

Adaptations to Sealife

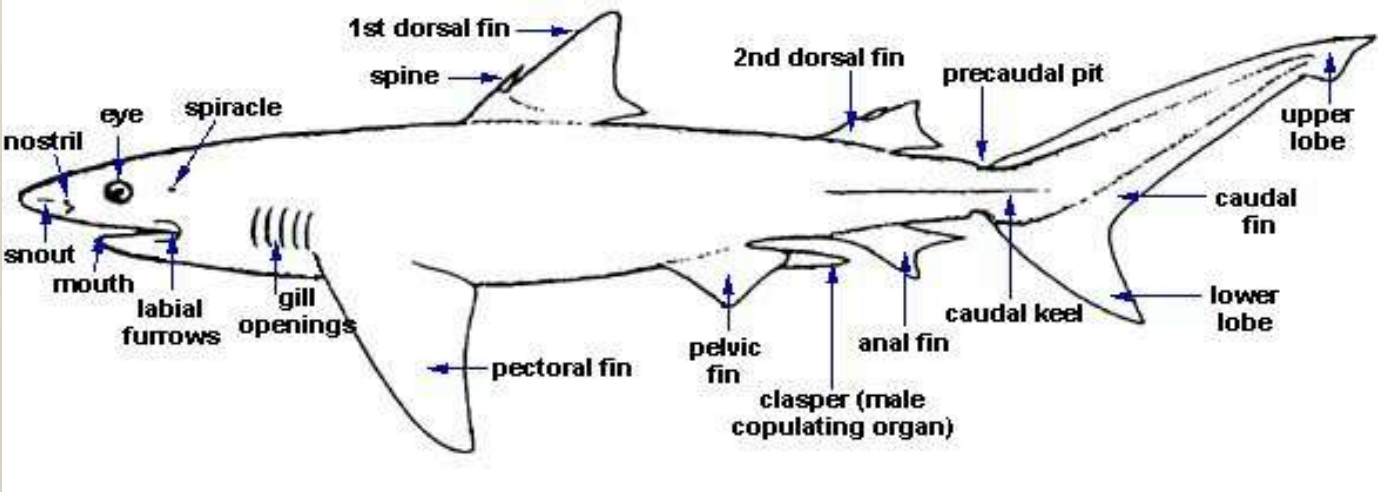


Blue World

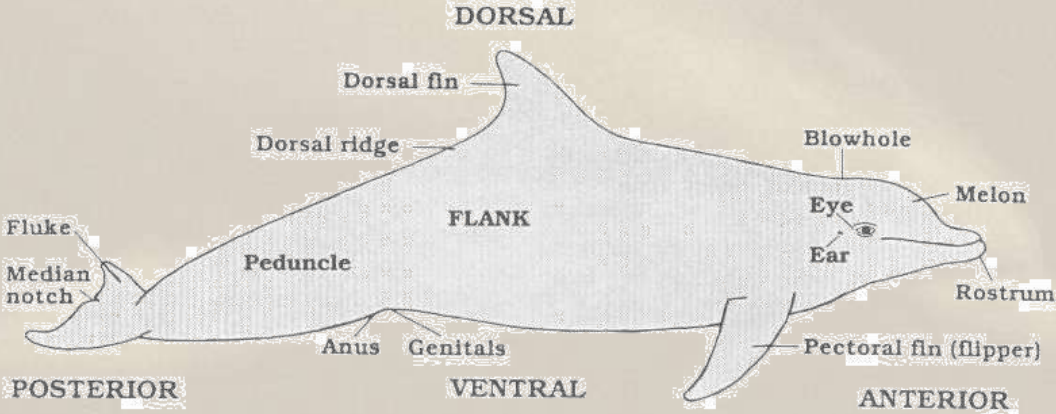


Fish or Mammal?

