



WHEEEEE !

What are we Doing Today?

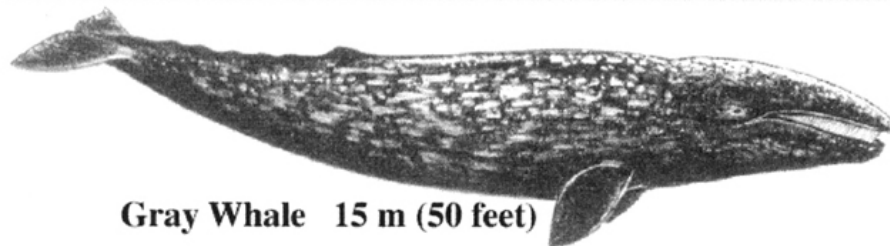
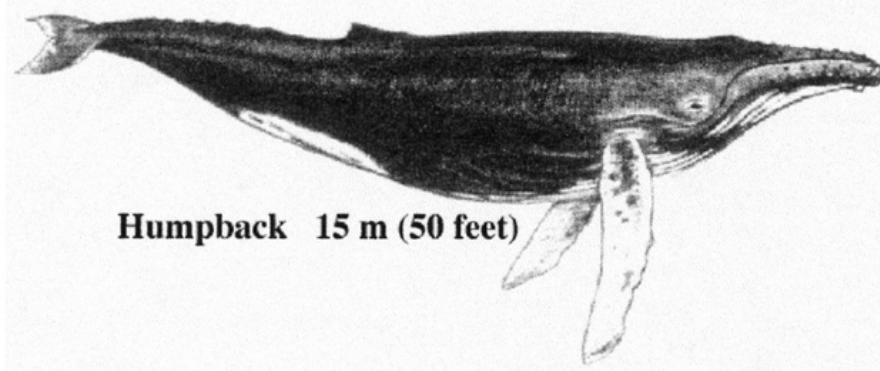
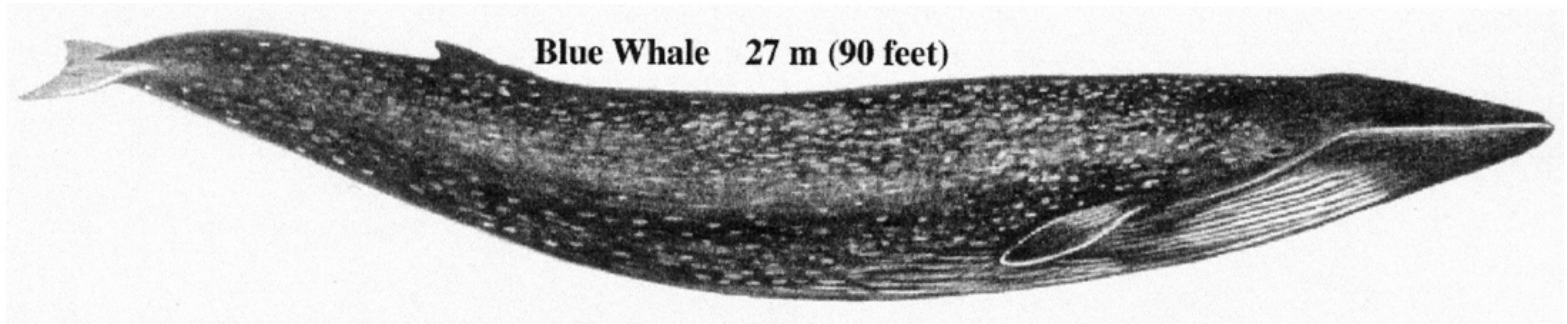
- Whale fossil hunt
- WHALE EVOLUTION

