



THE HARBOUR PORPOISE

THE SMALLEST CETACEAN OF THE NORTH SEA

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FOREWORD

The harbour porpoise, the smallest cetacean in the North Sea, is an iconic animal that reflects the challenges of nature in the North Sea. The information in this report is largely based on the writers’ own experience and research; 15 years of observations from Stena Line ships and 11 years of porpoise research on the Oosterschelde, the Netherlands.

The most recent literature on porpoises has been used and the following persons have been consulted: Ron Kastelein (Seamarco), Lonneke IJsseldijk (Faculty of Veterinary Medicine Utrecht University) and Meike Scheidat (Wageningen Marine Research).

INTRODUCTION

The harbour porpoise (*Phocoena phocoena*) is the smallest and most common cetacean in the North Sea. Actually, we do not know that much about them, but fortunately we are learning more and more. Not only is this information interesting, it is also important for its conservation. And protection is necessary. Although the North Sea harbour porpoise is not an endangered species, disturbances and threats are present on a large scale. After all, the North Sea is one of the busiest seas in the world, with industry, shipping, fishing and tourism, among other things happening concurrently.

The harbour porpoise is not as acrobatic as some dolphin species and their colour is inconspicuous. And yet, if you look closely, you will discover unexpected and special properties. This report takes you on a deep dive to get to know this animal better.

HISTORY

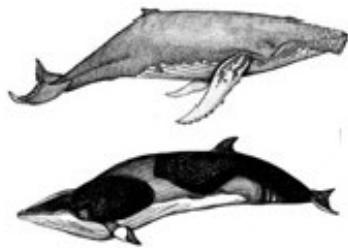
Although some found it unfit for consumption, the porpoise has been hunted historically. Descriptions even report that specific hunting techniques of the ‘sea pig’ was made. So much so, in fact, that a catch regulation was already in place on the Belgian coast in 1098. Recipes have also been found about it (“Notabel Boecxken van cokeryen”, from 1514; “Meerswijn metten pepere”). However, the hunt was not only for the meat, but also for the oil (fat). In addition, there are references to the use of the porpoise in medicines. Certainly, the animal was caught, sometimes it was actively hunted, sometimes it was bycatch.



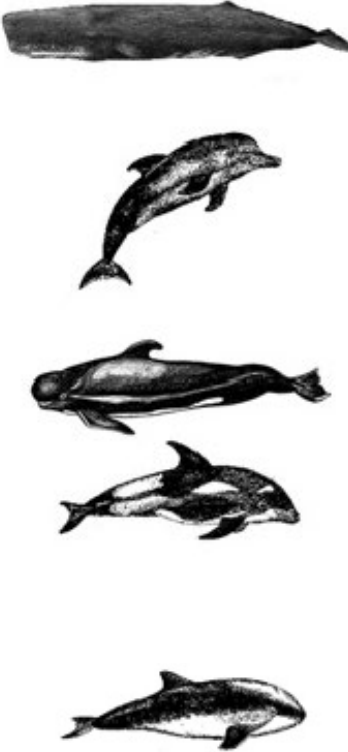
TAXONOMY

Worldwide there are six species of porpoises. In the animal kingdom, these species, including our harbour porpoise (*Phocoena phocoena*) are classified as mammals (class: Mammalia) and belong to the order of the cetaceans. According to science, whales, dolphins and porpoises all belong to this order.