Fish



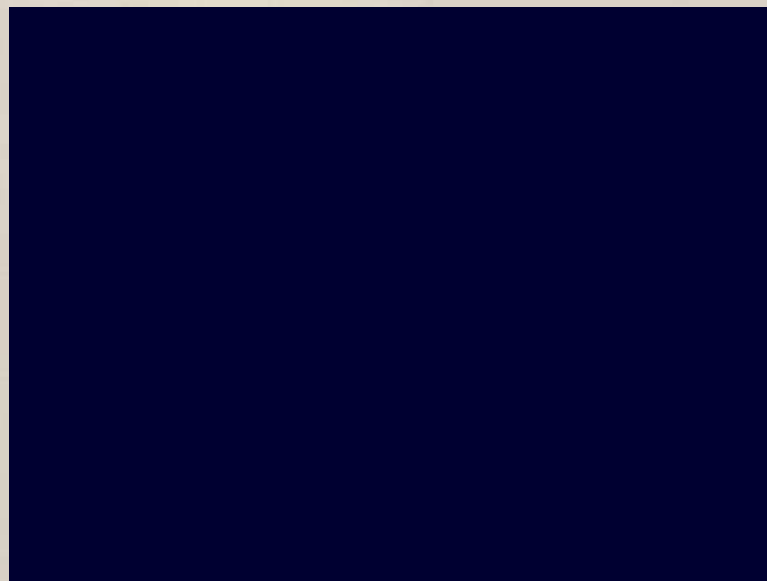
Mammal



Basic External Anatomy



Evolution



Aquatic environment adaptations

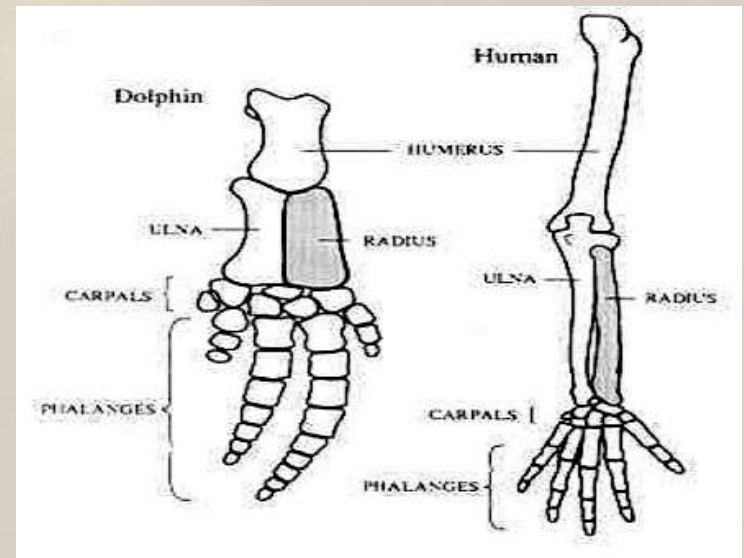




Hydrodynamics



- fur loss
- loss of rear limbs
- evolution of the front limbs
- dorsal fin
- fluke
- loss of external ear





Dorsal blowhole

- **Migration of the nares**



(2 in Mysticetes,
1 in Odontocetes)

