



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

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



Mating scars on female blue shark

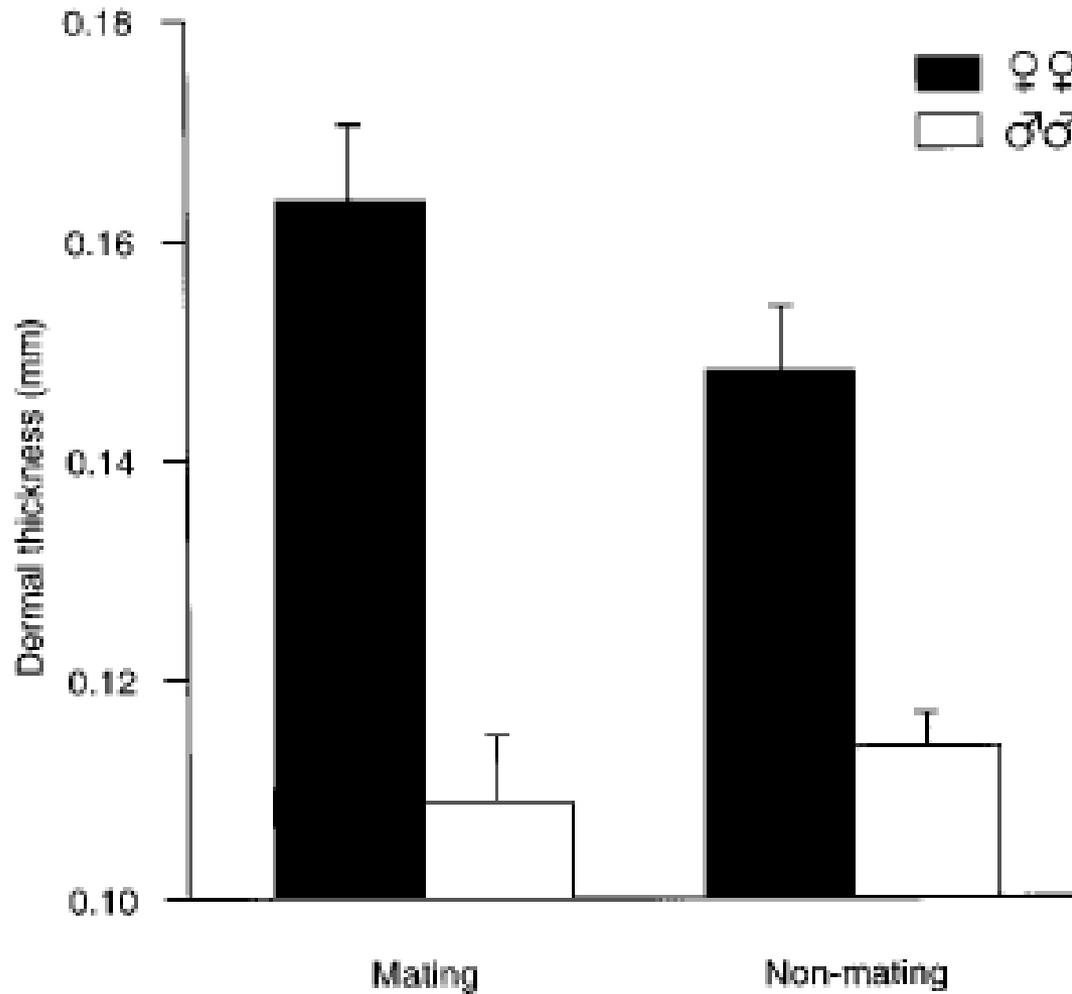


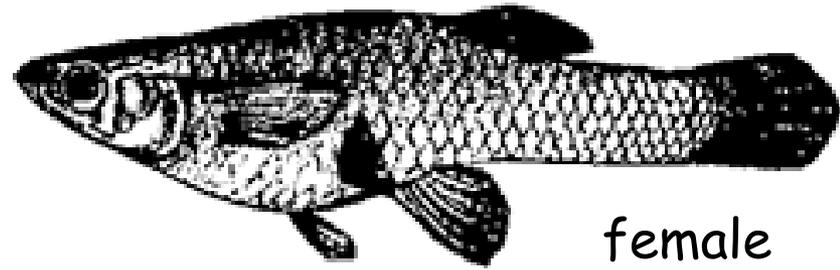
Figure 7. Dermis thickness ($\bar{x} \pm SE$) of male and female Atlantic stingrays sampled during the mating and non-mating seasons. The dermis is thicker in females than males in both the mating and non-mating seasons but dermal thickness does not vary across seasons for either sex; $n = 10$ for each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

Sexual determination

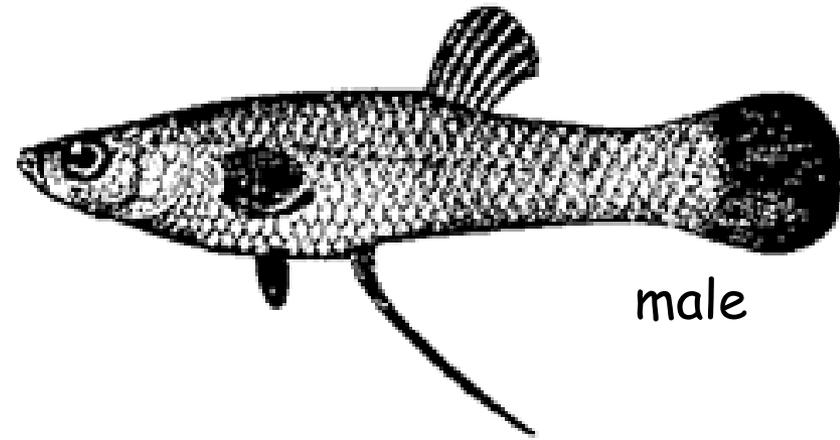
- Gonochorism (separate sexes: ♂ or ♀)
- Hermaphroditism
 - Simultaneous (fish with ♂ and ♀ gonads)
 - Protogynous (first ♀, then ♂)
 - Protandrous (first ♂, then ♀)
- Unisexuality
 - Parthenogenetic fishes

Livebearers

Poeciliidae



female



male





Thomas, Bonner, and Whiteside 2007

Poecillidae
Amazon molly
Poecilia formosa
Parthenogenetic fish



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Poecilia latipinna