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**First Advice Harbour Porpoise
Research in The Netherlands**

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First Advice Harbour Porpoise research in The Netherlands

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Summary

Advice on the future of harbour porpoise research and policy in the Netherlands is given on the basis of ten questions. The Netherlands is at the forefront of harbour porpoise research within Europe. However, since much research enormously gains in value if it is conducted in an international context, the Netherlands can take a major step forward by playing a leading role in international cooperation. This could include research into the population status of the porpoise, mortality studies based on strandings and bycatches, research into the effectiveness of pingers, research into the effects of chemical pollution and ecological research on the relationship between the occurrence of porpoises and food.

1. Introduction

Background

The Dutch Secretary of State has promised the House of Representatives to set up a national scientific advisory committee to assess qualitatively the research needs, research questions, research proposals and reports on Harbour porpoise research in the North Sea, following the recommendations in the Dutch Harbour porpoise Protection Plan (Camphuysen & Siemensma, 2011). The 'Porpoise Committee' was established in October 2015 and has drafted their first advice in the spring of 2016, so that it can be used for the programming of research in 2017. In this document, advice is given on the future of porpoise research and policy in the Netherlands on the basis of ten questions. It is also indicated which subjects will be elaborated on in the next advice document.

Methods

In addition to determining the population status of harbour porpoises in the Dutch waters (population size, age structure, spatial distribution), most policy-oriented research in the Netherlands is focused on possible threats to the population. Following the international ASCOBANS protection plan (Reijnders et al., 2009) and 'Dutch Porpoise Conservation Plan' (Camphuysen & Siemensma, 2011) we distinguish three immediate threats and one more general and indirect threat. The direct threats are: (a) bycatch, (b) noise pollution and (c) chemical pollution. The more general threat concerns the indirect effects of human activities on the porpoise population by influencing the prey and possibly predator populations. This influence may be the result of, for example, climate change or fishing.

A lot of research, whether focused on population status, bycatch, pollution or more general ecological issues, takes place by making use of stranded animals. Therefore prior to discussing estimates of population status and research on threats, first some general comments about the stranding investigation are made.

Our analysis elaborates on the recommendations listed in the Porpoise Conservation Plan (Camphuysen & Siemensma, 2011). In addition, we use a recent overview of the state of the art of harbour porpoise research in the Netherlands (Siemensma & Scheidat, 2015), the national report of the Netherlands for ASCOBANS (Scheidat, 2015) and the results presented at the annual Harbour Porpoise Day in Baarn (The Netherlands, 15 October 2015). Unlike Siemensma & Scheidat (2015) in this report both a review and recommendations for porpoise research and policy is given. Although the initial task of the Porpoise Committee was to coordinate and evaluate current scientific research, policy measures in many cases cannot be dissociated from this research. Research aims to determine the impact of human activities, with possible policy measures as a result. In addition, some measures are necessary to carry out research. Hence the line between the assessment of research and policy in this report is somewhat blurred.

The discussion of the different issues is done on the basis of questions, followed by a brief explanation and an overview of the status of the research and is concluded with a recommendation. A total of 10 questions is used.

Porpoises are 'popular' animals as all cetaceans are, and their welfare is important to the general public. Aspects of animal welfare, such as in relation to bycatch, however, are not dealt with by the committee.

General advice

As a general recommendation, we would like emphasize that the Dutch Porpoise Conservation Plan (Camphuysen & Siemensma, 2011) should be used for consultations on nature, environmental and fisheries issues with the other North Sea countries and the European Commission in order to strive for coherence and coordination of research and policy measures (e.g. the Marine Strategy Framework Directive). Furthermore, it would be useful to review the Porpoise Conservation Plan based on current new insights. The same applies to the ASCOBANS Protection Plan (Reijnders et al. 2009).

2. Stranding research (research on stranded harbour porpoises)

Question 1. Why Research on stranded porpoises?

While it is obvious to conduct research on stranded porpoises, in order to determine the possible cause of death, some aspects need further consideration. The research may be set up to: 1. to analyse the trend over time and the distribution patterns from certain causes of death along our coast; 2. to identify new developments (diseases, not previously encountered phenomena); or 3. to account to governments, politicians and the public about the policy pursued.

