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# Management of the Barnacle Goose (*Branta leucopsis*) in Finland: Conservation versus Hunting

Heimo Mikkola

## Abstract

The Barnacle Goose (*Branta leucopsis*) has had recent uncontrolled population increase in all of its northern distribution areas and is now one of the three most abundant goose species in the world. Not many birds, other than this have had such a naming mystery and a long time it was not known if the Barnacle Goose was a bird or a fish. So no wonder that also its conservation or possible hunting divides the opinions of people and authorities. This chapter is suggesting well regulated, sustainable, springtime hunting of these geese in such agriculture fields they will cause most serious crop losses. To be effective and meet public social approval, management actions must have a strong scientific basis and include an efficient monitoring programme. Necessary decisions to reach a consensus among stakeholders are discussed.

**Keywords:** Barnacle Goose, folklore, population increase, agriculture crop losses, hunting as a management tool

## 1. Introduction

The Barnacle Goose, *Branta leucopsis*, is one of the very few species of birds endemic to the north-east Atlantic region [1]. Nests have been found at heights of as much as 1,000 feet above sea level on steep faces of coastline. In these conditions, the parent birds are very successful in defending their eggs against predators explaining partly the success of this goose [1]. It belongs to black geese genus, *Branta*, with largely black colour separating them from the grey *Anser* species. First, the Barnacle Goose and the close relative Brent (or Brant) Goose, *Branta bernicla*, were previously seen as one species, but modern genetic analysis has shown that it is an eastern derivate of the Cackling Goose *Branta hutchinsii* lineage [2].

All Barnacle Goose populations are increasing, and growing geese foraging on cropland leads to serious challenges for many farmers. To prevent geese damage to agriculture farmers are seeking different tools to protect their crop. In Finland, the size of the migrating Barnacle Goose flocks are causing increasing human-wildlife conflicts (**Figure 1**). This chapter seeks a sustainable solution between conservation and hunting.



**Figure 1.** Barnacle goose flock landing like the African locusts to feed everything on the farmer's field in Finland. Photo: Courtesy of Esko Rajala.

## 2. Barnacle Goose—a bird or a fish

A very old myth from 12th century in the western British Isles and Ireland said that this 'bird' is spawned from the goose barnacle ('Shellfish' genus *Lepas*) living on seawater [3]. According to the myth, the barnacles, which seemed to grow out of driftwood steeped in sea, were developing geese. And, indeed, people saw goose feathers in the barnacles' cirri which are feather-like feeding appendages the barnacle opens up in water into a fan-shape to catch food particles [4]. So the goose barnacle was giving the Barnacle Goose its English name and the scientific name, *Branta bernicla*, for the Brant or Brent Goose [5]. This myth persisted until the end of the 18th century. Somehow it is easy to see the logic of this myth as in those days these geese or their goslings were never seen in the UK or Irish summer, and so they were assumed to develop underwater in the form of barnacles. And fall gales often blew ashore driftwood full of barnacles just when the annual appearance of geese started through migration from their remote summer breeding grounds north of the Arctic Circle [4].

It seems clear that the well known Swedish taxonomist, Carl von Linné, also knew this old Middle Age myth, for he named the genus *Lepas* and two local species *L. anatifera* Linnaeus 1758 and *L. anserifera* Linnaeus 1767 ('duck-bearing' and 'goose-bearing' correspondingly), and these pedunculate barnacles continue to be called goose barnacles [4].

Until relatively recently, Catholics in Contai Chiarrae (=County Kerry) in Ireland, who abstained from meat on the fasting days of the Church could still eat the Barnacle Goose because it was considered as fish [6]. These people did not know or care that Pope Innocent III (in 1215) had explicitly prohibited eating of these geese during Lent, arguing that despite their unusual reproduction, they lived and fed like ducks and so were of the same nature as other birds [7].

