Marine mammal species of relevance for assessment of impulsive noise sources in Danish waters

Background note to revision of guidelines from the Danish Energy Agency

Scientific note from DCE – Danish Centre for Environment and Energy

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Authors:	Jakob Tougaard, Signe Sveegaard and Anders Galatius
Institutions:	Aarhus University, Department of Bioscience
Referee:	Jonas Teilmann
Quality assurance, DCE:	Jesper Fredshavn
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Contents

Background

The Danish Energy Agency is revising guidelines for assessment of impact on marine mammals from pile driving related to offshore energy. As part of the process leading to this update, a series of technical reviews has been commissioned. This review is the first of these, covering the selection of species to include in assessments of projects and activities, which generate impulsive[1] noise capable of affecting the marine environment.

Summary of recommendations

The recommendations regarding which species to include in assessments are summarized in the table below. The table is divided into two geographical areas, as defined by the European Commission: the Atlantic marine biogeographical region, which covers the North Sea, Skagerrak and Kattegat, and the Baltic marine biogeographical region, which covers the rest of the Danish straits and the Baltic Sea.

Table 1. Summary of recommendations regarding marine mammal species commonly found in Danish EEZ and territorial waters.

Species	Atlantic marine biogeographical region	Baltic marine biogeographical region
Harbour seal	Include	Include
Grey seal	Include. Uncommon outside the North Sea, but expanding.	Include. Abundant in Baltic proper[2], Femern Belt and the Sound, otherwise uncommon or absent.
Other seal species	Not relevant	Not relevant
Harbour porpoise	Include	Include. Critically endangered in the Baltic proper
White-beaked dolphin	Include	Not relevant
Bottlenose dolphin	Uncommon, can be excluded	Uncommon, can be excluded[3].
Pilot whale and other deep-diving odontocetes	Include in Skagerrak, deeper than 200 m[4]	Not relevant
Killer whale	Uncommon, can be excluded	Not relevant
Minke whale	Include	Not relevant
Fin whale	Uncommon, can be excluded	Uncommon, can be excluded
Other cetaceans	Uncommon and unpredictable, can be excluded	Uncommon and unpredictable, can be excluded

Biogeographic regions

The Danish EEZ and territorial waters are hydrographically divided into two regions: a western part dominated by the influence from the Atlantic Ocean

[1] The term impulsive noise is poorly defined, but in this context it can be assumed to cover the same types of noise sources included under the D11C1 criterion of the EU Marine Strategy Framework Directive.

[2] Bordered by the Darss Sill between Gedser Odde and Darss (Mecklenburg-Vorpommern) and Drogden.

[3] At times single individuals may take up residence in a particular area for extended periods of time (months – years), in which case these individuals must be considered in an assessment relevant for that particular geographical area.

[4] To be understood as activities *radiating* noise into these waters, which means that it also applies to activities on the surface and in shallow waters on the slopes of the Norwegian trench.

(North Sea, Skagerrak and Kattegat) and a south-eastern part dominated by the brackish waters from the Baltic Sea. This division is also reflected in the marine biographical regions of the EU's Habitats Directive (European Commission, 1992), which defines an Atlantic marine biogeographic region and a Baltic marine biogeographic region (Figure 1).

