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Amphibious Vision in Sea Otters (*Enhydra lutris*)

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How has the visual acuity of sea otters evolved for survival in harsh freshwater + marine conditions?

Sea otters have developed stronger visual acuity. They adjust to various levels of light equally in air and water but struggle with the speed of adjustment during dives.
Sea otters forage at all times of day but spend a majority of their time above water in bright light. Because of this, they lack visual acuity in lower levels of light but compensate with alternate senses = high energy cost

Adaptations In Eye Structure:

1. Tapetum lucidum
2. Retina
3. Pupil

Function:

1. Improves vision in lower levels of light
2. Capture and transmit photons as chemical and electrical signals to the the brain for visual recognition
3. Controls the amount of light entering the eye

Pupil Adaptation

- The size + shape determines the amount of transmitted light to the lens and refracted to the tapetum lucidum and retina.
- Mobile in size but not in shape

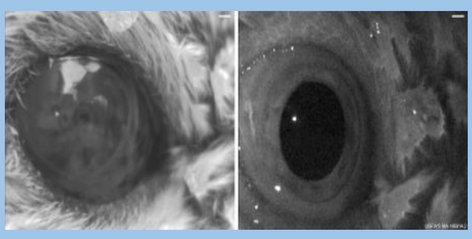
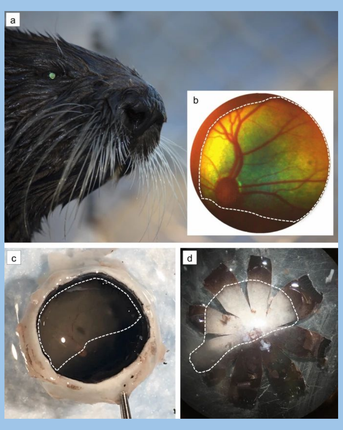


Image source: From "Adaptations for amphibious vision in sea otters (Enhydra lutris): structural and functional observations"

Retina Adaptation

- Heavily rod-dominated (rod cells = responsible for vision in low light)
  - similar to cats and ferrets



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Tapetum Lucidum Adaptation

- increases availability of light in darkness by reflecting any light to the retina
- TL thickness resembles with terrestrial carnivores

Importance of thickness?
- the thicker the TL the more light is captured and reflected in lower levels of light = better night vision

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