Becoming Whales



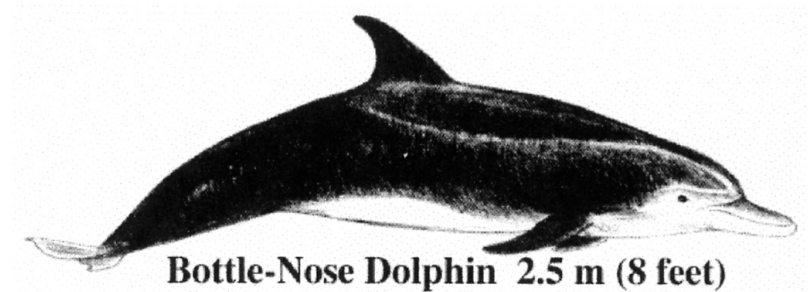
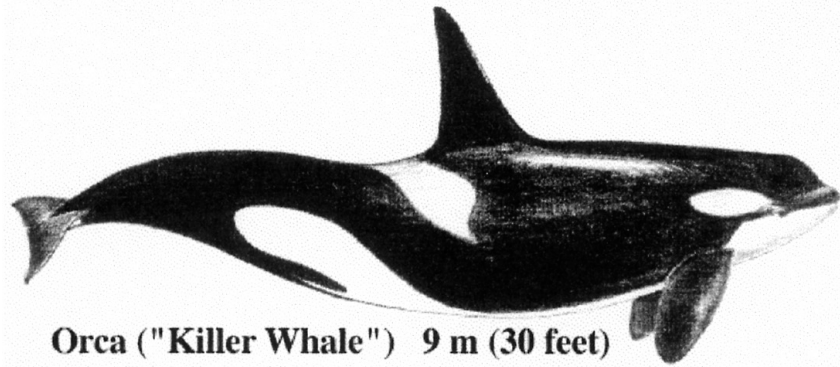
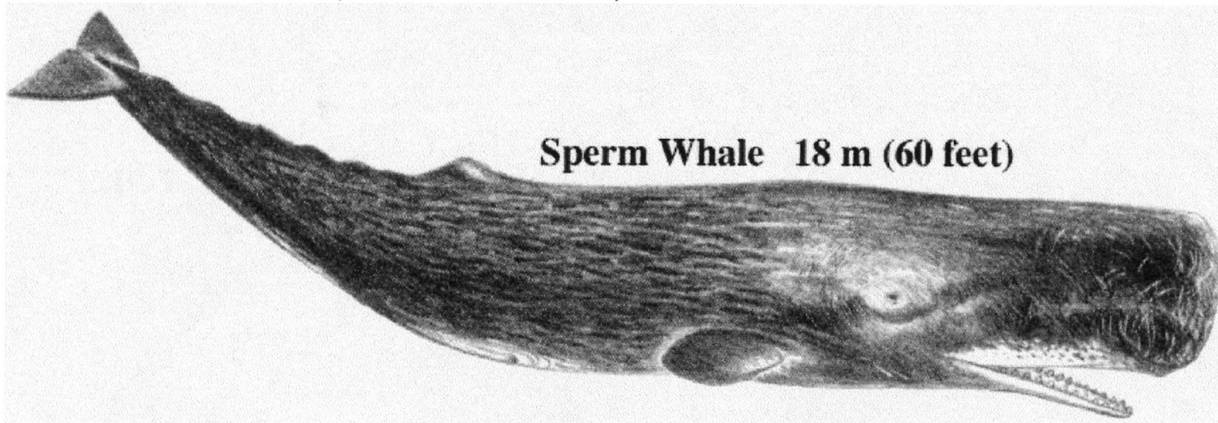
Diversity of Whales Today

Mysticetes (baleen whales):



Diversity of Whales Today

Odontocetes (toothed whales):



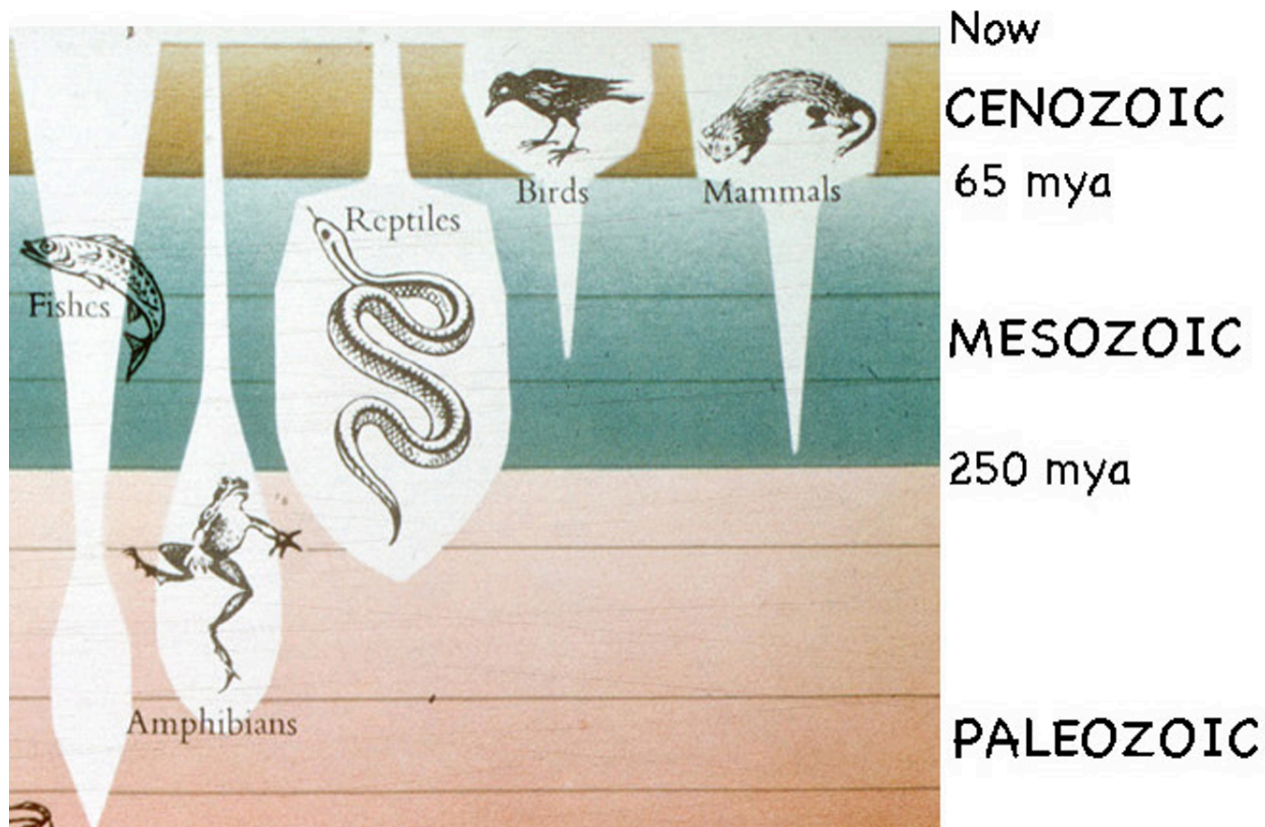
But Where Did They Come From?

