

Lord of the Things – Teaching material

Lord of the Things – teaching material is produced by the Helsinki Commission. The Helsinki Commission (HELCOM) works to protect the marine environment of the Baltic Sea from all sources of pollution through intergovernmental co-operation between Denmark, Estonia, the European Community, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden. HELCOM is the administrative body of the “Convention on the Protection of the Marine Environment of the Baltic Sea Area” – more usually known as the Helsinki Convention. In the protection of the Baltic Sea area, the key issues requiring action are eutrophication, toxic (hazardous) substances, maritime activities and biodiversity.

The teaching material is designed for 11-13 year old students. The material includes a cartoon with Lord of the Things film, exercises and a paper version of these exercises. This material can be copied. The material can be used both in English, Biology and Geography lessons. This teaching material is meant to help teachers deal with questions related to the protection of the Baltic Sea. The Lord of the Things film is a tale of how we can all help to achieve a healthy Baltic Sea.

The material can also be downloaded from the HELCOM website: www.helcom.fi under the “Publications” section.

The film includes important terminology which is not easy for all students to understand. This material provides the teacher with additional material to deal with the issues of e.g. eutrophication, loss of biodiversity and the fragile ecosystem of the Baltic Sea in greater detail. The material also includes descriptions of some organisms that live in the Baltic Sea and communicative exercises which encourage students to exchange ideas and have discussions either in English or in their mother tongue.

We wish you and your students interesting lessons with this material.



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Teaching unit 1: The Baltic Sea

You will need:

- Lord of the Things -film
- Copies of the map and exercises 1-4 for each student
- Copies of the text on the Baltic Sea
- A blank piece of paper, size A4

Instructions:

- Begin the lesson by showing the Lord of the Things film
- Give students the text on the Baltic Sea to read
- Give students exercises 1 and 2
- Check exercises 1 and 2 together
- Divide the students into pairs and give exercise 3
- Ask each pair to tell the rest of the class the conclusions they have come to
- Give each students a copy of the cartoon exercise and a blank piece of paper, size A4
Ask students to do exercise 4
- Hang the results of exercise 4 on the classroom wall

Duration: 2-3 lessons (each lesson about 45 minutes)

The Baltic Sea

Young sea with brackish water

The Baltic Sea is the youngest sea on the planet. It has brackish water which means that the water has a lot less salt than open oceans. The salinity of the northern and eastern parts of the Baltic Sea is 1-2 PSU (parts per thousand) and in the southern part it is 20 PSU. For example, the salinity of Atlantic and Pacific Ocean waters is about 35 PSU. The many rivers flowing into the Baltic Sea bring fresh water and the only way it gets salty water is from the North Sea through the narrow passage between Denmark and Sweden. The fresh and the salty water get mixed and this is how the Baltic Sea gets its brackish water. At the same time as salty water flows into the Baltic Sea, some brackish water flows out into the North Sea.

Shallow sea with little oxygen

The Baltic Sea is shallow and divided into many basins of varying depths. Because there is not very much water exchange in the Baltic Sea, the bottoms of these basins can easily become areas where there is no oxygen. Oxygen is important to the survival of animals and plants in the sea, therefore areas where there is no oxygen also have no life. The flow of salty water from the North Sea has to be extremely strong to reach the deepest basins. The salty water goes easily to the bottom because it is heavier than the brackish water. This is important because the salty water mixes the water in the basins and brings oxygen to the deepest areas of the Baltic Sea.

Few species

There are fewer species in the Baltic Sea than in open oceans. In the Baltic Sea, the salt level is either too low for the marine species or too high for the fresh water species. This alone makes life difficult for the different species in the Baltic Sea. But, survival for many species is becoming more difficult as the sea is getting more and more polluted. Also, the climate in the Baltic Sea region affects the living conditions of species. The northern and eastern parts of the Baltic Sea freeze over in winter. This is also one reason why there are more species in the southern parts of the Baltic Sea than in the northern and eastern parts.

Polluted sea

The Baltic Sea is still one of the most heavily polluted seas in the world. Nine countries share the Baltic Sea coastline: Sweden and Finland in the north, Russia, Estonia, Latvia and Lithuania in the east, Poland in the south, and Germany and Denmark in the west. About 16 million people live along the coast, and around 90 million in the entire catchment area of the Baltic Sea. In addition to the countries bordering the Baltic Sea, the catchment area also includes parts of Belarus, the Czech Republic, Norway, the Slovak Republic and Ukraine, as some of the rivers entering the sea begin far inland. In the catchment area, industry, traffic and farming are the main causes of pollution to the Baltic Sea. The Baltic Sea is very sensitive to pollution because it gets new, cleaner water from the North Sea too slowly and the polluted water flows too slowly out into the North Sea. Polluted water can stay in the Baltic Sea for up to 25-30 years.

EXERCISE 1 Names on the map

Write down the following names on the map.

A. Countries around the Baltic Sea:

Denmark
Estonia
Finland
Germany
Latvia
Lithuania
Poland
Russian Federation
Sweden

B. Other countries in the catchment area:

Belarus
The Czech Republic
Norway
The Slovak Republic
Ukraine

C. Parts of the Baltic Sea:

Archipelago Sea
Åland Sea
Arkona basin
Bay of Mecklenburg
Belt Sea
Bornholm basin
Bothnian Bay
Bothnian Sea
Eastern and Western Gotland Seas
Gulf of Finland
Gulf of Gdansk

Gulf of Riga
Kattegat
Kiel Bay
Northern Baltic Proper
Pomeranian Bay
The Sound
Southern Baltic Proper

D. Islands:

Åland Islands (Finland)
Bornholm (Denmark)
Gotland (Sweden)
Hailuoto (Finland)
Hiiumaa (Estonia)
Oland (Sweden)
Rügen (Germany)
Stockholm Archipelago (Sweden)
Usedom or Uznam (split between Germany and Poland)
Wolin (Poland)

E. Capitals:

Berlin
Copenhagen
Helsinki
Minsk
Moscow
Oslo
Riga
Stockholm
Tallinn
Vilnius
Warsaw



0 100 200 km

EXERCISE 2 Features of the Baltic Sea

A. Colour the line surrounding the Baltic Sea catchment area.

B. Add the following numbers to the correct places on the map.

1. A lot of salt
2. A smaller amount of salt
3. Lots of people
4. A smaller number of people
5. Many species
6. A smaller number of species
7. The sea freezes in the winter
8. The sea does not freeze

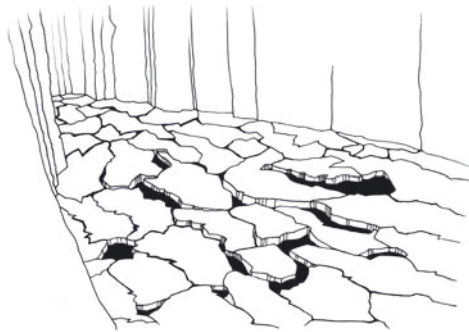
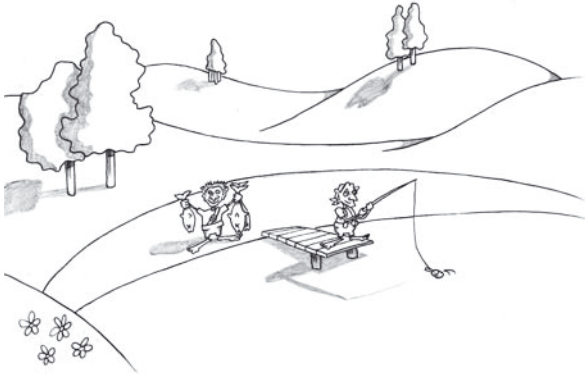
EXERCISE 3 Explain shortly to your partner

What makes the Baltic Sea unique in the world?

EXERCISE 4

Make a cartoon according to the film

A. Put the pictures in the correct order according to the film and glue them on a piece of paper.



B. Write shortly what happens in each picture.

C. Compare the results.



Teaching unit 2: The life of the Baltic Sea

– My future is your future

You will need:

- Safety pins or pins; one for each student
- Copies of info cards on species and ID-cards. One info card and one ID-card per student
- About 25 strings of wool per group, each string 50 cm in length
- 2 soft balls per group

Instructions:

- Read exercises 1-5. With every exercise you will find more detailed instructions
- Teacher-centred classroom work is recommended throughout these 5 exercises
- These exercises introduce 13 species of the Baltic Sea and this is why it is a good idea to divide the class into groups of 13 students already in the beginning of the teaching unit. If one group would have less than 13 members you can leave out a couple of species. For example, copepods, flounder, cod and common gull can be left out
- Exercises 1,2 and 5 can be done with the whole as one group
- Exercises 3 and 4 are best done in smaller groups defined by the number of species
- Give each student one info card and one ID-card
- Ask students to find out only what they need to know in the text for a particular exercise
For example, for exercise 1 students' task is to find out what group their species belong to etc

Duration: 2 lessons

EXERCISE 1

Get to know species of the Baltic Sea

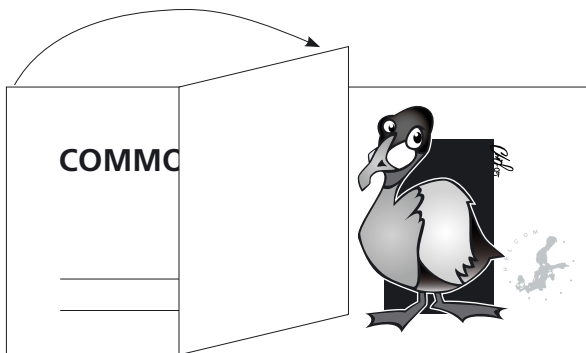
This teaching material includes info cards of different species of the Baltic Sea. There are 13 species introduced. There are examples of many groups of organisms and all these species are dependent on each other.

