

## Senses of fish

<b>For whom:</b> Lower and general upper secondary school	<b>Where:</b> In the classroom
<b>Wilderness passport section:</b> Fishing	<b>When:</b> All seasons
<b>Learning outcomes:</b> Comparing the senses of different animal groups to those of fish and reflecting on the significance of senses in fish.	<b>What you need:</b> Paper and pen, handout with the assignment and textbook/textbook section or Internet page on animal senses
<b>Duration:</b> 30 to 45 minutes	<b>Personnel resources:</b> 1

## INSTRUCTIONS

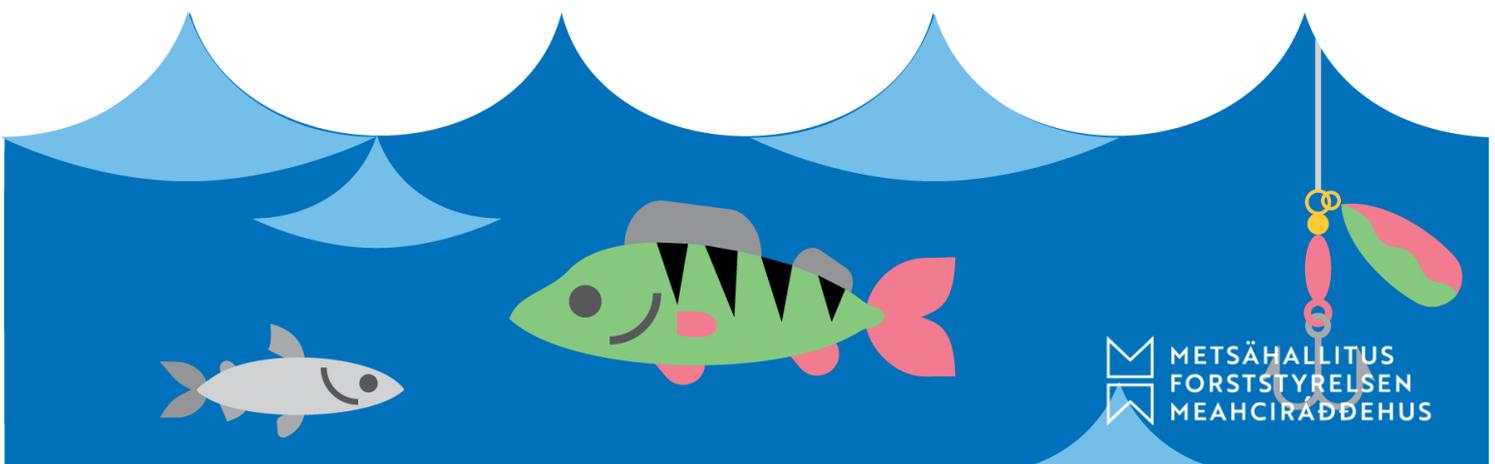
In this assignment, the pupils compare the senses of fish (for instance the pike), mammals (humans) and birds (the mallard). The idea is that the pupils find the answers either in their own textbooks and/or by using the Internet as a source of information.

## BACKGROUND

It goes without saying that compared to the senses of land animals, life in water creates different challenges and opportunities. For example, light gradually fades as the water gets deeper. The wavelength of red light only reaches the depth of a few metres; this means that you only need to go to the depth of about 5 metres for a red fish trap to look black. The senses of smell and hearing also work differently in the aquatic environment. In addition, fish have special senses, such as the lateral line sense and electroreception, which would be useless for land animals.

### Links

- About fish anatomy and senses on Wikipedia: [https://en.wikipedia.org/wiki/Fish\\_anatomy](https://en.wikipedia.org/wiki/Fish_anatomy)



## ASSIGNMENTS

### Compare the senses of different animal groups

Fill in the missing entries in the table. Which special features does each sense have in animals? Describe briefly the significance of each sense for the animal and the location of the relevant organs.

Use a textbook and/or the Internet to help you. Filling in the table is easier if you consider the habitats in which fish, mammals and birds live: which characteristics these conditions require and what kind of adaptations the animals could have developed.

