



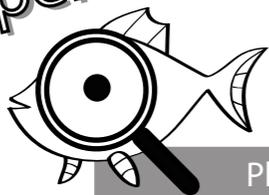
# Dolphins



# Introduction

At first glance, the sea might seem like a big, monotonous chunk of water, spreading out into the distance until it reaches the horizon. However, if we take a look under the surface of this blue yonder, we are astonished by its depth and fullness of colours. The richness of different forms of life can be compared with the most colourful carnival, exposing the treasures of nature. Actually, nowhere else on Earth can we find so many different animal and plant species interacting and sharing their environment, with humans present only as occasional guests. Looking at the sea and all the life it supports, we can learn about its inhabitants, admire its harmony and compare ourselves to it. We might be tempted to try and learn how to swim like a dolphin or use sound to orient ourselves in the environment. In order to swim faster, we construct swimming suits resembling shark skin. We would like to hold our breath as long as sea turtles. We learn about ways sponges and starfish regenerate parts of their body or how planktonic sea algae create oxygen. People can learn a great deal from the sea, which is why we have to appreciate it and take care of it. Let's dive into the secrets of its inhabitants as real researchers of the marine world! Read the book, and have fun learning and playing!

## experiment



Play and learn!

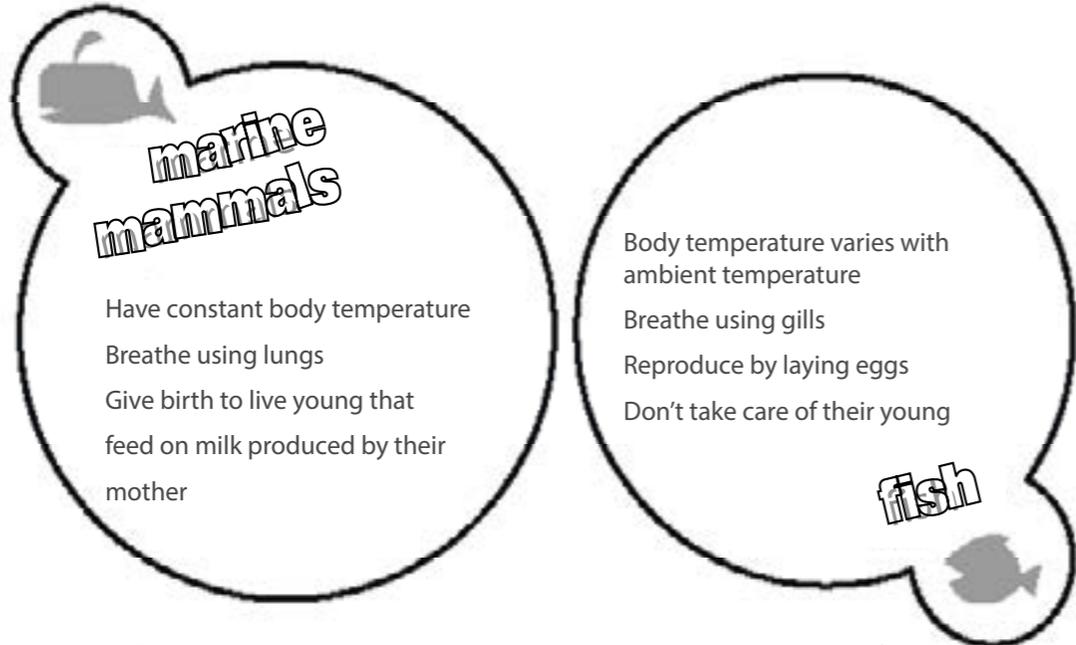
In every chapter you'll find a section called "Play and learn!", with many interesting assignments to complete. These experiments make learning and understanding facts about dolphins much easier and more amusing.

## contents

Dolphins - marine mammals.....	2
Dolphin anatomy.....	6
Reproduction.....	7
Locomotion.....	9
The evolution of dolphins.....	10
Feeding.....	12
Echolocation.....	14
How do dolphins sleep?.....	16
Research.....	18
Threats.....	20

# Dolphins - marine mammals

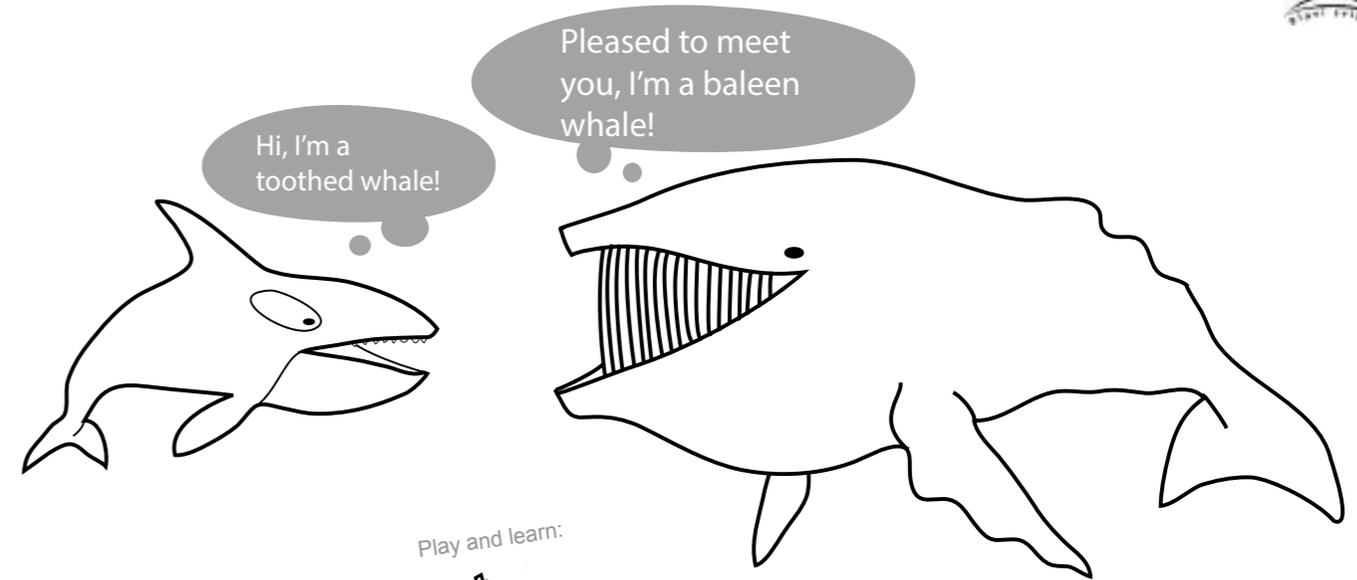
Even though marine mammals live in the sea, they are very different from fish. The main differences are:



