

19. Sexual reproduction and larval biology

[Hermaphroditism] immediately doubles your chances for a date on Saturday night. –*Woody Allen*

MAJOR THEMES

Animals as complete life cycles

Diversity in larval forms

Metamorphosis and complex life cycles

Modes of habitat use

Modes of development

Modes of fertilization

Modes of sexuality

The egg size/number tradeoff

Direct and indirect development

Hemimetabolous vs. holometabolous

Habitat shifts during the life cycle

OUTLINE

Recap: Asexual reproduction and the repeated evolution of modular growth

- 1) Viewing animals as complete life cycles
- 2) Modes of sexuality, fertilization, and life cycle habitat use among marine invertebrates
- 3) Metamorphosis as a radical reorganization of the body plan *within* individuals
- 4) Who wants to be a larval biologist? Variation in the larval-stage phylum body plan
- 5) The egg size-egg number tradeoff: consequences for life-history evolution
- 6) Possible fates of larvae released into the plankton

GOALS

After studying from lecture notes and the associated reading, you should be able to:

- Explain why representing an animal as only the adult stage neglects a great deal of invertebrate diversity in terms of body forms and habitat use
- Describe patterns in the distribution of sexuality found among invertebrate phyla
- Describe the different modes of fertilization among invertebrate phyla, and give examples of phyla that tend to show one or another mode
- Discuss the consequences of broadcast spawning for fertilization success
- Describe different modes of habitat use seen during marine invertebrate life cycles, and explain how these uses are related to the type of larval development seen
- Explain some of the benefits and challenges of brooding offspring in clutches
- Explain the process of metamorphosis and how it is carried out in some phyla
- Distinguish hemimetabolous and holometabolous development in the insects, and describe historical changes in their prevalence
- Describe representative larval stages of some marine invertebrates, and cases where larval similarity gives clues about phylogenetic relatedness between groups
- Explain why the tradeoff between offspring size and number is important for an invertebrate with a mixed pelagic/benthic life cycle
- Describe consequences of the size-number tradeoff for two modes of larval development
- Describe the possible fates of larvae or gametes that are released into the sea, and how variation in such risks could lead to natural selection for larger or smaller egg sizes