Here's a Peek into the Past...

Animals of the Past: Patterns in the Fossil Record



Moving in...



Notice that the earliest MAMMALS...
were TERRESTRIAL - with LEGS !

**But WHALES SWIM;
they DON'T WALK ON LAND !**

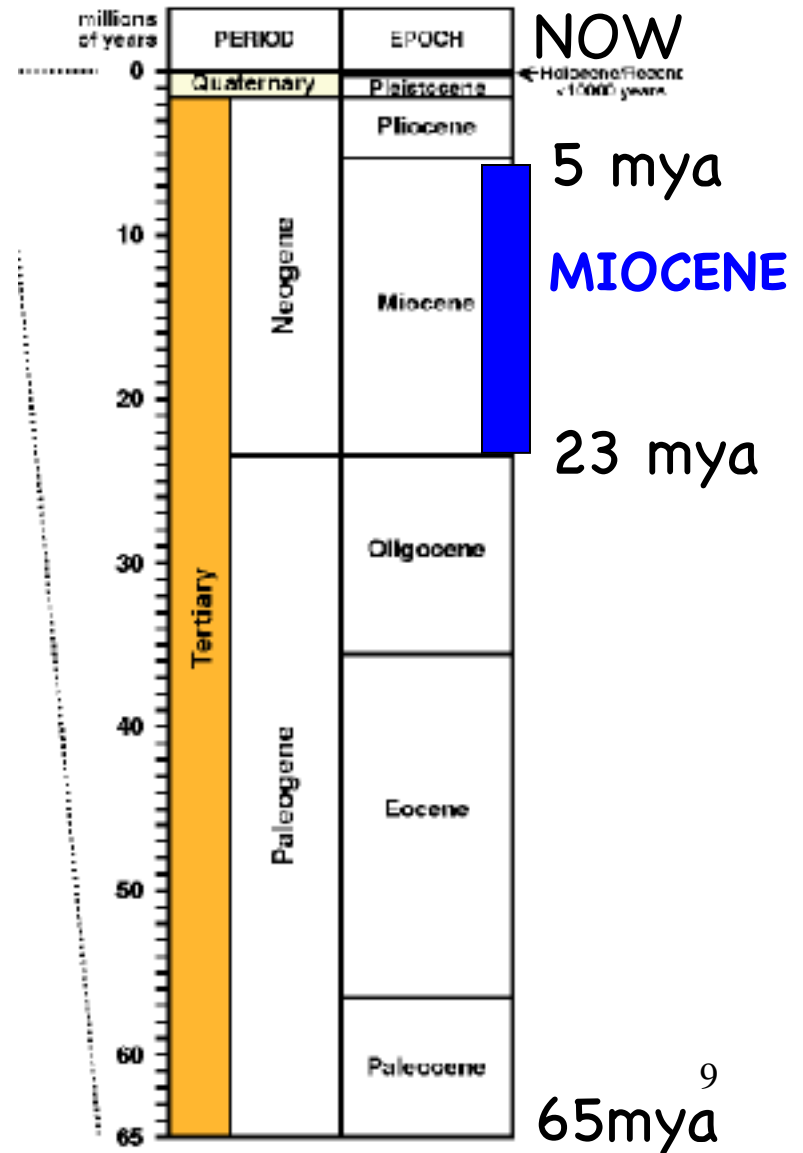
**So - Where DID Whales
Come From?**

**What would the earliest
whales look like?**

The Earliest **MODERN WHALES**...

Only go back to about 23 mya... the beginning of the **MIOCENE**...