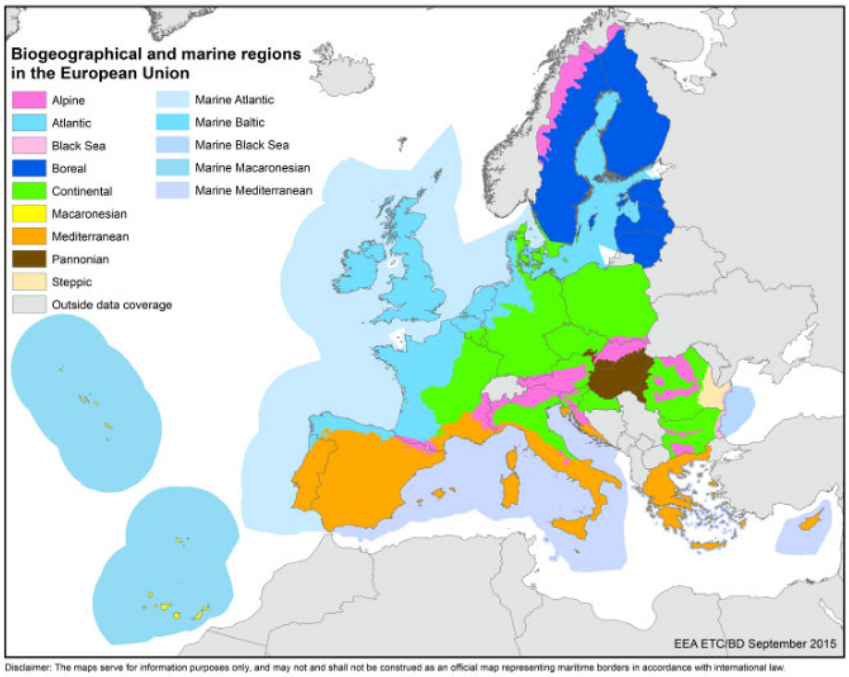

Figure 1. Marine biogeographical regions relevant to the Danish EEZ and territorial waters. Source European Environmental Agency.

A further hydrographical subdivision within the Baltic marine biogeographic region is the distinction between the Western Baltic and the Danish Straits on one hand and the Baltic Proper on the other. This separation is commonly defined by the shallow thresholds Darss Sill and Drogden Sill (Figure 2; see also HELCOM (2013)).

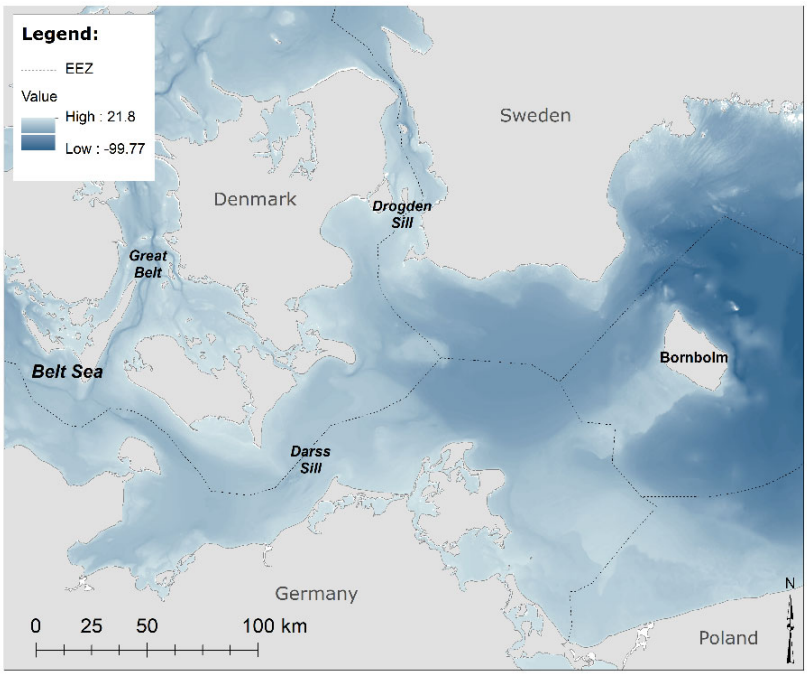

Figure 2. Subdivision of the Baltic marine biogeographical region, with border between Baltic proper (to the east) and the western Baltic and Danish Straits defined as the Darss and Drogden sills.

Species

A large number of marine mammal species have been recorded from Danish waters (Baagøe and Jensen, 2007), but only a handful are commonly occurring and thus relevant for assessment of impact. Several sources provide maps covering various parts of the Danish EEZ (see Figure 3 for an example), but none can be said to be authoritative. While these maps can provide large-scale information about general patterns in distribution of the species, they often fail to capture temporal variation and are rarely usable for fine-scale analysis.

