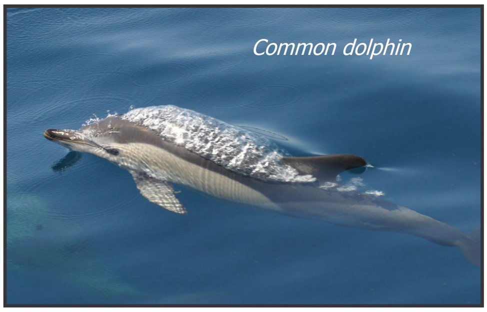
SCANS-II

SMALL CETACEANS IN THE EUROPEAN ATLANTIC AND NORTH SEA

A LIFE Nature project

Whales, dolphins and porpoises (collectively known as 'cetaceans') occur throughout European waters. More and more of us are fortunate enough to see these animals in the wild, especially with the growth of whale-watching. However, the occurrence of these animals off our coasts in the long-term depends on us being able to control our activities that can affect the lives of these captivating creatures.



One of the main threats to dolphins and porpoises (small cetaceans) in European waters is accidental capture in fishing nets, known as bycatch. The two main species affected are the harbour porpoise and the common dolphin. The European Union has recognised this as a serious problem and Member States are required to take conservation action.

Successful conservation is often hindered by our lack of knowledge about the biology and ecology of a species. In the case of bycatch, we need to know the numbers of animals being killed in this way and also the size of the population affected so an assessment can be made of the likely impact; that is, whether or not the population can sustain this additional mortality. But finding out the size of the population is not straightforward and this was one of the main aims of project Small Cetaceans in the European Atlantic and North Sea (SCANS-II).

Cetaceans are particularly difficult to study because they spend most of their time underwater and are widely distributed. We can't count them all but we can estimate abundance from surveys on ships or aircraft. Observers count animals when they surface to breath and also collect other data that can be used to extrapolate this sample, using statistical models, to determine the number of animals in the whole survey area.

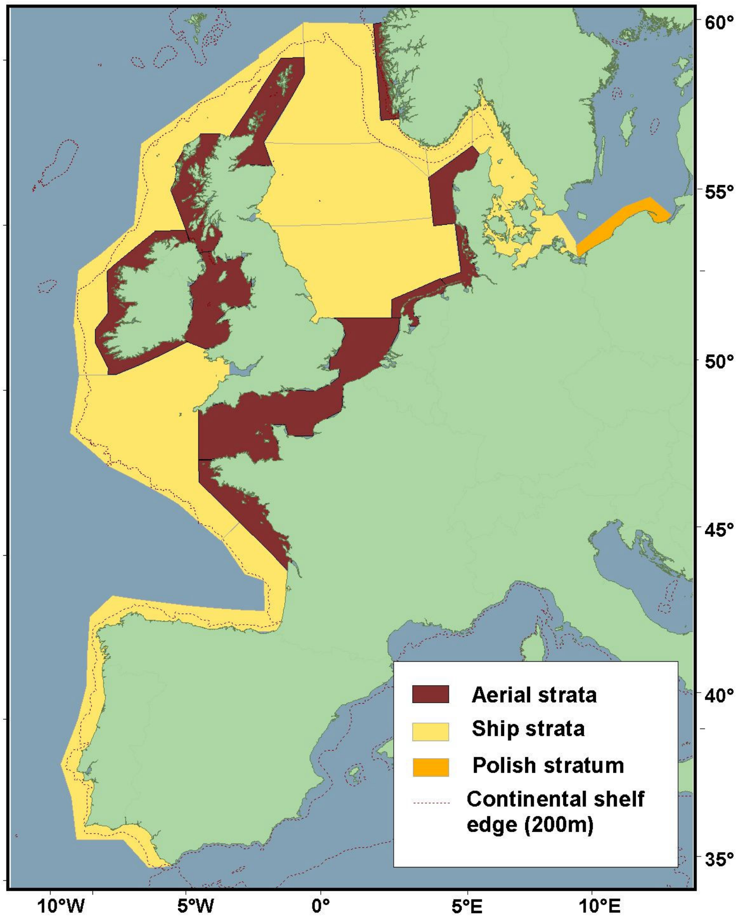


Figure 1: SCANS-II survey area

The first estimates of harbour porpoise abundance were made by the Small Cetacean Abundance in the North Sea and adjacent waters (SCANS) project in 1994. By 2004, these estimates needed to be updated and consequently, SCANS-II began with support from LIFE-Nature and 12 European governments. SCANS-II extended the survey area west and south into Irish, French and Spanish waters to cover all European Atlantic continental shelf waters (Figure 1).

