Agenda Item 4.6:   **Review of new information on population distribution, sizes, structures and bycatches of small cetaceans**

Expert Paper: Opportunistic Sightings of Harbour Porpoises (Phocoena phocoena) in the Baltic Sea; Third and Fourth Seasons 2004-5

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Opportunistic Sightings of Harbour Porpoises (*Phocoena phocoena*) in the Baltic Sea; Third and Fourth Seasons 2004-5

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Abstract

Starting in 2002, a public appeal was made to yachts people in the western Baltic to report opportunistic sightings of harbour porpoises. By 2005, the programme has become well known in yachting circles with over 2000 sightings reported, totalling approximately 5,000 animals. These data indicate where harbour porpoises occur, and the data from 2003 through 2005 have been analysed to provide indices of relative abundance, using a method to infer the effective sighting effort. This information can be important for the designation of protected areas for harbour porpoise and other conservation measures.

Introduction

The harbour porpoise (*Phocoena phocoena*) was once so common in the Baltic Sea that all or most bordering countries had directed porpoise fisheries during the 19th century (Berggren, 1994). Although there has been no porpoise hunting in the Baltic Sea since the 1940's, the population has continued to decline. The causes may include the commercial catching of porpoises historically (Kinze 1995), the periodic catastrophic mortality resulting from severe winter ice conditions (Teilmann and Lowry 1996), and habitat degradation (e.g. pollution, noise, decrease in prey abundance or quality; cf. Teilmann and Lowry). Whatever other factors may be involved, however, it is very likely that incidental mortality in fishing gear has played a major role in reducing porpoises to a small fraction of their historical abundance in the region, and is now helping to prevent their recovery (Jastarnia Plan 2002).

As further discussed in the ASCOBANS Recovery Plan for the Harbour Porpoises in the Baltic Sea, the problem of harbour porpoise conservation in the Baltic Sea is marked by scientific uncertainty. While recognising the need for more research and monitoring, the ASCOBANS Baltic Discussion Group (ABDG) and the Jastarnia workshop strongly emphasise that there is no need to wait for further research before implementing a by-catch reduction plan by reducing fishing efforts in certain fisheries (Recovery Recommendation, Jastarnia Plan 2002).

In addition to by-catch reduction, an increase in research and monitoring, and establishing marine protected areas, increasing public awareness has been identified as an essential part of the recovery plan: "Unless people are convinced that porpoises are present in their local waters, that these creatures are worth saving, and that the animals' existence is threatened, they are not likely to support recovery efforts." The elements of a comprehensive public awareness campaign are outlined in Appendix 3 of AC 9 D Doc 7.

The Gesellschaft zum Schutz der Meeressäugetiere (GSM, Society for the Conservation of Marine Mammals) has since 2002 run a programme for the reporting of opportunistic sightings of harbour porpoises by (mainly) yachts people in the western Baltic and approaches "Sailors on the lookout for harbour porpoises". About 100 sightings were reported in 2002, and since 2003, when the programme became well known, there have been over 2,000 sightings reported, totalling an estimated 5,000 animals. The programme serves the twofold purpose of gathering information on the occurrence of porpoises, and of spreading awareness of the conservation needs of the porpoise through the active involvement of the public in monitoring and research

An analysis of the data from 2003 was presented to 11th ASCOBANS Advisory Council (Document AC11/7(P)). This paper reports and analyses the data collected up to and including the 2005 season.

Data Collection

Each year the GSM has written to some 165 sailing clubs and marinas as well as several yachting magazines to raise awareness of the project "Sailors on the lookout for harbour porpoises" and encourage the collection and submission of sightings data. The project has been promoted each year on the „International Day of the Baltic Harbour Porpoise" (IDBHP; the third Sunday in May each year). Press conferences were held and in 2004 and

2005, and a press release distributed by the organisers Bundesamt für Naturschutz (BfN, German Federal Agency for Nature Protection, Island of Vilm), Deutsches Meeresmuseum (DMM, German Oceanographic Museum, Stralsund) and GSM, with several articles appearing in the media. Literature, maps and the questionnaire can be found on the GSM web site (www.gsm-ev.de) and information and "calls for action" have been distributed in pamphlets and published in yachting magazines, local (coastal) media, and other outlets. The media feedback is still very good, and the dissemination of the request for sightings is widespread. The programme has been described on TV (NDR's Baltic Report).