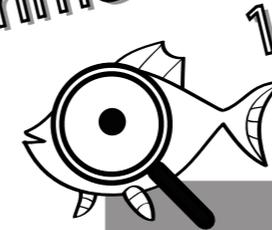
Dolphins are marine mammals belonging to the group of animals we call whales. We can divide whales in two categories - baleen whales and toothed whales.

Baleen whales have baleen plates for filtering seawater in their mouth. Their favourite food are small pelagic fish and planktonic crustaceans. Some of the biggest animals on Earth are baleen whales - the blue whale and fin whale.

Toothed whales have teeth, which they use for catching their prey. Dolphins, orcas, beluga whales and sperm whales are considered toothed whales.



## Play and learn: experiment



You need to prepare: one smaller and one bigger bowl of water, a thick comb, barbeque or cake gripper, 50 g of flax or sesame seeds, 25 bottle caps, stop watch, kitchen scale

### Who will eat more?

- 1 Pour water in both bowls until they're full. Put 50 g of flax or sesame seeds in the smaller one. The seeds represent plankton in this experiment. Put 25 bottle caps representing pelagic fish in the bigger bowl.
- 2 The comb represents baleen plates. Use it to catch as much plankton as you can from the smaller bowl. You have two minutes to do this. Now weigh the plankton you managed to "eat" and make a note of it.
- 3 The gripper will represent dolphin teeth in this experiment. Use it to eat as many fish as you can from the bigger bowl. Put the "fish" you ate in two minutes on the kitchen scale, and measure their weight.
- 4 Compare who ate more prey - the baleen whale or the dolphin?

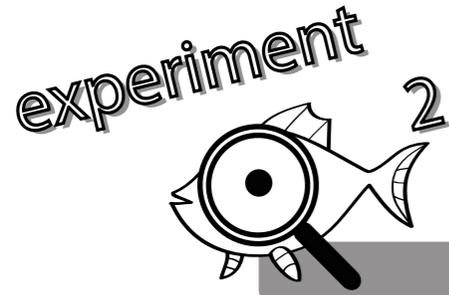


# exercise 1

Compare sizes of different whale and dolphin species:

species	maximum length	weight
Common dolphin	2,4 m	70 -110 kg
Bottlenose dolphin	3,8 m	200 – 400 kg
Orca	9,2 m	4000 – 9000 kg
Fin whale	26,8 m	70 000 – 80 000 kg
Blue whale	30,5 m	110 000 kg

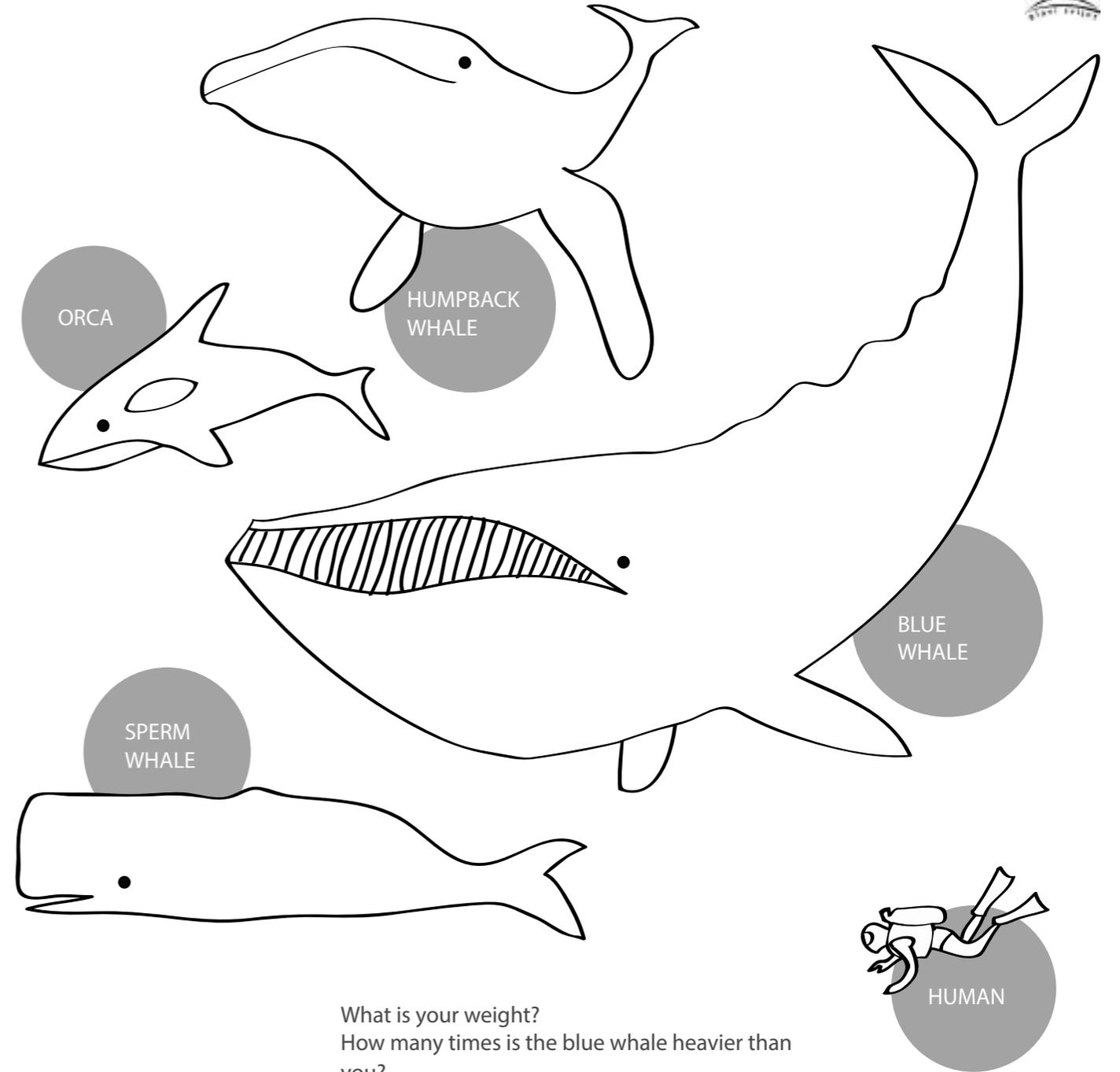
Play and learn:



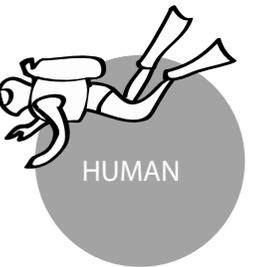
You need to prepare: a ball of rope (100 m long), a meter, scissors, paper and a pencil or a piece of chalk

## Small and big

- 1 Bring all the necessary material and the guidelines to an open space like a playground or an empty parking lot.
- 2 Using the meter, spread out the same length of rope a blue whale would occupy if it were laying across the playground (30 meters).
- 3 Using chalk, mark the beginning and the end of the rope. You can also use pen and paper. Make a note of the size of a blue whale.
- 4 Repeat the procedure for other species - fin whale, orca, bottlenose dolphin and common dolphin.
- 5 Calculate how many whales would fit in your playground/parking lot.



What is your weight?  
How many times is the blue whale heavier than you?





# Dolphin anatomy

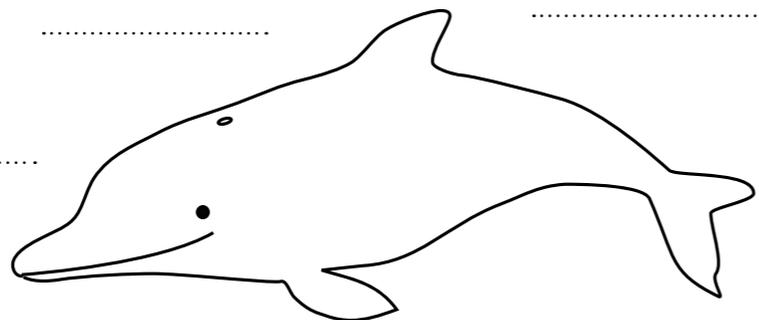
Dolphins have streamlined bodies adapted for easy movement through water. Their body is long and smooth and they use their tail for swimming. There is a thick layer of fat under the skin for maintaining permanent body temperature. Their jaw is elongated and forms a rostrum, which enables them to easily catch prey while swimming. It has a blowhole set on top of the head, so it can quickly take a breath while emerging on the sea surface.

## exercise 2

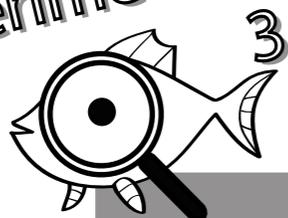
Mark these body parts on a drawing:

- head
- flipper
- dorsal fin
- tail fluke
- blowhole

Play and learn:



## experiment 3



You need to prepare: a pair of thin latex gloves, 1 thick rubbery glove, hair gel, two 2L pots, ice, water

### What is the fat layer for?

- 1 Pour 1L of water in both pots and add 2 cups of ice cubes.
- 2 Put on a thin latex glove and cover it with hair gel. Then put on a thick glove over the latex one and add more hair gel. Put your hand in the cold water.
- 3 Put a thin latex glove on your other hand and place it in another pot with icy water.
- 4 Determine how long it takes to feel the ice cold water on both hands.
- 5 Compare the results for both hands.



# Reproduction

Pregnancy can last up to 12 months. The young do not separate from their mothers in the beginning of their life. Such a close relationship between mother and calf lasts for 3 to 5 years. Later on, the calves gradually become independent.

It would be dangerous for the mother to separate from her baby in order to search for food. When feeding, other females from the same group (sometimes even older males) protect the calf. These females are known as babysitters.

## exercise 3

Connect all the dots to find out who is hiding in the picture!

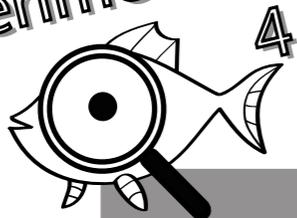


Females nurse their young for the first 12 to 18 months, upon which calves start to learn how to catch fish. Compared to land mammals, the milk is denser, which prevents mixing with seawater. Baby dolphins approach the mammary glands at which point the mother spurts the milk into their mouth, which is how they suckle.



