Supporting information for spatial representation of migration routes of Velvet Scoter (*Melanitta fusca)*

Introduction:

Observations of Velvet Scoter were collected from the Baltic Sea area for the HELCOM Migratory Sea Birds Workshop (MIGRATORY BIRD WS 1-2018).

HELCOM Recommendation 34E/1 "Safeguarding important bird habitats and migration routes in the Baltic Sea from negative effects of wind and wave energy production at sea" covers both planning and ecology/conservation aspects. It was identified by the State and Conservation Working Group that one of the first steps in the process to implement the Recommendation is to spatially identify migration routes and sensitivity of a given area with regards to migration.

A workshop on migration routes of birds over the Baltic Sea was convened on 20-22 November 2018 at the premises of HELCOM Secretariat, in cooperation with the ICES/OSPAR/HELCOM Joint Working Group on Seabirds (JWG BIRD). The workshop was organized in order to support the implementation of HELCOM Recommendation 34E/1 by producing maps with migration routes of waterbird species covering the entire Baltic Sea Region. The workshop brought together data from:

i) coastal migration counts,
ii) waterbird counts at staging/stopover sites,
iii) tracking data (satellite telemetry, GPS data loggers)
iv) radar observations.

The workshop agreed to produce a written accounts, e.g. relevant information to be included with the maps as part of the metadata information, and seasonal migration maps for selected example species for which reliable information is available and to include the confidence of the expert judgement or data to these maps.

Please note that in their current form the maps are not ready to be used for planning, but that they represent examples of what can be produced with significantly higher quality, given more time and resources. The maps produced in the workshop represent the initial steps in the process to map migration and represent the available information and the most common routes for the respective birds, but they do not mean that there are no birds migrating outside of the delineated areas. Due to lack of time, no buffers, sensitivity scores nor weighting has been added to the layers.

Migration season represented

Pre-breeding (spring) migration.

Ecology and behavior of species

Velvet Scoters are migrating mostly along coastlines and during daytime (but the amount of nocturnal migration is poorly known). Spring migration ranges from March to May. The flyway population "Western Siberia & Northern Europe/NW Europe" is estimated at 320,000 to 550,000 birds (Wetlands International 2019), of which the great majority is migrating across the Baltic Sea. Flight behaviour when confronting barriers such as offshore wind farms or bridges is poorly known for the species, but evidence from related species (Common Eider, Common Scoter; Pettersson 2005, Petersen et al. 2006, Krijgsveld et al. 2011, Hill et al. 2014) suggests that wind farms are avoided (circumvented) to a large degree.

Conservation status

As a migrating bird, Velvet Scoter is protected under EU Birds Directive and the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS). IUCN (2018) is listing the species as vulnerable (VU). The HELCOM Red List status for wintering birds in the Baltic Sea is endangered (EN), while the status

for the breeding population of the Baltic Sea is vulnerable (VU). The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) is preparing a Single Species Action Plan for the Conservation of the Velvet Scoter (Western Siberia & Northern Europe/NW Europe population).

Data type and sources

The map of Velvet Scoter spring migration route is based on land-based visual observations (seasonal totals per site compared to population size) and tracking of individuals (satellite telemetry), supported by information on wintering sites from ship-based, land-based and aerial surveys. Sources:

Visual observation of migration:

1. Fehmarnbelt (DE, DK): FEMERN A/S 2013: Feste Fehmarnbeltquerung Planfeststellung- Anlage 15: Umweltverträglichkeitsstudie (UVS) – Band II B. FEMERN A/S Kopenhagen. 607 p.
2. Hiddensee (DE): Dierschke V & Helbig AJ unpubl.data
3. Kåseberga/Sandhammaren and Revsudden (SE): Data from The Swedish species gateway https://www.artportalen.se/
4. Ottenby (SE): Rrk Öland 2017: Fågelobservationer på Öland 2016 [Bird observations on Öland 2016]. Calidris 2-3: 6-96; Rrk Öland 2018: Fågelobservationer på Öland 2017 [Bird observations on Öland 2017]. Calidris 2-3: 6-94.
5. Pape (LV): Celmins A 1989: The observations of spring migration in Pape in 1987. Putni daba 2: 88-104; Celmins A, Baumanis J, Roze V 1990: Spring migration of waterbirds on the sea near Pape in 1988. Putni daba 3: 92-104; Celmins A, Baumanis J, Roze V 1995: Spring migration of waterfowl in the sea near Pape in 1989. Putni daba 5: 17-31.
6. Kabli (EE): Ellermaa M 2018: Kabli kevadränne 2018. aastal. https://kabli.nigula.ee/images/aruanded/Ellermaa_2018_Kabli_kevadranne_2018_v2.pdf.
7. Virtsu (EE): Leito A 2009: EIA report
8. Ristna (EE): data extracted from http://kaart.delfi.ee//?bookmark=1d1416aa7088da1451c19240cd139a5b
9. Hanko (FI): Ornithological society of Helsinki Tringa ry (2018) Data of the Hanko Bird Observatory: Day counts (version 1.1). Downloaded from http://www.tringa.fi/hangon-lintuasema/hankodata on 09-11-2018.
10. Söderskär (FI), Kolka (LV), Geltinger Birk (DE), Hyllekrog (DK): Data extracted from www.trektellen.nl.