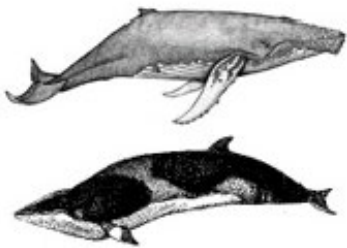
BALEEN WHALES (14)



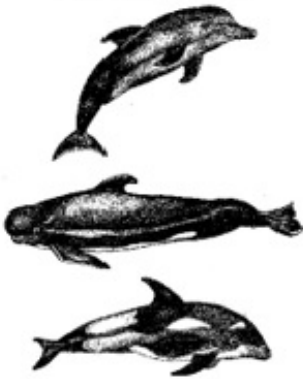
TOOTH WHALES (76)



LARGE WHALES (15)



DOLPHINS (69)



PORPOISES (6)



⬆ Two ways to divide cetaceans. Left: division in sub-orders: baleen and tooth whales. Right: division in large whales, dolphins and porpoises. Numbers refer to the number of extant species. (Drawings by M. de Ruiter).

THE HARBOUR PORPOISE IS ONE OF THE SMALLEST CETACEANS IN THE WORLD. IN THE NORTH SEA, IT IS THE SMALLEST, BUT ALSO THE MOST ABUNDANT CETACEAN. APPROXIMATELY HALF OF ALL HARBOUR PORPOISE IN THE WORLD LIVE IN THE NORTH SEA. THIS INDICATES THAT THE NORTH SEA IS VERY IMPORTANT FOR THE HARBOUR PORPOISE.

BIOLOGY

Porpoises are sturdy built animals with a blunt snout. They have a 15 cm large triangular dorsal fin in the middle and a broad horizontal tail fin. Such a tail fin is typical for cetaceans. Vertical tail fins indicate fish. The small pectoral fins are located behind the head. Adult female porpoises (the cows), are 160-190 cm long and weigh 55 kg on average. Adult males (the bulls) are on average smaller and are 145-180 cm long and weigh up to 50 kg. New-born calves are between 65-70 cm long and weigh about 5 kg (Lockyer 2003). For comparison: in humans, babies are 46- 54 cm long and weigh 2.5-4 kg. The blue whale is the largest whale in the world and has a length of 27 m on average, with an absolute measured maximum of 33 m.

The observed maximum age is 24 years, but 95% of the animals are not older than 12 years.

Regarding mating, it is striking that the male always seems to approach the female on the left side. This was discovered by the American research of Bill Keener and colleagues. Males get large and heavy testicles during the mating season, which form up to 5 % of their body weight. The penis is also quite large, about 50 cm!

THE SMALLEST CETACEANS ARE THE NEW ZEALAND HECTOR'S DOLPHIN AND THE VAQUITA, BOTH MEASURING A MAXIMUM OF 1.50 M: SLIGHTLY SMALLER THAN THE HARBOUR PORPOISE.



⬆ A porpoise surfacing sequence (F. Zanderink)

BEHAVIOUR

Harbour porpoises are good swimmers but modest when diving deep or at high speeds. The animals are rarely seen in areas deeper than 200 meters. By moving the tail vertically, the animals push themselves forward. The force originates mainly from the lower part of the back. The more muscular that lower back is, the faster the animals are. This can be clearly seen in another porpoise, Dall's porpoise. This is the fastest small whale, reaching 55 kilometres per hour at top speed and has a bodybuilder-like hump of muscles on its rear end. The harbour porpoise does not have this strength and is therefore a lot slower: it swims a maximum of 20-22 kilometres per hour.

The pectoral fins on both sides of the body are mainly used for steering and turning. The harbour porpoise does not jump out of the water that often, as several dolphin species tend to do. Only in the mating season you can see the males coming out of the water while approaching the females.

When the animals breathe calmly on the surface, they show their conspicuous 'wavy' movement very clearly. The head seldom comes out of the water completely, only the part with a blowhole, followed by the front part of the back, the dorsal fin and the rear part. The tail stays under water. You usually see them do this 3 times in a row with intervals of a few seconds, to continue swimming under

water for a longer period of time (2-3 minutes) When preparing for a dive, you can see from up close that the underside of the back with the tail is bent more.

Surfacing and diving looks different when a porpoise is hunting fish. When hunting on the surface, the porpoise only comes to the surface once to breathe. It then swims according to an irregular (zigzag) pattern to reappear a little further on. If the animal dives to greater depths, it usually takes three breaths and then dives straight down, as shown by the tail and rolling movement.

