

1  **CHAPTER 14****Animals of the Pelagic Environment**2  **Chapter summary in haiku form**

Oh, to be a fish  
 With nary a care at all  
 Well, being eaten...

3  **Chapter Overview**

- Pelagic animals use a variety of adaptations to help them survive.
- Marine mammals share similar characteristics with land mammals.
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4  **Marine Animals Avoid Sinking**

- May increase buoyancy
- Use of gas containers
  - Rigid gas containers
  - Swim bladders

5  **Avoiding Sinking**

- Ability to float
  - Zooplankton – some produce fats or oils to stay afloat
- Ability to swim
  - Nekton – larger fish and marine mammals

6  **Floating Zooplankton**

- Microscopic zooplankton have shells or tests.
  - Radiolarians
  - Foraminifers
  - Copepods

7  **Copepods**8  **Macroscopic Zooplankton**

- Krill
  - Resemble mini shrimp or large copepods
  - Abundant near Antarctica
  - Critical in Antarctic food chains

9  **Floating Macroscopic Zooplankton**

- Cnidarians
  - Hydrozoan (Portuguese man-of-war)
    - gas-filled float
  - Scyphozoan (jellyfish)
    - Soft, low-density bodies
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10  **Swimming Organisms**

- Fish, squids, sea turtles, marine mammals
- Swim by trapping water and expelling it, e.g., some squid
- Swim by curving body from front to back
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11  **Swimming Motion and General Fish Features**12  **Fin Designs in Fish**

- Paired vertical fins as stabilizers
- Paired pelvic fins and pectoral fins for “steering” and balance
- Tail fin (caudal) for thrust
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13  **Fin Designs in Fish**

- Rounded caudal fins
  - Flexible
  - Maneuver at slow speeds
- Truncate fins and forked fins
  - Useful for both maneuvering and thrust
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- 14  **Fin Designs in Fish**
  - Lunate fins
    - Rigid, little maneuverability
    - Efficient propulsion for fast swimmers
  - Heterocercal fins
    - Asymmetrical,
    - Lift for buoyancy (shark)
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- 15  **Adaptations for Finding Prey**
  - Mobility
  - Lungers wait for prey and pounce (grouper).
    - Mainly white muscle tissue
  - Cruisers actively seek prey (tuna).
    - Mostly red muscle tissue
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- 16  **Lungers and Cruisers**
- 17  **Adaptations for Finding Prey**
  - Swimming speed
  - Speed generally proportional to size
  - Can move very fast for short time (mainly to avoid predation)
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- 18  **Cold-Blooded vs. Warm-Blooded**
  - Most fish are cold-blooded – poikilothermic
    - Bodies same temperature as environment
    - Not fast swimmers
  - Some are warm-blooded – homeothermic
    - Found in warmer environments
    - Helps them capture prey
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- 19  **Adaptations of Deep-Water Nekton**
  - Mainly fish that consume detritus or each other
  - Lack of abundant food
  - Bioluminescence
    - photophores
  - Large, sensitive eyes
  - Large sharp teeth
  - Expandable bodies
  - Hinged jaws
  - Counterillumination
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- 20  **Deep Sea Nekton**
- 21  **Adaptations to Avoid Predation**
  - Schooling
    - Safety in numbers

- School may appear as single larger unit
- Schooling maneuvers confuse predator

22  **Adaptations to Avoid Predation**

- Symbiosis – two or more organisms mutually benefit from association
- Commensalism – less dominant organism benefits without harming host

23  **Adaptations to Avoid Predation**

- Mutualism – both organisms benefit
  - Example: clown fish and anemone
- Parasitism – parasite benefits at expense of host

24  **Adaptations to Avoid Predation**

- Speed
- Poisons
- Mimicry
- Transparency
- Camouflage
- Countershading

25  **Marine Mammals**

- Land-dwelling ancestors
- Warm-blooded
- Breathe air
- Hair/fur
- Bear live young
- Mammary glands for milk