Great swimmers...
but **NO WALKING LEGS !**

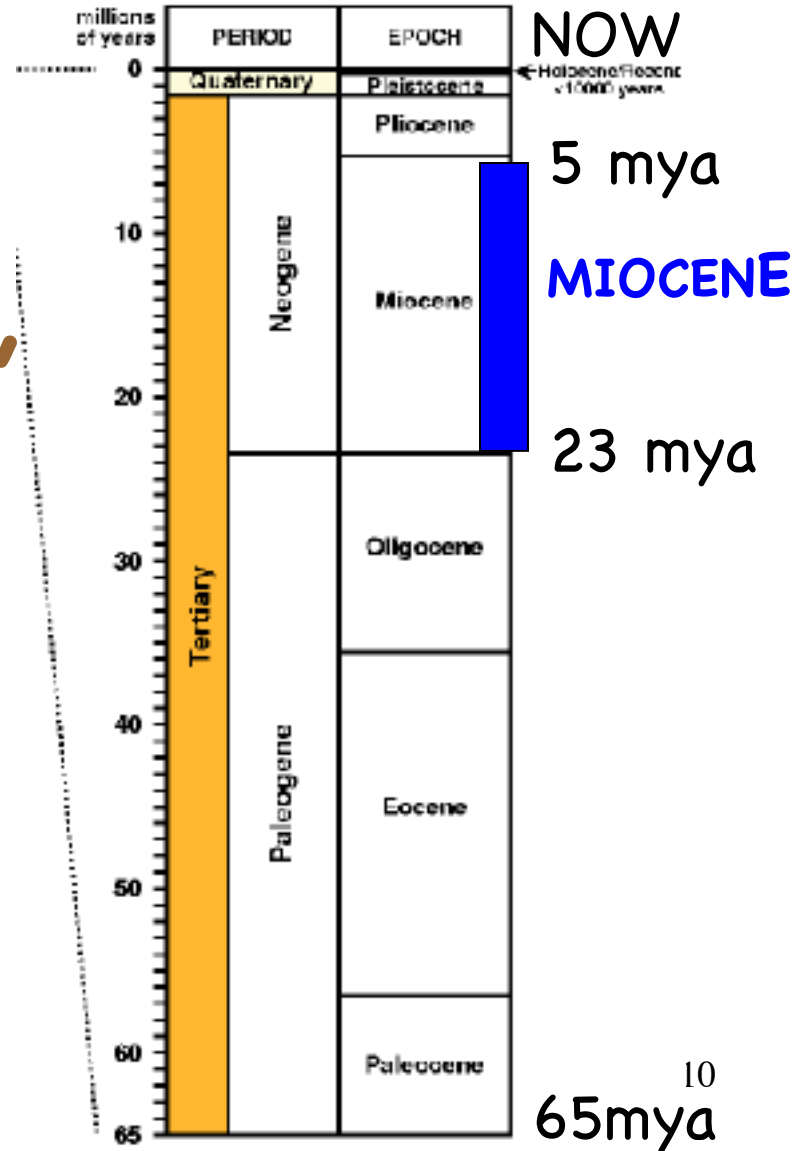


HOWEVER !

We DO have some whale-like fossils, with strange teeth,

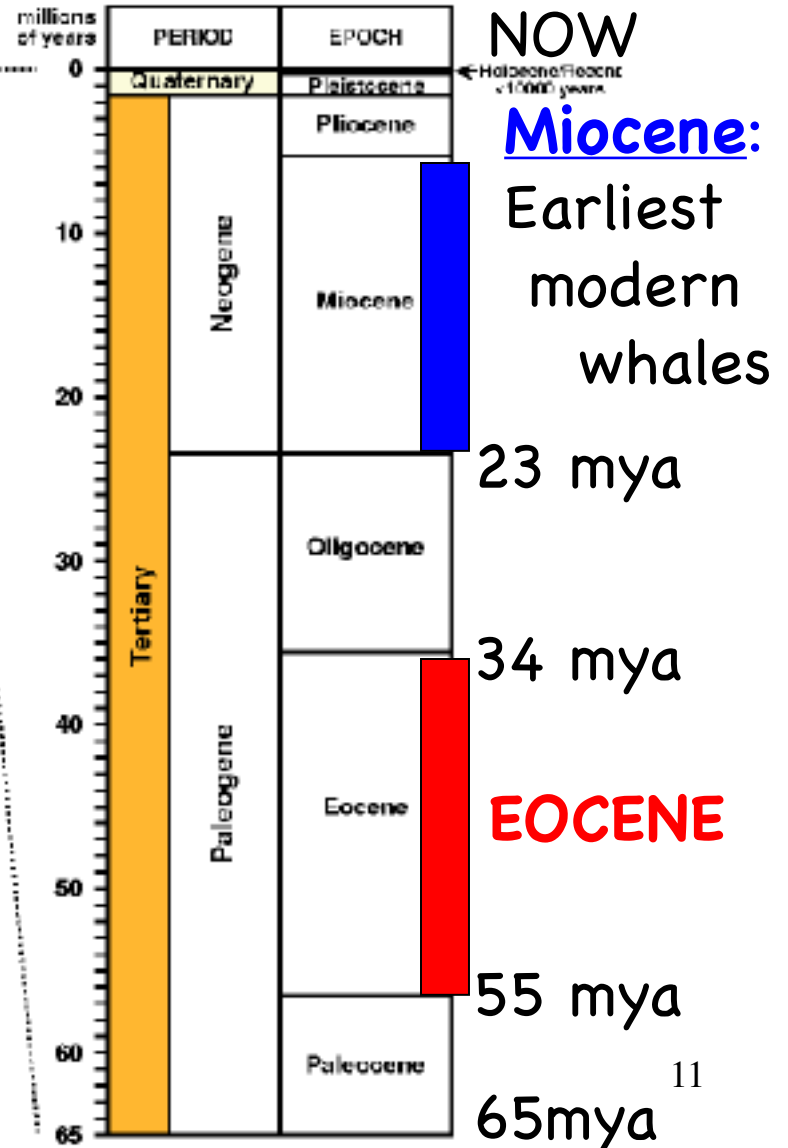
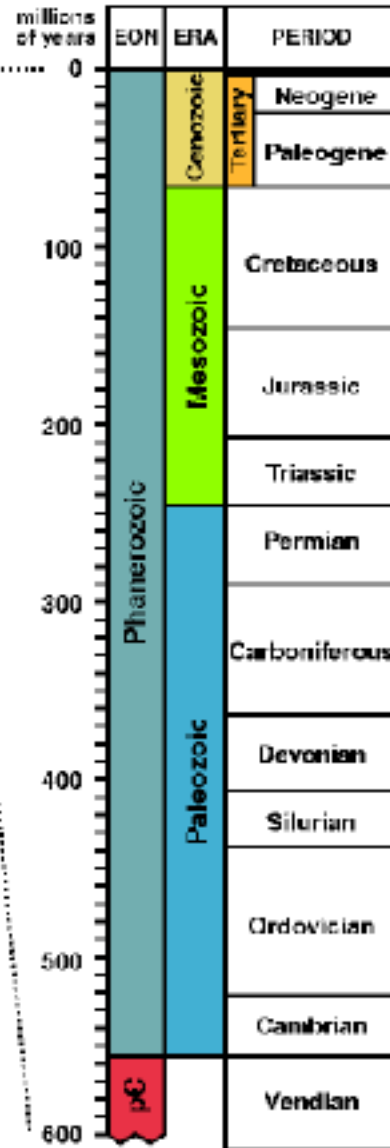
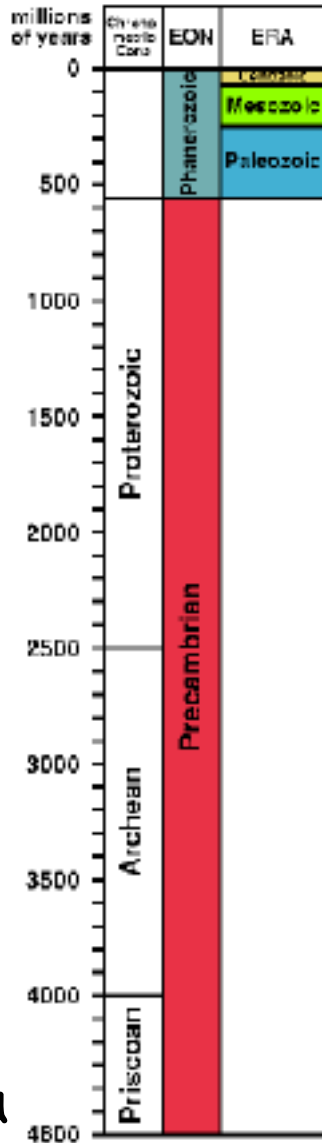