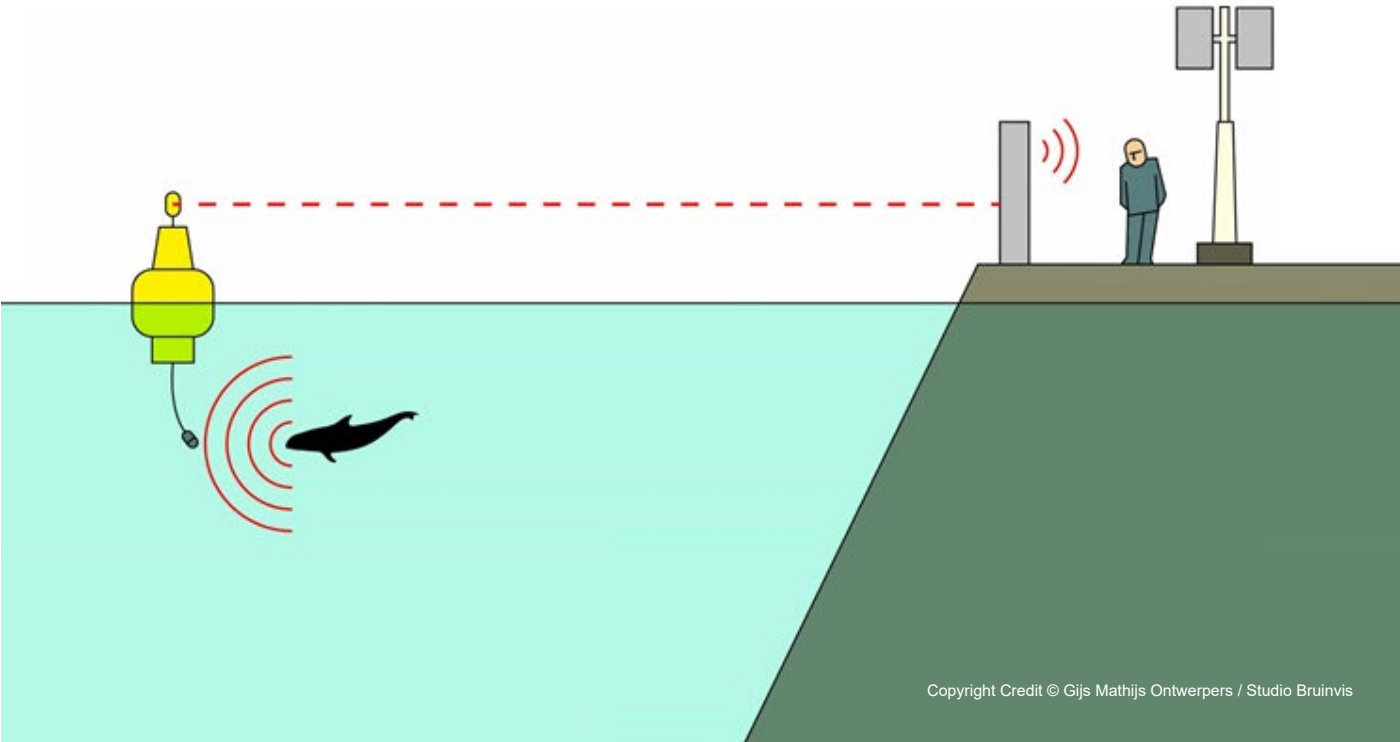
ECHOLOLOCATION

Harbour porpoise produce ultrasonic sounds. The ultrasound is produced in the skull using the so-called phonic lips or monkey lips and the melon. Air from outside is pressed through the lips to the melon. This oily organ lies at the front of the head, on top of the muzzle. It allows the ultrasound to be directed forward and can reach several hundred meters; comparable to the beam of a flashlight. When the sound collides with something - the bottom, a rock, a fish - the vibrations return. In the lower jaw they are captured and transmitted to the brain. The animal then knows exactly what