An important question is to what extent stranded animals are representative of the entire North Sea population or for the part of the population which occurs mainly near the coast. And a second question is to what extent the observed causes of death occur in the whole of the North Sea or in particular in the coastal zone.

Therefore in the stranding research it is of utmost importance to clearly state the purpose of the research conducted. In line with this, it is important to clearly identify which autopsy protocol it is most appropriate to answer the research questions.

Current state of research

In the period 2008-2013 annually 100-150 porpoises were examined in the Netherlands, both fresh and partly rotten individuals. A comprehensive report is available in which the main causes of death are distinguished. For some of them, temporal trends are provided. Additionally, parasitological, bacteriological and virus research is conducted. This has led to a number of scientific publications, a few describing possible impact on human health (Brucella).

Currently 30-50 stranded porpoises are examined annually. These are selected on the basis of freshness and annually reports are available. Limited additional research regarding hearing loss has yielded no clear positive evidence. Samples collected for inter alia toxicological studies are stored at IMARES.

Advice

It is recommended to continue the investigation of stranded porpoises. The results will be more effective if they can be compared with research on porpoises bycaught at sea. It is desirable that this will be made possible by solving policy and administrative issues. English and Danish researchers do indeed report on specimens bycaught at sea. An extension of the landing obligation for bycaught porpoises to the whole of the fleet probably requires that the Ministry provides a letter to the fishermen in both French and English pointing out the landing obligation in case of inspections by local authorities in foreign waters.

Question 2. How is stranding research conducted and this can be improved?

A comprehensive and approved protocol is available for the study of stranded porpoises. The question is whether this still sufficiently matches the purpose of the research to be conducted. Subsequently the question can be asked whether a more tailored and efficient protocol should be implemented to create space for a larger number of stranded animals. Furthermore, we are wondering what happens effectively with the collected samples, and fourthly in what way the collected results of the sections and analyses are processed and reported.

Current state of research

Of the 30-50 porpoises currently examined a wide range of characteristics is recorded, in terms of both the quality of the individuals, the nutritional status, and the presence of infectious diseases. Samples of blubber and organs are collected and stored, but not chemically analysed in a standardised way, as far as we could assess.

Advice

We advise to continue the stranding investigations, but more clearly define the targets of the research. They can be: 1. General communication (information of the general public), 2. Assessment of effectiveness of policy measures and/or, 3. Monitoring of trends in development of e.g. certain chemicals and identification of new developments. Moreover, the small number of porpoises examined will probably not be representative for all stranded porpoises, let alone for the total population, or that part which is regularly present near the coast.

Only a small percentage of the stranded animals is dissected. To obtain more information in a simple way, it is recommended that a guide (booklet) is made for responsible persons of local authorities and for volunteers involved in porpoise strandings. This guide should contain clear instructions for collecting animals, and if collection is not possible, instructions for how to document as much as possible from a stranding (exact location, height, sex, photos of all parts with details of snout and fins, and photo from which nutritional status can be estimated). Such a guide was already proposed in the Porpoise Conservation Plan ('Production of guidelines for volunteers to Enhance data quality'), but it seems not to have been realized yet.

We recommend to critically review the efficiency and effectiveness of the dissection protocol once more. In particular we would like to know if a downsizing of the protocol would lead to a gain in time that would allow for a raise in the number of animals than can be examined. This could be done by defining a clearer aim of the dissection and a clearer view of what data should and what data should not necessarily be collected. A standardization of the protocol for autopsies would be useful; the methodology used now (Chick & Garcia-Hartmann, 1991; Kuiken, 1994; Jauniaux et al., 2002) should be revised - not only for determining the cause of death. (A workshop was held in Madeira during the European Cetacean Society Conference). We recommend to at least publish the results of research in a way also appealing to the public.

Around the North Sea, stranding databases whether or not publicly available, have already been set up by most countries. Since porpoises in the North Sea belong to 1 population, according to most researchers, it would be useful to coordinate such databases. In that way, migrations and displacements of the population could be better monitored. Also negative effects of certain human activities such as bycatches could be better mapped. A coordinated database should at least contain data on age/body length, gender, thickness of the dorsal blubber and cause of death.

