

## LESSON 9

### OF WHALES AND SHARKS AND GIANT SQUID

#### Reflections on the Big, the Strange and the Powerful

by W.H. Berger and E.N. Shor

- 1 The world of whales
- 2 A matter of size
- 3 Feeding, breeding, and migration
- 4 Diving for food
- 5 Interlude: tales about strange creatures
- 6 Shark!
- 7 More about big animals in the sea
- 8 Nekton of ancient seas



Fig. 9.01. Humpback whale breaching in Hawaiian waters, as part of a social ritual. Males of this species sing.

The largest animals on the planet are the great whales. The biggest among these weigh more than twenty big elephants.

Modern whales arose within the last 30 million years or so, as a result of the cooling of the planet, which changed the productivity patterns of the sea in ways favorable for the development of large size. This is true both for whales that hunt (toothed whales) and for whales that filter the water containing small fish and krill and other plankton (baleen whales). Other vertebrate groups also have large animals; pinnipeds have elephant seals and walrus, sharks and their kin include whale sharks, the great white, and manta rays, and bony fishes have swordfish and sturgeon. Various unverifiable observations suggest that there are deep-sea giants yet to be discovered. Among the mollusks, the largest – the giant squid – apparently grow to well over a ton in size. Warm oceans also had large marine animals, especially among reptiles (ichthyosaurs, plesiosaurs, mosasaurs, crocodiles) and mollusks (giant ammonites). It is likely that their food requirements were met in highly productive shelf seas.

## Images



Fig. 9.02. Highly intelligent and trainable, the small whales called dolphins entertain thousands of visitors to open-air aquariums. (Here: on the island of Oahu, Hawaii.)

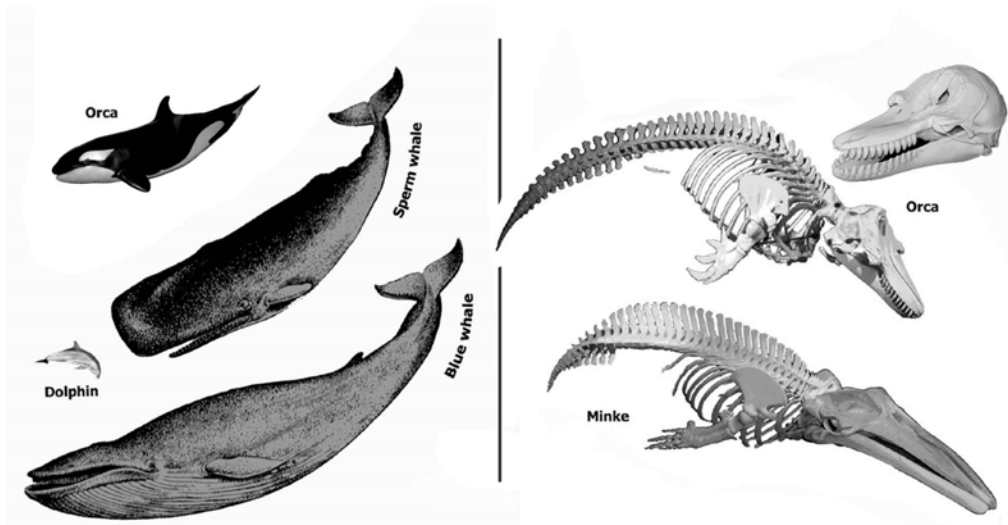


Fig. 9.03. Large whales (left): *Orca* (a delphinid) and sperm whale (*Physeter*) are toothed whales (dolphin for scale). The blue whale (*Balaenoptera*) is the largest animal on the planet. Right: *Orca* and Minke skeletons illustrate the contrasting development of skulls for toothed whales and baleen whales.

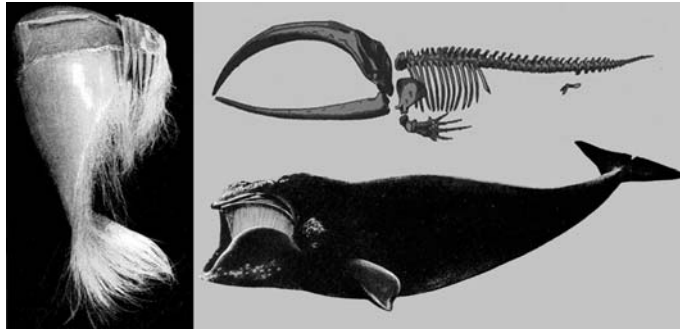


Fig. 9.04. Baleen-supported feeding: frayed end of baleen plate for filtering zooplankton from the water, and a large head to gulp water (bowhead whale).