The SCANS-II project estimated the abundance of small cetacean species by conducting surveys from ships and aircraft in July 2005. Because these large-scale surveys cannot take place very often, populations need to be monitored in the intervening years. SCANS-II compared different methods that can be used to monitor cetacean populations in between these times. The project also developed a computer-based tool to determine safe limits to bycatch for a given species in the face of the considerable uncertainty about our knowledge of these animals and the marine environment in which they live.

SURVEYS TO ESTIMATE ABUNDANCE

The survey methods used to estimate abundance during SCANS-II were essentially the same as had been used in the SCANS project in 1994, with some updating to incorporate recent developments. The basic method is known as line transect sampling. Observers search for animals either side of a series of predetermined transect lines travelled by the ship or aircraft throughout the study area (Figure 2).

When animals are sighted, the species is identified, the size of the group is determined and, importantly, the distance from the animals to the transect line is measured. These measurements are used to estimate the area actually searched during the survey, so that abundance for the whole area can be estimated at the end of the survey. The methods used take into account that the observers will miss some animals because they were underwater or just not seen, and also if they responded by moving either towards or away from the survey vessel.

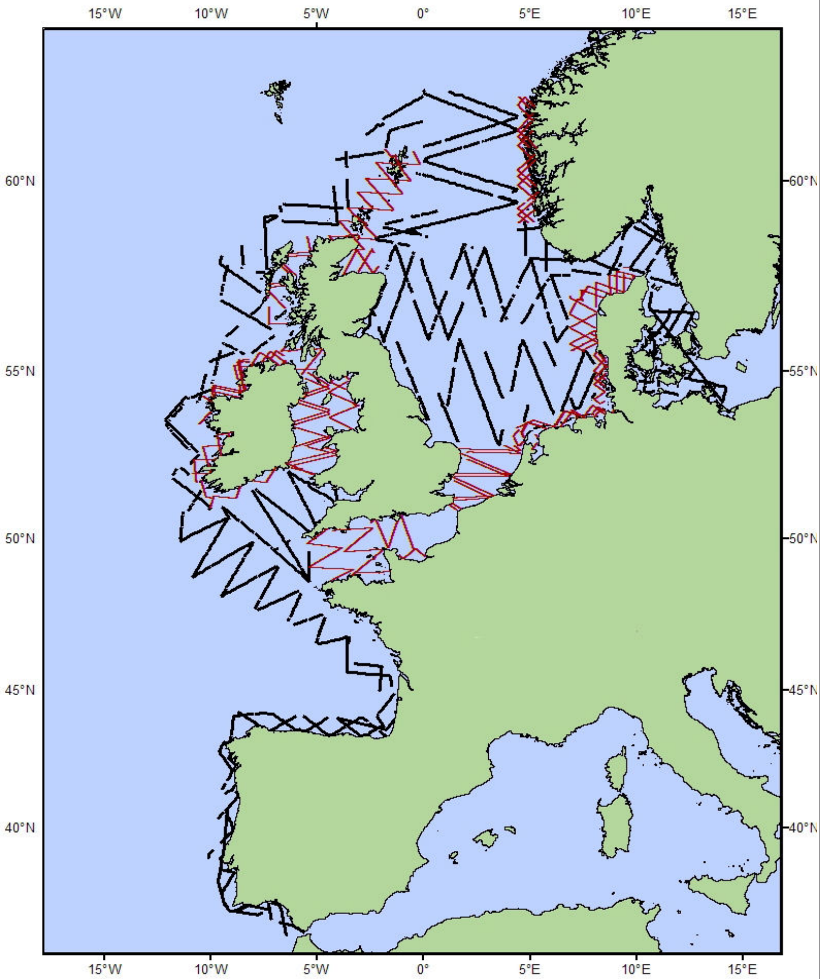


Figure 2: Transect lines searched by ship (black) and aircraft (red).