- A. Give each student a card. It doesn't matter if more than one student has the same card.
- B. Ask students to read the text on the card. Then ask them to make "an identification card" for themselves. This ID-card should have a name of the group the species belongs to (e.g. mammal, algae, etc).
- C. Ask students to pin the ID-card on their chest.
- D. Ask students to form two circles with the same number of students each: an inner circle and an outer circle.
- E. Ask students to introduce themselves (the species on the ID-card) to each other. The inner circle goes clock-wise and the outer circle goes anti clock-wise. Students should walk slowly so that they have time to shake hands and talk. If necessary ask students to do this introduction twice.

EXERCISE 2 Do you remember the names and groups?

For this exercise you will need two soft balls.

- A. Ask students to form one big circle with ID-cards so that they can see only the picture of the species.



- B. Ask a student to throw a ball to another student whose name and group they can remember. If more than one student has the same ID they should not throw the ball to those who have the same ID.
- C. Continue until every student has got the ball at least once.
- D. You can make the game a bit more exciting by having two balls in the game at the same time.

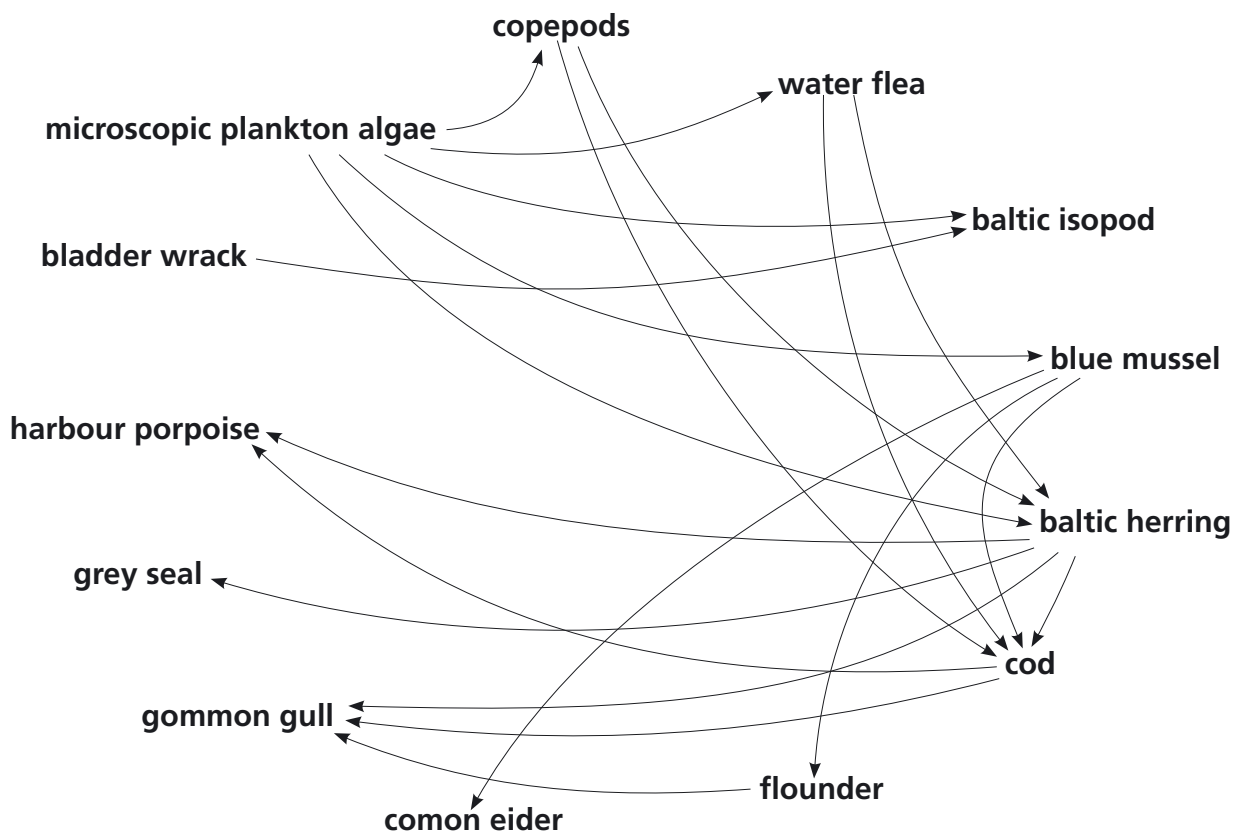
EXERCISE 3 What kind of species are you?

- A. Students sit in a circle so that they can see each other.
- B. Everybody tells a couple of interesting things about the species they represent.

EXERCISE 4 What do you eat?

You need 25 pieces of woollen strings, about 50 cm each.

- Students find out what they eat from their info cards. Students can have the ID-cards if necessary.
- Students take as many strings of wool as they have species to eat.
- While holding onto one end of their strings, students give the other end to those species that are part of their diet. Students should hold the strings of wool until everybody has found something to eat.
- Finally, students form the food web typical for the Baltic Sea.
- Now, students can say what species is eaten most.
- The species that is eaten most dies and lets go off their strings. Ask students to think how this would affect the other species in the food web.



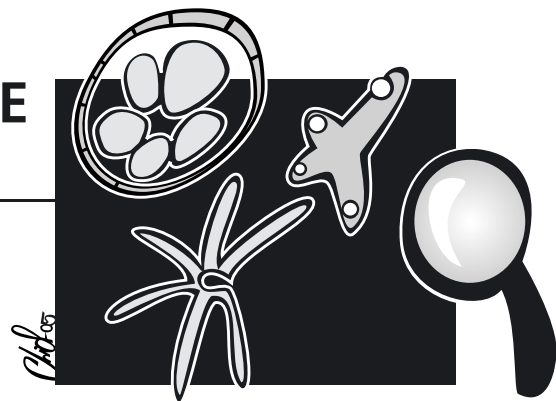
EXERCISE 5 Are you in danger?

- A. Students read this chapter in the info cards.
- B. Divide the class in two groups: group 1 those in danger, group 2 those not in danger.
- C. Students (species) in group 1 tell others why they are in danger.
- D. Students (species) in group 2 tell others why they are not in danger.

Alternative C and D

Group 1 discusses things that threaten them and then mime one of these threats at a time to group 2. Group 2 tries to guess what the threat is, and vice versa.

MICROSCOPIC PLANKTON ALGAE AND CYANOBACTERIA



What do they look like?

Microscopic plankton algae and cyanobacteria are so tiny that they cannot be seen by the naked eye. You need a microscope to identify different species from each other. They have only one cell and they can have different kinds of flagellas and cilia. Sometimes they can grow together as a line of cells. They can be identified by the shape or the colour of the cell.

If the number of individuals of microscopic plankton algae and cyanobacteria grow enormously they form so-called algal blooms. They colour the water and then it is easy to see them.

Where do they grow?

The microscopic plankton algae and cyanobacteria live as deep in the water as the rays of sunlight can reach because they need the sunlight to survive. They can float in the water with their flagellas and cilia. Some of them use gas bubbles or drops of oil to help them float. They can also be found on top of other bigger algae.

What do they need to live?

They need sunlight for the photosynthesis. They take carbon dioxide and water from the surrounding water to make sugar and oxygen. Sugar is the microscopic plankton alga's and cyanobacteria's food, so they are able to make their own food. They also take nutrients from the surrounding water. They use both sugar and nutrients to live and to multiply. Some of the sugar is used in respiration to give them energy. For respiration they need oxygen which is also made during photosynthesis.

Are they important species in the Baltic Sea?

The microscopic plankton algae and cyanobacteria are the beginning of the food chain. Therefore they play an important role in the marine animal and plant community. All the plankton animals, called zooplankton, many other invertebrates and some fish eat them. Without them other species will not survive.

Are they in danger?

The more nutrients in the sea the better the living conditions are for microscopic plankton algae and cyanobacteria. There have always been algal blooms in the sea. However, massive blooms have become more frequent and intense due to the eutrophication of the sea. So they are not in any danger.

