

Briefing note:

Status of Canada Geese in Greenland

The following is a brief digest of information relevant to Canada Geese in Greenland, their population status, and evidence for possible inter-specific competition with Greenland White-fronted Geese. It may be useful as background for discussions on Islay.

Population status and trends in Greenland

“Before the 1970s, the Canada Goose was a scarce vagrant and occasional breeding in W Greenland (Salomonsen 1950, 1967). Since then a rapid colonisation of W Greenland has taken place during the late 1980s and the 1990s (Fox *et al.* 1966; Gladher *et al.* 1996; Boertmann & Gladher (1999).” – Lyngs (2003)

An aerial survey was undertaken of the Greenland breeding population in June 1999 by Malecki *et al.* (2000). It found:

- Breeding pair estimates of 4,314 (\pm 785 SE) Greenland White-fronted (GWfG) and 2,631 (\pm 897 SE) Canada Geese (CG) between 62°–72°N.
- Only one pair of CG and no GWfG were found south of 66°45'N.
- Densities of both species were highest in the Kangerlussuaq region (central west Greenland) and densities declined to the north
- At a local scale, the two species were less likely to occur together than expected by chance suggesting some spatial segregation.

“A repeat survey of these transects flown in 2005 indicated a 6-fold increase in the total population estimate (T. Fox, pers comm.), but the pair density was unchanged. The increase was due to the observation of numerous groups of flocked birds, presumed to be non-breeding birds of Greenland origin. Observations of various sized and colored Canada geese in western Greenland, however, raise the question of the presence of North American molt migrants (T. Fox pers comm.)” – NAP Management Plan (2008)

Distribution in Greenland

“Most CG have been recorded in Isunngua (Sisimiut), Eqalummiut Nunaat, Naternaq/Lersletten (Kangerlussuaq), Qeqertarsuaq/Disko, the Nuussuaq Peninsula and Sigguup Nunnuua/Svartenhuk. Furthermore, a few breeding pairs and several summer visitors have been reported from Nuuk and Mantsiq, and autumn as well as spring migrants are recorded annually in Paamiut [southernmost Greenland] (Boertmann 1994); low numbers of moulting birds as well as a breeding pair have been recorded in Avangersuaq [extreme NW Greenland] (Boertmann & Gladher 1999).” – Lyngs (2003)

Studies of interactions with Greenland White-fronted Geese

Two studies have directly investigated interactions between the two goose species, both in the late summer moult period.

In Isunngua, Kristiansen and Jarrett investigated diet, nest site selection and behaviour interactions in Isunngua in summers 1998 and 1999 (Kristiansen 1997; Jarrett 1999; Kristiansen & Jarrett 2001, 2002). Their main conclusions were:

- Over a ten year period, numbers of CG in the study area increased from c.10 in 1988 to 90 birds in 1998; whilst numbers of GWfG declined from up to 70 to five birds in the same period.

- At a site where both species occurred, GWfG diet a) comprised significantly higher content of low quality mosses, and b) showed a significantly broader diet and lower food intake rates, compared to CG at the same site, and diet at sites where both species occurred separately.
- At sites where both species occurred, GWfG spent significantly more time feeding, possibly to compensate for the low quality food and low intake rate.
- Several physical inter-specific agonistic interactions were recorded with GWfG being the losers in all cases.
- “These results suggest that inter-specific competition [between the two geese] has occurred and may still occur in west Greenland.” – Kristiansen & Jarrett (2002)
- “Based on [very] limited data there may be no competition for nests sites, although in Isunngua most CG nest sites were located in areas known to be used as brood-raising areas by GWfG. Thus, there may be competition for these brood-rearing areas when White-fronts move to these sites after hatching. Breeding CG are extremely aggressive and are unlikely to permit GWfG to enter their brood-rearing areas, which may be the reason why we observed no brood-rearing areas in 1998 and 1999 that held both species of geese.” – Kristiansen & Jarrett (2001)

On Disko Island, Levermann & Raundrup investigated diet and interactions on Aqajarua-Sullorsuaq Ramsar site in July and August 2004 (Levermann & Raundrup undated; Levermann *et al.* in draft). Their main conclusions were:

- Total numbers of geese in the study area has increased, with now larger numbers of CG occurring than GWfG.
- Very few agonistic encounters between the two species were recorded.
- Faecal samples showed no difference in the diet between the two goose species.
- The vastness of the area and low relative densities of geese within it may provide opportunities to avoid inter-specific confrontations in the moult period.