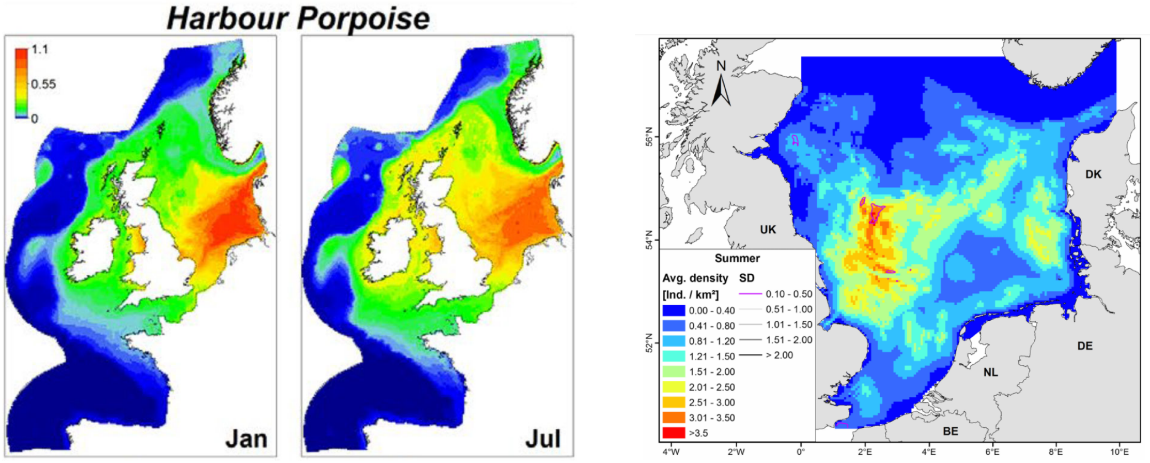

Figure 3. Two examples of modelled distribution maps for harbour porpoises, both based on observations from visual surveys. There are significant differences between the maps, reflecting differences in input data and choice of modelling framework. Left from Waggitt *et al.* (2019); right from Gilles *et al.* (2016).

Pinnipeds

Six species of seals are recorded from Danish waters. Only two are commonly encountered and should be considered in assessments: harbour seal and grey seal.

Harbour seal/spættet sæl/*Phoca vitulina*

The harbour seal is common in most parts of Danish waters and can be regularly encountered in the rest, except around Bornholm, where harbour seals are rarely seen. The species is listed on annex 2 of the Habitats directive, which means 22 Natura2000 areas has been designated as habitat areas for the species. These areas are centred on important breeding sites. Some of these sites are furthermore protected as wildlife reserves. Population development and status of the species in Danish waters have been assessed as favourable according to the EU Habitats Directive (Fredshavn *et al.*, 2019). Harbour seal distribution in Danish waters is centred around four genetically distinct population units (Olsen *et al.*, 2014): 1) the Wadden Sea, where the population is shared with the Netherlands and Germany. This population is abundant and was estimated at 40,800 seals in 2019, of which 2700 were in Danish waters (Galatius *et al.*, 2019). 2) the central Limfjord, this population was estimated at 1,100 individuals in 2018 (Sveegaard *et al.*, 2019). In the western Limfjord, a combination of harbour seals from the Wadden Sea and the central Limfjord occur. The abundance here was estimated at 650 individuals in 2018 (Sveegaard *et al.*, 2019). 3) In Kattegat, the population is shared with Sweden. Here, 9,900 seals were estimated in 2019, with 6300 in Danish waters, by compensating for the fraction of seals expected to be at sea during the surveys

(ICES, 2020). In total, the population size of the inner Danish waters is estimated at approx. 17,000. 4) In the western Baltic around southern Sjælland, Lolland, Falster and western Skåne, the population abundance was estimated at 1,800 seals (Sveegaard *et al*., 2019). Outside these areas, i.e., the Little Belt, Great Belt and the waters south of Fyn, harbour seals occur in lower densities, as there are no permanent haul-out sites and only seals from the neighbouring populations stray into the areas.