Does it matter if there are mass algal blooms?

Nowadays, harmful algal blooms occur in the Baltic Sea every year. Wide and dense blooms threaten life in the sea and negatively affect the use of marine resources, for example beaches and fishing. Algal blooms can be toxic and are therefore not only an aesthetic nuisance but also a real health risk for humans and animals. Regional algal blooms can occur earlier or later in the summer, depending on the weather and the nutrients available in the water.

BLADDER WRACK

What does it look like?

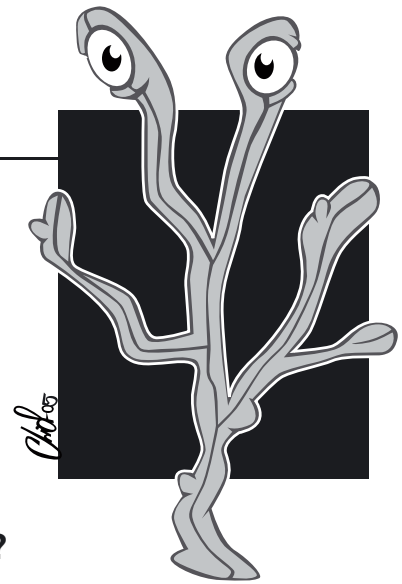
Bladder wrack can grow to over one metre. In its typical form, bladder wrack has air filled bladders that are attached in pairs. The leafy lobes have a clear central trunk that reaches all the way to the top. Its colour can vary from yellowish-green to brownish. It looks like a plant but it is an alga. Bladder wrack is a member of the brown algae group.

Where does it grow?

It grows almost everywhere in the Baltic Sea. It can be found in shallow waters where it grows on rocks and cliffs. It grows from shallow waters to 5 metres' depth. Bladder wrack grows only if the water is fairly clean.

What does it need to live?

Bladder wrack needs sunlight for photosynthesis. The alga takes carbon dioxide and water from the surrounding water to make sugar and oxygen. Sugar is the alga's food, so the alga is able to make its own food. It also takes nutrients from the surrounding water. It uses both sugar and nutrients to grow and to make new leafy lobes. Some of the sugar is used in respiration to give the alga energy. For respiration it needs oxygen which is also made during photosynthesis.



Is it in danger?

Bladder wrack is uncommon or has completely disappeared from certain areas of the Baltic Sea where it was quite common before. It can no longer live as deep as it used to.

It is believed that over-fertilisation in farming is the main reason for bladder wrack's problems. Over-fertilisation happens because people use too many nutrients for growing crops. Rain can wash large amounts of nutrients into rivers and streams and in the end into the Baltic Sea.

Over-fertilisation results in a massive growth of microscopic plankton algae and other particles in the water which make the water murky and thereby prevents the sunlight from reaching bladder wrack. Nutrients also help bigger green algae to grow. Green algae attach easily to bladder wrack and press it down. This makes it even harder for bladder wrack to get sunlight and without sunlight it dies.

Is it an important species in the Baltic Sea?

It is like a hotel for many species. Several crustaceans and many other marine invertebrates live among bladder wrack and eat it.

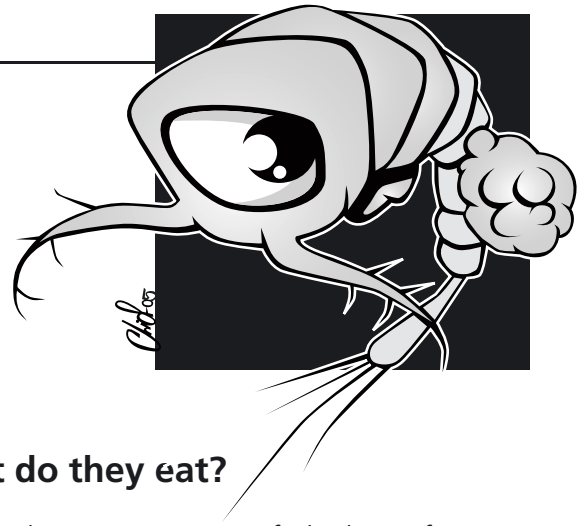
COPEPODS

How do they look like?

Copepods are a type of zooplankton. They are often transparent with a yellow to red tone. Copepods have three body parts – front, middle and back. In the front part of their body they have two antennae and one eye. They have many pairs of legs which they use for swimming. They are microscopic. Their maximum length is about 1.1 cm. Copepods are crustaceans.

Where do they live?

They live anywhere from sea-level to a depth of at least 4 000 m.



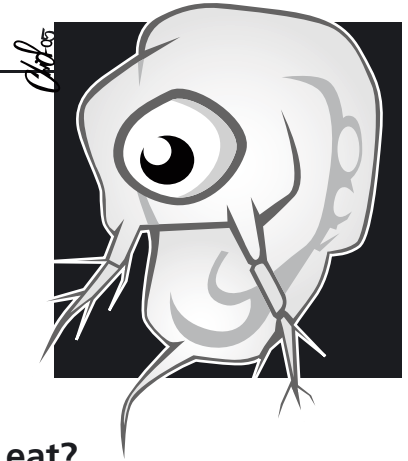
What do they eat?

Copepods eat most types of plankton: from microscopic plankton algae to other copepods.

Are they in danger?

Copepods will do well as long as there is food in the sea. Their enemies are for example crustaceans, mussels and fish.

WATER FLEAS



What do they look like?

Water fleas are a type of zooplankton. A water flea's body is covered by two shells that create an opening underneath. On its head it has one eye and two large antennae. The large antennae they use for swimming. Under its belly it has many legs which it uses to get water and food into its gills and mouth. Water fleas are microscopic and their maximum length is 0.6 cm. Water fleas are crustaceans.

Where do they live?

They can be found from the water surface down to a depth of a few metres. Water fleas are mainly freshwater organisms, but a few species tolerate brackish water.

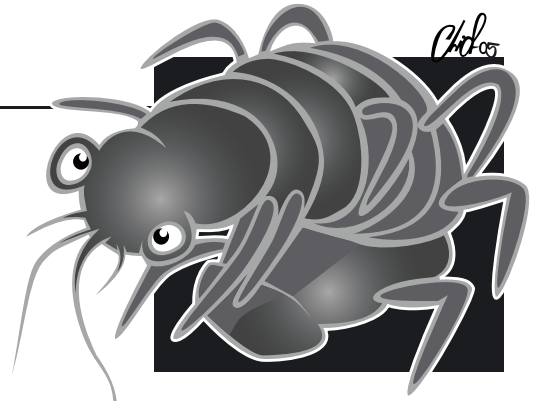
What do they eat?

Water fleas eat microscopic plankton algae and cyanobacteria.

Are they in danger?

Water fleas will do well as long as there is food for them in the sea. Their enemies are for example crustaceans, mussels and fish.

BALTIC ISOPOD



What do they look like?

The body of the Baltic isopod is elliptical; the back part of the body is narrower than the middle body. It has two kinds of antennae: the inner antennae are short while the outer are about a fourth of the body's length. Its colour can vary greatly, but it is usually greenish, dark brown or reddish and may have spots or patches. Females are shorter than males. Females' maximum length is 2 cm and males' 4.2 cm. The Baltic isopod is a crustacean.

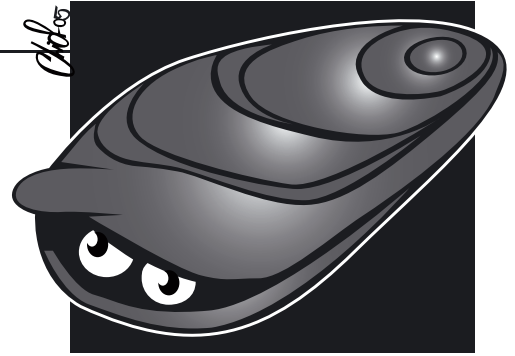
Where do they live and what do they eat?

Baltic isopods can be found from a depth of 20 m up to the water surface. They like to hide in bushes of bladder wrack where they can find microscopic plankton algae for nutrition. They also eat bladder wrack and sometimes only eat the soft parts leaving behind the hard trunk.

Are they in danger?

Sometimes fish eat Baltic isopods but usually fish have difficulties finding them because they can hide among bladder wrack. They hold so tight to the bladder wrack that it is very hard to get them off. They don't have dangerous enemies, but they would be in danger if bladder wrack disappeared because then they would have no place to stay.

BLUE MUSSEL



What do they look like?

Blue mussels' shells are bluish-brown-violet in colour. The blue mussel is inside two shells which are oval-shaped. In the shell you can see growth rings which tell how old the mussel is. In the Baltic Sea the blue mussel is rarely bigger than 5-6 cm long. The less salt there is in the water, the smaller they are. Blue mussels are molluscs.

Where do they live?