is in front of it and how far away it is from it. This is called echolocation. Unless an underwater microphone is used and the sound is transformed into sound audible to humans, people can't hear the ultrasonic sound of the porpoise. On sound file on the website of Stichting Rugvin you can hear the clicks that porpoise use to find fish and chase them. As soon as the clicks speed up you know that they have (almost) caught the fish. To survive, sound is vital for the porpoise. Human noise can make a porpoise's life quite difficult. You can read more about this under 'threats in the North Sea'

WHEN TO SPOT PORPOISES

It is not always easy to spot a harbour porpoise. Porpoises don't surface that high above the water and aren't big either, so if the wind is strong and waves are larger than 20-30 centimetres, the chance of spotting them is very small. As a rule of thumb, you could use: 0-2 Beaufort is excellent; 3-4 Beaufort gives some chance and with even more wind the chance of seeing them is very small. What is the best season? This has changed a lot in recent years. Spring is still the best season, but the last few years more =]and more animals are seen in the summer. Try to find an elevated spot, bring binoculars and some patience with you.



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HOW TO RECOGNIZE A PORPOISE

You can recognize porpoises by their behaviour, their appearance and by the sound they make. The most important thing is to know what to look for. To do this, you need to know that the animal never really comes out of the water. Also know that a porpoise is under water 95% of the time. When it comes out of the water you only see part of its back with the dorsal fin. And that usually happens three times in a row. After that the animal dives under for a minute or more and doesn't show itself for a while. Then the animal is there again for another series of about three breaths. This is typical porpoise behaviour. Also, the small, often almost triangular dorsal fin is a good landmark. At the start you could also look for flashes of light that reflect from the porpoise's wet body. Once you have made a confirmed sighting, a second sighting is a lot easier because you now have a good search image.

In winter or on cold days you can sometimes even see the little 'fountains' of breath that come out of their blowhole. If you are lucky and you are close you can also hear the 'puffing' sound of the porpoise exhaling.

THE ROLE OF THE HARBOUR PORPOISE IN THE ECOSYSTEM

The harbour porpoise plays an important role in the North Sea ecosystem. First, given the inconspicuous behaviour on the surface, one would think that the animal has a modest role. But beneath the surface lies the strength of the porpoise.

1) The harbour porpoise is one of few abundant predators in the North Sea. Their role is strengthened by the fact that there are about 350.000 porpoises in the North Sea. They prefer to eat gobies, sand eels, herring, whiting, cod fish and squid. Because of their high energy consumption, they eat up to 5-5.5 kilos of fish every day and thus play a major role in the ecosystem. They help determine the number and survival of prey fish. In the evolutionary race, they force prey fish adapt better and better: 'Survival of the fittest'. At the same time the porpoise also adapts to their prey. For 95% of the time the porpoise is under water and mostly hunting. For comparison: a lion sleeps 20 hours and eats an average of 10 kilos of meat a day and only weighs 3 times as much.

2) Due to the large consumption of fish by the entire population of porpoises, they also play an important role in the fertilization of the system. Porpoises have a liquid stool that is used again at the beginning of the food cycle.

3) By diving to the bottom where many of their prey are (sand eels, gobies etc.) they create vertical turbulence which in turn causes the mixing of the different water layers. Scientists discovered that whales grow more plankton in this way, plankton absorbs CO₂ and so cetaceans also have a role to play to combat climate change.

4) As a population, they roam the sea seasonally and can be found almost anywhere in the North Sea, so they have their impact over large scales.

5) Only a small proportion of the dead animals are stranded. Most of the dead animals are a source of food for bait-eating animals on the surface or on the seabed. That is estimated to be thousands of animals per year (dead makes life).