Important wintering sites and midwinter counts:

11. Petersen IK pers. comm.
12 Auniņš A, Luigujõe L & Stīpniece A (2017): Factors affecting the distribution and numbers of wintering sea ducks in the Eastern part of the Baltic sea. Poster presentation at the International Seaduck Conference, 06-09 Feb 2017, San Francisco, USA
13. Markones N et al. in prep: Update of seabird population numbers in German sea areas for the Art 12 BD reporting.
14. Dagys M et al. in prep: AEWA International Single Species Action Plan for the Velvet Scoter *Melanitta fusca*.
15. IWC Midwinter Count data 1991-2016 from Sweden and Finland as analysed for the HELCOM Core Indicator “Abundance of waterbirds in the wintering season” (HELCOM 2018).

Satellite telemetry:

16. Žydelis R, Dagys M, Morkūnas J & Raudonikis L: Satellite telemetry of Velvet Scoters, Long-tailed Ducks and Red-throated Divers in Lithuania. LIFE-Nature project "DENOFLIT" (tracks from www.movebank.org, visited 15 November 2018).

Method used and rational

Tracks of individual Velvet Scoters equipped with satellite transmitters were generalized and geo-referenced. As the tracking study only covered birds wintering from Lithuania to Poland, satellite telemetry can only indicate migration routes in the eastern Baltic Sea. To estimate the magnitude of migration in sections of that route, counts of wintering birds were used to add the relative proportions of the population step-wise from west to east (i.e. birds wintering further east are joining the flux of migrants later than those wintering further west). In addition, seasonal totals of spring migrating Velvet Scoters were used as backup information, especially for parts of the Baltic Sea not covered by satellite telemetry.

Level of confidence in presented results

For communicating the degree of certainty in key findings, confidence in the validity of a finding is presented, and is expressed qualitatively.

Each contributing scientist has rated their confidence in the evidence presented. An overall confidence rating of high, medium or low is derived by qualitatively assessing both the amount and consistency of the available information (e.g. the type, amount, quality, and consistency of evidence (e.g., mechanistic understanding, theory, data, models, expert judgement) and the degree of agreement, or conflicting evidence or differing opinions). Where both are high there is high confidence about what is happening. But if either are insufficient there is a high degree of uncertainty and an overall confidence rating of low (figure 1).

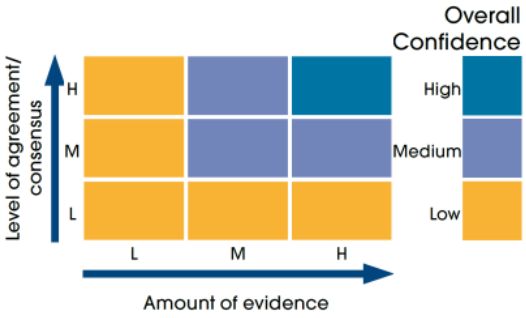


Figure 1.

Confidence in the presented information:

Medium.

Justification for confidence level:

Experts agreed in high quality information concerning the main migration route (H). The amount of evidence is medium (M), because some migration routes of minor importance are yet unknown.

Knowledge gaps and resource priorities

It is currently unknown which route(s) Velvet Scoters wintering in the Kattegat are taking for spring migration. This may be due to nocturnal overland migration (crossing southern Sweden) and needs further investigation.

References

Hill, R., K. Hill, R. Aumüller, K. Boos & S. Freienstein (2014): „Testfeldforschung zum Vogelzug am Offshore-Pilotpark alpha ventus“ und „Auswertung der kontinuierlich auf FINO1 erhobenen Daten zum Vogelzug der Jahre 2008 bis 2012“. StUKplus-Enbericht (FKZ 0327689A/Avitec1 und Avitec2). Avitec Research, Osterholz-Scharmbeck.

Krijgsveld, K.L., R.C. Fijn, M. Japink, P.W. van Horssen, C. Heunks, M.P. Collier, M.J.M. Poot, D. Beuker & S. Dirksen (2011): Effect studies Offshore Wind Farm Egmond aan Zee. Final report on fluxes, flight altitudes and behaviour of flying birds. Noordzeewind Rapport OWEZ R 231 T1 20111110. Bureau Waardenburg, Culemborg.