Blue mussels can be found on rocks and on sandy bottoms. Small blue mussels can attach onto bladder wrack. They live from shallow waters to a depth of 30 meters. They often live really close to each other at the bottom in so-called mussel banks.

What do they eat?

Blue mussels filter microscopic plankton algae from the water. They pump water inside their bodies, take the food from the water and then pump the water out. An about one-year-old mussel has the ability to pump between 2-3 litres of water an hour while an older mussel can pump as much as 6-9 litres an hour.

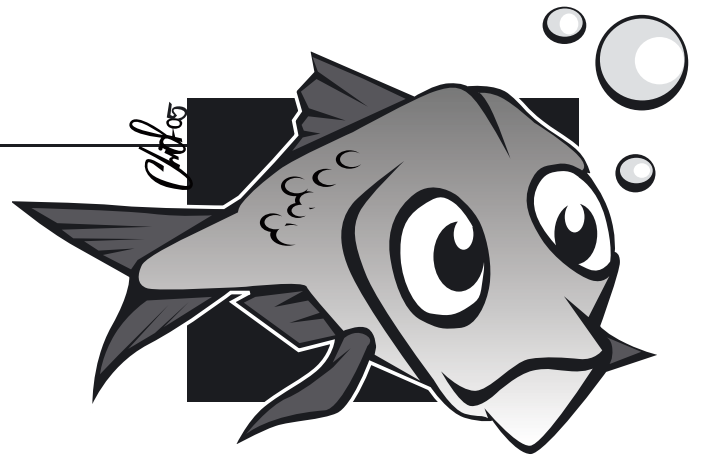
Are they in danger?

The most important thing for the blue mussels is to have enough salt in the water. The less salt there is in the water the smaller the mussels and the fewer the number of eggs and larva they produce. Blue mussels are food for eider ducks and crabs. Many fish, especially Baltic herring, eat its larva. The number of blue mussels varies greatly from year to year and it is not known well why this happens. It is not in danger if the water is salty enough.

Are they important for the Baltic Sea?

Blue mussels are an important food for some animals. Large mussel banks also offer shelter for many other animals. Blue mussels filter a large amount of microscopic plankton algae from the water and therefore keep the water clean.

BALTIC HERRING



What does it look like?

The Baltic herring is a small fish which is only 12-20 cm long and weighs 30-39 g. Its sides are silver and its back is dark grey. It has a big head where the lower jaw is longer than the upper one. The mouth is especially designed for eating plankton. It enables Baltic herring to get a lot of water into its mouth at one time and so also a lot of plankton. It has no teeth because it doesn't need them.

What does it eat?

It swims in open waters and eats mostly zooplankton but also plankton algae.

Where does it live?

The Baltic herring lives in all parts of the Baltic Sea. For the most part of the year, it inhabits the open sea and the open stretches between islands.

Is it in danger?

Today the number of Baltic herring has gone down because of falling salinity levels and changes in the amount of zooplankton. The Baltic herring is one of the most important catches for fisherman. It has been over-fished. Many birds, seals, harbour porpoises and bigger fish eat it. Today Baltic herring has got toxic substances called dioxins inside its body which are bad for its health. Animals that eat Baltic herring also suffer from dioxins.

COD



What kind of fish is it?

The cod has a long body and a very big head with a large mouth and sharp teeth. It has an overbite (its upper jaw is slightly longer than its lower jaw). It also has a barbel (a whisker under its lower jaw) and a light coloured streak from the back of its head to the end of its tail. Its colour can vary depending on its environment. Among water plants its colour can be red, brown or greenish. In open water or on sandy bottoms it can be light grey.

The cod grows fast. A two-year-old cod is normally 25 cm long and weighs 500 g. At the age of ten it can be 90-120 cm long and weigh 8-15 g. It can even grow up to 150 cm and can weight almost 40 kg. It is a strong and powerful beast which can swim fast.

What does it eat?

The cod is also known as “the vacuum cleaner of the seas” because it eats all the time and it eats everything. As a young fish it eats shellfish like water fleas, copepods, worms and other invertebrates like blue mussel. As an adult its main food is Baltic herring.

Where does it like to live?

Usually it swims close to the sea floor, but it also swims in the open sea from the depth of 5 metres down to 600 metres.

Cods need salty water. Cod eggs will only float and survive in fairly salty and oxygen-rich water, so their main spawning areas are in the south-western waters of the Baltic Sea. This is also why there are relatively few cods in the Gulf of Bothnia and the Gulf of Finland where the water is not that salty.

Is it in danger?

The situation for cods is not very good. The number of cods has gone down. There are mainly two reasons for this. First, during the 1980s and 1990s the Baltic Sea did not get enough salty water from the North Sea. In some areas of the Baltic Sea, water which had enough salt for the cod eggs had too little oxygen.

Secondly, the cod is the most important commercially exploited fish species in the Baltic Sea. It is heavily over-fished. Nowadays, there are not enough baby cods and the number of cods is decreasing fast.

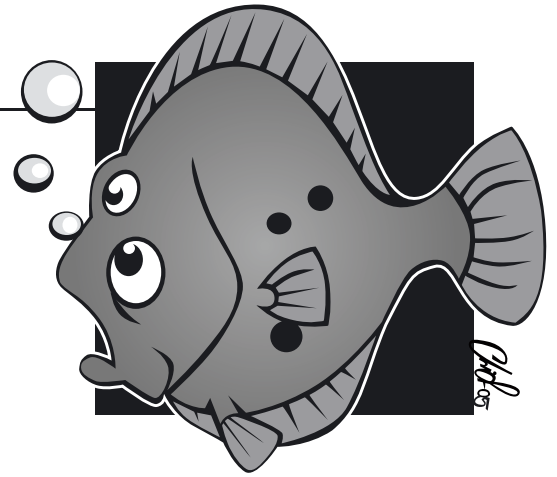
FLOUNDER

What does it look like?

The flounder is one of the funniest looking fish in the Baltic Sea. Its body is very flat and oval shaped. The majority of flounders turn their right side upwards, but up to a third can be left-sided. It swims on its side. The flounder has normally a white belly and a mixed brown back. It can change its colour to resemble the colour of the bottom. The flounder has rows of bumps along its back. It has both its eyes on the top side of its body. It can grow up to 50 cm long but its normal size is 20-35 cm. It weighs 300-600g.

Where does it live?

The flounder is found from the shoreline down to a depth of about 25 metres. The younger flounders keep to shallower waters. You can find them on muddy and sandy bottoms. Some of them wander up rivers into fresh-water.



What does it eat?

The flounder's diet consists of worms, shrimps, fish and common mussels like blue mussel. For the flounder every day is almost the same. It is most active at night in shallow waters, while during the day the flounder digs into mud and sand to rest.

Is it in danger?

Flounders can only mate in areas where there is at least 1 % salt in the water. At lower salt levels the eggs sink and often die. The flounder is fished, but not too much. It is not in danger and the number of flounders in the Baltic Sea has stayed almost the same for many years.

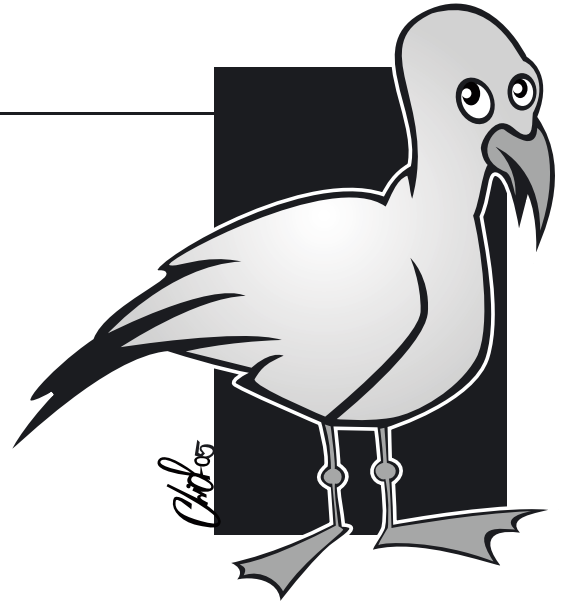
COMMON GULL

What does it look like?

The common gull is one of the smallest gulls in the Baltic Sea region. It has the friendliest looking face of all gulls. It has a small and thin bill and a round shaped head. The upper wings are pale grey in colour and the wings have black tips with white spots. The legs and the bill are greenish-yellow. Its wingspan is 99-108 cm. Its length is 40-46 cm and it weighs 300-480 g. The calls of common gulls are; 'ke ke ke ke kleeeh-a' and is said to resemble laughter.

What does it eat?

During winter, common gulls feed mainly on earthworms. At other times of the year they will also eat insects, fish like baltic herring, small mammals and rubbish.



Where does it live?

In the summer the common gull breeds on coasts and islands where there are a lot of different kinds of water plants. During the winter they can be seen on farmland, and they are often seen looking for food in rubbish dumps.

Is it in danger?

The common gull is not in danger at present.

COMMON EIDER

What does it look like?