## 3. Distribution and population

Barnacle Geese breed mainly on the Arctic islands, Greenland, Svalbard, and Novaya Zemlya. Small numbers of feral birds, also breed in the Northern European countries and since 1971 a new population originally from the Novaya Zemlya has started to breed on the islands and coasts of the Baltic Sea [8]. Principal

range states have been listed as: Belgium, Denmark (Including the Faroe Islands and Greenland), Estonia, Finland, Germany, Holland, Iceland, Ireland, Latvia, Lithuania, Norway, Russia, Sweden and the UK (Scotland) [9].

The Arctic Russia breeding population is migratory, the temperate Baltic breeding population, including the Norwegian Oslo Fjord breeding population, is also migratory but another temperate North Sea population, breeding in the Belgium, Holland, Germany and south-west Denmark is considered to be sedentary [9].

#### 4. Global population estimates

Estimated population was 1960 ca. 30,000 individuals [10] but a worry was expressed that what happens to those birds after the nuclear tests of the Soviet Union started in Novaja Zemlja in autumn 1961. However, the size of the Barnacle Goose population has increased from 112,000 in the 1980s to well over 1.4 million in the 2010s [9]. Of all three populations listed above, the Russia, Germany and Holland population is currently the largest and it is expected to grow from 1.2 million in 2014 to 8.7 million birds by the next few years. Such an increase in population size is set to place further pressure on ecosystems, human health and air safety [9].

#### 5. Barnacle Goose in Finland

The oldest observations known are 18 July 1840 from Sipoo and an adult male shot on July 1841 in Åland. After that more birds were seen in different parts of the country but one-third of these observations were made in the autumn [11]. Slowly the numbers started to increase and about 150 birds of this species were seen between Oulunsalo and Hailuoto between 24.-30.May 1954 [12].

During the spring migration 2,000 birds were seen in two days of May 1961, in Loviisa and 3,300 unidentified geese but some likely Barnacle Geese. The largest flocks were about 250 birds when other years before the flocks were much smaller [10].

In Finland, the Barnacle Goose has been breeding since the early 1980s [13]. The population size is now more than 14,000 individuals. Birds breeding in Finland head south later in the autumn than arctic breeders, and return north sooner in the spring [13]. A total of 3,421 have been ringed 1913–2019 (**Table 1**) and about half of those were goslings. There are 2,458 recoveries and 96% of those come from Finland. Some 80 per cent have been recovered alive, mainly by reading the ring number with binoculars or telescope. Before 2011 there were 11 recoveries from Holland, five from Germany, two from Russia, and one from Sweden [15]. Both of the geese shot in Russia were ringed as goslings in Helsinki and Kotka. The natal site fidelity is high as 13 goslings were recovered in subsequent summers on average 3 km distance (range 0–152 km). The longevity record for Finnish Barnacle Geese is 22 years 4 months and 17 days [15].

##### 5.1 Remarks on other goose in Finland

Before the conservation and the management options concerning the Barnacle Geese it is important to see the situation of the other goose species in the country.

##### 5.2 *Anser albifrons*

White-fronted Goose or Greater White-fronted Goose has holarctic distribution, predominantly in the tundra but to some extent also in the boreal climatic

Species	Ringed	Recoveries/Controls
<i>Anser albifrons</i>	8	0
<i>Anser anser</i>	1037	581
<i>Anser brachyrhynchus</i>	40	27
<i>Anser erythropus</i>	167	65
<i>Anser fabalis</i>	1618	9103
<i>Anser indicus</i>	15	44
<i>Branta bernicla</i>	25	3
<i>Branta canadensis</i>	891	691
<i>Branta leucopsis</i>	3421	2458
<i>Branta ruficollis</i>	2	4

**Table 1.**  
*Goose ringing in Finland 1913–2019 [14].*

zone. This species shows a remarkable similarity in behaviour with the Greylag Goose and in the south, their breeding ranges are immediately adjacent [1]. White-fronted Goose does not breed in Finland but Siberian birds are seen in the country on migration, especially in autumn, sometimes in large flocks. The birds that migrate over Finland spend the winter around the North Sea [16]. The number of these migrants varies between 250,000 and 400,000 individuals [17]. Ringing results reveal that most of the breeding birds from western Greenland on their autumn migration cross both the interior of Greenland and the wide stretch of the Atlantic Ocean to winter in Ireland and western parts of Scotland and England [1]. Global estimates rank this goose the third most numerous goose in the world with some 3 million birds [17, 18]. Hunting is popular and given the size of the population the daily bag limit for White-fronted Geese was recently increased from two to three birds in the US Central and Mississippi Flyways [18]. Japan has the largest population of Greater White-fronted Geese wintering in eastern Asia [19]. Recent flocks of up to 100,000 birds are starting similar discussion on agriculture damages as the Barnacle Geese are causing in Finland [20].

