Cenozoic Marine Predators

Cenozoic Oceans

 Much cooler in general One reason in moving of Australia away from Antarctica, allowing a circumpolar current Animals without much fat or a high metabolism tend to fare worse (sharks and reptiles)



Paleogene Marine Predators After the extinction of the dinosaurs, several marine predator niches were vacated, to be filled by early whales and large sharks





Marine Mammals

During the Eocene and Oligocene, whales occupied the top marine predator position, feeding on early pinnipeds and sirenians, as well as the usual fish and sharks (much as today)
Most use dorso-ventral undulation of the tail for propulsion







 Sirenians evolved in the Eocene (50 million years ago) from the Afrotheria, which includes elephants, tenrecs, and golden moles

- They are herbivorous, and are/were preyed upon by toothed whales
- Their skeletons exhibit pachyostosis (like some plesiosaurs)

Pinnipeds

 Divided into Odobenids (walruses), Otariids (sea lions/eared seals), and Phocids (true seals), pinnipeds evolved in the Late Oligocene, and are among the top predators of the sea, feeding on invertebrates and some vertebrates alike



Archaeoceti

 The ancient whales diverged from other artiodactyls in the Eocene, with forms becoming more streamlined and aquatic through the beginning of the Miocene



Archaeoceti

• *Pakicetus* is the earliest known whale

 As a more aquatic lifestyle was evolved (*Ambulocetus, Protocetus*), the hindlimbs became reduced, and the animals became larger



Basilosauridae



 The largest early whales (still toothed with Zeuglodon dentition [double rooted-typical of marine mammals]) could reach up to 85 feet in length in members such as Basilosaurus and Dorudon

Modern Cetaceans

- Modern cetaceans evolved in the Late Eocene and divided into two major groups:
 - Mysticeti (baleen whales) use keratinous plates to filter small invertebrates from the water
 - Odontoceti (toothed whales) retain conical teeth, and include dolphins (orcas), porpoises, sperm whales, narwhals, belugas, and beaked whales





Cenozoic Marine Reptiles

 With the extinction of the mosasaurs and plesiosaurs, the marine reptiles that survive to this day are the sea turtles, marine crocodiles, sea snakes, and the marine iguana



Sea Turtles

- The Late Cretaceous was home to the largest sea turtles ever to live, such as Archelon
- Modern sea turtles are placed in two families and are found in every ocean except the Arctic





Marine Crocodiles

 While many clades of marine crocodyliforms could be found throughout the Mesozoic (remember metriorhynchids, teleosaurs, phytosaurs?), today only the American crocodile and the Saltwater crocodile make seagoing voyages (in the Caribbean and Indonesian archipelagos, respectively)





Sea Snakes

 Related to cobras, some of these snakes are amphibious (sea kraits), while others are completely aquatic and hence ovoviviparous (retain eggs inside body until hatching)





Sharks





First evolving in the Silurian, sharks have always been a part of the world's oceans
Large sharks like *Squalicorax* and *Cretoxyrhina* coexisted with large marine predators during the Mesozoic

Sharks In the Miocene, certain lineages of white shark grew to over 50 feet in length (*Carcharocles megalodon*)



Today's Sea Monsters

People sometimes mistake masses of plant growth or other sea creatures for extinct marine predators...
And human minds have no shortage of imagination





Fictitious Sea Monsters

- Charybdis (from *The Odyssey*)
- Chthulu (of Howard Lovecraft)
- Iku-Turso (Finnish mythology)
- Unktehila (Lakota Sioux mythology)
- Jörmungandr (Norse Midgard serpent)
- Kraken (Norse mythology)
- Leviathan (Old Testament)
 - Loch Ness Monster
 - Lusca (Caribbean mythology) Hai Long Wang (Chinese mythology)