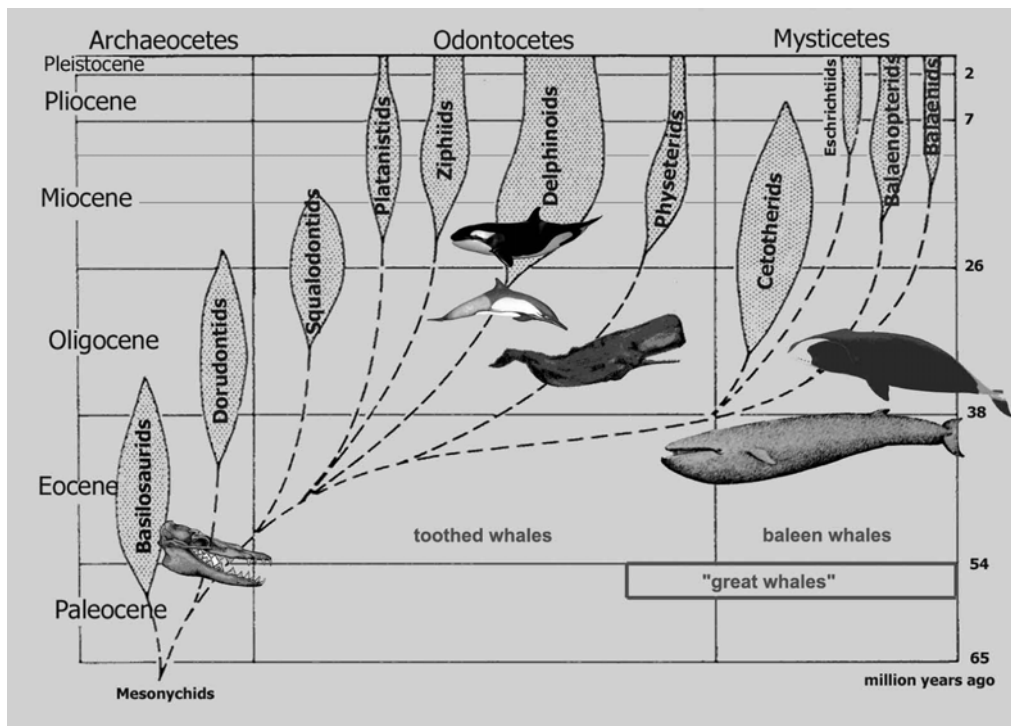


Fig. 9.05. Origin of the various groups of cetaceans, according to Bonner (1989). Note the development of maximum diversity in the Miocene.

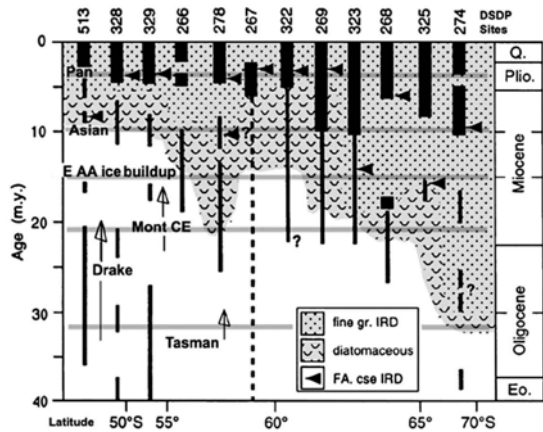


Fig. 9.06. History of expansion of diatom-rich deposits around the Antarctic in the Miocene (based on drilling results, according to Ciesielski and Weaver, 1983). This provides the chief evidence for the rise of seasonal feeding opportunities for baleen whales. Abbreviations: Pan, emergence of Panama Isthmus; Asian, restriction of Indonesian passage from Pacific to Indian Ocean; E AA, East Antarctic; Mont CE, upwelling off California (Monterey Carbon Event); Drake, widening of Drake Passage; Tasman, widening of Tasmanian Passage; fine gr. IRD, fine-grained ice-rafted debris; FA cse IRD, first appearance of coarse IRD.