Although there are several sources of satellite telemetry data for harbour seals in Danish waters (Tougaard *et al*., 2008; Dietz *et al*., 2012; Dietz *et al*., 2015), no generalised distribution maps are available.

Grey seal/gråsæl/*Halichoerus gryphus*

The grey seal is less common than the harbour seal, but occurrence is increasing in the Wadden Sea and Kattegat. It is the most common seal species in the waters around Bornholm where the numbers have stagnated in the past 5 years on the Danish localities, after a decade with rapid increase (Sveegaard *et al*., 2019; Galatius *et al*., 2020). The species is listed on annex 2 of the Habitats Directive and 12 areas in Danish waters have been designated as Natura 2000 areas for the species. Grey seals from two populations occur in Denmark, namely the greater North Sea population and the Baltic population (Fietz *et al*., 2016). The North Sea population occurs in the Wadden Sea, western Limfjord and Kattegat, while the Baltic population occurs in all inner Danish waters, including Kattegat (Fietz *et al*., 2016). The highest numbers of grey seals in Denmark occur at Ertholmene near Bornholm (850 grey seals at the haul-out in 2015). Considerable numbers of grey seals are further found at Falsterbo, at the south-western corner of Skåne and close to Danish waters. Other, less important, but significant haul-outs in the Baltic biogeographic region (20-100 seals on average in the moulting season) include Rødsand south of Lolland, Bosserne east of Samsø, Anholt and sand banks and reefs around Læsø (Galatius *et al*., 2020). In 2018, more than 200 grey seals were counted in the Danish Wadden Sea (Sveegaard *et al*., 2019). As grey seals travel farther than harbour seals, individuals can be encountered in all Danish waters.

As for harbour seals, there is no generalised distribution maps available for grey seals.

Other species

Four other species of seals have been recorded as exceptional visitors. Thus, they can be excluded from assessments in Danish waters. The species are: ringed seal/ringsæl/*Pusa hispida* (Baagøe and Jensen, 2007), harp seal/grønlandssæl/*Pagophilus groenlandicus* (Larsen et al., 1987), hooded seal/klapmyds/*Crystophora cristata* (Tougaard, 1987) and walrus/hvalros/*Odobenus rosmarus* (Born, 1988).

Cetaceans

A large number of cetaceans have been observed in Danish waters, some frequently, and others as very rare or singular visits. All cetacean species are included on the Habitats Directive annex 4, which means that they must be protected everywhere they occur. However, as for the seals, many of the species are encountered so rarely that they can be excluded from assessment. The distinction between what species should be included and which should not is

less sharp, however, and decisions must be based on the specific activity and geographical location.

Three species have been assessed in the Danish Red List of threatened species: harbour porpoise, white-beaked dolphin and minke whale. Three additional species, fin whale, killer whale and long-finned pilot whale, have also been assessed for the Danish reporting according to article 17 of the Habitats Directive (Fredshavn *et al.*, 2019). However, the likelihood of encountering individuals of these three species throughout the Danish waters varies greatly and the occurrence is irregular and unpredictable.

Harbour porpoise/marsvin/*Phocoena phocoena*

The harbour porpoise is the most common marine mammal in Danish waters and is abundant in both biogeographic regions. As it is listed also on annex 2 of the Habitats Directive, 16 Natura2000 areas throughout the Danish waters were designated in 2010 as habitat areas for porpoises. In 2019, 19 more sites were suggested for porpoises by the Environmental Protection Agency, currently in the process of approval by the EU Commission (Pers. Com. Anna-Grethe Underlien Pedersen, the Environmental Protection Agency, 4th of November 2020). The population in Danish waters is considered to consist of several populations: the North Sea population (inhabiting the North Sea, Skagerrak and the Northern Kattegat), the Belt Sea population (inhabiting the Southern Kattegat, the Belt Seas, the Sound and the western Baltic) and the Baltic population (Baltic Proper) (Wiemann *et al.*, 2010; Galatius *et al.*, 2013). The abundance of the first two populations (not limited to Danish waters) have been assessed to be relatively stable over time and was in 2016 estimated to be 345,373 individuals (CV = 0.18, 96% CI: 246,526 - 495,752 for the North Sea population and 42,324 individuals (CV = 0.304, 95% CI: 23.368 - 76.658) for the Belt Sea population (SCANSIII Hammond *et al.*, 2016). The Baltic Prober population has only been assessed once in 2011-2013 during the SAMBAH project. Here the abundance was estimated to 500 individuals (95 % CI: 80-1.091)(Amundin, 2016).

