Electroreception

Octavolateralis System

Ampullary or Pit organs
Ampullae of Lorenzini

Raja

Kryptopterus

Ampullae of Lorenzini

Nostril

Nerves

Jelly filled canal

Sensory cell

Epidermis

Surface pore
Kalmijn, 1974
Source of bioelectric fields

Mechanism of Ampullae of Lorenzini

Electrical Field (mV)

0.003  0.005  0.007  0.009  0.010  0.012
Some species of shark swim in straight lines for long distances, they cross oceans.

Faraday's Law of Induction

Any change in the magnetic environment of a coil of wire will cause a voltage (emf) to be "induced" in the coil. No matter how the change is produced, the voltage will be generated. The change could be produced by changing the magnetic field strength, moving a magnet toward or away from the coil, moving the coil into or out of the magnetic field, rotating the coil relative to the magnet, etc.
Hypothesis of mechanism for detection of earth’s magnetic field.

Kalmijn, 1978
Ostracoderms

Who has it?

LOST IN NEOPTERYGI!

lost

Lost in amniotes

Basal for Vertebrates!
Imagine an environment where electrorception would not be useful.

**Sensory refuge?**
NEOPTERYGII are characterized by: loss of electroreception greatly improved swimming

Who has it?

Electroreception lost

- Non-ampullary organ-based electroreception
- Ampullary organ-based electroreception well-developed
- Ampullary organ-based electroreception well-developed
- Ampullary organ-based electroreception absent
- Ampullary organ-based electroreception absent
- Novel electroreceptive systems evolved at least twice
- Rostral organ-based electroreception well-developed
- Ampullary organ-based electroreception well-developed
- Ampullary organ-based electroreception in aquatic larva
- Ampullary organ-based electroreception in aquatic larva
- Ampullary organ-based electroreception absent
- Ampullary organ-based electroreception absent—novel electroreceptive systems evolved at least once

Who has it?
American knifefishes (Teleostei: Gymnotiformes)