- **Voluntary respiration**



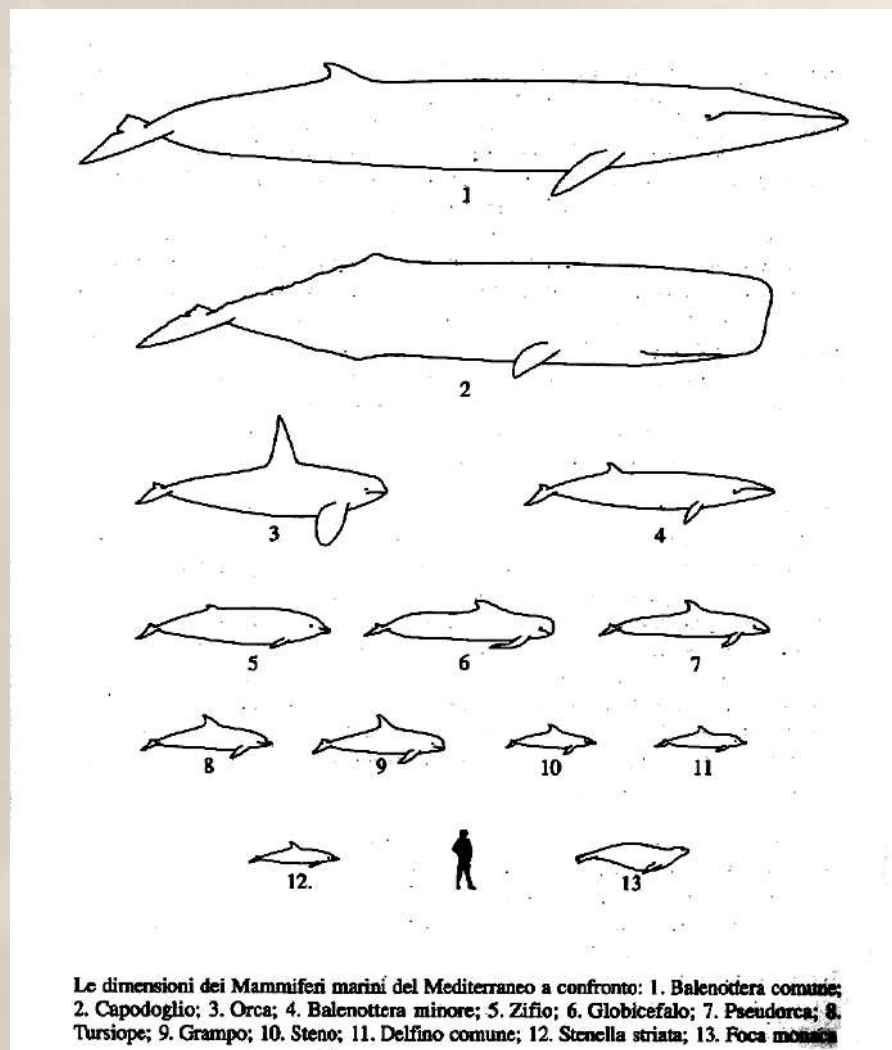


Naked skin

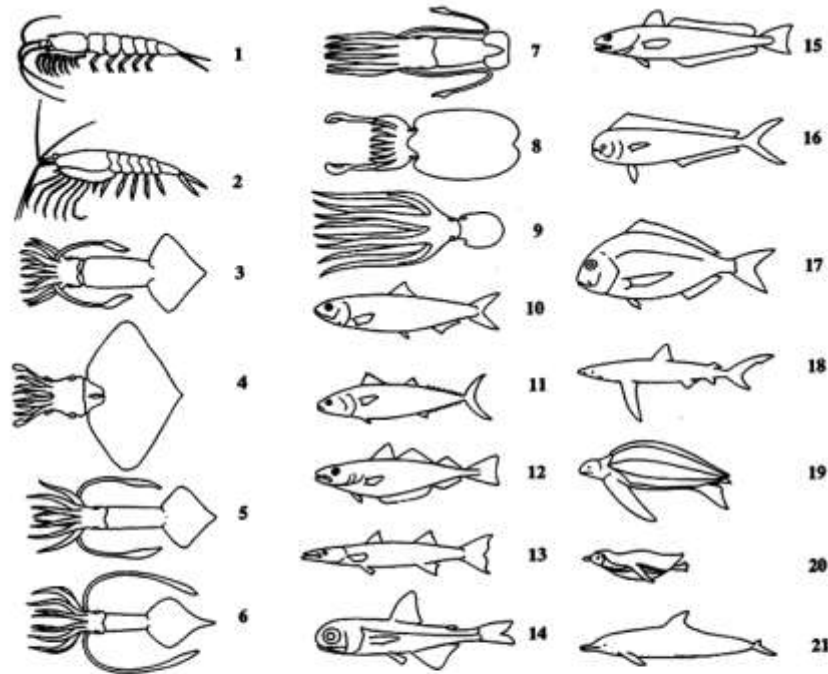
hair (vibrissae)
in foetal stage



Does size matter?



