Doc StC 10.13
Agenda item 10
5 June 2015

10th MEETING OF THE STANDING COMMITTEE

8-10 July 2015, Kampala, Uganda

DRAFT INTERNATIONAL SINGLE SPECIES ACTION PLAN FOR THE CONSERVATION OF THE LONG-TAILED DUCK

Introduction

This draft International Single Species Action Plan (ISSAP) for the Conservation of the Long-tailed Duck (*Clangula hyemalis*) was commissioned to the Wildfowl & Wetlands Trust (WWT), United Kingdom.

The planning process was launched at a workshop hosted by Estonia in April 2014. Drafts of the plan went through rigorous consultations with experts and the resulting draft provided to the Technical Committee for review on the TC workspace and sent to governmental officials at the Range States of the species for final consultations.

It was presented to the Technical Committee at its 12th Meeting in March 2015, after which comments from the Range States and final comments from the Technical Committee were incorporated into the current final draft.

Action Requested from the Standing Committee

The Standing Committee is requested to review and approve this draft ISSAP for submission to the 6th Session of the Meeting of the Parties to AEWA.

The current draft is for presentation to the
10th Meeting of the AEWA Standing Committee only.

Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA)

Draft International Single Species Action Plan for the Conservation of the Long-tailed Duck *Clangula hyemalis*

2016–2025

[#photo]

Prepared by

Wildfowl & Wetlands Trust, UK

Compiled by: Richard Hearn, Anne Harrison & Peter Cranswick
Wildfowl & Wetlands Trust, Slimbridge, Glos GL2 7BT, UK
Richard.Hearn@wwt.org.uk, Peter.Cranswick@wwt.org.uk, Anne.Harrison@wwt.org.uk

Contributors
Ib Krag Petersen, Stefan Pihl and Bent Ove Rasmussen (Denmark), Margus Ellermaa, the late Andres Kuresoo, Leho Luigujoe, Üllar Rammul and Veljo Volke (Estonia), Jens-Kjeld Jensen and Maria Gunnleivsdóttir Hansen (Faroe Islands), Mikko Alhainen, Martti Hario, Aleksi Lehikoinen, Jukka Rintala and Tero Toivanen (Finland), Bernard Deceuninck (France), Jochen Bellebaum and Jan Kube (Germany), David Boertmann (Greenland), Árni Einarsson, Arnþór Garðarsson and Kristinn Skarphéðinsson (Iceland), Olivia Crowe (Ireland), Ainars Aunins, Vilnis Bernards and Antra Stipneice (Latvia), Mindaugas Dagys, Saulius Svazas and Ramunas Žydelis (Lithuania), Menno Hornman (Netherlands), Tomas Aarvak, Jo Anders Auran, Arnold Håland, Oddvar Heggøy and Svein-Håkon Lorentsen (Norway), Alexander Kondratyev (Russia), Kjell Larsson, Leif Nilsson and David Schönberg-Alm (Sweden), Richard Hearn, Chas Holt, Matt Parsons and David Stroud (United Kingdom), Sergey Dereliev (AEWA), Christina Ieronymidou and Rob Pople (BirdLife International), Cy Griffin (FACE), Tim Bowman (USGS and Sea Duck Joint Venture), Szabolcs Nagy (Wetlands International), Peter Cranswick and Anne Harrison (Wildfowl & Wetlands Trust).

Nina Mikander and Jolanta Kremer (AEWA) and Agu Leivits, Liisa Rennel and Murel Truu (Estonian Environmental Board) helped with logistical arrangements for the workshop.

We gratefully acknowledge and remember the contribution to this plan made by Andres Kuresoo (Estonia), who sadly passed away during the course of its development.

Milestones in production of this plan

April 2014	Action planning workshop of national experts, Roosta, Estonia
November 2014	First draft submitted to the AEWA Technical Committee
March 2015	Final draft approved by the AEWA Technical Committee at its 12th meeting in Bonn, Germany
[July 2015	Final draft approved by the AEWA Standing Committee at its 10th meeting in Kampala, Uganda
November 2015	Final draft approved at the 6th Session of the Meeting of the Parties to AEWA, Bonn, Germany]

Revisions
Please send any information or comments for inclusion in the revision of this plan to the coordinator of the AEWA Long-tailed Duck International Working Group. Contact details can be found at [xxx].

This plan should be reviewed and updated every ten years (next revision 2025). An emergency review will be undertaken if there is a significant change to the species' status before the next scheduled review.

Recommended citation
Hearn, R.D., A.L. Harrison & P.A. Cranswick. 2015. *International Single Species Action Plan for the Conservation of the Long-tailed Duck* Clangula hyemalis, 2016–2025. AEWA Technical Series No. [#].

Cover photograph: [to be added]

Geographical scope

This plan should be implemented in the following countries:

Denmark, Estonia, Faroe Islands (to Denmark), Finland, Germany, Greenland (to Denmark), Iceland, Ireland, Latvia, Lithuania, Norway, Poland, Russian Federation, Sweden, United Kingdom. Key regions/districts of the Russian Federation in which the plan is to be implemented are: Arkhangelsk, Komi, Krasnoyarsk, Murmansk, Nenetsia and Yamalia.

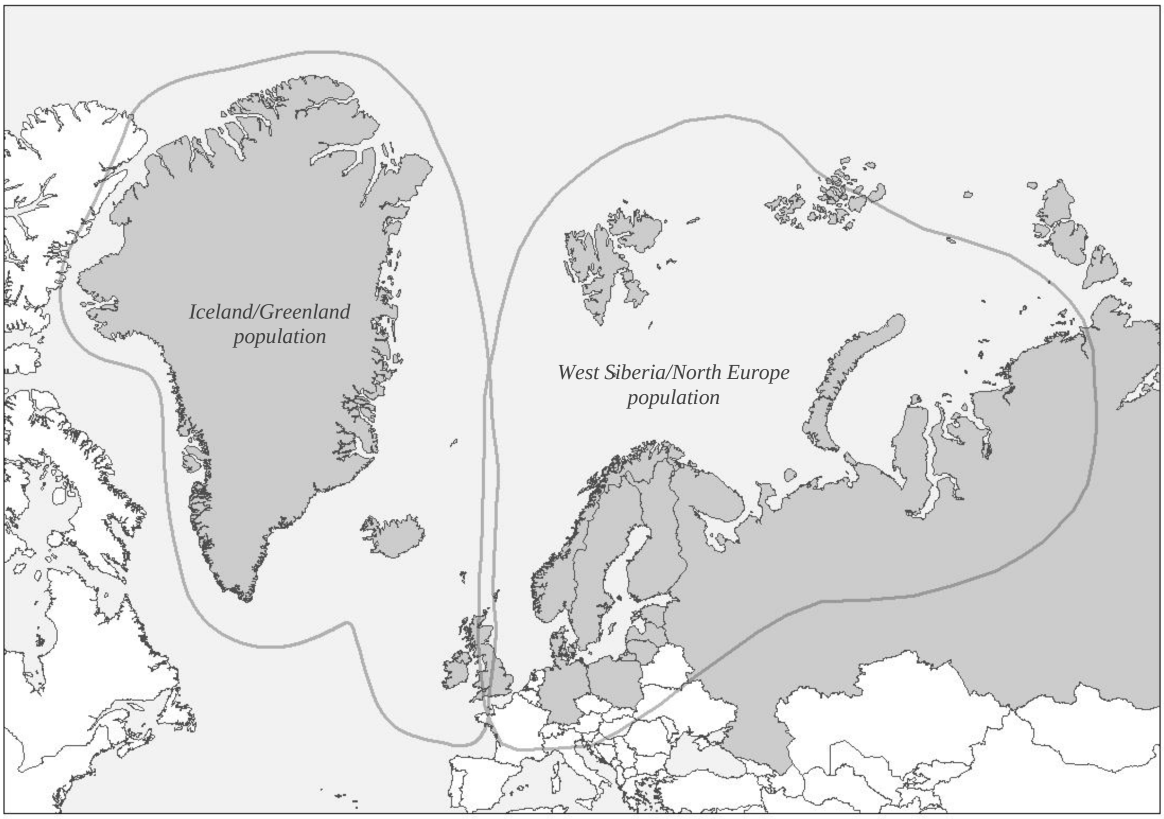

Figure 1. Countries in which the plan is to be implemented. Principal Range States are shaded dark grey.

Range States for the West Siberia/North Europe population should implement all actions within this Plan as appropriate. Range States for the Iceland/Greenland population should implement relevant actions to improve the understanding of the species' status within that flyway. Note that there is uncertainty regarding the precise boundaries of the currently recognised populations, and also the validity of treating them as discrete populations.

This Plan is not targeted at Range States for the two populations (occurring in North America and East Asia) that fall largely outside the AEWA region. Those countries are, however, encouraged to undertake monitoring and other activities that improve the understanding of numbers, trends and movements, to help monitor the global status of the species and identify where conservation actions may be needed.

Long-tailed Ducks occur in small numbers in other countries in the AEWA region, and have been found as vagrants in many European countries.

Table of Contents

List of acronyms

AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
CAFF	Conservation of Arctic Flora and Fauna
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on Migratory Species
EC	European Commission
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EU	European Union
FACE	The European Federation of Associations for Hunting and Conservation
HELCOM	Baltic Marine Environment Protection Commission - Helsinki Commission
IBA	Important Bird Area
IMO	International Maritime Organisation
IUCN	International Union for Conservation of Nature
IWC	International Waterbird Census
LtDIWG	AEWA Long-tailed Duck International Working Group
MEA	Multilateral Environmental Agreement
MSFD	Marine Strategy Framework Directive
N2000	Natura 2000 protected site network
OSPAR	OSPAR Commission
SPA	Special Protection Area
WHSG	Waterbird Harvest Specialist Group

0 – EXECUTIVE SUMMARY

The Long-tailed Duck *Clangula hyemalis* is a globally threatened species. It is classified as Vulnerable on the IUCN Red List. A large decline in numbers in the Baltic Sea, where the majority of the global population overwinters, has taken place since the mid 1990s, equivalent to a 59% decline in the global population size over three generations[1] (*i.e.* 27 years, 1993-2020), even when factoring in uncertainty regarding the sizes and trends of other populations. The decline in numbers has only been recently recognised and as a result the status of the Long-tailed Duck under most relevant international treaties does not yet reflect its current global status.

The species has a high-arctic circumpolar breeding distribution. It winters primarily in coastal waters of North America, northern East Asia and northern Europe. Four populations are recognised, two of which – West Siberia/North Europe and Iceland/Greenland – occur wholly within the AEWA region. Parts of the ranges of the other two populations – North America and East Asia – also fall within the AEWA region, but the majority of both occur outside.

The long-term goal of the Plan is to restore the populations of the Long-tailed Duck to a favourable conservation status within the Agreement area and to remove the species from the threatened categories of the IUCN Red List. The purpose is to significantly reduce direct anthropogenic mortality and understand the wider drivers of decline within the ten-year lifetime of the plan. The objectives of the plan are therefore to increase survival rates and to close key knowledge gaps.
To meet these objective, the plan sets out a series of results[2] to be achieved within its lifetime:

Result 1:	The impact of shipping activities – particularly mortality from operational oil pollution, and disturbance – is significantly reduced
Result 2:	The level of fisheries bycatch is significantly reduced
Result 3:	The level of mortality from hunting, if hunting continues, is sustainable
Result 4:	A network of protected areas, covering all important sites throughout the lifecycle, is designated and maintained
Result 5:	The understanding of population status is improved
Result 6:	Key knowledge gaps about populations, demographics and threats are addressed

A series of actions are identified to deliver each of the results. Two major threats – climate change and pollution by hazardous substances – are considered and/or predicted to have a number of direct effects and also to exacerbate other threats. Whilst tackling these major threats is beyond the scope of this Action Plan, issues for the Long-tailed Duck arising from these threats are highlighted, both to raise awareness with relevant groups and initiatives addressing these wider threats, and so that they can consider appropriate actions, mitigation or management for Long-tailed Duck when undertaking their duties and activities.

Relevant authorities, statutory bodies and stakeholders are encouraged to work collaboratively to implement the actions. International cooperation and coordination will be essential, particularly for actions in the marine environment to be effective. Progress towards both delivery of the actions and achievement of the results should be reviewed on a regular basis. Barriers to implementation should be identified and overcome to ensure that the objective of the plan is met.

---

[1] Generation length is estimated as nine years (BirdLife International 2014)
[2] Note these results are not ranked in order of importance or priority; the importance of specific actions within each results is shown in section 6

1 - PLAN PURPOSE AND TERM

1.1 Purpose of this action plan

This plan specifies a series of actions to improve the conservation status of the Long-tailed Duck *Clangula hyemalis*. Experts from all Range States for the two populations that occur wholly within the AEWA region have identified, through a series of workshops and consultations, the most important threats to the species and determined a series of actions to remove these threats or mitigate their effects. This approach enables unpublished data and expert opinion to be included in the development of the plan while retaining high scientific rigour.

Relevant actions should be implemented in each Range State. Countries are encouraged to develop national action plans for the Long-tailed Duck, or to transpose these actions into existing plans and legislation.

Implementation will require the collaborative efforts of national and regional authorities and statutory bodies, national and international organisations, and a range of key stakeholders. Principal among these are national and international non-governmental conservation organisations, hunting, game management and fishing organisations, shipping industries, offshore and inshore marine industries, organisations and initiatives, site management bodies, and researchers.

International cooperation and coordination will be essential for implementation. This should be facilitated, in the most part, through the inter-governmental AEWA Long-tailed Duck International Working Group (AEWA LtD IWG), described further in chapter 7.

It is expected that the actions identified in this plan will receive priority consideration for funding through relevant international and national instruments.

The conservation of the Long-tailed Duck is dependent on the successful implementation of this plan. Progress towards both delivery of the actions and achievement of the results should be reviewed on a regular basis. Barriers to implementation should be identified and overcome to ensure the objective of the plan is met.

1.2 Plan term

This plan covers the period 2016 to 2025.

2 - BIOLOGICAL ASSESSMENT

Monitoring and research on the Long-tailed Duck have been undertaken in key parts of the flyways of this species. However, this is generally limited both spatially and temporally, and the Long-tailed Duck remains relatively little-studied. The combination of remote Arctic and sub-Arctic breeding areas, and offshore marine wintering sites makes observations difficult, and it can only be surveyed satisfactorily by ship or aeroplane. In most Range States, there are relatively few academic or volunteer ornithologists studying or monitoring the species, and consequently demographic data in particular are often lacking or incomplete. Furthermore, in some cases, there is also relatively little hard evidence with which to determine to what extent some of the putative threats are actually a problem. As a consequence, whilst there is a reasonable qualitative understanding of conservation status, distribution, trends and key threats (particularly oiling and bycatch), the lack of data makes it difficult to recommend specific solutions for some of the conservation problems.

2.1 Taxonomy and biogeographic populations

Phylum: Chordata
Class: Aves
Order: Anseriformes
Family: Anatidae
Tribe: Mergini
Species: Clangula hyemalis (Linnaeus, 1758)

Common names
Danish: Havlit
English: Long-tailed Duck (also previously known as Oldsquaw in North America)
Estonian: Aul
Faroese: Ógvella
Finnish: Alli
Gaelic: Lach-bhinn
German: Eisente
Greenlandic: Alleq
Icelandic: Hávella
Inuktitut: Aggiajuk
Latvian: Kākaulis
Lithuanian: Ledinė antis
Norwegian: Havelle
Polish: Lodówka
Russian: морянка
Swedish: Alfågel

The Long-tailed Duck is monotypic, and there are two biogeographic populations in the African-Eurasian region: i) Iceland & Greenland, ii) West Siberia/North Europe. This Action Plan covers both African-Eurasian populations. Two further populations in i) East Asia and ii) North America are not included in this Action Plan.

2.2 Distribution throughout the annual cycle

The Long-tailed Duck is a long-distance migrant that breeds predominantly in Arctic freshwater habitats, moving to marine areas, mostly to the south, for the non-breeding season. It is, however, very tolerant of cold winter conditions and can overwinter far to the north if sea ice conditions allow. It has a circumpolar breeding distribution and within the African-Eurasian region it breeds predominantly in Russia, with smaller populations in Finland, Sweden, Norway, Iceland and Greenland. Information on movements is mostly lacking, but existing data suggest that most birds breeding in Greenland and Iceland overwinter around the coasts of those countries, with smaller numbers moving south to Faroe Islands, Britain and Ireland. Some Greenland breeding birds also move southwest to Newfoundland. The West Siberia/North Europe population moves predominantly to the south and west, with the vast majority breeding in western Russia and overwintering in the Baltic Sea, but possibly also wintering around Iceland and Greenland. Small numbers also overwinter in the Barents Sea, close to the Kola Peninsula, the northern Black Sea, and the northern Caspian Sea. Those breeding in Scandinavia are thought more likely to move west to the North Sea and North Atlantic (mostly along the coast of Norway). Concentrations of moulting birds, mostly males, form at a number of Arctic locations, including three key sites in the Pechora Sea: i) Nenetsky State Reserve, ii) Russky Zavorot peninsula, and iii) Khaipudirskaya Bay.

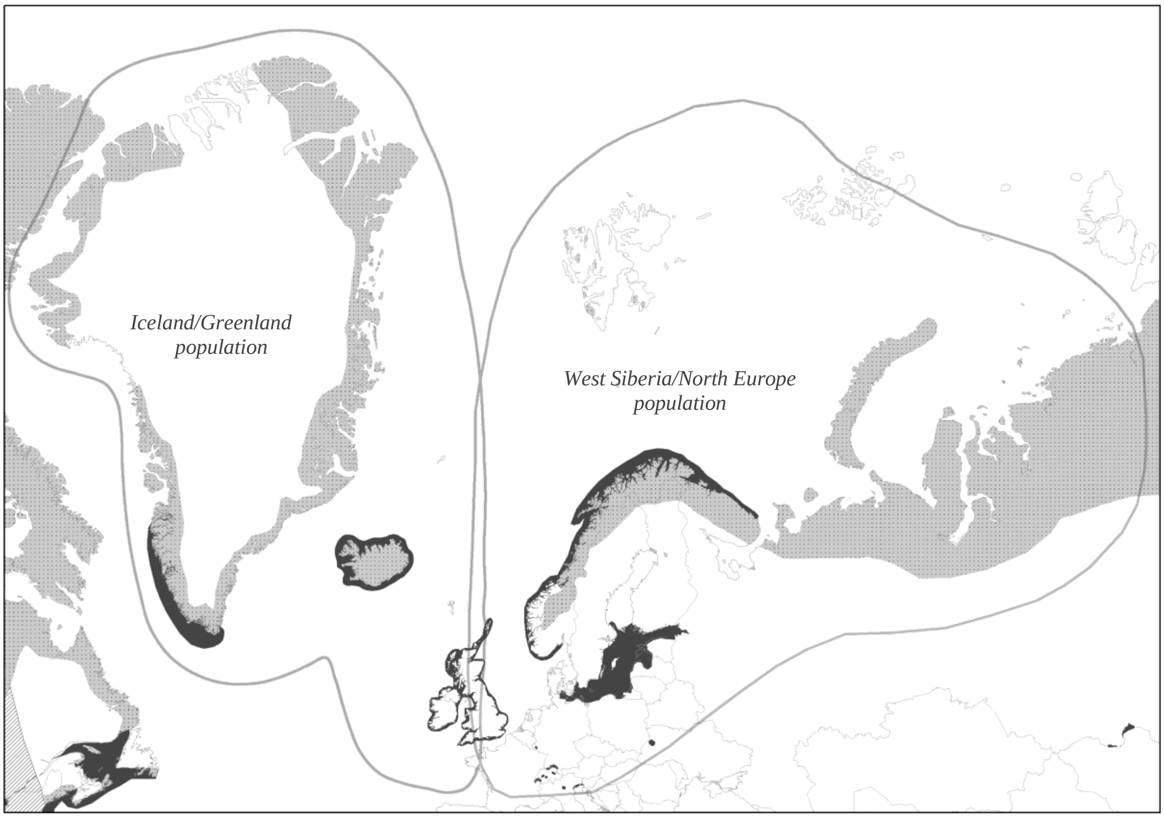

Figure 2. Range of Long-tailed Duck within the AEWA region.
Light grey stippling indicates the breeding area, dark grey indicates regularly used wintering and staging areas[3].

The breeding range in Russia is large, extending eastwards from the Kola Pensinsula north of approximately 66°N, including Novaya Zemlya but not including Franz Josef Land (Gavrilo 2013), as far as central Taymyr Peninsula (A. Kondratyev pers. comm.), at approximately 95°E. This is a greater eastwards extent than indicated by Scott & Rose (1996) who show the eastern extent of the breeding range to be western Taymyr Peninsula at approximately 89°E. There is uncertainty regarding the delineation of Long-tailed Ducks breeding further east in the eastern Taymyr Peninsula; Isakov (1952) speculated that Long-tailed Ducks from eastern Taymyr may well migrate west, as do Common Scoter *Melanitta nigra* and Velvet Scoter *M. fusca* breeding in this region, but the data are lacking.