However, if competitive interactions are the cause of declining Whitefront productivity, then such interactions would need to occur in the period before egg-laying (rather than late summer after families have already hatched). **There has been no research on interactions during this early season period (May to early June).**

Taxonomy

“At least three different subspecies of CG have been recorded in Greenland. The small *B. c. hutchinsii* has been recorded breeding north of 69°N and there is one record of *parvipes* from Disko Island (Salomonsen 1967; Boertmann 1994). Most of CG breeding south of 69°N apparently belong to the large *interior* (Fox *et al.* 1996) including all birds ringed in Isunngua. However the question of subspecies is complicated and still far from being resolved.” – Lyngs (2003)

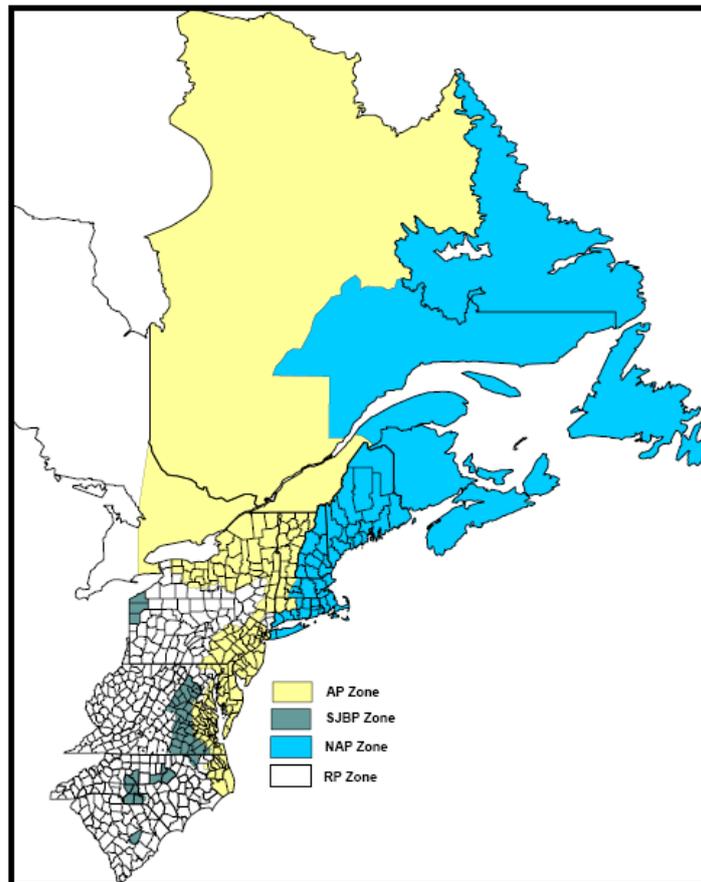
Population delineation

Two populations of migrant CG occur in NE America which might be the source of the expanding numbers in Greenland: the Atlantic Population (AP) and the confusingly similarly named North Atlantic Population (NAP).

“The **North Atlantic Population** (NAP) of CG is defined as all CG breeding in Labrador, Newfoundland, western Greenland, and portions of eastern Quebec. In 1996, both the United States Fish and Wildlife Service and the Canadian Wildlife Service (CWS) formally recognized the NAP as a separate population in the Atlantic Flyway from the Atlantic Population (AP). Prior to the formal recognition by both regulatory agencies, the CWS had managed the NAP as a separate unit. Historically, the NAP wintered along the coast from Nova Scotia south to North Carolina. However the component of the population wintering from Maryland to North

Carolina has largely disappeared. The main wintering region of the NAP is currently from New England north to Nova Scotia. Reliable long-term data on the status of NAP geese are lacking.”