The North Sea and the Belt Sea populations are assessed to be in favourable conservation status (Moeslund *et al.*, 2019), but the population inhabiting the Baltic proper is assessed as critically endangered (Hammond *et al.*, 2016). Particular attention is therefore required for activities occurring in the Danish part of the Baltic proper (cf. definition above).

Several sources of distribution data for harbour porpoises are available (Edrén *et al.*, 2010; Gilles *et al.*, 2016; Hammond *et al.*, 2017; Sveegaard *et al.*, 2018; Waggitt *et al.*, 2019). They are not all consistent with each other, however, and none are considered authoritative.

White-beaked dolphin/hvidnæse/*Lagenorhynchus albirostris*

The white-beaked dolphin is associated with shelf habitats and commonly encountered in the northern part of the North Sea, in Skagerrak with movements into Kattegat (Galatius and Kinze, 2016). As they occur year-round and breed in the North Sea, including the Danish part (Galatius *et al.*, 2013; Galatius and Kinze, 2016), the species is regarded part of the Danish resident fauna and the species should be considered in assessments for projects in the Atlantic biogeographic region. Little is known about population size and development,

but the population status has been assessed as favourable in Denmark according to the Habitats Directive (Fredshavn et al. 2019). In the greater North Sea area, an abundance of 37,689 individuals was estimated in 2005 (CV 0.29, 95% CI: 18,700-61,900) (Hammond *et al.*, 2013), in 2016 a similar survey over a slightly larger area gave an overall abundance estimate of 36,287 (CV 0.29, 95% CI: 18,700-61,900) (Hammond *et al.*, 2017).

Distribution data for white-beaked dolphins is scarce. Modelled distribution maps can be found in Hammond *et al.* (2017) and Waggitt *et al.* (2019).

Minke whale/vågehval/*Balenoptera acutorostrata*

Minke whales are found in the central and northern part of the North Sea year round and in appreciable numbers. It is therefore a stable part of the Danish resident fauna. The population status is considered favourable in Denmark according to the Habitats Directive (Fredshavn *et al.*, 2019). The species should be considered for activities in the Atlantic marine biographical region.

As for white-beaked dolphins distribution data is scarce for minke whales. Modelled distribution maps can be found in Hammond *et al.* (2017) and Waggitt *et al.* (2019).

Long-finned pilot whale/grindehval/*Globicephala melas* and other deep-diving odontocetes

Long-finned pilot whales are associated with deeper parts of the ocean and can be encountered occasionally in Skagerrak, associated with the Norwegian Trench. It represents a different ecological niche than other marine mammals occurring in and around Denmark: deep-diving species, which forage primarily on squid in the deep scattering layer. While pilot whales are not considered particularly sensitive to acoustic disturbance (Antunes *et al.*, 2014), they can serve as a proxy for the rarely encountered beaked whales. Beaked whales are considered very vulnerable to acoustic disturbance (Tyack *et al.*, 2011; DeRuiter *et al.*, 2013; Wensveen *et al.*, 2019) and they should be included in assessments of activities radiating loud impulsive sound into deep waters, i.e. the meso- and bathypelagic parts of Skagerrak (deeper than 200 m). This also applies to noise from activities on the surface and on the shallower slopes of the Norwegian Trench, which propagates into the meso- and bathypelagic habitat.