6) The harbour porpoise itself is prey to large grey seals and some killer whales. Bottlenose dolphins have also been recorded to kill harbour porpoise.

In addition, the animal has an indicator function. Large numbers of dead and stranded animals could indicate a problem in the ecosystem. Generally, a healthy population of harbour porpoise means a healthy sea.

THREATS IN THE NORTH SEA

Our North Sea is one of the busiest seas in the world, including activities related to industry, shipping, fishing and tourism. We use the North Sea for many things while in fact we often do not have a clear picture of the effects of our use, especially when these are adding up. It is therefore very important to continue to study porpoises and protect them in order to offer them healthy living conditions and space to live.

HUMAN ACTIVITIES

Fishing nets, the construction of wind farms, offshore industry, shipping, military activities, climate change, overfishing and pollution: all these human activities do not happen isolated. They often add on to each other. It is often difficult to estimate the exact effect of one specific human threat, let alone to predict the cumulative effect of two or more threats. At least we know that harbour porpoise can die in 3-5 days if they do not get enough feeding opportunities.

FISHERIES

Worldwide, bycatch is the biggest cause of death for dolphins and porpoises. It is estimated that at least 300,000 cetaceans die each year as the result of bycatch. The deliberate capture of porpoises by humans has long been forbidden in the entire North Sea. However, bycatch as a result of fishing is a large problem. In particular, the coarse-meshed so-called gillnets, which are set and left upright in the water column, are dangerous for porpoises. How many porpoises are victims

of bycatch in the North Sea is still unclear and more research is urgently needed. On top of that ways to prevent bycatch should be used on a large scale. For example, devices called pingers that emit unpleasant, high-frequency noises, have been developed to keep these animals away from nets.

Intensive fishing as practised in the 20th century and the 21st century has not only caused a decline in fish stocks, it has also had drastic consequences for the entire ecosystem. The fishing focus on large and often predatory fish species has also caused a shift in the ecosystem, with large fish species declining and small fish species flourishing as predator fish species decline. This has left the North Sea out of balance.



⬆ Stranded Harbour Porpoise on the beach.
Photo: J. v.d. Hiele (RTZ Ned, Schelphoek, 2017)

NOISE DISTURBANCES

Noise pollution from has recently been recognized as a negative human influence on marine mammals. Noise pollution can disrupt porpoise behaviour, limit their communication and mask sounds that are important to them. Effects can range from behaviour change and incidental and chronic stress to hearing damage and in extreme cases even to death.



SHIPPING

Commercial shipping traffic in the North Sea uses a network of defined sea routes and one of the busiest seas in the world. Recreational vessel traffic should certainly not be underestimated. This is also a major source of noise under water and these are often sounds that porpoises tend to hear well and tend to avoid.

Direct behaviour towards shipping noise varies per circumstance and on the context of what the animals is doing. It also varies per individual. Porpoises can get used to background noise to some degree, but if noise makes it difficult for them to find fish or rest, then they will have to move a lot, which costs additional energy and might affect their health if this happens frequently. It is also possible that porpoises are hit by vessels. Research on stranded porpoises shows that every year a few animals died from a physical injury with a blunt or sharp object pointing towards collisions with vessels.

**THE HARBOUR
PORPOISE HAS VERY
SENSITIVE HEARING.**



WINDFARMS

Offshore wind is necessary to facilitate the transition towards sustainable energy. In the coming years hundreds of wind turbines are being installed into the North Sea. This requires a lot of pile-driving and a lot of loud noise that comes with it. However, pile driving, and large amounts of noise are not always necessary. There are alternative techniques based on gravity and vacuum suction that are a lot quieter. In order to reduce the noise from construction at sea, measures such as large bubble curtains, screens and sleeves around the piling site are used as well. Under the right conditions these screens can be effective but are not always reliable. Sources that emit less noise are therefore most desirable. After construction, wind farms offer opportunities for local nature conservation. Research is needed to see whether porpoises also make use of wind farms.