Play and learn:

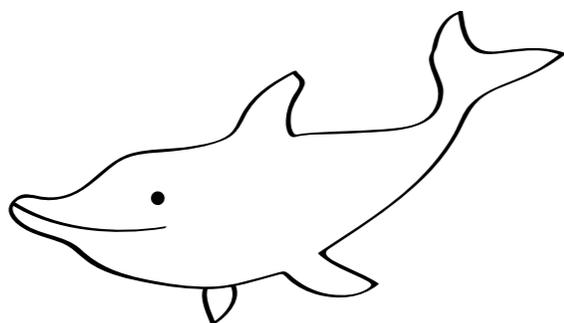
# experiment



You need to prepare: 2 tall glasses, a syringe, whipped cream, milk and water

## Dolphin milk

- 1 Pour water into the glasses. Inject half a syringe of milk into one glass, and the same amount of whipped cream into the other.
- 2 Look at what will happen. Which liquid mixes with water sooner and why?
- 3 Think about why dolphin milk is denser than that of terrestrial mammals?

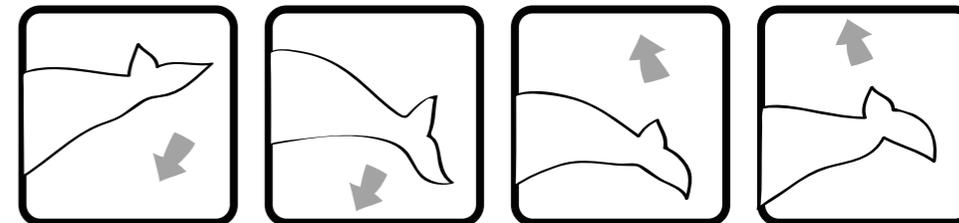


# Locomotion

Dolphins are known to be extremely fast and skilful swimmers capable of quickly changing speed. They display agility through performing impressive jumps, showing skill and strength.

The tail is mostly responsible for propelling the animal through the water, taking its strength from the body muscles.

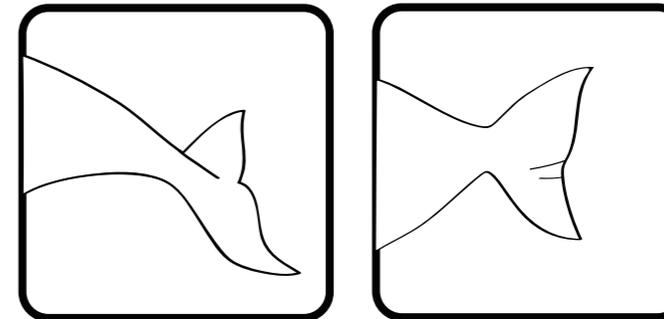
Dolphins are constantly moving and can swim up to, or even faster than 35 kilometres per hour!



Tail orientation is one of the most apparent features distinguishing marine mammals from fish. Dolphins and other marine mammals have horizontal tail orientation, moving their tail up and down through the water column when swimming. Fish have their tail positioned vertically, allowing them to swim by moving their body sideways, from head to tail.

# exercise

Which tail belongs to the fish and which to the dolphin?



# The evolution of dolphins

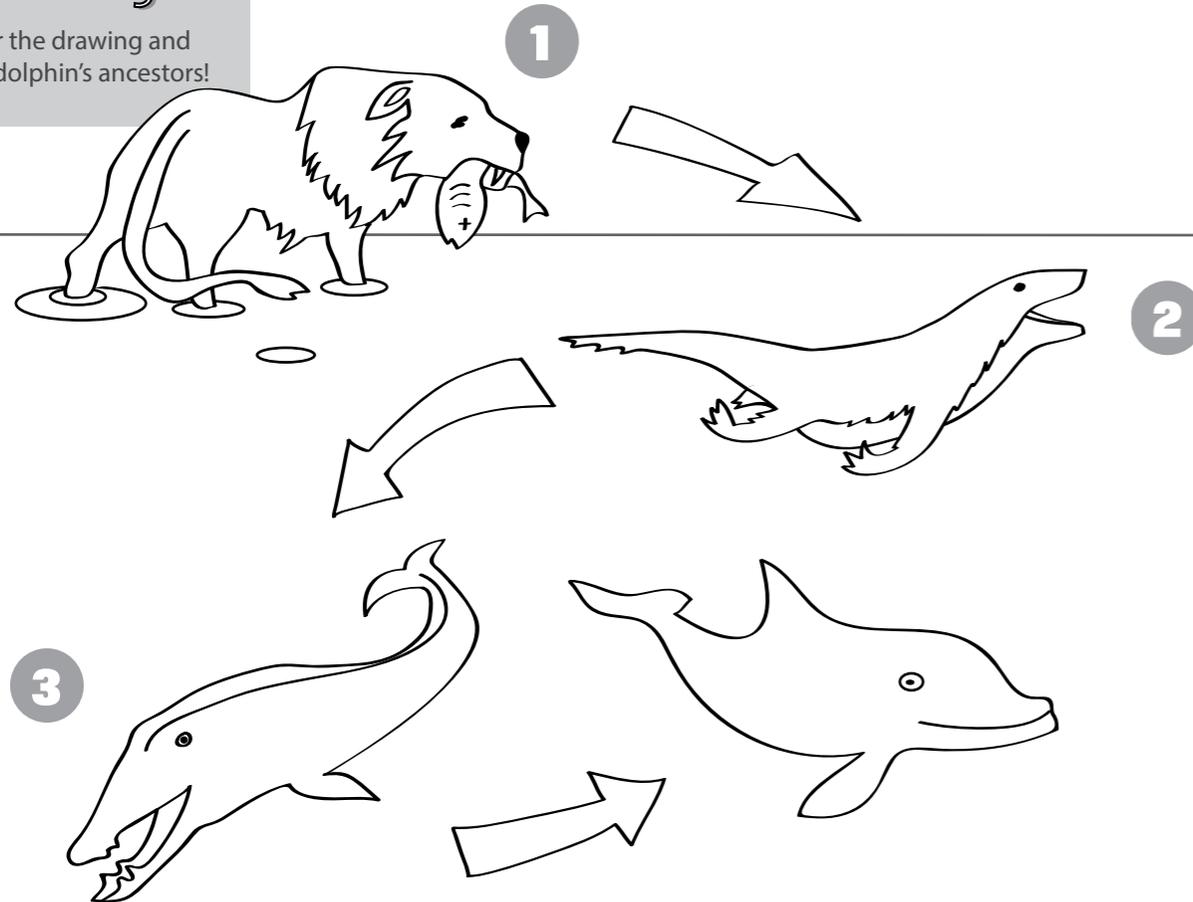
It is considered that all marine mammals originate from a terrestrial ancestor. They had time to adapt to marine life throughout Earth's long history. Although whales resemble fish, it is very likely their closest ancestors were terrestrial ruminants.