The common eider is the largest duck in the Baltic Sea. It weighs 1 800 g on average, but its weight can vary from 850 to 3 025 g depending on sex and time of year. Its length is 50-70 cm and its wingspan 110 cm.

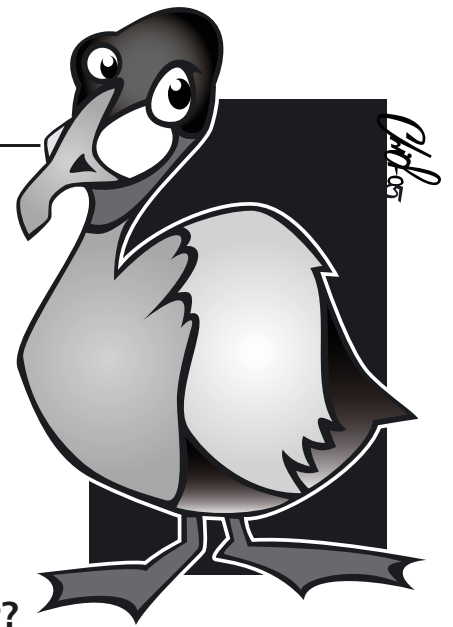
The best way to identify an adult male is to look for its white cheek, throat, neck, back and breast. Further, the top of the head, the sides, the belly and the tail are black and it has green on the back and the sides of the neck. Adult females are mostly brown, with black stripes.

What does it eat?

The common eider gets its food during the day by diving to the bottom to a depth of 3 to 20 metres. It eats mainly blue mussels which it swallows whole.

Where does it live?

The common eider lives along the shore and on the islands of the Baltic Sea.



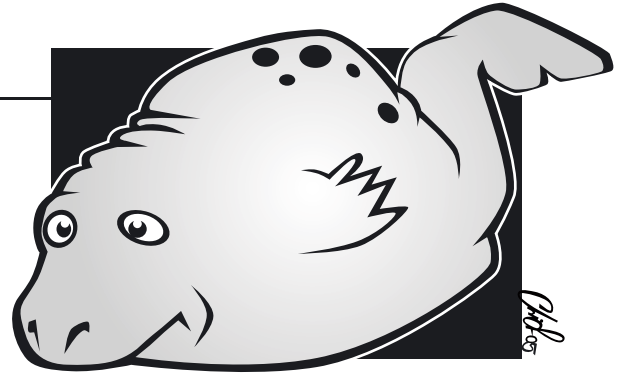
Is it in danger?

The main predators of common eiders are large gulls which eat the eggs and the baby birds. Because they nest mostly on small islands, common eiders have few mammal predators. Sometimes foxes and minks may be of danger to them.

Transportation of large amount of crude oil in the Baltic Sea is a threat to birds. Increasing oil transportation will raise the risk of a large oil spill. Oil in the water makes the birds' feathers greasy so that they get cold and cannot fly. When they try to clean themselves, they get toxic oil into their system.

Despite predators and oil transport, the number of common eider has grown a little in the Baltic Sea area during recent years.

GREY SEAL



What does it look like?

The male grey seal is 195-230 cm long and weighs 170-310 kg. The female has a length of 165-195 cm and a weight of 95-105 kg. This is a seal species where the male and the female look clearly different. The male grey seal has a long nose, heavy shoulders and thick, folded skin around the neck. The coat of mature males is dark brown, grey or black with lighter blotches on the neck and sides. The female's nose is shorter and narrower and is lighter in colour, with dark spots on a grey or yellowish background. Grey seals are mammals.

Where does it live?

The grey seal can be found everywhere in the Baltic Sea, but is more common in northern waters. Grey seals live in groups; at summer time they gather on outer islands and rocks, and in the winter they gather on drift-ice close to open water. The pups are born on the ice in late winter.

What does it eat?

The grey seal mainly eats fish, mostly Baltic herring and cod. It can also eat crustaceans.

Is it in danger?

The grey seal in the Baltic Sea is in danger. Many of the fish species in the grey seal's diet are over-fished, so it has to compete with fishermen. Sometimes grey seals steal from fishing nets and completely empty them. They also destroy fishing nets. Sometimes grey seals get caught in the fishing nets and drown.

The Baltic Sea is one of the most polluted seas in the world. In the Baltic Sea you can find toxic substances such as DDT and PCB. They cause illnesses and wounds to grey seals. Sometimes seals can get so sick that some of them can no longer have babies.

Increased transportation in the Baltic Sea and the construction of new ports and oil and chemical terminals disturb grey seals. This is also a threat to the grey seal population.

In the early 20th century there were a lot of grey seals but then the number of grey seals started to decrease fast. Currently the population seems to be recovering in the northern part of the Baltic Proper and the Gulf of Bothnia. However, in the southern parts of the Baltic Sea the situation for grey seals is still bad.

HARBOUR PORPOISE

What does it look like?

The harbour porpoise is a small whale. Its back is brown or dark grey, changing to a lighter grey on the sides. Its flippers are small, dark and slightly rounded; the fin on its back is triangular and is located in the middle of its back. With its back fin and small body size, this porpoise is easy to identify.

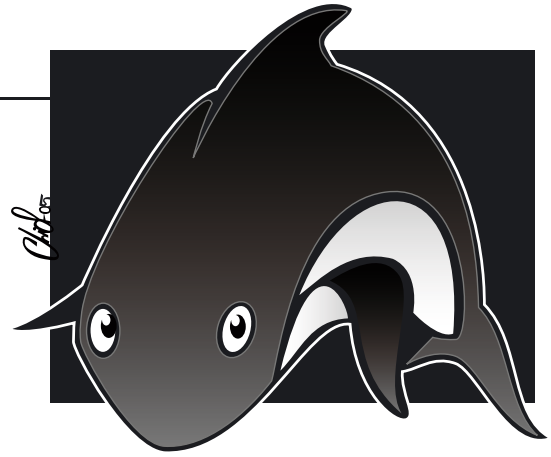
The average length for a harbour porpoise is 1.3-1.8 metres although it can grow to about 2 metres. Females are slightly larger than males. They weigh 45-65 kg, with a maximum of 90 kg. The harbour porpoise is a mammal.

Where does it live?

The harbour porpoise lives in the southern Baltic Sea and can sometimes be seen even off the Finnish coast. Harbour porpoises live in pairs or in small groups, always near the coast.

The harbour porpoise is a really good diver. Normally it dives to about 20-30 metres depth but it can dive down to more than 200 metres. It usually stays under water for a few minutes at a time. It has lungs and that is why it has to come to the surface to breathe.

Harbour porpoises rarely approach boats to ride bow waves, and often actively avoid vessels. They move by 'rolling' slowly forward in the water, and are not as acrobatic as other small whales. They also remain still, especially at night.



What does it eat?

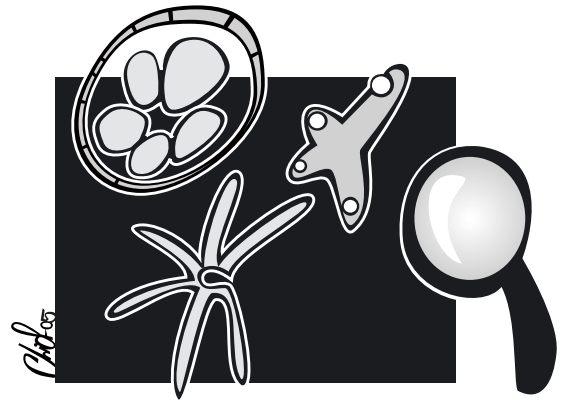
In the Baltic Sea the harbour porpoise eats fish, mostly Baltic herring and cod.

Is it in danger?

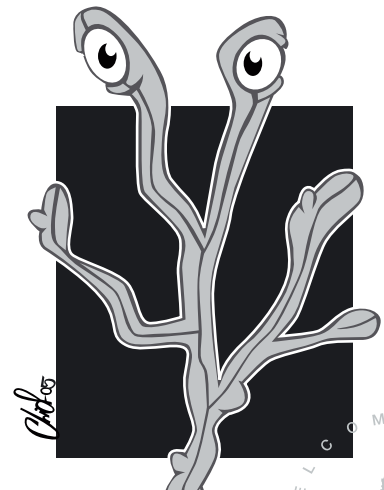
In the past, the harbour porpoise was hunted for food and its fat. Today, the most significant threat in most areas is fishing nets. Harbour porpoises often get caught in fishing nets and drown. Other types of threats include pollution, ship traffic, noise, and over-fishing of Baltic herring and cod. The Baltic Sea is one of the most polluted seas in the world. In the Baltic Sea you can find toxic substances such as DDT and PCB which cause illnesses and wounds to harbour porpoise. Sometimes harbour porpoises get so sick that they cannot have babies.