3. Population status

Determining the population status of the porpoise is particularly useful if it is done repeatedly using a standard protocol at the necessary precision. Only then is it possible to draw conclusions about increase or decline of the population. It is not yet entirely clear to which population belong the porpoises that occur in the Dutch waters. Some sources distinguish one population occurring in the North Sea, including the Eastern Channel. This population would then hardly mix with e.g. neighbouring populations occurring in the Kattegat-Skagerrak and the Irish Sea - Western Channel. Further international investigation into the structure of the Northeast Atlantic population is essential for a proper interpretation of the population counts. Population estimates are best performed on the basis of areal counts, but also coast-based counts (zeetrektellingen) or the number of stranded animals can give an indication of the population size.

Question 3. Why perform aerial count on the Dutch Continental Shelf?

Counts are mostly conducted to identify changes in population size. This may provide evidence of the impact of human activities on the population size. In addition, counts can be used to determine the spatial habitat use, to build ecological distribution models, or to support the selection of Natura 2000 sites or other protected areas. Finally, counts of porpoises in Dutch waters can be used to interpret the extent of the estimated bycatches (see below). Relating to this last point are a number of pitfalls that are discussed in the 'bycatch' chapter.

Current state of research

Between 2008-2013 annual aerial surveys were conducted on the Dutch Continental Shelf (DCS). Up to now, two international counts of the whole NE Atlantic Continental Shelf have been executed (SCANS I in 1994, SCANS II in 2005), a third count is carried out in 2016 (SCANS III).

Advice

Stand-alone annual counts of the DCS provide little information on the population size, given the large space-time variation in porpoise occurrence as demonstrated by the SCANS surveys. The effort will have to be more focused on internationally coordinated population-wide surveys. The SCANS surveys confirm indeed that there appear to be no local populations with little exchange between them.

In addition, more attention must be given to the statistical methods, on the basis of which confidence intervals of these different counts are determined. Interestingly, the DCS surveys report much wider intervals than the SCANS surveys. It needs to be investigated if this is a real difference, coupled with sampling effort, or if this is only due to differences in the analysis methodology. The confidence intervals of the DCS surveys are so large that the usefulness of such surveys is doubted. This uncertainty will have to be removed before these counts can be used effectively for policy purposes.

Until now, the DCS counts are usually performed in mid-summer. The question is whether this is the right season. In any case, the count would have to take place in the same season every year. The period of March and April could be considered as a more suitable period.

Question 4. Can the DCS aerial counts not replaced by or supplemented with cheaper methods?

Coastal counts (Zeetrektellingen) and stranding data provide an index of local population size. Perhaps these can be a useful addition to aerial surveys.

Current state of research

For the Dutch coastal zone in the period 1990-2010, there is a clear correlation between the number of reported strandings per year and the number of animals counted from the shore per unit time (Camphuysen and Siemensma, 2011). The question is whether this also is valid on an international North Sea scale. It is not known whether the detected movement to more southern waters as detected by the SCANS surveys, is also expressed in a relative reduction in the number of stranding along the Northern North Sea.

Advice

The data collected by coastal observers (zeetrekters) are very interesting. Especially in areas where recreational fishing with gill nets is performed (incl. from the beach), a high number of sightings of porpoises from the shore indicates a high risk of bycatch. It is recommended that such *ad hoc* data are reported to the competent authority. On the basis of this information it can then be decided to carry out additional monitoring of gillnet fishing from the beach.

For the estimation of (relative) densities of porpoises in a higher temporal resolution than possible by aerial surveys, passive acoustic monitoring (PAM) may be used, e.g. by means of Porpoise Detectors - PoDs. It is recommended to develop a cheaper system for anchoring. Ideally, PAM and aerial surveys are combined. Drones and unmanned aircrafts might be a future alternative.

An integrated and internationally coordinated approach and reporting of both coastal counts and strandings would greatly increase the value of this type of work. Our advice is to involve other North Sea countries in both the stranding research and coastal counts.

4. Bycatch

The bycatch research consists of two parts. The first part is monitoring of the bycatch in the gillnet fisheries which also includes research into the controlled use of pingers and their effects. The second part is directly related to the previously discussed stranding program, particularly the part to determine the cause of death.

Question 5. Has the research on bycatch in gillnet fisheries and on pingers given clear answers about the use of pingers??