5.3 *Anser anser*

The Greylag Goose is the ancestor of the domestic goose and in the historic times, the species nested over the whole of Europe, and even in northeastern Algeria [1]. Still, in the 18th century, the Greylag Goose nested on all the sea coasts of Finland. The increased traffic, cultivation of the suitable breeding grounds and direct nest disturbance were thought to be responsible for the great reduction in numbers of this species [11]. Therefore, it has ceased to breed over the great part of the earlier distribution area. Already in the 1920s, this goose was not breeding regularly in the Gulf of Finland and the bottom of the population was probably in the 1940s when only three pairs nested in the Gulf of Finland and 20 pairs in the Archipelago Sea [11]. After the species was given full protection in 1947 the slow increase started and in 1950 the population was estimated to be 150 pairs and 1955 already 250 pairs [11]. Then Greylag Geese started to return to breed along the entire coastal stretch of Finland but the majority of the population was found in the Gulf of Bothnia. The population kept growing and the full protection was withdrawn in 1960 [21]. In 1974 alarm bells were ringed again:” The populations of the Greylag Goose are alarmingly small and may be in serious need of protection” [22].

However, in 2010 the population was estimated to be 5,000–6,000 [23]. Nationwide surveys have not been very reliable but the population growth is believed to have continued until 2017 [21] when the breeding population was between 7,000 and 9,000 pairs [17]. After that, the population has started to decrease up to 20% per year as the hunting pressure has been too heavy. According to hunting statistics, 8,700 Greylag Geese were killed in 2017, and in 2018 before the end of July already 6,300 had been shot [21].

A total of 1037 Greylag Geese have been ringed in Finland between 1913–2019 (Table 1). Some 25 per cent of the recoveries have been made alive. The Finnish Greylag Geese migrate to central and western Europe, as far as the Mediterranean region. Three birds have even reached northern Africa, two in Algeria and one in Tunisia [15]. The longest distance, 3,774 km, was covered by a goose ringed at Liminka Bay near Oulu and shot in southern Spain. Hunting accounts for 92 per cent of the known death causes [15].

No goose species can tolerate hunting pressure heavier than 20 per cent of the total population. In the case of Greylag Goose, this limit is now reached so the hunting should not be allowed from the fields in August before the normal hunting season. In 2018 almost 60 per cent of the Greylag Geese were hunted from the fields [21].

#### 5.4 *Anser brachyrhynchus*

Historically, the Pink-footed Goose was considered as a subspecies of *Anser fabalis* but based on the mitochondrial DNA studies it was classified as a separate species [24].

Two biogeographical populations of Pink-footed Geese have been recognised: The western Iceland/East Greenland population wintering in the British Isles and the eastern Svalbard population staging in Norway and wintering in Denmark, the Netherlands and Belgium. Especially the western population has increased dramatically, approximately 10-fold between the 1950s and 1999 when the population was estimated to be 200,000–250,000 [25]. The population trend in the UK shows a 124 per cent increase between 1992/93–2017/18 and 67 per cent increase from 2007/08–2017/18 [26]. The late UK winter population estimates have been well over 500,000; in 2015 even 537,000 birds [27].