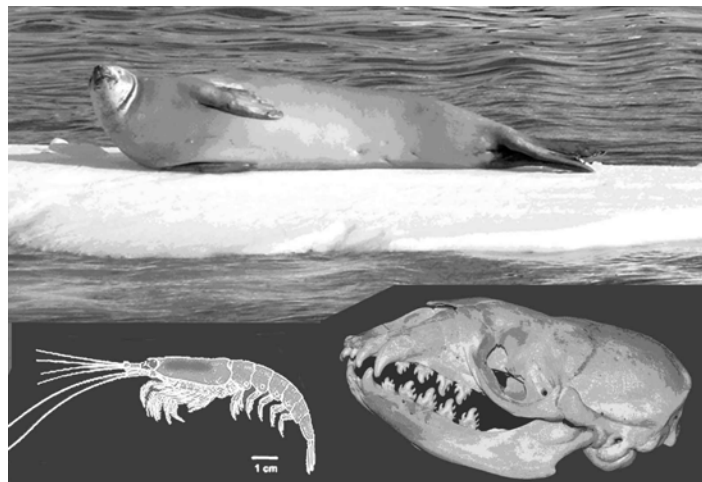


Fig. 9.07. The main food for the largest animals on Earth, krill, also feeds the most abundant type of seal (the “crabeater” seal). Note that the teeth are adapted for sieving. Not to scale.

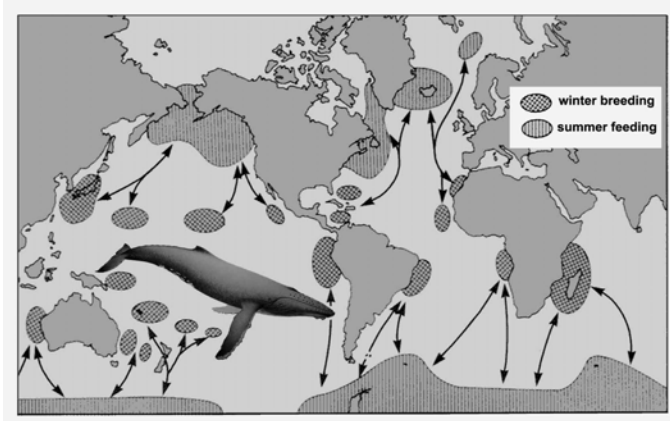


Fig. 9.08. Migration routes of humpback populations, according to Bonner, 1989.



Fig. 9.09. Elephant seals hauled out at Piedras Blancas, California; mainly females and juveniles, molting. The two immature bulls are sparring in mock fight. The animal in the foreground has completed the molt.

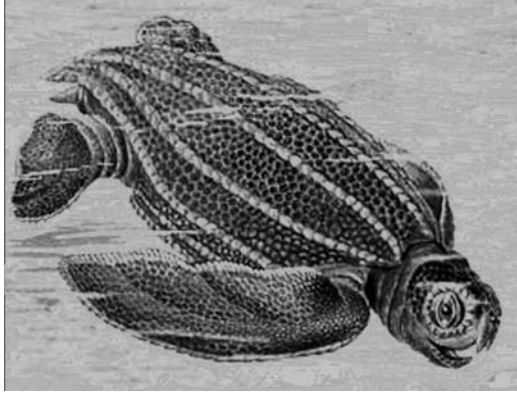


Fig. 9.10. Leatherback turtles are expert divers. They eat jellyfish.



Fig. 9.11. The oarfish, up to 20 feet long, might be confused with a large sea serpent.



Fig. 9.12. Reconstruction of a sea monster seen in Bergen harbor, as shown in Bergen's town square.

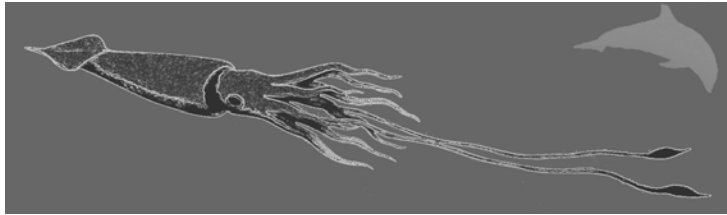


Fig. 9.13. The giant squid *Architeuthis*, at home in the deep sea. (Dolphin silhouette for scale only).