West of the Kola Peninsula, breeding occurs in northern Finland, with occasional breeding in southern coastal areas. This extends into Norway and northern Sweden, continuing southwards

[3] The extent of the Greenland breeding distribution is likely to be linked to the extent of annual ice cap melt, which can vary markedly between years. The map therefore represents the approximate average extent of ice-free breeding habitat.

through the central Scandinavian Peninsula to approximately 60°N (Gjershaug *et al*. 1994). Localised breeding also occurs in the Svalbard archipelago.

Arrival on the breeding grounds typically occurs from late May to early June, with egg-laying completed before the end of June. Most males, along with some non-breeding birds, leave nesting locations during incubation, typically in late June and early July, and gather in moult concentrations. These are usually near to the breeding site although some birds undertake more extensive movements to distant coastal lagoons and large lakes. This may include early movements to eventual wintering areas such as the Baltic Sea (Kumari 1979), though also hundreds, possibly thousands, of non-breeding birds, both males and females (and individuals older than the second calendar year), remain in the Baltic Sea during summer without moving to the Arctic; these birds thus also moult in the Baltic Sea (M. Ellermaa pers. comm.).

Moult flocks may be joined by some females and young during August and September, with all birds beginning to leave moult and breeding sites for wintering quarters in early September. Some reach the eastern Baltic Sea by mid September but most birds arrive in October to areas such as the Gulf of Finland and Gulf of Riga, reaching other areas further west between October and December (Skov *et al*. 2011).

Spring migration from the southern and central Baltic Sea to the northern Baltic Sea begins in March, and by late April large concentrations are present in the Gulf of Riga, western Estonia, Åland archipelago and Gulf of Finland. During late May the majority of the birds leave the Baltic Sea and move overland through Karelia, passing lakes Ladoga and Onega towards the White Sea (Skov *et al*. 2011).

Birds tracked from wintering grounds in the southern Baltic Sea migrated into the Gulf of Finland, overland to the White Sea, and from there they dispersed to breeding sites in north Russia as far east as the Yamal Peninsula (R. Zydelis pers. comm.). Those wintering on Caspian and Black Seas must move immense distances entirely overland; there are records of migrants in Kazakhstan between early April and late May and early October to early November (Wassink & Oreel 2007).

Annual distribution within the Baltic Sea varies according to the extent of sea ice, and as a result of a reduction in average annual maximum ice cover since the late 1980s there appears to be more birds on average now wintering in the eastern Baltic Sea, particularly in Finnish waters, when sea ice conditions permit[4]. However, there is no evidence to suggest a large scale shift in distribution that could account for the observed population trend, and the majority still overwinter at the major sites in the central and southern Baltic Sea (Skov *et al*. 2011, Nilsson 2012, J. Bellebaum in litt. 2012, M. Ellermaa in litt. 2012).

Extensive aerial (helicopter) surveys of the Kola Peninsula in 2009 revealed that whilst Long-tailed Duck was widespread it was not abundant, with 2,015 birds observed in total (BirdLife Norway, unpublished data). Elsewhere, the species is widespread along the coast of Norway, with key concentrations in the large fjords in Finnmark, Balsfjorden in Troms and the Trondheimsfjord in Sør-Trøndelag (Nygard *et al*. 1988, Svorkmo-Lundberg *et al*. 2006, BirdLife Norway unpublished data), and in Scotland at the Moray Firth and various sites in Orkney, Shetland and the Outer Hebrides (Balmer *et al*. 2013).

The Iceland & Greenland population breeds predominantly in Greenland, with breeding known to occur around the entire coast with the exception of Melville Bay in the northwest and possibly parts of the southeast coast from where there is a lack of data (D. Boertmann pers. comm.). In Iceland, it is a widespread species during the breeding season, occurring across most of lowland and central Iceland where suitable habitat exists (Icelandic Institute of Natural History data). An important

[4] This is not based on thorough survey; there remains a need to undertake surveys in Finnish waters to determine the total number of Long-tailed Ducks now wintering there.

moulting concentration used to occur at Lake Mývatn, north Iceland, in the 1960s, but the number decreased considerably during the 1970s and remains low (Einarsson & Garðarsson 2004).

Little is known of the winter distribution, but it is thought that the majority of birds winter at sea around southern Greenland (predominantly the southwest coast) and the coast of Iceland. A small number of ringing returns, a telemetry study from northeast Greenland conducted in 2007-10 (Boertmann & Mosbech 2011), and the preliminary results of an ongoing study using geolocators on birds breeding in northeast Iceland (I.K. Petersen pers. comm.) support this assertion. Greenland breeding birds have also been recovered in winter in Newfoundland and Denmark (Lyngs 2003). Some Icelandic breeding Long-tailed Ducks migrate southwards to Ireland and western Britain, and the Faroe Islands (where 50-500 overwinter; J-K Jensen pers. comm.), but the extent of this is poorly known as there have only been a small number of ringing recoveries and it is possible some birds wintering in these areas originate from other parts of the breeding range.

Movements of individual Long-tailed Ducks between the two recognised flyways have been recorded, and there is some uncertainty about the validity of the current delineation. These movements include: (i) one bird ringed in north Norway and recovered in Iceland, and (ii) three birds ringed in Iceland and recovered in north Russia east to 69°E (Yamal Peninsula), and (iii) chicks ringed in Greenland recovered four years later in Denmark (Lyngs 2003). Furthermore, observations of very large flocks in north Iceland in spring (May) are thought to be migrating birds moving eastwards towards Scandinavia and Russia from wintering areas further west (A. Garðarsson pers. comm.). However, even if the wintering ranges of the two populations overlap, this is not necessarily a basis for disregarding the current delineation. Other examples of movements across currently recognised flyway boundaries include chicks ringed in Greenland recovered three years later in western Nunavut (Canada), close to the Alaska border, and in Newfoundland 123 days later (Lyngs 2003).

Thus, whilst the basic range and flyways of the European populations of Long-tailed Duck are reasonably well known, there remain some important gaps in knowledge, most notably: (i) the origin of birds moving through Iceland in spring and whether they suggest the current population delineation needs to be revised; (ii) the population delineation of birds wintering around the British Isles and Faroe Islands and whether these include birds from Iceland & Greenland; (iii) the eastern extent of the breeding range of the West Siberia/North Europe population; (iv) the overwinter distribution at sea in northern regions such as Greenland, Svalbard and the Barents Sea; (v) the areas of greatest pair densities in the Russian breeding range; (vi) the migration routes; and (vii) the distribution of key concentrations of moulting birds.

2.3 Population size and trend[5]

The nature of Long-tailed Ducks, breeding in remote Arctic regions and wintering at sea, means counts of this species have always been difficult and there are consequently uncertainties surrounding total population size and historical population trend. In fact, Pihl *et al.* (1995) stated that it had, until their survey of the Baltic Sea, been impossible to monitor.

Nevertheless, there are indications that a severe crash in population size within the Baltic Sea took place in the 1940s and 1950s, possibly by as much as 90% (Bergman 1961), based on counts of spring migrating birds in Finland. It is likely this was due to the severe level of oil discharges taking place over the entire Baltic Sea during that period in combination with very severe winters when the birds were aggregated into small areas (M. Hario pers. comm., A. Lehikoinen pers. comm.). Following international agreements in the 1950s / 1960s[6], and the 1970s[7], the dumping of waste oil at sea was made illegal in most countries in the Baltic (though it continued illegally to a large extent)

[5] For the latest estimates of national population size and trend see BirdLife International (2015).
[6] OILPOL 1954 which entered into force on 26 July 1958, and amendments from 1962, 1969 and 1971.
[7] MARPOL 73/78 which entered into force on 2 October 1983 (Annexes I and II).

and the number of Long-tailed Ducks apparently recovered and probably peaked in the early to mid 1990s, when the first comprehensive and coordinated survey took place in the Baltic Sea during 1993-1995. This produced an estimated population size of 4,272,000 birds (Pihl *et al*. 1995), leading to an overall estimate for the West Siberia/North Europe population of 4,600,000 birds (Rose & Scott 1994). The second and most recent coordinated survey in the Baltic Sea took place in 2007-2009 and the results suggested that the population had declined to 1,482,000 birds, a 65.3% decline since 1993-95 (Skov *et al*. 2011), giving a total estimate for the West Siberia/North Europe population of 1,600,000 birds.

Although there is some uncertainty regarding the accuracy of the population size estimates reported by Durinck *et al*. (1994), Pihl *et al*. (1995) and Skov *et al*. (2011), the severe decrease in numbers recorded is believed to reflect the general trend of this population between the mid 1990s and late 2000s. This is supported by evidence from a number of other more local studies (*e.g.* Hario *et al*. 2009, Ellermaa 2010, Nilsson 2012, Bellebaum *et al*. 2014). Counts of migrating Long-tailed Ducks at the Põõsaspea Cape in Estonia have shown a decline since 2004 (Ellermaa 2010), though the efficacy of shore-based counts for monitoring trends is unclear. However, the number of migrating Long-tailed Ducks, in autumn and spring, at Söderskär Game Research Station in the central Gulf of Finland during 1968–2008 also declined rapidly from the mid 1990s (Hario *et al*. 2009) and is believed indicative of a population scale decline. Interestingly, however, counts at Söderskär have increased again since 2008, but it is unclear whether this is a reflection of population trend, some migration seasons with favourable wind conditions for observing a higher proportion of the migrating population, or that more Long-tailed Ducks are now found in Finnish waters during mid winter (J. Rintala pers. comm., A. Lehikoinen pers. comm.). Furthermore, comparison between a large number of boat surveys in the offshore areas of the Baltic coast of Sweden in the 1960s and 1970s and the more recent aerial surveys of the same area during 2007-11 show marked decreases in the number of wintering Long-tailed Ducks, as have also Swedish coastal counts undertaken as part of the IWC since the 1970s (Nilsson 2012, 2014).

Elsewhere within the wintering range of the West Siberia/North Europe population there have also been negative trends reported. In the United Kingdom, numbers over a similar period declined from 23,500 in 1994/95-1998/99 (Kershaw & Cranswick 2003) to 11,000 in 2004/05-2008/09 (Musgrove *et al*. 2011). Although derived from shore-based counts, trends from the Wetland Bird Survey are of a similar magnitude to flyway trends: -28% during 1985-2010 and -59% during 2000-2010 (C. Holt pers. comm.). Detailed counts at the main site in the UK, the Moray Firth, show a decline of 76% from the early 1980s to the early 2000s (Kalejta-Summers & Butterfield 2006). In Ireland there are insufficient data with which to estimate the size of the wintering population, but it is thought to be less than 2,000 birds (Crowe *et al*. 2008).

In Norway, winter count data indicate that approximately 40,000-60,000 occur (Svorkmo-Lundberg *et al*. 2006), with a trend of -59% during 1980-2011 (Norwegian monitoring programme for seabirds; S.-H. Lorentsen pers. comm.). Some 80,000-120,000 were estimated to winter in Norway during the late 1980s (Nygård *et al*. 1988). The west coast of Norway (bordering the North Sea) has seen a larger decrease in the number of wintering Long-tailed Duck, of *c*.70-80% during the period 1980s-2010s (Håland 2014), similar to that in northeast Scotland. The timing of the decline also largely parallels that found in the Baltic Sea.

In Russia, around 2,000 birds are thought to overwinter off the Kola Peninsula, which is approximately half of what was found during surveys in the early 1990s. However, no exact trend estimates are available for this region (BirdLife Norway pers. comm.).

Estimates of population size from breeding areas in Russia are broad but reasonably similar to those from other sources based on winter counts. Krivenko & Vinogradov (2008) estimate a breeding population of 2,000,000 individuals in European Russia, and a further 3,700,000 individuals in the Yamal, Gydan and Taymyr Peninsulas, of which the Yamal, Gydan and western Taymyr are considered to be within the flyway of the West Siberia/North Europe population. No separate estimates for Yamal, Gydan and Taymyr are available, but if we estimate that approximately two thirds of this total is within the West Siberia/North Europe population (reasonable given the approximate size of these regions and an assumption of an even density of pairs throughout) then approximately 2,465,000 West Siberia/North Europe birds occur on the Yamal, Gydan and Taymyr Peninsulas. Added to the estimate for European Russia, this gives a total of 4,465,000 individuals in the West Siberia/North Europe population, roughly equivalent to the estimate for the West Siberia/North Europe during the 1990s (4,600,000 individuals), when data used by Krivenko & Vinogradov (2008) were collected.

Even if the complete estimates of 2,000,000 individuals in European Russia, and 3,700,000 individuals in the Yamal, Gydan and Taymyr Peninsulas are used, the difference can be partly explained as the estimates from Krivenko & Vinogradov (2008) are late summer estimates and therefore include a high number of juveniles, many of which presumably die by the time midwinter counts are undertaken in the Baltic Sea and elsewhere.

Few data exist for the Iceland & Greenland population, and population and trend estimates are thus of low quality. The population was estimated at 100,000-150,000 birds in the early 1990s (Pihl & Laursen 1996), but this was recently updated following extensive review to 36,000 – 99,000 birds (BirdLife International 2015). Little information is available on the trend of this population; it was given as stable by Wetlands International (2012), based on Pihl & Laursen (1996), but has more recently been given as unknown (BirdLife International 2015). Approximately 2,000 – 3,000 pairs breed in Iceland (Guðmundsson 1998). The trend for the Icelandic breeding population is unknown though monitoring at Lake Mývatn shows that the number of spring males there increased by 82% between 1974 and 2014 (Á. Einarsson unpublished data). Approximately 10,000 – 30,000 pairs breed in Greenland (Boertmann 2008) and the trend is not known. Monitoring of breeding birds at Zackenberg in northeast Greenland during 1996-2007 included a small population of 5-8 pairs of Long-tailed Duck and no trend was obvious (Meltofte *et al*. 2007).

2.4 Population dynamics

Data on productivity and survival are scant for both European populations of Long-tailed Duck. No long-term studies have been carried out, with the exception of hunting bag data from Denmark, and few short-term studies have focused on demography.

However, information on the ratio of adults to immature birds during the winter comes from a number of sources (see Figure 3) within the Baltic Sea and these data suggest that annual productivity has declined significantly during approximately the 20 years up until the late 2000s. Although Long-tailed Duck productivity has always fluctuated significantly between years, in response to well-established factors such as weather and predator-prey cycles in the Arctic breeding grounds, the peaks in productivity have become less frequent since the early 1990s and thus average productivity has apparently decreased. It is also possible that at some point during this decline the average level of productivity became insufficient to maintain a stable population trend.

These data derive from the examination of corpses from harvests, oiling incidents and gill net drowning and, since 2008, a more focused effort to estimate the ratio of adult to immature (first-winter) males by photographing large numbers of flocking birds and identifying the age class of each bird on plumage differences. The only continuous dataset of >20 years is the Danish wing survey, which shows a decline in productivity from the mid 1980s to the mid 2000s, and a small increase since then though remaining below average levels of the 1980s. Other temporally shorter datasets (see Figure 3) do not individually demonstrate a decline in productivity, however, they do show similar temporal patterns in the range of annual productivity, with datasets from before the 1990s showing a large range in annual productivity, and those since the early 1990s showing a lower range and overall average. Collectively, data from gill net victims in the south Baltic indicate that annual productivity decreased by approximately 75% from 1990 to 2000 (J. Bellebaum in litt.).

Ageing of wintering birds in the field has been undertaken at key wintering areas in the central Baltic Sea and at migration bottlenecks in the Åland archipelago, the Gulf of Finland and in Estonia. Data from Gotland and the Swedish offshore banks indicate that the annual proportion of immature birds averaged 11.4% between 1996 and 2012 (K. Larsson pers. comm.).

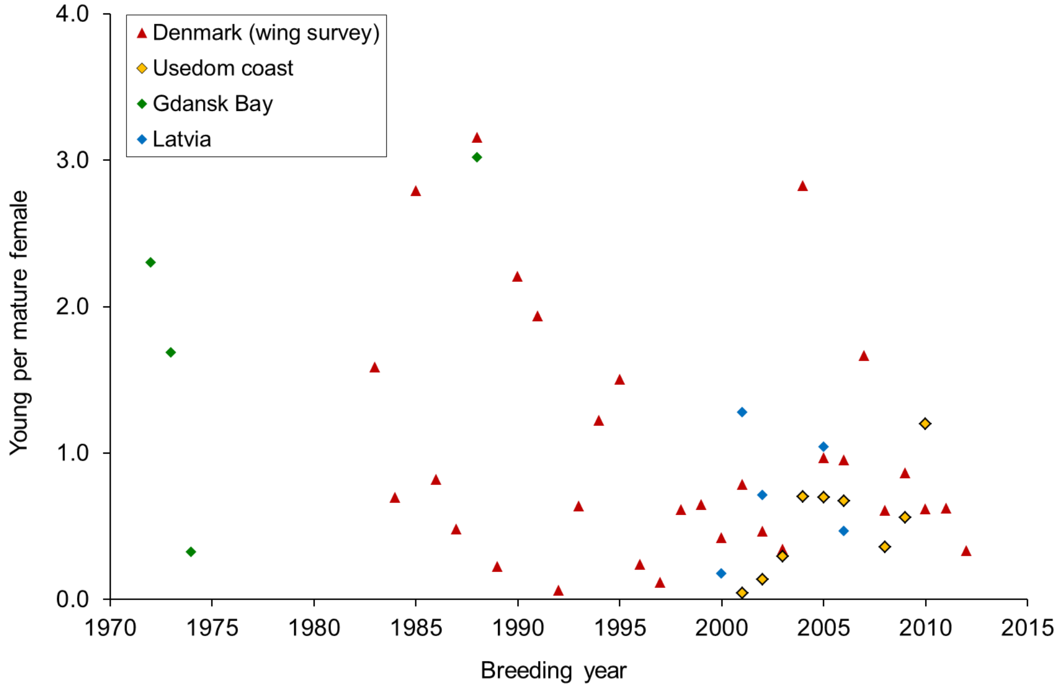

Figure 3. Index of annual productivity of Long-tailed Ducks wintering in the Baltic Sea (data provided by T.K. Christensen, B. Schirmeister, L. Stempniewicz, A. Stipniece; data compiled by J. Bellebaum).

There is little information regarding the cause or causes of this apparent decrease in productivity, but a significant positive correlation between annual productivity (as estimated by the proportion of immature birds in the Danish wing sample data) and lemming abundance on the Taymyr Peninsula was shown by Hario *et al*. (2009). These data also show that since the mid 1990s the relationship between annual productivity and lemming abundance has broken down as a result of changes to the lemming abundance cycle, most probably due to climatic changes in the Arctic. This suggests that there may be a predation effect contributing to the reduction in the overall productivity of the West Siberia/North Europe Long-tailed Duck population. A climate effect has also been demonstrated in the Willow Ptarmigan *Lagopus lagopus* where the effect of climate was stronger than the effect of rodent abundance in impacting juvenile recruitment, especially after the collapse in rodent cycles since the 1990s (Kvasnes *et al*. 2014). A positive relationship between Long-tailed Duck productivity and lemming abundance was also found in Sweden (Pehrsson 1986).

Studies of Long-tailed Ducks at Kolguev Island, Russia indicate a low proportion of broods in relation to the number of pairs present during spring (A. Kondratyev pers. comm.). Data collected in 2006-12 indicate that not more than 20% of spring pairs were subsequently seen with broods, which is much lower than some other areas, at least in productive years; up to 70-80% of pairs had broods in Chukotka (Asian Russia) during studies in the 1980s (Kondratyev 1989). This is despite comparable pair densities of approximately 0.6 pairs/km^2. This low productivity may be the result of complete clutch/brood predation (the most common predation effects) or it could be due to a low breeding propensity of individual females resulting from poor condition during the nest initiation period. However, Kolguev Island does not hold any rodent populations and therefore predators there are more dependent upon birds every year. Thus, predation rates may show less pronounced variation. There is no evidence to determine whether this rate of productivity has decreased during the period of population decline; it has been stable during the study period. There is also evidence from Kolguev Island that brood size for those females hatching young has not decreased, suggesting a lack of a predation effect once the young have left the nest.

At Hardangervidda (at the southern edge of the breeding range in Norway) the proportion of Long-tailed Duck females with broods varied between 0% and 50% during 2000 – 2014 (A. Håland, upublished data).