Increase of potential prey

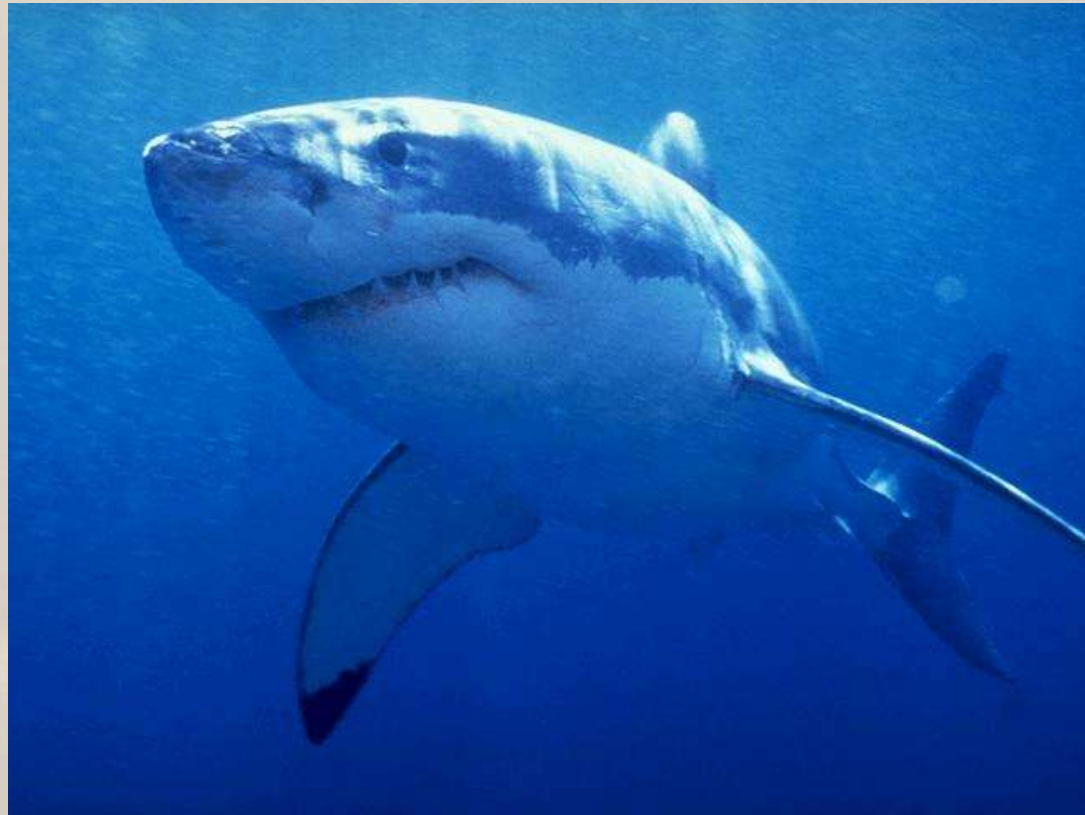


Alcuni esempi di prede tipiche dei Cetacei.

- | | | |
|---|--------------------------------|----------------------------------|
| 1. <i>Meganyctiphanes norvegica</i> | 8. <i>Sepia officinalis</i> | 15. <i>Merluccius merluccius</i> |
| 2. <i>Euphausia superba</i> | 9. <i>Octopus punctatus</i> | 16. <i>Coryphaena hyppurus</i> |
| 3. <i>Ommastrephes oceanicus</i> | 10. <i>Sardina pilchardus</i> | 17. <i>Sparus aurata</i> |
| 4. <i>Taningia danae</i> | 11. <i>Auxis thazard</i> | 18. <i>Prionace glauca</i> |
| 5. <i>Todarodes sagittatus</i> | 12. <i>Merlangus merlangus</i> | 19. <i>Dermochelys coriacea</i> |
| 6. <i>Ancistroteuthis lichtensteini</i> | 13. <i>Sphyræna sphyraena</i> | 20. <i>Spheniscus humboldti</i> |
| 7. <i>Histioteuthis reversa</i> | 14. <i>Myctophum punctatum</i> | 21. <i>Stenella coeruleoalba</i> |



Decrease of potential predators





Small Surface Area/Volume Ratio

- **more efficient swimming**
- **decrease in heat loss**
- **accumulation of reserves of energy**

Independence from external conditions



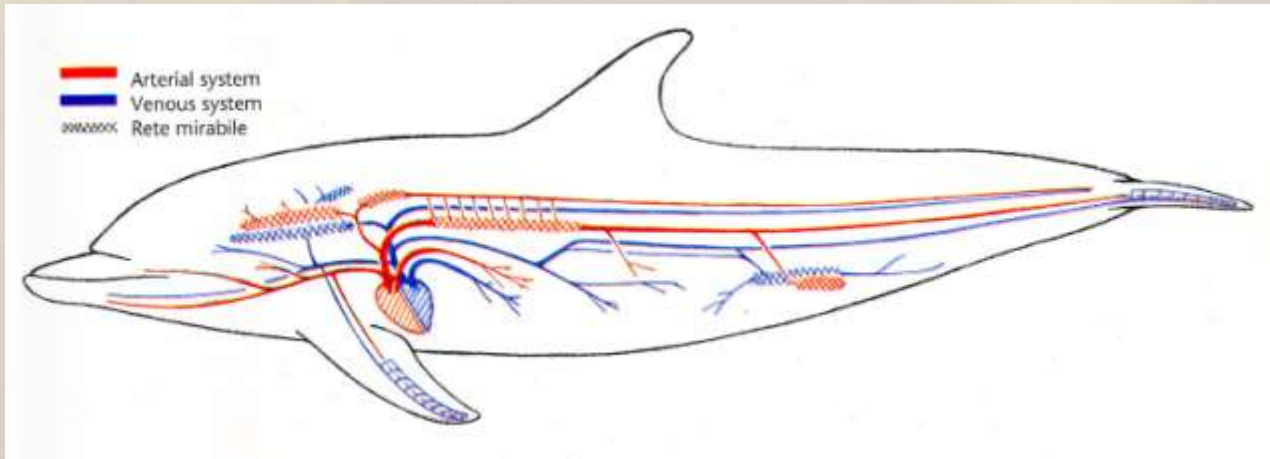
Dive prolongation

- **oxygen storage**
- **slowing of heart beat -
bradycardia**
- **change of peripheral
blood circulation**





avoiding high-pressure disease (Bends)