A data form for sightings reports has been made available on the web and distributed. Contributors are requested to record the time and position of sightings, estimated number of animals in the sighted group, and other information (www.gsm-ev.de). The form can be mailed or faxed to GSM, or filled in on-line.

The sightings from 2002 through 2005 (over 2,000 to date) have been transferred to official seas charts by the Bundesamt für Seefahrt und Hydrographie (BSH, Federal Maritime and Hydrographic Agency) (2002-4) and BfN (2005) (see Figs1a-c). The map for 2005 also shows the positions of porpoise detection devices (PODs) placed by DMM. The on-line versions of the maps will shortly be made interactive, such that details of each sighting can be obtained by clicking on it. The data are at the disposal of BfN and Forschungs- & Technologiezentrum Westküste (FTZ, Research and Technology centre West Coast, Büsum) for further research.

Analysis

For the purpose of analysis, the data from the summer months (May through September) of 2003 through 2005 were used, divided into five geographical areas, labelled for convenience Flensburger Förde(FF), Kieler Bucht (KB), Mecklenburger Bucht (MB), Store Bælt (SB)and Lille Bælt (LB) (see Fig 1a). The Fredericia Channel, a small area with a very high density of sightings, was omitted because the narrow waterway makes it a special case. Records to the north and east of these areas were not used due to very sparse coverage.

In the case of records without exact geographical co-ordinates, approximate positions were inferred from descriptive information on the locations of the sightings. Records with exact and inferred positions are distinguished in Fig 1a. Anonymous reports were not used, but a few sightings reported second hand were used when the original observer was named to the person or vessel.

The group size for each sighting was taken as the mean of the minimum and maximum estimated number of animals present. This is probably an underestimate of the true group size, but may still be useful for comparative purposes. The very few records without any group size estimate were omitted.

The data contain the sightings only, not the search effort expended. In order to relate the records to relative abundance of porpoises in time and space, it is necessary to determine an index based on net effort inferred from the records. Here we use an adaptation of a method originally developed for the purpose of estimating trends in abundance of minke whales (Cooke, 1984). The validity of the method is demonstrated in the original paper.

To construct a net effort measure, the records from each vessel were grouped into 4-hour periods (08:00-1200; 12:00-16:00; 16:00-20:00). The unit of net effort is a vessel-period with at least one porpoise sighting. The net number of sightings in a period is the number of sightings excluding the first in the period. The Net Encounter Index is the net sighting rate per unit of net effort. The Net Encounter Index times the mean group size yields an index of porpoise density. Sightings before 08:00 and after 20:00 were not used.

If a given subset of the data contains S sightings totalling A animals from E vessel periods with at least one sighting, then the Index of Porpoise Density (IPD) is given by $(A/S)(S - E)/E = A(1/E - 1/S)$.

Analyses of variance of the encounter index and mean group size were conducted using years, areas, months, and time of day as potential covariates. There were three levels for the year (2003-05), five levels for month (May through September) five levels for area (FF, KB, LB, SB and MB) and three levels for time of day (08:00-1200; 12:00-16:00; 16:00-20:00). Although porpoise density is not expected to depend on time of day, this was considered as a covariate as a check on the consistency of the data with the effort correction method.

Because the data consist of counts, log-linear models were fitted assuming an (overdispersed) Poisson distribution for the dependent variable. Separate analyses were conducted for the mean group size (dependent variable is A with S as a multiplicative offset) and the net encounter rate (dependent variable is $S - E$ with E as a multiplicative offset). Covariates were selected according to the minimum AIC criterion. The results of the two analyses were combined to provide an index of porpoise density.

Results

Table 1 summarises the number sightings used in the analysis by area and year, along with the numbers of net effort periods and the calculated raw index of porpoise density.

Table 2 shows the results of the model-fitting exercise. The results show quite clearly that the net encounter rate depends strongly only on the area, while the mean group size depends strongly only on the month. Because only one covariate was found to be important for each dependent variable, interactions between variables were not considered.

Fig. 2 shows the estimated Net Encounter Index by area, with 95% confidence intervals. The effect of the effort correction method is clearly apparent. Although the maps indicate high densities of records in the Flensburger Förde, the Kieler Bucht and the Lille Bælt relative to the Store Bælt, the resulting indices show that the high densities in the coastal areas are due to high sighting effort, and that porpoise densities are actually higher in the Store Bælt where the sighting effort is lower. The Mecklenburger Bucht appears to be an area where both sighting effort and porpoise density are fairly low.