In addition to the direct effect on population size from this lack of productivity, it has also been suggested that the lack of immature birds in the winter population may have resulted in an increased proportion of adults in the overall mortality (Hario *et al*. 2009). This may have exacerbated the decline as the winter mortality is now more additive than previously. It is possible that this is particularly true for hunting mortality, as hunting effort is likely to be maintained and thus transferred to adults.

Whilst data on productivity are limited, and there are no survival estimates for the West Siberia/North Europe population, it is likely that Long-tailed Ducks exhibit, as do other seaducks, a life history strategy in which variable or low productivity is compensated for by relatively high adult survival. In such species, very small changes in adult survival (1-2%) can alter a population trajectory (Newton 1998), making them very susceptible to extra adult mortality (Larsson & Tydén 2005). This combination of demographic effects has likely been the cause of the rapid decline observed since the mid 1990s (Hario *et al*. 2009).

The only survival estimates for Long-tailed Ducks in Europe are from birds ringed in Iceland which gave a mean mortality rate for adults of 28% and a life expectancy of 3.1 years (Cramp and Simmons 1977). This appears to be a very high rate of mortality, but is similar to an estimate of apparent annual survival of adult females, based on mark-recapture of nesting females, of 74% from the Yukon-Kuskokwim Delta, Alaska (Schamber *et al*. 2009). This study, from 1991 to 2004, also found clutch size to be 7.1 eggs, nesting success averaged 30%, and duckling survival to 30 days averaged 10% (range of 0-25%). In a study in Nunavut, Canada, during 1998-2013 the annual apparent survival rate of 84 marked nesting Long-tailed Duck females was 85% (Kellet & Alisauskas 2014). The generation length is estimated at nine years (BirdLife International 2014).

2.5 Habitat requirements

The Long-tailed Duck breeds in typical Arctic tundra environments, nesting close to shallow wetlands (ponds, lakes and coastal bays) in low lying tundra, often on islands. Some nest in loose colonies, sometimes in association with Arctic Tern *Sterna paradisaea* or Red-breasted Goose *Branta ruficollis* colonies, themselves typically associated with a raptor nest. They may also breed in tundra bogs, or along rivers and at coastal sites in the high Arctic. It generally avoids wooded tundra, although in north Scandinavia it does breed in the arctic-alpine zone among willows and dwarf birch. In the southern Fennoscandian mountain range it is typically associated with deeper ponds and lakes. There is evidence that breeding Common Scoter (and other diving ducks) prefer lakes with a low density of Brown Trout *Salmo trutta* where there is less competition for the preferred prey of adults and ducklings (macro-invertebrates), and it is possible that Long-tailed Ducks may show similar preferences (Håland 2012, Håland in litt.).

During moult, birds frequent coastal lagoons or large lakes, mostly relatively near to the breeding area, although some undertake more significant movements to reach safe moulting sites.

In winter it selects offshore banks and relatively shallow marine areas, generally <25 m deep, however it is the only seaduck in the Baltic to occur in large numbers in waters deeper than 20 m. Pihl *et al*. (1995) and Skov *et al*. (2011) found the main depth range of Long-tailed Ducks in the Baltic Sea to be 10–35 m. In spring more birds forage in more shallow areas of the Baltic Sea, typically diving 3-8 m. Dives to depths of 60 m have also been recorded (Schorger 1951).

During winter Long-tailed Ducks forage mostly diurnally, primarily seeking molluscs, but also taking amphipods and fish, co-existing with other seaducks by taking smaller prey items. Smaller marine bivalves are particularly abundant in the Baltic Sea compared to other marine areas because their growth is restricted by the lower salinity levels. They also take other crustaceans, marine invertebrates (including echinoderms and worms) and fish eggs.

Within the Baltic Sea Long-tailed Ducks feed on sandbanks as well as reefs. On reefs they prey on Blue Mussel *Mytilus spp.* and other epibenthic invertebrates. On sandbanks they dig for various small-sized solitary bivalves. In the eastern Baltic Sea, the large isopod *Saduria entomon* forms an additional food source locally (Kube & Skov 1996). In general, whilst Blue Mussels are probably the main food for most overwintering Long-tailed Ducks in the Baltic Sea, they are less reliant on them than other seaducks, enabling them to also winter in less productive, soft-bottomed habitats (Nilsson 1972, Žydelis & Ruškyte 2005).

A comparative study with Steller's Eider *Polysticta stelleri* in Varanger fjord, north Norway (Barents Sea) also showed greater flexibility, where Long-tailed Ducks changed their diet completely from feeding on benthic invertebrates in early winter, as do Steller's Eiders, to spawning Capelin *Mallotus villosus* in late winter (Bustnes & Systad 2001).

3 – THREATS

3.1 General overview

The Long-tailed Duck is thought to be a relatively long-lived, *K*-selected[8] species that can therefore, like many Arctic-breeding waterbirds, withstand high variation in annual breeding success. In such species, population growth rate is much more sensitive to variations in adult survival than to variation in fecundity or survival of immature birds. For populations to remain stable, long-term breeding success needs to exceed a certain level to ensure sufficient debut breeders enter the breeding stock to compensate for adult mortality. Data on demographic rates for Long-tailed Ducks are, however, severely lacking.

The observed decline in productivity of Long-tailed Ducks suggests that low recruitment is an important demographic factor in the observed population decline (Hario *et al*. 2009). A number of factors may be contributing to low productivity, including changing ecological conditions and increased predation on the breeding grounds, due to climate change, and potential carry-over effects from threats in non-breeding areas. It is unclear whether failed breeding or fewer breeding attempts is driving low productivity, or whether a combination of drivers exists.

A number of factors in the non-breeding areas have been identified as potentially reducing survival, and it is suggested that low productivity may have exacerbated this through an increase in adult mortality (Hario *et al*. 2009). Three anthropogenic factors are the main causes of direct mortality in the non-breeding areas: (i) recurrent operational oil discharges; (ii) fishing bycatch; and (iii) hunting. Mortality from hunting is fairly well known as good bag monitoring systems exist in the key countries, but the other factors are very difficult to quantify as few data exist. However, it would seem from existing data that since the 1990s these three factors have accounted for mortality of approximately 2-5% of the population each year and that this has remained roughly similar as the population size has decreased.

Thus, the most likely demographic explanation of the observed population trend is likely to be low productivity in combination with the additional mortality from anthropogenic causes.

Due to their high dependence on filter-feeding bivalves in the wintering areas, factors influencing the availability and accessibility of optimal prey resources are of considerable concern for Long-tailed Ducks. In particular, energy gain per foraging dive is affected by the soft body tissue content of bivalves, which comprise the bulk of the diet in winter and spring. A number of factors may be negatively affecting the food resources in Long-tailed Duck wintering and staging areas in the Baltic Sea (*e.g.* increased water temperature, reduced nutrient loads or predation by the non-native Round Goby *Neogobius melanostomus*), or causing effective loss of feeding habitat (*e.g.* disturbance from shipping activities). Subsequent reductions in energy intake may impact winter survival and/or body condition and thus potentially have consequences for breeding propensity and/or productivity if females fail to survive or accumulate sufficient reserves during spring.

The cumulative impacts of multiple factors on the bivalve resource may therefore be significant, and of increasing concern given anticipated increases in other activities that restrict the distribution of Long-tailed Ducks, such as shipping, oil extraction and renewable infrastructure development.

Few of the identified threats have been studied for Long-tailed Duck specifically. While many data exist for processes and threats in the wintering grounds, direct links with demographic parameters

[8] Species whose populations fluctuate at or near the carrying capacity (K) of the environment in which they reside. *K*-selected species possess relatively stable populations and tend to produce relatively low numbers of offspring.

and responses are lacking. However, it is likely that the cumulative effects of reduced productivity and increased, presumably additive, mortality have driven the observed decline.

Threats are ranked according to the following relative scale:

- **Critical**: a factor causing or likely to cause very rapid declines and/or extinction;
- **High**: a factor causing or likely to cause rapid decline leading to depletion;
- **Medium**: a factor causing or likely to cause relatively slow, but significant, declines;
- **Low**: a factor causing or likely to cause fluctuations;
- **Local**: a factor causing or likely to cause negligible declines in small parts of the population;
- **Unknown**: a factor that is likely to affect the species but it is unknown to what extent.

Assigning a particular rank to threats using the above definitions can sometimes be difficult, especially when the impacts have not been fully quantified. The most important aspect in this assessment is, therefore, the relative ranking of each threat, as this provides prioritisation for subsequent action.

3.2 Priority threats

Small scale oil discharges in non-breeding areas (Importance: High)

At favoured non-breeding sites, Long-tailed Ducks form aggregated flocks, concentrating in specific areas of the sea where bivalves are abundant and accessible. Many of the most important wintering and staging sites for the species overlap with or lie adjacent to major shipping and oil transportation routes, such as Hoburgs Bank and Northern Midsjö Bank in Swedish waters of the Baltic Sea (*e.g.* Larsson & Tydén 2005; Figures 4 and 5). The species is, therefore, highly vulnerable to oil pollution from shipping in such areas.

(a) (b)

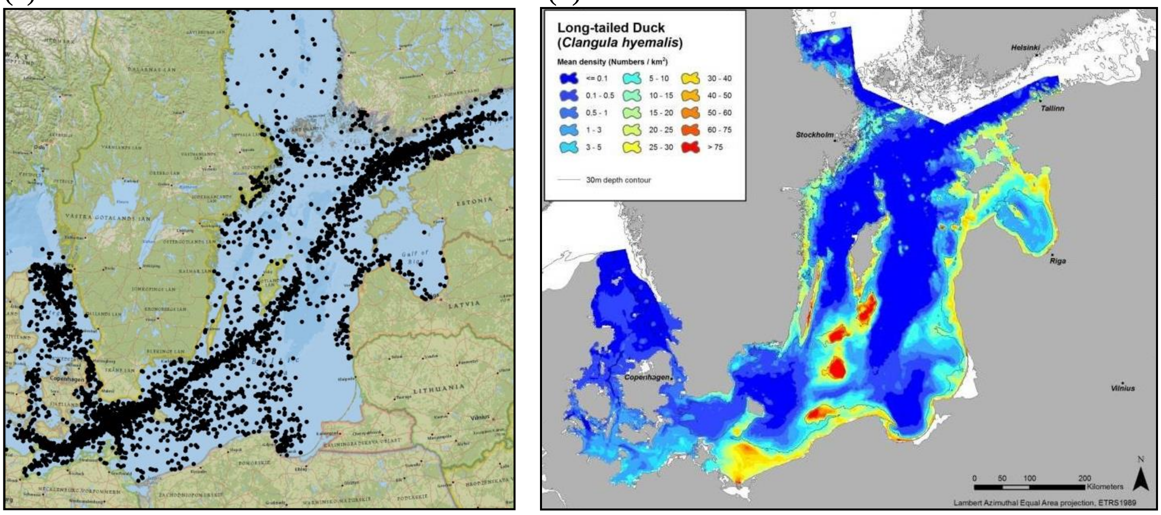

Figure 4. (a) Locations of confirmed oil spills in the Baltic Sea between 1998 and 2012 (HELCOM); (b) Distribution of wintering Long-tailed Ducks in the Baltic Sea, 2007-09 (from Skov *et al*. 2011).

Oiling causes hypothermia and drowning of birds, restricts diving and flying movement and may reduce immune system efficiency directly or through ingestion of toxins accumulated in their prey.

Oil pollution occurs by a number of means: (i) large-scale or catastrophic oil spills (from about ten to several thousand tons of oil) caused by ship grounding or collisions; (ii) smaller discharges (usually between one and ten tons of oil) due to accidents when bunkering oil or other onboard accidents; and (iii) intentional illegal discharges of oil or oily water (usually less than one ton of oil) from machinery or cargo spaces. The last category is the most common and poses the greatest threat to

Long-tailed Ducks because these discharges regularly occur offshore within or close to the main wintering sites.

Standardized weekly monitoring of oiled Long-tailed Ducks has been performed in southern Gotland, close to Hoburgs Bank, Sweden, from mid October to mid April each winter from 1996/97 to 2014/15 (Larsson & Tydén 2005, 2011, K. Larsson pers. comm.). From 1996/97 to 2006/07, a minimum of 20,000 oiled birds (occasionally as many as 35,000 birds) were observed annually. The number of observed oiled birds has decreased considerably since, but this threat remains and birds are still affected annually. The observed decrease of oiled birds in recent years is most likely due both to fewer oil spills close to Hoburgs Bank and to fewer wintering Long-tailed Ducks in the area. The standardised weekly observations of oiled birds close to shore probably significantly underestimate the total mortality. Larsson & Tydén (2005) estimated that total mortality from oiling within the central Baltic Sea may have been around 50,000 to 100,000 birds annually during the 1990s and early 2000s.

Despite an increase in shipping traffic in the Baltic Sea, both the number of spills recorded by aerial surveillance and the estimated volume of oil spilled has decreased since the 1990s (HELCOM 2013). However, the number of illegal discharges in the main shipping routes is still high (Figures 4 & 5). Oil discharges also occur within the major wintering sites located within Natura 2000 site boundaries.

(a) (b)

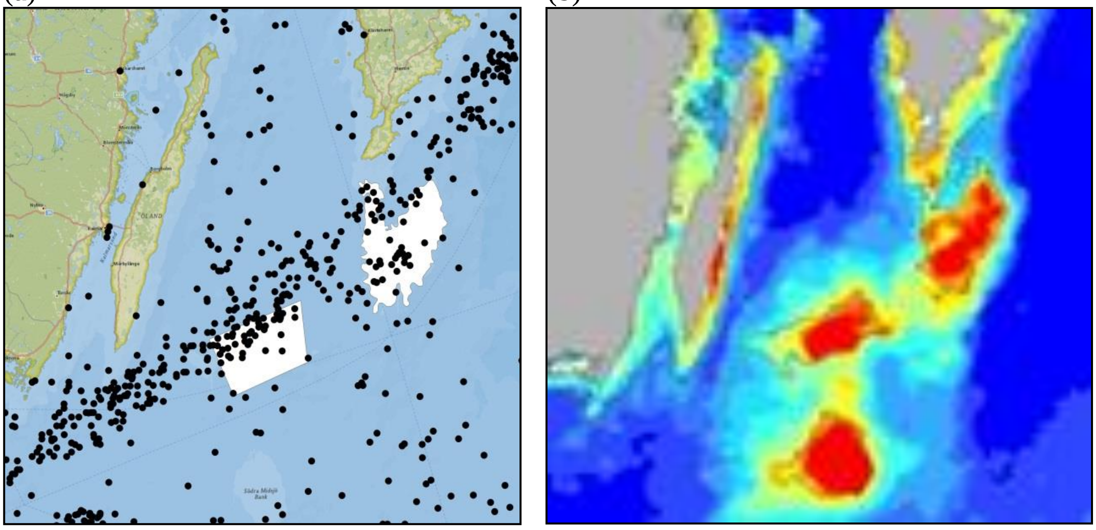

Figure 5. (a) Locations of confirmed oil spills between 1998 and 2012 in central Baltic Sea (HELCOM). White areas show the Natura 2000 sites Hoburgs Bank and Northern Midsjö Bank where a large part of the WS/NE Long-tailed Duck population overwinters; (b) Distribution of wintering Long-tailed Ducks in central Baltic Sea (red=highest densities) (Skov *et al*. 2011)

The expected development of shipping activities and oil operations in the northern seas, *e.g.* the Barents Sea and Kara Sea, is likely to increase the prevalence of oil spills in key moulting areas of Long-tailed Ducks. Similarly, small oil discharges are increasingly evident in non-breeding areas around Greenland and northern Iceland, due to increased shipping activity in those waters. Future increases in general shipping activity are likely to further increase the threat if the challenges of monitoring and enforcement are not overcome.

Accidental bycatch in static fishing nets in wintering and staging areas (Importance: High)

Benthivorous, diving and piscivorous bird species are highly susceptible to entanglement and subsequent drowning in static nets due to their diving habits. Coastal gillnet, trammel net and entangling net fisheries are widespread in the Baltic and North Seas, where herring and cod are the key target species. Incidental bird mortality, or bycatch, in static fishing gear has been recorded in all countries around the Baltic Sea, as well as in other parts of the wintering range of Long-tailed Duck. Žydelis *et al*. (2009) estimated a cumulative bycatch of at least 90,000 seabirds annually in the Baltic and North Seas, but suggested the actual number could be much higher (100,000-200,000 birds). Long-tailed Ducks were numerically the most significantly affected species, with tens of thousands of individuals drowned each year. Long-tailed Ducks (and other seaducks) also frequently drown in gill nets in alpine lakes in Norway, which may have a locally negative impact (Håland 1983).

Long-tailed Ducks are particularly susceptible, occurring in high concentrations over shallow banks which overlap with an intensive coastal fishery comprised of small vessels using static nets (Pedersen *et al*. 2009; Sonntag *et al*. 2012). Long-tailed Duck has been identified as the most frequent victim in the eastern and south eastern Baltic Sea (waters of Estonia, Latvia, Lithuania and Poland; Skov *et al*. 2011). Gillnets are the predominant type of net in which birds are killed, due to their widespread use in small-scale coastal fisheries.

Bycatch of Long-tailed Ducks is directly related to bird abundance. Hence, due to the severe population decline, bycatch in the Pomeranian Bay has decreased over the last two decades (Bellebaum *et al*. 2013). Based on a study conducted in the German Baltic Sea, which estimated monthly losses of 0.81% of the population, annual bycatch losses of 1-5% of the total population are estimated for the species (Bellebaum *et al.* 2013). Mortality from bycatch is, therefore, assumed to have contributed additively to the observed decline in the West Siberia/North Europe Long-tailed Duck population.

Changes in fishing levels and recent regulations of cod fishing effort are suspected to have decreased bycatch risk for Long-tailed Duck, though this situation could worsen again as cod stocks recover. The real scale of the problem is, however, difficult to assess and regulate, as current EU fishery statistics do not cover boats of less than 8 m length, which form a large part of set-net fishing vessels (Sonntag *et al*. 2012), and also do not record net length (Bellebaum *et al*. 2013). Current estimates of fisheries-induced mortality in Long-tailed Duck are therefore likely to be significant underestimates.

To date, there has been little targeted effort toward reducing bycatch of Long-tailed Ducks, either through reduced fishing effort in sensitive areas or replacement of set nets with alternative, less harmful fishing gears (*e.g*. long-lines, herring traps, or baited pots for cod).

Hunting (Importance: Medium)

Hunting of Long-tailed Ducks occurs in the majority of Principal Range States, though the total number harvested has fallen significantly in recent decades and in most countries is now negligible. This fall in harvest is partly a result of the decrease in Long-tailed Duck population size, which has reduced hunting opportunities and led to the introduction of greater regulation, and partly a general decline in the number of hunters targeting seaducks.

At its peak in the early 1990s, the annual harvest of the West Siberia/North Europe population was as high as 90,000-120,000 birds in some years, but in most years from the late 1980s to the mid 1990s it was around 50,000-70,000 birds (1-2% of the total population). The current annual harvest by Range States is estimated at around 15,000 birds in the West Siberia/North Europe population and 2,000 in the Iceland/Greenland population. Most of the former are taken in Finland and most of the latter are taken in Iceland. Importantly though, bag estimates are not available for some countries, most notably Russia and Greenland, though bags in both of those countries are thought to be relatively small. Key harvest statistics and further details for individual Range States are shown in Annex 5.

Most hunting of Long-tailed Ducks takes place in autumn and early winter, and occasionally in spring. Spring hunting of Long-tailed Ducks in Norway officially ended in 2012, though small-scale spring hunting (with bag limits) continues in some Sami areas of Finnmark (the hunting period is 10 September to 23 December). The species is expected to be removed from the Norwegian list of game species altogether in 2017 if the population decline continues. Spring hunting in Finland (mainly in the Åland archipelago) was prevalent but ended in 2013. In addition, low levels of subsistence hunting occurs in Russia, primarily in the moulting season, though the numbers of birds taken is unknown (A. Kondratyev pers. comm.).

Consequently, it is thought that hunting mortality in isolation has not been sufficient to have driven the observed population decline of Long-tailed Duck. However, the approximate scale of known hunting mortality appears to be of the same order of magnitude to each of the other main causes of mortality (oiling and bycatch). Furthermore, despite the long-term decrease in total bag size of the West Siberia/North Europe population, there has been a short-term increase in Finland; during 2010-13 the number hunted increased from 8,000 to 19,400 birds. This may be a response to increased opportunity for hunters, due to an increase in the number of Long-tailed Ducks wintering in Finnish waters. If warmer and more ice-free winters continue to become more frequent, this trend may continue. Hunting is also a more density-independent factor than other causes of mortality, and so with fewer juveniles on average in winter populations, the effect of hunting mortality may now be affecting a greater proportion of adult birds.

