Agenda Item 12.1 National Reporting

Reports from Parties

Information Document 12.1.b

2013 Annual National Report Denmark

Action Requested

- Take note

Submitted by Denmark

NOTE:
DELEGATES ARE KINDLY REMINDED
TO BRING THEIR OWN COPIES OF DOCUMENTS TO THE MEETING

2013 ASCOBANS Annual National Reports

Pre-filled with answers given in 2012 National Report - please update!

This format for the ASCOBANS Annual National Reports was endorsed by the 6th Meeting of the Parties in 2009. Reports are due to be submitted to the Secretariat by 31 March of each year.

Parties are requested to use this report to provide NEW information on measures taken or actions towards meeting the objectives of the Conservation and Management Plan and the Resolutions of the Meeting of the Parties.

The 7th Meeting of the Parties in 2012 agreed to move to online reporting with immediate effect. In order to benefit fully from the opportunities for synergies among CMS Family treaties afforded by this tool, Parties decided that a revised national report format be developed by a small working group assisted by the Secretariat for consideration by the Advisory Committee in preparation for the 8th Meeting of the Parties. While retaining the questions related only to ASCOBANS, it should align more closely to the format used in CMS, AEWA and EUROBATS.

General Information

Name of Party
› Denmark

Report submitted by

Name	Lars Seidelin
Function	Biologist
Organization	Fjord&Bælt
Address	Margrethes Plads 1
Telephone/Fax	+4542131554
Email	lars@fjord-baelt.dk

Changes

Changes in Coordinating Authority or appointed Member of the Advisory Committee
› Lars Seidelin will in 2013 take over from Magnus Wahlberg, Fjord&Bælt

List of National Institutions

List of national authorities, organizations, research centres and rescue centres active in the field of study and conservation of cetaceans, including contact details
› DTU AQUA, National Institute of Aquatic Resources, Section of Coastal Ecology, Technical University of Denmark, Charlottenlund Slot, Jægersborg Allé 1, 2920 Charlottenlund, Denmark. Contact person: Finn Larsen, phone +4535883496, email: fl@aqua.dtu.dk

› The Fisheries and Maritime Museum, Tarphagevej 2, 6710 Esbjerg V, Denmark. Contact person: Lasse Fast Jensen, phone +4576122000, email: lfj@fimus.dk

› Fjord&Bælt and Marine Biological Research Center, University of Southern Denmark, Margrethes Plads 1, 5300 Kerteminde, Denmark. Contact person: Lars Seidelin, phone: +4542131554, email: lars@fjord-baelt.dk

› Department of Bioscience, Aarhus University, Frederiksborgvej 399, 4000 Roskilde, Denmark. Contact person: Jonas Teilmann, phone +4587158494, email: jte@dmu.dk

Habitat Conservation and Management

Fisheries Interactions

Direct Interaction with Fisheries

1.1 Investigations of methods to reduce bycatch

› DTU, AQUA conducted research on Fully Documented Fishery onboard gillnet vessels <15 m. to test whether electronic monitoring can be used to provide reliable documentation of the fishing operation and the catches onboard gillnet vessels less than 15 m in length.

› Determining optimal pinger spacing for harbour porpoise bycatch mitigation
Larsen, Finn ; Krog, Carsten ; Eigaard, Ole
in journal: Endangered Species Research (ISSN: 1863-5407) (DOI: http://dx.doi.org/10.3354/esr00494), vol: 20, issue: 2, pages: 147-152, 2013

› Acoustic activity of harbour porpoises (Phocoena phocoena) around gill nets
Boström, Maria K. ; Krog, Carsten ; Kindt-Larsen, Lotte ; Lunneryd, Sven-Gunnar ; Wahlberg, Magnus
in journal: Aquatic Mammals (ISSN: 0167-5427) (DOI: http://dx.doi.org/10.1578/AM.39.4.2013.389), vol: 39, issue: 4, pages: 389-396, 2013

1.2 Implementation of methods to reduce bycatch

› None

1.3 Other relevant information

Other relevant information, including bycatch information from opportunistic sources
› Swimming patterns of wild harbour porpoises Phocoena phocoena was investigated. The study showed detection and avoidance of gillnets at very long ranges <50 m. It was unclear whether the porpoise use sonar or other senses to detect the nets on long distances

› Biosonar, dive, and foraging activity of satellite tracked harbor porpoises (Phocoena phocoena). /
Linnenschmidt, Meike; Teilmann, Jonas; Akamatsu, Tomonari; Dietz, Rune; Miller, Lee A.
I: Marine Mammal Science, Vol. 29, Nr. 2, 2013, s. E77-E97.

1.4 Report under EC Regulation 812/2004

Please provide the link to your country's report under EC Regulation 812/2004.
› http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0578:FIN:EN:HTML

Reduction of Disturbance

2.1 Anthropogenic Noise

Please reference and briefly summarise any studies undertaken
› Effects of underwater noise on harbour porpoises around major shipping lanes.

Mortensen, Lars O.; Tougaard, Jakob; Teilmann, Jonas.
BaltSeaPlan - www.baltseaplan.eu, 2012. 42 s. (BaltSeaPlan Report; Nr. 21).

2.2 Ship Strike Incidents

Please list all known incidents and provide information separately for each

	Incident 1	Incident 2	Incident 3	Incident 4	Incident 5
Date					
Species					
Type of Injury					
Fatal Injury (Yes/No)					
Type of Vessel (length, tonnage, speed)					
Location (coordinates)					
More Information (name, email)					

2.3 Major Incidents

Major Incidents Affecting Significant Numbers of Cetaceans (two or more animals)

	Incident 1	Incident 2	Incident 3	Incident 4	Incident 5
Date					
Location					
Type of Incident					
Further Information					

2.4 Pollution and Hazardous Substances

Please report on main types of pollution and hazardous substances (including source, location and observed effects on cetaceans). Please provide information on any new measures taken to reduce pollution likely to have an impact.
› Sonne C., Leifsson PS, Dietz R 2013. Liver and renal lesions in mercury contaminated narwhals (Monodon monoceros) from North West Greenland. Toxicological and Environmental Chemistry 95:1-14.

› PFAS profiles in three North Sea top predators: metabolic differences among species?. / Galatius, Anders; Bossi, Rossana; Sonne, Christian; Riget, Frank Farsø; Kinze, Carl Chr.; Lockyer, Christina; Teilmann, Jonas; Dietz, Rune.
I: Environmental Science and Pollution Research, Vol. 20, Nr. 11, 2013, s. 8013-8020.

2.5 Other Forms of Disturbance

Please provide any other relevant information, e.g. relating to recreational activities affecting cetaceans.
› The effect of harbour porpoise distribution was investigated by the restoration of a large reefs at Læsø. After the establishment of the reef, the number of harbour porpoises to the area. This is due to an increase in fish stocks around the reef. In the area which was used as a reference, could however see a decline in the number porpoise sightings. It is unclear what this decline is due.

