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THIRD MEETING OF THE STANDING COMMITTEE
04 - 05 July 2005, Bonn, Germany

**DRAFT SINGLE SPECIES ACTION PLAN FOR THE LIGHT-BELLIED
BRENT GOOSE *Branta bernicla hrota*,
EAST CANADIAN HIGH ARCTIC POPULATION**

INTRODUCTION

The Single Species Action Plan for the Light-bellied Brent Goose *Branta bernicla hrota*, East Canadian High Arctic population, has been initiated by AEWA. The plan covers the range of the sub-species. The drafting of the plan has been contracted out to the Wildfowl & Wetlands Trust (UK) and has been compiled mainly by Dr. James Robinson.

This draft represents a version that had been circulated amongst expert organisations within the sub-species' range, and all amendments have been incorporated. It is being sent out to Range States to which the plan applies, and their feedback was sought until 31 May 2005.

The Technical Committee is reviewed the present latest draft at its 6th meeting in May 2005 and made a proposals that Spain and France should also be included as range states for the sub-species on the basis of growing numbers of wintering birds in these two countries. Currently the WWT is working on extending the scope of the SSAP that should be resubmitted to the Secretariat within the next weeks. Afterwards the second draft will be sent out for comments to the AEWA Focal Points in the two countries. The final draft will be circulated by e-mail within the Technical Committee after the deadline for comments and Committee's agreement will be sought on submission of the SSAP to MOP3.

ACTION REQUESTED FROM THE STANDING COMMITTEE

The Standing Committee is requested to principally approve the SSAP to be submitted to MOP3 with the provision that its scope will be extended and the Technical Committee should also approve the second draft prior to MOP3.

**AEWA International Single Species Action Plan
for the
Light-bellied Brent Goose
Branta bernicla hrota
(East Canadian High Arctic population)**

Version for consultation

April 2005

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Milestones in the production of the Plan

Workshop: 30 September-3 October 2003, WWT Castle Espie, Strangford Lough, Northern Ireland
First draft: February 2004
Second draft: May 2004
Third draft: April 2005

Geographical scope

This AEWA International Single Species Action Plan requires implementation in the following countries regularly supporting East Canadian High Arctic Light-bellied Brent Geese: Canada, Greenland, Iceland, Ireland and the UK.

Reviews

This AEWA International Single Species Action Plan should be reviewed and updated every three years (first review 2007). An emergency review will be undertaken if there are sudden major changes liable to affect the population.

Credits

Thanks go to Bert Lenten, Yuki Itakura (both UNEP/AEWA Secretariat) and Lorraine Robinson who provided support during the preparation of this AEWA International Single Species Action Plan. Kendrew Colhoun edited the third draft.

Recommended citation: Robinson, J.A. 2004. AEWA International Single Species Action Plan for the Light-bellied Brent Goose *Branta bernicla hrota* (East Canadian High Arctic population). Agreement on the Conservation of African-Eurasian Migratory Waterbirds, Bonn.

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Executive summary

The East Canadian High Arctic (ECHA) Light-bellied Brent Goose *Branta bernicla hrota* breeds in Canada's eastern Queen Elizabeth Islands with the great majority wintering on the coastline of the island of Ireland and smaller numbers on the Channel Islands and northern France. It is protected under the general provisions of the European Union Directive on the Conservation of Wild Birds (79/409/EEC) (Birds Directive), the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and the Canada–U.S. Migratory Birds Convention 1916. The population is listed under Category A (2) of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), prepared under the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention/ CMS), because there are only between 10,000 and 25,000 individuals in the population.

The key threats to this population are habitat loss/degradation, natural disasters, changes in native food species dynamics (e.g. *Zostera* wasting disease) and pollution (directly through oil/chemical spills or indirectly through the potentially catastrophic effects and impacts of climate change). Other less important threats include illegal persecution, accidental mortality, disturbance, invasive alien species (e.g. *Spartina* encroachment in estuaries or potential competition with other geese on the breeding grounds) and intrinsic factors (restricted range, low productivity, climate-caused periodic non-production). In light of the small number of countries involved, and given the history of cooperative international conservation and research initiatives, it has been deemed appropriate to take an international approach to the conservation of this population, with the production of an AEWA International Single Species Action Plan (SSAP).

This AEWA International Single Species Action Plan provides a framework for the conservation for the ECHA Light-bellied Brent Goose and is based on the format prepared by BirdLife International. Successful implementation of this SSAP will require effective international co-ordination of organisation and action. The broad aim of this SSAP will be for the long term to restore the ECHA Light-bellied Brent Goose to favourable conservation status, i.e. by removing it from Column A (2) of the AEWA and therefore negating the formal requirement for an action plan. The aim of the SSAP is, in the short term, to maintain the current population and distribution of the population throughout its range and, in the long-term, to secure a population size of more than 25,000 individuals. The SSAP has been developed using internationally agreed standards for identifying actions and has been prepared specifically to facilitate the monitoring and evaluation of subsequent implementation, linking threats, actions and measurable objectives.

This SSAP will need implementation in five countries. The activities identified in this SSAP focus on the protection of the population and its habitats, appropriate management of key sites, and developing our understanding of the population and its conservation through research and monitoring. Each country within the core range of the population should commit to implementing this SSAP and develop National Action Plans.

The first international workshop held for this population was convened at the Wildfowl & Wetlands Trust, Castle Espie (Strangford Lough, Northern Ireland) in autumn 2003. Experts attended from throughout the range of the Light-bellied Brent Goose, gave various presentations on the biology of the population and its conservation, and discussed the threats posed to the population and necessary conservation activities required to improve its conservation status.

The ECHA Light-bellied Brent Goose Working Group is the International Species Working Group (ISWG) for implementation of this SSAP. It is proposed that this working group will work under the auspices of the AEWA Technical Committee. This group will comprise representatives of the five Range States, relevant international interest groups and several technical advisors.

1. Biological assessment

<p>General information</p>	<ul style="list-style-type: none"> • The East Canadian High Arctic (ECHA) population of Light-bellied Brent Geese <i>Branta bernicla hrota</i> breeds in Canada's eastern Queen Elizabeth Islands with the great majority wintering on the coastline of the island of Ireland, and smaller numbers in the Channel Islands and northern France. It comprises around 22,000 individuals in winter and is listed under Category A (2) of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA). • Robinson <i>et al.</i> (2004) have produced a review that provides detailed information on abundance, trends, population delimitation, ecology and threats across the range of this population. It is an essential companion document to this AEWA International Single Species Action Plan (SSAP). • The first International Workshop held for this species was convened at the Wildfowl & Wetlands Trust, on the shores of Strangford Lough in Northern Ireland, in autumn 2003. Experts attended from throughout the range of this population and gave various presentations on the biology of the species and its conservation requirements. The workshop promoted cooperation and exchange of knowledge between researchers and conservationists and resulted in formal support for the production of an AEWA SSAP for this population of Brent Geese.
<p>Taxonomy</p>	<ul style="list-style-type: none"> • Phylum: <i>Chordata</i> • Class: <i>Aves</i> • Order: <i>Anseriformes</i> • Family: <i>Anatidae</i> • Species: <i>Branta bernicla</i> • Race/subspecies: <i>Branta bernicla hrota</i> • Biogeographical population: Eastern Canadian High Arctic
<p>Population development</p>	<ul style="list-style-type: none"> • There are no reliable estimates of population size in winter prior to the 1950s. Anecdotal information suggests that between 1850 and 1950 the population appeared to decline rapidly, possibly as a consequence of the disappearance of its favoured food <i>Zostera</i> from key sites (in the 1930s), and also hunting in European countries during the non-breeding season. The population was estimated at around 6,000 in the mid 1950s, rising to around 11,900 by 1960/61, when the first complete census was undertaken. Counts made in the 1960s and 1970s indicated that numbers fluctuated between 7,300 and 13,000 birds. Successful breeding seasons in the early 1980s were probably responsible for a rapid increase in numbers to around 25,000 individuals by winter 1985/86. Numbers fell, however, through the late 1980s and 1990s as the population levelled to around 20,000 birds. Low production through the 1990s caused the population to decline to around 8,300 birds in winter 1992/93. Since then, numbers have increased markedly, after several years of high productivity, to a high of over 26,000 in autumn 2003. • A global population of about 22,000 birds seems likely, although the true number may be higher (Wetlands International 2002; Irish Brent Goose Research Group unpubl. data).
<p>Distribution throughout the annual cycle</p>	<ul style="list-style-type: none"> • Breeds in the eastern Queen Elizabeth Islands, north of Lancaster Sound, from eastern Melville Island east to northern Ellesmere Island (Merne <i>et al.</i> 1999). Almost the entire population winters on the coastline of the island of Ireland with much smaller numbers reaching the Channel Islands, the west coast of Britain, the north coast of France, and the Galician coast of northern Spain (Robinson <i>et al.</i> 2004). There are three other

	<p>recognised biogeographic populations of Light-bellied Brent Geese: a) the Western High Arctic Light-bellied Brant Goose that breeds on Melville Island, Prince Patrick Island and other smaller adjacent islands and winters in the northern Puget Sound area on the Pacific coast of the USA (population estimate: 7,500 individuals); b) the Atlantic Brant that breeds in the eastern low arctic of Canada, from Queen Maud Gulf east to Baffin Island and from Southampton Island to Somerset Island and winters on the Atlantic coast of the USA (population estimate: 181,600 individuals); and c) the East Atlantic Light-bellied Brent Goose that breeds in Svalbard and northeast Greenland and winters around the North Sea (population estimate: 5,000 individuals) (Merne <i>et al.</i> 1999; Wetlands International 2002). Ringing studies have suggested that there is very little interchange between these populations. The question of interchange is, however, now being evaluated through studies using genetic markers.</p> <ul style="list-style-type: none"> ECHA Light-bellied Brent Geese migrate through Greenland and Iceland in spring and autumn (Boyd & Maltby 1979; Gudmundsson <i>et al.</i> 1995; Boertmann <i>et al.</i> 1997; Gardarsson & Gudmundsson 1997). The list of countries used by the population during the breeding and non-breeding seasons is presented in Table 1. A distribution map and probable flyway delimitation are shown in Fig. 1. 			
Survival and productivity	<p>Between winters 1960/61 and 1999/2000, the mean proportion of first-winter birds in flocks was 14% (range 0-47%; Robinson <i>et al.</i> 2004). Over this period, mean brood size varied between 0 and 3.1 juveniles per pair on the wintering grounds. Although there have been marked birds in the population, survival rates have never been accurately assessed because too few birds have been marked and recaptured.</p>			
Life history	<p>Pre-breeding: Counts indicate that the entire flyway population occur in W Iceland during spring stopover. First arrivals are in early April, peak arrivals in early May and synchronous departure in the last week of May. Satellite-tracking indicates a rapid passage through Greenland in most years and arrivals to the breeding grounds in the Eastern Queen Elizabeth Islands during the first half of June.</p>	<p>Breeding: The results of the only intensive study made on the breeding grounds suggest that nests are isolated and widely dispersed, usually associated with freshwater lakes or braided riverbeds (Ó Briain <i>et al.</i> 1998). Some small colonies occur on offshore islands. Brood-rearing occurs on the shorelines of estuaries, lakes and rivers. In that study, mean clutch size was 4.5 eggs per pair. Mean incubation period was 23 days. Hatching occurred between 11 and 14 July. On lakes, broods were raised singly or in loose groups of 2-3 families, whereas on rivers and estuaries groups of</p>	<p>Feeding: The species is herbivorous. On the breeding grounds, broods feed on sparsely distributed graminoids and other fleshy plants and mosses (Ó Briain <i>et al.</i> 1998). On the wintering grounds, birds rely almost entirely on intertidal <i>Zostera</i> in the late autumn and early winter (Portig <i>et al.</i> 1994; Mathers <i>et al.</i> 1998a, b). Algal foods such as <i>Enteromorpha</i> and <i>Ulva</i> and saltmarsh plants such as <i>Festuca</i> and <i>Puccinella</i> become increasingly more important later in the winter. Inland feeding has been recorded since the mid 1970s (Merne <i>et al.</i> 1999). Birds feed on improved grasslands, autumn stubbles, winter and spring</p>	<p>Post-breeding: Moult movements are poorly understood, but small flocks of non-breeding individuals gather to moult around lakes, river valleys and mouths of estuaries (Ó Briain <i>et al.</i> 1998). Some failed breeders moult in the vicinity of the nest site. Others have been captured during moulting on Prince Patrick and Melville Islands. Birds arrive in northwest Greenland from late August and most have left by mid September. Large numbers stage in western Iceland during the autumn. Small numbers arrive at Irish sites in County Kerry and at Strangford Lough (County Down) in</p>