Killer whale/spækhugger/*Orcinus orca*

Killer whales are irregular visitors to Danish waters, most commonly seen in the northern part of the North Sea and in Skagerrak. Their occurrence is too sporadic to warrant including the species in assessments.

Fin whale/finhval/*Balaenoptera physalus*

Fin whales are commonly visiting the Danish straits and the western Baltic, but always as single individuals. Coupled with the fact that they move extensively means that the chance of encountering a visiting fin whale in a particular area is very low. Fin whales may be more common in Skagerrak, but little information is available. In the Atlantic biogegraphical region fin whales may be de facto protected through any mitigation measures taken to protect minke

whales, which likely share similarities with fin whales with respect to hearing physiology and behaviour.

Bottlenose dolphin/øresvin/ *Tursiop truncatus*

Bottlenose dolphin is a coastal species with a clustered distribution. Closest population to Danish waters is in Scotland (Moray Firth), with other populations in the Irish Sea and Normandy. There have been regular occurrence of the species, either single individuals or small groups. These individuals can remain in the same geographical area for extended periods (months to years). The occurrence of the species is generally so low that it can be excluded from assessments, but due to their habit of remaining in the same spot for long periods, these individuals and groups should be included in assessments of activities planned in areas, where individuals of bottlenose dolphins are known to be present at the time of the assessment.

Other species

Other species can be expected to occur sporadically and in low numbers. For a complete list see Baagøe and Jensen (2007). All species are expected to occur so infrequently that the probability of encountering them for a particular project is virtually zero. Should they nevertheless happen to occur during activities, whatever mitigation measures taken to protect other cetaceans are considered adequate also for the rare species, offering these a de facto protection, even though they have not been addressed in a specific assessment.

References

Amundin, M. (**2016**). "SAMBAH Final report LIFE08 NAT/S/000261," (Kolmårdens Djurpark AB, Vildmarksvägen, SE-618 92 Kolmården, Sweden, Kolmårdens Djurpark AB), p. 77.

Antunes, R., Kvadsheim, P. H., Lam, F. P. A., Tyack, P. L., Thomas, L., Wensveen, P. J., and Miller, P. J. O. (**2014**). "High thresholds for avoidance of sonar by free-ranging long-finned pilot whales (*Globicephala melas*)," Mar.Pollut.Bull.

Born, E. W. (**1988**). "Hvalrosstrejfere i Europa," Flora og Fauna **94**, 9-14.

Baagøe, H. J., and Jensen, T. S. (**2007**). *Dansk pattedyratlas* (Gyldendal, Copenhagen).

DeRuiter, S. L., Southall, B. L., Calambokidis, J., Zimmer, W. M. X., Sadykova, D., Falcone, E. A., Friedlaender, A. S., Joseph, J. E., Moretti, D., Schorr, G. S., Thomas, L., and Tyack, P. L. (**2013**). "First direct measurements of behavioural responses by Cuvier's beaked whales to mid-frequency active sonar," Biol. Lett. **9**.

Dietz, R., Galatius, A., Mikkelsen, L., Nabe-Nielsen, J., Riget, F., Schack, H. B., Skov, H., Sveegaard, S., Teilmann, J., and Thomsen, F. (**2015**). "Marine mammals - Investigations and preparation of environmental impact assessment for Kriegers Flak Offshore Wind Farm," (Energinet.dk), p. 208.

Dietz, R., Teilmann, J., Andersen, S. M., Rigét, F., and Olsen, M. T. (**2012**). "Movements and site fidelity of harbour seals (Phoca vitulina) in Kattegat, Denmark, with implications for the epidemiology of the phocine distemper virus," ICES Journal of Marine Science: Journal du Conseil **70**, 186-195.

Edrén, S. M. E., Wisz, M. S., Teilmann, J., Dietz, R., and Söderkvist, J. (**2010**). "Modelling spatial patterns in harbour porpoise satellite telemetry data using maximum entropy," Ecography.

European Commission (**1992**). "Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora."