The number of harbour porpoises has gone down dramatically during the 20th century. In the beginning of the 20th century there were approximately 10 000-20 000 harbour porpoises. Today, there are only approximately 600 harbour porpoises left, mainly in the southern part of the Baltic Sea.

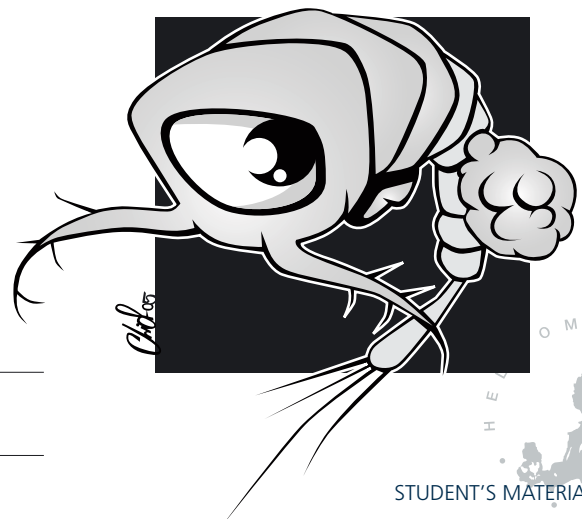
MICROSCOPIC PLANKTON ALGAE AND CYANOBACTERIA



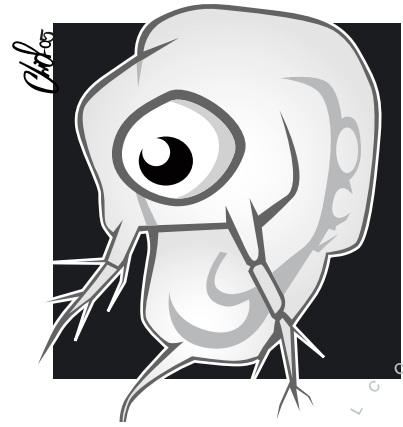
BLADDER WRACK



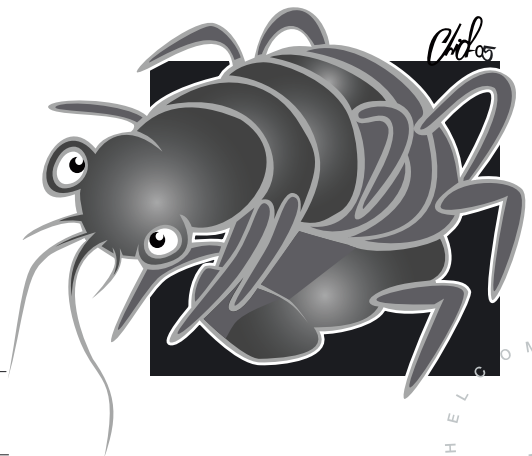
COPEPOD



WATER FLEA



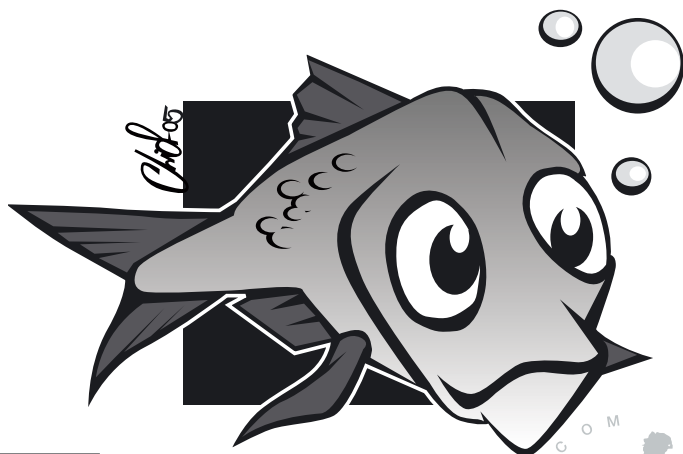
BALTIC ISOPOD



BLUE MUSSEL



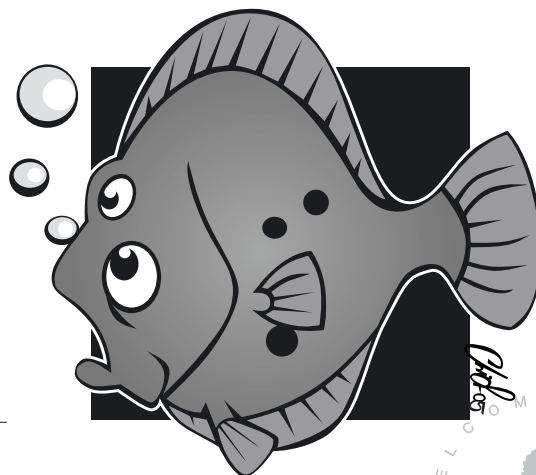
BALTIC HERRING



COD



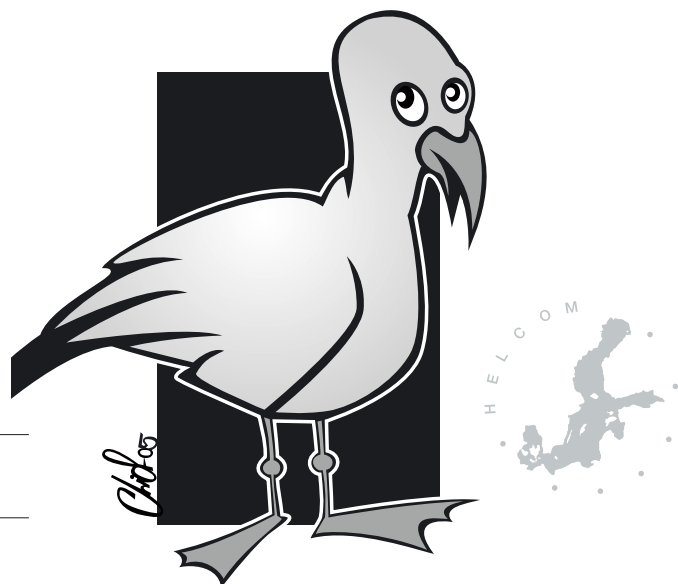
FLOUNDER



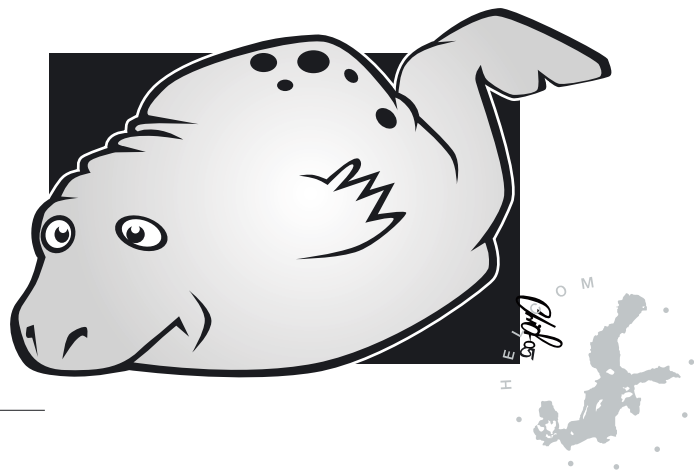
COMMON EIDER



COMMON GULL



GREY SEAL



HARBOUR PORPOISE



Teaching unit 3:

The speech of the Lord of the Seas

You will need:

- Copies of texts dealing with threats to the Baltic Sea (Eutrophication, Toxic substances, Oil, Biodiversity). One threat for one student
- One copy of exercise 2 per student
- Paper for writing an essay

Instructions:

- In the beginning of the lesson you can show the Lord of the Things film again to refresh everybody's memory
- Read the exercises 1-3. With each exercise you will find more detailed instructions
- Divide students into groups of four
- Give each student in a group a text dealing with one of the threats (four different texts within a group) and ask students to read their text carefully
- Ask students in a group to tell each other about their subject (threat). And after this ask them to work together and to make a summary on the texts according to exercise 1
- Ask the groups to present their summaries to the other groups and hang possible drawings on the wall
- For exercise 2 divide students into pairs and give each pair a copy of the exercise.
- Ask students to compare their answers with another pair
- Discuss the topic of 'What can I do?' with the whole class
- Exercise 3 is done individually by each student

Duration: 2-3 lessons

The speech of the Lord of the Seas

Eutrophication

All plants, algae and cyanobacteria need sunlight, water, carbon dioxide, oxygen and nutrients, mainly nitrogen and phosphorus, in order to grow.

Large quantities of nutrients come into the sea from land and air via rivers and rain. This can cause over-fertilisation of the water and is called eutrophication. People often use too much fertiliser in the fields of their farms. Waste water is released to the sea without proper cleaning resulting in too many nutrients washing into the sea. Nutrients come into the air mainly from cars and factories. When we use fossil fuels we pollute the air with toxic substances and nutrients such as nitrogen and phosphorus.