Fig. 3 shows the estimated mean group size, net encounter index and index of porpoise density by month. Mean group size is lower in mid-summer than earlier or later in the season, but this is partly compensated by a higher encounter index in summer (which seems to be negatively correlated with mean group size) such that the estimated porpoise density index shows no clear trend over the season. It is not known why the porpoise tend to segregate into smaller groups in summer.

Discussion and future plans

Although there is no doubt that opportunistic observations and reports have to be interpreted cautiously, the information collected through our sightings programme may well have scientific value and may help conservation efforts, since they will supplement the official aerial and on-board abundance sightings surveys such as SCANS II. The results show that opportunistic data of this kind do have value for mapping and quantifying porpoise distribution provided that the analysis method includes an appropriate correction for inferred effort, as in the analysis presented here.

The programme will continue in 2006, and GSM hopes for an even wider response following to the positive support it has seen already. The success of such a programme depends to a large extent on being well known amongst the public. The 2006 press conference at the occasion of the IDBHP will take place on May 18 in the "Kieler Yacht Club Hotel", Kiel, Schleswig-Holstein again in cooperation with BfN, DMM and GSM. This season's idea is a photo and video competition associated with the sightings project. There will be a qualified jury of media representatives and the results will be announced on October 20, 2006 at the DMM in Stralsund and published on the websites of GSM, DMM, and the YPS (Yachtphotoservice; www.yps.com).

In all four years most sighting reports came from the Western Baltic, because most sailors from Germany mainly visit the Western Baltic (because of availability of marinas, proximity to home port, tourist facilities, wind situation, and security). Although we drew attention to the fact that data from the eastern Baltic Sea are very important, we received hardly any reports east of the Darsser Schwelle (Darss Sill). We will try to find yachts people who sail further to the east and would be prepared to report sightings in the eastern Baltic.

A limitation of our current method is that the estimation of effective effort relies on the frequency of sightings not being too low. In the case of areas with almost no sightings, we cannot distinguish between an absence of porpoises or an absence of effort. A further plan of GSM is therefore to find especially enthusiastic contributors who could collect more detailed data, including behavioural observations and data logs of the complete track route of individual voyages (including data on periods with no sightings so that a better index of "sightings per unit effort" can be obtained). Thus, we hope to be able to help generate relative abundance indices of harbour porpoises in the Baltic Sea for areas for which data are currently missing or incomplete. We hope to co-operate with other institutions working on comparable projects in other countries.

The European Union's Council Directive 92/43/EEC (Habitats & Species Directive) requires special conservation measures for harbour porpoises (listed on Annexes II and IV). In the German EEZ (Exclusive Economic Zone: over 12 nautical miles from the coast) of the Baltic Sea, five especially protected areas have so far been designated as protected areas (pSCI) for harbour porpoises, sandbanks, reefs and birds (www.Habitat MareNatura2000.de). The sightings data collected by the GSM confirm the presence of porpoises in the areas in

the German EEZ (Fehmarnbelt and Kadetrinne) , as well as in a coastal pSCI in the Flensburger Förde. As noted above we still lack data of sightings from the eastern parts of the Baltic Sea, i.e. until now our data cannot be used to suggest or verify protected areas east of the Darss Sill (Baltic Proper)

REFERENCES

Berggren, P. 1994. Bycatches of the harbour porpoise (*Phocoena phocoena*) in the Swedish Skagerrak, Kattegat and Baltic seas; 1973-1993. *Rep. Int. Whal. Commn.* (Special Issue 15): 211-215.

Cooke, J.G. 1984. The Relationship between the Net Catcher Day and the Gross Catcher Day as a unit of effort. *Rep. int. Whal. Commn* 34:288-90.

Deimer, P., Schütte, H.-J., Wilhelms, S. and Cooke, J. 2004. Opportunistic Sightings of Harbour Porpoises (Phocoena phocoena) in the Baltic Sea; Second Season. AC11/7, ASCOBANS. www.ascobans.org

Kinze, C.C. 1995. Exploitation of harbour porpoises (*Phocoena phocoena*) in Danish waters: a historical review. *Rep. Int. Whal. Commn* (Special Issue 16): 141-153.

Koschinski, S. 2001. Current Knowledge on the harbour porpoises (*Phocoena phocoena*) in the Baltic Sea, Review. *Ophelia* 55 (3): 167-193.