Similarly but only on the three-fold scale, the eastern population has increased over the last decades on the high-arctic archipelago of Svalbard. In 1999 eastern population size was on the order of 32,000–37,000 individuals [28] when in 2011 it was already 80,000 [29]. Coinciding with the recent population increases, the wintering ranges of the western and eastern populations have come closer, possibly increasing the current rate of exchange between the populations [30]. The population increase and the change in the migration routes bring continuously more Pink-footed Geese in the Western part of Finland [17]. From the total European population of 80,000 birds, some 10,000 are estimated to migrate through Finland. The largest flocks during the spring have been more than 2,000 birds [17]. The continued growth of the Svalbard population is a conservation success story, yet its increasing population size, along with other goose species, has progressively brought them into conflict with agricultural interests as well as having other environmental and social implications. In particular, an increase in conflicts has been noted in Norway during spring. Furthermore, there is concern about degradation of vulnerable tundra vegetation in Svalbard due to increasing goose grazing intensities [31].

Management plan [32] is aiming that the eastern population size should be around 60,000 ensuring sustainable hunting in Norway and Denmark. New

scientific evaluation could change the target population size following ‘wise use’ principals. The western population is huntable during open season in Iceland and the UK. The harvest rates are recorded in Iceland where ca. 15,000–24,000 Pink-footed Geese were shot annually between 2008–2019 [33]. The UK statistics are not so well kept (no bag reporting system in place to monitor hunting) but the indirect estimation of the Pink-footed Geese hunting in Britain indicated that about 25,000 birds have been shot annually [34]. Obviously, these hunting numbers had no negative impact on the Pink-footed Geese population as it still kept growing rapidly (67% in the last 10 years as shown above).

### 5.5 *Anser caerulescens*

The Snow Goose is native North American species but occasionally some individuals stray into Europe. Birds found in Europe are known to have nested in several countries and, for example, in the UK a few nestings have been witnessed almost every year in the 21st century [35]. In Finland, Snow Goose breeding was ensured for three consecutive years in the same Kirkkonummi archipelago between 1982 and 1984. In the 1980s, the species was in Finland more common than ever before or later. During the Atlas period, 2006–2010 only one breeding time sighting was made in Hailuoto [36]. **Table 2** shows that between 2008 and 2019 Snow Geese have been recorded 0–9 times annually, and no further breedings are known.

### 5.6 *Anser erythropus*

The Lesser White-fronted Goose resembles a small form of the White-fronted Goose, and undoubtedly these species are closely related, but the degree of mutual relationship is not clear [1]. The Lesser White-fronted Goose was once globally a common bird and the main wintering grounds at the Caspian Sea in Iran used to have at least 50,000 birds in the 1930s. In 1980 the amount went down to 4,000 to 5,000 individuals [15]. Enormous massacres of these birds have taken place in the wintering grounds in Japan, in consequence of which the species has become rare in eastern Siberia [1].

Before 2nd World War, the breeding population in Finland was estimated to be 2,100 individuals [17] when in 1955 same estimation was 200 pairs [11] and 1980 only 10–12 pairs [15]. The whole Fennoscandian population was earlier 10,000 pairs and was estimated to be only 15–25 pairs in 2008 [23]. The reasons for this drastic decrease are not well known but some changes in agriculture practices like the use of pesticides and strong industrial development in the wintering grounds are mentioned [23]. Despite the heavy decrease, the hunting was banned only in 1969 when there were no geese left for hunting.

**Table 1** shows that 167 birds have ringed between 1913 and 2019. Three birds ringed as goslings in 1994–1995 were shot in Russia (one) and Kazakhstan (two) during their first autumn. The main cause of death has been hunting but only 11 wild birds have been ringed before 2011 [15]. One adult bird ringed in May 2006, in Norway was shot in Kerkinilake, an internationally known bird and biodiversity area (IBA), in Greece despite hunting is illegal in that area [37].