› Parameters of growth and reproduction of white-beaked dolphins (Lagenorhynchus albirostris) from the North Sea. /Galatius, Anders; Jansen, Okka E; Kinze, Carl Christian .
I: Marine Mammal Science, Vol. 29, Nr. 2, 2013, s. 348-355.

Marine Protected Areas

Marine Protected Areas for Small Cetaceans

3.1 Relevant Information

Please provide any relevant information on measures taken to identify, implement and manage protected areas for cetaceans, including MPAs designated under the Habitats Directive and MPAs planned or established within the framework of OSPAR or HELCOM.
› In June 2011, Denmark began a monitoring program of the designated SACs (special areas of conservations, Natura2000) for harbour porpoises. Passive acoustic dataloggers, CPODs, have been deployed in two SACs, an acoustic porpoise survey has been conducted in the Inner Danish waters, two aerial surveys have been performed covering SACs: one in the North Sea and one in Skagerrak.

› The Natura 2000 project aims to ensure endangered and valuable species. In this project 16 areas has been selected to protect the Harbour Porpoise.

http://naturerhverv.dk/fiskeri/natura-2000-i-hav/marsvin/

http://www.naturstyrelsen.dk/Udgivelser/Aarstal/2013/Vandmiljoe_og_Natur_2012_NOVANA.htm

3.2 GIS Data

Please indicate where GIS data of the boundaries (and zoning, if applicable) can be obtained (contact email / website).
› Contact: Signe Sveegaard, sign@dmu.dk

Surveys and Research

4.1 Abundance, Distribution, Population Structure

Overview of Research on Abundance, Distribution and Population Structure
› The SAMBAH project to estimate abundance and distribution of harbour porpoises in the Baltic Sea by static acoustic monitoring is running in the data collection phase. Analysis of data starts in 2013.

› A study showed that the number of harbour porspoise were significant higher from April to October than during winter. It also showed that cod, herring and goby were the common prey during summer and winter.

Sveegaard, S., H. Andreasen, K. N. Mouritsen, J. P. Jeppesen, J. Teilmann, C. C. Kinze 2012. Correlation between the seasonal distribution of harbour porpoises and their prey in the Sound, Baltic Sea. Marine Biology 159: 1029-1037.

› Satellite telemetry data have been used to define high density areas of porpoises. These areas have been helpful in determining the newly established Danish marine Nature2000 areas.

Sveegaard, S., Teilmann, J., Tougaard, J., Dietz, R., Mouritsen, K. N., Desportes, G., Siebert, U. 2011. High-density areas for harbor porpoises (Phocoena phocoena) identified by satellite tracking. Marine Mammal Science 27(1), 230-246.

› Population structure of harbour porpoises.

Galatius, A., Kinze, C.C., Teilmann, J. (2012) Population structure of harbour porpoises in the greater Baltic region: Evidence of separation based on geometric morphometric comparisons. Journal of the Marine Biological Association of the United Kingdom. 92: 1669-1676.

› Reef establisment and how it influense on the distribution of harbour porpoise.

Mikkelsen, L. 2012. Re-established stony reef in Kattegat, Denmark attracts harbour porpoises (Phocoena phocoena).

› Distribution of Cetaseans

Hammond, PS, Macleod, K, Berggren, P, Borchers, DL, Burt, ML, Cañadas, A, Desportes, G, Donovan, GP, Gilles, A, Gillespie, D, Gordon, J, Hedley, S, Hiby, L, Kuklik, I, Leaper, R, Lehnert, K, Leopold, M, Lovell, P, Øien, N, Paxton, C, Ridoux, V, Rogan, E, Samarra, F, Scheidat, M, Sequeira, M, Siebert, U, Skov, H, Swift, R, Tasker, ML, Teilmann, J, Van Canneyt, O Vázquez, JA. (2013). Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. Biological Conservation 164: 107-122

› Viquerat, S., Feindt-Herr, H., Gilles, A., Peschko, V., Siebert, U., Sveegaard, S. & Teilmann, J. (2013). Abundance of harbour porpoises (Phocoena phocoena) in the Western Baltic, Belt Sea and Kattegat. Marine Biology, DOI 10.1007/s00227-013-2374-6
http://download.springer.com/static/pdf/707/art%253A10.1007%252Fs00227-013-2374-6.pdf?auth66=1389882289_40ca69187d2cd9021f7093a4dba01d0d&ext=.pdf

› Nabe-Nielsen, J., Sibly, R. M., Tougaard, J., Teilmann, J., & Sveegaard, S. (2014). Effects of noise and by-catch on a Danish harbour porpoise population. Ecological Modelling, 272, 242–251. doi:http://dx.doi.org/10.1016/j.ecolmodel.2013.09.025

›
Nabe-Nielsen, J., Teilmann, J., & Tougaard, J. (2013). Effects of wind farms on porpoise population dynamics. In Danish Offshore Wind. Key Environmental Issues – a Follow-up (pp. 61–68). Copenhagen, Denmark: The Environmental Group: The Danish Energy Agency, The Danish Nature Agency, DONG Energy and Vattenfall.

› Wright, A. J., Maar, M., Mohn, C., Nabe-Nielsen, J., Siebert, U., Jensen, L. F., ... Teilmann, J. (2013). Possible causes of a harbour porpoise mass stranding in Danish waters in 2005. PLoS ONE, 8(2), e55553. doi:http://dx.plos.org/10.1371/journal.pone.0055553

› Abundance survey of harbour porpoises in Kattegat, Belt Seas and the Western Baltic, July 2012 : Note from DCE - Danish Centre for Environment and Energy. / Sveegaard, Signe; Teilmann, Jonas; Galatius, Anders. 2013. 11 s., jun 26, 2013.
See attaced PDF

› The stranding anomaly as population indicator: The case of harbour porpoise Phocoena phocoena in North-Western Europe.
Peltier, H., Baagøe, H.J., Camphuysen, K.C.J., Czeck, R., Dabin, W., Daniel, P., Deaville, R., Haelters, J., Jauniaux, T., Jensen, L.F., Jepson, P., Keijl, G.O., Siebert, U., Van Canneyt, O. & Ridoux, V. (2013) PLoS ONE, 8(4): e62180.

› Possible Causes of a Harbour Porpoise Mass Stranding in Danish Waters in 2005.
Wright, A.J., Maar, M., Mohn, C., Nabe-Nielsen, J., Siebert, U., Jensen, L.F., Baagøe, H.J. & Teilmann, J. (2013)

PLoS ONE, 8(2): e55553.