Petersen, I. K., T. K. Christensen, J. Kahlert, M. Desholm & A. D. Fox (2006): Final results of bird studies at the offshore wind farms at Nysted and Horns Rev, Denmark. National environmental Research Institute, Kalø.

Pettersson, J. (2005): The Impact of Offshore Wind Farms on Bird Life in Southern Kalmar Sound, Sweden. Report to Swedish Energy Agency. Lunds Universitet, Lund.

Wetlands International (2019): Waterbird Population Estimates. Retrieved from wpe.wetlands.org on Monday 25 Feb 2019.

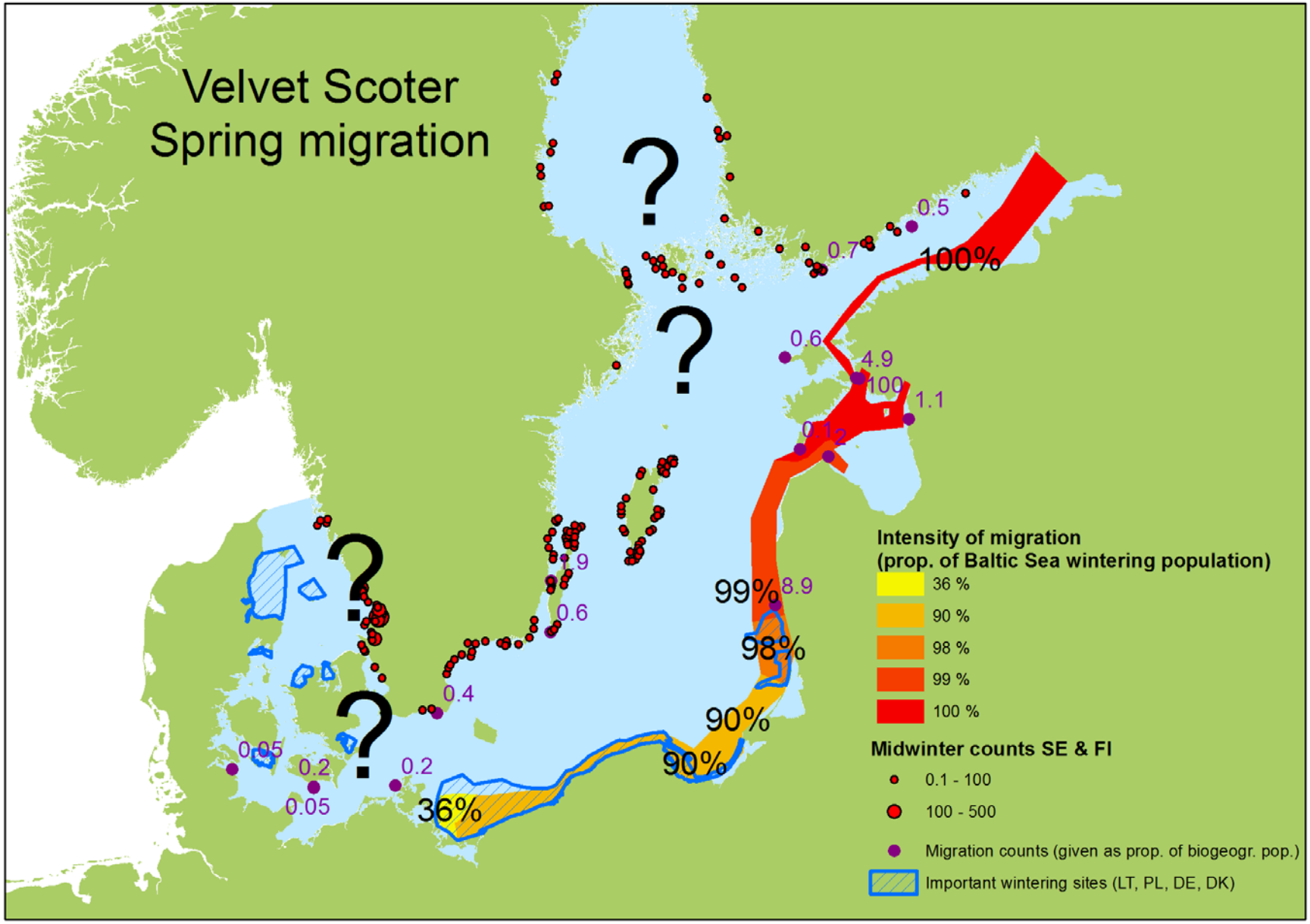
Spatial data product (map) metadata:

Categories	Filled in by Secretariat
Keywords	Filled in by Secretariat e.g. *marine birds *migration *environment
Language	English
Resource identifier (System generated ID)	Filled in by Secretariat
Legal constraints	Data product can be used, given that the source (HELCOM) and underlying data used for creating the data product (the references listed in lineage section) must be referred as original sources.
Resource Constraints	Map based on aggregated data from various sources.
Contact for the resource	HELCOM Secretariat

Technical Information

Representation type	Vector/raster
Coordinate reference system	ETRS89LAEA
Format	ESRI Shapefile / TIFF
Lineage (This is a statement on process history and/or overall quality of the spatial data set. Where appropriate it may include a statement whether the data set has been validated or quality assured, whether it is	This dataset displays spatial representation of the migration routes of **Velvet Scoter** in spring according to the HELCOM migratory sea birds workshop (MIGRATORY BIRD WS 1-2018). It is aggregated from the following data sources: <u>Visual observation of migration:</u> 1. Fehmarnbelt (DE, DK): FEMERN A/S 2013: Feste Fehmarnbeltquerung Planfeststellung-Anlage 15: Umweltverträglichkeitsstudie (UVS) – Band II B. FEMERN A/S Kopenhagen. 607 p. 2. Hiddensee (DE): Dierschke V & Helbig AJ unpubl.data 3. Kåseberga/Sandhammaren and Revsudden (SE): Data from The Swedish species gateway https://www.artportalen.se/ 4. Ottenby (SE): Rrk Öland 2017: Fågelobservationer på Öland 2016 [Bird observations on Öland 2016]. Calidris 2-3: 6-96; Rrk Öland 2018: Fågelobservationer på Öland 2017 [Bird observations on Öland 2017]. Calidris 2-3: 6-94. 5. Pape (LV): Celmins A 1989: The observations of spring migration in Pape in 1987. Putni daba 2: 88-104; Celmins A, Baumanis J, Roze V 1990: Spring migration of waterbirds on the sea near Pape in 1988. Putni daba 3: 92-104; Celmins A, Baumanis J, Roze V 1995: Spring migration of waterfowl in the sea near Pape in 1989. Putni daba 5: 17-31.

the official version (if multiple versions exist))	6. Kabli (EE): Ellermaa M 2018: Kabli kevadränne 2018. aastal. https://kabli.nigula.ee/images/aruanded/Ellermaa_2018_Kabli_kevadranne_2018_v2.pdf. 7. Virtsu (EE): Leito A 2009: EIA report 8. Ristna (EE): data extracted from http://kaart.delfi.ee//?bookmark=1d1416aa7088da1451c19240cd139a5b 9. Hanko (FI): Ornithological society of Helsinki Tringa ry (2018) Data of the Hanko Bird Observatory: Day counts (version 1.1). Downloaded from http://www.tringa.fi/hangon-lintuasema/hankodata on 09-11-2018. 10. Söderskär (FI), Kolka (LV), Geltinger Birk (DE), Hyllekrog (DK): Data extracted from www.trektellen.nl. Important wintering sites and midwinter counts: 11. Petersen IK pers. comm. 12 Auniņš A, Luigujõe L & Stīpniece A (2017): Factors affecting the distribution and numbers of wintering sea ducks in the Eastern part of the Baltic sea. Poster presentation at the International Seaduck Conference, 06-09 Feb 2017, San Francisco, USA 13. Markones N et al. in prep: Update of seabird population numbers in German sea areas for the Art 12 BD reporting. 14. Dagys M et al. in prep: AEWA International Single Species Action Plan for the Velvet Scoter *Melanitta fusca*. 15. IWC Midwinter Count data 1991-2016 from Sweden and Finland as analysed for the HELCOM Core Indicator “Abundance of waterbirds in the wintering season” (HELCOM 2018). Satellite telemetry: 16. Žydelis R, Dagys M, Morkūnas J & Raudonikis L: Satellite telemetry of Velvet Scoters, Long-tailed Ducks and Red-throated Divers in Lithuania. LIFE-Nature project "DENOFLIT" (tracks from www.movebank.org, visited 15 November 2018).


Velvet Scoter
Spring migration
?
?
?
?
0.5
0.7
100%
0.6
4.9
100
1.1
0.12
99%
8.9
98%
90%
90%
9
0.6
0.4
0.05
0.2
0.2
0.05
36%
Intensity of migration
(prop. of Baltic Sea wintering population)
36 %
90 %
98 %
99 %
100 %
Midwinter counts SE & FI
0.1 - 100
100 - 500
Migration counts (given as prop. of biogeogr. pop.)
Important wintering sites (LT, PL, DE, DK)