In open waters, the effects of eutrophication are often seen in the rapid growth of microscopic plankton algae and cyanobacteria. In coastal areas you can find extreme growth of water plants. In shallow water and bays, for example thread-like filamentous green algae take over the area rapidly.

Eutrophication has good and bad effects in the Baltic Sea. The good effects are for microscopic plankton algae and cyanobacteria, certain water plants and some algae. It is good for zooplankton and for example blue mussel

when the number of microscopic plankton algae grows. The number of fish which eat zooplankton also grows. When there are more fish in the sea, it is also good for the birds, grey seals and harbour porpoises.

The bad effects are greater than the good ones. Water becomes clouded and there are water plants and algae which cannot get enough sunlight and die. Both small and large algae and plants end up at the bottom, where decomposing processes can result in a lack of oxygen and the production of poisonous hydrogen sulphides. These bottom areas are called dead bottoms. Animals that have lived on these bottoms die from the lack of oxygen and the poisonous hydrogen sulphides. All this leads to the loss of biodiversity.

Some types of cyanobacteria can be toxic, and they can be a real health risk for humans and animals. Also, water which is full of cyanobacteria does not look nice. You do not want to go swimming among masses of cyanobacteria.

Eutrophication is the most serious problem in the Baltic Sea.



Toxic substances

The Baltic Sea is one of the most polluted seas in the world. Most toxic and harmful substances do not exist naturally in the water. Man's activities have put them there in some way or another. Many factories and traffic produce waste materials which are toxic, for example dioxins, DDTs, PCBs, lead, copper and mercury. They enter into the water by air, waste water or dumping. Once released into the Baltic Sea, toxic substances can remain there for hundreds, even thousands of years.

Toxic substances can end up in plants, macroscopic and microscopic algae. Animals which eat plants and algae then collect the toxic substances inside their bodies. Predators that eat other animals get even more toxic substances inside them. Animals' bodies cannot break down toxic substances so they get more and more of them every day. Animals get all kinds of diseases as a result and can even have difficulties having babies.



Oil

Oil is a serious threat to the Baltic Sea and its wildlife. There are a lot of oil transportation and other kind of traffic on the Baltic Sea every day. Shipping accidents and illegal oil-spills from ships' machinery spaces and cargo tanks are the main sources of oil pollution in the Baltic Sea. Especially, the ships transporting oil are the biggest threat. We can only imagine what would happen if two oil tankers collide!

Oil easily spreads over a large area. Some of the oil stays on the surface and some of it sinks deeper and mixes with water - depending on the quality of oil. Of course, what we can first see are the problems caused by the oil on the surface. Oil makes birds' feathers dirty which

causes three kinds of problems: they cannot fly, they get cold and they get the toxic oil inside their body. Seals suffer from similar problems. Oil also destroys places where plants grow and animals live - and beaches where people spent their free time. Because oil is very toxic it can cause serious problems to plankton, fish and animals on the sea floor.

Oil decomposes slowly in the cold waters of the Baltic Sea, where the average water temperature is only about 10 degrees. The colder the water is the more slowly oil decomposes. If oil reaches land, people have to clean it up and this is really hard work and takes a long time.



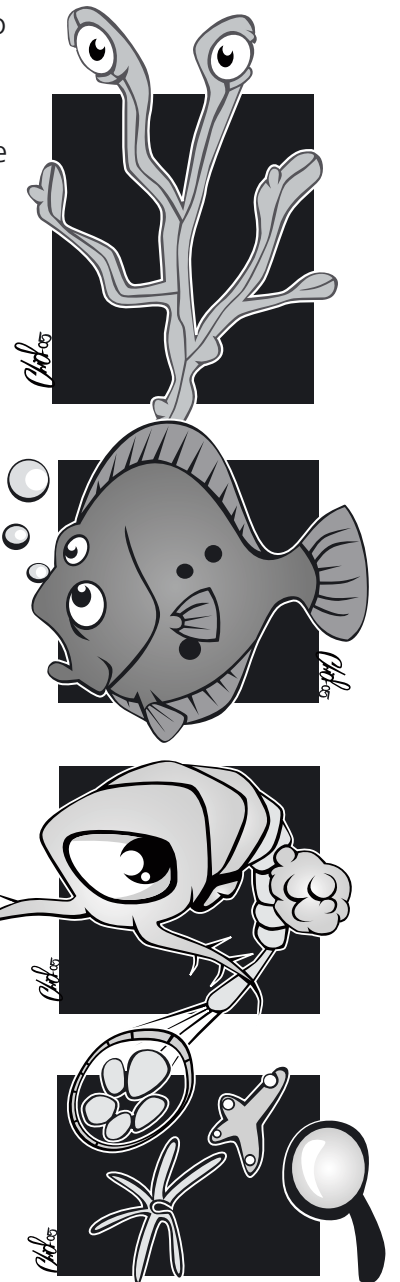
Biodiversity

The more species there are in a certain area the better the biodiversity. Also, if there are many different kinds of natural living areas for different species, we can say that biodiversity is good. In the Baltic Sea area protecting biodiversity means that we want to keep all the species we have today and to have many different kinds of natural living areas.

Because the Baltic Sea has brackish water it has fewer species than open oceans. So, the biodiversity in the Baltic Sea is naturally lower than in the biodiversity in open oceans. The species living in the Baltic Sea are very sensitive to any changes in their natural environment.

Eutrophication, toxic substances oil-spills and over-fishing make life a lot more difficult for many species in the Baltic Sea. Some of the species get ill, some cannot have babies and some species die. Many species are food for other species. If we lose species the others will suffer and they will also disappear in the end.

About 16 million people live along the coast of the Baltic Sea. People build for example ports, industrial areas and towns which destroy the natural living areas of other species.



EXERCISE 1 The race has not ended yet

There are different things that are dangerous for the well-being of the Baltic Sea.

Think about what you can do to protect the Baltic Sea.

Dangers

Eutrophication
Oil transportation
Loss of biodiversity
Over-fishing
Toxic substances

What can we do?

- Make changes in farming practices to reduce the discharge of nitrogen and phosphorous
- Build more waste water treatment plants
- Use more bicycles
- Use more public transport
- Use less fossil fuels
- Consume less
- Use more wind, wood and solar energy
- Build safer tankers which have double hulls or double bottoms
- Use less toxic substances
- Lower amount of fertilizers in the fields
- Increase international co-operation and make more laws that protect the environment
- Create new ways of earning a living
- Punishment for those who break the law
- Take part in nature conservation work
- Leave natural living areas as they are

What can I do?

- Think of what you personally can do. Choose from the list above. Can you think of anything else?

EXERCISE 2 The speech of the Lord of the Seas

- A. Students read the texts EUTROPHICATION, TOXIC SUBSTANCES, OIL and BIODIVERSITY
- B. Students make a simple summary of the texts in their mother tongue. Students can imagine that the summary is for smaller children than they are. Encourage students to use drawings in their work.

EXERCISE 3 Essay

Students write an essay in their mother tongue or in English about one of the following titles:

1. What kind of Baltic Sea would I like to have?
2. What does "ignorance" mean?

List of key words

THE BALTIC SEA

Young sea with brackish water

the Baltic sea _____
brackish water _____
a lot less salt _____
salt _____
a salinity _____
northern _____
eastern _____
the Atlantic Ocean _____
The Pacific Ocean _____
to bring _____
fresh water _____
salty _____
the North Sea _____
a narrow passage _____
to get mixed _____
to flow _____

Shallow sea with little oxygen

shallow _____
divided _____
a basin _____
varying _____
a depth _____

Water exchange

a bottom _____
to become _____
oxygen _____
the survival _____
extremely strong _____
to reach _____
the deepest _____
heavier than _____
to mix _____

Few species

fewer species _____
either too low _____
species _____
or too high _____
more difficult _____
as _____
more and more _____
polluted _____
a climate _____
a region _____
to affect _____
the living conditions _____
freeze over _____
southern _____

Polluted sea

the most heavily
polluted
in the north
in the east
in the south
in the west
the entire
a catchment area
in addition to
the countries
bordering
to include
Belarus

the Czech Republic
the Slovak Republik
Ukraine
far inland
industry
traffic
farming
main causes
pollution
sensitive
too slowly
polluted water

MICROSCOPIC PLANKTON ALGAE AND CYANOBACTERIA

microscopic
plankton algae
cyanobacteria
by the naked eye
to identify
species (both
singular and plural)
a cell
flagellas
ciliars
algal blooms
the rays of sunshine
a ray
to reach
to survive
to float
gas bubbles
drops of oil

on top of smthng
bigger algae
the photosynthesis
carbon dioxide
surrounding
oxygen
to be able to
nutrients
to multiply
respiration
a food chain
zooplankton
an invertebrate
the more...
the better
living conditions
more frequent
eutrophication