› Surveys by Institition for Bioscience Aarhus University (contact Anders Galatius, agj@dmu.dk):
- Harbour porpoise 27-30 August, 2013, 123 detections, Belt Seas Acoustic survey
- Harbour porpoise 22 August, 2013 Skagerrak Aerial survey, 42 sightings
- Harbour porpoise 27 July, 2013 North Sea Aerial survey, 51 sightings

› 12 Harbour Porpoise marked with D-tag, GPS or Argos tags. Institition for Bioscience Aarhus University (contact Anders Galatius, agj@dmu.dk)

You have attached the following documents to this answer.

Abundance_survey_of_harbour_porpoises_2012_20130612.pdf
Input from National Institute of Aquatic Resources - DTU-Aqua.docx

4.2 Technological Developments

New Technological Developments
› Enviromental DNA were used to detect the presence of marine mammals. At the same time acoustic dataloggers detected porpoises. In relation to the datalogger with the higest number of acoustic porpoise-detections enviromental DNA were found.

Foote, A. D., P. F. Thomsen, S. Sveegaard, M. Wahlberg, J. Kielgast, L. A. Kyhn, A. B. Salling, A. Galatius, L. Orlando, M. T. P. Gilbert 2012. Investigating the potential use of environmental DNA (eDNA) for genetic monitoring of marine mammals. PLOS One 7(8): e41781.

› Data from acoustic loggers (POD's) can be used to comment on the frequency of harbour porpoise in a given area.

Kyhn, L. A., J. Tougaard, L. Thomas, L. Rosager Duve, J. Stenback, M. Amundin, G. Desportes, J. Teilmann 2012. From echolocation clicks to animal density - Acoustic sampling of harbor porpoises with static dataloggers. Journal of the Acoustical Society of America 131(1):550-560.

› Mann, J. and Teilmann, J. (2103). Environmental impact of wind energy. Environmental Research Letters 8 035001, doi:10.1088/1748-9326/8/3/035001

4.3 Other Relevant Research

› Study on genetic differences of harbour porpoise populations.

de Luna, C. J., S. J. Goodman, O. Thatcher, P. D. Jepson, L. Andersen, K. Tolley, A. R. Hoelzel 2012. Phenotypic and genetic divergence among harbour porpoise populations associated with habitat regions in the North Sea and adjacent seas. Journal of evolutionary biology doi: 10.1111/j. 1420 9101.2012.02461.

› Harbour porpoise and climate changes.

Heide-Jørgensen, M. P., M. Iversen, N. Hjort Nielsen, C. Lockyer, H. Stern, M. Hvid Ribergaard 2012. Harbour porpoises respond to climate change. Ecology and Evolution 580-586.

› New measurements of the sound beam pattern of porpoises:

Koblitz, J., Wahlberg, M., Stilz, P., Madsen, P., Beedholm, K., Schnitzler, H.-U.
2012. Asymmetry and dynamics of a narrow sonar beam in an echolocating harbour porpoise. Journal of the Acosutical Society of America, in press.

› Study on offshore pile driving.

Brandt, M. J., A. Diedrichs, K. Betke, G. Nehls 2012a. Effect of offshore pile driving on harbour porpoise (Phocoena phocoena). In: AN Popper & A Hawkins (eds.): The effects of noise on aquatic life. Springer-Verlay, NY, pp. 281-284.

› Linnenschmidt, M., J. Teilmann, T. Akamatsu, R. Dietz, L. A. Miller 2012c. Biosonar, dive, and foraging activity of satellite tracked harbor porpoises (Phocoena phocoena). DOI: 10.1111/j.1748 7692.2012.00592.x

› Thyroid and stress hormones in free-ranging and captive porpoises:

Siebert, U., Pozniak, B., Hansen, Kirstin A., Nordstrom, G., Teilmann, J., van Elk, Niels, Vossen, A., Dietz, R. 2011. Investigations of Thyroid and Stress Hormones in Free-Ranging and Captive Harbor Porpoises (Phocoena phocoena): A Pilot Study. Aquatic Mammals 37(4), 443-453.

› Galatius, A., Bossi, R., Sonne, C., Rigét, F.F., Kinze, C.C., Lockyer, C., Teilmann, J., Dietz, R. (in press)

Perfluorinated alkylated contaminant profiles of three marine mammal species from the North Sea: a comparative study. Environmental Science and Pollution Research.

› Study on growth and reproduction of white-beaked dolphins.

Galatius, A., Jansen, O.E., Kinze,C.C. (in press) Parameters of growth and reproduction of white-beaked dolphins (Lagenorhynchus albirostris) from the North Sea. Marine Mammal Science.

› Study of how porpoises regulate their hearing during echolocation:

Linnenschmidt, M., Beedholm, K., Wahlberg, M., Kristensen, J. H., Nachtigall, P. E. 2012. Keeping returns optimal: gain control elicited by dynamic hearing thresholds in a harbour porpoise. Proceedings of the Royal Society B, doi
10.1098/rspb.2011.2465.

› Electronic monitoring of harbour porspoise:

Lotte Kindt-Larsen, Jørgen Dalskov, Bjarne Stage, Finn Larsen, Observing incidental harbour porpoise Phocoena phocoena bycatch by remote electronic monitoring. DOI: 10.3354/esr00455

› Behavioral Reactions of Harbor Porpoise to Pile-Driving Noise.

Tougaard, Jakob; Kyhn, Line Anker; Amundin, Mats; Wennerberg, Daniel; Bordin, Carolina. The Effects of Noise on Aquatic Life. red. / Arthur N. Popper; Anthony Hawkins. Springer Berlin Heidelberg New York, 2012. s. 277-280 (Advances in Experimental Medicine and Biology; Nr. 730).

›
Rasmussen, MH, Akamatsu, T, Teilmann, J, Vikingsson, G. and Miller LA. (2013). Biosonar, diving and movements of two tagged white-beaked dolphin in Icelandic waters. Deep Sea Research II 88-89: 97-105 http://dx.doi.org/10.1016/j.dsr2.2012.07.011

› L. A. Kyhn, J. Tougaard, K. Beedholm, F. H. Jensen, E. Ashe, R. Williams, and P. T. Madsen. Clicking in a Killer Whale Habitat: Narrow-Band, High-Frequency Biosonar Clicks of Harbour Porpoise (Phocoena phocoena) and Dall's Porpoise (Phocoenoides dalli). PlosOne 8 (5):e63763, 2013.

› Müller, S., Lehnert, K., Seibel, H., Driver, J., Ronnenberg, K., Teilmann, J., van Elk, N., Kristensen, J., Everaarts, E. & Siebert U. (2013). Evaluation of immune and stress status in harbour porpoises (Phocoena phocoena): Can stress hormones and mRNA expression levels serve as indicators to assess stress levels? BMC Veterinary Research, 9:145 doi:10.1186/1746-6148-9-145

› - Nabe-Nielsen, J., Tougaard, J., Teilmann, J., Lucke, K., & Forchhammer, M. C. (2013). How a simple adaptive foraging strategy can lead to emergent home ranges and increased food intake. Oikos, 122(9), 1307–1316. doi:10.1111/j.1600-0706.2013.00069.x

- Sexual dimorphism of Dall's porpoise and harbor porpoise skulls. / Frandsen, Marie Michele Schou; Galatius, A.
I: Mammalian Biology, Vol. 78, Nr. 2, 2013, s. 153-156.