from the **EOCENE** !



But... Where's the Eocene?

NOW



4.5bya

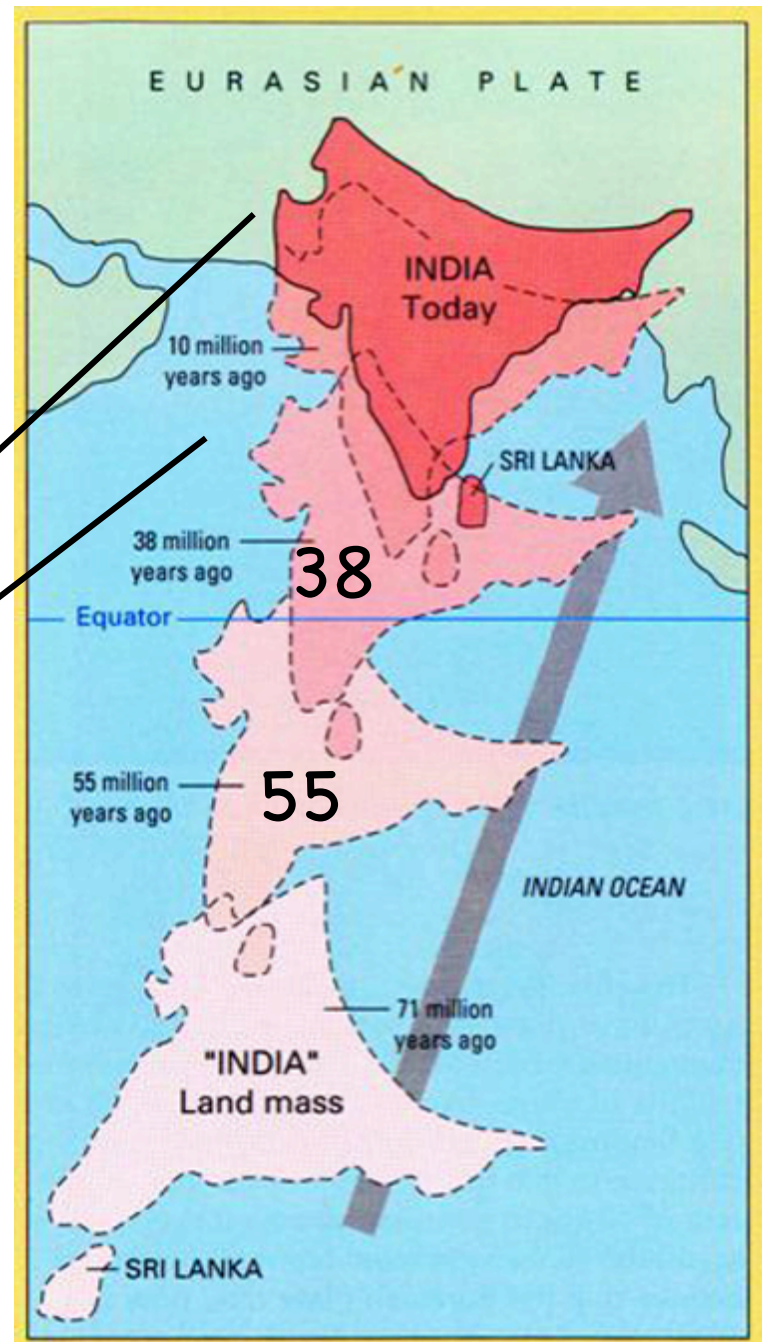
OK! So, where shall we look for Eocene Fossils?

Mountains of Pakistan

The Tethys Sea

India Moved North...

...Squished into Asia...



Where shall we look?