Fietz, K., Galatius, A., Frie, A. K., Teilmann, J., Dietz, R., Klimova, A., Jensen, L. F., Graves, J. A., Hall, A., McConnell, B. J., Hoffman, J., Gilbert, M. T. P., and Olsen, M. T. (**2016**). "Shift of grey seal subspecies boundaries in response to climate, culling and conservation," Mol. Ecol. **25**, 4097-4112.

Fredshavn, J., Nygaard, B., Ejrnæs, R., Damgaard, C., Therkildsen, O. R., Elmeros, M., Wind, P., Johansson, L. S., Alnøe, A. B., Dahl, K., Nielsen, E. H., Pedersen, H. B., Sveegaard, S., Galatius, A., and Teilmann, J. (**2019**). "Bevaringsstatus for naturtyper og arter – 2019. Habitatdirektivets Artikel 17-rapportering. Videnskabelig rapport fra Aarhus Universitet, DCE – Nationalt Center for Miljø og Energi nr. 340, 52 s.."

Galatius, A., Brasseur, S., Cremer, J., Czeck, R., Jeß, A., Körber, P., Pund, R., Siebert, U., Teilmann, J., and Klöpper, S. (**2019**). "Aerial surveys of Harbour Seals in the Wadden Sea in 2018. Common Wadden Sea Secretariat, Wilhelmshaven, Germany.."

Galatius, A., Jansen, O. E., and Kinze, C. C. (**2013**). "Parameters of growth and reproduction of white-beaked dolphins (*Lagenorhynchus albirostris*) from the North Sea," Mar. Mamm. Sci. **29**, 348-355.

Galatius, A., and Kinze, C. C. (**2016**). "*Lagenorhynchus albirostris* (Cetacea: Delphinidae)," Mammalian Species **48**, 35-47.

Galatius, A., Teilmann, J., Dähne, M., Ahola, M., Westphal, L., Kyhn, L. A., Pawliczka, I., Olsen, M. T., and Dietz, R. (**2020**). "Grey seal *Halichoerus grypus* recolonisation of the southern Baltic Sea, Danish Straits and Kattegat," Wildlife Biology.

Gilles, A., Viquerat, S., Becker, E. A., Forney, K. A., Geelhoed, S. C. V., Haelters, J., Nabe-Nielsen, J., Scheidat, M., Siebert, U., Sveegaard, S., Beest, F. M. v., Bemmelen, R. v., and Aarts, G. (**2016**). "Seasonal habitat-based density models for a marine top predator, the harbor porpoise, in a dynamic environment," Ecosphere **7**, e01367.

Hammond, P. S., Bearzi, G., Bjørge, A., Forney, K. A., Karczmarski, L., Kasuya, T., Perrin, W., Scott, M. D., Wang, J. Y., Wells, R. S., and Wilson, B. (**2016**). "*Phocoena phocoena* (Baltic Sea subpopulation). The IUCN Red List of Threatened Species 2016: e.T17031A98831650. Downloaded on 08 November 2016."

Hammond, P. S., lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M. B., Scheidat, M., Teilmann, J., Vingada, J., and Øien, N. (**2017**). "Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys," (St. Andrews).

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

HELCOM (**2013**). "HELCOM Monitoring and Assessment Strategy," (Helsinki).

ICES (**2020**). "Report of the working group on marine mammal ecology (WGMME)," ICES Scientific Reports **39**.

Larsen, B. H., Jensen, B., Clausen, B., and Tougaard, S. (**1987**). "Grønlandssæler (*Phoca groenlandica*) i Danmark i foråret 1987," Flora og Fauna **93**, 77-79.

Moeslund, J. E., Nygaard, B., Ejrnæs, R., Bell, N., Bruun, L. D., Bygebjerg, R., Carl, H., Damgaard, J., Dylmer, E., Elmeros, M., Flensted, K., Fog, K., Goldberg, I., Gønget, H., Helsing, F., Holmen, M., Jørum, P., Lissner, J., Læssøe, T., Madsen, H. B., Misser, J., Møller, P. R., Nielsen, O. F., Olsen, K., Sterup, J., Søchting, U., Wiberg-Larsen, P., and Wind, P. (**2019**). "Den danske rødliste 2019," (Aarhus).