		up to 15 families were observed. There is no known information on nesting or fledging success.	cereals, and waste potatoes.	late August. The main arrival, however, occurs in late October (Robinson <i>et al.</i> 2004).
Habitat requirements	Habitat type*		Breeding	Non-breeding
	5. Wetlands (inland)			
	5.1. Permanent Rivers/Streams/Creeks [includes waterfalls]		■	
	5.2. Seasonal/Intermittent/Irregular Rivers/Streams/Creeks		■	
	5.5. Permanent Freshwater Lakes [over 8 ha]		■	
	5.6. Seasonal/Intermittent Freshwater Lakes [over 8 ha]		■	
	5.7. Permanent Freshwater Marshes/Pools [under 8 ha]		■	
	5.8. Seasonal/Intermittent Freshwater Marshes/Pools [under 8 ha]		■	
	5.10 Tundra wetlands [includes pools and temporary waters from snowmelt]		■	
	5.14. Permanent Saline, Brackish or Alkaline Lakes		■	■
	5.15. Seasonal/Intermittent Saline, Brackish or Alkaline Lakes and Flats		■	■
	5.16. Permanent Saline, Brackish or Alkaline Marshes/Pools		■	■
	5.17. Seasonal/Intermittent Saline, Brackish or Alkaline Marshes/Pools		■	■
	9. Sea			
	9.2. Shallow [usually less than 6 m deep at low tide; includes sea bays and straits]		■	■
	10. Coastline			
	10.1. Rocky shores [includes rocky offshore islands and sea cliffs]			■
	10.3. Estuarine Waters		■	■
	10.4. Intertidal Mud, Sand or Sand Flats		■	■
	10.5. Intertidal marshes [includes salt marshes]		■	■
	10.6. Coastal Brackish/Saline Lagoons		■	■

10.7. Coastal Freshwater Lagoons	■	■
11. Artificial - Terrestrial		
11.1. Arable land		■
11.2. Pastureland		■
11.5. Urban areas		■
12. Artificial - Aquatic		
12.8. Seasonally Flooded Agricultural Land		■

*The number preceding each descriptor is the GLCC classification number, see: <http://edcdaac.usgs.gov/glcc/glcc.html>

Fig. 1. Global distribution of the East Canadian High Arctic Light-bellied Brent Goose *Branta bernicla hrota* (breeding areas – black, non-breeding areas – grey, delimitation of flyway – hatched line)

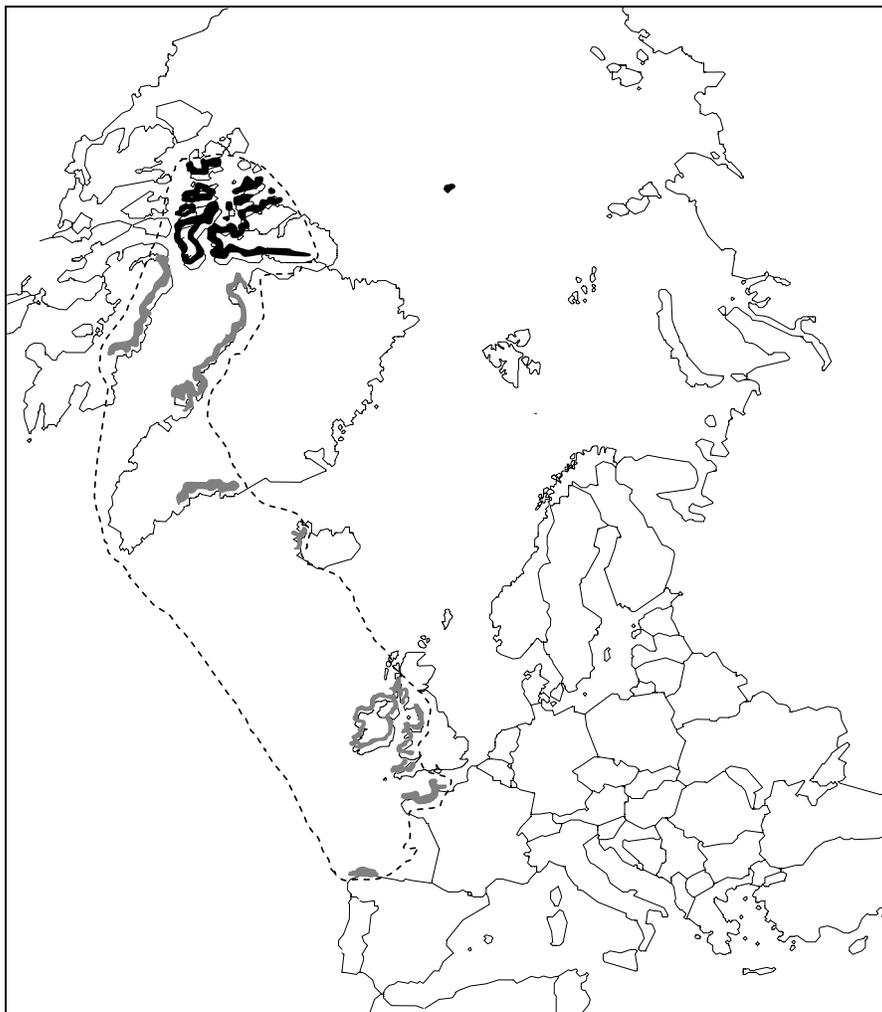


Table 1. Geographical distribution of the East Canadian High Arctic Light-bellied Brent Goose *Branta bernicla hrota* during the annual cycle (v – vagrant only).

Breeding season	Non-breeding season
Canada	France (several hundred birds) Greenland Iceland Ireland Spain (v) United Kingdom

2. Available key knowledge

The most contemporary information on the numbers and trends for the ECHA Light-bellied Brent Goose across its range is presented in Table 2. More detailed information on the populations, demography and ecology of the species and gaps in knowledge are presented in Robinson *et al.* (2004).

Table 2. Numbers and trends for the Light-bellied Brent Goose *Branta bernicla hrota* in individual range states (in alphabetical order). (Grey cells represent periods when the species is probably not present in the country)

Country	Breeding Season						Non-breeding season				
	No. Breeding (pairs)	Quality	Year(s) of Estimate	Trend	Quality	Year(s) of Estimate	No. Migrating or Non-breeding (indivs) ¹	Quality	Year(s) of Estimate	Trend	Quality
Canada		3			3						
France							700	2	2003		2
Greenland								3	2003		3
Iceland							>17,000	2	2003		2
Ireland							16,000	1	2002	+1	1
Spain							<50	1	2003	+1	1
United Kingdom							25,000	1	2003	+1	1

Comment [KC1]:
Responding to Gudmundur's point about all-Ireland figures. I have updated but have to treat UK (Northern Ireland) and "Ireland" separately. Figures refer to maxima in recent years.

Quality: Data quality is assessed by assigning one of the following categories: **1** Reliable quantitative data (e.g. atlas data or monitoring data) are available for the whole period and region in question; **2** Species generally well known, but only poor or incomplete quantitative data available; and **3** Species poorly known, with no quantitative data available.

Trend: Trend in numbers is assessed by assigning to one of the following categories: **+2** Large increase of at least 50% between 1995 and 2002; **+1** Moderate increase of 20-49% between 1995 and 2002; **0** Stable, with overall change less than 20% between 1995 and 2002; **-1** Moderate decrease of 20-49% between 1995 and 2002; **-2** Large decrease of at least 50% between 1995 and 2002; and **F** Fluctuating with changes of at least 20%, but no clear trend since 1995.

¹It should be noted that there is considerable redistribution of this population of Brent Geese during the non-breeding season and, therefore, simply adding peak counts from each country cannot derive the international population estimate. The vast majority of the 25,000 birds recorded at peak times in the UK are confined to Northern Ireland; the peak number of birds in Ireland estimated from counts made at sites south of the border (i.e. The Republic of Ireland). The international population size is estimated during a systematic and synchronised census of all key sites in the island of Ireland (and in recent years Iceland) during the late autumn.

3. Threats

The ECHA Light-bellied Brent Goose faces various threats throughout its range. In this section, a comprehensive description of the threats facing the ECHA Light-bellied Brent Goose at a global scale, together with information on special cases, and the relative importance of each threat for the global population, is presented. In addition, a complete list of the threats facing the species in the breeding and non-breeding seasons, and their relative importance, is presented in Table 3. All threats have been identified according to categories listed in the IUCN Species Survival Commission SIS Threats Authority files.

The criteria used to assess threats in this review are:

Critical	a factor causing or likely to cause very rapid declines (>30% over 10 years);
High	a factor causing or likely to cause rapid declines (20-30% over 10 years);
Medium	a factor causing or likely to cause relatively slow, but significant, declines (10-20% over 10 years);
Low	a factor causing or likely to cause fluctuations ;
Local	a factor causing or likely to cause negligible declines ;
Unknown	a factor that is likely to affect the species but it is not known to what extent.

3.1. Description of threats

Threat	Overall importance	Specific threat category	Issues
Habitat Loss/Degradation (human induced)	HIGH	<ul style="list-style-type: none"> • Agriculture (Marine aquaculture) • Infrastructural development (Industry, Human settlement, Tourism/Recreation, Dams) • Invasive alien species (directly impacting habitat) 	Many of the most important sites used by ECHA Light-bellied Brent Geese have been proposed for human development, especially on the wintering grounds (Heath & Evans 2000). Proposals for new developments across the range will undoubtedly increase the pressure on the carrying capacity of the small number of sites used and require sensitive management. The encroachment of <i>Spartina</i> has been identified as a potential threat to the feeding areas used by birds on the wintering grounds (Heath & Evans 2000; NATURA & Robinson 2003). However, the scale of the problem remains unknown at many sites.
Invasive alien species (directly affecting species)	LOCAL	<ul style="list-style-type: none"> • Competitors 	It remains unclear whether large increases in the populations of some large goose species, e.g. snow geese, may put pressure on the habitat used by breeding ECHA Light-bellied Brent Geese.
Accidental mortality	LOCAL	<ul style="list-style-type: none"> • Collision (Pylon and building collision) 	Accidental hunting probably occurs on a small scale throughout the non-breeding range (Robinson <i>et al.</i> 2004). Collisions with pylons have been recorded and the potential effects of wind turbines located in key areas remain unclear. The number of birds involved is, however, thought to be small.
Persecution	LOCAL	<ul style="list-style-type: none"> • Pest control 	Illegal hunting probably occurs on a small scale away from the breeding grounds. For example, in Ireland, there are known cases of farmers shooting birds to protect crops (Robinson <i>et al.</i> 2004). The number of birds involved is, however, thought to be small but may increase if the use of cropped habitats for feeding increases.
Pollution (affecting habitat and/or species)	CRITICAL?	<ul style="list-style-type: none"> • Atmospheric pollution (Global warming/oceanic warming (sea-level rise)) 	The potential effects and impacts of global climate change require urgent attention given that they are incredibly

Threat	Overall importance	Specific threat category	Issues
		<ul style="list-style-type: none"> Water pollution (Agricultural, Domestic, Commercial/Industrial, Oil slicks) 	<p>difficult to predict. On the breeding grounds, short-term effects of increased temperatures will melt the upper permafrost under vegetated areas, eventually leading to soil slumping and vegetational dieback (S. Edlund unpubl. data). The impacts of increased drought and sea-level rise on coastal nesting areas remain unknown. Alternatively, warmer temperatures in the arctic could conceivably increase production and survival rates and/or changes in the numbers of predators and competitors. The effects on the wintering and staging grounds, e.g. from loss of habitat due to sea-level rise, frozen seas due to disruption of the North Atlantic Meridional Overturning Circulation system, and erosion due to increased frequency of storms, may also be damaging but their effects are, as yet, unknown. Increased incidence or severity of storms could impact on migration, increasing mortality in some cases.</p> <p>Although the majority of studies suggest a negative impact of nutrient enrichment (both from agricultural run-off and domestic discharges) on <i>Zostera</i> beds (e.g. Borum 1985; den Hartog & Poldeman 1975), the impact may be positive in some cases (e.g. Fonseca <i>et al.</i> 1975) and the consequences for Brent Geese remain unclear. By contrast, the likely impacts of major petrochemical spills at the numerically most important sites for geese on the staging and wintering grounds could be catastrophic for the population.</p>
Natural disasters	HIGH	<ul style="list-style-type: none"> Drought Storms/flooding 	<p>Increased frequency of natural disasters due to global climate change could be damaging to habitats across the range. Drought could reduce the productivity of tundra on the breeding grounds whilst stormy conditions on the wintering grounds can remove large areas of <i>Zostera</i>, green algae and saltmarsh plants from important feeding sites.</p>
Changes in native species dynamics	CRITICAL	<ul style="list-style-type: none"> Pathogens/parasites 	<p>In the 1930s, the abundance of <i>Zostera</i> across Europe and North America was severely reduced by a 'wasting disease' (Rasmussen 1977), which may have led to a dramatic decline in the ECHA Light-bellied</p>