Whales originated from the same evolutionary line as horses, giraffes, bison and hippos. Their ancestors appeared 65 million years ago but the oldest whale fossil is 55 million years old.



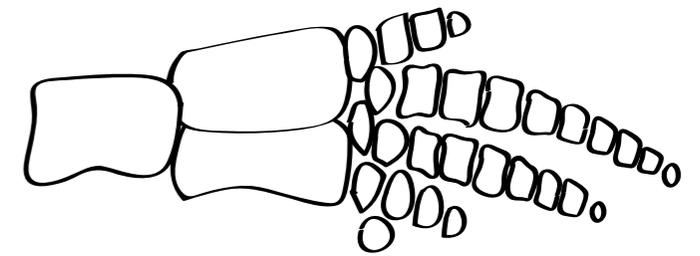
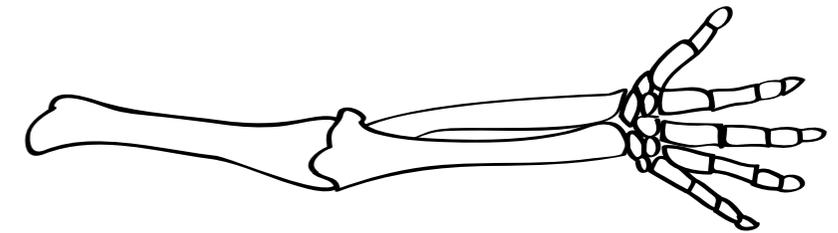
## exercise 5

Colour the drawing and meet dolphin's ancestors!



## exercise 6

Compare the drawings of a human hand and dolphin flipper!



1

Mesonyx was probably 1,5 meters long. It had a big head and powerful jaws, indicating it was a predator, even though it belongs to the order Condylarthra, which consists of herbivorous hoofed mammals. These were predecessors of present camels and horses.

2

Ambulocetus natans is considered to be a link between whales and their terrestrial ancestors. Skeletons of this animal show that it was able to move on land and in water. While swimming through the water, its body and tail probably moved up and down in the same way as they do in case of present whales.

3

Zygorhiza kochii had shorter vertebrae and strong teeth. It is considered the ancestor of present whales. This animal was not completely adapted to marine life due to the presence of small, but well developed hind legs, remnants of previously being a terrestrial animal.

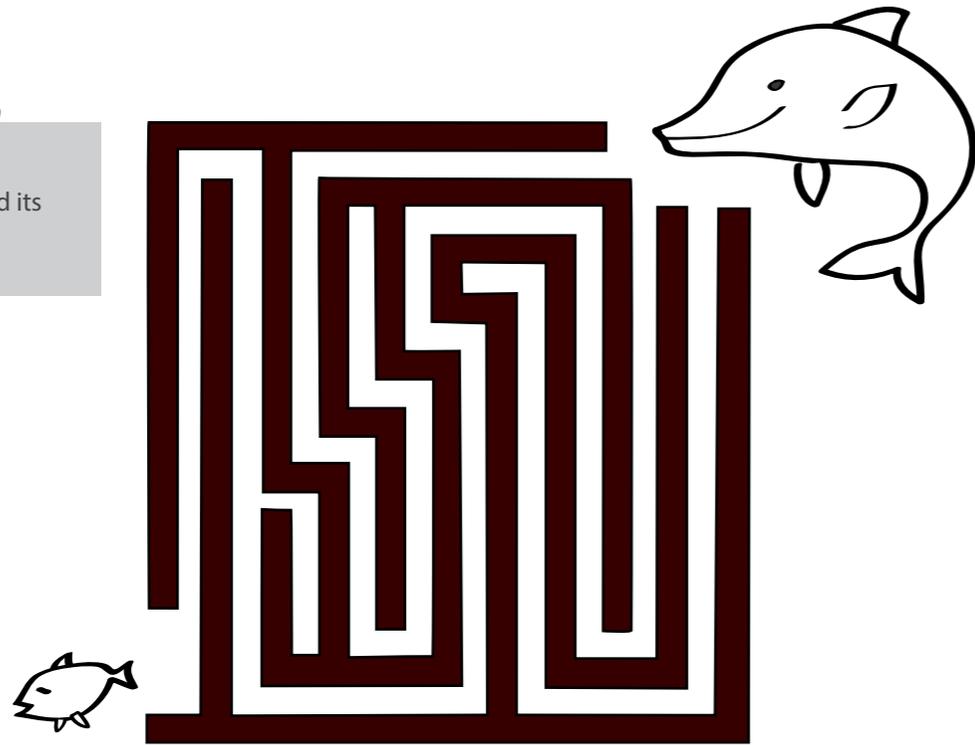
# Feeding

Bottlenose dolphins are predators able to adapt to available food sources. They prefer to eat fish, consuming benthic and pelagic species as well as squid and octopuses. On average, they eat around 3-5 kilograms of fish per day. There is increasingly less fish in the sea due to overfishing, so dolphins have to spend more time looking for food. This leaves them with less time for other activities like playing and resting.