- Decrease of lung volume
- Alveolar collapse
- A system to catch nitrogen bubbles



High pressure resistance



Senses in the water

- **Sight - adaptable vision in and outside the water**
- **Hearing - specialised inner ear**
- **Touch**
- **Orientation**
- **Biosonar**



Biosonar

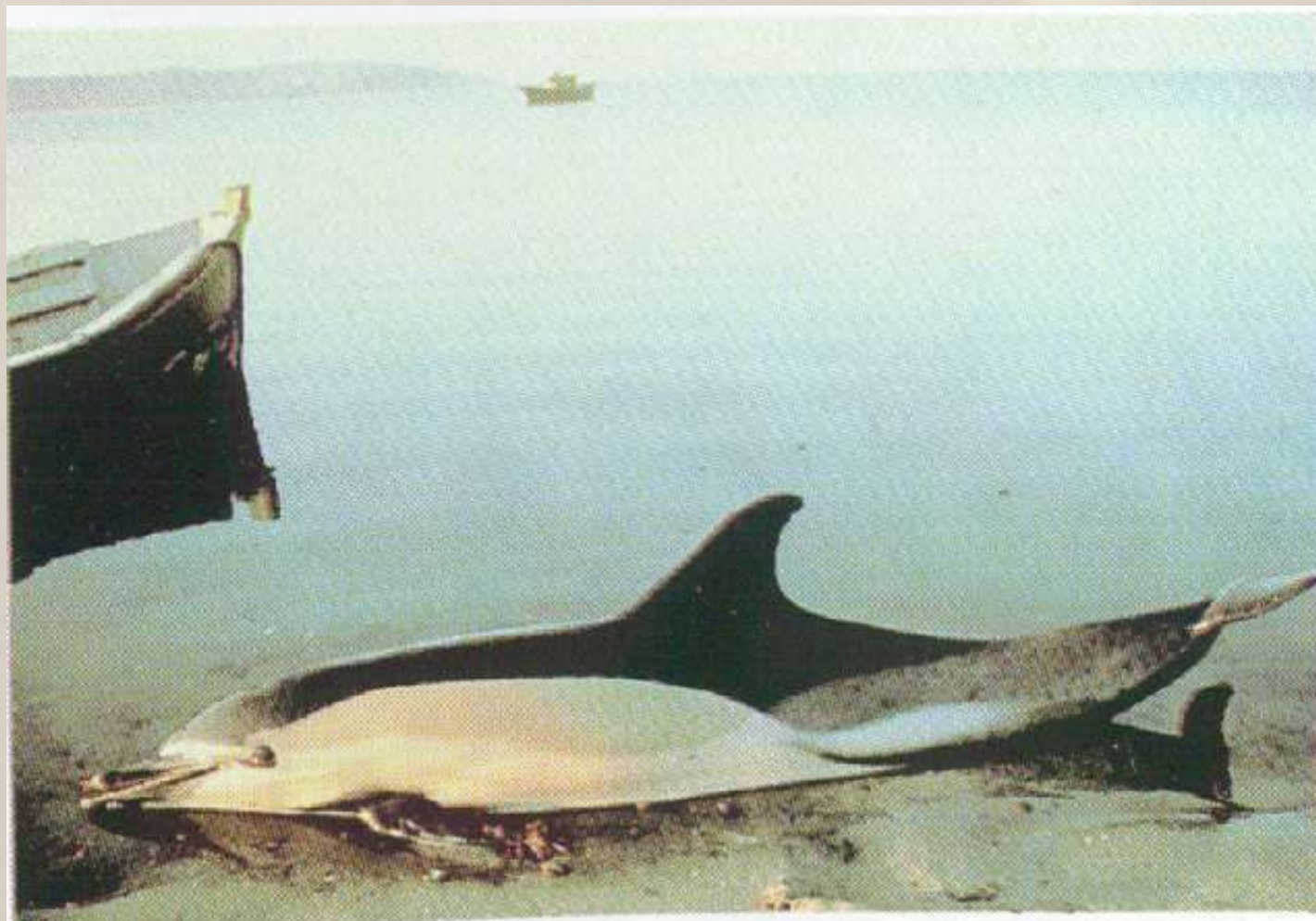




Orientation at sea

- **Sun**
- **Biosonar**
- **Chemical and thermal reception**
- **Magnetic field**