Olsen, M. T., Andersen, L. W., Dietz, R., Teilmann, J., Harkonen, T., and Siegismund, H. R. (**2014**). "Integrating genetic data and population viability analyses for the identification of harbour seal (*Phoca vitulina*) populations and management units," Mol. Ecol. **23**, 815-831.

Sveegaard, S., Galatius, A., Kyhn, L. A., and Teilmann, J. (**2019**). "Havpattedyr - sæler og marsvin. I J. W. Hansen, & S. Høgslund (red.), Marine områder 2018. NOVANA (s. 87-99). Aarhus Universitet, DCE - Nationalt Center for Miljø og Energi. Videnskabelig rapport fra DCE - Nationalt Center for Miljø og Energi, Nr. 355 . https://dce2.au.dk/pub/SR355.pdf."

Sveegaard, S., Nabe-Nielsen, J., and Teilmann, J. (**2018**). "Marsvins udbredelse og status for de marine habitatområder i danske farvande. Aarhus Universitet, DCE – Nationalt Center for Miljø og Energi, 36 s. - Videnskabelig rapport nr. 284."

Tougaard, J., Teilmann, J., and Tougaard, S. (**2008**). "Harbour seal spatial distribution estimated from Argos satellite telemetry - overcoming positioning errors," Endanger.Species Res. **4**, 113-122.

Tougaard, S. (**1987**). "Første fund af klapmyds (*Cystophora cristata*) i Danmark," Flora og Fauna **93**, 75-76.

Tyack, P. L., Zimmer, W. M. X., Moretti, D., Southall, B. L., Claridge, D. E., Durban, J. W., Clark, C. W., D'Amico, A., DiMarzio, N. A., Jarvis, S., McCarthy, E., Morrissey, R., Ward, J., and Boyd, I. L. (**2011**). "Beaked whales respond to simulated and actual navy sonar," PLoS ONE **6**, e17009.

Waggitt, J. J., Evans, P. G. H., Andrade, J., Banks, A. N., Boisseau, O., Bolton, M., Bradbury, G., Brereton, T., Camphuysen, C. J., Durinck, J., Felce, T., Fijn, R. C., Garcia-Baron, I., Garthe, S., Geelhoed, S. C. V., Gilles, A., Goodall, M., Haelters, J., Hamilton, S., Hartny-Mills, L., Hodgins, N., James, K., Jessopp, M., Kavanagh, A. S., Leopold, M., Lohrengel, K., Louzao, M., Markones, N., Martínez-Cedeira, J., Ó Cadhla, O., Perry, S. L., Pierce, G. J., Ridoux, V., Robinson, K. P., Santos, M. B., Saavedra, C., Skov, H., Stienen, E. W. M., Sveegaard, S., Thompson, P., Vanermen, N., Wall, D., Webb, A., Wilson, J., Wanless, S., Hiddink, J. G., and Punt, A. (**2019**). "Distribution maps of cetacean and seabird populations in the North-East Atlantic," J. Appl. Ecol. **57**, 253-269.

Wensveen, P. J., Isojunno, S., Hansen, R. R., von Benda-Beckmann, A. M., Kleivane, L., van, I. S., Lam, F. A., Kvadsheim, P. H., DeRuiter, S. L., Cure, C., Narazaki, T., Tyack, P. L., and Miller, P. J. O. (**2019**). "Northern bottlenose whales in a pristine environment respond strongly to close and distant navy sonar signals," Proc Biol Sci **286**, 20182592.

Wiemann, A., Andersen, L., Berggren, P., Siebert, U., Benke, H., Teilmann, J., Lockyer, C., Pawliczka, I., Skora, K., Roos, A., Lyrholm, T., Paulus, K., Ketmaier, 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," Conserv Genet **11**, 195-211.