The effect of hunting disturbance has the potential to be locally significant, particularly during periods of colder than average weather when ducks are under greater pressure to meet their daily energetic needs, but nothing is known about its effect on Long-tailed Ducks. However, as they are highly clumped during the non-breeding season, disturbance from hunting, where it occurs, has the potential to impact a large proportion of the local population and should be taken into account in harvest management plans. In Finland, all of the known important concentrations of Long-tailed Duck are in the outer archipelago areas which are government owned and open for hunting. These sites are only partly protected and, although hunting mortality is low, some (occasionally intentional) disturbance of large flocks does occur as hunters move by boat between hunting areas.

Given this, whilst current and previous harvest levels are considered to be of little population-level concern, there is a strong need for appropriate management practices to be developed and implemented in order that the harvest is sustainable. Assessing this in the absence of good estimates of other causes of mortality will be difficult and therefore a precautionary approach is encouraged until the harvestable surplus can be more accurately estimated. This emphasises the importance of maintaining and enforcing strong hunting restrictions and management practices.

Development of offshore infrastructure in wintering and staging areas (Importance: Medium)

Small numbers of offshore wind farms are currently operational in the Baltic Sea, mostly in Danish and Swedish waters, whilst extensive plans for development now exist in all of the Baltic States and Poland, including at the Southern Midsjö Bank in Sweden, one of the most important wintering areas for Long-tailed Ducks. This has largely been driven by EC and government requirements to meet renewable energy targets.

Many favoured areas for development, *i.e.* shallow, hard-bottomed offshore banks, overlap with important Long-tailed Duck feeding areas and existing Important Bird Areas (IBAs) and Special Protection Area (SPAs). Hence, the most significant impact of such extensive development is likely to be displacement from favoured feeding areas, potentially forcing birds into sub-optimal sites. High disturbance levels associated with construction activities may on their own influence distribution over large areas, while general avoidance of turbines may occur post-construction. In a study undertaken at Nysted wind farm, Denmark, reduced habitat use and displacement distances of up to 2 km from the wind farm footprint occurred for 5-6 years after turbine construction (Petersen *et al*. 2006). Similar effects were also found at Lillgrund in the Öresund, between Sweden and Denmark (Nilsson & Green 2011). Whilst some species habituate to turbines, and may even feed among them, there is no evidence for this in Long-tailed Ducks.

Wind farm construction also physically alters the benthic community *e.g.* mussel beds, particularly where cables and turbine foundations are established. Recovery, however, is relatively fast. While the net amount of available food may therefore not alter significantly, these resources may remain inaccessible to Long-tailed Ducks due to the disturbance effect from the presence of the turbines. The cumulative loss of or damage to sensitive habitats, *e.g.* on sandbanks or reefs in shallow waters, may be significant, especially if multiple, large developments are sited in such locations (Langston & Pullan 2003).

If sited inappropriately, wind farms may cause barriers to movement of Long-tailed Ducks, particularly if sited along migration bottleneck sites or other key movement corridors. A potential impact of such barrier effects is increased energy expenditure due to additional flight distances required to avoid turbines, leading to indirect mortality and/or reduced productivity due to poor body condition. Potential bottlenecks used by large numbers of passage Long-tailed Ducks have been identified in Estonia: in the Irbe Strait, Suur Väin, the straits between the mainland and Osmussaar and Naissaar islands, and around a number of prominent peninsulas (Tahkuna, Ristna, Pakri, Undva, Pärispea). Other important sites may yet need to be identified.

Direct mortality from collision with wind turbines is also of concern, though collision risk in Long-tailed Ducks is deemed negligible due to the predominantly diurnal and low-level flights they exhibit and their apparent avoidance of wind farm footprints.

Indirect mortality from avoidance of wind farms is considered to be additive in Long-tailed Ducks, such that even at low level it may contribute to population decline. Up to now, the effects of turbines on Long-tailed Ducks are probably of minor significance. Future impacts are, however, potentially much larger if extensive areas of key wintering sites are exploited. National and international Government-led programmes must be in place to deliver Strategic Environmental Assessment (SEA) of the cumulative effects from multiple wind farm proposals. Assessment of cumulative impacts are often inadequately considered in Environmental Impact Assessments (Langston & Pullan 2003), despite the obligation of States, under the Espoo (EIA) Convention, to communicate and provide relevant information to potentially affected States on activities that may have significant adverse transboundary environmental impacts.

Other marine renewable infrastructure, such as wave and tidal power, may also become a more significant threat to Long-tailed Duck in the future unless the impacts are carefully considered and the sites carefully selected. Proposals for schemes in northeast Scotland are currently under consideration and could be expanded to other sites where suitable conditions permit.

Other infrastructure development within the Baltic Sea, *e.g.* bridges and ports, may have similar displacement and barrier effects. Marine spatial planning should, therefore, consider potentially harmful proposals in the context of one another.

3.3 Additional threats

Large scale accidental oil spills (Importance: Low)

A number of shipping accidents (*c.*130) occur every year in the Baltic, mostly involving groundings and collisions, and occurring very close to shore or in harbours (Brusendorff *et al*. 2012). Only a few of these incidents have, however, so far resulted in serious pollution. The last major oil spill (more than 100 tonnes of oil) in the Baltic Sea happened in 2003 following the collision of the bulk carrier *Fu Shan Hai* with a container ship off Bornholm Island, Denmark (Brusendorff *et al*. 2012).

An overall decrease in the number of accidental oil spills in the Baltic Sea over recent years has been reported (HELCOM 2010), attributed to the launch of maritime safety schemes (*e.g.* HELCOM AIS) and improvements to ship reporting and systems (Brusendorff *et al*. 2012). However, there are still approximately 130 accidental spills annually in the Baltic Sea. Furthermore, the overlap of shipping lanes with important Long-tailed Duck feeding areas increases the vulnerability of the species,to future spills and large scale disasters.

The dramatic rise in oil transportation from Russia and the Baltic States (Brusendorff *et al*. 2012) significantly raises the risk of large oil spills occurring in moulting, staging and wintering areas of Long-tailed Ducks, thus increasing the threat to the species.

A region-wide risk assessment carried out within the EU-funded project BRISK (Subregional risk of spill of oil and hazardous substances in the Baltic Sea) estimated that large spills of 300-500 tonnes of oil are expected to occur once every four years, whereas exceptional accidents of over 5,000 tonnes of oil are expected once every 25 years. Intervals between spills are expected to be shortest in the Sound and the Kattegat, closely followed by the south western Baltic Sea (Brusendorff *et al*. 2012). The level of impact on Long-tailed Ducks is highly dependent on the location of such incidents.

Competition with Round Goby Neogobius melanostomus *in the Baltic Sea (Importance: Low, potentially medium)*

The Round Goby is an invasive fish species of Ponto-Caspian origin, first observed in the Baltic Sea in the Gulf of Gdansk in 1990. It is thought to have arrived via ship ballast water. Currently it has been found or established in the southern and eastern Baltic Sea, Bothnian Sea, Gulf of Finland, Archipelago Sea, Kattegat and Belt Sea and southern Sweden (Michalek *et al*. 2012). Due to its adaptive habits, the species is expected to continue spreading to new coastal areas of the Baltic Sea.

The Round Goby is primarily a mussel feeder and is believed to have caused the observed dramatic decrease in the biomass of Blue Mussel stocks in the shallow hard-bottomed coastal areas off Lithuania and Latvia. These decreases coincided with the rapid increase in Round Goby abundance in these areas, whereas in deeper (> 20 m) offshore areas where Round Goby does not occur in large numbers, Blue Mussel biomass and Long-tailed Duck numbers remain high (M. Dagys pers. comm.). Where the depletion of Blue Mussels has been significant, Long-tailed Duck numbers have decreased, presumably as a result of the reductions in the availability of optimal-sized mussels. Displacement of birds from optimal feeding areas, due to competition with Round Goby, has been shown to occur in the Palanga Coastal Area, Lithuania (M. Dagys pers. comm.). The likely impacts on populations are indirect mortality and/or reduced breeding success in females arising from insufficient energy intake during spring.

The Baltic Sea Action Plan (HELCOM 2007) does not currently have a direct ecological objective for the distribution and abundance of non-native species, nor actions to control their numbers – the management objective 'No new introductions of non-indigenous species' only addresses new introductions and the ecological objective 'Thriving communities of plants and animals' addresses the whole community (Michalek *et al*. 2012). Understanding the mechanisms by which Round Goby populations are likely to disperse and colonise new areas will be necessary to predict the severity of the impacts on Long-tailed Ducks. Controlling further spread may be impossible, and impacts are likely to be minimised by maintaining a network of protected sites able to support viable numbers of Long-tailed Ducks, and where other population pressures are minimised.

Disturbance from shipping activities in the non-breeding areas (Importance: Low)

The overlap or close proximity of major shipping lanes to important Long-tailed Duck wintering areas in the Baltic Sea and other important marine areas results in strong disturbance responses of birds in their foraging habitat (*e.g.* Schwemmer *et al*. 2011). Disturbance from smaller recreational or fishing craft is also likely to be high in certain areas, particularly around the coast. Indeed, it is suggested that the possibilities for birds to habituate to disturbance are lowest in areas where high vessel activity occurs outside of the main shipping channels (Schwemmer *et al*. 2011).

Disturbance is likely to cause increased energy expenditure due to escape behaviour, and reduced energy intake through reduced time spent foraging, which may have subsequent fitness consequences. Studies at some wintering sites have shown that foraging Long-tailed Ducks spend the majority of the daylight hours feeding in order to meet their energy requirements, and that birds probably have little capacity to cope with impacts of disturbance, *e.g.* through increasing foraging time, due to the physical limitations of bivalve digestion (Dorsch *et al*. 2011).

The current levels of shipping disturbance to Long-tailed Ducks in non-breeding areas are thought to be low, but they are more significant in some areas, including the Pomeranian Bight, Northern Midsjö Bank and Hoburgs Bank. Whilst the potential impacts on Long-tailed Duck populations have not been quantified, disturbance is anticipated to increase as shipping traffic becomes more intensive.

Dredging and dumping of sediments and aggregates in non-breeding areas (Importance: Local)

Dredging of sediments and dumping of dredged spoils, for the building industry and coastal protection, occur in many coastal areas of the Baltic Sea, including within a number of SPAs supporting concentrations of wintering Long-tailed Ducks. There is a high degree of overlap between the preference of Long-tailed Ducks for shallow coastal regions and offshore banks and the prime locations for sediment extraction.

The potential effects of dredging on Long-tailed Ducks include the destruction of benthic foraging habitats and associated bivalve prey and increased disturbance of birds (see section below on Disturbance), all of which may have fitness consequences. Dredging of ship navigation channels is also likely to become a more significant threat to the species as shipping activity increases in non-breeding areas.

Dredging and dumping activities within Natura 2000 sites are subject to Appropriate Assessment in accordance with Article 6 of the Habitats Directive. However, this process does not always provide adequate assessment of risk, and the proper assessment of cumulative impact is rare. Outside SPAs, however, laws and guidance relating to Environmental Impact Assessments (EIAs) for dredging activities have been developed and adopted at the country level, resulting in regulation differences between Range States. In addition, requirements for EIAs in outer parts of Exclusive Economic Zones, where most wintering Long-tailed Ducks occur, tend to be less stringent than in more coastal zones.

3.4 Potential threats

Potential threats are those for which there is no clear evidence of direct links between the threat and Long-tailed Duck population impacts, but for which there is reason to believe that there may be an impact, either currently or one is anticipated during the lifetime of this plan.

Pollution from hazardous substances in the Baltic Sea (Importance: Unknown, potentially low)

Bioaccumulation of toxins, through consumption of bivalves that filter large volumes of water, is considered a potentially significant threat to Long-tailed Ducks in the non-breeding areas. Such pollutants may cause indirect mortality, reduced fitness, disturbed reproduction and pathological disorders in individuals, and thus have knock-on impacts on the population.

In the Baltic Sea, many of the most harmful substances such as Polychlorinated biphenyls (PCBs), Dichlorodiphenyltrichloroethane (DDT/DDE) and Tributyltin (TBT) – which were primarily input decades ago – are still present in undesirable concentrations (Skov *et al*. 2011). Other substances have seen increasing trends, for example, levels of Hexabromocyclododecane (HBCDD) and Perfluorooctane sulphonate (PFOS) recorded in Guillemot *Uria aalge* eggs have shown increasing trends since the 1960s, which may be of high concern to other predatory bird species. Pharmaceuticals are also increasingly being recognized as environmental contaminants in the Baltic

Sea, with potential adverse effects on Blue Mussels reported for some substances (HELCOM 2010). Toxin release from oil spills, both deliberate and accidental, is expected to rise given the rapid increase in oil extraction and transportation from the Arctic (see above).

The main routes by which hazardous substances enter the Baltic ecosystem are i) point source pollution along the coast or inland catchments, ii) land-based diffuse sources such as agricultural runoff, iii) at sea activities such as shipping, iv) dredging, and v) atmospheric deposition of contaminants from various sources. Exposure concentrations to toxins in the Baltic Sea are relatively high compared with other sea areas, due to the enclosed brackish waters of the Baltic in which pollutants are not diluted to the same extent as in more open seas. Open-sea waters in the main basin of the Baltic Sea – the Northern Baltic Proper, and the Western and Eastern Gotland Basins – together with some areas of the Kiel and Mecklenburg Bights have been identified as the most contaminated areas (HELCOM 2010).

Eutrophication and nutrient loads in the Baltic Sea (Importance: Unknown, potentially high)

The extent and direction of the responses of Long-tailed Duck individuals and populations to eutrophication and/or reduced organic inputs, and the impacts and interactions with other processes causing ecosystem change (*e.g.* climate change), are complex and poorly understood.

Eutrophication, caused by excessive inputs of nutrients (primarily nitrogen and phosphorus) to the marine environment, is one of the main threats to the biodiversity of the Baltic Sea (HELCOM 2014) but the precise mechanisms for how it might impact Long-tailed Ducks are currently poorly understood. However, it is thought to have already affected local densities of Long-tailed Ducks through die-offs of invertebrates arising from anoxic conditions in large parts of the Baltic. This effect may be stronger nowadays, and thus could still limit Long-tailed Duck food resources and local abundance in areas such as the Pomeranian Bay (J. Kube pers. comm.). Nutrient inputs have decreased since the late 1980s, but concentrations have not declined accordingly and nearly the entire sea area of the Baltic is still strongly affected by eutrophication. Nutrient concentrations are expected to take decades to reach target levels agreed in the Baltic Sea Action Plan (HELCOM 2014).

Eutrophication control has been suggested as a potential contributing mechanism behind observed Long-tailed Duck declines. Bivalve biomass and abundance has a positive relationship with the availability of nutrients. Thus, due to their dependence on filter-feeding bivalves, there is great potential for eutrophication control to negatively impact food supply for Long-tailed Ducks (Skov *et al*. 2011). However, the effects of eutrophication on bivalve populations in the Baltic Sea are very poorly understood and are likely to be highly dependent on local conditions and nutrient loads. For example, oxygen depletion in enclosed areas with low mixing rates (also a consequence of eutrophication) may result in impoverished bivalve biomass, while positive relationships between eutrophication and bivalve availability have been found in more exposed, oxygenated areas (Lundberg 2005; Skov *et al*. 2011). Eutrophication may also reduce the light levels reaching bottom habitats due to increased algal biomass and surface turbidity, which in turn may affect the bottom flora on which bivalves depend; and is a suggested cause of Thiamine deficiency in molluscs (M. Ellermaa pers. comm.; see below).

Disease and vitamin deficiencies (Importance: Unknown, probably low)

Infectious diseases can kill large numbers of waterbirds in a short time, particularly those that occur in large concentrations in non-breeding areas. The Long-tailed Duck suffered heavy losses from an outbreak of avian cholera in 1970 at Chesapeake Bay, Maryland, USA. The species is known to be susceptible to highly pathogenic avian influenza and avian botulism and may be threatened by future outbreaks of these diseases. Recently, thiamine (vitamin B1) deficiency has been suggested as a potential cause of adult mortality and breeding failures in Baltic Common Eiders *Somateria mollissima* and other waterbird species (Balk *et al*. 2009). Whilst Long-tailed Ducks do not breed in the Baltic Sea, reduced thiamine may affect them in an unknown way. Further investigations focusing on the causes and extent of thiamine deficiency syndrome are needed for its significance to be fully understood.

Whilst disease alone is not thought to be responsible for the species' population decline, large-scale disease-induced mortality is likely to be additive in nature. Future mass die-off events, coupled with observed poor recruitment levels, may further increase the likelihood of population-level impacts.

Introduced freshwater fish populations (Importance: Unknown, probably local)

The introduction of fish for both recreational angling and commercial fisheries to alpine lakes/ponds is a long-established tradition in Norway, both within the southern Scandinavian breeding range of Long-tailed Duck and probably also further north. Such introductions may have caused a reduction in food availability for adults and ducklings as fish and ducks compete for the same prey. The main fish species that has been introduced is Brown Trout, but during the past 40 years Minnow *Phoxinus phoxinus* has also entered this ecosystem, either accidentally during Brown Trout introductions or because it is used as live bait by anglers. Evidence for negative effects on Common Scoter (and other breeding seaducks) comes from Hardangervidda, southern Norway (Håland 2012, Håland unpubl.). It is unknown whether these also affect Long-tailed Ducks, though this seems likely. The introduction of Brown Trout and use of Minnow as live bait is now either strongly controlled (Brown Trout) or illegal (Minnow) in Norway, but the full extent of introductions of fish competitors within the range of Long-tailed Duck is currently unknown.

3.5 Climate change

Climate change is currently the biggest threat to global biodiversity and is believed to have played a part in recent declines of many Arctic-breeding birds. It may be having both direct and indirect impacts on Long-tailed Duck populations throughout their range, including the exacerbation of several of the threats already identified. Possible ecosystem changes at wintering and breeding sites are complex and diverse, and may include changing nutrient loads, phytoplankton communities, fish communities, growth seasons, precipitation, water salinity and water temperature, all of which are likely to affect the quality, quantity and distribution of bivalves and other prey. The general increase of winter water temperature in the Baltic Sea and the increase in the frequency of mild winters are predicted to significantly and negatively affect the condition and distribution of Blue Mussels and other bivalves in winter and spring at foraging sites of seaducks (Waldeck & Larsson 2013). This may lead to lower nutritional quality of mussels in spring, itself resulting in Long-tailed Ducks and other seaducks being less able to increase their body reserves before migration and breeding.

Further, such changes may increase the vulnerability of prey to the negative effects of hazardous substances by exacerbating physiological stress. Changes in the timing of seasonal events, *e.g.* spring arrival of females, may lead to a mismatch between the onset of breeding, hatching, and emergence of the invertebrate prey of ducklings in tundra pools (*e.g.* Guillemain *et al*. 2013), and reduced snow and ice cover during winter may cause low invertebrate productivity in tundra pools or 'drying out' of feeding habitat essential for female and duckling survival. Changes in species distributions, such as the expansion of fish that compete with ducklings, may also negatively affect Long-tailed Ducks. Finally, sea level rise may cause the effective loss of habitat at all stages of the life cycle through reductions in the extent of tundra breeding habitats.

Furthermore, as a warmer climate reduces winter ice-cover and allows a more hospitable and accessible working environment in the tundra, further increases in anthropogenic activities are anticipated. This could potentially result in direct habitat loss, *e.g.* through inappropriately sited development of oil and gas infrastructure, increased pollution of key sites, or increased disturbance to breeding and/or moulting birds.

An additional consequence of climate change is reduced ice and snow cover in winter and this has resulted in increased short-stopping of other migratory waterbird species in more northerly areas (*e.g.* Tufted Duck *Aythya fuligula* and Goldeneye *Bucephala clangula*; Lehikoinen *et al*. 2013). Recent observations show increased numbers of Long-tailed Ducks wintering in northern parts of the Baltic Sea, *e.g.* the Gulf of Finland, when ice conditions permit, though numbers are apparently too low to explain large-scale population distribution shift (though further surveys are needed to confirm this). The consequences of this phenomenon for the status of Long-tailed Duck are currently unknown, though changes in distribution may have implications for the implementation of established conservation measures, *e.g.* changes in the relative importance of key sites may require the adoption of different management strategies, and/or the extension of existing site protection measures to new areas. Opportunities for northward range shifts within the Baltic Sea may, however, be limited, given that the winter distribution depends on the availability of sufficient optimal-sized prey. Blue Mussels reach the edge of their salinity tolerance in northern areas of the Baltic Sea and show much reduced abundance, size structure and growth rate beyond such limits (Westerbom *et al*. 2002). Increased survey coverage in northernmost parts of the Baltic (particularly southwest and south Finland and the Åland Islands, but also including the Bothnian Sea, and Inner Gulf of Finland) may, however, be necessary to detect northward shifts in the species[9].