Current state of research

The Remote Electronic Monitoring (REM) program is running in cooperation with a number of professional fishermen. The pinger project is running as well, testing the Banana pinger. The research conducted in the Netherlands, with regard to (1) REM, (2) examination of pingers, and (3) research using animals in captivity, is an example for other countries. Fishermen are closely involved in the investigation, which can only be encouraged.

Advice research

Ongoing programs on both the REM and pingers (in the field and with captive animals) are sufficient for the time being in terms of size and objectives.

For an estimate of the total catch (extrapolation from data collected in the REM pilot project) more data may be needed about the fleet: the number of vessels, type of nets used, length of the nets x soak time, fishing areas, period of fishing, etc.. Additional monitoring of recreational gillnet fishing at sea and gillnet fishing from the beach seems necessary. Would an estimation be possible of the effort, number of vessels, number of fishers, type of nets, soak time, etc.?

Throughout Europe, many individual research projects have been designed to assess the effectiveness of pingers, but it seems that there is a need for additional coordination and consultation. The REM project will be most successful when performed in an international context; abroad similar research is done, and it would be useful to combine the results of different studies.

In future REM projects sufficient vessels of any type (size, scope, type of gear, ...) should participate so that a proper extrapolation is possible. Before a new investigation is launched, it will have to be determined how many vessels are sufficient.

The estimation of bycatch should not merely be based on observations (of REM) and extrapolation. A link should be established with the results of dissection. Possibly bycatch in fisheries not using REM (e.g. recreational fishing) could be mapped this way.

Question 6. How to continue after EC Council Regulation 812/2004?

Status

EC Regulation 812/2004 (monitoring of bycatches, ban on driftnets, mandatory use of pingers) will be replaced this year (2016) by new legislation. It now appears that in the new fisheries legislation aspects of monitoring and measures will be split.

Advice policy

The aforementioned split seems very inefficient at first sight. The Porpoise Commission recommends that the two aspects are/remain coordinated at the national level. Given the density of porpoises in the southern North Sea and the intensity of fishing with gill nets, it seems necessary that the monitoring should be made compulsory for ICES area IVc (southern North Sea), contrary to the provisions of EC Regulation 812/2004, in which hardly any monitoring was required in this area.

Question 7. Do the data on bycatch as cause of death in stranded animals provide relevant information for the total population?

To correctly assess the bycatch relative to the population size, also data on the spatio-temporal distribution and abundance of porpoises are required, in addition to data on bycatch.

Current state of research

It is still not clear which proportion of the population is taken as bycatch, in the context of the pre-set limits of mortality due to human activities.

Advice

It is recommended that, when estimating the limits for by-catch, seasonal variation in the number of animals present in Dutch waters is taken into account (for example, by making use of the results of the DEPONS project; Gilles et al., in press). In the Dutch Porpoise Conservation Plan, estimates of bycatch limits are made based on maximum numbers of porpoises present in Dutch waters. When seasonal variation in the number of animals present is taken into account, the limit will be lower.

To get more precise estimates, additional counts could be made in areas / periods preferred by gillnet fishers.

In addition to the Dutch approach to relate bycatch to population size, an approach at the level of the entire population should be chosen, i.e. in cooperation with at least all North Sea countries. See also the observations made previously under the questions 2 to 4.

5. Underwater noise

In recent years, the Netherlands have clearly played a leading role in the investigation of effects of noise on animals in captivity, in the drafting of noise contours for activities in the Dutch part of the North Sea, in the modelling of damage in porpoises by the destruction of Unexploded Ordnance (UXO), etc.

Question 8. Is there sufficiently known about the harmful effects of underwater acoustic disturbance?

Current state of research

The Porpoise Conservation Plan (Camphuysen & Siemensma, 2011) indicates that "*While there is concrete evidence for avoidance behaviour of loud (explosive) underwater sounds (such as pile driving for windfarm construction, seismic exploration, underwater explosions, and naval sonar operation), there is no factual evidence for lethal damage. Adequate studies of hearing damage and death as a result of underwater sound are lacking*" and that "*hearing damage has not been properly investigated.*" However, research has shown that potentially hundreds of porpoises could suffer from temporary hearing loss caused by underwater noise from explosions.

