

Discussion of Amphibian Life History Characteristics

For Discussion on Feb 9, and preparation for lecture & discussion on Feb 14

Background (come to class on Feb 14 with answers to and/or thoughts on these questions):

- Amphibian literally means “both lives” (*amphi*: both or all; *bios*: life)
- Amphibians first colonized the land in the mid-Devonian, 350 mya.
- As a group, they are transitional between fully aquatic lobe-finned fishes (Sarcopterygians) and fully-terrestrial *amniotes* (what’s an amniote?). As such, many (but not all) amphibians experience metamorphosis.
- What problems are solved, and what caused, by a move to land?
- >4500 species of amphibians, of which just a few are caecilians (Gymnophiona), a few hundred are salamanders (Caudata), and the vast majority are Anurans (frogs and toads). (We’ll review some of amphibian diversity next week.)
- What defines amphibian? In other words: What are diagnostic traits of amphibians?
- Adaptive radiations in many groups of amphibians have resulted in more life history strategies than among any other group of tetrapods (land-dwelling vertebrates).
- Assess this quotation from Linnaeus, on the subject of amphibians (1758): “These foul and loathsome animals are abhorrent because of their cold body, pale color, cartilaginous skeleton, filthy skin, fierce aspect, calculating eye, offensive smell, harsh voice, squalid habitation, and terrible venom; and so their Creator has not exerted his powers to make many of them.” On what fronts was he right? On what was he wrong?

Frog Life Histories: The most common (and phylogenetically widespread) mode

- An entire population convenes around a pond for a very short period of time in the late Winter or Spring.
- During amplexus (mating position), large masses or strings of eggs are laid in the water, and afterwards both male and female disperse, never to encounter their offspring again.
- Eggs that don’t get eaten develop and hatch in the water. Tadpoles survive by eating muck or small aquatic insects, until they metamorphose, and only then come on land.

Questions for discussion today (Thursday, Feb 9):

- The pond in which “typical” young frogs (as eggs and tadpoles) develop is full of potential predators and competitors for food. What are some changes in life history and reproductive characteristics that might evolve that would allow more of an individual’s offspring to survive this peril?
- One alternative is to utilize temporary bodies of water (vernal pools) in which predation pressure is lower. However, this leads to a new problem – yearly variations in local climate can leave aquatic stages high and dry before they complete development. What are some changes in life history and reproductive characteristics that might evolve that would allow more of an individual’s offspring to survive this peril?
- Organisms show a variety of reproductive strategies but certain characteristics are often linked. Assuming that the population is stable (that is, neither growing nor shrinking), all members of that (sexually-reproducing) population will, on average, leave two offspring that themselves make it to reproductive age (see chapter 1 of Livi-Bacci, next week’s seminar reading, for more on this). Species that produce large numbers of offspring often leave them to the vagaries of the environment, while other species, including humans and some amphibians, take the opposite approach and have a small number of offspring. Low clutch size is generally correlated with some degree of parental care. Why? When frogs show parental care, what kinds of actions might they take to improve the survival of their offspring?