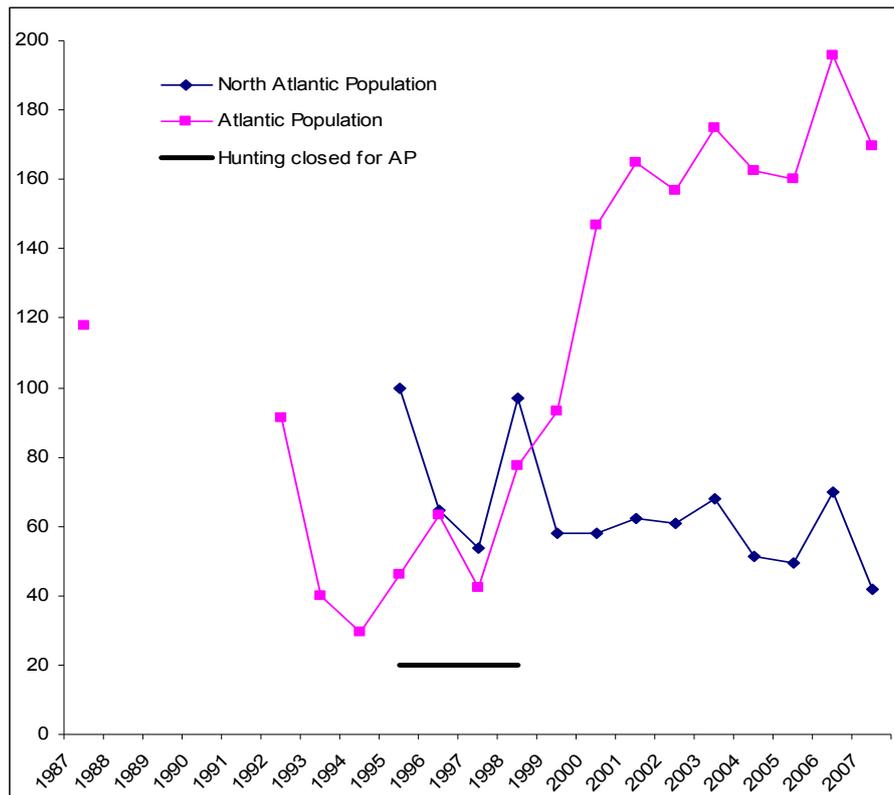
“With respect to the breeding range, there is uncertainty about where the breeding area boundary between NAP and AP geese should be drawn. There is undoubtedly some overlap, but determining where the populations are most distinct will ensure that appropriate areas are included in population surveys and other monitoring programs on the breeding grounds. Likewise, the contribution of geese from Greenland to the NAP has not been well established, and has not been reflected in monitoring programs to date.” – NAP Management Plan (2008)



Canada Goose harvest zones in the Atlantic Flyway 2007. AP Management Plan (2008). AP = Atlantic Population (yellow); SJBZ = Southern James Bay Population (grey); NAP = North Atlantic Population (blue); RP = Resident Population (white, non-migratory).

“The **Atlantic Population (AP)** comprises the northernmost group of CG of the subspecies *Branta canadensis interior*. Geese affiliated with the AP nest north of 48° latitude in northern Québec along Ungava Bay, the north-eastern shore of Hudson Bay (where 80% of the breeding birds are found), and in the interior of the Ungava Peninsula. ... The AP was once considered the largest CG population in North America. Winter indices approached one million birds by the mid-1980s and annual harvests often exceeded those of any duck species.

“The AP winters from southern Ontario eastward though the southernmost part of Québec and southward to North Carolina with major concentrations occurring on the Delmarva Peninsula and in portions of New York, south-eastern Pennsylvania, New Jersey, and Virginia.” – AP Management Plan (2008)



Scribner *et al.* (2003) investigated the genetic relationships of CG from Greenland, and the Atlantic and North Atlantic Populations using genetic markers and satellite telemetry.