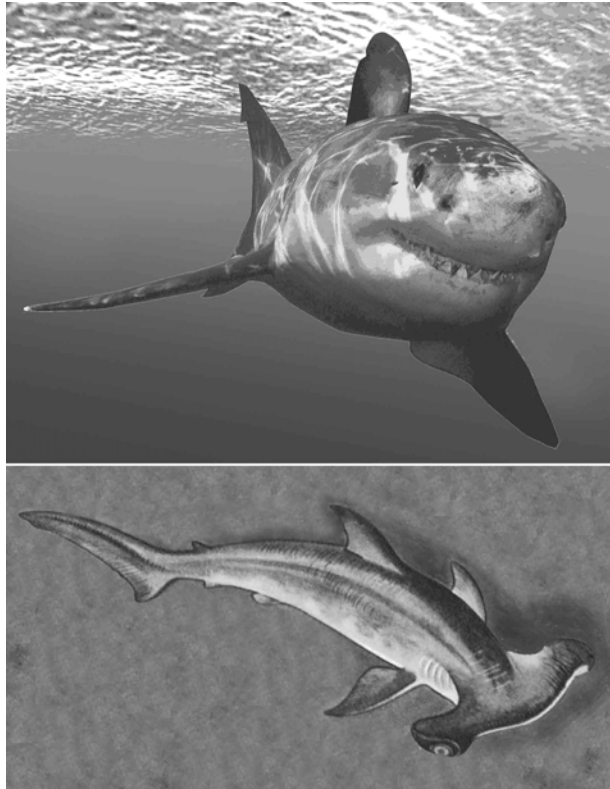


Fig. 9.14. Mako and hammerhead sharks, among the largest of predatory fishes. The hammerhead illustrates the importance of the special sensing apparatus of sharks.

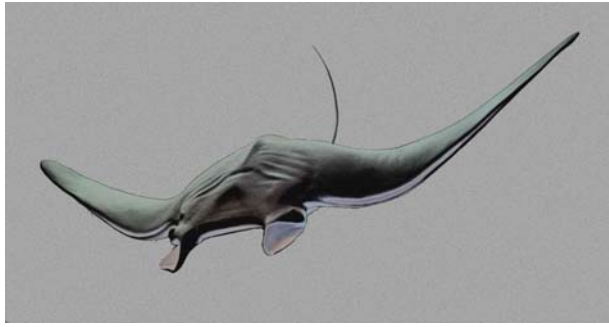


Fig. 9.15. Manta ray, a plankton eater common in coastal warm waters.

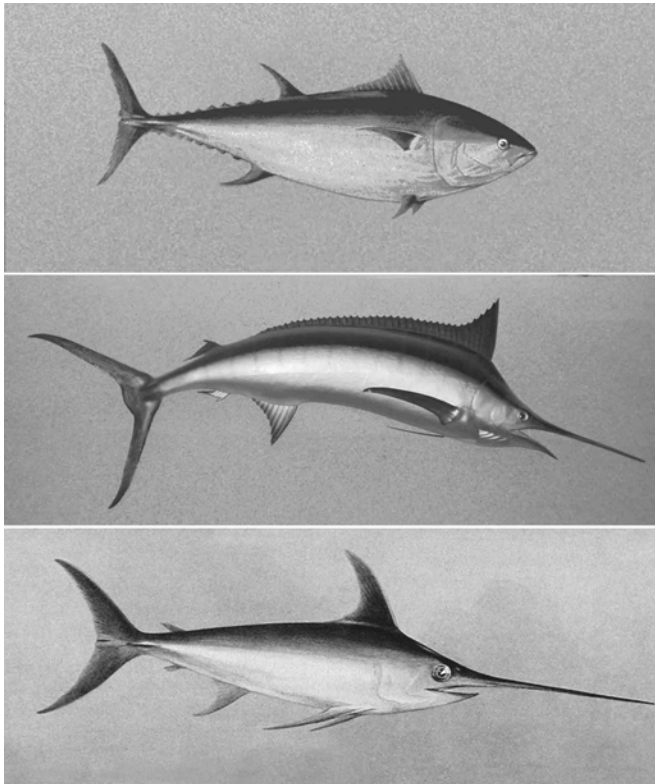


Fig. 9.16. Profiles of speed: bluefin tuna, blue marlin, and swordfish. (Not to scale.)