Scheidat, M., Siebert, U. & Kock, K.-H. 2003: Summer distribution of harbour porpoise (*Phocoena phocoena*) in the German North and Baltic Sea Working Paper presented at the 2003 ASCOBANS meeting. 14 pages.

SRU (German Advisory Council on the Environment). 2004. Marine Environment Protection in the North and Baltic Seas. Summary Report: 1-28;

SRU (Der Rat von Sachverständigen für Umweltfragen) 2004. Meeresumweltschutz für Nord- und Ostsee. *Sondergutachten*: 1-460. www.umweltrat.de

Teilmann, J. & N. Lowry. 1996. Status of the harbour porpoise (*Phocoena phocoena*) in Danish waters. *Rep. Int. Whal. Commn* 46: 619-625.

Table 1. Summary of sightings[1] by area and year

Year	Area		Sightings	Net periods	Animals	Abundance index
2003	Kieler Bucht	KB	86	73	183	0.379
2003	Flensburger Förde	FF	41	40	97	0.059
2003	Mecklenburger Bucht	MB	47	46	120	0.055
2003	Lille Bælt	LB	100	92	197	0.171
2003	Store Bælt	SB	151	107	370	1.006
2003	Total		425	358	966	0.425
2004	Kieler Bucht	KB	98	87	244	0.314
2004	Flensburger Förde	FF	37	36	94	0.071
2004	Mecklenburger Bucht	MB	42	37	92	0.294
2004	Lille Bælt	LB	113	86	242	0.671
2004	Store Bælt	SB	149	116	287	0.547
2004	Total		439	362	957	0.464
2005	Kieler Bucht	KB	121	111	279	0.208
2005	Flensburger Förde	FF	72	66	152	0.192
2005	Mecklenburger Bucht	MB	67	62	181	0.218
2005	Lille Bælt	LB	158	130	339	0.461
2005	Store Bælt	SB	186	143	472	0.762
2005	Total		604	512	1422	0.423

[1] sightings meeting the inclusion criteria (May-September, 08:00-20:00 hrs in the 5 areas)

Table 2. Summary of model fitting results

Dependent variable	Net encounter index	Mean group size
Model	AIC	AIC
Constant	325.6	305.3
Year	328.9	307.1
Area	*288.4	306.8
Month	325.8	*280.2
Time of day	328.9	306.9

* = best-fitting model according to Akaike Information Criterion (AIC)

Fig. 2.

Net Encounter Index for harbour porpoise schools May-Sept 2003-05 by area

Fig. 3.

