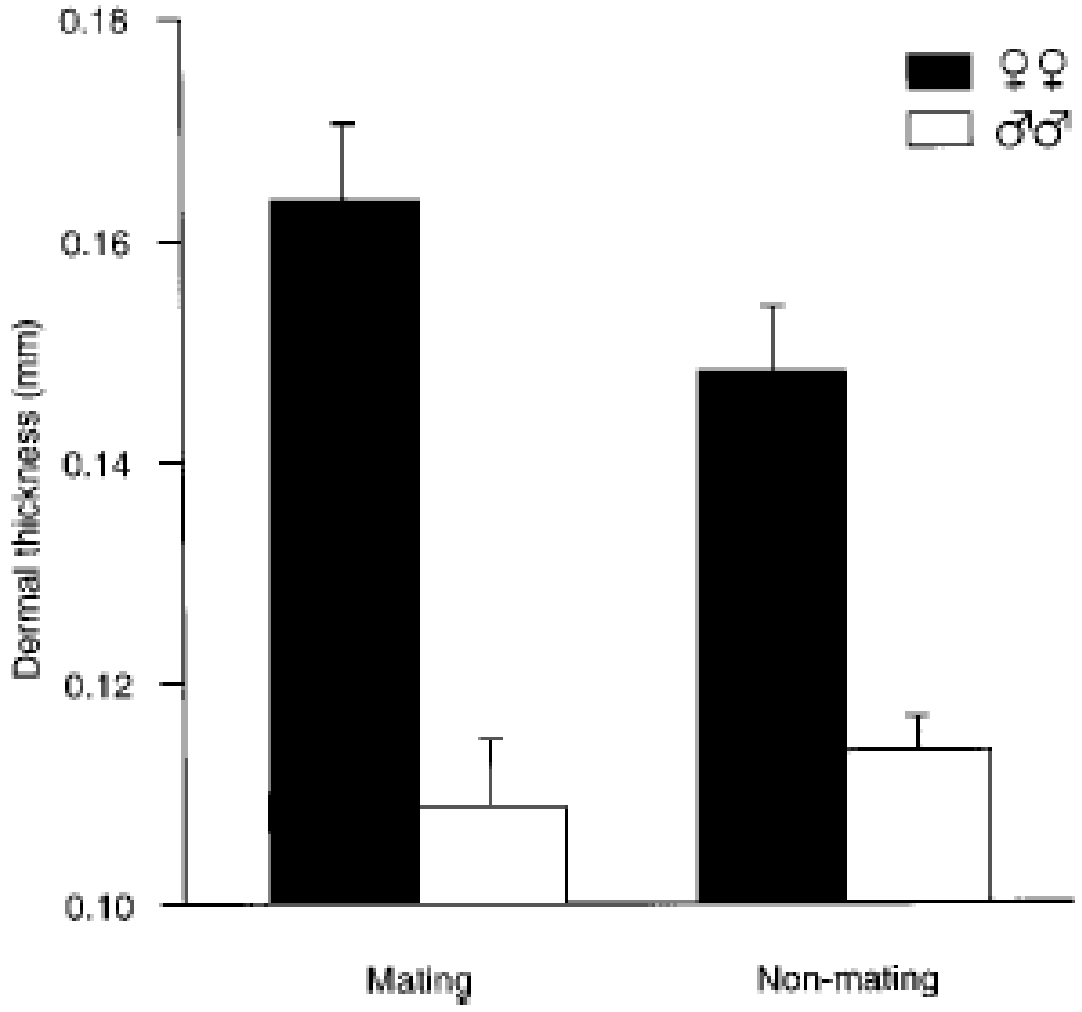


Figure 7. Dermis thickness ($\bar{x} \pm SE$) of male and female Atlantic stingrays sampled during the mating and non-mating seasons. The dermis is thicker in females than males in both the mating and non-mating seasons but dermal thickness does not vary across seasons for either sex; $n = 10$ for each sample.

Kajiura et al. 2000

Sexual determination

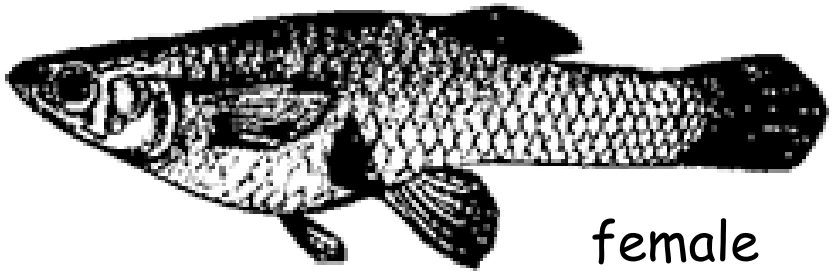
- Gonochorism (separate sexes: ♂ or ♀)

- Hermaphroditism
  - Simultaneous (fish with ♂ and ♀ gonads)
  - Protogynous (first ♀, then ♂)
  - Protandrous (first ♂, then ♀)

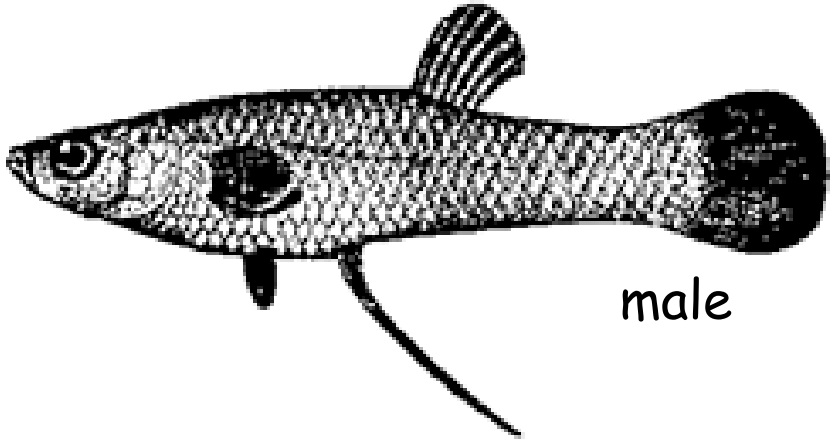
- Unisexuality
  - Parthenogenetic fishes

Livebearers

Poecillidae



female



male

Poecillidae

Amazon molly

Poecilia formosa

Parthenogenetic fish

Poecilia latipinna