Senses to be compared	<b>FISH</b> 	<b>MAMMALS</b> 	<b>BIRDS</b> 
<b>Sight</b>			
<b>Hearing</b>			
<b>Smell</b>			
<b>Taste</b>			
<b>Touch</b>			

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**FISH**



**MAMMALS**



**BIRDS**



Senses to be compared

<b>Sense of balance</b>			
<b>Electroreception</b>			
<b>Magnetoreception</b>			
<b>Lateral line sense</b>			

## QUESTIONS TO REFLECT ON

**1. What challenges and opportunities does water as a habitat offer for fish?**

**2. How can you benefit from your knowledge of fishes' senses if you go fishing?**

## ANSWERS

### Comparing the senses of different animal groups

Fill in the missing entries in the table. Which special features does each sense have in animals? Describe briefly the significance of each sense to the animal and the location of the relevant organs.

Use a textbook and/or the Internet to help you. Filling in the table is easier if you consider the habitats in which fish, mammals and birds live: which characteristics these conditions require and what kind of adaptations the animals could have developed.

Senses to be compared	<b>FISH</b> 	<b>MAMMALS</b> 	<b>BIRDS</b> 
<b>Sight</b>	Fish living in surface waters have developed the best sense of sight, whereas fish living on dark bottoms often have poor vision. The pike is an excellent example of a fish which uses its vision to hunt.	The rod and cone cells in the eye sense wave lengths of visible light. There are three types of cone cells that are sensitive to different wavelengths, or blue, green and red light. The rod cells, on the other hand, help you see in the dark.	Birds sense visible light and ultraviolet light. The so-called camera eye resembles the human eye in its structure. Mallards have excellent eyesight.
<b>Hearing</b>	The sense of hearing varies in different fish species. Fish do not have an outer ear, but their inner ear resembles the human inner ear in its structure. The pike also uses its hearing to hunt.	Most mammals, including humans, have two ears. The ear is divided into the outer, middle and inner ear. Vibrations travel through the auricle and ear canal to the eardrum and finally into the fluid of the cochlea in the inner ear.	Birds usually have excellent hearing. They have no external auricles and only one hearing bone that transmits eardrum vibrations. In many respects, the sense of hearing is very similar in birds and in humans.
<b>Smell</b>	The spread of odour molecules is inefficient in water. This is why the pike, for instance, does not have a particularly good sense of smell. Sensory receptors are found in the mouth and on the skin.	The cells that sense smells are located on the ceiling of the nasal cavity. The surfaces of these sensory cells have different receptors for different odours. It has been estimated that humans are able to smell up to 10,000 different molecules.	With some exceptions, birds do not have a very good sense of smell.
<b>Taste</b>	Especially fish that live and prey in cloudy waters have a well-developed sense of taste. For fish, the sense of taste is a so-called localised sense, which they use to check if food is fit to eat.	Humans can taste at least five basic flavours. The taste receptor cells are located on the tongue and in the mouth and pharynx, and they guide us to eat the right things.	Many species have an accurate sense of taste, which allows them to identify edible materials. The taste receptor cells are usually located in the bill.

<b>Touch</b>	The sense of touch and ability to feel pain have been studied in fish. It has been shown that fish have pain-sensing nerve endings in the head area, although they do not feel pain in the same way as mammals, for example.	In addition to the skin, receptors for sensing touch are found in muscles, joints and internal organs. The sense of touch is used to perceive touch, sharpness, softness, temperature, pain and body positions.	These receptors are found in the feet, bill and skin. Birds have a highly sensitive sense of touch.
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	<b>FISH</b>	<b>MAMMALS</b>	<b>BIRDS</b>
Senses to be compared			
<b>Sense of balance</b>	Fins (especially pectoral fins), swim bladder and lateral line help fish stay in balance.	The sense of balance is based on the combined effect of proprioception, vision and the inner ear.	The vestibular system is found in the inner ear. Flying requires excellent balance, which is why the hindbrain is highly developed in birds.
<b>Electroreception</b>	Sensory organs located on the skin (especially in the head) are used to detect electrical impulses produced by other organisms. Helpful in hunting. Only in some species.	Not applicable	Not applicable
<b>Magnetoreception</b>	Not applicable	Not applicable	Helps to navigate during migration. The exact mechanism is not known, but apparently birds use the sensory cells in the head to sense the earth's magnetic fields.
<b>Lateral line sense</b>	The fish use the lateral line to sense changes in pressure waves in the water. The lateral line is located on the side of the fish and consists of perforated scales. The lateral line allows the fish to navigate in the water and catch other fish.	Does not apply	Does not apply

### **Sources of the photographs**

- Pike, Aku Ahlholm/Metsähallitus
- Human, Petri Jauhiainen/Vastavalo
- Bird, Markku Pirttimaa