Threat	Overall importance	Specific threat category	Issues
			Brent Goose population The recovery of adequately surveyed beds has been limited and localised and the disease has reappeared intermittently. There is some evidence to suggest that <i>Zostera</i> succumbs to the disease when under stress from factors such as low levels of insolation, increases in temperature or pollution.
Intrinsic factors	HIGH	<ul style="list-style-type: none"> • Poor recruitment, reproduction, and/or regeneration • Restricted range 	In very cold summers (when June temperatures are below -3°C), ECHA Light-bellied Brent Geese do not breed (Ó Briain <i>et al.</i> 1998). Predators such as Arctic Foxes <i>Alopex lagopus</i> may take large numbers of young and there may be a relationship between annual productivity and the lemming cycle. Therefore, breeding success is unpredictable and, on average, the rate of success is low. The habitats used by this population in the breeding and non-breeding seasons are restricted within the geographical areas frequented. For example, at least 75% of the population occurs at Strangford Lough, Northern Ireland, in the late autumn (Ó Bríain & Healy 1991) and is susceptible to catastrophic events at this site.
Human Disturbance	MEDIUM	<ul style="list-style-type: none"> • Recreation/tourism • Transport • Other (Agricultural) • Other (Industrial) 	Disturbance can prevent Brent Geese from gaining access to food resources and roosting areas, either temporarily or for longer periods. In this respect, disturbance can be equated to net habitat loss (Mathers <i>et al.</i> 2000). The impacts of disturbance involve a reduction in body condition, productivity or survival and are of primary conservation concern and may be particularly important for population dynamics if large numbers of birds are involved.

3.2. Relative importance of threats throughout the range

A breakdown of the threats and their relative importance during the breeding and non-breeding seasons is shown in Table 3.

Table 3. Relative importance of threats to the ECHA Light-bellied Brent Goose *Branta bernicla hrota* during the breeding and non-breeding season

Threat category	Breeding	Non-breeding
1. Habitat Loss/Degradation (human induced)		
1.1. Agriculture		
1.1.6. Marine aquaculture	-	LOCAL
1.4. Infrastructure development		
1.4.1. Industry	-	HIGH
1.4.2. Human settlement	-	HIGH
1.4.3. Tourism/recreation	-	HIGH
1.4.6. Dams (Barrages etc.)	-	HIGH
1.5. Invasive alien species (directly impacting habitat)	-	MEDIUM
2. Invasive alien species (directly affecting the species)		
2.1. Competitors	-	LOCAL
4. Accidental mortality		
4.2. Collision		
4.2.1. Pylon and building collision	-	LOCAL
5. Persecution		
5.1. Pest control	-	LOCAL
6. Pollution (affecting habitat and/or species)		
6.1. Atmospheric pollution		
6.1.1. Global warming/oceanic warming	CRITICAL?	CRITICAL?
6.3. Water pollution		
6.3.1. Agricultural	-	LOW
6.3.2. Domestic	-	LOW
6.3.3. Commercial/Industrial	LOW	HIGH
6.3.6. Oil slicks	LOW	HIGH
7. Natural disasters		
7.1. Drought	HIGH	HIGH
7.2. Storms/flooding	HIGH	HIGH
8. Changes in native (food) species dynamics		
8.5. Pathogens/parasites	LOW	CRITICAL
9. Intrinsic Factors		
9.2. Poor recruitment/reproduction/regeneration	MEDIUM	-
9.9. Restricted range	MEDIUM	HIGH
10. Human disturbance		
10.1. Recreation/tourism	-	MEDIUM
10.4. Transport	-	MEDIUM
10.6. Other (Agricultural)	-	MEDIUM
10.6. Other (Industrial)	LOCAL	MEDIUM

'Problem trees' for the ECHA Light-bellied Brent Goose are shown in Fig. 2a and b. They have been produced to explain how the threats affect the population and how they are related. The root causes of the problems facing the species are shown on the right hand side of the tree.

Fig. 2a. Problem tree for the ECHA Light-bellied Brent Goose *Branta bernicla hrota* I: Direct Threats (solid bold frame – CRITICAL; hatched bold frame – HIGH, dotted thin frame – MEDIUM, solid thin frame – LOCAL; numbers in parentheses relate to IUCN SSC Threats Authority File codes)

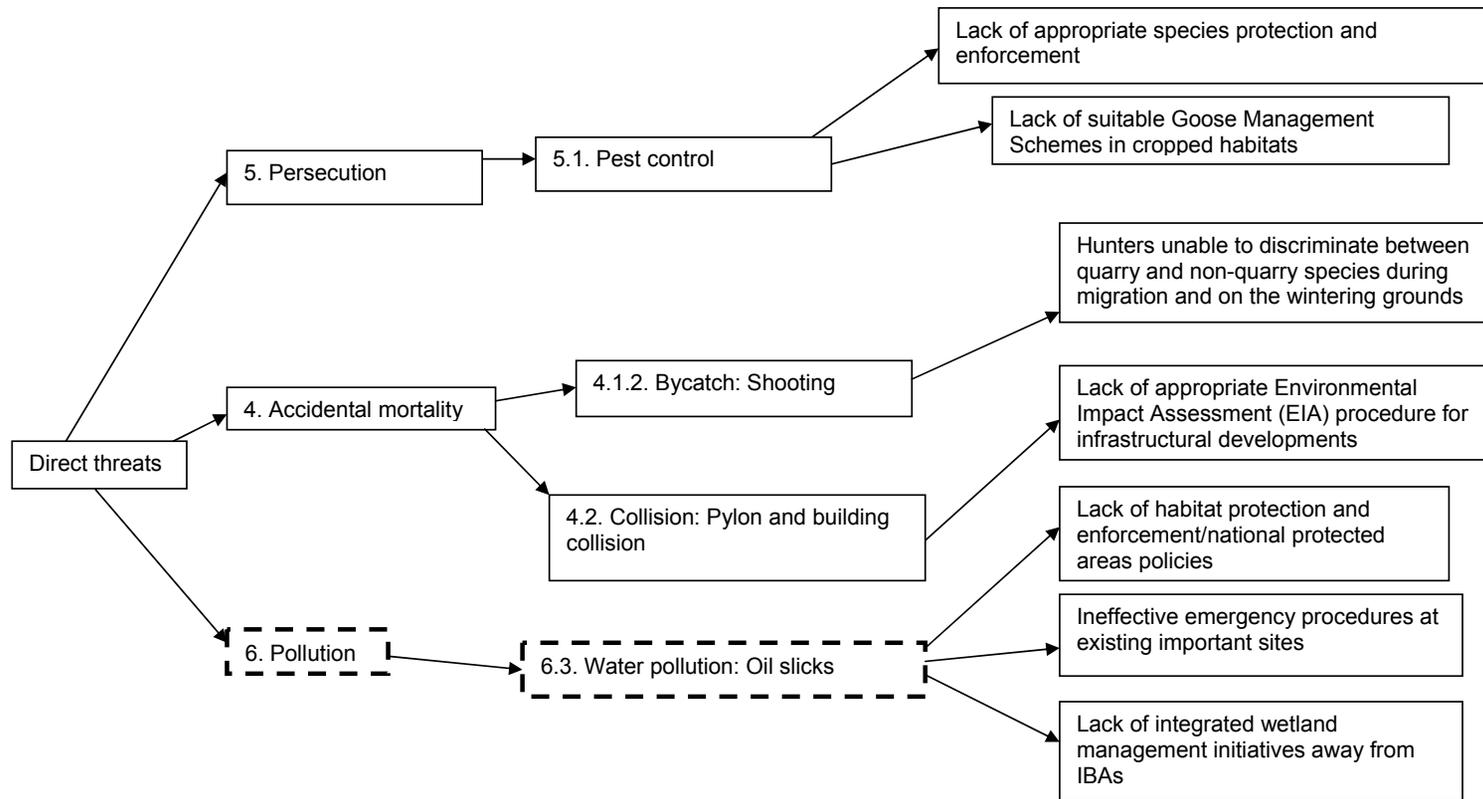
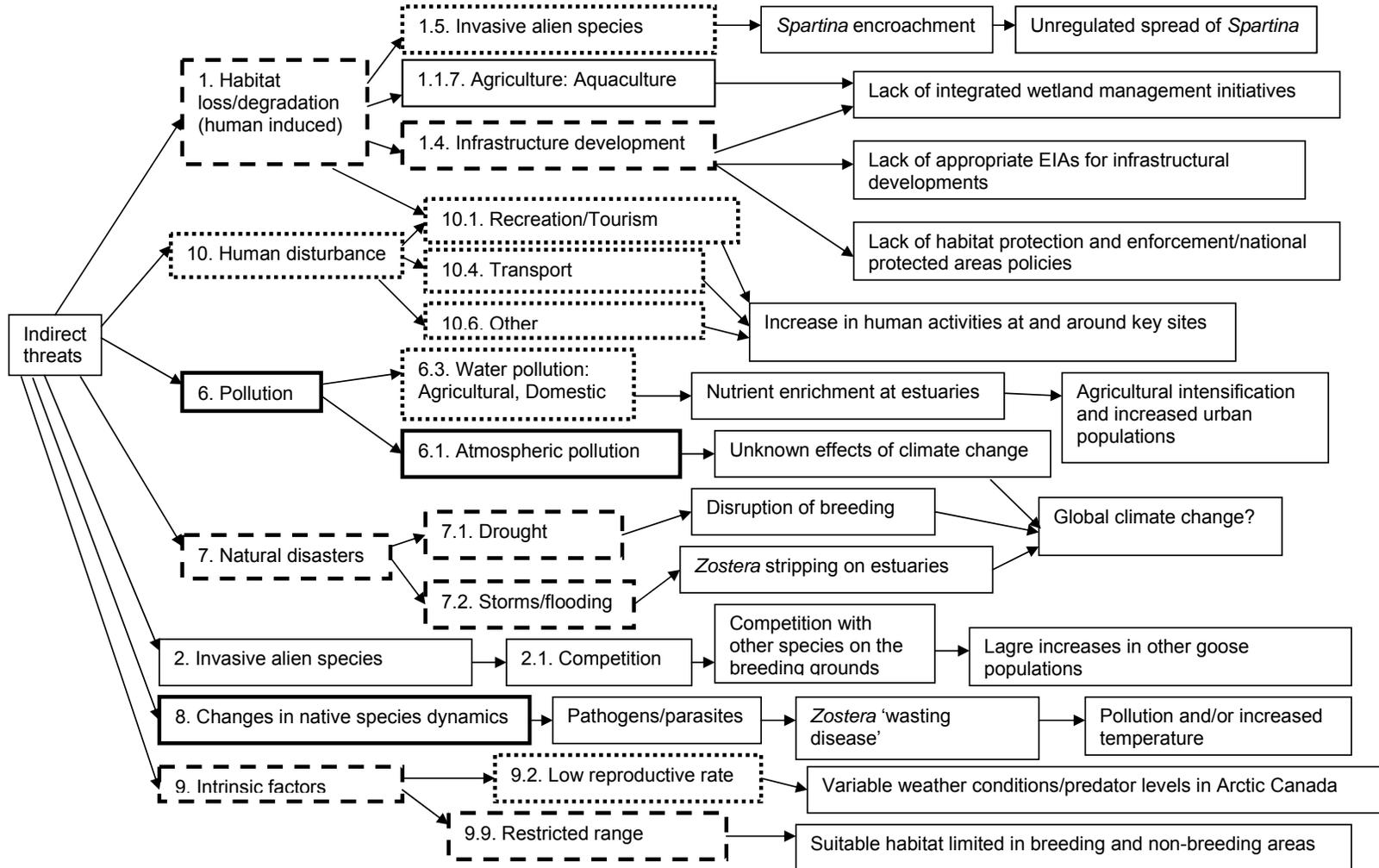


Fig. 2b. Problem tree for the ECHA Light-bellied Brent Goose *Branta bernicla hrota* II: Indirect Threats (solid bold frame – CRITICAL; hatched bold frame – HIGH, dotted thin frame – MEDIUM, solid thin frame - LOCAL; numbers in parentheses relate to IUCN SSC Threats Authority File codes)



4. Policies and legislation relevant for management

4.1. International conservation and legal status of the species

Table 4 shows the status of the ECHA Light-bellied Brent Goose under the main international legislative instruments for conservation.