Mean group size, net encounter index and density index for opportunistic harbour porpoise sightings May-Sept 2003-05 in areas FF, KB, MB, LB, SB
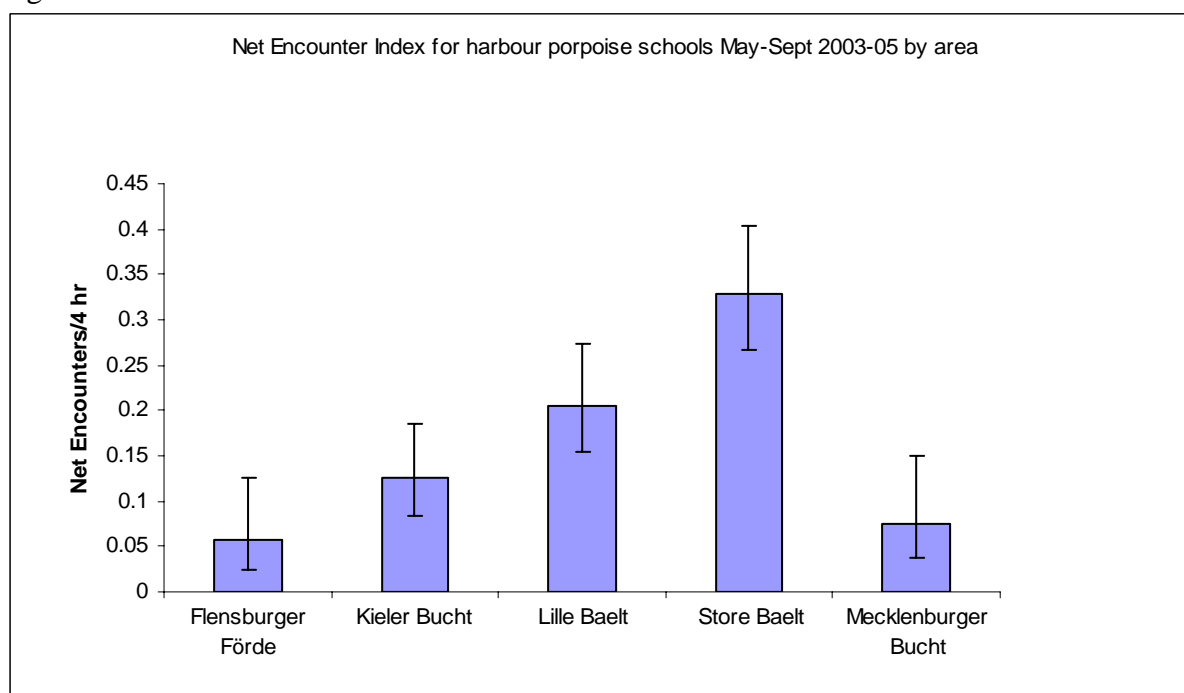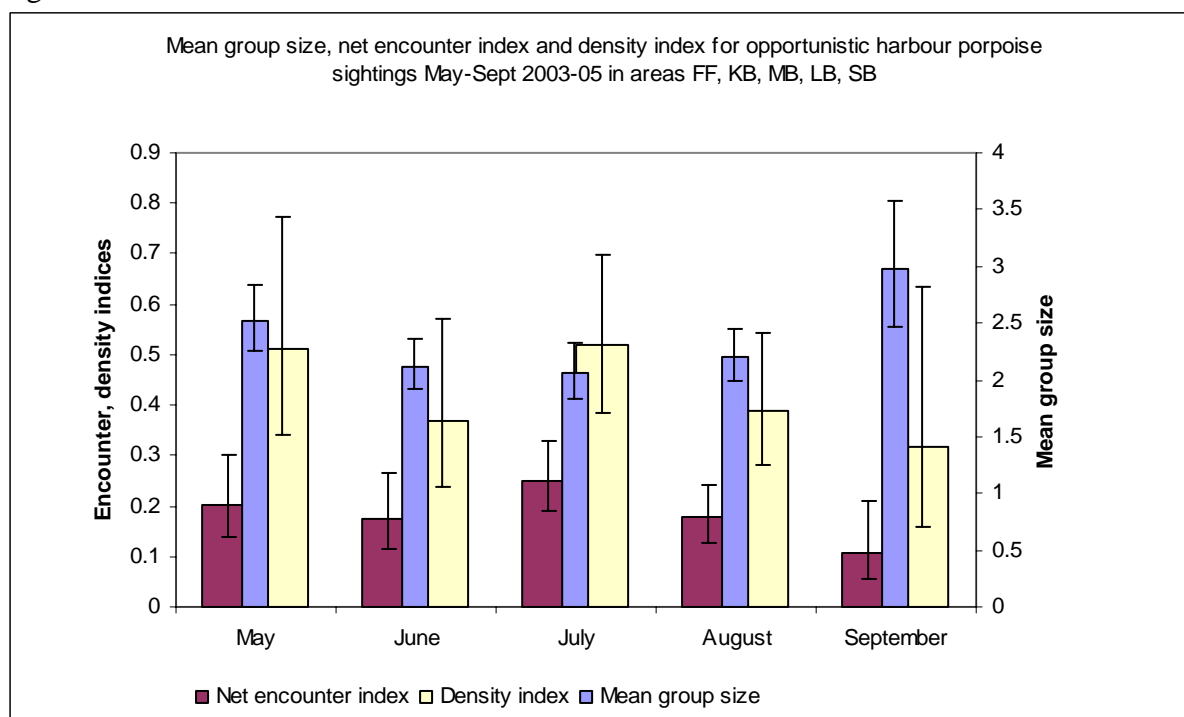