On the ships, two teams of observers, one placed at a higher vantage point than the other, searched simultaneously ahead of the ship. Observers on the higher team (known as trackers) searched farther ahead than the lower team (known as primary observers) by using high-powered binoculars. This was so that they could pick up animals before they had a chance to respond to the ship, and so that the proportion of animals seen by the trackers but not the primaries could be used to take account of the animals that were missed. Thus the methods used generated accurate estimates of the number of animals.

On the aircraft, there was a single team of observers but the method involved circling back and surveying the same section of transect line to give observers the chance to 'resight' animals they had just seen. This method allowed the missed animals to be taken account of on the aerial surveys.

High winged partenavia aircraft used for the aerial surveys.

Searching with binoculars on the tracker platform

ACOUSTIC SURVEYS

Harbour porpoises make distinctive click sounds to navigate and find food by echolocation. The clicks can be detected using an underwater microphone, called a hydrophone. All the SCANS-II survey ships towed a hydrophone on the end of a 200m cable to collect data on acoustic detections of porpoises.

These acoustic surveys can be carried out at night and in poor weather conditions and are thus more efficient than visual surveys. Only relative abundance can be estimated from recording porpoise clicks but acoustic surveys can be a good way of monitoring trends in abundance over time. The acoustic data thus complement the sightings data collected by visual observers onboard the ships.

Deploying the hydrophone from the stern of the ship

SURVEY RESULTS

In July 2005, seven ships and three aircraft surveyed of the entire European Atlantic continental shelf during the SCANS-II project. As expected, harbour porpoises were the most commonly seen cetacean in the survey area. Figure 3 shows a map of where they were seen – in inner Danish waters, throughout the North Sea and to the west of the UK and Ireland. As expected, few were seen off the coasts of France, Spain and Portugal. But a lot of animals were seen in the southern North Sea and western Channel, where none were seen in 1994. Bottlenose, white-beaked and common dolphin and minke whale were also frequently seen. Killer whales and Cuvier's beaked whales were among the species seen less often.

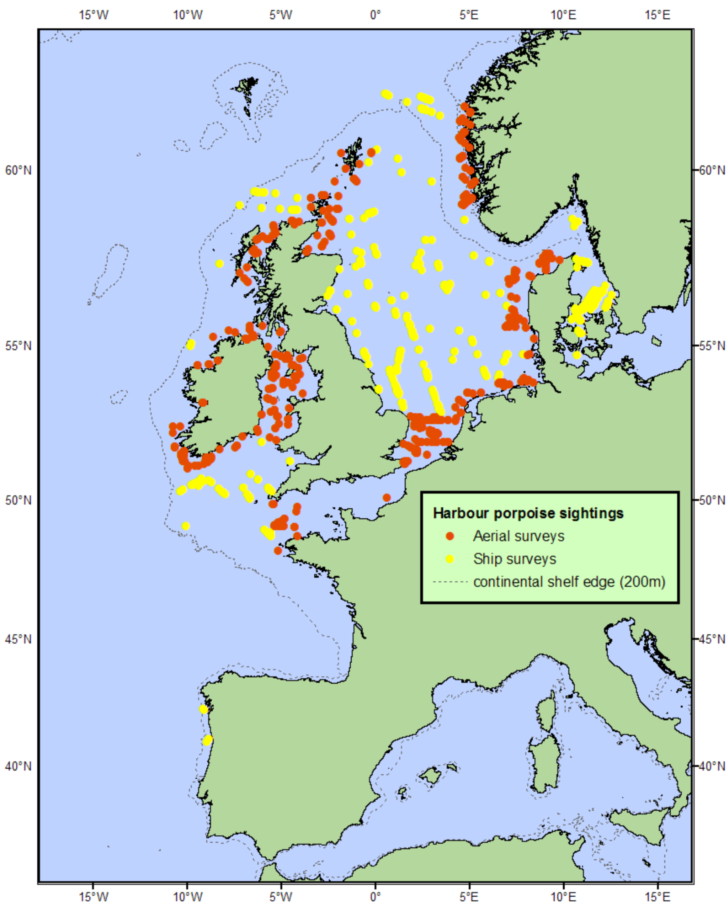


Figure 3: Position of harbour porpoises seen on the shipboard and aerial surveys.