## exercise 7

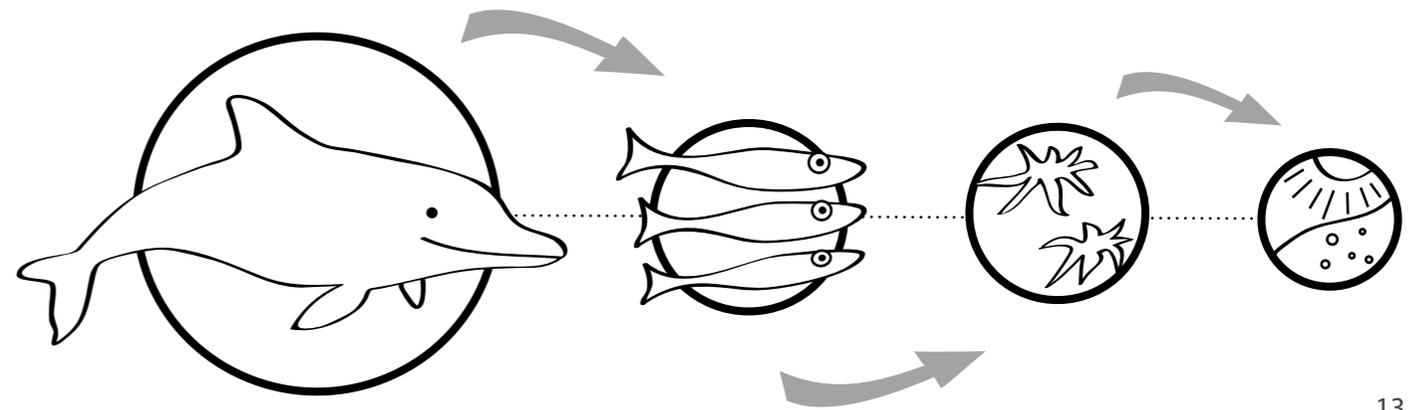
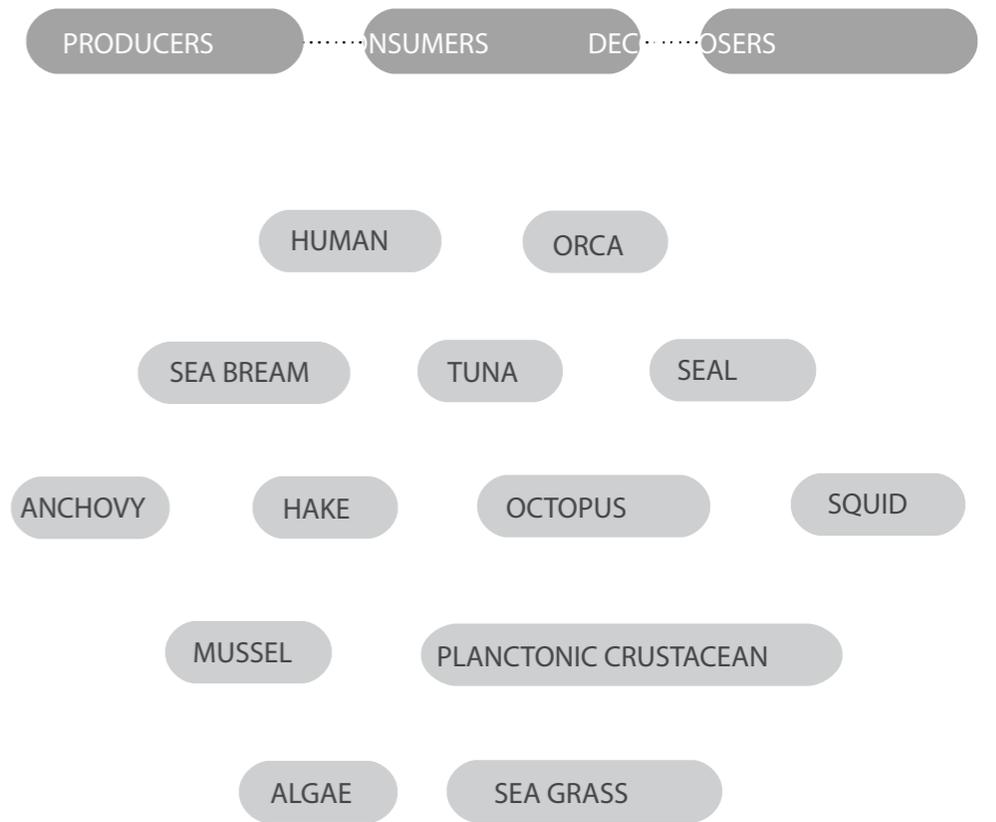
Help the dolphin find its way to the fish!



Dolphins are predators on top of the food chain, so they can be used to indicate the health of the marine environment.

## exercise 8

Arrange these organisms in food chains, following the example! How many food chains can you make using the provided organisms?





# Echolocation

Dolphins live in a murky environment. Using eyes to determine what is in the surroundings is not useful for seeing at great distances. They had to adapt to low visibility, sometimes limited only to a few meters. This is why they developed a complex system for transmitting and receiving sounds, enabling them to find their way in the sea. The emitted sound travels through the sea until it is reflected off an obstacle and echoed back to the dolphin, ready to be interpreted and recognised for what it is. Dolphins have a fatty organ situated on top of their heads called the melon, which allows them to change the orientation of the sound waves. Sound travels through the wa-

## exercise 9

Colour the picture that shows how dolphin uses echolocation to find its prey!

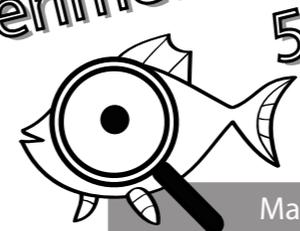


ter five times faster than through the air, so dolphins can get the information immediately. This allows for a fast reaction. During echolocation, some toothed whales produce sounds of such intensity they can stun their prey.

