Northern Fur Seal

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Callorhinus ursinus

Pelagic animals found in the **Northern Pacific**

Largest rookeries near the **Bering Sea** (Russia/ Alaska)

~Wikipedia

Callorhinus ursinus

- Clade: Pinnipeds (“seals”)
- Family: Otariidae (“otary”/ “eared seal”)
  - Examples: fur seals, sea lions
  - **Semiaquatic** animals
  - Limbs are large flippers; rear flippers can be rotated forward
  - Able to walk on all fours (on land) and propel (in water)
  - Feed and migrate in water, breed and rest on land
- Subfamily: Arctocephalinae (**Fur Seals**); dense underfur layer
- Genus: Callorhinus (“shortened nose”)

~ Wikipedia

PHYSICAL Features

Extreme sexual dimorphism

- Males are about 2m and 270kg, while females are 1.5m and about 50kg
- Males 30-40% longer, 4.5x heavier, larger canine teeth

- Foreshortened head and short, down-curved muzzle (nose)
- **Long whiskers** extending beyond the ears
- Fur: Full black in males, Dark silver gray with patterns in females

  Dense underfur in creamy colour with guard hairs

  Fur is absent on the top of the fore flippers

Hind flippers are proportionately longest, small claws on digits 2-4

~ Wikipedia

Perceptual Abilities

Whiskers (vibrissae)

- Sense for prey, predator, explore environment

~ Hanke et. al, 2013. Hydrodynamic perception in true seals (Phocidae) and eared seals (Otariidae) in Journal of Comp. Physio A

Great hearing abilities

Vocal recognition used between mothers and pups

~ Insley, 2000. Long-term vocal recognition in the northern fur seal in Nature Vol. 406 Issue 6794

No colour vision, but have good eyesight

~ New England Aquarium Blog. Northern Fur Seals.

BEHAVIOUR

Solitary feeding

- Prey: pelagic fish like herring and mackerel
- Predator: sharks and killer whales

Breeding

- Polygynous; males breed with up to 50 females each season (harem)
- Delayed implantation (only 4 months after fertilisation)

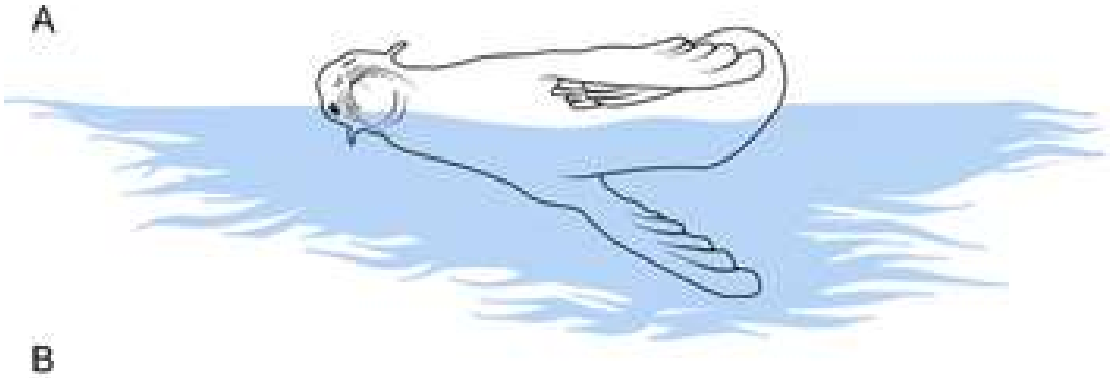
~Wikipedia

BEHAVIOUR

Unihemispheric Sleep (USWS) (especially in water), but also have BSWS, bihemispheric REM

~ Mascetti, 2016. Unihemispheric sleep and asymmetrical sleep: behavioral, neurophysiological, and functional perspectives in Nature of Science and Sleep

BEHAVIOUR



Jug handle posture

- Nostrils are above water surface to breathe
- Reduce heat loss from other limbs

Unilateral eye closure with **intermittent visual monitoring**

~ Kendall-Bar et. al, 2019. Eye state asymmetry during aquatic unihemispheric slow wave sleep in northern fur seals (Callorhinus ursinus) in PLoS ONE

Paddling needed to maintain asymmetrical posture

~ Lyamin et. al, 2017. Sleep in the northern fur seal in Current Opinion in Neurobiology

SIGN RELATIONSHIPS

Behavioural habit: **maintaining the "jug handle" posture**

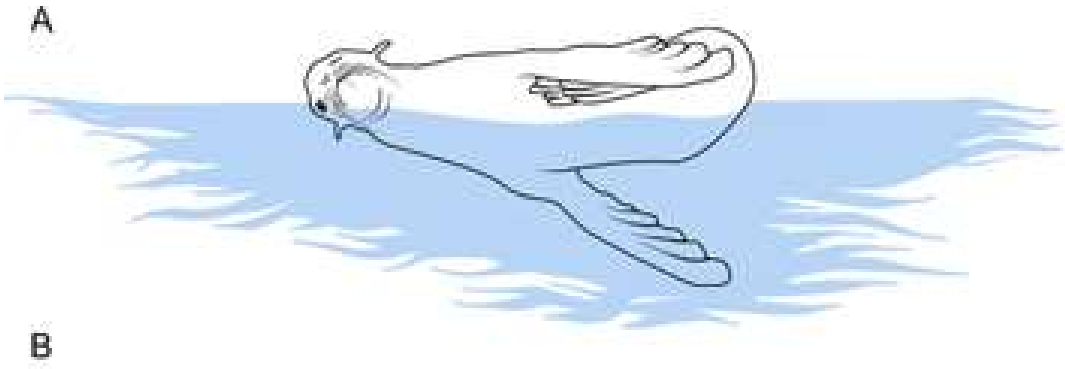
1. Fur seal senses posture; unknown if this perception is done via vision, vibrissae sensing or vestibular (or a combination)
2. More **Acetylcholine (ACh)** release in "awake" hemisphere

~Lapierre et. al, 2007. Cortical Acetylcholine Release Is Lateralized during Asymmetrical Slow-Wave Sleep in Northern Fur Seals in The Journal of Neuroscience

3. "Awake" hemisphere able to control contralateral foreflipper

Hypothesis

Northern Fur Seals use their **eyesight** to **sense and maintain their body position during USWS**.



Experiment

Monitor northern fur seals in tanks, including acclimatisation period to water and recording equipment

Eye contralateral to the waking hemisphere periodically opens

~ Kendall-Bar et. al, 2019.

- Include option to sleep on land

During sleep in the jug handle position, cover with cloth

(a) None of the eyes, (b) Both eyes

(c) The eye in the water ("waking eye")

(d) The eye above the water

Experiment

The hypothesis is true if fur seals in (b) and (c) who have the **"waking eye" covered are unable to maintain their jug handle posture**, while seals in (a) and (d) can.

Indicators of "not being able to maintain the jug handle position"

- Inability to recover from perturbations
- Reduced sleep times
- Preference to sleep on land