Fig. 9.17. Sturgeon, an ancient type of giant bony fish at home in coastal estuaries and in certain freshwater environments (such as the Great Lakes and the Caspian Sea). Its roe (caviar) is a delicacy. The fish has become rare

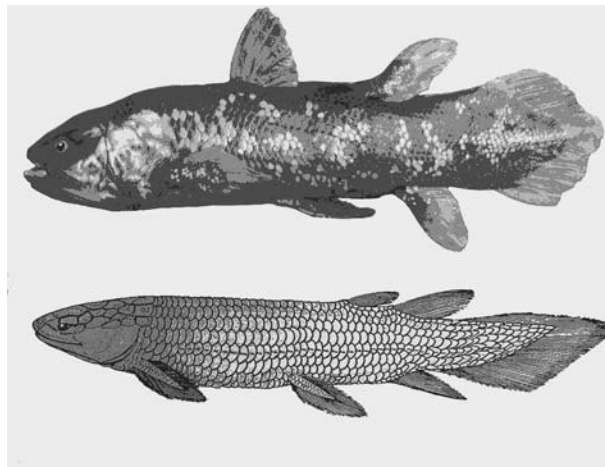


Fig. 9.18. The modern lobe-finned fish *Latimeria* closely resembles crossopterygian fishes living in the Devonian, some four hundred million years ago.

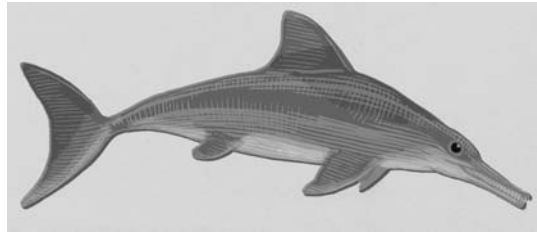


Fig. 9.19. Reconstruction of an ichthyosaur, perhaps the fastest and smartest of the Mesozoic swimmers.

**Figure sources** (where based on sources in the literature, on the web or in museum exhibits: figures are considerably modified and adapted for present purposes, using Adobe Photoshop; drawings and photographs by the author are marked “orig.”): 1, courtesy Karl Berger, Esq.; 2, Sea Life Park, Oahu (orig.); 3, Zoological Institute and Museum Hamburg (orig.), and orig. (dolphin); 4, Sverdrup et al. 1942 (see Ch. 2 for reference), Brehm’s Tierleben (see Ch. 1 for reference), and NOAA; 5, Bonner 1989, with additions; 6, Ciesielski and Weaver 1983; 7, orig. (upper), Dietz 1962 (krill), and Bremerhaven Zoo at the Sea (orig.); 8, Bonner 1989, with additions; 9, orig.; 10, E. Haeckel (see Ch. 1 for reference); 11, L.A. Museum of Nat. Hist. (orig.); 12, Bergen City; 13, Maritime Museum Stralsund (orig.); 14, SIO Explorations, and Brehm’s Tierleben; 15, Maritime Museum Stralsund (orig.); 16, H. Murayama (see Ch. 1 for reference) and L.A. Museum of Nat. Hist.; 17, Helgoland Aquarium (orig.); 18, Bergen Museum of Nat. Hist. (orig.) and H. Colbert 1955; 19, M. Colbert 1955. **References:** National Oceanic and Atmospheric Administration, U.S. Department of Commerce; N. Bonner, 1989. *Whales of the World*. Facts on File, New York and Oxford, 191pp.; P.F. Ciesielski and F.M. Weaver 1983, cited in W.H. Berger and G. Wefer, 1996, *Expeditions into the past: Paleoceanographic studies in the South Atlantic*. In: G. Wefer, W.H. Berger, G. Siedler, D.J. Webb (eds) *The South Atlantic: Present and Past Circulation*. Springer Verlag Berlin Heidelberg, 363-410; R.S. Dietz, 1962, *The sea’s deep scattering layers*, *Scientific American* 207 (2) 44-50; E. H. Colbert, 1955. *Evolution of the Vertebrates*. John Wiley and Sons, New York.