EARLY LIFE HISTORY

INDETERMINATE GROWTH

- Most fish have indeterminate growth
- Growth can be defined as the:
  - Change in size (length and/or weight)
  - Change in calories that are stored as somatic and reproductive tissue

DEVELOPMENT

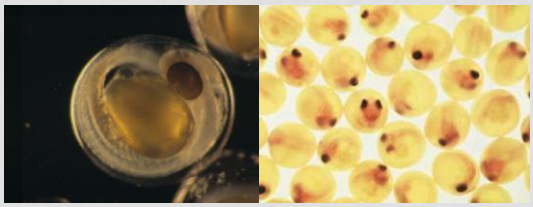
- Eggs, embryos, larvae, and juveniles reflect the reproductive behavior and ecology of the parent
- 5 major developmental periods
  - Embryonic period
  - Larval period
  - Juvenile period
  - Adult period
  - Senescent period

EMBRYONIC PERIOD

- Period in which developing individual is entirely dependent on nutrition provided by the mother
  - Yolk from the egg
  - Direct placenta-like connection
- Begins at fertilization and can be divided into 3 phases
  - Cleavage egg
  - Embryo
  - Free embryo

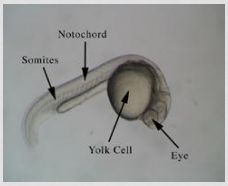
CLEAVAGE EGG

- The interval between the first cellular division and the appearance of recognizable predecessors of the organ systems



EMBRYO PHASE

- The interval during which the embryo becomes recognizable as a vertebrate because the major organ systems begin to appear and ends at hatching



FREE-EMBRYO PHASE

- The embryo ceases to be curled up and becomes increasingly fish like, but continue to rely on its yolk or mother for nutrition

LARVAL PERIOD

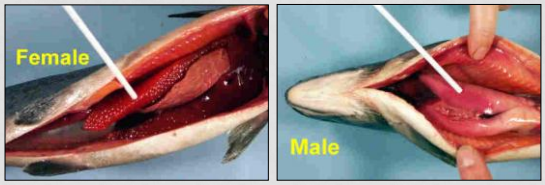
- Signified by the ability to capture food organisms

JUVENILE PERIOD

- The period begins when organ systems/fins are fully formed and lasts until gonads become mature
- Typically the period of most rapid growth

ADULT PERIOD

- Marked by sexual maturity



SENESCENT PERIOD

- The period of "old age" when growth has stopped and gonads are no longer functional

Sturgeon - years

Salmon - days

MERISTIC VARIATION

- Meristic traits (e.g., fin rays, lateral scale rows, vertebrae, gill rakers) are known to vary with environmental conditions
  - Pollutants, temperature, oxygen content, salinity, etc.
- Patterns of meristic variation can be complex
  - Jordan's rule
  - V relationship

JORDAN'S RULE

- Fish tend to develop more vertebrae in cold environments than in warm ones
  - Viscosity increases with colder temperatures
  - More vertebrae allow for greater flexibility
- The closest relative of a species are found immediately adjacent to it but isolated by a geographical barrier

V RELATIONSHIP

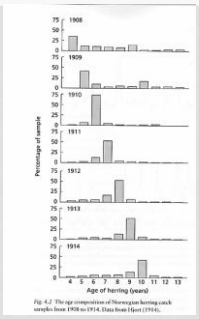
- Fewer meristic elements develop in fish raised at intermediate temperatures, but more elements are laid down at higher and lower temperatures
- Typical range of change is 0.1% to 3% difference in number of elements per Celsius degree of temperature

LARVAL FEEDING AND SURVIVAL

- Once the food supply provided by the yolk are exhausted, the larval fish must feed on exogenous food sources
- This phenomenon plays an important role in larval mortality and subsequent strength of year classes
- Several hypotheses have been proposed to account for this

CRITICAL PERIOD HYPOTHESIS

- Proposed by Hjort in 1914
- Stated that year class strength is correlated with the onset of exogenous feeding



MATCH-MISMATCH HYPOTHESIS

- Proposed by Cushing in 1975
- Stated that the timing of reproduction in many marine fishes is correlated with peaks in the abundance of planktonic prey
  - That is, fish reproduction and ocean production are synchronized

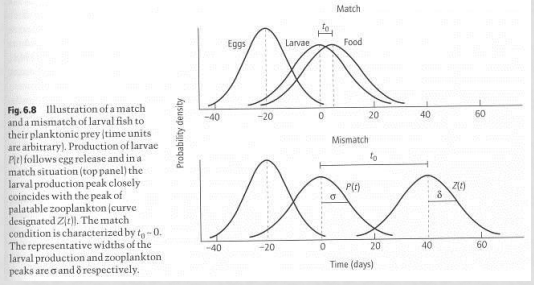


Fig. 6.8 Illustration of a match and a mismatch of larval fish to their planktonic prey (time units are arbitrary). Production of larvae $P(t)$ follows egg release and in a match situation (top panel) the larval production peak closely coincides with the peak of palatable zooplankton (curve designated $Z(t)$). The match condition is characterized by $t_0 = 0$. The representative widths of the larval production and zooplankton peaks are σ and δ respectively.

FLOOD PULSE

- Predicts recruitment is enhanced by connectivity between floodplain and channel habitats provided that floods occur during periods of fish reproduction when water temperatures are warm