26  **Major Marine Mammal Groups**

27  **Order Carnivora**

- Prominent canine teeth
- Sea otters
- Polar bears
- Pinnipeds
  - Walruses
  - Seals
  - Sea lions
  - Fur seals

28  **Carnivora**

29  **Seals vs. Sea Lions and Fur Seals**

- Seals lack prominent ear flaps
- Seals have smaller front flippers
- Seals have fore flipper claws
- Different hip structures
- Different locomotion strategies

30  **Order Sirenia**

- Herbivores
- Manatees
  - Coastal areas of tropical Atlantic Ocean
- Dugongs
  - Coastal areas of Indian and western Pacific Oceans

31  **Order Cetacea**

- Whales, dolphins, porpoises
- Elongated skull
- Blowholes on top of skull
- Few hairs
- Fluke – horizontal tail fin for vertical propulsion

32  **Order Cetacea**

33  **Order Cetacea**

- Adaptations to increase swimming speed
  - Streamlined bodies
  - Specialized skin structure
    - 80% water
    - Stiff inner layer
    - Narrow canals with spongy material

34  **Order Cetacea**

- Adaptations for deep diving
- Use oxygen efficiently
  - Able to absorb 90% of oxygen inhaled
  - Able to store large quantities of oxygen
  - Able to reduce oxygen required for noncritical organs
- Muscles insensitive to buildup of carbon dioxide
- Collapsible lungs

35  **Order Cetacea**

- Suborder Odontoceti (toothed)
  - Dolphins, porpoises, killer whale, sperm whale
  - Echolocation to determine distance and direction to objects
  - Determine shape, size of objects

36  **Dolphins vs. Porpoises**

- Porpoises
  - Smaller, more stout body shape
  - Blunt snout
  - Triangular, smaller dorsal fin
  - Blunt or flat teeth
- Dolphins
  - Larger, more streamlined shape
  - Longer rostrum
  - Falcate dorsal fin (hooked)
  - Pointy teeth like killer whales (orca)

37  **Echolocation**

- Good vision of marine mammals is limited by ocean conditions.
- Mammals emit clicks of different pitches.
  - Low frequency – great distance
  - High frequency – closer range
- Dolphins can detect schools of fish at more than 100 meters (330 feet).

38  **Echolocation**

- Toothed whales send sound through water.
- Sound is reflected, returned to the animal, and interpreted.
- An evolved inner ear structure may help toothed whales pick up sounds.

- Increased marine noise pollution may affect cetacean echolocation.

39  **Echolocation**

40  **Intelligence in Toothed Whales**

- Large brains relative to body size
- Communicate with each other
- Brains convoluted
- Trainable

41  **Order Cetacea**

- Suborder Mysticeti
- Baleen whales
- Blue whale, finback whale, humpback whale, gray whale, right whale
- Fibrous plates of baleen sieve prey items
- Vocalized sounds for various purposes
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42  **Use of Baleen**

43  **Baleen Whale Families**

- Gray whales
- Rorqual whales
  - Balaenopterids
  - Megapterids – humpback whales
- Right whales

44  **Gray Whale Migration**

- 22,000 km (13,700 miles) annual migration from coastal Arctic Ocean to Baja California and Mexico
- Feeding grounds in Arctic (summer)
- Breeding and birthing grounds in tropical eastern Pacific (winter)
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45  **Whales as Endangered Species**

- Fewer whales now than before whaling
- International Whaling Treaty
- Hunting of gray whale banned in 1938
- Gray removed from endangered list in 1993 as population rebounded
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46  **Gray Whale Friendly Behavior**

47  **Whaling**

- International Whaling Commission (IWC) 1948 – established to manage whale hunting
- In 1986, 72 IWC nations banned whaling
- Three ways to legally hunt whales:
  - Objection to IWC ban
  - Scientific whaling
  - Aboriginal subsistence whaling

48  **End of CHAPTER 14**

**Animals of the Pelagic Environment**