Harbour porpoise abundance in the whole survey area was estimated to be 386,000 animals; with 95% confidence that the true number lies within the range 260,000 to 570,000 animals. Within the area that was surveyed during the 1994 SCANS project (North Sea and adjacent waters), there were an estimated 335,000 animals in 2005, almost the same as the 340,000 porpoises estimated to be present in 1994 and indicating no evidence of change in the population between 1994 and 2005.

However, large-scale changes in the distribution of porpoises were observed between 1994 and 2005. Figure 4 shows the results of a statistical analysis to generate maps of predicted distributions. In 1994, porpoises favoured areas off the northeastern coast of the UK and waters around Denmark. In 2005, the main concentration had shifted to the southern North Sea.

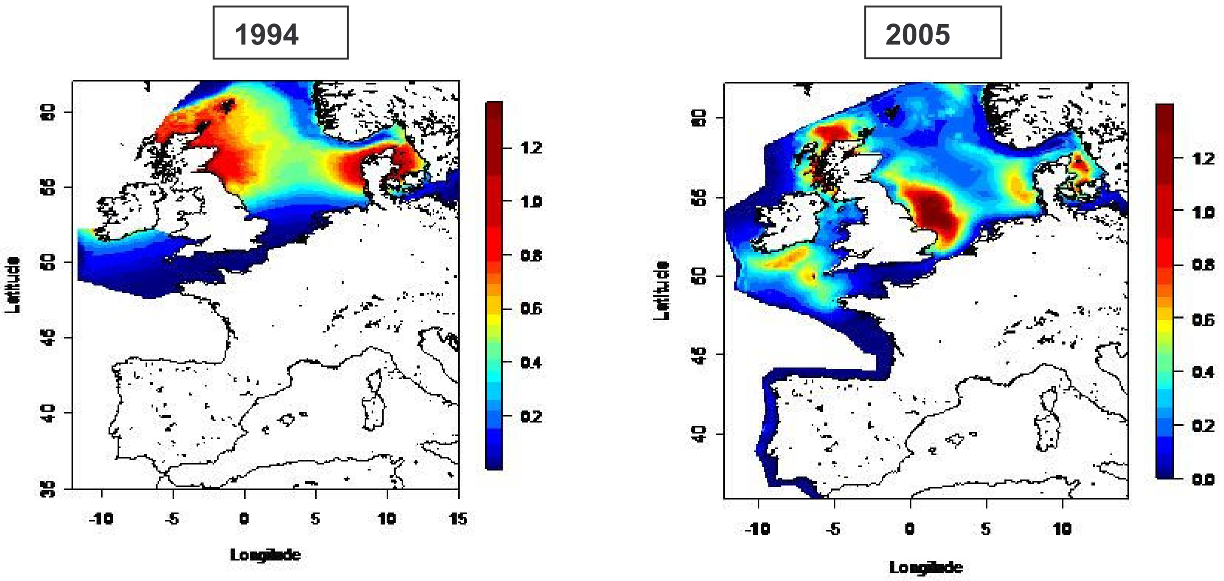


Figure 4: Estimated harbour porpoise density in 1994 and 2005.

Why this change in distribution has occurred is not clear. Many factors influence where porpoises spend their lives. The most important is the availability of their food. Porpoises eat a variety of fish, including herring, whiting and sandeel. Changes in the distribution and abundance of preferred prey may have led to porpoises redistributing themselves to follow their food or to find alternative prey.

Abundance was also estimated for other species: 22,700 white-beaked dolphins; 12,600 bottlenose dolphins; 63,400 common dolphins and 18,600 minke whales. The associated statistical estimation error means that we are 95% confident that the true number lies within about half to double the numbers given for each species.