Use of Bycatches and Strandings

Post-Mortem Research Schemes

5.1 Contact Details

Contact details of research institutions and focal point
› Department of Bioscience, Aarhus University, Frederiksborgvej 399, 4000 Roskilde, Denmark. Phone +4528710372, email: agj@dmu.dk

› The Fisheries and Maritime Museum, Tarphagevej 2, 6710 Esbjerg V, Denmark. Phone +4576122000, email: lfj@fimus.dk

5.3 Samples

Collection of samples (type, preservation method)
› Aarhus University: Teeth, muscle, skin, blubber, liver, kidney, stomach contents, urine, blood, spleen, gonads, lung, diaphragm, faeces

› The Fisheries and Maritime Museum: some of the above.
Contact Lasse Fast Jensen, lfj@fimus.dk

› National Veterinary Institute, necropsies
Contact Mariann Chriél, march@vet.dtu.dk

5.5 Additional Information

Additional information (e.g. website addresses, intellectual property rights, possibility of a central database)
› Strandings of marine mammals are reported on an annual basis in a report (in Danish) from the Danish Nature Agency. The latest available report covers 2011:

http://www.naturstyrelsen.dk/Udgivelser/Aarstal/2012/Strandede_havpattedyr_i_Danmark.htm

› Future reports will be uploaded at:
http://www.naturstyrelsen.dk/Udgivelser/Aarstal/

Activities and Results

5.6 Necropsies

Number of necropsies carried out in the reporting period

	Number	Recorded cause of death
Phocoena phocoena	24	Diffrent. Contact Marianna Chriél (see 5.3)
Tursiops truncatus		
Delphinus delphis	7	Diffrent. Contact Marianna Chriél (see 5.3)
Stenella coeruleoalba		
Grampus griseus		
Globicephala melas		
Globicephala macrorhynchus		
Lagenorhynchus albirostris		
Lagenorhynchus acutus		
Orcinus orca		
Hyperoodon ampullatus		

Mesoplodon bidens		
Kogia breviceps		
Other (please specify under number)		
Other (please specify under number)		
Other (please specify under number)		
Other (please specify under number)		
Other (please specify under number)		
Other (please specify under number)		

5.7 Other Relevant Information

Please provide any other relevant information on post-mortem / stranding schemes
› See attached

You have attached the following documents to this answer.

ASCOBANS - strandings.xlsx

Relevant New Legislation, Regulations and Guidelines

6.1 New Legislation, Regulations and Guidelines

Please provide any relevant information
› The Danish Nature Agency has drafted a new Action plan for stranded cetaceans in Denmark in 2012.

› Natura 2000 as descibed in section A

Public Awareness and Education

7.1 Public Awareness and Education

Please report on any public awareness and education activities to implement or promote the Agreement to the general public and to fishermen.
› Fjord&Bælt in Kerteminde, Denmark, houses four harbour porpoise (3 live-caught and 1 born in the facility) for research and public display. The center is visited by more than 55,000 guests every year, including more than 7,000 school children. A long range of Danish and international media teams (TV, radio, newspapers, home pages) visit the center every year and usually focus their outreach on harbour porpoise research and conservation. Fjord&Bælt is hosting the yearly meeting about harbour porpoise conservation by the Danish Nature Agency. The meeting includes government
representatives, scientists, legislators, and NGOs and creates local media interest.

› In 2012 the center opened a new big exhibition with the theme Oceans of sound. An essential part of these exhibitions are the harbour porpoises behaviour and senses. There is special focus on research and conservation efforts of harbour porpoises during a number of arrangements in Kerteminde, such as the Day of the Baltic Porpoise, two yearly science festivals, and ‘special events’, scheduled by Fjord&Bælt with regular intervals. The outreach for the public is based on the four harbour porpoises at the center. In 2012 actors at Fjord&Bælt performed a theatre for young children about harbour porpoise conservation in particular and marine protection in general.

Possible difficulties encountered in implementing the Agreement

Difficulties in Implementing the Agreement

Please provide any relevant information
› None

Abundance survey of harbour porpoises in Kattegat, Belt Seas and the Western Baltic, July 2012

Note from DCE - Danish Centre for Environment and Energy 12. June 2013

Signe Sveegaard
Jonas Teilmann
Anders Galatius

Department of Bioscience

Quality control by DCE, Hanne Bach

Part of the NOVANA programme commissioned by
Danish Nature Agency

AARHUS
UNIVERSITY
DCE – DANISH CENTRE FOR ENVIRONMENT AND ENERGY

Tel.: +45 8715 0000
E-mail: dce@au.dk

http://dce.au.dk

Contents

Preface

In a joint cooperation between Aarhus University and Institute for Terrestrial and Aquatic Wildlife Research, University of Veterinary Medicine Hannover (ITAW), a visual ship survey targeting harbour porpoises (*Phocoena phocoena*) was carried out from 2 July to 21 July 2012. The survey was funded as part of the NOVANA program (2011-2015) under the Danish Nature Agency, Danish Ministry of Environment and the German Federal Ministry for Food, Agriculture and Consumer Protection.

Background and objective

The harbour porpoises inhabiting the Kattegat, the Belt Seas, the Sound and the western Baltic constitute a distinct population (hereafter called the Belt Sea population), which is genetically and morphologically distinguished from the two neighbouring populations in the North Sea/Skagerrak and in the Baltic Proper (Galatius et al. 2012, Wiemann et al. 2010). Abundance estimates based on two European surveys (SCANS in 1994 and SCANS II in 2005) have suggested a large decline in this region (Hammond et al 2002, SCANS-II 2008), which has been a cause for concern in the management of harbour porpoises in both Denmark and Germany as well as in international conservation bodies such as ICES, IWC and ASCOBANS. The original survey strata in the 1994 and 2005 surveys were not directly comparable due to strata size differences. However, since the transects within each stratum were planned using an equal coverage design, the Distance Sampling method allows for dividing the strata into smaller areas as long as a sufficient number of observations are included (Thomas et al 2007, Williams & Thomas 2007). Thus, the objective of this project was to conduct a third harbour porpoise survey (called "MiniSCANS") within the overlapping area from the 1994 and 2005 surveys to improve the knowledge of the conservation status of the population inhabiting the Belt Sea by comparing the three abundance estimates.