Table 4. International conservation and legal status of the ECHA Light-bellied Brent Goose Branta bernicla hrota (Note: Headers in grey relate to measures relevant to European countries only).

World Status (IUCN)	European Status	SPEC category	EU Birds Directive Annex	Bern Convention Annex	Bonn Convention Annex	African-Eurasian Migratory Waterbird Agreement	Convention on International Trade in Endangered Species	Migratory Birds Convention (Canada and United States)
NT	Vulnerable	SPEC 3	II-2	Appendix III	Appendix II	A (2)	Not listed	Protected migratory game bird

4.2. Member States/Contracting Parties obligations

The obligations/commitments of Member States/Contracting Parties under various Directives/Conventions are presented in Annex 1.

4.3. National policies, legislation and ongoing activities

The species is afforded full protected under national legislation in Canada, Greenland, Iceland, Ireland and the UK. A sustained harvest, primarily for subsistence, is allowed in Canada and subsistence hunting occurs in Greenland.

4.4. Site (and habitat) protection and research

The complete list of European Important Bird Areas (IBAs) identified for the ECHA Light-bellied Brent Goose, together with their co-ordinates, the numbers of birds they support, the season for which they are important and the criteria used to identify each site, is shown in Annex 2.1. The protection status of each of these IBAs is shown in Annex 2.2. If we accept that the global population estimate is roughly 22,000, then the IBA network in Europe currently supports up to 100% during passage period in Iceland and up to 100% during the winter. There have been no IBAs identified for this population in Greenland.

Only one IBA in the United Kingdom has yet to be notified as an SPA and Ramsar site and all receive some protection under national legislation (e.g. as Areas of Special Scientific Interest and National Nature Reserves). In Ireland, all but one IBA has been designated as an SPA, 75% as Ramsar sites (the remainder having been proposed), but only 54% receive protection under national legislation (e.g. as Wildfowl Sanctuaries, Natural Heritage Areas or Nature Reserves). Of the six IBAs identified in Iceland, only one is a Ramsar site and four receive some protection under national legislation (e.g. as Conservation Areas or Nature Reserves).

In the Canadian arctic, ECHA Light-bellied Brent Geese receive protection within the following protected areas:

- Northern Ellesmere Island National Park
- Seymour Island Migratory Bird Sanctuary
- Polar Bear Pass National Wildlife Area

The following IBAs have been identified in northern Canada, and could support ECHA Light-bellied Brent Geese: NU010, NU045, NU049, NU051, NU052, NU053, NU054, NU059, NU060. Details about these sites can be found at <http://www.ibacanada.com>.

Given that nest sites are highly dispersed and the breeding range has yet to be accurately identified, it remains unclear as to what proportion of the population is protected within these areas. A new national park has been proposed (abutting the Polar Bear Pass NWA), and would include much of Bathurst Island and some surrounding adjacent islands.

4.5. Recent conservation measures

Table 5 provides a summary of some of the conservation measures already in place for the ECHA Light-bellied Brent Goose. This population remains one of the least studied of all the goose populations that spend the winter in the Western Palearctic and there are many gaps in our knowledge. A comprehensive list of published studies is presented in Section 8.

Table 5. Recent conservation measures, by country

Country	Conservation measures
<p>Joint initiatives</p>	<p>In 1989, the Canadian Wildlife Service (CWS) signed a Memorandum of Understanding with the Irish National Parks & Wildlife Service twinning Polar Bear Pass National Wildlife Area (NWA) with three nature reserves in County Dublin (North Bull Island, Rogerstown Estuary and Baldoyle Estuary) as ‘Sister Reserves’. In the same year, CWS and the Northern Ireland Department of the Environment and the Northern Ireland National Trust signed a Statement of Intent linking Polar Bear Pass NWA with areas in Strangford Lough protected by the Strangford Lough Wildlife Scheme. These agreements were implemented for a five-year period in the first instance; unfortunately, neither has been formally reviewed since (Merne <i>et al.</i> 1999; Robinson <i>et al.</i> 2004).</p> <p>Annual all-Ireland censuses were initiated by Major R.F. Rutledge in winter 1960/61 and were continued by the Irish Wildfowl Committee/Irish Wildbird Conservancy and then the Forest & Wildlife Service (predecessors of the current National Parks and Wildlife Service). Since 1996, all-Ireland censuses of this population have been organised by the Irish Brent Goose Research Group through the Wildfowl & Wetlands Trust and the Irish Wetland Bird Survey (see Robinson <i>et al.</i> 2004). Late autumn and mid-winter counts are now made. The proportion of first-year birds in flocks and brood sizes are recorded during the census.</p> <p>Satellite telemetry studies, investigating the use of key sites and migratory routes, were undertaken in the early 1990s, 2002 and 2004 (Gudmundsson <i>et al.</i> 1995; K. Colhoun, J.A. Robinson, G.A. Gudmundsson & P. Clausen unpubl. data). The genetic structuring within and between global populations of Light-bellied Brent Geese is on-going, coordinated by the Canadian Wildlife Service (CWS).</p>
<p>Canada</p>	<p>The Canadian Museum of Nature, CWS and the Irish Brent Goose Study (IBGRG) undertook studies of Light-bellied Brent Geese on Bathurst and Seymour Islands between 1968 and 1989. Much of the data collected appears in Ó Briain <i>et al.</i> (1998). Before then, ad-hoc research trips to the breeding grounds were undertaken by the CWS.</p> <p>The Nunavut Wildlife Management Board completed a territory-wide harvest survey during 1996-2001 (Nunavut Wildlife Management Board, in press). Average annual harvest of ECHA Light-bellied Brent</p>

	<p>Geese was estimated at 15 birds. CWS is currently reviewing and updating the publication "Key migratory bird terrestrial habitat sites in the Northwest Territories", (Alexander <i>et al.</i> 1991).</p>
France	<p>Counts are made annually at key sites as part of the International Waterbird Census (Debout & Leclerc 1990).</p>
Greenland	<p>The little information about Light-bellied Brent Geese in Greenland comes primarily from the studies co-ordinated by the National Environmental Research Institute, Denmark (Boertmann <i>et al.</i> 1997).</p>
Iceland	<p>Aerial and land-based counts of staging geese have been organised by the University of Iceland and Icelandic Institute of Natural History since the early 1990s (Gardarsson & Gudmundsson 1997). Autumn counts have been made by land and plane since 2002.</p> <p>Collaborative studies of stopover ecology and timing of migration is ongoing at a key site in W Iceland, including colour-marking individuals and behaviour (GA Gudmundsson & WWT/IBGRG).</p>
Ireland	<p>The Irish Wetland Bird Survey was initiated in 1994/95. Counts are made by volunteer, and some professional, ornithologists at various wetland habitats generally on the middle Sunday of each month, and primarily between September and March (Robinson <i>et al.</i> 2004).</p> <p>Studies on the distribution, feeding ecology and social behaviour of Light-bellied Brent Geese was undertaken at University College, Dublin, in the mid-1980s (e.g. Ó Briain 1989, 1991; Ó Briain & Healy 1991; Ó Briain <i>et al.</i> 1998).</p>
United Kingdom	<p>Outside of national legislative site-safeguard, the National Trust established the Strangford Lough Wildlife Scheme in 1966, which provides extra protection at this particularly important site (Merne <i>et al.</i> 1999).</p> <p>The inclusion of wetland sites in Northern Ireland within the UK Wetland Bird Survey began in 1986. Counts are made by volunteer, and some professional, ornithologists at various wetland habitats, generally on the middle Sunday of each month, and primarily between September and March (Robinson <i>et al.</i> 2004).</p> <p>The Queen's University, Belfast, has been undertaking research projects on the ecology of Light-bellied Brent Geese at Strangford Lough since the early 1990s (e.g. Portig <i>et al.</i> 1994; Mathers & Montgomery 1997; Mathers <i>et al.</i> 1998a, 1998b, 1998c, 2000). In addition, an international research programme was developed by WWT in 2000, components of which are undertaken by various members of the Irish Brent</p>

	Goose Research Group. One of the key components of this work is the marking and resighting of birds with engraved coloured plastic leg-rings to provide novel information on population dynamics and movements of individual birds.
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5. Framework for action

This section of the document identifies and defines the goal, the purpose and results of the SSAP and sets targets and the means of verification of its implementation.

The Goal is the higher level of objective to which the SSAP will contribute. The Purpose is the objective or effect of the plan. The Results are the changes that will need to have been brought about by the plan if the Purpose is to be realised. The Objectively Verifiable Indicators specify the meaning of the Results. They are designed to be easy to measure and independent from the Operational Objectives. The indicators are designed to measure the impact of the activity rather than the process undertaken to achieve it. The indicators are measured by Means of Verification, which are time bound.

The Goal, purpose, results and activities of this plan have been designed to be specific, measurable, agreed, realistic and time-bound following the internationally agreed process.

5.1. Goal

Overall, the goal of this Plan will be to secure the favourable conservation status of the ECHA Light-bellied Brent Goose. The short-term aim of the plan is to maintain the current population and distribution of the species throughout its range. The long-term aim is to increase to and then maintain the population size at or above 25,000 birds, thus removing it from Category A2 of the AEWA and removing the requirement for national action planning.

5.2. Purpose

An overall **priority** for each Purpose is given, according to the following scale:

- **Essential:** an objective that will prevent a large decline in the population which could lead to species or sub-species extinction
- **High:** an objective that will prevent a decline of more than 20% of the population in 20 years or less
- **Medium:** an objective that will prevent a decline of less than 20% of the population in 20 years or less
- **Low:** an objective that will prevent local population declines or which is likely to have only a small impact on the population across the range

A **priority** for each Result is given, according to the following scale:

- **Essential:** an action that is needed to prevent a large decline in the population which could lead to species or sub-species extinction
- **High:** an action that is needed to prevent a decline of more than 20 % of the population in 20 years or less
- **Medium:** an action that is needed to prevent a decline of less than 20% of the population in 20 years or less
- **Low:** an action that is needed to prevent local population declines or which is likely to have only a small impact on the population across the range

Purpose	Priority	Result	Priority	Objectively verifiable indicator	Means of verification ¹
To end illegal and accidental shooting by 2014	LOW	Strict enforcement of species protection legislation across the range by 2008	LOW	By 2008, a measurable increase in the number of penalties issued to those infringing national and international legislation regarding the species and its habitat	<p>Within three years:</p> <ul style="list-style-type: none"> All known incidences of illegal shootings investigated Guilty parties penalised according to national legislative requirements <p>Within six years:</p> <ul style="list-style-type: none"> Financial penalties for contravening national legislation Annual assessment of illegal shootings
		No conflict between ECHA Light-bellied Brent Goose and agricultural interests on the non-breeding areas after 2014	LOW	By 2014, a measurable increase in the number of Goose Management Schemes designed to reduce conflict between ECHA Light-bellied Brent Goose and agricultural interests	<p>Within nine years:</p> <ul style="list-style-type: none"> Goose Management Schemes developed and implemented in areas where there is known conflict between ECHA Light-bellied Brent Geese and agricultural interests National monitoring of the success and efficacy of Goose Management Schemes designed to reduce conflict between ECHA Light-bellied Brent Goose and agricultural interests
		A reduction in the number of birds taken accidentally during the non-breeding season by 2008	LOW	By 2008, a measurable decrease in the number of accidental shootings reported	<p>Within three years:</p> <ul style="list-style-type: none"> Articles on identification and conservation of the ECHA Light-bellied Brent Goose published in shooting magazines across the non-breeding range <p>Within six years:</p> <ul style="list-style-type: none"> Annual assessment of accidental shootings Introduction of an identification test for hunters; where one exists already, to include ECHA Brent if not already done so
To ensure permitted harvest levels continue to remain	LOW	Harvest levels monitored at regular intervals in Canada and Greenland to ensure that the take	LOW	By 2014, knowledge of the number of ECHA Light-bellied Brent Geese harvested annually in Canada and Greenland	<p>Within nine years:</p> <ul style="list-style-type: none"> Harvest assessed in Canada and Greenland