Bottlenose dolphin (Raquel Gaspar)

White beaked dolphins

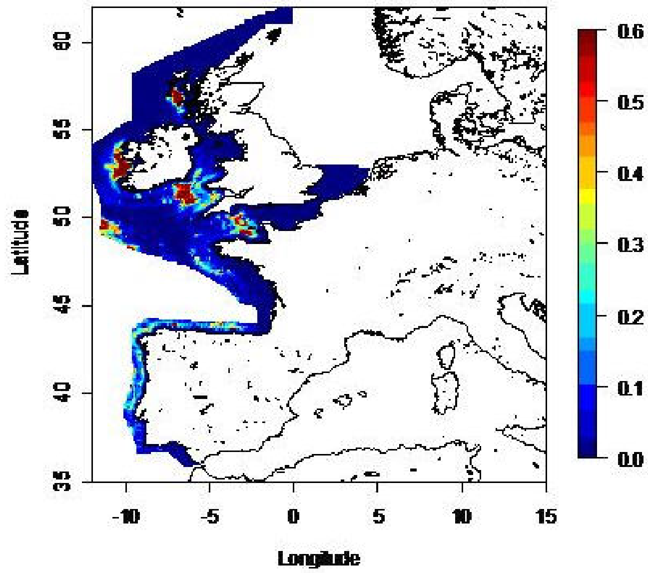


Figure 5: Estimated common dolphin distribution in 2005.

MONITORING SMALL CETACEANS

Large-scale abundance surveys, such as those undertaken by the SCANS project, are extremely expensive and available funds to carry them out are limited so they cannot take place very often. But if abundance estimates are only available every 10 years or so, how can we know what's happening to populations in the intervening years? The solution is to monitor relative abundance using one or more of number of different methods.

Techniques to monitor small cetaceans can be broadly divided into those utilising visual or acoustic methods. Visual methods include placing an observer (or two) on either dedicated surveys or "platforms of opportunity" (such as fisheries or seabird surveys, or ferries). If the species in question has suitable natural markings, photo-identification of the unique marks on individuals can generate data that can be used for monitoring; this is a good method for coastal bottlenose dolphins. Acoustic methods make use of hydrophones, either towed behind boats or fixed to the seabed; these can currently only be used for harbour porpoise.

The best method to use for monitoring depends on the questions that need to be answered (the objectives of monitoring), the species of interest, the available resources, practical and logistical issues, and the size of the area that needs to be monitored to provide data at the appropriate spatial resolution.

In the SCANS-II project, we took advantage of the abundance survey to collect data that allowed us to make quantitative comparisons of various monitoring methods. We conducted an analysis to investigate the power of different methods to detect trends of a given size over a specified period. And we did a cost-benefit analysis to see which methods were most efficient at delivering a useful result. The results of these analyses will allow EU Member States to take the best collective decisions about how to monitor small cetacean populations in the future.

Common dolphins

DETERMINING SAFE LIMITS TO BYCATCH

Although harbour porpoises are numerous in European Atlantic waters, bycatch continues to remove thousands of animals annually. While an overall goal should be to reduce bycatch to levels approaching zero, the reality is that fishing continues and it is important to try to determine levels of bycatch that populations may not be able to sustain. In the SCANS-II project, we developed a computer-based tool to determine limits to the bycatch of porpoises that should be safe even in the face of the uncertainties about our knowledge of the populations and the marine environment in which they live.