Methods

The study area covered southern Kattegat, the Belt Seas, the Sound and the Western Baltic. Studies of satellite tracked porpoises in this region have shown that there is some geographical overlap in distribution between the Belt Sea population and the neighbouring populations. Thus, the northern border of the Belt Sea population area was defined as the line with least possible overlap of satellite tracked porpoises from this population and porpoises from the North Sea/Skagerrak population (for details see Teilmann et al 2011). The south-eastern border between the Belt Sea population and the Baltic Proper population is thought to be further east than Fehmarn Belt, so for comparison the largest possible area with survey coverage in all three surveys (1994, 2005, 2012) was used (Fig. 1). This total survey area was 30,130 km^2.

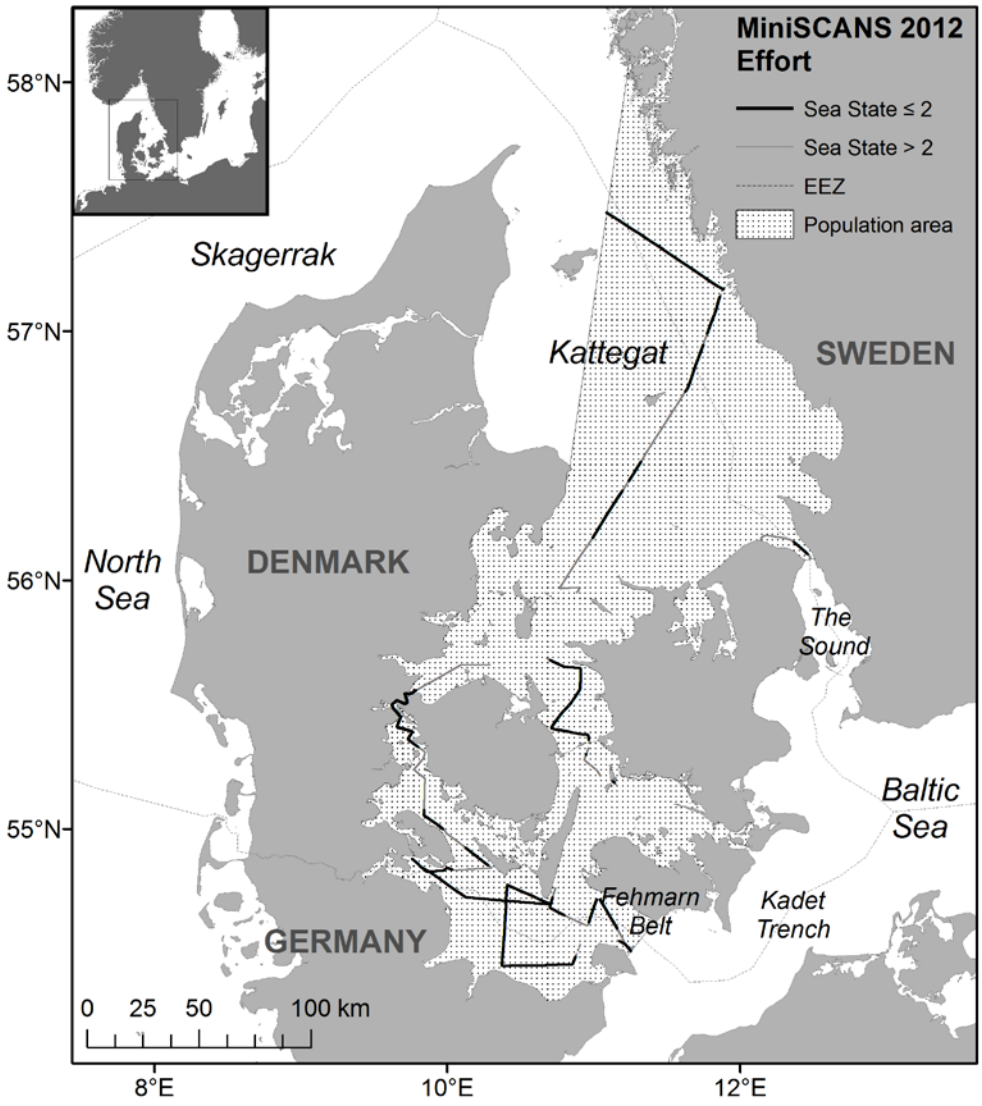

Figure 1 Map of survey area showing effort in Beaufort Sea State ≤ 2 (black line) and Sea State > 2 (grey line, not used for the analysis in this report). The shaded area indicates the area for which the abundance estimates of the harbour porpoise Belt Sea Population were calculated.

The survey transect design was replicated from the SCANS-II survey in 2005 (SCANS-II 2008) and designed to provide equal coverage probability. The survey was conducted on board RV Skagerak, a research vessel owned by Gothenburg University. This ship was also used during SCANS-II and proved very suitable due to low noise emission and two separated observation platforms (Fig. 2). RV Skagerak was kept at a constant speed of 9-10 knots. The Danish ship Gunnar Thorsen was used in 1994, but there is no reason to believe that differences between the two ships used over the years should affect the results.

Figure 2 The research vessel "Skagerak" used for the survey with the two observation platforms indicated. Photo: Signe Sveegaard.

The survey method adopted was double platform line transect survey with two teams of observers: a primary team (two people at a time) on the foredeck (6 m above sea surface) and a tracker team (four people at a time) on top of the Bridge (10 m above sea surface). By using two observation platforms, abundance estimates can be generated that are corrected for animals missed on the transect line and for the effects of animals moving in response to the ship (Buckland et al. 2001, Laake & Borchers, 2004).

Data were analysed to obtain animal density and abundance using the Mark Recapture Distance Sampling engine (MRDS) in Distance 6.0 r2 (Thomas et al 2009) and incorporating covariates that could possibly affect detectability of the porpoises such as Beaufort Sea State (The state of the sea according to the Beaufort scale), sightability (a subjective judgement of the potential for spotting a porpoise under the given environmental conditions), glare from the sun, swell, perpendicular distance to the track line, behaviour of the porpoise, group size and observer name. We chose a Full Independence model, which was also used in 1994 and 2005 and which is suitable when porpoises display responsive movement towards the survey vessel (i.e. are either attracted to or repelled from the ship, Fig. 3).

We estimated a probability distribution for the change in abundance between 1994 and 2005, 1994 and 2012 and 2005 and 2012 using the point estimates and their standard errors in the Bayesian approach of Gerrodette (2011) and Gerrodette et al. (2011). We assumed the same uniform priors of abundance for all three surveys (range: 635-86040). The Bayesian analysis was performed in R (R development core team 2008).