Purpose	Priority	Result	Priority	Objectively verifiable indicator	Means of verification ¹
sustainable		remains sustainable			
To provide protection and management of sufficient habitat across the range to support 25,000 birds by 2014	HIGH	Adequate protection and management of existing IBA network for the ECHA Light-bellied Brent Goose by 2014	HIGH	By 2014, all existing IBAs identified for ECHA Light-bellied Brent Geese protected and adequately managed	<p>Within three years:</p> <ul style="list-style-type: none"> Review and develop the Sister Reserves Memorandum of Understanding <p>Within six years (not relevant to Canada):</p> <ul style="list-style-type: none"> Full protection of known IBAs under national legislation Emergency measures and procedures developed and documented for IBAs that are likely to be highly vulnerable to pollution incidents Review of existing human activities at known IBAs to inform comprehensive management planning process <p>Within nine years (not relevant to Canada):</p> <ul style="list-style-type: none"> Designation of all IBAs as Ramsar sites and SPAs, as appropriate Management plans developed and implemented for all IBAs (to include provisions for nutrient management as a priority) EIAs undertaken for all development proposals within IBAs Disturbance-free zones established in at least eight IBAs where human disturbance occurs Licence schemes developed for IBAs supporting aquacultural interests <p>Within twelve years:</p> <ul style="list-style-type: none"> Regular monitoring of human activities at IBAs for the ECHA Light-bellied Brent Goose, identifying illegal development and adverse effects of existing human activity (will form essential component of management plan monitoring schemes)

Purpose	Priority	Result	Priority	Objectively verifiable indicator	Means of verification ¹
		Regular assessments of the numbers of ECHA Light-bellied Brent Geese at IBAs across the range by 2008	LOW	By 2008, an improved knowledge of IBAs and their importance to ECHA Light-bellied Brent Geese, particularly in Greenland, Iceland and Canada	<p>Within three years:</p> <ul style="list-style-type: none"> National inventories of known IBAs for the ECHA Light-bellied Brent Goose published Numbers of ECHA Light-bellied Brent Goose at each IBA in the non-breeding range published annually, where possible (International Waterfowl Census (IWC) to provide support)
		Knowledge of IBAs in remote areas by 2008	MEDIUM	By 2008, data on migratory movements and key sites in remote areas used to inform future IBA identification	<p>Within three years:</p> <ul style="list-style-type: none"> PTTs attached to birds on the staging and breeding grounds and migratory routes tracked At least one published paper on migratory movements and potentially important staging areas Results used to inform discussions of the International Species Working Group regarding the need for ground-truthing studies and site protection
		Knowledge of habitat requirements and feeding ecology, especially during migration, by 2011	HIGH	By 2011, data on habitat requirements and feeding ecology used to inform site management plans	<p>Within six years:</p> <ul style="list-style-type: none"> At least two published papers on habitat requirements and feeding ecology in Greenland and Iceland Results used to inform discussions of the International Species Working Group (see definition in Section 7.1) regarding site management
		Inclusion of wider countryside measures for ECHA Light-bellied Brent Goose conservation in national strategies and policies by 2014	HIGH	By 2011, national strategies and policies promoting the conservation management of important areas outside the IBA network	<p>Within nine years:</p> <ul style="list-style-type: none"> Integrated wetland management initiatives developed across the range to ensure sensitive management of key wetland sites for the population outside the IBA network (e.g. in non-estuarine coastal areas during the winter)

Purpose	Priority	Result	Priority	Objectively verifiable indicator	Means of verification ¹
To understand population dynamics fully by 2014	HIGH	Knowledge of population dynamics by 2014	HIGH	By 2014, data on the abundance, productivity and survival rates of this population used to inform species management	<p>Within three years:</p> <ul style="list-style-type: none"> • Annual assessment of population size (international census) • Annual assessment of productivity during the annual census • Upkeep of international census database • Upkeep of re-sightings database • 200 birds colour-ringed per year <p>Within nine years:</p> <ul style="list-style-type: none"> • First comprehensive analysis of annual survival rates undertaken • At least one published paper on population dynamics (using productivity and resightings data) • Results used to inform discussions of the International Species Working Group regarding future conservation measures
		More accurate census technique developed by 2014	MEDIUM	By 2014, development of a more effective census technique to assess annual population size	<p>Within nine years:</p> <ul style="list-style-type: none"> • A review of census techniques published, informing national monitoring • Results used to inform discussions of the International Species Working Group regarding population assessment
To understand fully the effects and impacts of currently unquantified threats by 2014	ESSENTIAL	Knowledge of the impacts of climate change during the non-breeding season by 2017	ESSENTIAL	By 2017, development of suitable models to predict the potential effects and impacts of global climate change on the wintering and staging grounds and inform future conservation efforts	<p>Within three years:</p> <ul style="list-style-type: none"> • First assessments of the food resource available to birds in the island of Ireland and in Iceland • At least one published paper on the use of food resources by ECHA Light-bellied Brent Geese in Ireland and Ireland • A scheme to monitor intertidal food resources in the island of Ireland and in Iceland, developed and implemented (to monitor, in part, potential outbreaks of 'wasting disease').

Purpose	Priority	Result	Priority	Objectively verifiable indicator	Means of verification ¹
					<p>Within six years:</p> <ul style="list-style-type: none"> Comprehensive review of the potential effects and impacts of climate change on the non-breeding grounds <p>Within twelve years:</p> <ul style="list-style-type: none"> A population model that predicts the impacts of sea-level rise on the population (using data collected on demography and resource use) Results used to inform discussions of the International Species Working Group regarding future conservation measures
		Knowledge of the impacts of climate change on the breeding grounds by 2008	ESSENTIAL	By 2008, a greater understanding of the potential effects and impacts of global climate change on the breeding grounds	<p>Within three years:</p> <ul style="list-style-type: none"> A review of the potential impacts of global climate change in the Canadian arctic A research plan developed in conjunction with other researchers working in the breeding areas to assess the impacts of climate change on this population <p>Within six years:</p> <ul style="list-style-type: none"> Results of review and new research used to inform discussions of the International Species Working Group regarding future conservation measures
		Knowledge of the possible effects of tertiary sewage water-treatment on food availability for ECHA Light-bellied Brent Geese in the non-breeding areas	LOW	By 2014, data on the availability of green algae and other food resources in relation to implementation of EU Directives on sewage treatment (e.g Water Framework Directive)	<p>Within nine years:</p> <ul style="list-style-type: none"> At least one published paper on the effects of tertiary treatment of sewage on food availability for foods for ECHA Brent <p>Within twelve years:</p> <ul style="list-style-type: none"> Results used to inform discussions of the International Species Working Group regarding habitat management

Purpose	Priority	Result	Priority	Objectively verifiable indicator	Means of verification ¹
		Knowledge of the impact of <i>Spartina</i> encroachment on the ECHA Light-bellied Brent Goose and its wintering habitat by 2014	LOW	By 2014, data on the effects of <i>Spartina</i> encroachment on the ECHA Light-bellied Brent Goose and its habitat used to inform habitat management	<p>Within nine years:</p> <ul style="list-style-type: none"> At least one published paper on the effects of <i>Spartina</i> encroachment on the ECHA Light-bellied Brent Goose and its habitat <p>Within twelve years:</p> <ul style="list-style-type: none"> <i>Spartina</i> monitoring programme developed and implemented in the island of Ireland All-Ireland <i>Spartina</i> management plan developed Results used to inform discussions of the International Species Working Group regarding habitat management
		Knowledge of the effects of interspecific competition on the ECHA Light-bellied Brent Goose and its breeding grounds by 2014	LOW	By 2014, data on competition between the ECHA Light-bellied Brent Goose and other goose species used to inform species management	<p>Within nine years:</p> <ul style="list-style-type: none"> At least one scientific paper on the effects of interspecific competition on ECHA Light-bellied Brent Geese <p>Within twelve years:</p> <ul style="list-style-type: none"> Results used to inform discussions of the International Species Working Group regarding species management

¹Period mentioned in these columns refers to the period of the formal adoption and review of the SSAP by the Meeting of the Parties to AEWA.

6. Activities by Range States

This section identifies the activities at country level where the actions needed to achieve each ‘Result’ are listed with their priority and urgency, and with ‘Means of Verification’. The activities for each country are identified using the following system:

Time scales (linked to the timescale for formal adoption of the SSAP by AEWA) are attached to each Activity using the following criteria:

- Immediate: completed within the next year
- Short: completed within the next 1-3 years
- Medium: completed within the next 1-6 years
- Medium/Long: completed within the next 1-9 years
- Long: completed within the next 1-12 years

6.1. Canada

Result	National activity	Time scale
Strict enforcement of species protection legislation across the range by 2008	<ul style="list-style-type: none"> • Investigate and record any reported incidences of illegal hunting • Apply existing penalties for those contravening legislation 	SHORT
Harvest levels monitored at regular intervals in Canada to ensure that the take is sustainable	<ul style="list-style-type: none"> • Monitor harvest on a regular basis 	MEDIUM
Adequate protection and management of existing IBA network for the ECHA Light-bellied Brent Goose by 2014	<ul style="list-style-type: none"> • Review and develop the Sister Reserves Memorandum of Understanding with other countries in the range • Produce a review of human activities in key breeding areas, if appropriate • Develop and implement emergency measures for breeding areas likely to be highly vulnerable to pollution incidents 	SHORT
Regular assessments of the numbers of ECHA Light-bellied Brent Geese at IBAs across the range by 2008	<ul style="list-style-type: none"> • Undertake studies to refine knowledge of the breeding range, possibly through habitat suitability mapping using remotely-sensed data 	MEDIUM
Knowledge of IBAs in remote areas by 2008	<ul style="list-style-type: none"> • Investigate the potential for attaching PTTs on the breeding grounds to complement on-going satellite telemetry studies 	SHORT
Inclusion of wider countryside measures for ECHA Light-bellied Brent Goose conservation in national strategies and policies by 2014	<ul style="list-style-type: none"> • Work with the Nunavut Wildlife Management Board, and the people who determine land use processes, to protect important lowland areas in the eastern high arctic 	LONG
Knowledge of population dynamics by 2014	<ul style="list-style-type: none"> • Undertake at least one study on the factors influencing annual productivity 	LONG
Knowledge of the impacts of climate change on the breeding grounds by 2008	<ul style="list-style-type: none"> • Review of the potential impacts of global climate change in the Canadian arctic • In conjunction with other researchers working in the breeding areas, develop a research plan to assess the impacts of climate change on this population of geese 	SHORT

Result	National activity	Time scale
Knowledge of the effects of interspecific competition on the ECHA Light-bellied Brent Goose and its habitat by 2014	<ul style="list-style-type: none"> Investigate the potential impact of interspecific competition between ECHA Light-bellied Brent Geese and other goose species breeding in the eastern high arctic 	LONG

6.2. Greenland

Result	National activity	Time scale
Strict enforcement of species protection legislation across the range by 2008	<ul style="list-style-type: none"> Investigate and record any reported incidences of illegal hunting Apply existing penalties for those contravening legislation 	SHORT
Reduction in the number of birds taken accidentally by hunters during the non-breeding season by 2008	<ul style="list-style-type: none"> Investigate and record any reported incidences of accidental shooting Publish articles on the identification and conservation of the ECHA Light-bellied Brent Goose in relevant periodicals 	SHORT
Harvest levels monitored at regular intervals in Greenland to ensure that the take is sustainable	<ul style="list-style-type: none"> Monitor harvest on regular basis 	MEDIUM
Adequate protection and management of existing IBA network for the ECHA Light-bellied Brent Goose by 2014	<ul style="list-style-type: none"> Investigate entering the Sister Reserves Memorandum of Understanding Ensure all known IBAs are protected under national legislation and designated as Ramsar sites Develop and implement emergency measures for staging areas likely to be highly vulnerable to pollution incidents Use EIAs to investigate the impact of new developments on IBAs Develop and implement management plans for all known IBAs 	SHORT
Regular assessments of the numbers of ECHA Light-bellied Brent Geese at IBAs across the range by 2008	<ul style="list-style-type: none"> Review national inventory of IBAs for ECHA Light-bellied Brent Goose Attempt to make at least one spring and autumn count at each IBA every three years 	SHORT
Knowledge of habitat requirements and feeding ecology, especially during migration, by 2011	<ul style="list-style-type: none"> Undertake at least one study on the habitat requirements of ECHA Light-bellied Brent Geese at Greenland IBAs during the spring (and autumn, if appropriate) 	MEDIUM

