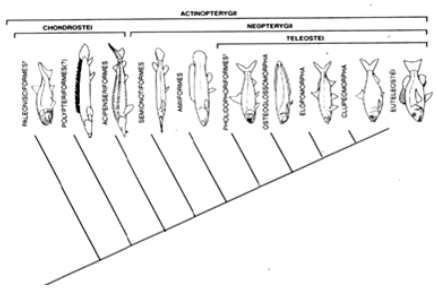
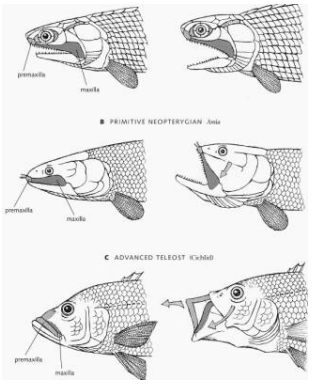
OSTEICHTHYES

Ecology, behavior, reproduction



Infraclass NEOPTERYGII

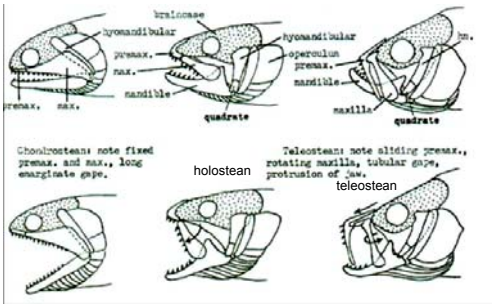
1.
2.
3.



Fish Skulls

1. Advanced teleosts have a mobile premaxilla and maxilla.
2. The maxilla is completely excluded from jaw border

Fig. 6-7 Jaw Protrusion in Teleosts



Comparison of Forces Associated with Swimming and Flying

1. Birds and fish must overcome gravity and drag, generate thrust, and control the body axis.

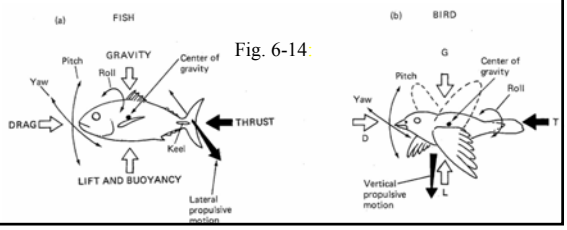


Fig. 6-14

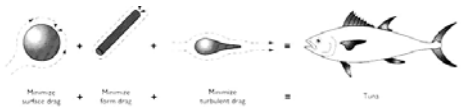
Locomotion

1. Maintaining position in the water column.
   A. .
   B.
2. Overcoming Drag
   A.
3. Thrust
   A.
4. Control of Body Axis
   A. Dorsal and anal fins
   B. Pectoral and pelvic fins.
      a.
      b. .

Body design for Overcoming Drag

1. surface drag
   A.
2. Form drag
   A.
   B.
   C. minimize cross-sectional
3. turbulent drag
   A. minimize retarding force
   B.
   C.

Fig. 6-16 Effect of body shape on drag

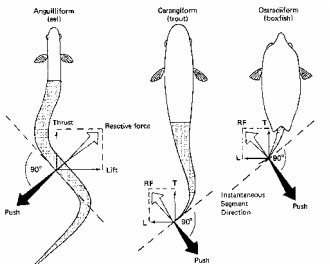


1. minimize drag by having
   A. a circular cross section,
   B. Width to length of about 0.25, and
   C. a fusiform shape

Generation of Forward Thrust

1. Lateral undulations and oscillations propel most fish forward.
2. Thrust mainly generated by caudal fin.

Fig. 6-13. Three major swimming types based on flexibility of body.



Anguilliform

1. can bend into more than 1/2 wavelength
2. a wave of lateral curvature passes from head to tail
3. Increase in drag and current forces
4. Maneuver into narrow openings and resist the force of current

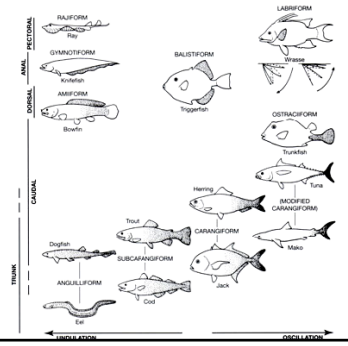
Carangiform

1. fish can bend into less than 1/2 wavelength
2. undulation mainly in caudal region;
3. oscillation of caudal fin only in modified carangiforms

Ostraciform

1. Specialized, inflexible body
2. undulation limited to caudal fin
3. Boxfish: when stalking prey.
   A.
   B.

Propulsion from other fins [fig 6-15]



Caudal Fin Aspect Ratio (AR)
(caudal fin height)^2/caudal fin area

Low aspect ratio

1. broad surface area → powerful thrust
2. high frictional drag at high speeds.