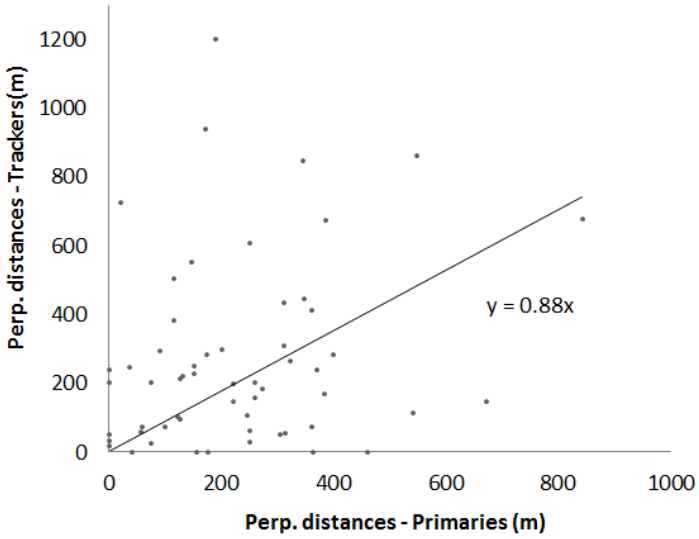

Figure 3 Perpendicular distances of duplicate observations at the time they were detected by observers on the Primary platform (x-axis) and by observers on the Tracker platform (y-axis). Since trackers use binoculars and search an area >1 km away from the vessel, the tracker observations (animal behaviour) are believed to be unaffected by the vessel. So if y = x (displayed by the diagonal line) there is no responsive movement to the boat. Here, y = 0.88x, indicating that the porpoises observed by the primaries are slightly repelled by the vessel.

Results

Of the 21 potential survey days, visual observation was carried out on 9 days. In the remaining 12 days, poor weather conditions prevented any visual surveying. In total, 516 km was surveyed in Beaufort Sea States ≤ 2, which are the recommended conditions for visual surveys of harbour porpoises.

In total, the primary observers detected 149 individual porpoises distributed in 106 groups and the tracker observers observed 147 individual porpoises in 98 groups. 33 sightings (groups) were duplicate sightings in which the tracker observation was also observed by a primary observer.

Abundance models were created for each of the three surveys and model selection was based on the lowest AIC score (Akaike Information Criterion, see Akaike 1974). The covariables affecting detectability of the porpoises varied slightly between years with perpendicular distance, group size, sightability and Beaufort Sea State being the best explanatory variables (Table 1).

Table 1 Details on abundance estimation models for the three harbour porpoise surveys in 1994, 2005 and 2012. Truncation refers to right side truncation of primary observations further than 1000 m from the survey trackline. For definition of model parameters see text.

Survey	Year	Model	Truncation (m)	Model parameters
SCANS	1994	Full Independence	1000	Distance + Group Size + Beaufort
SCANS-II	2005	Full Independence	1000	Distance + Sightability
MiniSCANS	2012	Full Independence	1000	Distance + Beaufort

For the 2012 survey, we estimated the abundance of harbour porpoises within the population area of 30,130 km² to be 18,495 animals (95% CL: 10,892–31,406, CV = 0.27), the associated density to 0.61 animals/km² (95% CL: 0.36–1.04, CV = 0.27) and the expected cluster size to be 1.51 animals/group (Table 2). Table 2 also displayed the abundance estimates for the 1994 survey: 27,923 (CV = 0.46) and the 2005 survey: 10,614 (CV: 0.28). The population estimate of 1994 is by far the largest being 62% higher than the 2005 estimate and 34% higher than the 2012 estimate (Fig. 4). The 2012 survey estimate is 43% higher than the 2005 survey. Despite these differences, all surveys had overlapping confidence intervals, due to the inherent statistical uncertainty of surveys for cetaceans in general and porpoises in particular.

Table 2 Abundance estimates (N) of harbour porpoises in the population area (Fig. 1) for three visual surveys in 1994, 2005 and 2012. Effort includes only conditions with Beaufort Sea State≤2. CV= Coefficient of Variation. LCL= 95% lower confidence limits, UCL = 95% upper confidence limits. Group size is average harbour porpoise group size for each survey.

Survey	Effort (km²)	N	CV	LCL	UCL	Density	Group size
SCANS	607	27,923	0.46	11,916	65,432	1.13	1.61
SCANS-II	644	10,614	0.28	6,218	18,117	0.35	1.45
MiniSCANS	516	18,495	0.27	10,892	31,406	0.61	1.51

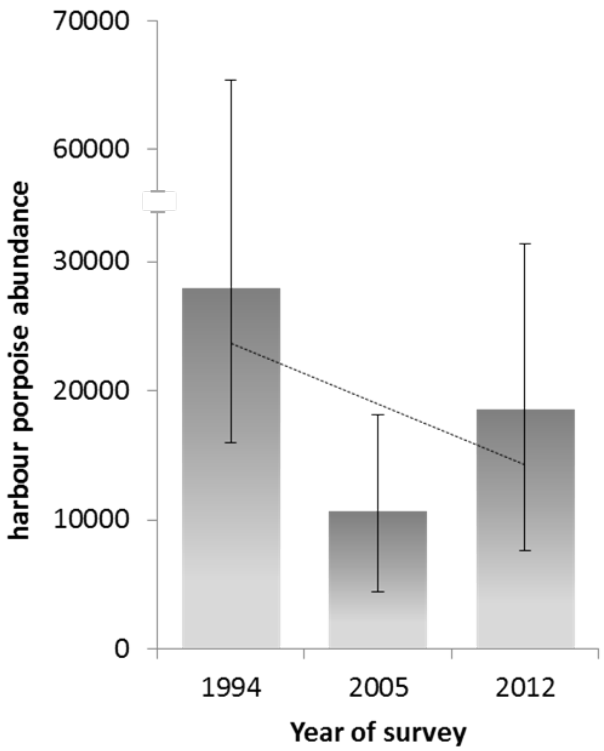

Figure 4 Estimated abundance of harbour porpoises in the population area (Southern Kattegat, the Belt Seas, the Sound and the western Baltic) for three surveys: SCANS in 1994, SCANS-II in 2005 and MiniSCANS in 2012. Bars illustrate the lower and upper 95% confidence limits. Note the broken y-axis.

By using Baysian statistics, we found that the posterior distribution analyses had highest support (distribution peak) for a change in abundance of -9392 porpoises from 1994-2005, -4270 porpoises from 1994-2012 and +7701 porpoises from 2005-2012. This corresponds to a 96.2% support for a decline in abundance between 1994 and 2005, a 75.6% support for a decline from 1994-2012 and only 7.3% support for a decrease from 2005-2012 (Table 3).

Table 3 Comparison of three abundance estimates from harbour porpoise surveys in 1994, 2005 and 2012 for the population area (Fig. 1). Analysis conducted according to method described by Gerrodette (2011) and Gerrodette et al. (2011).