6.3. Iceland

Result	National activity	Time scale
Strict enforcement of species protection legislation across the range by 2008	<ul style="list-style-type: none"> Investigate and record any reported incidences of illegal hunting Apply existing penalties for those contravening legislation 	SHORT
No conflict between ECHA Light-bellied Brent Goose and agricultural interests on the non-breeding areas by 2014	<ul style="list-style-type: none"> Develop and implement Goose Management Schemes in areas where there is known conflict between ECHA Light-bellied Brent Geese and agricultural interests Develop and implement schemes to monitor the success of these Goose Management Schemes 	MEDIUM/ LONG
Reduction in the number of birds taken accidentally by hunters during the non-breeding season by 2008	<ul style="list-style-type: none"> Investigate and record any reported incidences of accidental shooting Publish articles on the identification and conservation of the ECHA Light-bellied Brent Goose in relevant periodicals 	SHORT
Adequate protection and management of existing IBA network for the ECHA Light-bellied Brent Goose by 2014	<ul style="list-style-type: none"> Review and develop the Sister Reserves Memorandum of Understanding with other countries in the range Ensure all known IBAs are protected under national legislation and designated as Ramsar sites (see Annex 2.2) Develop and implement emergency measures for staging areas likely to be highly vulnerable to pollution incidents Use EIAs to investigate the impact of new developments on IBAs Produce a review of human activities at IBAs and consider a long-term scheme to monitor human impacts at IBAs Develop and implement management plans for all known IBAs 	SHORT
Regular assessments of the numbers of ECHA Light-bellied Brent Geese at IBAs across the range by 2008	<ul style="list-style-type: none"> Review national inventory of IBAs for ECHA Light-bellied Brent Goose Undertake spring and autumn counts at IBAs on an annual basis (where possible also assessing productivity) 	SHORT
Knowledge of habitat requirements and feeding ecology, especially during migration, by 2011	<ul style="list-style-type: none"> Undertake at least one study on the habitat requirements at Icelandic IBAs for the population during the spring 	MEDIUM
Inclusion of wider countryside measures for ECHA Light-bellied Brent Goose conservation in national strategies and policies by 2014	<ul style="list-style-type: none"> Investigate the application of national policies and strategies to protect birds using areas outside the IBA network 	MEDIUM
Knowledge of population dynamics by 2014	<ul style="list-style-type: none"> Contribute to international census in autumn and submit data to international coordinator Partake in annual re-sightings programme and submit data to international coordinator Catch and mark at least 50 birds a year with colour rings from the internationally agreed scheme Contribute scientific expertise to analyses of survival rates 	SHORT
Knowledge of the impacts of climate change during the non-breeding season by 2017	<ul style="list-style-type: none"> Liase with experts in Northern Ireland and Ireland to investigate ways of extending the geographical scope of the predictive population modelling work 	SHORT

6.4. Ireland

Result	National activity	Time scale
Strict enforcement of species protection legislation across the range by 2008	<ul style="list-style-type: none"> Investigate and record any reported incidences of illegal hunting Apply existing penalties for those contravening legislation 	SHORT
No conflict between ECHA Light-bellied Brent Goose and agricultural interests on the non-breeding areas by 2014	<ul style="list-style-type: none"> Develop and implement Goose Management Schemes in areas where there is known conflict between ECHA Light-bellied Brent Geese and agricultural interests Develop and implement schemes to monitor the success of these Goose Management Schemes 	MEDIUM/ LONG
Reduction in the number of birds taken accidentally by hunters during the non-breeding season by 2008	<ul style="list-style-type: none"> Investigate and record any reported incidences of accidental shooting Publish articles on the identification and conservation of the ECHA Light-bellied Brent Goose in relevant periodicals 	SHORT
Adequate protection and management of existing IBA network for the ECHA Light-bellied Brent Goose by 2014	<ul style="list-style-type: none"> Review and develop the Sister Reserves Memorandum of Understanding with other countries in the range Ensure all known IBAs are protected under national legislation and designated as Ramsar sites/SPAs (see Annex 2.2) Develop and implement emergency measures for non-breeding areas likely to be highly vulnerable to pollution incidents Use EIAs to investigate the impact of new developments on IBAs Establish disturbance-free zones at at least four IBAs where human disturbance is a potential threat Develop and implement licence schemes for aquacultural developments on key sites Produce a review of human activities at IBAs and monitor activities thereafter Develop and implement management plans for all known IBAs 	SHORT
Regular assessments of the numbers of ECHA Light-bellied Brent Geese at IBAs across the range by 2008	<ul style="list-style-type: none"> Review national inventory of IBAs for ECHA Light-bellied Brent Goose Undertake monthly counts at IBAs on an annual basis through I-WeBS Publish count data in I-WeBS annual report 	SHORT
Knowledge of IBAs in remote areas by 2008	<ul style="list-style-type: none"> Support satellite telemetry study of migratory movements and potentially important sites along the entire flyway 	MEDIUM
Inclusion of wider countryside measures for ECHA Light-bellied Brent Goose conservation in national strategies and policies by 2014	<ul style="list-style-type: none"> Investigate the application of national policies and strategies to protect birds using areas outside the IBA network 	MEDIUM
Knowledge of population dynamics by 2014	<ul style="list-style-type: none"> Contribute to international census in autumn and winter and submit data to international coordinator (includes annual assessments of productivity) Partake in annual re-sightings programme and submit data to international coordinator Catch and mark at least 50 birds a year with colour rings from the internationally agreed scheme 	SHORT

Result	National activity	Time scale
	<ul style="list-style-type: none"> Support analyses of survival rates 	
More accurate census technique developed by 2014	<ul style="list-style-type: none"> Support the review of census methodology through the Irish Brent Goose Research Group 	MEDIUM/ LONG
Knowledge of the impacts of climate change during the non-breeding season by 2017	<ul style="list-style-type: none"> Support the collection of demographic and resource use data to support development of a predictive population model Develop a scheme to monitor the food resources available in Ireland 	SHORT
Knowledge of the impact of <i>Spartina</i> encroachment on the ECHA Light-bellied Brent Goose and its wintering habitat by 2014	<ul style="list-style-type: none"> Support research to measure the effects of <i>Spartina</i> encroachment on ECHA Light-bellied Brent Geese and their habitats Develop an all-Ireland <i>Spartina</i> monitoring programme with UK Publish an all-Ireland <i>Spartina</i> management plan, if necessary 	MEDIUM/ LONG

6.5. United Kingdom

Result	National activity	Time scale
Strict enforcement of species protection legislation across the range by 2008	<ul style="list-style-type: none"> Investigate and record any reported incidences of illegal hunting Apply existing penalties for those contravening legislation 	SHORT
No conflict between ECHA Light-bellied Brent Goose and agricultural interests on the non-breeding areas by 2014	<ul style="list-style-type: none"> Implement existing Goose Management Schemes (<i>Countryside Management Scheme</i> and <i>Management of Sensitive Sites</i>) in areas where there is known conflict between ECHA Light-bellied Brent Geese and agricultural interests (especially around Strangford Lough) Develop and implement schemes to monitor the success of these Goose Management Schemes 	MEDIUM/ LONG
Reduction in the number of birds taken accidentally by hunters during the non-breeding season by 2008	<ul style="list-style-type: none"> Investigate and record any reported incidences of accidental shooting Publish articles on the identification and conservation of the ECHA Light-bellied Brent Goose in relevant periodicals 	SHORT
Adequate protection and management of existing IBA network for the ECHA Light-bellied Brent Goose by 2014	<ul style="list-style-type: none"> Review and develop the Sister Reserves Memorandum of Understanding with other countries in the range Ensure all known IBAs are protected under national legislation and designated as Ramsar sites/SPAs (see Annex 2.2) Develop and implement emergency measures for non-breeding areas likely to be highly vulnerable to pollution incidents Use EIAs to investigate the impact of new developments on IBAs Establish disturbance-free zones at at least four IBAs where human disturbance is a potential threat Develop and implement licence schemes for aquacultural developments at key sites Produce a review of human activities at IBAs and monitor activities thereafter Develop and implement management plans for all known IBAs 	SHORT

Result	National activity	Time scale
Regular assessments of the numbers of ECHA Light-bellied Brent Geese at IBAs across the range by 2008	<ul style="list-style-type: none"> • Review national inventory of IBAs for ECHA Light-bellied Brent Goose • Undertake monthly counts at IBAs on an annual basis through WeBS • Publish count data in WeBS annual report 	SHORT
Knowledge of IBAs in remote areas by 2008	<ul style="list-style-type: none"> • Support satellite telemetry study of migratory movements and potentially important sites along the entire flyway 	MEDIUM
Inclusion of wider countryside measures for ECHA Light-bellied Brent Goose conservation in national strategies and policies by 2014	<ul style="list-style-type: none"> • Investigate the application of national policies and strategies to protect birds using areas outside the IBA network, e.g. Integrated Coastal Zone Management (ICZM) 	MEDIUM
Knowledge of population dynamics by 2014	<ul style="list-style-type: none"> • Contribute to international census in autumn and winter and submit data to international coordinator • Partake in annual re-sightings programme and submit data to international coordinator • Catch and mark at least 100 birds a year with colour rings from the internationally agreed scheme • Support analyses of survival rates 	SHORT
More accurate census technique developed by 2014	<ul style="list-style-type: none"> • Support the review of census methodology through the Irish Brent Goose Research Group 	MEDIUM/ LONG
Knowledge of the impacts of climate change during the non-breeding season by 2017	<ul style="list-style-type: none"> • Support the collection of demographic and resource use data to support development of a predictive population model • Develop a scheme to monitor the food resources available in Ireland 	SHORT
Knowledge of the impact of <i>Spartina</i> encroachment on the ECHA Light-bellied Brent Goose and its wintering habitat	<ul style="list-style-type: none"> • Support research to measure the effects of <i>Spartina</i> encroachment on ECHA Light-bellied Brent Geese and their habitats • Develop an all-Ireland <i>Spartina</i> monitoring programme with Ireland • Publish an all-Ireland <i>Spartina</i> management plan, if necessary 	MEDIUM/ LONG

7. Implementation

This section provides a framework for the implementation of the SSAP focusing on the role of the ECHA Light-bellied Brent Goose Working Group, country actions and a timetable for monitoring, evaluation and communication (Table 6).

7.1. International ECHA Light-bellied Brent Goose Working Group

The ECHA Light-bellied Brent Goose Working Group is the International Species Working Group (ISWG) for implementation of this SSAP, working under the auspices of the AEWA Technical Committee.

This group comprises representatives of each of the 6 Range States and representatives of relevant international interest groups, including each of the relevant treaties (e.g. AEWA Technical Committee) and several technical advisors.

AEWA Range States have a responsibility to monitor the national populations of the species and its habitat, as well as the actions taken, including their impact on the species/habitat, successes and problems. This should be done by NSWG as recommended by the AEWA Conservation Guidelines No. 1 (National Single Species Action Plans). To ensure lessons are learnt and shared internationally, this information then needs to be communicated to the ECHA Light-bellied Brent Goose Working Group and thus to other Range States, including via the relevant international treaties.

To improve action for the species, the ECHA Light-bellied Brent Goose Working Group aims to catalyse and co-ordinate the collection of improved conservation-relevant information on the species, including on population biology (e.g. details of breeding population size and range, migration habits, wintering range) and ecology (e.g. habitat use and diet).

Thus, the role of the ECHA Light-bellied Brent Goose Working Group will include work to:

- Develop guidelines for population censusing and monitoring.
- Organise a co-operative ringing programme.
- Develop guidelines for habitat management practices.
- Facilitate the development of a population model, where this will be helpful to focus conservation effort (for example through identifying parameters for which improved data are most needed).
- Assist in and co-ordinate the process of National Action Plan preparation.
- Co-ordinate and facilitate information exchange between Range States (NSWG) and between the AEWA and the Range States.
- Collect country data and annual reports on the implementation of the SSAP from the NSWGs.
- Monitor implementation of the SSAP through the preparation of an annual international report by the ISWG.
- Organise intermediate meetings with groups of Range States (training, emergency measures, etc.).
- Prepare and organise the triennial review meeting between Range States.
- Prepare and submit a review of the SSAP to the triennial Range States' meeting and to the AEWA MOPs.

Detailed Terms of Reference based on the above description of activities will be prepared by the AEWA Technical Committee, and endorsed by the Range States to assist the ECHA Light-bellied Brent Goose Working Group with its work.

7.2. Country actions

To assist implementation of the SSAP, each Range State should commit itself to, at least:

- Endorse the Terms of Reference of the ECHA Light-bellied Brent Goose Working Group.
- Endorse this SSAP.
- Establish a National Species Working Group
- Report to the ECHA Light-bellied Brent Goose Working Group (through the AEWA Secretariat) about relevant issues in the country, at least through contributing information for the preparation of the annual report by the ISWG.
- Prepare within one year a National Action Plan, in co-operation with the NSWG, and based on this International SSAP (see AEWA Conservation guidelines No. 1).
- Implement the National Action Plan.
- Prepare a review of National Action Plan every three to five years.