There is currently little understanding of the relationship and mechanisms between observed changes in Long-tailed Duck abundance and climate change. Whilst addressing climate change directly is beyond the scope of any species action plan, one key issue most pertinent to Long-tailed Ducks is highlighted below in order that appropriate mitigation or adaptive management can be considered.

Changing predation pressures on the breeding grounds (Importance: Unknown, potentially high)

The key potential impact of climate change on Long-tailed Duck abundance seems to be through the disruption of established predator-prey cycles in breeding areas. Long-term, climate-induced alteration of conditions in the breeding areas, particularly in relation to changing predation pressures, has been suggested as a possible mechanism driving the reduction in average productivity of West Siberia/North Europe Long-tailed Ducks (Hario *et al*. 2009). Predator-prey cycles in the tundra are widely known to have a strong influence on annual breeding success of many bird species such as ducks, geese and waders. Highest predation rates generally occur in cycle with years of low abundance of lemmings (*Lemmus* spp. and *Dicrostonyx* spp.) and other small rodents (*Myodes* spp. and *Microtus* spp.; time lags vary between species) as predators (such as Arctic Fox *Vulpes lagopus*, skuas *Stercorarius* spp. and gulls *Larus* spp.) are forced to switch from their preferred rodent prey to the eggs and/or young of Arctic-nesting birds. Such years of low breeding success are interspersed by years of high breeding success on a 3-5 year cycle.

During the last 20 years or so, however, vole and lemming cycles have become less predictable in some tundra regions, with peaks in lemming abundance no longer as pronounced and less regular (though regional variation exists and in some areas, regular cycles seem more or less intact). This is possibly associated with changes in winter climate, with less snow cover leading to lower overwinter survival of lemmings (*e.g.* Nolet *et al*. 2013, Ims *et al*. 2008, Kausrud *et al*. 2008, Gilg *et al*. 2009). Also, the more frequent freezing and thawing can affect the quality of the snow, creating hard layers compared to more typical powdery snow. The result is more frequent increased predation of eggs and young birds, leading to a reduction in the number of years of high productivity and further depressing years of moderate and low production.

Range expansion of predators such as Red Fox *Vulpes vulpes* may also be influencing predator-prey relationships in the Arctic breeding grounds, and is already threatening the viability of the small Finnish Lapland breeding population of Long-tailed Ducks. The extent of the threat to breeding Long-tailed Ducks elsewhere is unclear, though predator control in some areas of northern Finland

[9] Some sites in the Åland archipelago, mainly in the south and west, have been surveyed using ships and shore-based counts; these do not indicate any increase in wintering numbers. The largest gap is from southeast Åland east towards the Hanko Peninsula.

has had positive effects on the productivity of other duck species, which confirms predation is an important driver (Kauhala 2004). Culling of Red Fox within the core breeding area of the Lesser White-fronted Goose *Anser erythropus* in Norway has changed the mean population trend of the geese from -5% per year to more than +20% per year (BirdLife Norway, unpublished data).

Furthermore, whilst not related to climate change, the spread of introduced mammalian carnivores, particularly American Mink *Neovison vison*, might also have negative consequences for the reproductive success of Long-tailed Ducks breeding in Scandinavia and other areas where they occur. Raccoon Dog *Nyctereutes procyonoides* is also a potential threat though it’s expanding range does not yet overlap with that of breeding Long-tailed Ducks.

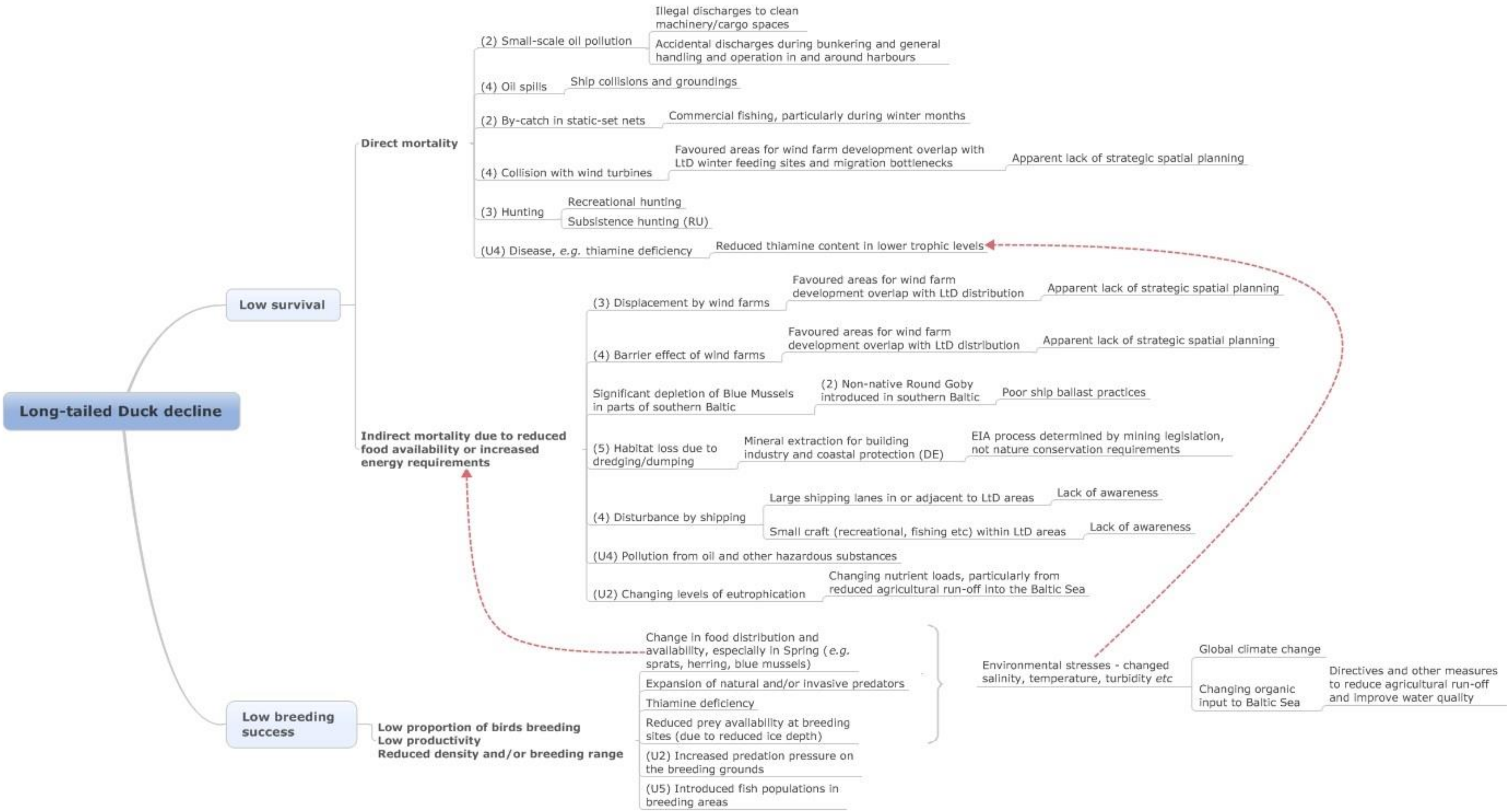

Figure 6. Problem tree for Long-tailed Duck.
The problem tree summarises the main threats to Long-tailed Duck, their root causes, and how they impact upon the species. Numbers in parentheses refer to the relative importance of threats, where 1=critical, 2=high, 3=medium, 4=low and 5=local. Where the relative importance is unknown, due to lack of evidence of the scale of impact, the number is preceded by a ‘U’, *e.g.* U4 = Unknown, potentially Low.

Threats are also displayed below in the form of a two-way ranking, whereby they are ranked by both their relative importance as well as the perceived relative difficultly of addressing the threat. This allows visualisation of those threats for which realistic conservation actions may be best targeted.

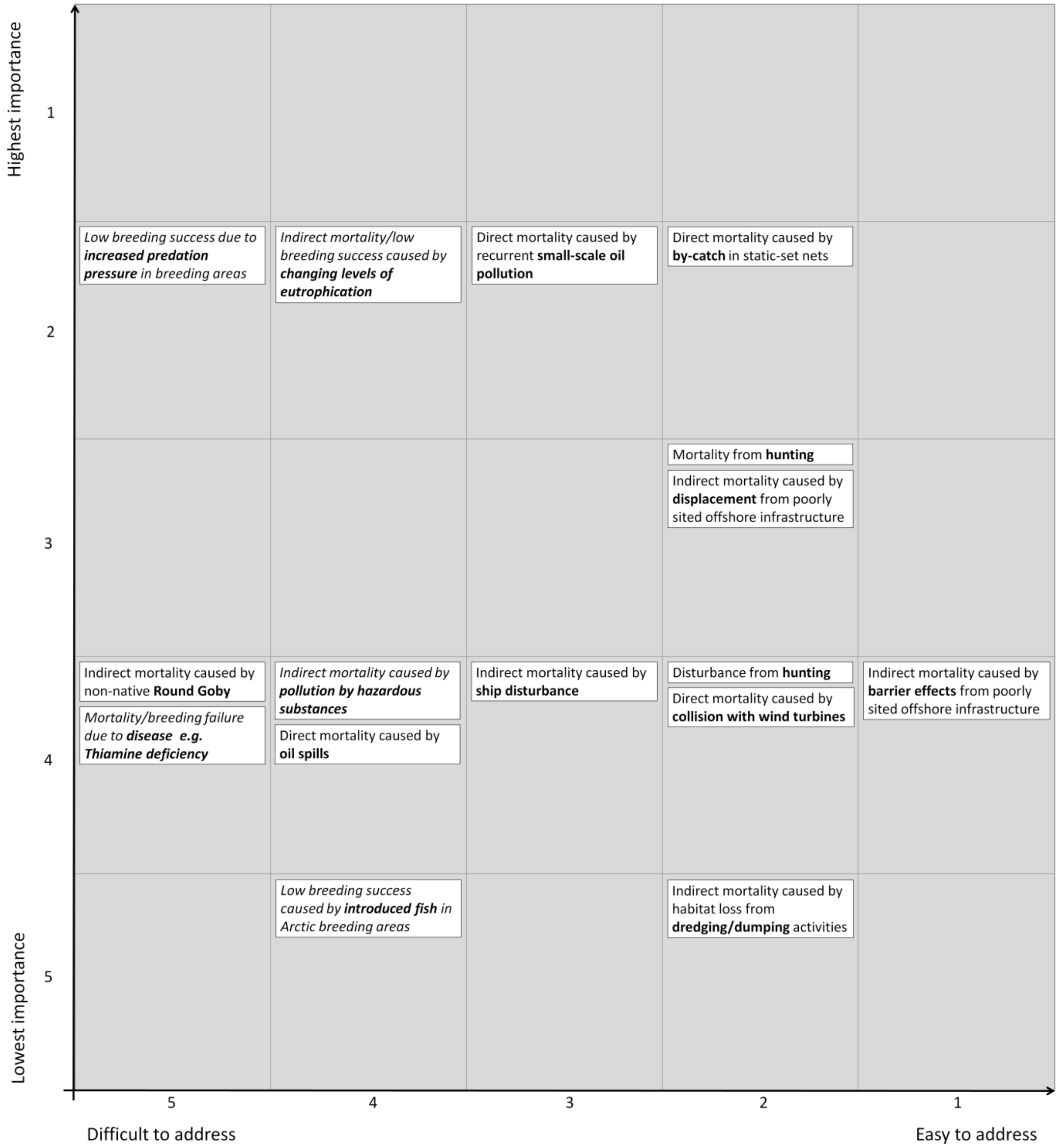

Figure 7. Two-way ranking of threats of Long-tailed Duck.
Threats are ranked according to their relative importance: 1=critical, 2=high, 3=medium, 4=low and 5=local; and the perceived relative difficultly of addressing the threat, from 1 (easiest) to 5 (most difficult). Text in italics refers to threats for which the severity is currently unknown, where ranking is assigned based on best estimates of the potential impacts.

4 - KNOWLEDGE GAPS AND NEEDS

Current knowledge is limited for all basic population and demographic parameters for the Long-tailed Duck, and about many of the identified and potential threats to the Long-tailed Duck. Significant knowledge gaps may hinder the successful implementation of conservation measures and therefore highlighting the areas where further evidence is required is of high relevance. Addressing these knowledge gaps is an essential part of the implementation of this plan.

The key factors where current information is inadequate are highlighted in Table 1, and a more detailed list of knowledge gaps is presented in Annex 6. These knowledge gaps are not in a prioritised order.

Table 1. Key knowledge gaps for the conservation of Long-tailed Duck.

Category	Attribute	Knowledge gap	Population[1]
Threat	Eutrophication	Effect of eutrophication or reduced nutrient loading on quality and quantity of key food species in the Baltic Sea	WS/NE
Threat	Bycatch	Up-to-date estimates of annual bycatch	WS/NE
Population status	Distribution	Location of core breeding densities in Russia	WS/NE
Population status	Distribution	Location of all key moult sites	WS/NE; I/G
Population status	Movements	Distribution changes within wintering areas in relation to ice cover and other environmental factors	WS/NE; I/G
Population status	Population size	Accurate estimates of population size	WS/NE; I/G
Population status	Population trend	Trend of WS/NE population since 2009	WS/NE
Population status	Population trend	Trend of I/G population	I/G
Population status	Survey methods	Consensus on the best survey methods e.g. aerial or ship-based, for accurate population size estimates	WS/NE; I/G
Demography	Annual breeding success	Population scale estimates of annual breeding success (based on winter ratios of adult males, young males, and females)	WS/NE; I/G
Demography	Annual breeding success	Estimate of breeding propensity of individual females in WS/NE population	WS/NE
Population dynamics	Limitations to productivity	Clarify causes of apparent low breeding success, e.g. faltering lemming cycles	WS/NE; I/G
Population dynamics	Limitations to productivity	Extent to which breeding success governed by food availability in spring staging, and potentially wintering areas	WS/NE; I/G
Ecology	Limitations to food availability	Identify key limitations to food availability in wintering and staging areas	WS/NE; I/G

[1] WS/NE = West Siberia/North Europe population; I/G = Iceland/Greenland population.

5 – POLICIES AND LEGISLATION

5.1 Global status

The Long-tailed Duck is a globally threatened species, classified as Vulnerable on the IUCN Red List since 2012. A large decline of 65% in the Baltic Sea, where most of the global population occurs in winter, since the beginning of the 1990s implies that the global population will undergo a 59% decline over three generations, even when factoring-in uncertainty regarding the sizes and trends of other populations.

5.2 International conservation and legal status of the species

The Long-tailed Duck is listed in several Multilateral Environmental Agreements (MEAs). The species' status under most other relevant Conventions, Directives and Agreements does not, however, yet reflect its current global status (Table 2).

Table 2. Summary of the international conservation and legal status of the European populations of Long-tailed Duck. Year in parentheses indicates when the classification was last reviewed.

<table>
<tr><th>Population</th><th>Global status</th><th>European status</th><th>EU Birds Directive</th><th>Bern Convention</th><th>CMS</th><th>AEWA</th><th>CITES</th><th>HELCOM</th><th>OSPAR</th></tr>
<tr><td>W. Siberia/ N. Europe</td><td rowspan="2">Vulnerable (A4bce) (2012)</td><td rowspan="2">Vulnerable[10] (A2abcde+3 bcde+ 4abcde) (2015)</td><td rowspan="2">Annex II, Part B (1979)</td><td rowspan="2">Appendix III (1979)</td><td rowspan="2">Not listed</td><td>B2c (1999)</td><td rowspan="2">Not listed</td><td>EN Endangered (2013)</td><td rowspan="2">Not listed</td></tr>
<tr><td>Iceland & Greenland</td><td>C1 (1999)</td><td>n/a</td></tr>
</table>

It is important to note that there are several international instruments and MEAs that either do not apply throughout the range of Long-tailed Duck, or to which Principal Range States are not a Party. Most notably these are EU Directives, the Convention on Migratory Species (CMS) and its subsidiary the African-Eurasian Waterbird Agreement (AEWA) (Table 3).

Table 3. Applicability of major international conservation instruments to Principal Range States for the Long-tailed Duck.

Principal Range State	EU Directives & Policies	Bern Convention	CMS	AEWA	CBD	Ramsar Convention
Denmark	Yes	Yes	Yes	Yes	Yes	Yes
Estonia	Yes	Yes	Yes	Yes	Yes	Yes
Faroe Islands (to Denmark)	n/a	No	Yes	Yes	No	Yes
Finland	Yes	Yes	Yes	Yes	Yes	Yes
Germany	Yes	Yes	Yes	Yes	Yes	Yes
Greenland (to Denmark)	n/a	No	No	No	Yes	Yes
Iceland	No	Yes	No	Yes	Yes	Yes
Ireland	Yes	Yes	Yes	Yes	Yes	Yes
Latvia	Yes	Yes	Yes	Yes	Yes	Yes
Lithuania	Yes	Yes	Yes	Yes	Yes	Yes
Norway	No	Yes	Yes	Yes	Yes	Yes
Poland	Yes	Yes	Yes	No	Yes	Yes
Russian	No	No	No	No	Yes	Yes

[10] Long-tailed Duck is classified as Vulnerable at both the EU27 scale and the Pan-European scale (BirdLife International 2015).

Federation						
Sweden	Yes	Yes	Yes	Yes	Yes	Yes
United Kingdom	Yes	Yes	Yes	Yes	Yes	Yes

5.3 National policies, legislation and site protection

Information on national policies and legislation in each Range State are summarised in Annex 3. This indicates that the conservation of Long-tailed Duck has not yet been prioritised through most national policy frameworks. In the majority of Range States Long-tailed Duck is still classified as a low priority, even if there is tacit understanding that its conservation status has deteriorated. Responses are taking place, however, and it is likely to receive additional protection in some Range States in the near future.

No Range States reported ongoing targeted conservation action for the species, but there are generic actions in place to address some of the key threats, such as oiling and bycatch, for Long-tailed Duck and other affected species.

The IBA inventory for this species and the protection of key areas through designation (primarily as marine SPAs) are both incomplete. In particular, significant gaps exist in the SPA suites in Finland and Denmark, with some gaps also in Estonia. Other sites of major importance, including the Southern Midsjö Bank, Sweden, are also neither listed as IBAs nor legally protected. The gaps in national marine SPA suites in the Baltic Sea are principally a result of incomplete IBA inventories and this is a particular issue for Long-tailed Duck as it occurs predominantly in offshore areas. Away from the Baltic Sea, protected areas are also limited; the most significant gaps are in Iceland and Greenland.

5.4. Ongoing activities for conservation of the species

5.4.1. Recent conservation projects

The decline of Long-tailed Duck and its consequent addition to the IUCN Red List was only recognised relatively recently, thus few projects focusing on Long-tailed Duck conservation have been developed. There have been, however, a number of restrictions to hunting seasons implemented as a result of the decline in abundance, and some other projects related to general seabird conservation will have benefitted Long-tailed Ducks.

In particular, a number of studies and actions concerned with gill net bycatch have been carried out. Several studies have taken place, particularly in the southern Baltic Sea (Germany, Poland, Lithuania and Latvia; see Žydelis *et al*. 2009), that have documented the extent of this mortality and the significance of it for Long-tailed Duck. As a result of these studies and other activities, the EU Bycatch Action Plan[11] was agreed in 2012.

This Plan sets out actions to minimise and, where possible, eliminate the bycatch of seabirds, including seaducks, in EU waters. It sets out to achieve this through a range of actions, notably calling on fishermen to apply mitigation measures to prevent seabirds coming into contact with fishing gear. It also sets out goals for research and development, and awareness-raising and training for fishermen. The implementation of the Plan, however, is largely voluntary so its degree of effectiveness remains unclear at the current time. In Poland, restrictions in fishing activities in Natura 2000 areas in order to reduce bycatch have met with opposition from fishing industry.

[11] Full title: Action Plan for reducing incidental catches of seabirds in fishing gears.

Comprehensive networks of protected areas for seabirds have only begun to be implemented relatively recently due to a historical lack of data. Many national networks are still far from complete in several Principal Range States, but improvements to marine conservation legislation, *e.g.* the Marine Strategy Framework Directive, is driving forwards the implementation of protected area networks.

5.4.2. Monitoring

Most monitoring of Long-tailed Ducks is carried out during the non-breeding season, primarily in the form of counts designed to assess overall abundance and trend, and identify key sites of national or international importance. In order to be carried out effectively, this requires ship-based or aerial surveys to be undertaken, as many birds occur too far offshore to be counted from land. Historically, such surveys have been limited, particularly outside the Baltic Sea, but their use has increased since the mid 1990s as the demand for information on marine birds increased due to the need to identify and designate marine protected areas and to provide information for marine environmental impact assessments, particularly since the advent of the offshore wind energy industry. However, many national waterbird count schemes still frequently undertake shore-based counts because the resources available to such long-term annual schemes typically does not allow for the regular use of ship or aerial surveys. Some countries, *e.g.* Sweden, are able to make more regular use of ship/aerial surveys for monitoring of Long-tailed Ducks and other marine waterbirds.