### 5.7 *Anser fabalis*

The taxonomy of the Bean Goose is still not fully resolved but current view divides the species into four subspecies: *A.f.fabalis*, *A.f.middendorffii*, *A.f.rossicus* and *A.f.serrirostris* [38]. The subspecies are also grouped into breeding forms that inhabit different habitats in Fennoscandia and Russia. The tundra breeding forms

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
A.c.	1	2	5	5	9	2	2	5	3	4	4	0
A.i.	45 <sup>1</sup>	27	13	15 <sup>2</sup>	11	9	8	15	14	7	9	11 <sup>3</sup>
B.b.	9	4	6	15	8	4	10	3	4	7	8	3
B.r.	15	5 <sup>4</sup>	14	5	18	16	18	12	21	44	18	40

A.c. = *Anser caerulescens*; A.i. = *Anser indicus*, B.b. = *Branta bernicla hrota*, and B.r. = *Branta ruficollis*.

<sup>1</sup>Very good year for the Bar-headed Geese with 45 records, very early in the spring and late in the autumn, including first sure breeding in Finland. Kemijärvi parents with 4 young ones 14/06/2008 [66].

<sup>2</sup>A good year - 15 birds seen in 2011 [62] – the same report mentions that 2006–2008 was seen 40, 52 and 45 *Anser indicus* in Finland.

<sup>3</sup>Bar-headed Geese are now interpreted to be of natural origin, monthly numbers being April – 1, May – 8, June – 4, July – 3, August – 2, September – 11 and October 8. Liminka 6 individuals 13.9–1.10.

<sup>4</sup>2009 was a low year for the Red-breasted Goose – 5 records (mentions that 2008 15, 2007 9, 2006 7 and 2005 6 records).

**Table 2.**  
Rare goose recorded in Finland between 2009–2019 [54–65].

(*rossicus* and *serrirostris*) inhabit open tundra when the taiga forms (*fabalis* and *mid-dendorffii*) inhabit open or wooded mires. Two forms differ slightly in colour, size and shape, especially bill colouration and morphology but the visual identification of each subspecies is not easy. Thus, the subspecies are not recorded in goose counts or hunting statistics [38].

The Bean Goose breeds mainly in northern parts of Finland, but occasionally nests have been found in bogs in Central Finland. The Finnish population estimated at 1,000–2,500 pairs [39]. The population has declined in the south due to heavy hunting from the fields [40]. A total of 1,618 Bean Geese have been ringed. The main cause of death is hunting, 89 per cent of the known causes of death. Twenty geese were predated. Out of the nine known predators, Golden Eagle is to be accounted for eight cases and White-tailed Eagle for one case [15].

The Taiga Bean Goose population was very low several years and the hunting was banned six years ago. Last year hunting started again in Lapland 20–27 August but only one bird per hunter and season are allowed and a bag reporting has to be made for each bird [40]. In the eastern part of the country, Tundra Bean Goose is much more common than the Taiga Bean Goose due to the migrating birds from Russia. These birds can be hunted from October to November but the catch has to be reported like in Lapland [40]. The genomic analysis has shown that over half of the Finnish Bean Goose bag consists of the declining Taiga Bean Geese, which is far too many considering the fast decline of this subspecies [38]. The hunting of the Tundra Bean Goose with a large and stable population could be acceptable as long as it does not affect the Taiga Bean Goose population [38].

### 5.8 *Anser indicus*

The Bar-headed Goose breeds normally in Central Asia in colonies of thousands near high altitude mountain lakes and winters in South Asia, as far south as peninsular India (**Figure 2**). The grey goose genus *Anser* has no other member indigenous to the Indian region. The Bar-headed Goose is often kept in captivity, as it is



**Figure 2.** The Bar-headed goose is one of the world's highest-flying birds and normal breeding areas often above 4,000 metres. Has recently bred in Finnish Lapland. Photo from Qinghai, China, courtesy of Coke and Some Smith <naturetraveler@msn.com>.

considered beautiful and breeds readily. Breeding feral populations have become established in Norway and England, where the feral population is believed to be declining due to over-hunting [41]. Recent observations in Finland and the first breeding in Kemijärvi in Finnish Lapland [42] are shown in **Table 2**. The Finnish breeding population varies from zero to two pairs and that of Europe from 10 to 30, respectively [17].