Maintain and further develop adequately funded research and monitoring programmes to deliver key data.

Table 6. Timetable for monitoring, evaluation and communication

Time path	1 st year	2 nd year	3 rd year	4 th year
	↓	↓	↓	↓
Actions	<p>AEWA Technical Committee:</p> <ul style="list-style-type: none"> • Approve/ recommend endorsement of the International Action Plan by the Standing Committee • Prepare Terms of Reference for the Working Group • Facilitate information exchange <p>AEWA Standing Committee</p> <ul style="list-style-type: none"> • Endorse the International Action Plan and propose it for submission to MOP 	<p>Working group:</p> <ul style="list-style-type: none"> • Assist and co-ordinate production of National Action Plans • Monitor implementation of the National and International Action Plans • Organise workshops/training • Facilitate information exchange 	<p>Working group:</p> <ul style="list-style-type: none"> • Monitor implementation of the National and International Action Plans • Organise workshops/training • Facilitate information exchange 	<p>Working group:</p> <ul style="list-style-type: none"> • Prepare triennial Range States meeting • Monitor implementation of the National and International Action Plans and prepare three-year reports • Prepare Action Plan review • Organise workshops/training • Facilitate information exchange
	<p>Range States:</p> <ul style="list-style-type: none"> • Endorse the International Action Plan¹ • Endorse the Working Group • Identify national focal points 	<p>Range States:</p> <ul style="list-style-type: none"> • Prepare National Action Plan • Implement National Action Plan • Contribute to workshops • Exchange information 	<p>Range States:</p> <ul style="list-style-type: none"> • Implement National Action Plan • Contribute to workshops • Exchange information 	<p>Range States:</p> <ul style="list-style-type: none"> • Implement National Action Plan • Contribute to the three-year reports • Contribute to workshops • Exchange information
	⇓	⇓	⇓	⇓

¹ This could be done for the AEWA Contracting Parties by adoption of the International Species Action Plan by MOP.

<p>Products</p>	<ul style="list-style-type: none"> ❖ Endorsed Action Plan ❖ Endorsed Working Group ❖ Web page for information exchange 	<ul style="list-style-type: none"> ❖ National Action Plans ❖ ❖ ❖ National Focal Points ❖ Technical Guidelines (i.e. population / habitat monitoring) ❖ Information exchange 	<ul style="list-style-type: none"> ❖ ❖ Information exchange ❖ Guidelines for management practices ❖ Population model ❖ Review of scientific knowledge (filling specific gaps) 	<ul style="list-style-type: none"> ❖ Triennial Range States' meeting ❖ Triennial Range States report ❖ Triennial report on International Action Plan ❖ Information exchange ❖ Reviewed Action Plan
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8. Bibliography

- Alerstam, T., Gudmundsson, G.A., Jönsson, P.E., Karlsson, J. & Lindström, A. 1990. Orientation, migration routes and flight behaviour of Knots, Turnstones and Brent geese departing from Iceland in spring. *Arctic* 43: 201-204.
- Alexander, S.A., R.S. Ferguson and K.J. McCormick. 1984. Key migratory bird terrestrial habitat sites in the Northwest Territories. Can. Wildl. Serv. Occas. Paper No. 71. 184 pp.
- Andrews, D.J., Mathers, R.G. & Rainey, E. 1996. Brent Geese feeding on agricultural land around Strangford Lough, Co. Down. *Irish Birds* 5: 407-412.
- Bennike, O. 1990. Observations of geese and other birds in West Greenland, 1989 and 1990. *Dansk Orn. Foren. Tidsskr* 84: 145-150.
- Berry, J. 1939. *The status and distribution of wild geese and wild duck in Scotland*. Cambridge.
- Bertelsen, A. 1921. Fulene i Umánaq Distrikt. *Meddr Grønland* 62: 139-214.
- Boertmann, D., Mosbech, A. & Frimer, O. 1997. Autumn migration of Light-bellied Brent Geese *Branta bernicla hrota* through north-west Greenland. *Wildfowl* 48: 98-107.
- Borum, J. 1985. Development of epiphytic communities on eelgrass (*Zostera marina*) along a nutrient gradient in a Danish estuary. *Marine Biology* 87: 21-218.
- Boyd, H. 1980. Importance of Ireland's Brent Geese. *British Birds* 73: 363-364.
- Boyd, H. & Maltby, L.S. 1979. The Brant of the western Queen Elizabeth islands, N. W. T. Pp 5-21. In R.L. Jarvis, & J.C. Bartonek (eds.) *Management and Biology of Pacific Flyway Geese*. OSU Book Stores, Corvallis, Oregon.
- Brown, R.A. 1988. Is there competition between Light-bellied Brent Geese and Wigeon on Strangford Lough? In J. Harradine (ed.) *Wigeon - current trends and future needs*: 76-84. British Association for Shooting and Conservation, Fordingbridge.
- Cabot, D. 1965. *The Pale-bellied Brent Goose (Branta b. hrota) in Ireland, 27th/28th November 1965*. Irish Wildfowl Committee Publication No. 1.
- Cabot, D. 1966. *The status and distribution of the Pale-bellied Brent Goose (Branta b. hrota) in Ireland, 5th/6th February 1966*. Irish Wildfowl Committee No. 2.
- Cabot, D. 1967. *The status and distribution of the Brent goose (Branta b. hrota) in Ireland, 1966/67*. Irish Wildfowl Committee Publication No. 6.
- Cabot, D. 1968. *The status and distribution of the Brent Goose in Ireland, 1967/68*. Irish Wildfowl Committee Publication No. 10.
- Cabot, D. 1973. *National Brent Goose Census, 1972/73*. Unpubl. report.
- Cabot, D. 1974. *National Brent Goose Census, 1973/74*. Unpubl. report.
- Cabot, D. 1975. *National Brent Goose Census, 1974/75*. Unpubl. report.
- Colhoun, K. & Newton, S.F. 2000. Winter waterbird populations on non-estuarine coasts in the Republic of Ireland: results of the 1997-98 Non-Estuarine Coastal Waterbird Census (NEWS). *Irish Birds* 6: 527-542.
- Debout, G. & Leclerc, F. 1990. La Bernache cravant à ventre clair *Branta bernicla hrota*, en France: Precisions sur son statut. *Alauda* 58: 209-215.
- Den Hartog, C. & Polderman, P.J.G. 1975. Changes in the seagrass populations of the Dutch Waddenzee. *Aquatic Biology* 1: 141-147.
- Dúchas, The Heritage Service 2002. *Special Protection Areas for Birds in Ireland*. Dublin.
- Fonseca, M.S., Kenworthy, W.J., Rittmaster, K. & Thayer, G.W. 1987. *Environmental impact research program: The use of fertiliser to enhance transplants of the seagrasses Zostera marina and Halodule wrightii*. US Army Corps of Engineers, Waterways Experimental Station, Technical Report.
- Fox, A.D., Bell, M.C., Brown, R.A., Mackie, P. & Madsen, J. 1994b. An analysis of the abundance and distribution of Brent Geese and Wigeon at Strangford Lough, 1965/6-1988/9. *Irish Birds* 5: 139-150.
- Gardarsson, A. 1974. Islenskir votlendisfluglar. *Votlendi: Rit Landverndar* 4: 100-134.
- Gardarsson, A. 1979. *Sites of major importance to Branta bernicla hrota in Iceland*. Proceedings of First Technical Meeting on Western Palearctic Migratory Bird Management, Paris 1977.
- Gardarsson, A. & Gudmundsson, G.A. 1997. Numbers of Light-bellied Brent Geese *Branta bernicla hrota* staging in Iceland in spring. *Wildfowl* 47: 62-66.
- Gray, D.R. 1990. Winter studies of birds and mammals in the Canadian Arctic islands. In C.R. Harrington, (ed.) *Canada's missing dimension. Science and History in the Canadian Arctic Islands. Vol. II*: 564-569. Canadian Museum of Natural History.
- Gregory, R.D., Wilkinson, N.I., Noble, D.G., Robinson, J.A., Brown, A.F., Hughes, J., Procter, D., Gibbons, D.W. & Galbraith, C.A. 2002. The population status of birds in the United Kingdom,

- Channel Islands and Isle of Man: an analysis of conservation concern 2002-2007. *British Birds* 95: 410-448.
- Gudmundsson, G.A., Benvenuti, S., Alerstam, T., Papi, F., Lilliehögl, K. & Åkesson, S. 1995. Examining the limits of flight and orientation performance: satellite tracking of brent geese migrating across the Greenland ice-cap. *Proceedings of the Royal Society, London B* 261: 73-79.
- Heath, M.F. & Evans, M.I. (eds.) 2000. *Important Bird Areas in Europe: Priority sites for conservation*. I: Northern Europe. Cambridge, UK: BirdLife International (BirdLife Conservation Series No. 8).
- Hjort, C. 1995. Brent geese in northeasternmost Greenland. *Dansk Ornithologisk Forenings Tidsskrift* 89: 89-91.
- Hjort, C., Hakansson, E. & Molgaard, P. 1987. Brent Geese *Branta bernicla*, Snow Geese *Anser caerulescens* and Barnacle Geese *Branta leucopsis* on Kilen, Kronprins Christian Land, Northeast Greenland, 1985. *Dansk Ornithologisk Forenings Tidsskrift* 81: 121-128.
- Hutchinson C. 1979. *Ireland's Wetlands and their Birds*. IWC, Dublin.
- Kennedy, P.J., Ruttledge, R.F. & Scroope, C.F. 1954. *Birds of Ireland*. Oliver & Boyd, Edinburgh.
- Mathers, R.G. & Montgomery, W.I. 1997. Quality of food consumed by over-wintering Pale-bellied Brent Geese *Branta bernicla hrota* and Wigeon *Anas penelope*. *Biology and Environment: Proceedings of the Royal Irish Academy* 97B: 81-97.
- Mathers, R.G., Montgomery, W.I. & Portig, A.A. 1998a. Exploitation of intertidal *Zostera* species by Brent Geese (*Branta bernicla hrota*): why dig for your dinner? *Biology and Environment: Proceedings of the Royal Irish Academy* 98B: 147-152.
- Mathers, R.G., Montgomery, W.I., Portig, A.A. & Stone, R. 1998b. Winter habitat use by Brent Geese *Branta bernicla hrota* and Wigeon *Anas penelope* on Strangford Lough, Co. Down. *Irish Birds* 6: 257-268.
- Mathers, R.G., Portig, A.A. & Montgomery, W.I. 1998c. Distribution and abundance of Pale-bellied Brent Geese and Wigeon on Strangford Lough, Northern Ireland. *Bird Study* 45: 18-34.
- Mathers, R.G., Watson, S., Stone, R. & Montgomery, W.I. 2000. A study of the impact of human disturbance on Wigeon *Anas penelope* and Brent Geese *Branta bernicla* on an Irish sea loch. *Wildfowl* 51: 67-81.
- Meltofte, H. 1976. Ornithological observations in Southern Parry Land, North Greenland 1973. *Meddelelser om Grønland* 205.
- Meltofte, H., Elander, M. & Hjort, C. 1981. Ornithological observations in Northeast Greenland between 74°30' and 76°00'N, 1976. *Meddelelser om Grønland, Bioscience* 3.
- Merne, O.J., Boertmann, D., Boyd, H., Mitchell, C., Ó Bríain, M., Reed, A. & Sigfusson, A. 1999. Light-bellied Brent Goose *Branta bernicla hrota*: Canada. In: J. Madsen, G. Cracknell, & A.D. Fox (eds.) *Goose populations of the Western Palearctic. A review of status and distribution*: 298-311. Wetlands International Publ. No. 48, Wetlands International, Wageningen, The Netherlands and National Environmental Research Institute, Rønde, Denmark.
- NATURA Consultants & Robinson, J.A. 2003. *All-Ireland Review of Intertidal Eel-grass (Zostera) Beds*. Unpubl. report to the Heritage Council.
- Newton, S., Donaghy, A., Allen, D. & Gibbons, D. 1999. Birds of Conservation Concern in Ireland. *Irish Birds* 6: 333-342.
- Ó Bríain, M. 1989. *The social organisation, population ecology and distribution of Light-bellied Brent Geese (Branta bernicla hrota) wintering in Ireland*. Unpubl. PhD Thesis, National University of Ireland, Dublin.
- Ó Bríain, M. 1991. Use of a *Zostera* bed in Dublin by Light-bellied Brent Geese, 1981/82 to 1990/91. *Irish Birds* 4: 299-316.
- Ó Bríain, M. & Healy, B. 1991. Winter distribution of Light-bellied Brent Geese *Branta bernicla hrota* in Ireland. *Ardea* 79: 317-326.
- Ó Bríain, M., Reed, A. & MacDonald, S.D. 1998. Breeding, moulting, and site-fidelity of Brant (*Branta bernicla*) on Bathurst and Seymour Islands in the Canadian High Arctic. *Arctic* 51: 350-360.
- Owen, M. 1976. Factors affecting the distribution of geese in the British Isles. *Wildfowl* 27: 143-147.
- Porsild, M.P. 1922. Migration of the Brant *Branta bernicla* in Greenland. *Canadian Field Naturalist* 36: 144-145.
- Portig, A.A., Mathers, R.G., Montgomery, W.I. & Govier, R.N. 1994. The distribution and utilisation of *Zostera* species in Strangford Lough, Northern Ireland. *Aquatic Botany* 47: 317-330.
- Ramsar. 1999. *Strategic Framework for the List of Wetlands of International Importance*. Ramsar Bureau, Gland, Switzerland.
- Rasmussen, E. 1977. The wasting disease of eelgrass (*Zostera marina*) and its effects on environmental factors and fauna. In C.P. McRoy & C. Helfferich (eds.) *Seagrass ecosystems – a scientific perspective*: 1-15. Marcel Dekker Inc., New York.