Collectively, these national schemes contribute to the International Waterbird Census, though the use of shore-based counts means that this dataset alone does not provide a basis for monitoring the population size and trend of Long-tailed Duck. However, in most key countries where Long-tailed Duck occurs there are occasional coordinated international surveys using appropriate methods. The most important of these took place in the Baltic Sea during 1992-1993 (Pihl *et al*. 1995) and 2007-2009 (Skov *et al*. 2011), and these provide the basis for our understanding of size and trend in the West Siberia/North Europe population.

Counts of migrating Long-tailed Ducks are also undertaken at several coastal watchpoints, most notably Söderskär, Finland and Põõsaspea, Estonia. Although the reliability of these data for trend estimation is uncertain, as the proportion of migrating birds counted varies according to weather conditions, the large volume of birds passing these points means they make a valuable contribution to population scale monitoring. At Põõsaspea, autumn counts are included in the national wildlife monitoring plan. They take place every five years (most recently in 2004, 2009 and 2014). About 20-30 % of the West Siberia/North Europe population passes Põõsaspea each autumn close enough to collect abundance and breeding success data.

Other site specific surveys, such as those undertaken as part of environmental impact assessments, also collect information on Long-tailed Duck abundance and distribution, though these data are often considered commercially sensitive and therefore can be unavailable for conservation purposes.

Monitoring of Long-tailed Ducks in breeding areas is limited. Atlas projects have been undertaken in some countries, from which distribution and relative abundance changes can be monitored. These are Finland (1974-79, 1986-89, and 2006-10), Sweden (1976-88), Norway (1977-89 and 2014-present), and Iceland (1990s). The breeding populations of northern Fennoscandia were surveyed in 1972-1975 (Haapanen & Nilsson 1979) and a repeat survey was undertaken in the same areas of the Swedish mountains in Lapland during 2009 (Nilsson & Nilsson 2012). Annual monitoring of the breeding population at Lake Mývatn, northern Iceland, has been conducted since the mid 1970s, and at Hardangervidda in southern Norway studies of pair densities and brood surveys of all breeding seaducks have been carried out since 1978. No other long-term studies of breeding Long-tailed Ducks have been carried out.

Demographic monitoring is also very limited in the breeding grounds, but efforts to assess annual breeding success through the ageing of males in winter flocks has been undertaken in the central Baltic Sea since 2008 as a result of the wider recognition of the decline in annual breeding success and the importance of monitoring this parameter. Data on breeding success have also been derived from other sources since the mid 1990s, including casualties from gill nets and oil spills.

The monitoring of hunting bags is reasonably comprehensive, especially in Denmark where wings from shot birds are used to estimate the age ratio in the harvest. In most countries where a Long-tailed Duck harvest is taken some estimate of the number of birds harvested and the trend in the bag size is available, though there are notable exceptions such as Russia, Latvia and Greenland.

6. FRAMEWORK FOR ACTION

Goal

The long-term goal is to restore the populations of the Long-tailed Duck to favourable conservation status within the Agreement area and to remove the species from the threatened categories of the IUCN Red List.

Purpose

The purpose of this plan is to significantly reduce direct anthropogenic mortality and understand the drivers of decline by 2025.

Objectives

The objectives of the plan are therefore to: 1) increase survival rates and 2) close key knowledge gaps.

Six **results** are identified to deliver these objectives, to be achieved by implementation of specific actions (Tables 4–9). Most actions address the key threats, and some seek to address knowledge gaps about threats in order to develop appropriate actions. Further actions ensure that key sites for the species are protected, and ensure that the species is monitored appropriately, in particular to clarify its current status.

Actions should be implemented in all Principal Range States unless otherwise indicated (Annex 1). It is expected that some actions can be undertaken relatively quickly, while others may take until the end of the period plan to be completed. Timescales are given as 2018, 2021 and 2025 to reflect actions that can be completed by the end of the first, second and final thirds of the term of the plan. It is expected that significant progress should have been made on all actions by 2025.

Some actions are not specific to geographical areas. For example, the provision of a sensitivity map for the Baltic Sea is not country specific. Such actions can therefore be developed initially by one country on behalf of all Range States, to share efforts and costs, and to speed delivery of the action plan by enabling several actions to be developed at the same time. Range States are encouraged to cooperate through the AEWA LtD IWG to agree how implementation can be shared in such cases.

Footnotes capture suggestions made at the action-planning workshop that should facilitate implementation of certain actions, or identify specific issues for consideration.

The objectives and actions listed below should be incorporated into the relevant national action plans of each Range State in which they apply. Range States are, however, encouraged, through the AEWA LtD IWG, to develop and share best practice and imaginative ideas to implement actions. Range States are also encouraged to develop collaborative cross-border projects for implementation, as these are likely to be more effective than implementing actions in isolation.

Many of the conservation needs for Long-tailed Duck are also relevant to other seaducks and waterbirds. Range States are encouraged to consider how implementation of the actions could also have benefits for other species, particularly those that are threatened or known to be declining. Actions could also be achieved as part of the implementation of relevant EU legislation (*e.g.* Marine Strategy Framework Directive) and regional sea conventions (*i.e.* HELCOM and OSPAR).

Table 4. Objectives, results, indicators and means of verification.

Objective	Result	Indicators	Means of verification
1. Increase survival rates	1.1. The impact of shipping activities – particularly mortality from operational oil pollution, and disturbance – is significantly reduced.	Relevant information is available to appropriate bodies and agencies and demonstrated in changes to their operational practices Shipping routes avoid important sites for Long-tailed Duck Inspections and enforcement reduces violations of the existing legislation on anti-pollution measures in the Baltic Sea Surveys of oiled birds carried out in the Baltic Sea show a reduction in oiling rates	Communication from LtDIWG Plans by national maritime administrations and HELCOM and data on shipping routes HELCOM, OSPAR and IMO data and reports National inventories of protected sites
	1.2. The level of fisheries bycatch is significantly reduced.	Surveys / assessments of the scale of bycatch show a reduction Fishing activities are adjusted to avoid spatial and temporal hotspots of Long-tailed Duck bycatch Alternative fishing gear that reduces bycatch is widely used	Reports from EU *Action Plan for reducing incidental catches of seabirds in fishing gears* Reports and datasets from fishing industry bodies
	1.3. The level of mortality from hunting, if hunting continues, is sustainable.	Bag estimates and other data required for assessments of sustainability are collected and promptly reported Assessments of sustainability by relevant experts indicate that the annual harvest is below the harvestable surplus threshold An adaptive harvest management regime is in place to ensure the	National bag statistics Reports of sustainability assessments FACE and national hunting organisations member communication records

Objective	Result	Indicators	Means of verification
		sustainability of future harvesting and is effectively implemented in all range states where hunting is allowed Hunters are informed of the need for restraint when hunting Long-tailed Ducks	
	1.4. A network of protected areas, covering all important sites throughout the lifecycle, is designated and maintained.	Surveys identify a comprehensive network of important sites and their carrying capacity National and international inventories of important sites are up-to-date and reported to LtDIWG A sufficient suite of important sites, covering all periods of the life cycle, is legally protected Management plans for protected sites that take account of the needs of Long-tailed Ducks are prepared and implemented Knowledge of important sites is incorporated into marine spatial plans and impact assessment processes	Survey reports and dataset National IBA inventories National inventories of protected sites Site management plans Sensitivity map available and disseminated National archives of environmental assessments
2. Close key knowledge gaps	2.1. The understanding of population status is improved.	Accurate assessments of abundance and population trend are based upon synchronised, flyway-wide, and sufficiently frequent censuses occurring not less than once in every six years Assessments of status are supported by robust estimates of pair densities from a representative suite of breeding areas Assessments of annual	Published international survey protocol, reports and datasets AEWA Conservation Status Reports MSFD reporting National Birds Directive Article 12 reports Long-tailed Duck population model

Objective	Result	Indicators	Means of verification
		productivity are incorporated into population models	
	2.2. Key knowledge gaps about populations, demographics and threats are addressed.	Published literature and data availability pertaining to the high priority knowledge gaps increases	Published research and datasets Reports and datasets

Table 5. Result 1.1.: The impact of shipping activities – particularly mortality from operational oil pollution, and disturbance – is significantly reduced.

Action	Priority	Timescale	Organisations
1.1.1. Ensure national bodies/agencies responsible for marine pollution are aware of the increased threatened status of the Long-tailed Duck and the threat from operational oil pollution[12]	High	By 2018	HELCOM, OSPAR
1.1.2. Modify shipping routes during winter and spring that pass through or close to Natura 2000 sites important for Long-tailed Ducks in the Baltic Sea[13]	High	Assessment by 2018; sufficient changes to routes by 2021	HELCOM, IMO
1.1.3. Raise awareness of sensitive sea areas among shipping companies and ship crews in the Baltic Sea[14]	High	Means of raising awareness in place by 2018; rollout by 2021	HELCOM, OSPAR
1.1.4. Identify and designate sensitive sites for Long-tailed Ducks in Arctic seas and raise awareness of the potential impact of shipping among relevant bodies	High	By 2021	Norwegian and Russian authorities, Arctic Council/CAFF, relevant shipping companies
1.1.5. Enforce existing regulations[15] applying to the discharging of oil	High	By 2021	HELCOM, OSPAR
1.1.6. Ensure IMO guidelines for ballast water treatment are followed[16]	High	By 2021	HELCOM, OSPAR, IMO, shipping companies

[12] Provide specific information relevant to Long-tailed Duck, *e.g.* noting the combined impact of numerous small incidents is particularly important to the species even though it may be a relatively small proportion of the total volume of oil pollution.
[13] Provide maps and relevant information to HELCOM, International Maritime Organisation and National Maritime Administrations
[14] Research project and actions already underway under HELCOM to explore issue of 'environmental culture' among ship crews
[15] MARPOL 73/78 which entered into force on 2 October 1983 (Annexes I and II).
[16] This action relates to the need to reduce the risk posed by invasive species, for example Round Goby, that may affect the food resource for Long-tailed Ducks and is not related to pollution from oil or other substances

Table 6. Result 1.2.: The level of fisheries bycatch is significantly reduced.

Action	Priority	Timescale	Organisations
1.2.1. Implement monitoring scheme for bycatch, including reporting of effort	High	By 2018	EC DG Environment, DG Maritime Affairs and Fisheries and national governments
1.2.2. Close the use of gill and trammel nets at key sites for Long-tailed Duck during times of the year when they are present[17]	High	By 2021	EC DG Environment and DG Maritime Affairs and Fisheries (many sites are in EEZ)
1.2.3. Develop and test, as required, currently available or alternative seabird-friendly fishing gear suitable for Long-tailed Duck	High	By 2021	EC DG Maritime Affairs and Fisheries
1.2.4. Promote the use of seabird-friendly fishing gear and identify funding (*e.g.* EU subsidies) for their implementation	High	By 2025	EC DG Environment, DG Maritime Affairs and Fisheries, BirdLife International

Table 7. Result 1.3.: The level of mortality from hunting, if hunting continues, is sustainable.

Action	Priority	Timescale	Organisations
1.3.1. Assess the sustainability of hunting of Long-tailed Duck and make appropriate recommendations[18]	High	By 2018	FACE, WHSG
1.3.2. Assess the benefit of selective hunting of males and, if this is sustainable and can be practically achieved, promote among stakeholders[19]	Medium	By 2018	FACE and national member organisations
1.3.3. Raise awareness amongst hunters of the serious decline of Long-tailed Duck	Medium	By 2018	FACE and national member organisations

[17] Some key sites have yet to be identified, *e.g.* spring staging areas in Russia.
[18] LtDIWG will propose appropriate actions if current hunting activities are found to be unsustainable.
[19] Such an approach would also require compatibility with relevant national and international legislation.

Table 8. Result 1.4.: A network of protected areas, covering all important sites throughout the lifecycle, is designated and maintained.

Action		Priority	Timescale	Organisations
1.4.1.	Revise the IBA list for Long-tailed Duck, taking into account the carrying capacity and stability of food resources between years	High	By 2018	BirdLife partners
1.4.2.	Evaluate the adequacy of existing SPAs and other site protection designations and designate as appropriate[20]	High	Evaluation by 2018; designation by 2021	Range States
1.4.3.	Ensure that management plans for SPAs and other protected sites include measures for Long-tailed Duck, and develop management plans for sites where these are currently lacking	High	By 2021	Range States
1.4.4.	Undertake surveys of marine distribution, including hitherto unsurveyed potential wintering and staging grounds[21]	High	Every 6 years, combined with national monitoring programs	Range States, HELCOM, OSPAR, CAFF, Wetlands International, National monitoring scheme coordinators
1.4.5.	Locate and survey moult sites to assess their importance[22]	High	By 2021	Range States, HELCOM, OSPAR, CAFF, Wetlands International
1.4.6.	Identify and designate key staging areas for the species[23]	Medium	By 2021	Range States, HELCOM, OSPAR, CAFF, Wetlands International
1.4.7.	Produce sensitivity map to inform marine spatial planning, to minimise effects of offshore marine industries and other potentially damaging activities on important Long-tailed Duck concentrations[24]	High	By 2021	Range States

[20] Additional areas that meet relevant IBA criteria should be designated as SPAs or another appropriate designation in non-EU range states; Long-tailed Ducks should also be listed as qualifying species for existing designated sites where appropriate. Of particular priority is the Southern Midsjö Bank in Sweden.
[21] Priority area for winter and spring surveys is Finland, particularly from Åland to Hanko and the Gulf of Finland.
[22] Surveys would ideally assess importance for all seaducks, not just Long-tailed Duck. Data may be available from previous surveys. May require a combination of surveys and telemetry studies.
[23] Using coordinated surveys or telemetry studies.
[24] Respond to potential negative impacts using Ramsar's Avoid-Minimise-Compensate planning framework. Also, ensure that appropriate data are provided to other bodies undertaking similar exercises, *e.g.* HELCOM.

1.4.8.	Ensure that appropriate Strategic Environmental Assessments and/or Cumulative Impact Assessments are undertaken for major developments that may together have a potential impact on Long-tailed Ducks and which may not be obvious when undertaking single project assessments	High	Ongoing	Range States

Table 9. Result 2.1.: The understanding of population status is improved.

Action		Priority	Timescale	Organisations
2.1.1.	Assess coverage and methodologies of existing national monitoring schemes, and design suitable synchronised survey to determine population trend	High	By 2016	Wetlands International, National monitoring scheme coordinators
2.1.2.	Implement synchronised annual survey of representative sample of sites in winter to determine population trend	High	Established by 2018; ongoing and repeated at least twice in every 6 year period	Range States, Wetlands International, National monitoring scheme coordinators
2.1.3.	Undertake periodic coordinated full surveys in winter to determine population size, linked to Marine Strategy Framework and Birds Directives reporting requirements	High	Every 6 years, combined with national monitoring programs	Range States, Wetlands International, National monitoring scheme coordinators
2.1.4.	Undertake sample surveys on the breeding grounds to assess population trend	Low[25]	By 2025	Range States, Wetlands International, National monitoring scheme coordinators, universities
2.1.5.	Undertake photographic surveys at representative sites and times in the wintering range to assess age and sex ratios	High	Established by 2018, then ongoing annually	Range States, Wetlands International, National monitoring scheme coordinators

[25] This information is highly desirable, but classed as low priority in recognition of the considerable logistical difficulties and cost of surveys. The priority of this action should be reviewed once the efficacy of winter surveys has been assessed.

Table 10. Result 2.2.: Key knowledge gaps about populations, demographics and threats are addressed.

Action		Priority	Timescale	Organisations
2.2.1.	Produce more reliable estimates of birds affected by oiling incidents	High	By 2018	Range States, HELCOM, OSPAR, shipping industries
2.2.2.	Produce up-to-date estimates of birds affected by bycatch in wintering and breeding areas	High	By 2018	Range States, fishing industries
2.2.3.	Undertake integrated surveys of breeding success and its drivers to assess loss at each stage and to assess breeding propensity	Medium	Established by 2021, then ongoing	Range States, Wetlands International, National monitoring scheme coordinators, universities
2.2.4.	Undertake coordinated telemetry program to describe annual use of sites for delineation of populations[26] and potential sub-populations	Medium	Significant progress by 2021	Range States, universities
2.2.5.	Evaluate and monitor breeding densities and habitat quality over the breeding range[27]	Medium	Significant progress by 2025	Range States, universities
2.2.6.	Collect data about female body condition in spring	Low	By 2025	Range States, universities
2.2.7.	Clarify link between loss of Blue Mussel stocks (*e.g.* due to Round Goby) and Long-tailed Duck distribution and predict impact	Medium	By 2025	Range States, universities
2.2.8.	Clarify effect of changing nutrient inputs on quality and quantity of food	Medium	By 2025	Range States, universities
2.2.9.	Clarify effect of hazardous substances on quality and quantity of food	Medium	By 2025	Range States, universities
2.2.10	Identify food preferences and availability in space and time, and thus assess site carrying capacity and stability	Medium	By 2025	Range States, universities

[26] Priority areas for population delineation are eastern Taimyr, Iceland and Greenland
[27] The focus is a better understanding of habitat preferences and baseline breeding densities. Data on habitats may already be available from other projects, *e.g.* Arctic Wader Atlas.

7. *INTERNATIONAL COORDINATION OF ACTION PLAN IMPLEMENTATION*

International coordination of the implementation of International Single Species Action Plans is a key factor in their successful realization. To ensure the coordination of this Action Plan following its adoption, the UNEP/AEWA Secretariat will convene an inter-governmental AEWA Long-tailed Duck International Working Group once a suitable coordinating agency or organization has been identified. The Working Group will consist of government representatives from all range states as well as national experts, designated by the respective governing bodies charged with the implementation of AEWA. In addition, relevant international conservation and hunting organizations as well as other international stakeholders with a vested interest in the species can be invited to join the Working Group as observers.

8. REFERENCES

Balk, L., Hagerroth, P-Å., Åkerman, G., Hanson, M., Tjärnlund, U., Hansson, T., Hallgrimsson, G.T., Zebühr, Y., Broman, D., Mörner, T. & Sundberg, H. 2009. Wild birds of declining European species are dying from a thiamine deficiency syndrome. Proceedings of the National Academy of Sciences 2009.

Balmer, D., Gillings, S., Caffrey, B., Swann, B., Downie, I. & Fuller, R. 2013. Bird Atlas 2007-11: The breeding and wintering birds of Britain and Ireland. BTO books, Thetford.

Bellebaum, J., Kube, J., Schulz, A., Skov, H. & Wendeln, H. 2014. Decline of Long-tailed Duck *Clangula hyemalis* numbers in the Pomeranian Bay revealed by two different survey methods. Ornis Fennica 91: 129-137.

Bellebaum, J., Schirmeister, B., Sonntag, N. & Garthe, S. 2013. Decreasing but still high: bycatch of seabirds in gillnet fisheries along the German Baltic coast. Aquatic conservation: Marine and Freshwater Ecosystems 23: 201-221.

Bergman, G. 1961. The migrating populations of the Long-tailed Duck (*Clangula hyemalis*) and Common Scoter (Melanitta nigra) in the spring 1960. In Finnish; English summary. Suomen Riista 14: 69-74.

BirdLife International. 2014. Species factsheet: *Clangula hyemalis*. Downloaded from http://www.birdlife.org on 28/07/2014.

BirdLife International. 2015. European Red List of Birds. Luxembourg: Office for Official Publications of the European Communities.

Boertmann, D. 2008. Grønlands Rødliste 2007. Grønlands Hjemmestyre og Danmarks Miljøundersøgelser.

Boertmann, D. & Mosbech, A. (Eds.). 2011. The western Greenland Sea, a strategic environmental impact assessment of hydrocarbon activities. Aarhus University / DCE – Danish Centre for Environment and Energy. DCE Scientific Report No. 22.

Bustnes, J.O. & Systad, G.H. 2001. Comparative feeding ecology of Steller's Eider and Long-tailed Duck in winter. Waterbirds 24: 407-412.

Cramp, S. & Simmons, K.E.L. (Eds.). 1977. The Birds of the Western Palearctic. Handbook of the birds of Europe, the Middle East and North Africa,Volume 1. Oxford University Press.

Crowe, O., Austin, G.E., Colhoun, K., Cranswick, P.A., Kershaw, M. & Musgrove, A.J. 2008. Estimates and trends of waterbird numbers wintering in Ireland, 1994/95 to 2003/04. Bird Study 55: 66-77.