Advice

The next step is to translate the findings of the investigation into measures. This is already the case for e.g. pile driving. It is necessary that theoretical knowledge about various research areas is further brought together, e.g. studies of the effects of noise on animals in captivity and noise measurements of activities at sea. Moreover, it is recommended that the focused research is continued, e.g. the TTS studies with porpoises in captivity.

Given the future pile driving activities involving larger structures, it is recommended to set up a monitoring program for clarifying the effects on porpoises of pile driving these much larger and heavier piles. Such monitoring may consist of aerial surveys just before and during pile driving operations, and/or the deployment of passive acoustic monitoring devices at different distances from the pile driving location. Ideally, these two techniques are combined. Also, sound levels in the field need to be measured.

Furthermore it would be useful to develop a permit system for seismic surveys, with standardized practical measures (protocol) (cfr. JNCC, 2010). These measures should scientifically have been shown to have a beneficial effect on the avoidance of damage and should reduce disturbance.

6. Research on contaminants

Question 9. Why research on contaminants?

Dutch research in the Wadden Sea has shown that seals experience serious damage (reproduction) due to increased levels of organic and inorganic contaminants. It is also shown that porpoises have increased loads of chlorinated and halogenated compounds and suffer from losses in reproduction.

For the Dutch situation, porpoises are representative for the North Sea habitat, while seals, having different feeding patterns, are representative for especially the Wadden Sea / and coastal waters. Therefore porpoises could fulfil an interesting indicator role. This relates on the one hand to structural changes in the structure of the North Sea ecosystem, e.g. as a possible consequence of climate change. On the other hand, the indicator could give insight in to what extend the Dutch coastal waters, with a strong industrial influence (Rhine and Scheldt port areas), are comparable to the English and Danish coastal waters, in terms of chemical stress.

Current state of research

Research on porpoises in the UK and DK has shown that porpoises have elevated levels of PCBs and other chlorinated and halogen compounds that can cause reproductive problems. Exploratory research at Dutch porpoises confirms this.

However, there is limited understanding of the development over time of these loads which makes it difficult to determine whether the (inter) national policies to reduce the burden of persistent organic pollutants (POPs) are effective.

Based on English research there is insight into the impact of policies targeting tributyltin (TBT): the policy has led to a reduced load in marine mammals. However, copper and zinc-containing antifouling agents are still in use and could have impact as well.

Advice

It is advisable to determine the loads over time of chlorinated and fluorinated hydrocarbons in porpoises. The recently established Harbour porpoise protection plan for the UK includes a comprehensive analysis of the development in the loads of various substances for porpoises off the coast of Scotland, England and Wales. This study already provides a lot of information. Stored samples of the Dutch porpoises could be (re)analysed for this purpose and be compared to previously reported loads of these elements.

Selection of samples of Dutch porpoises to be analysed could be done in two steps: 1. First collect selectively from the stored material a few samples of porpoises where contamination is one of the most likely cause of death. This may result in evidence for a temporal trend of the loads of various substances. 2. Then, for those substances where a trend is present, perform a more accurate analysis. This may include a greater number of porpoises and/or analysis of various types of tissue samples.

Concerning the general indicator function of the Harbour porpoise, the Dutch government could promote this in an international context so that alignment and coordination of the research conducted in different countries and is facilitated and stimulated.

7. General threats and ecological research

Question 10. Should there be more focus on population-dynamics and food ecology?

Surveys give, at most, estimates of (sub) population size and/or trends in population size, but do not provide an understanding of the causes behind the changes. Diet studies mainly concern stranded animals and possibly give a distorted view of the total population.

Current status of research and provisional advice

Only little research is conducted on the general ecology and population dynamics of the Harbour porpoise. ASCOBANS proposes that a maximum of 1.7% of the population may die due to human impact. It is not clear on what scientific basis this figure is based. This should be better substantiated; further research on the population dynamics (for population size, birth and death rates) can contribute to this. Investigation of the harbour porpoises that are bycaught at sea would contribute as well. In addition, direct observations at sea may provide a better understanding of the feeding ecology of the Harbour porpoise (for example, where do they forage and which water layers and prey are preferred), thus giving an interpretation of population surveys (aerial surveys).

The Porpoise Commission will elaborate on these points in their next advice.

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