	Change in abundance between surveys		
	1994-2005	**1994-2012**	**2005-2012**
Posterior distribution peak	-9392	-4270	7701
Support for negativ udvikling	96.2%	75.6%	7.3%

Discussion

Here, we present abundance estimates for the Belt Sea harbour porpoise population, based on surveys in 1994, 2005 and 2012 that are directly comparable in geographical extent as well as survey method and data analysis. The highest abundance estimate

was found in 1994 which was 62% higher than in 2005 and 34% higher than in 2012. This may result from one of the following explanations:

1. The inherent uncertainty in survey for cetaceans
2. An overall decreasing trend from 1994 to 2005 encompassing a decrease from 1994 to 2005 and an increase from 2005 to 2012
3. Immigration and emigration of porpoises in to and from the survey area

None of the hypotheses can be ruled out but they do not exclude each other. Below, we explore each option.

It is well known that cetacean abundance surveys such as these, inherently produce large uncertainty, and it is thus highly recommended to invest in long time monitoring to adjust for these variations (Taylor et al 2000). However, for now, these are the best available data to evaluate the status of this population. Furthermore, it should be noted that cetacean surveys covering entire populations are rare and that these three surveys over 18 year covering the core geographical area of a distinct harbour porpoise population is a unique data set.

The decline in estimates from 1994 to 2005 has been the cause of much concern and consequently, a further decline from 2005 to 2012 would have been seriously alarming. This is, however, not the case, so although the results still indicate an overall negative trend from 1994 to 2012, the population decline seen in 2005 seems to have stopped and may even be improving. We can only speculate as to what could have caused these changes. The harbour porpoise faces several threats in Danish and adjacent waters such as food depletion, bycatch, chemical pollution, noise pollution, and habitat degradation. Consequently, variations in the pressure from these threats may influence the abundance of porpoises. Unfortunately, the direct link between pressures and abundance is difficult and for some pressures impossible to access. For instance, incidental bycatch in gillnet fisheries is considered a significant threat to harbour porpoises in European waters (Carlström et al., 2009; Kock and Benke, 1996) and in the North Sea alone an estimated 5900 animals were bycaught annually in 1987–2001 just by the Danish gillnet fleet (Vinter and Larsen, 2004). However, no estimate of the bycatch rate exists for the area inhabited by the Belt Sea population, and although the overall number of days at sea for the Danish gillnet fishermen has not changed significantly from 1998 to 2011 (DTU Aqua, unpublished data), gillnet types or fishing areas may have shifted causing a change in the pressure on porpoises.

A Bayesian model including all three years is under development and will define continuous probability intervals for abundance trends throughout the period. This will help elucidate the current status as well as population development.

The harbour porpoise is a wide-ranging species and satellite tracking has showed that individuals may move over 1000 km away from original tagging site in six months (Teilmann et al. 2008, Sveegaard et al. 2011). The Belt Sea population has, however, proven to

be relatively spatially stationary, especially during summer at which time the survey was carried out (Sveegaard 2011). Since studies of genetics and morphology support this (Galatius et al. 2012, Wiemann et al. 2010) we find it unlikely that major emigration between neighbouring populations is the cause of the observed differences in abundance between the three surveys.
However, due to the limited extent of the 1994 strata, our analysis does not include the waters between Fehmarn Belt and Rügen (approx. 13°E) including the southern part of the Sound. Satellite tracking of porpoises since 1997 as well as the preliminary results from the SAMBAH project (www.sambah.org, Aarhus University, unpublished data) suggests that these areas are also inhabited by the Belt Sea population, and furthermore that this area in the last couple of years holds increasing densities of porpoises from the Belt Sea population. Thus it is possible that a larger proportion of the animals were present east of the comparable survey area during all three surveys, which could have resulted in the lower abundance estimates. For the 1994 survey this cannot be evaluated due to lack of survey effort, but in 2005 relatively few sightings were detected east of Fehmarn Belt. In 2012, though, many sightings were noted in both the Sound and the area between Fehmarn Belt and the Kadet Trench, suggesting an expansion of the population into these areas. For future surveys aimed at abundance estimation, a population boundary further east should be used.

In conclusion, we found high support (>75%) for an overall decrease in abundance from 1994 to 2012, but the alarming decline in estimates from 1994 to 2005 was not perpetuated, as the 2012 estimate was higher than the 2005 estimate. The only way to reduce the inherent uncertainty when estimating trends in harbour porpoise abundance surveys is to carry out surveys on a regular basis in a long-term monitoring scheme. This may be obtained by participating in future European cetacean surveys such as the planned SCANS-III in 2015-2017 and by incorporating surveys for abundance estimates into future NOVANA programmes.

Acknowledgement

This survey was partly funded by the Danish Nature Agency under the Danish Ministry of Environment under the NOVANA programme and partly by the German Federal Ministry for Food, Agriculture and Consumer Protection, Project Number 2812HS010, "Survey zum Schweinswalbestand in der westlichen Ostsee".

We would like to thank the survey observers Anders Galatius, Line Kyhn, Genevieve Desportes, Els de Jong, Aline Hock, Ernst Schrijver and Laia Agust and the excellent crew of RV Skagerak for excellent assistance in the field. Furthermore Mats Amundin from Kolmården Wildlife Park is thanked for help with logistics and Louise Burt and Len Thomas from University of St Andrews for their analytical and statistical advice.

References

Akaike, H. (1974) A new look at the statistical model identification. IEEE Transactions on Automatic Control 19 (6): 716 – 723

Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L., Thomas, L. 2001. Introduction to Distance sampling. Estimating Abundance of biological populations. Oxford University Press, New York

Carlström, J., Berggren, P., Tregenza, N.J.C., 2009. Spatial and temporal impact of pingers on porpoises. Canadian Journal of Fisheries and Aquatic Sciences 66, 72-82.

Galatius, A., Kinze, C.C. and Teilmann, J. 2012. Population structure of harbour porpoises in the greater Baltic region: Evidence of separation based on geometric morphometric comparisons. Journal of the Marine Biological Association of the United Kingdom 92(8): 1669-1676.

Gerrodette, T. 2011. Inference without significance: measuring support for hypotheses rather than rejecting them. Marine Ecology 32:404-418.

Gerrodette,T. Taylor, BL., Swift, R., Rankin, S., Jaramillo_Legoretta, AM, Rojas-Bracho, L. 2011. A combined visual and acoustic estimate of 2008 abundance, and change in abundance since 1997, for the vaquita, Phocoena sinus. Marine Mammal Science 27:E79-E100.

Hammond, P. S., Berggren, P., Benke, H., Borchers, D. L., Collet, A., Heide-Jorgensen, M. P., Heimlich, S., Hiby, A. R., Leopold, M. F., and Oien, N. 2002. Abundance of harbour porpoise and other cetaceans in the North Sea and adjacent waters. Journal of Applied Ecology 39:361-376

Kock, K.-H., Benke, H., 1996. On the by-catch of harbour porpoise (*Phocoena phocoena*) in German fisheries in the Baltic and the North Sea. Arch. Fish. Mar. Res. 44, 95-114.