Dorsch, M., Zydelis, R. & Nehls, G. 2011. Foraging patterns and energy budgets of common eiders and long-tailed ducks wintering in the southern Baltic Sea. Conference abstract: 4th International Sea Duck Conference, Seward, Alaska.

Durinck, J., Skov, H., Jensen, F. P. & Pihl, S. 1994. Important marine areas for wintering birds in the Baltic Sea. EU DG XI Research Contract no. 2242/90-09-01. Ornis Consult Report.

Einarsson, Á. & Garðarsson, A. 2004. Moulting diving ducks and their food supply. Aquatic Ecology 38: 297-307.

Ellermaa, M., Pettay, T. & Könönen, J. 2010. Autumn migration in Põõsaspea Cape in 2009. Hirundo 23: 21-46.

Gavrilo, M.V. 2013. The long-tailed duck Clangula hyemalis and Sabine's gull Xema sabini – new species in avifauna of Franz Josef Land Archipelago. The Russian Journal of Ornithology 859: 747-748.

Gilg, O., Sittler, B. & Hanski, I. 2009. Climate change and cyclic predator-prey population dynamics in the high Arctic. Global Change Biology 15: 2634–2652.

Gjershaug, J.O., Thingstad, P.G., Eldøy, S. & Byrkjeland, S. (Eds.). 1994. Norwegian Atlas of Breeding Birds. Norsk Ornitologisk Forening, Klæbu.

Guðmundsson, G. 1998. Þýðins votlendis fyrir fugla. Í Jón S. Ólafsson, ritstj. Íslensk votlendi: verndun og nýting, bls. 167-172. Reykjavík: Háskólaútgáfan.

Guillemain, M., Pöysä, H., Fox, T., Arzel, C., Dessborn, L., Ekroos, J., Gunnarsson, G., Holm, T.E., Christensen, T.K., Lehikoinen, A., Mitchell, C., Rintala, J. & Møller, A.P. 2013. Effects of climate change on European ducks: what do we know and what do we need to know? Wildlife Biology 19: 1-16.

Haapanen, A. & Nilsson, L. 1979. Breeding waterfowl populations in northern Fennoscandia. Ornis Scandinavica 10: 145-219.

Håland, A. 1983. Population ecology of alpine breeding diving ducks at Hardangervidda. Preliminary results from the period 1978 - 1982. Negative factors. Management implications. Report to the Royal Ministry of Environment. Dept. of Animal Ecology, Univ. of Bergen, 22 pp. [In Norwegian].

Håland, A. 2012. Numbers, density and trends of breeding Black Scoters *Melanitta nigra* at the Hardangervidda plateau, southern Norway, 1978 – 2012, in perspective of climate variations and varying density of Brown Trout *Salmo trutta*. Ornithology Studies 1: 1-15.

Håland, A. 2014. Change in the winter population of the Long-tailed duck *Clangula hyemalis* on the west coast of Norway 1980 - 2014. Ornithology Studies 2014 (1): 1-14.

Hario, M., Rintala, J. & Nordenswan, G. 2009. Dynamics of wintering long-tailed ducks in the Baltic Sea – the connection with lemming cycles, oil disasters, and hunting. Suomen Riista 55: 83-96. (in Finnish, with English summary).

HELCOM. 2007. HELCOM Baltic Sea Action Plan. Adopted 15 November 2007. Krakow, Poland. Accessed 22 August 2014. http://helcom.fi/Documents/Baltic%20sea%20action%20plan/BSAP_Final.pdf

HELCOM. 2010. Hazardous substances in the Baltic Sea – An integrated thematic assessment of hazardous substances in the Baltic Sea. Baltic Sea Environment Proceedings 120B.

HELCOM. 2014. Eutrophication status of the Baltic Sea 2007-2011 - A concise thematic assessment. Baltic Sea Environment Proceedings No. 143.

Ims, R.A., Henden, J-A. & Killengreen, S.T. 2008. Collapsing population cycles. Trends in Ecology & Evolution 23: 79–86.

Isakov, Y.A. 1952. Subfamily Anatidae. In: Dementiev, G.P. & W.A.Gladkov (Eds.). The Birds of the Soviet Union (Volume 4). M. Sov. Nauka.

Kalejta-Summers, B. & Butterfield, D. 2006. Numbers and distribution of wintering divers, grebes and seaducks in the Moray Firth, Scotland, 1998/99–2003/04. Wildfowl 56: 113-128.

Kauhala, K. 2004. Removal of medium-sized predators and the breeding success of ducks in Finland. Folia Zool. 53(4): 367–378.

Kausrud, K.L., Mysterud, A., Steen, H., Vik, J.O., Østbye, E., Cazelles, B., Framstad, E., Eikeset, A.M., Mysterud, I., Solhøy, T. & Stenseth, N.C. 2008. Linking climate change to lemming cycles. Nature 456: 93–98.

Kellett, D.K. & Alisauskas, R.T. 2014. Population ecology of Long-tailed Ducks at Karrak Lake, Nunavut. Proceedings of the Fifth International Sea Duck Conference. Reykjavik, Iceland.

Kershaw, M. & Cranswick, P.A. 2003. Numbers of wintering waterbirds in Great Britain, 1994/1995-1998/1999: 1. Wildfowl and selected waterbirds. Biological Conservation 111: 91-104.

Kondratyev A.V. 1989. Comparative ecology of Black Scoter, White-winged Scoter and Long-tailed Duck in the Middle Anadyr river basin. Zoologichesky Journal 68: 93-103.

Krivenko V.G. & Vinogradov, V.G. 2008. Birds of the Water Environment and Rhythms of Climate of the Northern Eurasia [In Russian]. Moscow, Nauka.

Kube, J. & Skov, H. 1996. Habitat selection, feeding characteristics, and food consumption of long-tailed ducks, *Clangula hyemalis*, in the southern Baltic Sea. Meereswiss. Ber., Warnemünde 18: 83-100.

Kumari, E. 1979. Moult and moult migration of waterfowl in Estonia. Wildfowl 30: 90-98.

Kvasnes, M.A.J., Pedersen, H.C., Storaas, T. & Nilsen, E.B. 2014. Large-scale climate variability and rodent abundance modulates recruitment rates in Willow Ptarmigan (Lagopus lagopus). Journal of Ornithology DOI 10.1007/s10336-014-1072-6.

Larsson, K. & Tydén, L. 2005. Effects of oil spills on wintering Long-tailed Ducks *Clangula hyemalis* at Hoburgs bank in central Baltic Sea between 1996/97 and 2003/04. Ornis Svecica 15: 161–171.

Larsson, K. & Tydén, L. 2011. Inventeringar av oljeskadad alfågel längs Gotlands sydkust under perioden 1996/97 till 2010/11. Report to Gotland University. [In Swedish: Surveys of oil damaged Long-tailed Ducks].

Lehikoinen, A., Jaatinen, K., Vähätalo, A.V., Clausen, P., Crowe, O., Deceuninck, B., Hearn, R., Holt, C.A., Hornman, M., Keller, V., Nilsson, L., Langendoen, T., Tománková, I., Wahl, J. & Fox, A.D. 2013. Rapid climate driven shifts in wintering distributions of three common waterbird species. Global Change Biology 19: 2071–2081.

Lundberg, C. 2005. Eutrophication in the Baltic Sea: from area-specific biological effects to interdisciplinary consequences. PhD thesis. Åbo Akademi University, Åbo, Finland.

Lyngs, P. 2003. Migration and winter ranges of birds in Greenland. Dansk Ornitologisk Forenings Tidsskrift 97: 1-167.

Meltofte, H., Sittler, B. & Hansen, J. 2007. Breeding performance of tundra birds in High Arctic Northeast Greenland 1987-2007. Arctic Birds 9: 43-53.

Michalek, M., Puntila, R., Strake, S. & Werner, M. 2012. Baltic Sea environment fact sheet title. HELCOM Baltic Sea Environment Fact Sheets. Online. Accessed 15 August 2014. http://www.helcom.fi/baltic-sea-trends/environment-fact-sheets/

Musgrove, A.J., Austin, G.E., Hearn, R.D., Holt, C.A., Stroud, D.A. & Wotton, S.R. 2011. Overwinter population estimates of British waterbirds. British Birds 104: 364-397.

Newton, I. 1998. *Population limitation in birds*. Academic Press, London.

Nilsson, L. 1972. Habitat Selection, Food Choice and Feeding Habits of Diving Ducks in Coastal Waters of South Sweden during the Non-breeding Season. Ornis Scandinavica 3:55-78.

Nilsson, L. 2012. Distribution and numbers of wintering sea ducks in Swedish offshore waters. Ornis Svecica 22: 39-60.

Nilsson, L. 2014. International counts of waterfowl and geese in Sweden. Annual report for 2013/2014. Biological Institute, Lund University.

Nilsson, L. & Green, M. 2011. Birds in southern Öresund in relation to the windfarm at Lillgrund. Final report of the monitoring program 2001 – 2011. Biological Institute, Lund University. http://corporate.vattenfall.se/Global/sverige/verksamhet/vindkraft/lillgrund/birds_in_southern_oresund.pdf.

Nilsson, L. & Nilsson, J. 2012. Changes in numbers and distribution of breeding waterfowl in the Swedish mountain chain between 1972 - 1975 and 2009. Ornis Svecica 22: 107-126.

Noer, H., Asferg, T., Clausen, P., Olesen, C.R., Bregnballe, T., Laursen, K., Kahlert, J., Teilmann, J., Christensen, T.K. & Haugaard, L. 2009: Vildtbestande og jagttider i Danmark: Det biologiske grundlag for jagttidsrevisionen 2010. Danmarks Miljøundersøgelser, Aarhus Universitet. Faglig rapport fra DMU nr. 742. http://www.dmu.dk/Pub/FR742.pdf.

Nolet, B.A., Bauer, S., Feige, N., Kokorev, Y.I., Popov, I.Y. & Ebbinge, B.S. 2013. Faltering lemming cycles reduce productivity and population size of a migratory Arctic goose species. Journal of Animal Ecology 82: 804–813.

Nygård, T., Larsen, B.H., Follestad, A. & Strann, K.B. 1988. Numbers and distribution of wintering waterfowl in Norway. Wildfowl 39: 164-176.

Pedersen, S.A., Fock, H., Krause, J., Pusch, C., Sell, A.L., Böttcher, U., Rogers, S.I., Sköld, M., Skov, H., Podolska, M., Piet, G.J. & Rice, J.C. 2009. Natura 2000 sites and fisheries in German offshore waters. ICES Journal of Marine Science 66: 155–169.

Pehrsson, O. 1986. Duckling production of the Oldsquaw in relation to spring weather and small-rodent fluctuations. Canadian Journal of Zoology, 64: 1835–1841.

Petersen, I.K., Christensen, T.K., Kahlert, J., Desholm, M. & Fox, A.D. 2006. Final results of bird studies at the offshore wind farms at Nysted and Horns Rev, Denmark. Report to Dong Energy and Vattenfall A/S, National Environmental Research Institute, Rønde, Denmark.

Pihl, S, Durinck, J. & Skov, H. 1995. Waterbird numbers in the Baltic Sea, Winter 1993. NERI Technical Report no. 145. National Environmental Research Institute, Kalø.

Pihl, S. & Laursen, K. 1996. A reestimation of Western Palearctic seaduck numbers from the Baltic Sea 1993 Survey. In: Proceedings of Anatidae 2000. M. Birkan, J. van Vessem, P. Havet, J. Madsen, B. Trolliet, and M. Moser (eds.). Gibier Faune Sauvage.

Rose, P.M. & Scott, D.A. 1994. Waterfowl Population Estimates. IWRB Publication 29, Slimbridge.

Schamber, J.L., Flint, P.L., Grand, J.B., Wilson, H.M. & Morse, J.A. 2009. Population Dynamics of Long-tailed Ducks Breeding on the Yukon-Kuskokwim Delta, Alaska. Arctic 62: 190-200.

Schorger, A.W. 1951. Deep diving of the Old-squaw. Auk 63: 112.

Schwemmer, P., Mendel, B., Sonntag, N., Dierschke, V. & Garthe, S. 2011. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning. Ecological Applications 21: 1851–1860.

Scott, D.A. & Rose, P.M. 1996. Atlas of Anatidae Populations in Africa and Western Eurasia. Wetlands International Publication No. 41. Wetlands International, Wageningen, Netherlands.

Skov, H., Heinänen, S., Žydelis, R., Bellebaum, J., Bzoma, S., Dagys, M., Durinck, J., Garthe, S., Grishanov, G., Hario, M., Kieckbusch, J., Kube, J., Kuresoo, A., Larsson, K., Luigujoe, L., Meissner, W., Nehls, H. W., Nilsson, L., Petersen, I.K., Roos, M. M., Pihl, S., Sonntag, N., Stock, A., Stipniece,A. & Wahl, J. 2011. Waterbird populations and pressures in the Baltic Sea. Norden report.

Skov, H., Vaitkus, G., Flensted, K.N., Grishanov, G., Kalamees, A., Kondratyev, A., Leivo, M., Luigujõe, L., Mayr, C., Rasmussen, J.F., Raudonikis, L., Scheller, W., Sidlo, P.O., Stipniece, A., Struwe-Juhl, B. & Welander, B. 2000. Inventory of coastal and marine Important Bird Areas in the Baltic Sea. BirdLife International, Cambridge.

Sonntag, N., Schwemmer, H., Fock, H., Bellebaum, J. & Garthe, S. 2012. Seabirds, set nets and conservation management: assessment of conflict potential and vulnerability of birds to bycatch in gill nets. ICES Journal of Marine Science 69: 578–589.

Svorkmo-Lundberg, T., Bakken, V., Helberg, M., Mork, K., Røer, J.E. & Sæbø, S. (Eds.). 2006. Norwegian Atlas of Wintering Birds. Norsk Ornitologisk Forening, Trondheim.

Waldeck, P. & Larsson, K. 2013. Effects of winter water temperature on mass loss in Baltic blue mussels: Implications for foraging sea ducks. Journal of Experimental Marine Biology and Ecology 444: 24–30.

Wassink, A. & Oreel, G.J. 2007. *The Birds of Kazakhstan.* Privately published, De Cocksdorp, Texel, The Netherlands.

Westerbom, M., Kilpi, M. & Mustonen, O. 2002. Blue mussels, *Mytilus edulis*, at the edge of the range: population structure, growth and biomass along a salinity gradient in the north-eastern Baltic Sea. Marine Biology 140: 991-999.

Wetlands International. 2012. Waterbird Population Estimates. Retrieved from wpe.wetlands.org on Thursday 24 Jul 2014.

Žydelis, R., Bellebaum, J., Österblom, H., Vetemaa, M., Schirmeister, B., Stipniece, A., Dagys, M., van Eerden, M.& Garthe, S. 2009. Bycatch in gillnet fisheries – An overlooked threat to waterbird populations. Biological Conservation 142: 1269-1281.

Żydelis, R. & Ruškyte, D. 2005. Winter foraging of Long-tailed Ducks (*Clangula hyemalis*) exploiting different benthic communities in the Baltic Sea. Wilson Journal of Ornithology 117: 133–141.

ANNEX 1.

Importance of threats at the country level

The following table lists the severity scores for identified threats assigned by individual Range States, where 1=Critical, 2=High, 3=Medium, 4=Low, 5=Local and U=Unknown.

Threats	Denmark	Estonia	Faroe Islands	Finland	Germany	Greenland	Iceland	Ireland	Latvia	Lithuania	Norway	Poland	Russian Federation	Sweden	United Kingdom
Priority threats															
Small scale oil discharges in non-breeding areas	4	3	U	2[28]	4	4	4	4	3	4	3	U	U	1	4
Accidental bycatch in static fishing nets	4	2	U	4	2	4	3	U	2	2[29]	4	1	U	4[30]	U
Hunting	3	4	n/a	3	n/a	3	4	n/a	U	n/a	4	n/a	U	4	n/a
Development of offshore infrastructure	3	3	4	4	3	n/a	5	4	4	4	4	3	4	3	4
Additional threats															
Large scale accidental oil spills[31]	4	2	4	4	4	4	4	4	4	4	4	4	3	4	4
Competition with Round Goby *Neogobius melanostomus*	U	U	n/a	U	U	n/a	n/a	n/a	3	1	n/a	U	n/a	U	n/a
Dredging and dumping of sediments and aggregates	5	5	5	5	4	5	5	4	5	5	5	4	5	5	5
Disturbance from shipping	4	4	4	4	3	4	4	4	4	4	4	3	4	3	3
Potential threats															
Pollution from hazardous substances in the Baltic Sea	U	U	n/a	U	U	n/a	n/a	n/a	U	U	n/a	U	U	U	n/a
Eutrophication and nutrient loads in the Baltic Sea	U	U	n/a	U	U	n/a	n/a	n/a	U	U	n/a	U	U	U	n/a
Disease and vitamin deficiencies	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Introduced fish populations	n/a	n/a	n/a	U	n/a	U	U	n/a	n/a	n/a	5	n/a	U	U	n/a
Changing predation pressures on the breeding grounds	n/a	n/a	n/a	3[32]	n/a	U	5	n/a	n/a	n/a	4	n/a	2[33]	U	n/a
Increasing water temperature in the Baltic Sea	U	U	n/a	U	U	n/a	n/a	n/a	U	U	n/a	U	n/a	U	n/a

[28] High risk of accidental oil spills, particularly in Gulf of Finland where intensive shipping activity.
[29] Reduced in recent years due to decline in bird numbers and reduced intensity of fishing activities.
[30] Presently very low level at Hoburgs Bank, low at Northern Midsjö Bank and not possible to estimate for Southern Midsjö Bank. Assigned overall threat as Low, though could increase if cod stocks recover and fishing intensity increases.
[31] Whilst the probability of a very large oil spill is low, the consequences would almost certainly be very severe in any country hosting large numbers of Long-tailed Ducks
[32] Viability of small northern Finnish population may be threatened by predation from expanding American Mink and Red Fox populations.
[33] Collapse of lemming cycles identified as specific threat in Russia, though severity unknown.

ANNEX 2.

Key sites for conservation of the species and their protection status[34]

IBA Site Code and Name	**Area (ha)**	**SPA**	**Ramsar**	**Location**		**Population size**	**Year**	**Season**	**Accuracy**
				Lat.	**Long.**				
DENMARK									
DK120: Rønne Banke	100,000		Yes	54°50 N	14°22 E	8,000	2008	P	
ESTONIA									
EE049: Irbe Strait (Riga Bay)	206,640	Kaugatoma-Lõu - EE0040441 Kura kurgu - EE0040434		57°49 N	21°51 E	30k – 700k	1993	W	Good
EE059: Pärnu Bay (Riga Bay)	109,330	Pärnu lahe - EE0040346		58°15 N	24°03 E	57k – 270k	1999	P	Unknown
EE063: Kahtla-Kübassaare (Riga Bay)	14,355	Kahtla-Kübassaare - EE0040412 Väinamere - EE0040001		58°25 N	23°08 E	50k – 195k	1996	P	Unknown
EE045: Nõva-Osmussaare	23,924	Nõva-Osmussaare - EE0040201		59°11 N	23°27 E	20k – 200k	1999	P	Unknown
EE070: Pakri	21,039	Pakri - EE0010129		59°21 N	24°13 E	59,100	1999	P	Unknown
FINLAND									
FI002: Käsivarsi fjelds	220,078	Käsivarren Erämaa - FI1300105		69°00 N	21°30 E	100 pairs	1996	B	Medium
FI045: Merenkurkku archipelago	223,652	Merenkurkun saaristo - FI0800130	Quark Archipelago	63°20 N	21°05 E	10k – 100k	1996	P	Poor
FI016: Sammutinjänkä-Vaijoenjänkä	51,750	Kaldoaivin Erämaa - FI1302002		69°25 N	27°30 E	1-11 pairs	1996	B	Unknown
GERMANY									
DE040: Pomeranian Bay	333,425	Pommersche Bucht -		54°18 N	14°05 E	837,000[35]	1995	P	Unknown

[34] This list is derived from BirdLife International's Important Bird Areas database (see http://www.birdlife.org/datazone/species/factsheet/22680427/additional) and updated where new information was available. However, it is not comprehensive for every country and there is a need to more thoroughly review knowledge of key sites and their designation status (see Result 4).
[35] Total from Skov *et al*. (2000) for Germany and Poland combined.