Fig. 1a. Opportunistic sightings of harbour porpoise in the western Baltic Sea from pleasure craft in 2003, and the areas used for the analysis
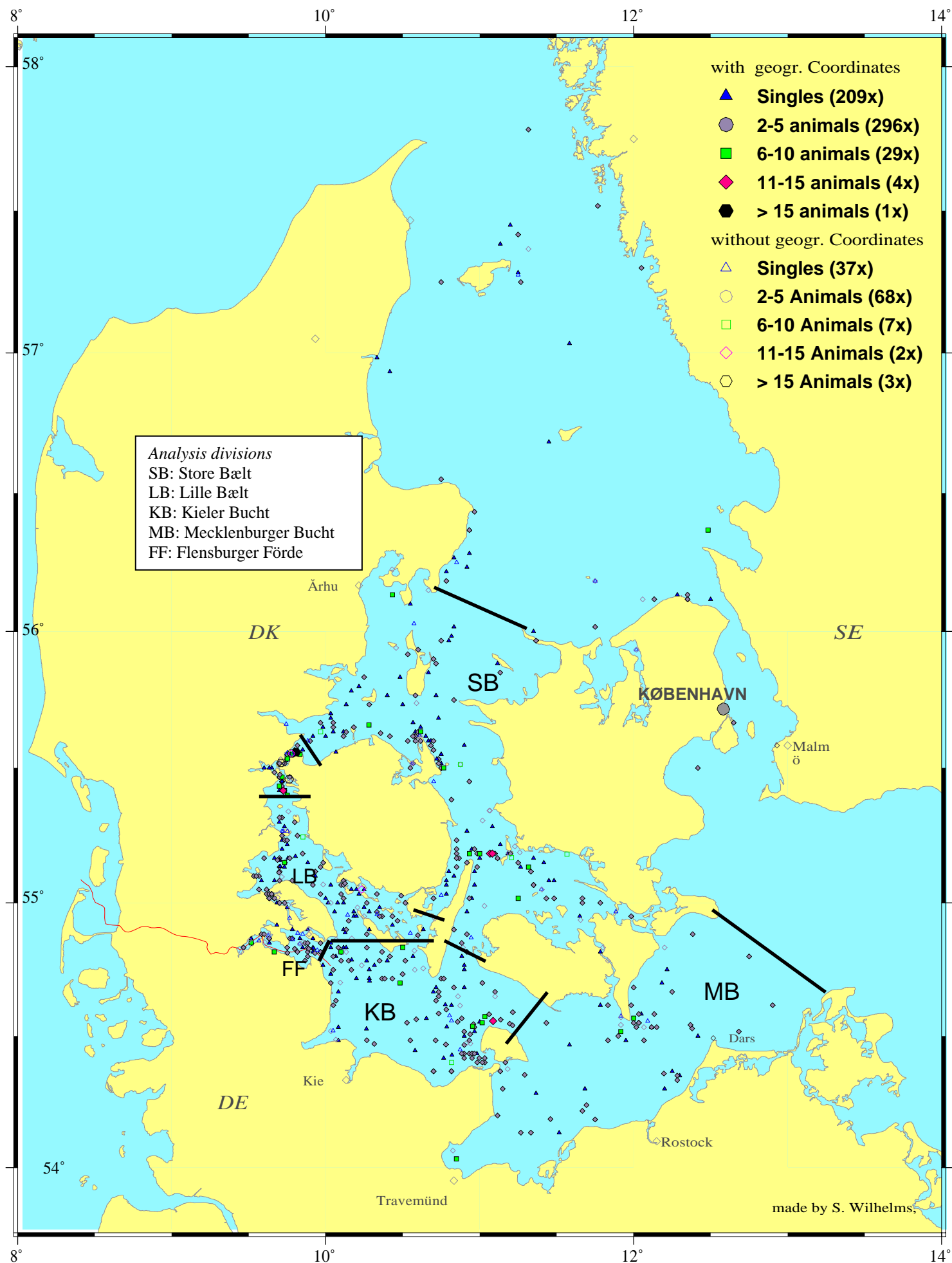