Pakistan

Lots of exposed
marine **Eocene**
rocks in the
Pakistan mountains



Eocene Epoch Timeline



This is the time period between 34 mya and 55 mya.

It was a time of rising temperatures, and there was an abundance of mammals, including the first horses, bats, and whales.

The dinosaurs had only been extinct about ten million years when the Eocene began. Mammals evolved larger bodies and became more diverse during the Eocene.

Eon (Phanerozoic) --> Era (Cenozoic) --> Period (Paleogene)
--> Epoch (Eocene)

Early Whale Teeth



in Dorudon



~ 36 mya

Discovered - 1936 - Pakistan

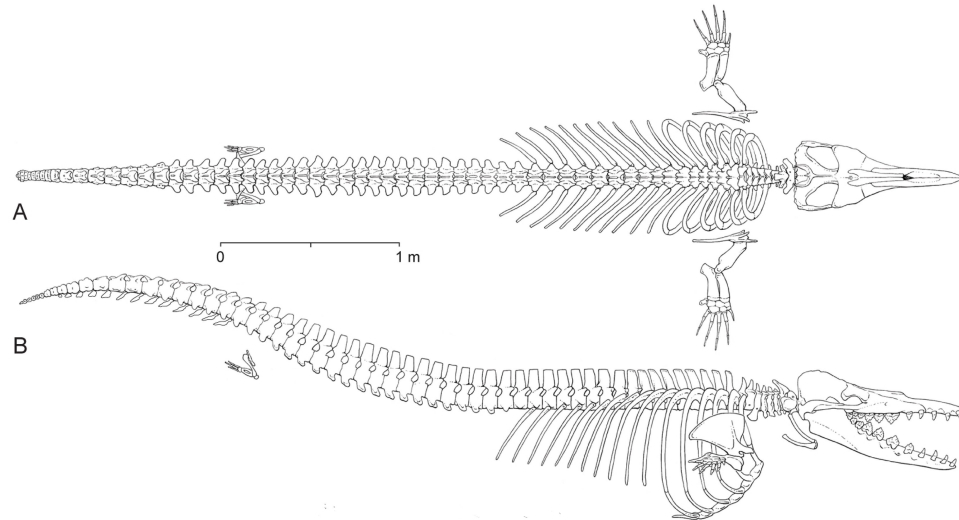


Eocene Epoch Timeline

Dorudon 36 mya



Species: 33 mya - 40 mya



Deep ocean mammal
Primitive whale teeth
Tiny hind legs, no hooves

Early Whale Teeth... in a 4-legged mammal?



a Mesonychid -
called *Pachyaena*
Translates to "Thick Hyena"



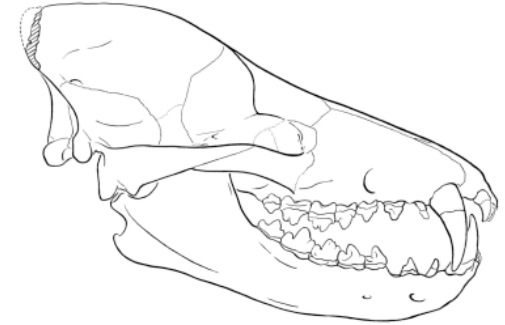
... with tiny **hooves!**



~ 55 mya

Discovered in 1955
Pakistan

Eocene Epoch Timeline



Land Mammal
Primitive whale-like teeth
Tiny hooves

— *Pachyaena* 55 mya

Early Whale Teeth

WITH LEGS !



...and **hooves**,
too! In Pakistan...



Pakicetus - an early whale

~50 mya

Discovered in 1983 - Pakistan

Eocene Epoch Timeline



Pakicetus

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Shore dwelling mammal
Primitive whale-like teeth
Tiny hooves

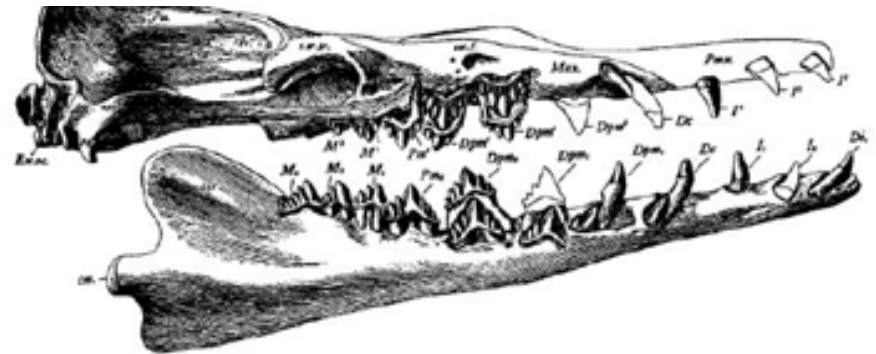
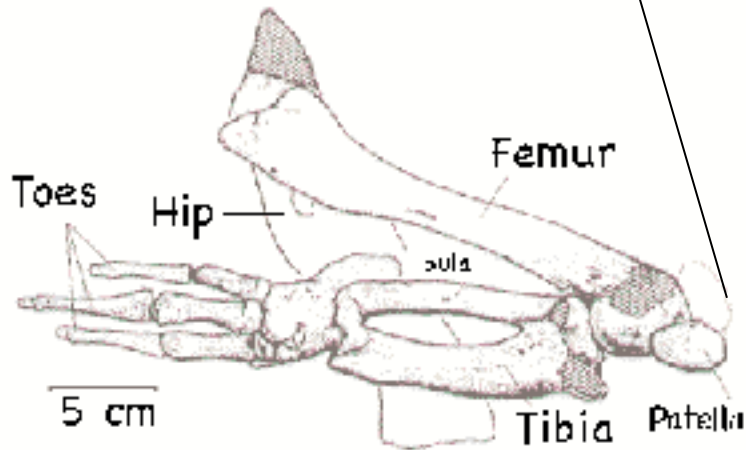
Pakicetus 50 mya

Early whale teeth in...