IBA Site Code and Name	Area (ha)	SPA	Ramsar	Location		Population size	Year	Season	Accuracy
				Lat.	Long.				
		DE1552401 Westliche Pommersche Bucht - DE1649401							
DE044: Greifswalder Bodden	103,155	Greifswalder Bodden und südlicher Strelasund - DE1747402		54°13 N	13°31 E	42,000		P	Unknown
DE288: Wismar Bay and Salzhaff	102,030	Wismarbucht und Salzhaff - DE1934401	Qualifies	54°01 N	11°26 E	7,000	2004	W	Medium
DE304: Coast and Lagoons of Western Pomerania	203,180	Vorpommersche Boddenlandschaft und nördlicher Strelasund - DE1542401 Plantagenetgrund - DE1343401	Qualifies	54°26 N	12°54 E	60,000	1995	P	Unknown
DE286: Sagas Bank and Eastern coast of Oldenburg		Ostsee östlich Wagrien - DE1633491	Qualifies	54°14 N	11°09 E	36,000	2000	W	
DE287: Eastern part of Kiel Bight	59,800	Östliche Kieler Bucht - DE1530491		54°28 N	10°56 E	35,000	2000	W	
DE007: Stoller Grund, Gabelsflach and Mittelgrund (including DE006: Southern shore of Eckernförde Bay)		Eckernförder Bucht mit Flachgründen - DE1525491		54°31 N	10°12 E	4,000	2006	W	
GREENLAND									
GL018: Itsako (Svartenhuk)	8,000	n/a		71°43 N	54°03 W	Unknown		B	
GL031: Naternaq (Lersletten)	184,010	n/a	Naternaq (Lersletten)	68°24 N	51°0 W	Unknown – probably some 100s		B	
GL032: Eqalummiut Nunaat and Nassuttuup Nunaa	579,530	n/a	Eqalummiut Nunaat and Nassuttuup Nunaa	67°28 N	50°49 W	Unknown – probably some 1,000s (common)		B	
GL051: Hochstetter Forland	184,800	n/a	Hochstetter Forland	75°27 N	20°00 W	Unknown	-	B	Unknown
GL052: South coast of Germania Land, and	35,000	n/a		76°50 N	19°20 W	Common	1989	B	Unknown

IBA Site Code and Name	Area (ha)	SPA	Ramsar	Location		Population size	Year	Season	Accuracy
				Lat.	Long.				
Slaedelandet									
GL053: Western part of Germania land	100,000	n/a		77°15 N	22°00 W	Common	1988	B	Unknown
LATVIA									
LV018: Gulf of Riga, west coast	120,000	Western Coast of the Gulf of Riga - LV0900400		57°14 N	23°11 E	71k – 142k	1999	W	Good
LV014: Irbe Strait	145,000	Irbe Strait - LV0900300		57°47 N	21°51 E	309k	1993	W	Good
LITHUANIA									
LT001: Marine waters along the continental part of Lithuania	65,914	Baltijos jūros priekrantė - LTPALB001	No	55°56 N	20°54 E	100-200	2014	W	Good
LT002: Marine waters along the Curonian Spit	60,606	Kursiu nerijos nacionalinis parkas - LTKLAB001	No	55°30 N	21°02 E	200-400	2012-14	W	Good
NORWAY									
SJ013: Bjørnøya (Bear Island)	18,000	n/a	Bear Island (Bjørnøya)	74°27 N	19°03 E	Present	-	B	Unknown
SJ003: Inner parts of Kongsfjorden	140	n/a	Kongsfjorden	78°55 N	12°32 E	Frequent	1995	B	Unknown
SJ015: Adventdalen & Adventfjorden		n/a		78°11 N	15°54 E	1-5 pairs	2005-14	B	Good
NO042: Hardangervidda		n/a		60°12 N	07°37 E	Present	2014	B	Poor
NO041: Dovrefjell		n/a	Fokstumyra	62°19 N	09°27 E	25-60 pairs	2004-13	B	Medium
NO054: Varangerhalvøya		n/a		70°20 N	29°57 E	Abundant	2014	B	Poor
NO057: Slettnes		n/a	Slettnes	71°05 N	28°12 E	20k – 25k	2010	P	Medium
NO057: Slettnes		n/a	Slettnes	71°05 N	28°12 E	16 pairs	2012	B	Good
NO066: Tautra & Svaet	1,650	n/a	Tautra & Svaet	63°34 N	10°37 E	50-120	2000-14	W	Good
NO017: Balsfjord		n/a	Balsfjord wetland system	69°15 N	19°15 E	800-1,000	2007-13	W	Medium
NO067: Været		n/a		63°49 N	09°31 E	20-120	2012-13	W	Good
NO075: Altælvmunningen		n/a		69°58 N	23°24 E	500-1,200	2005-14	W/P	Medium
POLAND									

IBA Site Code and Name	Area (ha)	SPA	Ramsar	Location		Population size	Year	Season	Accuracy
				Lat.	Long.				
PL171: Slupsk Bank	75,440	Ławica Słupska - PLC990001		54°57 N	16°45 E	25k – 32k	2005	W	Unknown
PL173: Pomeranian Bay	578,600	Przybrzeżne wody Bałtyku - PLB990002 Wybrzeże Trzebiatowskie - PLB320010 Zatoka Pomorska - PLB990003		54°24 N	14°32 E	60k – 100k	2005	W	Medium
PL172: Central polish coastal waters	194,300	Pobrzeże Słowinskie - PLB220003 Przybrzeżne wody Bałtyku - PLB990002	Słowinski National Park	54°49 N	18°17 E	90k – 120k	2007	W	Medium
RUSSIAN FEDERATION									
RU1220: Seashore at Nidal[36]	77,000	n/a		55°38 N	20°51 E	68,000	1999	W	Medium
RU1044: Berezovye islands of Vyborg Bay	57,460	n/a	Berezovye Islands, Gulf of Finland	60°18 N	29°00 E	300k – 400k	1996	P	Good
RU1228: Burnaya River Mouth	10,800	n/a		60°40 N	30°32 E	50,000	1992	P	Medium
RU1048: Kurgalski Peninsula	6,855	n/a	Berezovye Islands, Gulf of Finland	59°38 N	28°09 E	70k – 75k	1998	P	Unknown
RU1008: Lapland Biosphere Reserve	278,436	n/a		67°55 N	32°00 E	100 pairs	1995	B	Poor
RU1227: Petrocrepost' Bay	73,350	n/a		59°55 N	31°16 E	20k – 200k	1999	P	Medium
RU1036: Russki Zavorot Peninsula and eastern part of Malozemelskaya Tundra	338,250	n/a		68°35 N	53°30 E	8,000 pairs	1996	B	Poor
RU1030: Vaygach island	412,000	n/a		70°00 N	59°30 E	20,000 pairs	1987	B	Unknown
RU2006: Lower Yuribey	71,800	n/a		68°55 N	69°00 E	5k – 7k pairs	2005	B	Poor
RU2005: Lower Ob’	593,300	n/a		66°40 N	68°50 E	25k – 30k	2004	P	Medium
RU2001: Valley of the	75,200	n/a		68°13 N	68°56 E	1,500 pairs	2000	B	Unknown

[36] Cross-border IBA with LT002.

IBA Site Code and Name	Area (ha)	SPA	Ramsar	Location		Population size	Year	Season	Accuracy
				Lat.	Long.				
Yorkutayakha river									
SWEDEN									
SE065: Hoburgs Bank	122,673	Hoburgs bank - SE0340144		56°34 N	18°23 E	90k – 426k	2009-11	W	Good
SE001: Taavavuoma	54,000	Tavvavuoma - SE0820619	Tavvavuoma	68°29 N	20°41 E	50 pairs	2009	B	Good
SE014: Lake Ånnsjön-Storlien	110,000		Ånnsjön	63°13 N	12°19 E	10 – 30 pairs	2000	B	Poor
SE066: Northern Midsjö Bank	32,700	Norra Midsjöbanken - SE0330273		56°21 N	17°13 E	63k – 76k	2009-11	W	Good
SE067: Southern Midsjö Bank	81,430			55°46 N	17°23 E	22k – 137k	2009-11	W	Good
SE050: Coastal areas of eastern Gotland island[37]	150,000	Ålarve - SE0340114 Asunden - SE0340154 Austerrum - SE0340161 Faludden - SE0340099 Flisviken - SE0340162 Grötlingboudd-Ytterholmen - SE0340098 Heligholmen - SE0340121 Hummelbosholm - SE0340016 Langhammars - SE0340094 Laus holmar - SE0340021 Lausvik - SE0340167 Närsholmen - SE0340017 Ryssnäs - SE0340155 Sigdesholm - SE0340106 Skenholmen - SE0340127 Södra Grötlingboudd - SE0340105 Yttre Stockviken - SE0340104	Gotland, east coast	58°21 N	18°48 E	11k – 15k	2009-11	W	Good

[37] Listed by BirdLife International but not considered an important area for Long-tailed Duck by national experts.

ANNEX 3.

National legal status, conservation actions, monitoring and site protection

Range State	Denmark	Estonia	Faroe Islands	Finland	Germany	Greenland	Iceland	Ireland	Latvia	Lithuania	Norway	Poland	Russian Federation	Sweden	UK
Is LtD legally protected?	G[38]	G	Yes	G	Yes	G	G	Yes	G	Yes	G	Yes	G	G	Yes
Does LtD have a national red list status?[39]	No	No	No	LC	NT	LC	No	Red	No	No	No	No	No	EN	Red
Is there a national action plan?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Is there a national working group	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Are there ongoing targeted conservation actions?[40]	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	Yes
Is there a national survey programme?	Yes	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes
Are protected areas surveyed?[41]	Yes	Partly	U	U	Yes	No	U	No	Partly	Partly	U	U	U	Partly	Partly
Percentage of national population occurring in IBAs	U	U	U	U	U	U	U	<10	>80	80	60-70	U	U	U	U
Percentage of national population occurring on EU SPAs	14	100	n/a	0	80	n/a	n/a	0	84.5	0[42]	n/a	0	n/a	53	6.5
Percentage of national population occurring on Ramsar sites	U	U	U	U	U	U	U	<1	0	0	55-60	U	U	U	6.5
Percentage of national population occurring in areas protected by national law	U	U	U	U	U	U	U	<10	>80	10	9-13	U	U	U	U

[38] G indicates that the species is a managed game species
[39] LC = Least Concern, NT = Near Threatened, EN = Endangered
[40] For relevant countries, data are from http://bd.eionet.europa.eu/article12/summary; the designation of protected areas is not included as a targeted conservation action
[41] U = unknown
[42] A new offshore SPA is under designation upon which nearly 100% of Long-tailed Ducks wintering in Lithuania will be protected

ANNEX 4.

Key harvest statistics for Long-tailed Duck in each Principal Range State

Principal Range State	Season	Annual harvest	Harvest trend
Denmark	1 Oct – 31 Jan; no bag limit	Mean 2008-12: 1,440	Stable
Estonia	20 Aug – 30 Nov; no bag limit	Mean 2000-12: 68 (annual maximum 223) Mean 2008-12: 25 (annual maximum 70)	2000-12: decline 2008-12: stable
Faroe Islands (to Denmark)	Not hunted	Not hunted	n/a
Finland	1 Sep – 31 Dec; occasional spring hunting permitted but none since 2011 (and banned in 2013)	Mean 1996-2013: 14,419 (range 6,200-35,500) Mean 2009-13: 12,220	1996-2013: -53% 2001-13: +50%
Germany	Not hunted	Not hunted	n/a
Greenland (to Denmark)	1 Sep – 28/29 Feb	<1,000 birds p.a.	Unknown
Iceland	1 Sep – 15 Mar	Mean 1995-2012: 1,364 Mean 2008-12: 816	Decline
Ireland	Not hunted	Not hunted	n/a
Latvia	16 Sep – 30 Nov; also limited in Aug (3 days per week from 2nd week)	Unknown, but thought to be very small	Unknown
Lithuania	Not hunted	Not hunted	n/a
Norway	10 Sep – 23 Dec; no bag limit	Mean 1992-2012: 960 Mean 2008-12: 260	1992-12: decline 2008-12: stable
Poland	Not hunted	Not hunted	n/a
Russian Federation	Autumn - mid Aug until freezing (Sep-Nov) Spring - 10 days, period varies regionally Summer - unregulated subsistence	Unknown	Unknown
Sweden	Varies regionally; typically mid Aug – end Nov or end Jan	In 1950-90 *c.*7000 p.a. Very few since 2000	Decline
United Kingdom	Not hunted	Not hunted	n/a

The largest harvest is taken in Finland, at around 10,000 birds annually since 2001, with larger numbers in years when a spring harvest has been permitted, though this has not taken place since 2011 due to the decline in population size, and was more formally banned in 2013. Prior to 2001, an average of 25,870 birds were harvested annually during the period 1996-2000, and in the late 1980s and early 1990s the annual harvest was in the range of 30,000–80,000 birds (precise annual estimates are not available). These harvest levels are considered to have been sustainable by Finnish game management authorities as they constituted <2% of the population size at that time. The size of the annual bag declined rapidly from 2001, averaging 8,140 during 2001-05, as a result of the long-term population decline, but has increased again in the most recent five year period, averaging 12,220 birds during 2009-13 and peaking in the most recent year with a total of 19,400 in 2013, the largest annual bag since 2000. This is most likely a result of increased opportunity for hunters due to more extensive ice-free conditions and thus a greater number of birds wintering in Finnish waters. This harvest remains <1% of the current total population size. Annual fluctuations are also partially caused by the regulation or closure of spring hunting. In Finland, Long-tailed Ducks are hunted by a relatively small number of hunters, and the harvest statistics and current methodology tend to overestimate hunting pressure.

In all other countries where the bag size trend is known it has declined, though in some the trend has now stabilised at a lower level.

In Denmark, around 1,500 birds are currently taken annually, the second largest national harvest of Long-tailed Ducks. This harvest has declined from around 9,000 in the early 1990s (Noer *et al*. 2009).

In Sweden, a relatively large bag of *c*.15,000-25,000 was taken annually during the mid 1990s, but averaged *c*.7,000 over the long-term before this (1950-1990). Since the mid 1990s, the annual harvest decreased rapidly and is now negligible; 130 were harvested in 2007 (Skov *et al*. 2011).

In Norway, a continued decline in population size will most likely mean Long-tailed Duck will be removed from the game list in 2017, when it is next reviewed. In local communities in northern Lapland, a traditional limited spring hunt included Long-tailed Duck until it was prohibited in 2012, however, this tradition still goes on to some extent in spite of the prohibition.

In Russia, Long-tailed Duck is of low importance to local communities with no strong hunting traditions. It generally forms <1.5% of the bag, based on collected game statistics. In some indigenous communities on the tundra it has greater importance, but the numbers hunted are still believed to be low.

In Iceland, the number of Long-tailed Duck hunted annually has also declined from a mean of 1,755 during 1995-99, to 815 during 2008-12. This decline is not thought to reflect population trajectories, rather it relates to a decrease in the number of auk hunters who are responsible for the majority of the Long-tailed Duck harvest, taken opportunistically whilst hunting auks. Whilst hunting is a major threat to some bird populations in Greenland, apparently very few Long-tailed Ducks are shot there.

ANNEX 5.

Knowledge gaps pertinent to the conservation of the Long-tailed Duck

Category	Attribute	Knowledge gap	Importance	Population[1]
Threat	Inter-specific competition	Linkages between predation of Blue Mussel by invasive Round Goby and impacts on Long-tailed Duck abundance	Medium	WS/NE
Threat	Inter-specific competition	Suitable control measures for invasive Round Goby	Medium	WS/NE
Threat	Inter-specific competition	Ecological impacts of introduced fish at breeding sites in Scandinavia	Low	WS/NE
Threat	Wind farm development	Collision risk estimate for migrating Long-tailed Ducks	Low	WS/NE
Threat	Wind farm development	Cumulative effects of multiple wind farm developments, particularly in the Baltic Sea	High	WS/NE
Threat	Other development	Cumulative effects of other renewable energy and infrastructure development in non-breeding areas	Low	WS/NE
Threat	Eutrophication	Effect of eutrophication or reduced nutrient loading on quality and quantity of key food species in the Baltic Sea	High	WS/NE
Threat	Hazardous substances	Effects of hazardous substances on quality and quantity of key prey species and on Long-tailed Duck populations	Medium	WS/NE
Threat	Vitamin deficiency	Establish prevalence of Thiamine deficiency in Long-tailed Duck population, and identify causes	Low	WS/NE; I/G
Threat	Oiling	Reliable estimates of annual numbers of birds affected by oiling incidents	High	WS/NE; I/G
Threat	Bycatch	Up-to-date estimates of annual bycatch from both wintering and breeding areas	High	WS/NE
Threat	Bycatch	Information on scale of bycatch related to precise distribution information, to allow interpretation of caught numbers	Medium	WS/NE
Threat	Hunting bag	Data on bag size and/or trend in bag size from Russia, Latvia and Greenland	Low	WS/NE; I/G
Threat	Predation	Rate of expansion of native and non-native ground predators in breeding areas	Low	WS/NE
Threat	Disturbance	Sensitive areas to disturbance from shipping activities	Low	WS/NE; I/G
Threat	Disturbance	Impact of disturbance from hunting, particularly at key feeding areas	Medium	WS/NE; I/G
Population status	Population delineation	Location of the definitive population boundary at the eastern edge of the breeding range in Taymyr Peninsula	Medium	WS/NE
Population status	Population delineation	Winter distribution of Iceland/Greenland population, particularly around British Isles	Low	I/G
Population status	Population delineation	Breeding distribution of birds wintering around Iceland	Low	I/G
Population status	Distribution	Breeding distribution and location of core breeding densities in Greenland	Medium	I/G
Population status	Distribution	Location of key wintering areas around Greenland, Iceland and other northern seas	Medium	WS/NE; I/G
Population status	Distribution	Location of unknown key wintering and stop-over areas in the Baltic Sea and Russia	Medium	WS/NE

Category	Attribute	Knowledge gap	Importance	Population[1]
Population status	Distribution	Location of core breeding densities in Russia	High	WS/NE
Population status	Distribution	Location of all key moult sites	High	WS/NE; I/G
Population status	Movements	Migration routes of birds wintering in coastal Norway	Medium	WS/NE
Population status	Movements	Migration routes of birds wintering in British Isles	Low	WS/NE; I/G
Population status	Movements	Distribution changes within wintering areas in relation to ice cover and other environmental factors	High	WS/NE; I/G
Population status	Movements	Within-winter movements and site use	Medium	WS/NE; I/G
Population status	Movements	Between-winter site fidelity	Low	WS/NE; I/G
Population status	Movements	Moult migrations	Medium	WS/NE; I/G
Population status	Population size	Consensus on current population size of WS/NE population	Medium	WS/NE
Population status	Population size	Accurate estimates of population size	High	WS/NE; I/G
Population status	Population size	Abundance in Caspian and Black Seas	Low	WS/NE
Population status	Population trend	Trend of WS/NE population since 2009	High	WS/NE
Population status	Population trend	Trend of I/G population	High	I/G
Population status	Population structure	Estimate of sex ratios in winter flocks	Medium	WS/NE; I/G
Population status	Survey methods	Consensus on the best survey methods e.g. aerial or ship-based, for accurate population size estimates	High	WS/NE; I/G
Population status	Data analysis	Can datasets from aerial and ship surveys be combined for accurate estimation of population size and trend	Medium	WS/NE; I/G
Demography	Annual breeding success	Population scale estimates of annual breeding success (based on winter ratios of adult males, young males, and females)	High	WS/NE; I/G
Demography	Annual breeding success	Estimates of clutch size, hatching success, fledging success and other breeding season parameters	Medium	WS/NE; I/G
Demography	Annual breeding success	Estimate of breeding propensity of individual females in WS/NE population	High	WS/NE
Demography	Annual breeding success	Estimate of breeding propensity of individual females in I/G population	Medium	I/G
Demography	Survival	Estimate of survival rates for all age/sex cohorts in both populations	Medium	WS/NE; I/G
Population dynamics	Limitations to productivity	Clarify causes of apparent low breeding success, e.g. faltering lemming cycles	High	WS/NE; I/G
Population dynamics	Limitations to productivity	Extent to which breeding success governed by food availability in spring staging, and potentially wintering areas	High	WS/NE; I/G
Ecology	Diet during spring	Proportional representation of prey types, e.g. Bivalves, fish, in spring diet	Medium	WS/NE; I/G
Ecology	Limitations to food availability	Extent of 'drying-out' of tundra pools in key breeding areas, and effects on invertebrate abundance	Medium	WS/NE; I/G
Ecology	Limitations to	Evidence of phenological mismatch	Medium	WS/NE; I/G

Category	Attribute	Knowledge gap	Importance	Population[1]
	food availability	relating to arrival of females, hatching, and emergence of aquatic invertebrates		
Ecology	Limitations to food availability	Identify key limitations to food availability in wintering and staging areas	High	WS/NE; I/G
Methods		Consensus on census methodology	Medium	WS/NE; I/G
Methods		Can datasets from aerial and ship surveys be combined for accurate estimation of population size and trend	Medium	WS/NE; I/G

[1] WS/NE = West Siberia/North Europe population; I/G = Iceland/Greenland population.