Harbour porpoise

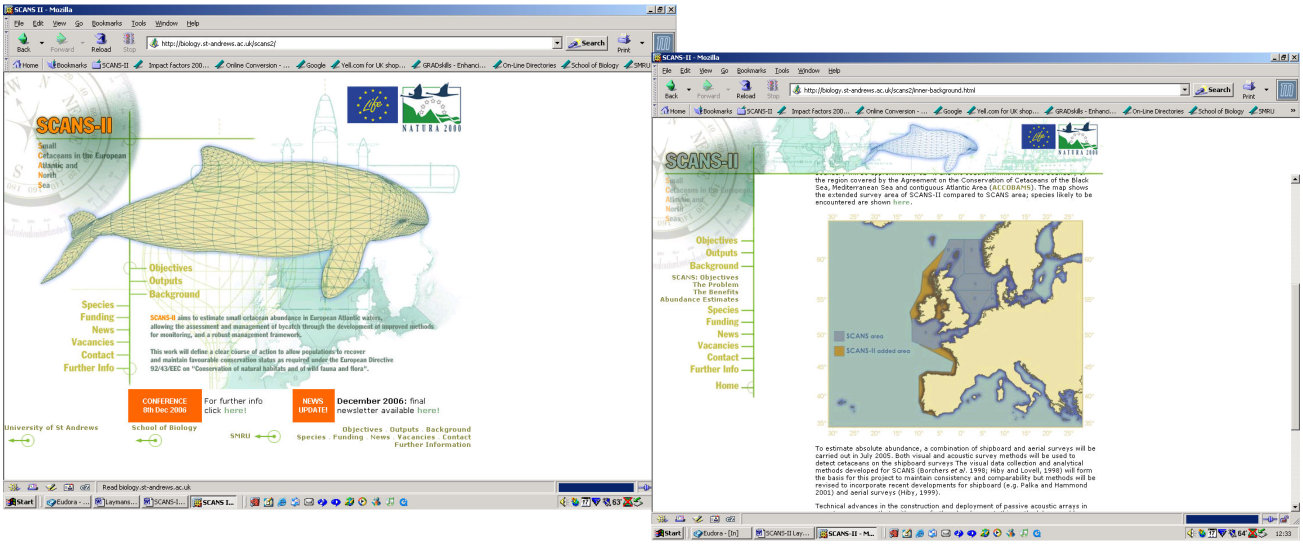
These limits are safe in the sense that they indicate the number of porpoises that could be accidentally caught before the population would be negatively affected in the long term. The actual numbers depend on several factors including, most crucially, the stated conservation objectives. We assumed an objective that populations should be allowed to recover to and/or be maintained at 80% of the population size that would be achieved without bycatch. Under a range of conditions we found that bycatch limits that allowed the stated conservation objective to be met varied between 0% and 1.5% of abundance depending on our confidence about our knowledge.

The tool developed by the SCANS-II project can also be adapted for other species. The common dolphin, for example, is bycaught in pelagic trawls and other gear. When further information on abundance becomes available from offshore waters, it will be possible to assess the importance of this threat to common dolphin populations.

SPREADING THE WORD

The results of the SCANS-II project need to reach those people that need them. These people include scientists and those responsible for making and carrying out conservation and fisheries policy. We will be taking our results to policy makers and managers in countries across Europe and to the European Commission itself with the message that this new information will be of benefit to the conservation of European cetacean populations.

We also want non-specialists to share those results and these can be found on our website **www.biology.st-andrews.ac.uk/scans2**, which provides further information on the project, from its conception to completion. The project newsletter is also available for download.



Not every day was suitable for surveying – rough seas for the survey ship Mars Chaser, west of Orkney Isles (left) and a day of fog for the Spanish survey on Investigador (right).

SCANS-II PARTICIPANTS

Beneficiary
University of St Andrews, UK

Partners

Belgium: Management Unit of the North Sea Mathematical Models

Denmark: National Environmental Research Institute

France: University of La Rochelle

Germany: Christian Albrechts-University of Kiel

Ireland: University College Cork

The Netherlands: The Ministry of Agriculture, Nature and Food Quality

Poland: University of Gdansk

Portugal: Instituto da Conservação da Natureza

Spain: Spanish Cetacean Society

UK: Joint Nature Conservation Committee

Co-financers

Denmark: Danish Forest and Nature Agency

France: Ministere de l'ecologie et du developpement durable

Germany: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany

Ireland: National Parks and Wildlife Service

Portugal: Instituto da Conservação da Natureza

Spain: Ministry of Fisheries

Sweden: Environmental Protection Agency

UK: Department of Environment, Food and Rural Affairs

Sub-Contractors

Denmark: Danish Hydrographic Institute

Denmark: GDNatur

Denmark: Fjord and Baelt Centre

Sweden: University of Stockholm

The Netherlands: Alterra

UK: Conservation Research Ltd

UK: International Fund for Animal Welfare