Cetacean strandings



Alimentation



Mysticete



Baleen plates

Odontocete

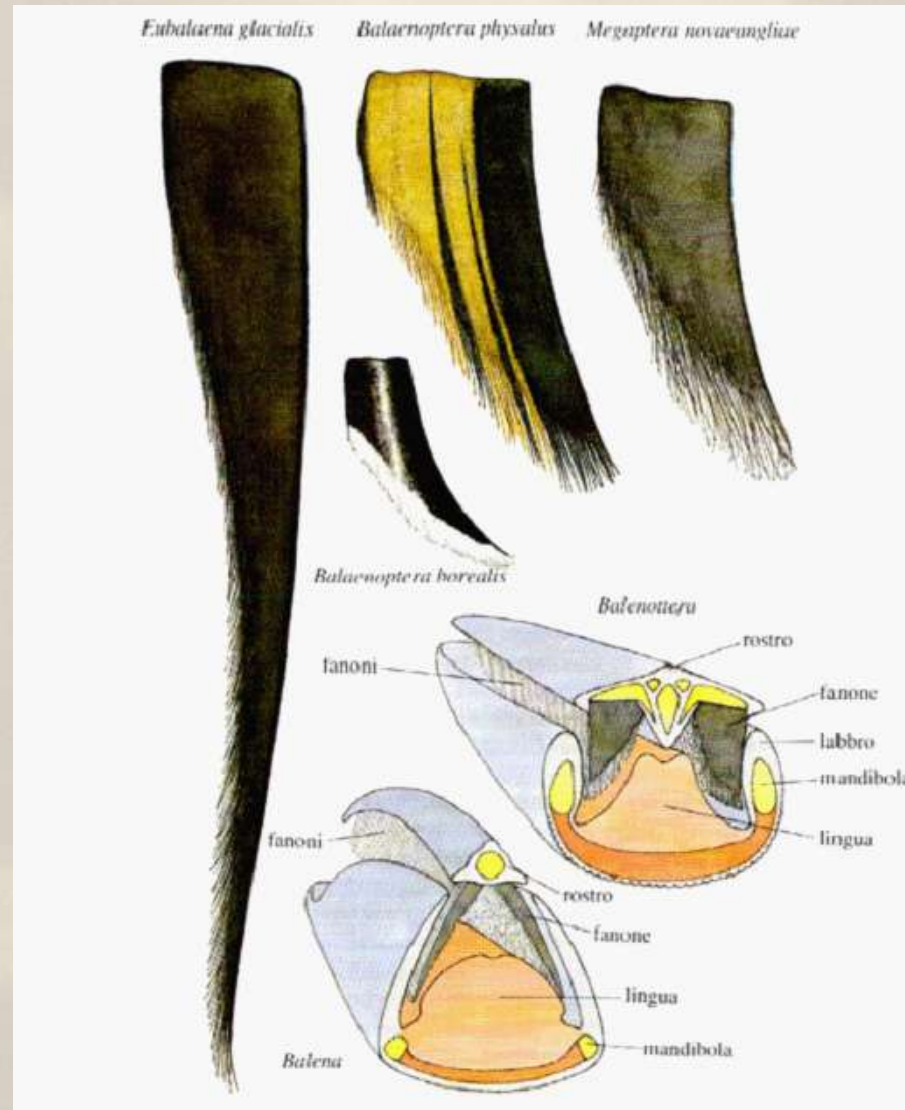


Teeth