### 5.9 *Branta bernicla*

The Brent Goose is a rare breeder in Greenland (100–150 pairs), Svalbard (500–1500) and the Russian Arctic (400–600) [43]. Its European wintering population used to be large (> 240,000 individuals), and it did increase between 1970–1990 [44]. However, more recently the species has undergone a large decline (> 30%) overall and is now evaluated as vulnerable [43]. It is not known if the enormous increase of the Barnacle Geese would somehow explain the decrease of the Brent Goose. Indeed, there seems to be a possibility for the extensive food competition between these two species at least on the wintering grounds where they share the same tidal zone with coastal meadows, mudflats, or sand-banks [1]. It was interesting that in 1965 I only saw the Light-bellied Brent Geese in Kapp Linné, Svalbard, while now there would be more Barnacle Geese [45].

In Finland, the Brent Goose has never been common but in May 1954 a total of 20,000 were counted near Oulu [10] and that time the wintering population was estimated in Britain and West Europe to be only 26,500. Almost all of the birds seen in Finland are the nominate race *Branta bernicla bernicla*, though there are occasional sightings of the Eastern Siberian race *B.b. nigricans* which has a brownish-black belly and pale flanks [44]. There are also regular but few annual sightings of light-bellied *B.b.hrota* race from Greenland and Svalbard (**Table 2**).

### 5.10 *Branta canadensis*

The Canada Goose is estimated to be the most abundant goose species in North America, already in 2000, the population was between 4 and 5 million birds [46]. In recent years, the populations have grown substantially making it the most common goose in the world. The US goose harvest for 2013/14 reported over 1.3 million Canada Geese taken [47]. The Canada Goose was introduced to Sweden in 1930s – first shot in Finland 1955 in Hailuoto was thought to have arrived from Sweden [13]. Later it was also brought to Finland as a game animal in the 1960s but a self-sustained population developed much later, 1970s [15]. Nowadays 9,000–10,000 pairs are breeding mainly in the southern parts of the country [48]. The Canada Goose is well adapted to living in Finland and can even winter in Finnish waters. More commonly it migrates to winter in the southern parts of the Baltic Sea and Sweden, with a few birds migrating as far as Denmark or Holland [49]. In some areas, many consider them pests for their droppings, bacteria in their droppings, noise, and confrontational behaviour [49]. In Finland, these problems have been noted, particularly on the golf courses, in public parks and beaches, and planned communities. and pastures in the country. Hunting in Finland takes place from 10 August to 31 December and during the last twenty years, some 5,000 birds have been shot annually [50].

### 5.11 *Branta ruficollis*

The Red-breasted Goose breeds in a relatively confined area on the tundra of central Siberia east of the River Ob as far as the Taimyr Peninsula [51]. A large part



**Figure 3.**  
*An original Red-breasted geese papyrus painting from the Dr. Ragab's papyrus institute, Giza, Egypt. Photo: Heimo Mikkola 1982.*

Range State	Compensation	Subsidies	Derogation and derogation shooting	Hunting	Other measures <sup>1</sup>
Belarus				X <sup>2</sup>	
Belgium	X		X	X	X
Denmark			X	X	X
Estonia	X		X	X	X
Finland	X			X	X
France			X	X <sup>2</sup>	
Germany	X	X	X	X	X
Holland	X		X	X	
Iceland <sup>3</sup>				X	X
Latvia	X			X	X
Norway		X	X <sup>4</sup>	X	X
Sweden	X	X	X	X	X
Ukraine				X	X
United Kingdom	X	X	X	X	X

<sup>1</sup>Other measures include for instance different scaring methods, providing alternative foraging areas for geese etc.

<sup>2</sup>In France, geese are hunted for recreational used only, and hunting is not related to agricultural conflicts.

<sup>3</sup>A compensation scheme is under development negotiation.

<sup>4</sup>Norway is not a member of the European Union and has a specific regulation rooted in the national game law.

**Table 3.**  
*Management tools used for geese in European goose management platform range states [68].*

of the population traditionally wintered in Kirov Bay in the Caspian Sea, but when vineyards and cotton replaced the cereal crops in the 1960s, the geese were forced to alter their migration strategy. Now the remaining population (less than 40,000

birds) winter in suitable habitats in Hungary, Bulgaria and Romania [52]. This may not be the first time when this species had to alter its wintering site, as during the antiquity the Red-breasted Goose occurred more frequently in Egypt [53] and is featured on ancient Egyptian paintings (**Figure 3**).