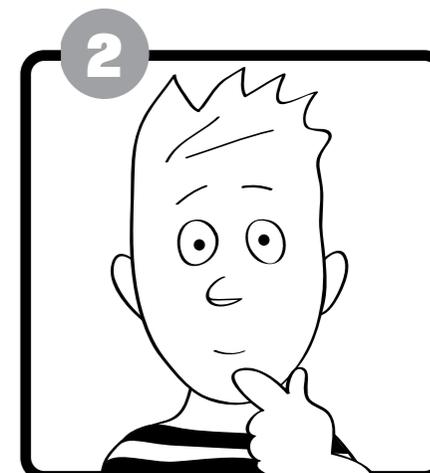


Play and learn:

## experiment 5



Make a sound like a dolphin!



1 Close your nose.

2 Close your mouth.

3 Say "O" three times.





# How do dolphins sleep?

Dolphins can only breathe on the surface. They will drown if rendered unconscious, which is why they never sleep but only rest one part of their brain at a time. While one part is "turned off", the eye on the opposite side of the head is closed and the other part of the brain is responsible for monitoring activities in the environment. Dolphins switch resting and active sides in two hour intervals.

While sleeping, dolphins swim close to the surface in order to breathe with ease. They usually move in groups, creating a formation where dolphins swim on the same side as their open eye. This means a dolphin with the right eye open will also swim on the right side of the group and vice versa. This allows them to look out for danger in all directions, covering the space other dolphins are unaware of.

## exercise 10

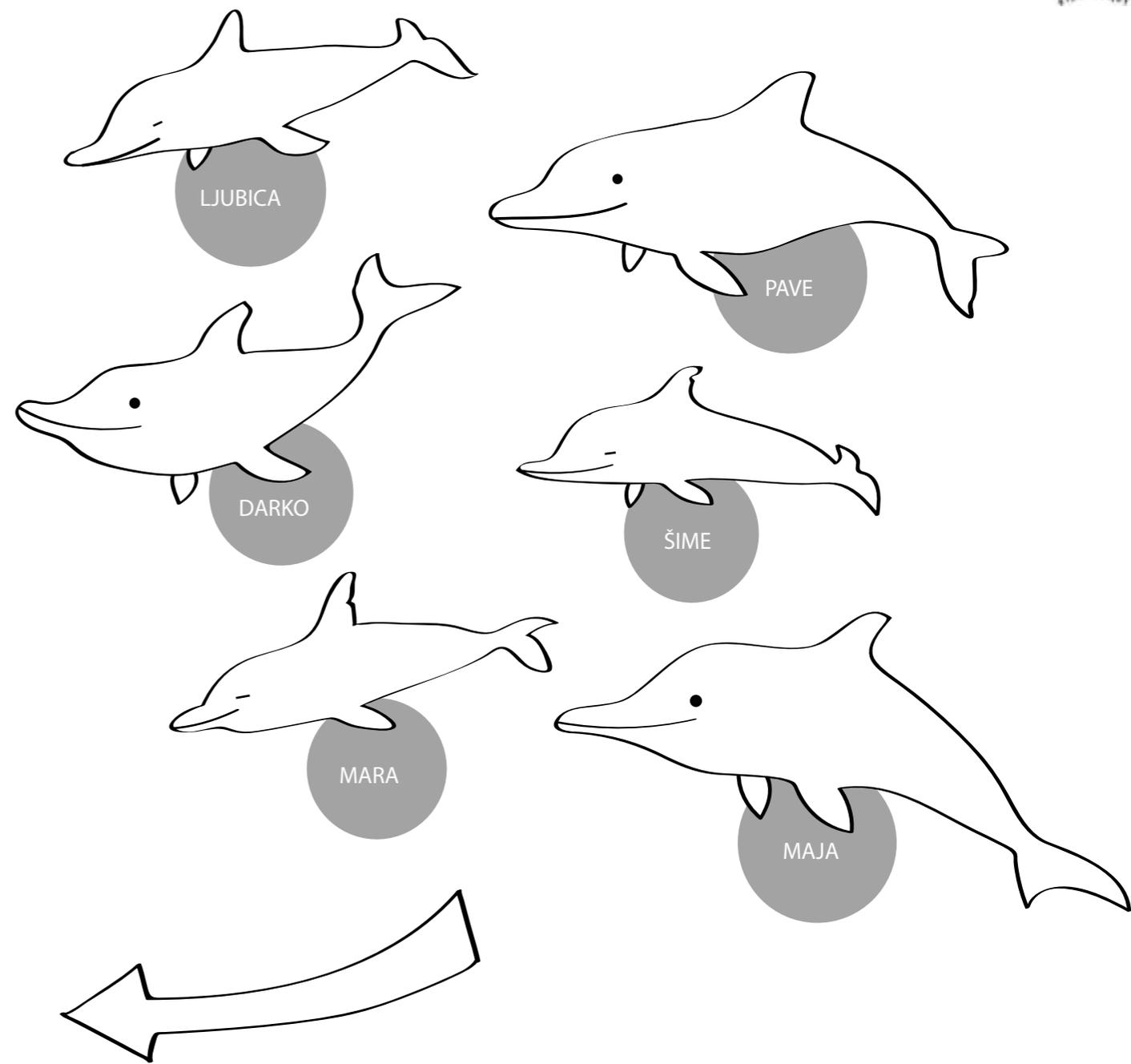
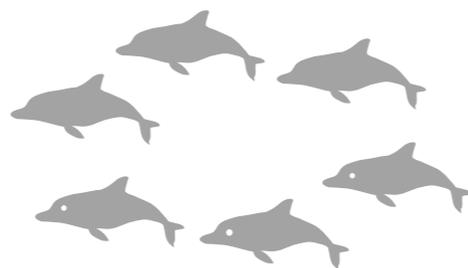
Arrange the sleeping dolphins in the right order so they can defend each other from the threats in the environment. Pay attention to the position of the open eye.