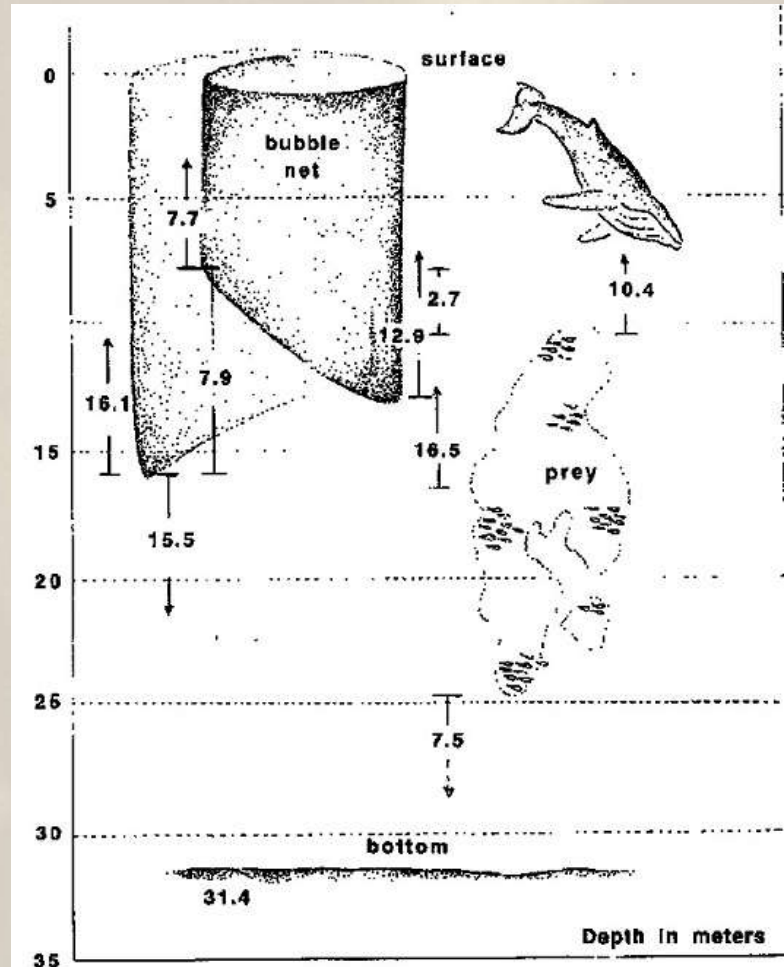
Filter Feeding





Humpback whales:

Bubble Net



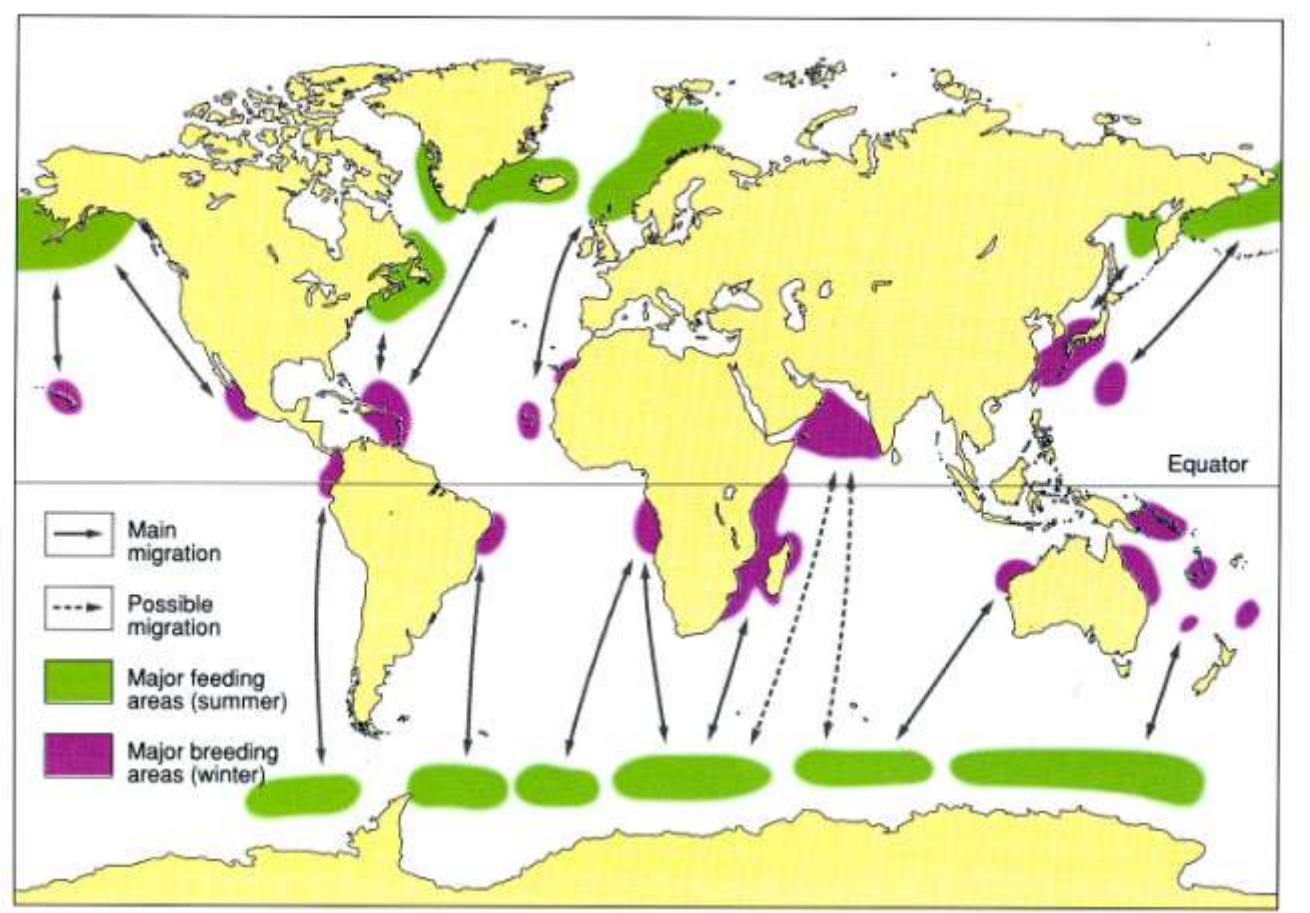
Other feeding strategies:

Grey whales

Killer whales



Migration



In search of better feeding / breeding conditions



Reproduction

1) Coupling

2) Gestation

3) Growth rate





Social structure and parental care



Advantages of a pod

- Foraging cooperation
- Pod protection
- Parental care cooperation



“Whales Societies”



- **mother-calf link lasts up to weaning**
- **acoustic pod**



“Dolphin Societies”



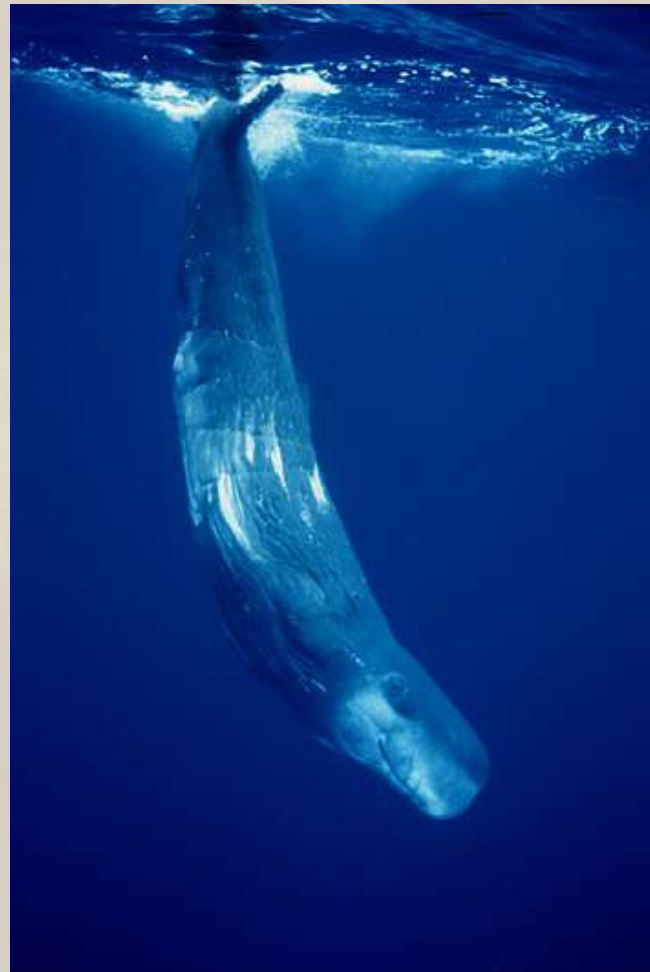
- Family pods
- Pods of males
“singles”
- Babysitting





Sperm whale

- **Family pod: adult females with calves**
- **Singles pod: males about 15-21 y.o., of the same size, number decreasing with the age**
- **Common lactation and babysitting**





Pilot whales

- **Max gregarious**
- **Family pod
“matriarchate”**
- **Males: resident
/ “overgroups”?**





Bottlenose dolphin

- Family unit: adult females with not-weaned calves
- After weaning: mixed pod of youngs
- Females → other family unit
- Males: link with other male of the same age, with reproductive and collaboration purposes



Striped dolphin

- **Pods of 10-40 individuals**
- **Group of adults with not-weaned calves**
- **Pods of youngs without sexual activity**
- **Interspecies interaction: striped dolphins and fin whales**





the end