BLADDER WRACK

a bladder wrack	_____	respiration	_____
air filled	_____	uncommon	_____
to attach	_____	completely	_____
leafy lobes	_____	disappeared	_____
a trunk	_____	no longer	_____
to vary	_____	over-fertilisation	_____
a plant	_____	a crop	_____
an alga	_____	large amounts	_____
algae	_____	to result in	_____
shallow	_____	on	_____
a depth	_____	a growth	_____
dense	_____	microscopic	_____
fairly	_____	plankton algae	_____
the photosynthesis	_____	particles	_____
carbon dioxide	_____	murky	_____
surrounding	_____	thereby	_____
oxygen	_____	to prevent	_____
to be able to	_____	even harder	_____
nutrients	_____	without	_____

COPEPODS

copepods	_____	a depth	_____
transparent	_____	microscopic	_____
antennae	_____	plankton algae	_____
a length	_____	a mussel	_____
a crustacean	_____		

WATER FLEAS

a water flea	_____	mainly	_____
zooplankton	_____	fresh water	_____
to cover	_____	a few	_____
to create	_____	species	_____
underneath	_____	to tolerate	_____
antennae	_____	brackish water	_____
a gill	_____	microscopic	_____
a length	_____	plankton algae	_____
a crustacean	_____	cyanobacteria	_____
a surface	_____	a mussel	_____
a depth	_____		

BALTIC ISOPOD

Baltic isopod	_____	a crustacean	_____
elliptical	_____	a depth	_____
narrower	_____	a surface	_____
antennae	_____	to hide	_____
inner	_____	a bush	_____
outer	_____	a bladder wrack	_____
a fourth	_____	microscopic	_____
a length	_____	plankton algae	_____
to vary	_____	nutrition	_____
usually	_____	difficulties	_____
a patch	_____	tight	_____
a female	_____	off	_____
a male	_____	disappear	_____

BLUE MUSSEL

blue mussel	_____	an ability	_____
oval-shaped	_____	2-3 litres of	_____
growth rings	_____	water an hour	_____
the Baltic Sea	_____	the most important	_____
rarely	_____	enough	_____
bigger than	_____	salt	_____
the less...the smaller	_____	the number of	_____
a mollusc	_____	an egg	_____
to attach	_____	larva	_____
bladder wrack	_____	an eider duck	_____
shallow	_____	a crab	_____
a depth	_____	a Baltic herring	_____
each other	_____	to vary	_____
so-called	_____	it is not known	_____
mussel bank	_____	salty	_____
filter	_____	offer	_____
microscopic	_____	a shelter	_____
plankton algae	_____	therefore	_____

BALTIC HERRING

A Baltic herring	_____	the salinity	_____
to weigh	_____	a change	_____
a lower jaw	_____	the amount of	_____
an upper jaw	_____	the most important	_____
especially	_____	a catch	_____
at one time	_____	to over-fish	_____
zooplankton	_____	a seal	_____
plankton algae	_____	a harbour porpoise	_____
the Baltic Sea	_____	toxic substances	_____
to inhabit	_____	a health	_____
the number of	_____	suffer from	_____

COD

a cod _____
teeth _____
overbite _____
an upper jaw _____
a lower jaw _____
a barbel _____
streak _____
a tail _____
to vary _____
depending on _____
environment _____
to weigh _____
a vacuum cleaner _____
shellfish _____
a worm _____
an invertebrate _____
a Baltic herring _____
usually _____
salty _____
to float _____

to survive _____
fairly _____
oxygen-rich _____
a spawning area _____
south-western _____
the Baltic Sea _____
relatively few _____
the Gulf of Bothnia _____
the Gulf of Finland _____
the number of _____
mainly _____
a reason _____
the North Sea _____
the most important _____
commercially _____
to exploit _____
species _____
over-fish _____
to decrease _____

FLOUNDER

a flounder _____
the Baltic Sea _____
flat _____
oval-shaped _____
a majority _____
upwards _____
a third _____
to change _____
to resemble _____
both _____
to weigh _____
a shoreline _____
a depth _____
shallower _____
muddy _____

to wander _____
freshwater _____
a diet _____
to consist of _____
a worm _____
a shrimp _____
a mussel _____
to rest _____
to mate _____
lower _____
salt _____
a level _____
to sink _____
a number of _____

COMMON EIDER

a common eider _____
the Baltic Sea _____
to weigh _____
on average _____
to vary _____
depending on _____
a sex _____
a length _____
a wingspan _____
to identify _____
an adult _____
a male _____
a cheek _____
a tail _____
a female _____
a stripe _____
by diving _____
a depth _____
mainly _____
a blue mussel _____

to swallow _____
whole _____
a predator _____
a gull _____
to nest _____
few _____
a mammal _____
an amount of _____
crude oil _____
a threat _____
to increase _____
to raise _____
an oil-spill _____
a feather _____
greasy _____
toxic _____
despite _____
has grown _____
during recent years _____

COMMON GULL

a common gull _____
the Baltic Sea _____
a region _____
a bill _____
a wingspan _____
a length _____
to weigh _____
to resemble _____
a laughter _____

mainly _____
an earthworm _____
an insect _____
a mammal _____
to breed _____
a plant _____
they can be seen _____
a rubbish dump _____
at present _____

GREY SEAL

a grey seal _____
a male _____
to weigh _____
a female _____
a length _____
species _____
a coat _____
mature _____
a blotch _____
narrower _____
a mammal _____
the Baltic Sea _____
more common _____
northern _____
to gather _____
drift-ice _____
a Baltic herring _____
a cod _____
a crustacean _____
a diet _____
to over-fish _____
to compete _____
to destroy _____

even though _____
illegal _____
to get caught _____
to drown _____
the most polluted _____
toxic substances _____
an illness _____
a wound _____
no longer _____
increased _____
transportation _____
a construction _____
to disturb _____
a threat _____
in the early _____
20th century _____
a number of _____
to decrease _____
seems to be _____
recovering _____
the Gulf of Bothnia _____
southern _____

HARBOUR PORPOISE

a harbour porpoise _____
a whale _____
a flipper _____
a fin _____
triangular _____
is located _____
to identify _____
an average _____
a length _____
a female _____
slightly _____
larger than _____
a male _____
to weigh _____
a mammal _____
southern _____
the Baltic Sea _____
off the Finnish coast _____
a diver _____
at a time _____
a surface _____
to breathe _____
rarely _____

to approach _____
a bow wave _____
to avoid _____
a vessel _____
forward _____
to remain still _____
especially _____
a Baltic herring _____
a cod _____
the most significant _____
threat _____
to get caught _____
to drown _____
pollution _____
ship traffic _____
over-fishing _____
the most polluted _____
toxic substances _____
an illness _____
a wound _____
during the 20th _____
century _____
approximately _____

EUTROPHICATION

eutrophication _____
a plant _____
algae _____
cyanobacteria _____
carbon dioxide _____
oxygen _____
nutrients _____
mainly _____
nitrogen _____
phosphorous _____
large quantities _____
via _____
over-fertilisation _____
a fertiliser _____
waste water _____
without proper _____
cleaning _____
fossil fuels _____
to pollute _____
toxic substances _____
an effect _____
a rapid growth _____
microscopic _____
plankton algae _____
shallow _____

a bay _____
filamentous _____
green algae _____
to take over _____
the Baltic Sea _____
zooplankton _____
a blue mussel _____
the number of _____
a grey seal _____
a harbour porpoise _____
greater than _____
clouded _____
enough _____
to end up at _____
the bottom _____
to decomposing _____
processes _____
to result in _____
a lack of _____
poisonous _____
hydrogen sulphides _____
the loss of _____
biodiversity _____
a health risk _____

TOXIC SUBSTANCES

toxic substances _____
the Baltic Sea _____
the most polluted _____
harmful _____
to exist _____
man's activities _____
in some way or another _____
a factory _____
to produce _____
waste materials _____
lead _____
copper _____
mercury _____

dumping _____
to remain _____
to end up _____
macroscopic _____
microscopic _____
algae _____
predators _____
even more _____
to break down _____
more and more _____
a disease _____
a difficulty _____

OIL

oil _____
a serious threat _____
the Baltic Sea _____
wildlife _____
oil transportation _____
traffic _____
shipping accidents _____
illegal _____
an oil-spill _____
a machinery space _____
a cargo tank _____
a main source _____
pollution _____
especially _____
would happen _____
to collide _____
to spread _____
an area _____

to stay on the _____
surface _____
to sink _____
to mix _____
depending on _____
the quality of oil _____
a feather _____
toxic _____
a seal _____
suffer from _____
similar _____
to destroy _____
to decompose _____
an average _____
water temperature _____
the colder... _____
the more slowly _____
to reach _____

BIODIVERSITY

biodiversity _____
the more species _____
the better _____
biodiversity _____
a living area _____
the Baltic Sea _____
to mean _____
brackish water _____
fewer species _____
naturally _____
lower _____

a change _____
environment _____
eutrophication _____
toxic substances _____
an oil- spill _____
over-fishing _____
a lot more difficult _____
to get _____
to suffer _____
to disappear _____