.....

.....

.....

.....



# Research

Scientists conduct research to find out how dolphins live in the wild. The most common method of research is the recognition and monitoring of individual dolphins by photo-identification. Photos of the dorsal fin are used to determine which individual is in the picture. Dorsal fins differ by size, shape and characteristic scars they acquire through playing, fighting or mating. Hence, two dolphins cannot have the same dorsal fin shape and markings, in much the same way as there are no people with identical fingerprints.

Photos of dorsal fins are organised in catalogues made by scientists, and every dolphin is given a name. This makes it easier to note collected data about the location of the encounter, company of other dolphins, their behaviour, "friendships" or family relations, etc.. Through data analysis, it is possible to determine in what way dolphins spend their time, where and who they hang out with. This kind of information can contribute to our better understanding of these animals and their protection.



## exercise 11

Look at the picture, connect the dorsal fins with corresponding dolphins and write down their names!

1

2

3

4

5

- 1 .....
- 2 .....
- 3 .....
- 4 .....
- 5 .....

ŠIME

DARKO

PAVE

LJUBICA

MARA



# Threats

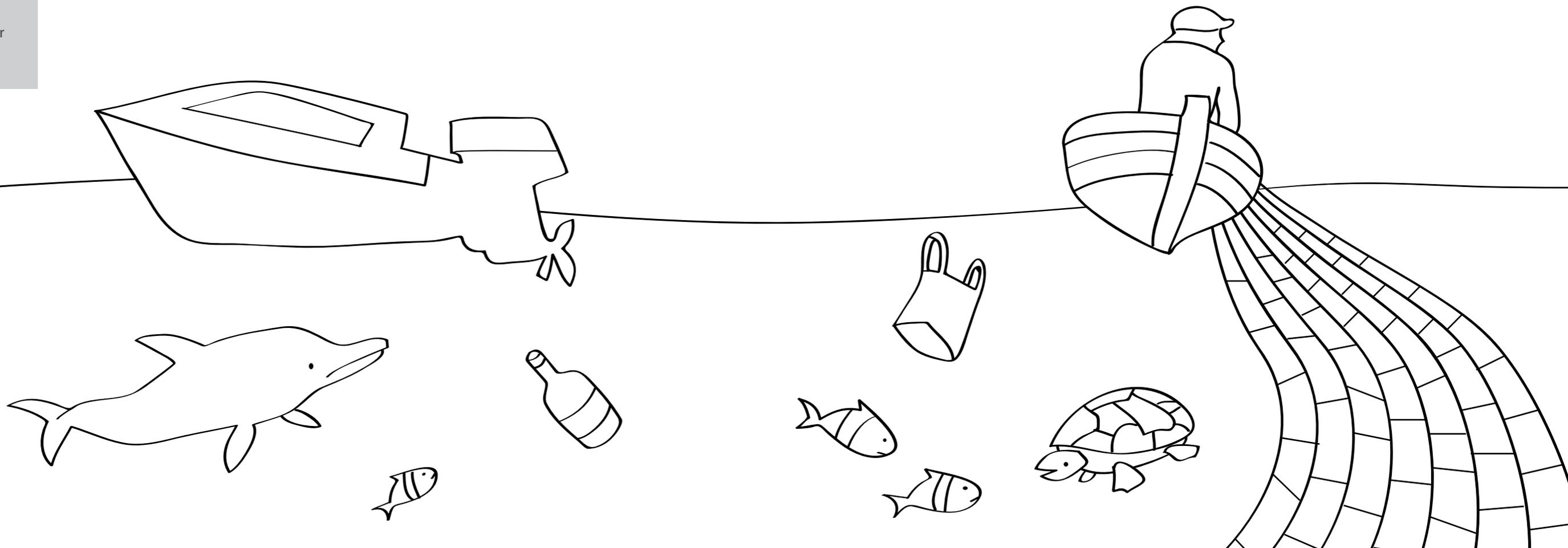
Many human activities present threats to the marine environment and its inhabitants. Irresponsible behaviour is threatening the survival of many marine organisms, including dolphins. The major threats for dolphins include by-catch in fishing nets, overfishing, noise disturbance caused by speed boats and an increasing number of recreational boats directly approaching and interrupting dolphins in order to get a better look. Climate change, disappearing of costal habitats caused by overbuilding and increasing pollu-

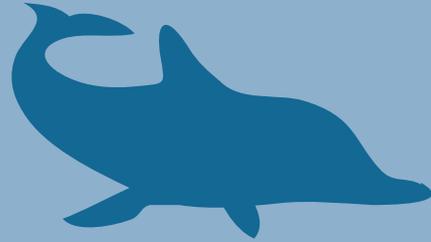
tion are causing illness or death of an increasing number of dolphins. There is also a big problem with debris causing trouble to thousands of marine animals that are getting hurt from entanglement or by accidentally eating plastic bags, bottles, nets, cans...

It is important to understand you can help by behaving responsibly and taking care of the environment. Don't throw garbage into the environment, recycle, decrease use of plastic bags, don't collect marine animals and teach others how to treat nature properly.

## exercise 12

Look at the picture and circle all the things that could present threats for dolphins!





Printing of this publication was funded by the National Foundation for Civil Society Development. The contents of this publication are the sole responsibility of the authors and do not necessarily express the opinion of the National Foundation.

Publisher: Blue World Institute of Marine Research and Conservation, Veli Lošinj, 2013.

[www.plavi-svijet.org](http://www.plavi-svijet.org)

Design and illustration: Anton Horvatović

Copyright © Plavi svijet, 2013.