Laake, J.L. & Borchers, D.L. 2004. Methods for incomplete detection at distance zero. In Buckland, S.T., Anderson D.R., Burnham, K.P, Laake, J.L., Borchers, D.L. and Thomas, L. (eds) Advanced Distance Sampling. Oxford University Press, Oxford

SCANS-II 2008. Small Cetaceans in the European Atlantic and North Sea (SCANS-II). Final report to the European Commission LIFE Nature programme on project LIFE04NAT/GB/000245. Available from http://biology.st-andrews.ac.uk/scans2/

Sveegaard, S. 2011. Spatial and temporal distribution of harbour porpoises in relation to their prey. Ph.D. Thesis. National Environmental Research Institute, Aarhus University, Denmark

Sveegaard, S., Teilmann, J., Tougaard, J., Dietz, R., Mouritsen, K.N., Desportes, G., Siebert, U. 2011. High density areas for harbour porpoises (*Phocoena phocoena*) identiWed

by satellite tracking. Mar Mamm Sci 27:230–246

Taylor, B. L., Wade, P.R., Demaster, D. P., Barlow, J. 2000. Incorporating uncertainty into management models for marine mammals. Conservation Biology: 1243–1252.

Teilmann, J., Sveegaard, S., Dietz, R., Petersen, I.K., Berggren, P., and Desportes, G. 2008. High density areas for harbour porpoises in Danish waters. National Environmental Research Institute, Aarhus University - NERI. Technical Report No. 657. Available at: http://www.dmu.dk/Pub/FR657.pdf.

Thomas, L., Laake, J.L., Rexstad, E., Strindberg, S., Marques, F.F.C., Buckland, S.T., Borchers, D.L., Anderson, D.R., Burnham, K.P., Burt, M.L., Hedley, S.L., Pollard, J.H., Bishop, J.R.B. and Marques, T.A. 2009. Distance 6.0. Release 2. Research Unit for Wildlife Population Assessment, University of St. Andrews, UK. http://www.ruwpa.st-and.ac.uk/distance/

Thomas, L., Williams, R., Sandilands, D. 2007. Designing line transect surveys for complex survey regions. Journal of Cetacean Ressearch Management 9:1–13

Vinter, M., Larsen, F., 2004. Updated estimates of harbour porpoise (Phocoena phocoena) bycatch in the Danish North Sea bottom-set gillnet fishery. Journal of Cetacean Research and Management 6, 19-24.

Williams, R., Thomas, L. 2007. Distribution and abundance of marine mammals in the coastal waters of British Columbia, Canada. Journal of Cetacean Ressearch Management 9: 15–28

Wiemann, A., Andersen, L. W., Berggren, P., Siebert, U., Benke, H., Teilmann, J., Lockyer, C., Pawliczka, I., Skora, K., Roos, A., Lyrholm, T., Paulus, K. B., Ket-maier, V., and Tiedemann, R. 2010. Mitochondrial Control Region and microsatellite analyses on harbour porpoise (*Phocoena phocoena*) unravel population differentiation in the Baltic Sea and adjacent waters. Conservation Genetics 11:195-211.

Copies sent to:

Maj Friis Munk, Henrik Lykke Sørensen & Marie-Louise Krawack
Danish Nature Agency
Haraldsgade 53
DK-2100 Copenhagen

Anja Gadgård Boye
The Danish AgriFish Agency
Ministry of Food, Agriculture and Fisheries of Denmark
Nyropsgade 30,
DK-1780 København V

Name of agency/institute	Abbreviation (use in rest of report)	Contact e-mail address
National Institute of Aquatic Resources, Technical University of Denmark	DTU-Aqua	fl@aqua.dtu.dk

As part of the FP7 project MESMA (Monitoring and Evaluation of Spatially Managed Areas), a study was carried out in the Skagerrak Sea mapping interactions between harbour porpoises and commercial fisheries with a view to propose spatially explicit management plans for two Natura 2000 areas. The study, among other things, combined data on harbour porpoise distribution and abundance with data on distribution of fishing effort to predict high-risk areas for porpoise bycatch. Lotte Kindt-Larsen & Thomas Kirk Sørensen, DTU-Aqua.

From May 2011-January 2014 up to 10 Danish gillnet vessels monitored harbour porpoise and other bycatch in ICES areas 22-23 by use of CCTV cameras. Estimated bycatch from this project will be available after May 2014. Finn Larsen & Lotte Kindt-Larsen, DTU-Aqua.

A project on different aspects of mitigating bycatch of harbour porpoises is conducted during 2013-14. The project includes assessing the acoustical properties of gillnets in the wild, trials of Banana-pingers, tests of pingers with short range, research on habituation and habitat exclusion caused by pingers, and assessing the effects of pinger deployment in the Natura 2000 area Storebælt. Results will become available after June 2014. Finn Larsen & Lotte Kindt-Larsen, DTU-Aqua, and Magnus Wahlberg, SDU.

A project assessing the effects of pinger deployment in 10 selected Natura 2000 areas was begun in 2013 and will end in May 2015. Results will become available after August 2015. Finn Larsen, Lotte Kindt-Larsen & Thomas Kirk Sørensen, DTU-Aqua.

PUBLICATIONS

Boström, M.K., Krog, C., Kindt-Larsen, L., Lunneryd, S.-G. & Wahlberg, M. 2013. Acoustic Activity of Harbour Porpoises (Phocoena phocoena) Around Gill Nets. *Aquatic Mammals 2013, 39(4), 389-396.*

Kindt-Larsen, L., Dalskov, J., Stage, B. & Larsen, F. 2012. Observing incidental harbour porpoise (Phocoena phocoena) bycatch by Remote Electronic Monitoring. Endang Species Res Vol. Vol. 19: 75–83`.

Larsen, F., Krog, C. & Eigaard, O.R. 2013. Determining optimal pinger spacing for harbour porpoise bycatch mitigation. Endang Species Res Vol. 20: 147–152.

Sørensen, T.K. & Kindt-Larsen, L. 2012. Skagerrak Sea, Governance analysis (WP6). *Report to MESMA.*

Sørensen, T.K. & Kindt-Larsen, L. Uncovering governance mechanisms surrounding harbour porpoise conservation in the Danish Skagerrak Sea (*Submittet to European Policy*).

ASCOBANS

8. Strandings

Species	No. Strandings	No. Post mortems	Contact person
P. phocoena	138	6	Lasse Fast Jensen/FOS
L. albirostris	8	4	Lasse Fast Jensen/FOS
B. acutorostrata	2	0	Lasse Fast Jensen/FOS
Delphinus delphis	1	1	Lasse Fast Jensen/FOS

Contact email address
lfj@fimus.dk
lfj@fimus.dk
lfj@fimus.dk
lfj@fimus.dk