The first know record from Finland is from 6/10/1879 when one individual was caught in a snare in Sääminki [11]. **Table 2** shows that this species is becoming more common every year since 2005 but still there are no breeding attempts [54–65].

From the rare geese in Finland, the real expanders have been only the Red-breasted Goose and to some extent the Bar-headed Geese which are now counted as the natural origin birds in Finland. However, none of these species in **Table 3** could tolerate any hunting or other human disturbance [54–66].

## 6. Conservation

The Barnacle Goose conservation is regulated under the EU Birds Directive and it is also listed on Appendix II of the Bern Convention [67]. So the species is protected from hunting. An International Single Species Management Plan for the Barnacle Goose covers all three populations: (1) The East Greenland/Scotland & Ireland population, (2) the Svalbard/South-West Scotland population and (3) the Russia/Germany & Holland population [9]. This report aimed to provide a framework to coordinate management measures in the Range States in a manner that is consistent with their legal obligations (**Table 3**).

**Table 3** shows that nine out of 14 countries use various forms of financial tools to reduce economic losses due to goose foraging. Twelve countries are using also other measures such as different scaring methods or provision of alternative foraging fields for geese. Eight countries practice derogation or derogation shooting. All the Range States have an open season for goose hunting [68].

## 7. Sustainable hunting

With population sizes still rising, the IUCN lists the species' conservation status being of Least Concern (LC) [69]. However, as at present, the Barnacle Goose has the protection of endangered species based on the Nature Conservation Act. The coverage of monitoring of agricultural damage and conflicts is poor. Information is merely based on annual compensations applied and paid to farmers.

The authorities should declare the Barnacle Geese as overabundant and allow a sustainable spring harvest which should be allowed only on farmlands to attenuate goose damage to crops at that time. The spring harvest could be considered also as a conservation strategy to protect the goose habitats. It is expected that very soon the rapidly increasing population will exceed the carrying capacity of their breeding areas and in winter some marshes heavily used by the Barnacle Geese become completely denuded (cf. [70]).

Sustainable hunting is defined as "the use of wild game species and their habitats in a way and at the rate that does not lead to the long-term decline of biodiversity or hinder its restoration" [71].

Knowing that far more than 800,000 Barnacle Geese are feeding during the spring migration the valuable crops, especially in eastern Finland, it would not be too much to hunt 15,000 birds to compensate the crop losses. That would not reduce the total population more than two per cent even if assuming that each killed bird would have got two goslings next breeding season in the north. With the same

assumptions (50:50 sex ratio, two flyable young/pair, and 10% predator losses from the total population) the autumn population would be 1,059,750 individuals despite the proposed spring harvest in Finland. If we would plan to establish a target spring population between 750,000 and one million, this calculation shows that there is a safe room for the autumn harvest of some 60,000 birds.

It is a common opinion in Finland that only two most common geese species can and should be hunted. These species are Canada Goose and Barnacle Goose. Hunting of these two species would not cause any identification problems, as more rare and fully protected Brent Goose has no white in the head and all *Anser* species are grey distinguishing them from the largely black *Branta* genus.

There is now an official petition for the people to sign on the internet to demand the government to reconsider its decision not to allow the hunting of the Barnacle Geese in Finland although it is the far most common geese in the country and causing a lot of problems to the farmers, golf courses and city parks etc.

Same time the hunting of the much less common Greylag Goose and Taiga Bean Goose could be terminated until the population will recover also [21].

New management actions must have a scientific basis, result from a consensus among stakeholder, and include an efficient monitoring programme (cf. [70]). Different stakeholders should include representatives of farmers, hunters, bird-watchers, conservation associations, and local, regional and national authorities. These people should meet annually to share current information about the Barnacle Goose population and to discuss their respective concerns (cf. [70]).

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