It is not only porpoises that suffer from human noise. Species of fish, crabs, lobsters and squids react to underwater noise. For example, they cease feeding, flee or have decreased immune systems due to stress. Shellfish have been observed to dig themselves in at loud noises, or keep their valves closed. We still know little about the long-term consequences of underwater noise pollution. We should therefore try to limit human noise as much as possible and invest in research on this topic.

OTHER NOISE DISTURBANCES

Explosions are also an important noise source. It is estimated that between 800 and 8000 porpoises suffer hearing damage each year as a result of explosions to disarm unexploded ordinances in the Southern North Sea.

The oil and gas production in the North Sea is also a source of noise disturbance. Especially when searching for oil and gas sound waves are used to map the seabed. These sounds are produced by so called air guns. These can be almost as loud as an explosion.

If there are multiple disturbances happening at the same time or consecutively you can speak of a cumulative effect. Animals such as porpoises may then chased from one place to another, looking for a more suitable place to live. It is therefore important to reduce noise levels and ensure quiet areas in places that are important for porpoises to survive.

CLIMATE CHANGE

The general trend of warming of seawater, changes in sea currents and the change in quantities of fresh water also have a major impact on the entire food chain in the North Sea and thus indirectly on the harbour porpoise. The North Sea is getting warmer and warmer and there are indications that the changing climate is already affecting the North Sea ecosystem.

As top predators, marine mammals have an important function in the ecosystem. In many coastal waters, it has already been shown that increases in marine mammal populations also have a beneficial effect on fish stocks, for example. Seas and oceans convert carbon dioxide into oxygen; this is beneficial for reducing the climate problem. The protection of seas and oceans are crucial for the current climate problem.

FUTURE PERSPECTIVE

It was not until the second half of the 20th century that the structural monitoring of populations of fish and marine mammals started in Europe. Before that time, we depend on scarce data, literature and stories that were passed on. As a result, we do not really have a good idea of what the North Sea ecosystem was like before large scale human impact. The image that is constructed from historic material seems to tell the tale of a North Sea with a much richer marine life. Looking back might give us a perspective of a healthy North Sea and a goal to work towards for the recovery of the ecosystem, including that of porpoises, dolphins and whales.