High aspect ratio

1. large amount of thrust relative to drag.
2. high aspect ratio and narrow caudal peduncle for rapid sustained propulsion
3. Examples:

Swimming Modes

1. Functional Morphology Plane
   A. Cruisers
   B. Accelerator
   C. Maneuverer
   D. Generalist
2. Continuum of swimming modes
   A.

Locomotor Strategies: Cruising

1. rapidly swimming fishes
   A. thunniform swimming
      a.
      b. undulations restricted to caudal peduncle and caudal fin (low drag)

Locomotor Strategies: Acceleration

1. moderately low aspect;
2. white muscle: rapid contraction, easily fatigued
3. Lungers are ambush predators

Locomotor Strategies: Maneuverability

1. slow moving
2. low aspect ratio
3. Round body shape
4. use paired fins for locomotion
5. pelvic fin anterior

Locomotor Strategies: Generalists

1. range of locomotive styles

Fish Adaptations: Schooling

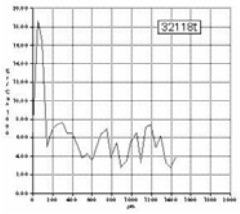
1. well-defined social organizations for
   A. Protection
   B. reducing drag
   C. keep population together.

Marine teleost reproduction

1. r-selection
   A. large numbers of eggs.
   B. Fertilized externally.
   C. drift in open sea.
2. feed on oceanic plankton.
3. juveniles locate appropriate habitat.

What a Fish's Ears tell about its life [Box 6-2].

1. otolith biomineralization patterns
   A. Age
   B. Growth History
   C. Hatch date
   D. salinity histories
   E. temperature history

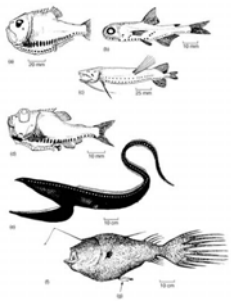


Deep-Sea Fishes

1. light to depth of 1000 m in clear water
2. 75% of the ocean is perpetually dark
3. Plankton biomass falls
4. Below epipelagic, animals rely on detritus
5. Fish diversity

Adaptations of Deep-water Fish

1. Good sensory devices
2. Bioluminescence
3. Large, sharp teeth
4. Large mouths and expandable bodies
5. Hinged jaws



BIOLUMINESCENCE

1. Light organs in some deep-water fish
2. symbiotic bacteria
3. self-luminous cells called photophores.
4. attract prey
5. attract mates.

Midwater (Mesopelagic) Fish

1. Dysphotic and Aphotic Zones [100-1000m]
2. Small size, large mouths and teeth;
3. 100 X more light sensitive than humans,
4. large eyes;
5. 80% with photophores

The upward migration of a scattering layer at sunset [fig 6-19].

1. Dusk and dawn migrations of mesopelagic fishes in response to light-intensity levels
2. Ascend closer to surface at night to feed;
   A. Benefit:
   B. Costs:
   C.

Bathypelagic fish

1. 75% of ocean
2. Many blind, mainly small predaceous fish;
3. Less dense bone, less skeletal muscle,
4. bizarre fish [fig 6-20].

Bathypelagic anglerfish

1. Eggs
2. larvae
3. Adults
4. Females
5. Males
6. Unbalanced sex ratio; 30 males per female.
7. Females release pheromone to attract males.

Bathypelagic anglerfish

1. Males
2. male attaches onto female
3. Monogamy

Coral-Reef Fishes (Fig. 6-21)

1. warm, shallow tropical waters
2. most diverse group of vertebrates
3. Multiple microhabitats.
4. Reefs trap and hold nutrients
5. Diversity also possibly from repeated isolations of reefs

Coral-Reef Fishes (Fig. 6-21)

1. Diversity depends on the structural integrity of coral reef systems
2. problem is that coral reefs are
   A.
   B.
   C.

Coral-Reef Fishes (Fig. 6-21)

1. Most are
2. Most are
3. Adapt to day or night feeding behaviour
4. Diurnal feeders:
   A.
   B.
   C.
   D.
5. Night feeders