- Robinson, J.A., Colhoun, K., Gudmundsson, G.A., Boertmann, D., Merne, O., Ó Briain, M., Portig, A., Mackie, K. & Boyd, H. 2004. *Light-bellied Brent Goose Branta bernicla hrota (East Canadian High Arctic population) in Canada, Ireland, Iceland, France, Greenland, Scotland, Wales, England, the Channel Islands and Spain 1960/61-1999/2000*. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
- Rutledge, R.F. 1966. *Ireland's Birds*. Witherby, London.
- Rutledge, R.F. 1985. Brent Geese feeding on grain. *Irish Birds* 3: 103-104.
- Rutledge, R.F. & Hall Watt, R. 1958. The distribution and status of wild geese in Ireland. *Bird Study* 5: 22-23.
- Salaverri, L. 2002. Os Gansos de Cara Negra (*Branta bernicla*) en Galicia. *A Carriza* 2: 9-15.
- Salomonsen, F. 1950. *Grønlands Fugle, The Birds of Greenland*. Munksgaard, Copenhagen.
- Salomonsen, F. 1967. *Fuglene på Grønland*. Rhodos, København.
- Scott, D.A. & Rose P.M. 1996. *Atlas of Anatidae Populations in Africa and Western Eurasia*. Wageningen, The Netherlands, Wetlands International Publication No. 44.
- Sheppard, R. 1993. *Ireland's Wetland Wealth*. Irish Wildbird Conservancy.
- Shields, G.F. 1990. Analysis of mitochondrial DNA of Pacific Black Brant *Branta bernicla nigricans*. *Auk* 107: 620-623.
- Smiddy, P. 1987. Brent geese feeding on potatoes. *Irish Birds* 3: 452-453.
- Stroud, D.A., Chambers, D., Cook, S., Buxton, N., Fraser, B., Clement, P., Lewis, I., McLean, I, Baker, H. & Whitehead, S. (eds.) 2001. *The UK SPA network: its scope and content*. JNCC, Peterborough. 3 volumes.
- Tucker, G.M. & Heath, M.F. 1994. *Birds in Europe: their Conservation Status*. BirdLife International, Cambridge, UK (BirdLife Conservation Series No. 3).
- Ussher, R.J. & Warren, R. 1900. *The Birds of Ireland*. Gurney & Jackson, London.
- Wetlands International. 2002. *Waterbird Population Estimates – Third Edition*. Wetlands International Global Series No. 12, Wageningen, The Netherlands.

9. Annexes

Annex 1. Contracting parties to international conventions, agreements and directives that are relevant to the conservation of the ECHA Light-bellied Brent Goose *Branta bernicla hrota* (acc. – accession only; sig. – signatory only; app. – approved only. Light grey cells relate to European countries only, dark grey to Canada only)

Country	Ramsar	CMS	AEWA	Bern	EU	CBD	Migratory Birds Convention
Canada	•					•	•
France	•	•	•	•	•	•	
Greenland	•					•	
Iceland	•			•		•	
Ireland	•	•	•	•	•	•	
United Kingdom	•	•	•	•	•	•	

Key

Ramsar: Convention on Wetlands of International Importance

CMS: Convention on the Conservation of Migratory Species of Wild Animals

AEWA: Agreement on the Conservation of African-Eurasian Migratory Waterbirds

Bern: Convention on the Conservation of European Wildlife and Natural Habitats (

EU: European Union Directive on the Conservation of Wild Birds (79/409/EEC)

CBD: Convention on Biological Diversity

Annex 2. Important Bird Areas of relevance for the ECHA Light-bellied Brent Goose *Branta bernicla hrota* in Europe

Annex 2.1. Data presented in Important Bird Areas in Europe (Heath & Evans 2000)

Country	International name	Area (ha)	Location		Population		Year	Season	Criteria
			Lat (N)	Lon (E)	Min	Max			
France*	Baie des Veys et Marias du Contenin	37,500	49° 20	1° 15	?	?	1997	winter	A4i, B1i, C3
	Havre de la Seine	5,150	49° 00	1° 34	250	750	1997	winter	B1i, C3
United Kingdom	Lough Foyle (also Ireland)	21,083	55° 10	7° 05	4,500	4,500	1996	winter	A4i, B1i, C3
	Strangford Lough	15,580	54° 27	5° 35	10,700	10,700	1995	winter	A4i, B1i, C3
	Carlingford Lough (also Ireland)	4,660	54° 04	6° 12	315	315	1995	winter	B1i, C3
	Killough Harbour and Coney Island Bay	240	54° 15	5° 38	-	330	1994	winter	B1i, C3
	Larne Lough and Swan/Blue Circle Islands	1,160	54° 49	5° 46	220	220	1995	winter	B1i, C3
	Dundrum Inner Bay	500	54 15	5 49	210	210	1995	winter	B1i, C3
	Outer Ards	1,016	54° 29	5° 25	255	255	1995	winter	B1i, C3
	Ireland	Dublin Bay	3,000	53° 21	6° 12	1,800	1,800	1995	winter
Boyne Estuary		404	53° 43	6° 15	210	210	1996	winter	B1i, C3
Skerries Islands		62	53° 34	6° 05	215	215	1996	winter	B1i, C3
Wexford Harbour and Slobs		5,000	52° 19	6° 26	2,609	2,609	1995	winter	B1i, C3
Tralee Bay and Barrow Harbour		3,290	52° 16	9° 48	535	535	1995	winter	B1i, C3
Dundalk Bay		4,920	53° 55	6° 20	447	447	1996	winter	B1i, C3
Rogerstown Estuary		368	53° 30	6° 06	1,804	1,804	1996	winter	B1i, C3
Malahide/Broadmeadow Estuary		606	53° 27	6° 09	1,200	1,200	1996	winter	B1i, C3
Baldoyle Bay		203	53° 24	6° 08	480	480	1995	winter	B1i, C3
North Wicklow coastal marshes		670	53° 04	6° 03	1,000	1,000	1995	winter	B1i, C3
Bannow Bay		958	52° 13	6° 48	1,161	1,161	1995	winter	B1i, C3
The Cull/Killag		896	52° 12	6° 39	695	695	1995	winter	B1i, C3
Dungarvan Bay		1,300	52° 04	7° 34	616	616	1995	winter	B1i, C3
Tramore Backstrand		1,557	52° 10	7° 06	591	591	1996	winter	Bi1, C3
Castlemaine Harbour		11,374	52° 07	9° 55	1,062	1,062	1996	winter	B1i, C3
Shannon and Fergus Estuary	16,718	52° 40	9° 04	318	318	1995	winter	B1i, C3	
Inner Galway Bay	11,905	53° 12	9° 03	525	525	1996	winter	B1i, C3	

Country	International name	Area (ha)	Location		Population		Year	Season	Criteria
			Lat (N)	Lon (E)	Min	Max			
	Broadhaven, Blacksod and Tullaghan Bays and parts of the Mullet peninsula	10,852	54° 15	9° 52	194	227	1997	winter	B1i, C3
	Killala Bay	4,294	54° 13	9° 09	229	229	1996	winter	B1i, C3
	Ballysadare Bay	2,146	54° 13	8° 35	200	-	1996	winter	B1i, C3
	Trawbreaga Bay	1,100	55° 17	7° 18	319	319	1995	winter	B1i, C3
	Cummeen Strand (Sligo Harbour)	1,865	54° 18	8° 32	608	608	1996	winter	B1i, C3
Iceland	Skerjafjörður	3,300	64° 04	22° 00	205	1,334		passage	B1i
	Breidafjörður	300,000	65° 19	23° 00	-	10,000		passage	A4i, B1i
	Hvalfjardareyri-Laxárvogur	900	64° 19	21° 40	-	395		passage	B1i
	Innstavogsnes-Grunnafjörður	1,900	64° 22	21° 55	-	4,983	-	passage	A4i, B1i
	Álftanes-Akrar	13,300	64° 31	22° 15	307	10,000	-	passage	A4i, B1i
	Álftafjörður-Hofsstadavogur	3,000	65° 00	22° 40	1,200	3,200	-	passage	B1i

Criteria: the following criteria were used to identify IBAs for *Light-bellied Brent Geese*:

Category A1 Species of global conservation concern: The site regularly holds significant numbers of a globally threatened species, or other species of global conservation concern.

Category A4 Congregations: i) The site is known or thought to hold, on a regular basis, $\geq 1\%$ of a biogeographic population of a congregatory waterbird species.

Category B1 Congregations: 1) The site is known or thought to hold $\geq 1\%$ of a flyway or other distinct population of a waterbird species.

Category B2 Species with an unfavourable conservation status in Europe: The site is one of the 'n' most important in the country for a species with an unfavourable conservation status in Europe (SPEC 2, 3) and for which the site-protection approach is thought to be appropriate.

Category C1 Species of global conservation concern: The site regularly holds significant numbers of a globally threatened species, or other species of global conservation concern.

Category C2 Concentrations of a species threatened at the European Union level: The site is known to regularly hold at least 1% of a flyway population or of the EU population of a species threatened at the EU level (listed on Annex 1 and referred to in Article 4.2 of the EC Birds Directive).

Category C6 Species threatened at the European Union level: The site is one of the five most important in the European region (NUTS region) in question for a species or subspecies considered threatened in the European Union (i.e. listed in Annex 1 of the EC Birds Directive).

Annex 2.2. Protection status of Important Bird Areas for the ECHA Light-bellied Brent Goose *Branta bernicla hrota* (boxes are filled when a protective status has been conferred on the site; P = proposed)

Country	IBA name	Protective instrument								
		Ramsar	SPA	Conservation Area	Nature Reserve	Area of Special Scientific Interest	National Nature Reserve	Private Reserve	Wildfowl Reserve	Hunting Reserve
United Kingdom	Lough Foyle (also Ireland)									
	Strangford Lough									
	Carlingford Lough (also Ireland)									
	Killough Harbour and Coney Island Bay									
	Larne Lough and Swan/Blue Circle Islands									
	Dundrum Inner Bay		P							
	Outer Ards									
Ireland	Dublin Bay									
	Boyne Estuary									
	Skerries Islands		P							
	Wexford Harbour and Slobs									
	Tralee Bay and Barrow Harbour									
	Dundalk Bay									
	Rogerstown Estuary									
	Malahide/Broadmeadow Estuary									
	Baldoyle Bay									
	North Wicklow Coastal Marshes									
	Bannow Bay									
	The Cull/Killag									
	Dungaravan Bay									
	Tramore Backstrand									
	Castlemaine Harbour									
	Shannon and Fergus Estuary									
	Inner Galway Bay									
	Braodhaven, Blacksod and Tullaghan Bays and parts of the Mullet peninsula									
	Killala Bay									
	Ballysadare Bay									
Trawbreaga Bay										
Cummeen Strand (Sligo Harbour)										
Iceland	Skerjafjörður									
	Breidafjörður, including Alftafjörður-Hofstadavogur									
	Hvalfjardareyri-Laxárvogur									
	Innstavogsnes-Grunnafjörður									
	Alftanes-Akrar									