Basilosaurus ~37mya



and LEGS,
too...



Discovered 1990 - Egypt

Eocene Epoch Timeline



Basilosaurus 37 mya (39-36 mya)

Deep ocean mammal

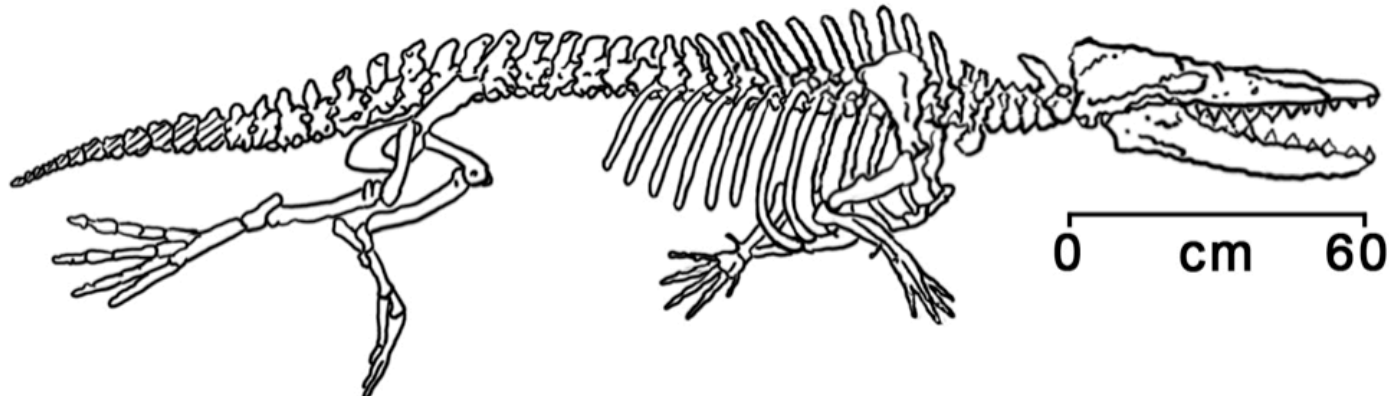
Primitive whale teeth

Small hind legs - no hooves



Early Whale Teeth

Rodhocetus - an early whale



And tiny **hooves**, too !

~46 mya

Discovered 1994 - Pakistan

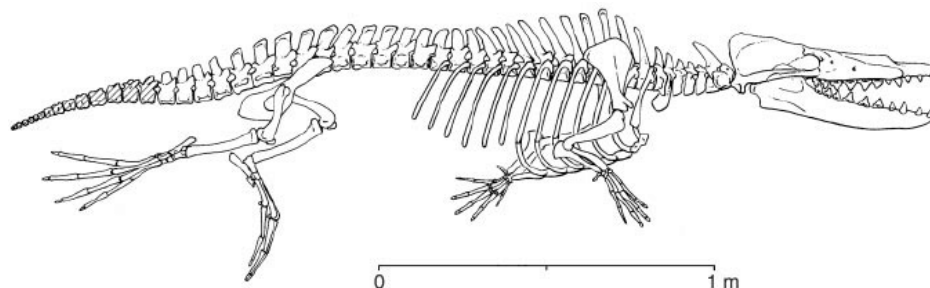
Eocene Epoch Timeline

Rodhocetus was a small whale, measuring 2–3 m (6.6–9.8 ft) long. It had four short legs, a strong tail, pointed snout, and sharp teeth. It also had a "balance organ" that helped it keep its balance in the water.

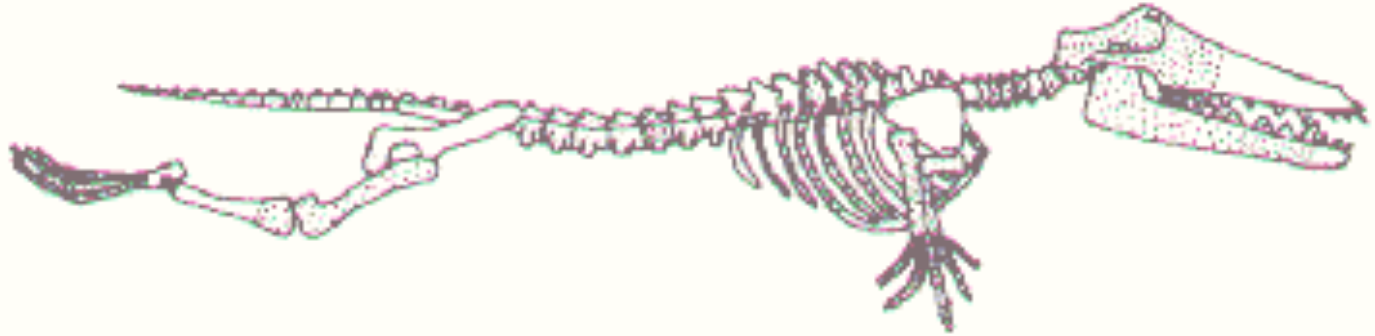
Rodhocetus was more aquatic than earlier known species. It had large, paddling hind feet to propel it through the water. It also had a strong tail which may have helped to act as a rudder.