STATUS AND PROTECTION

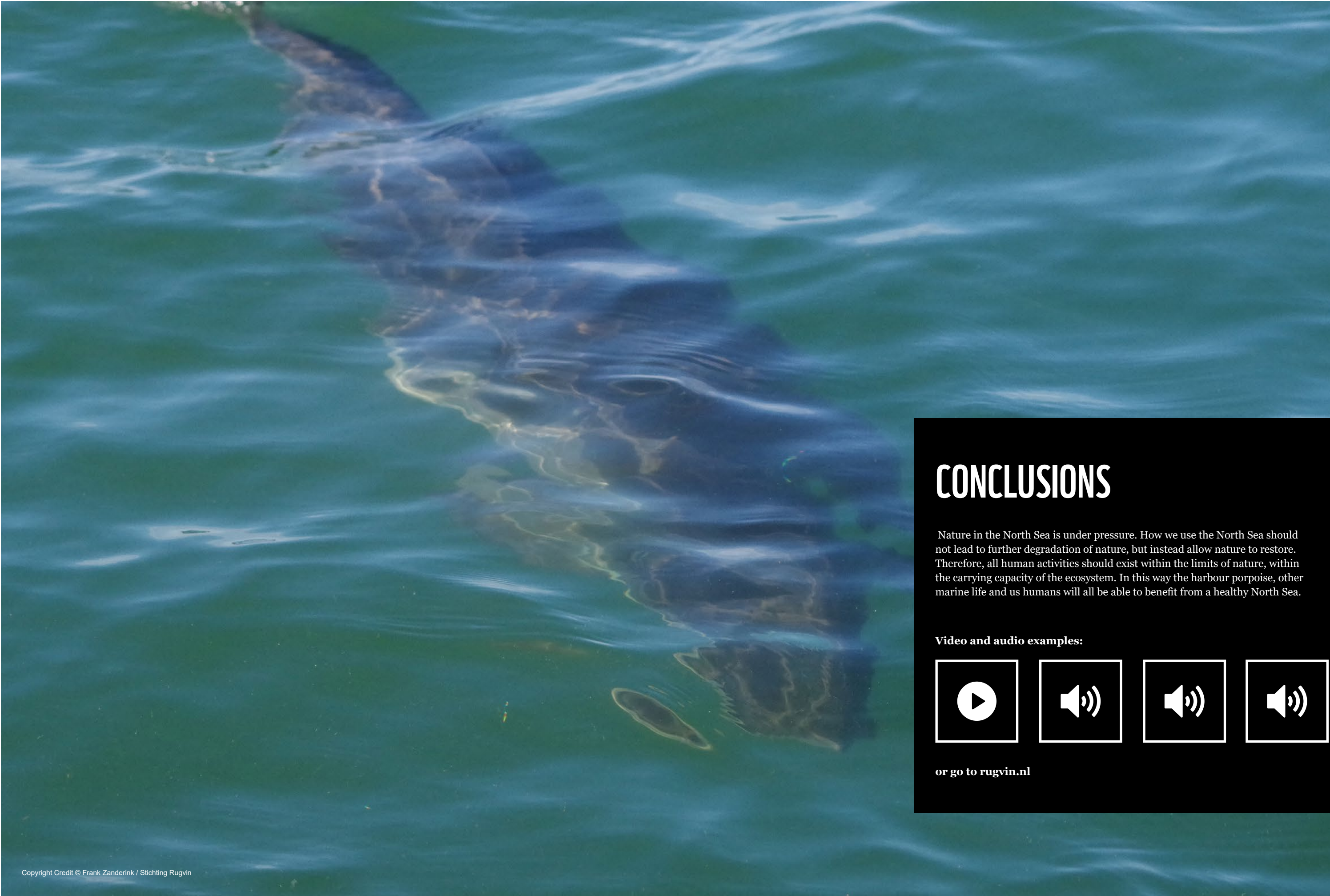
The protection of porpoises is regulated by European, regional and national policies. Area protection of ecologically valuable areas (including breeding areas) and general protection measures are both essential for the protection of harbour porpoises. The designation of protected areas without harmful fishing practices is an important example. Recently, an underwater noise monitoring project for the North Sea (JOMOPANS) has also been set up and can help to inform the protection of the harbour porpoise and other marine species.



CORONA CRISIS

The corona crisis gives us an unexpected insight into a world with reduced human activity. In many places, animal species otherwise rarely, if ever, seen in urban areas suddenly come to take a look. This phenomenon is also seen at sea, with similar reports for cetaceans. For example, false killer whales in the Mediterranean near the Israeli coast (May 2020), bottlenose dolphins near the ports of Malta (April 2020) and orcas, for the first time in a side arm near Vancouver, Canada (March 2020). Porpoises in the Oosterschelde in the Netherlands have also been observed to show different behaviour. During several observations porpoises were seen together at the surface for a longer period of time than usual. Sometimes as many as 10-15 animals hunted together for several hours. Observations of large groups of animals for such a long period of time have never been seen in the 11 years of this project. At the time of the lockdown there were much less vessels on the water and so it seems that the absence of boats seems to have played an important role in these prolonged 'group formations' and feeding opportunities.





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CONCLUSIONS

Nature in the North Sea is under pressure. How we use the North Sea should not lead to further degradation of nature, but instead allow nature to restore. Therefore, all human activities should exist within the limits of nature, within the carrying capacity of the ecosystem. In this way the harbour porpoise, other marine life and us humans will all be able to benefit from a healthy North Sea.

Video and audio examples:



or go to rugvin.nl

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