with geogr. Coordinates
▲ Singles (209x)
⬤ 2-5 animals (296x)
◼ 6-10 animals (29x)
◆ 11-15 animals (4x)
⬣ > 15 animals (1x)
without geogr. Coordinates
△ Singles (37x)
◯ 2-5 Animals (68x)
◻ 6-10 Animals (7x)
◇ 11-15 Animals (2x)
⬡ > 15 Animals (3x)

Analysis divisions
SB: Store Bælt
LB: Lille Bælt
KB: Kieler Bucht
MB: Mecklenburger Bucht
FF: Flensburger Förde

DK

SE

SB

KØBENHAVN

Malmö

LB

FF

KB

MB

Dars

Kie

DE

Rostock

Travemünd

Ärhu

made by S. Wilhelms,

Fig. 1b. Opportunistic sightings of harbour porpoise in the Western Baltic and approaches, 2004. (624 sightings; 1384 animals).

Legend:
- Einzeltier (244 x)
- 2 - 5 Tiere (359 x)
- 6 - 10 Tiere (18 x)
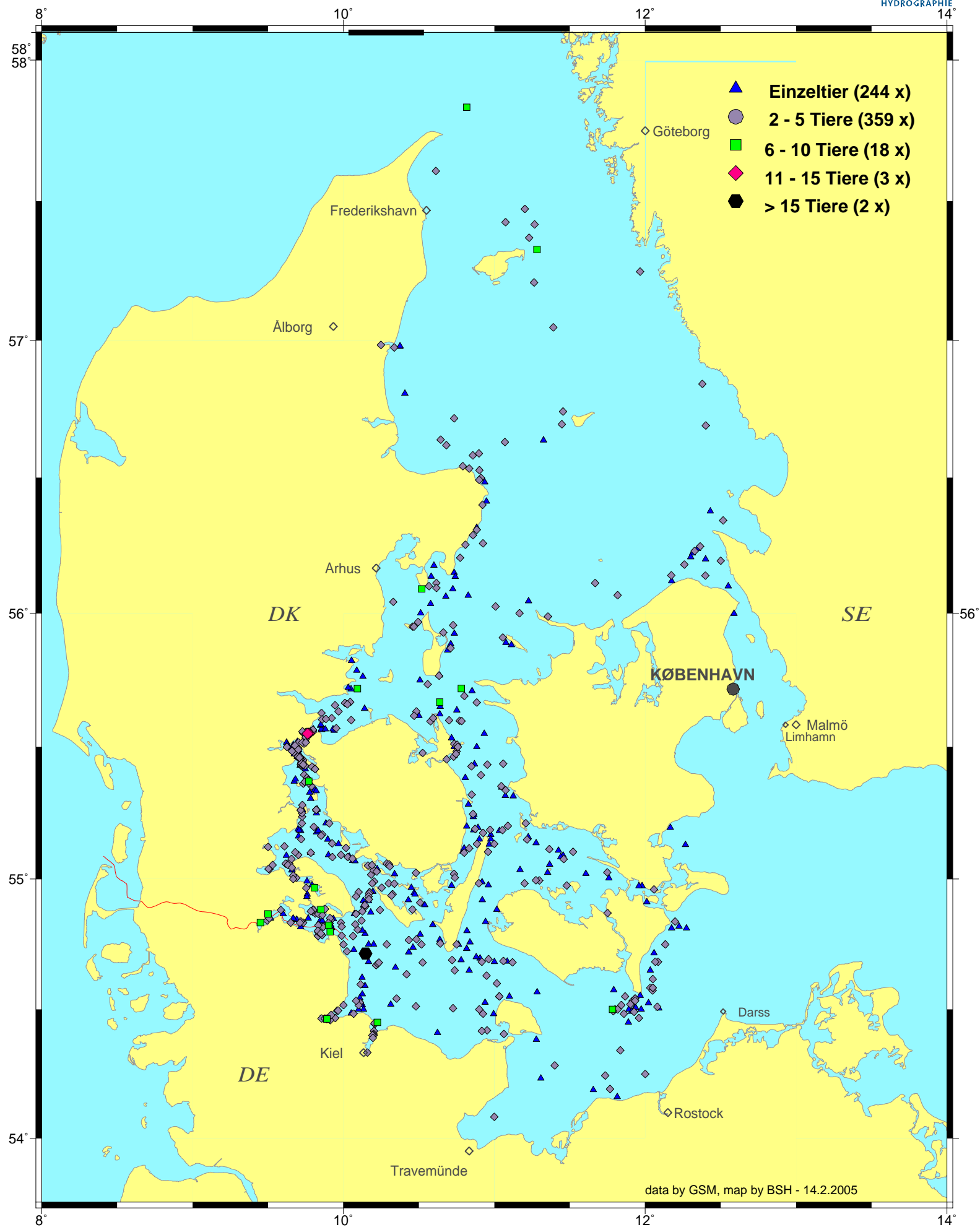- 11 - 15 Tiere (3 x)
- > 15 Tiere (2 x)

data by GSM, map by BSH - 14.2.2005

Fig. 1c. Opportunistic harbour porpoise sightings in 2005