Rodhocetus 46 mya (early 1994 - Pakistan)

*Shallow ocean mammal
Primitive whale teeth
Tiny hooves*



Early Whale Teeth... in Pakistan



With tiny **hooves**, too ! _____

Ambulocetus - the “walking whale”

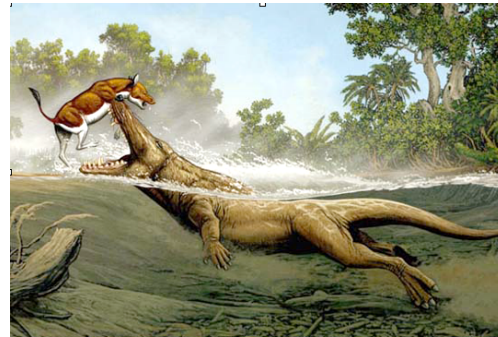
~48 mya

Discovered 1994 - Pakistan

Eocene Epoch Timeline

Ambulocetus was a 10-foot-long cetacean that could both walk on land and swim proficiently.

Their forelimbs were equipped with fingers and small hooves. The hind feet of Ambulocetus were clearly adapted for swimming. They could swim by pushing back with their hind feet and undulating their tail, as otters do today.

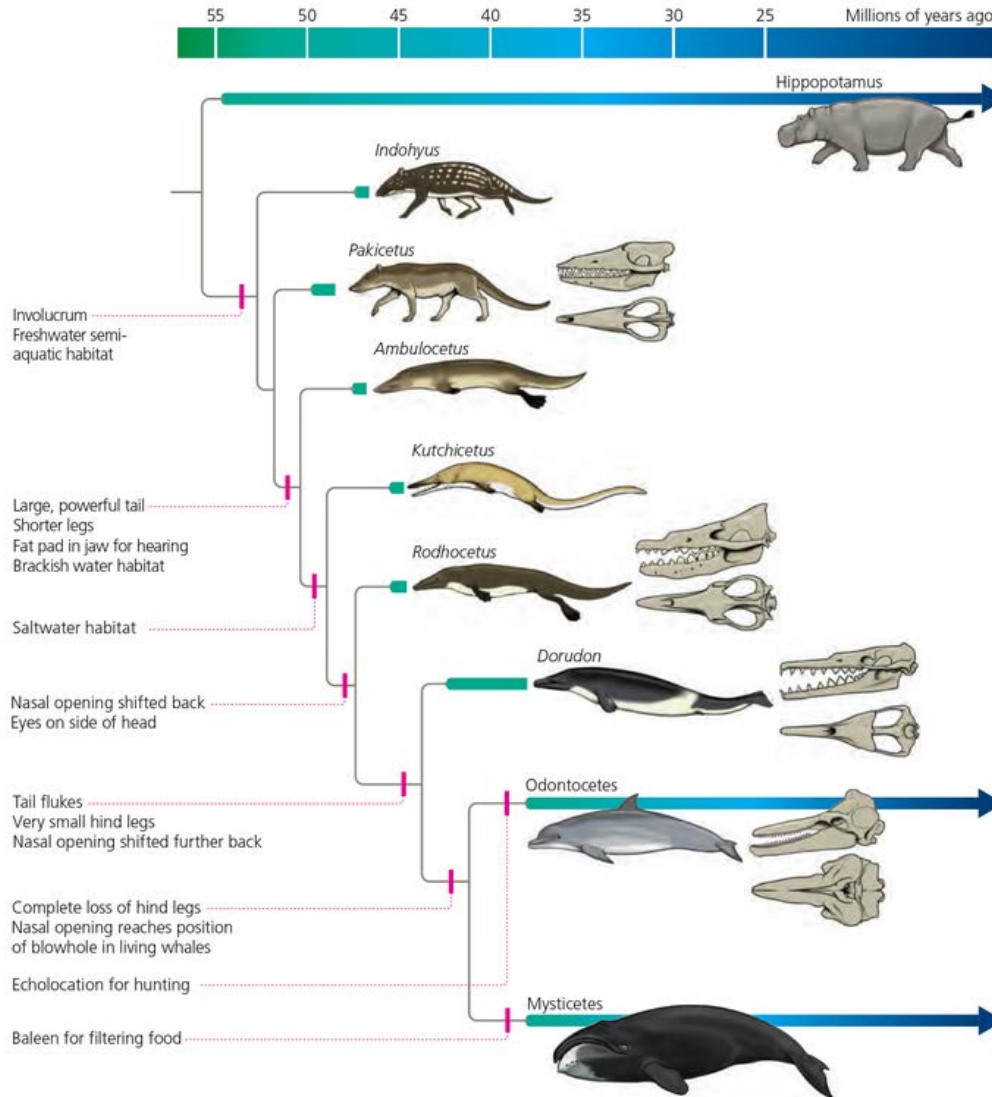


Ambulocetus 48 mya

Shallow ocean mammal
Primitive whale teeth
Tiny hooves



Whale Evolution



Whale's Closest Cousin: Hippos





FAREWHALE!

Have a Whale of a Time!



FINI