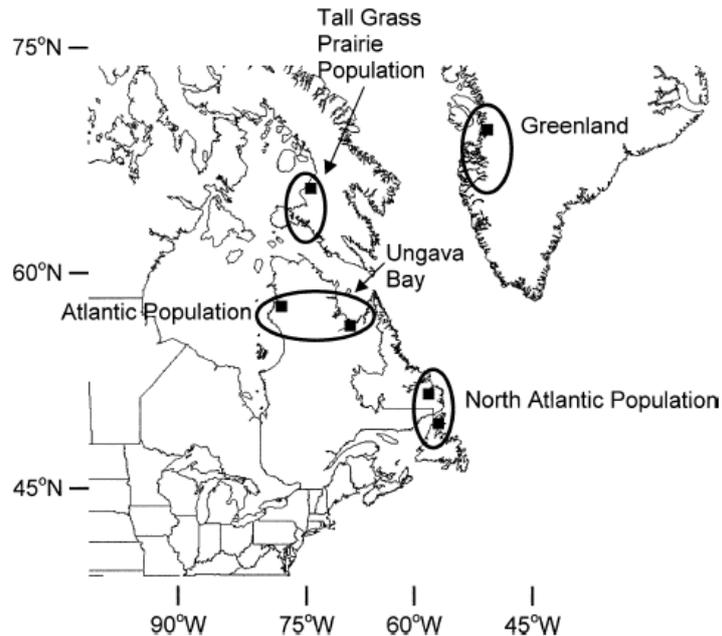


FIGURE 1. Sampling locations of breeding Canada Geese (*Branta canadensis*) from putative source populations in eastern North America and newly colonized sites in Greenland. Population names are as defined in Dickson (2000).

They found that:

- Multilocus genotypes of Greenland CG were consistent with the hypothesis of origin from birds of the AP breeding around southern Ungava Bay, Québec, Canada.

- The AP, based on previous studies of seasonal movements and demography, appeared to be reproductively isolated from the NAP.
- The AP and NAP were genetically differentiated.
- Findings of high levels of genetic discordance among North American breeding populations are consistent with migratory movements, despite high levels of distributional overlap of birds from the North Atlantic and Atlantic Populations during migration and on wintering areas.
- Findings based on genetic markers were concordant with satellite telemetry conducted during spring migration, which showed that birds destined for Greenland migrate through the southern Ungava Bay breeding colony.

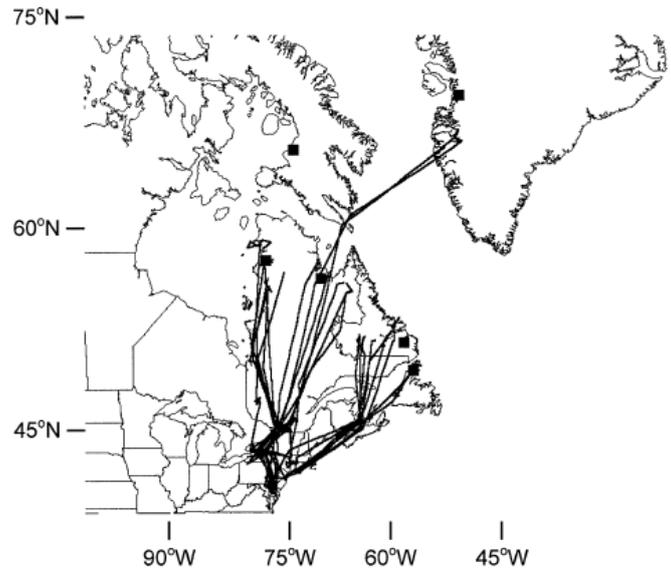


FIGURE 2. Spring migration routes of Canada Geese from breeding populations within the Atlantic Population, North Atlantic Population, and Greenland recorded using satellite telemetry. Filled squares indicate sampling locations from Figure 1.

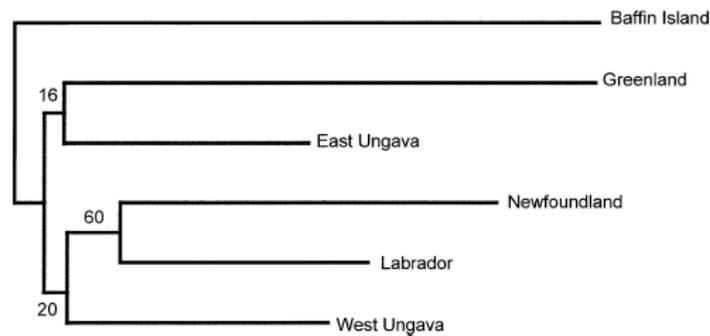


FIGURE 4. Neighbor-joining population tree based on genetic distances among breeding populations of Canada Geese from putative source populations in eastern North America and newly colonized sites in Greenland (Fig. 1). Numbers above tree branches indicate bootstrap support for branch topography (based on 2000 replicates).

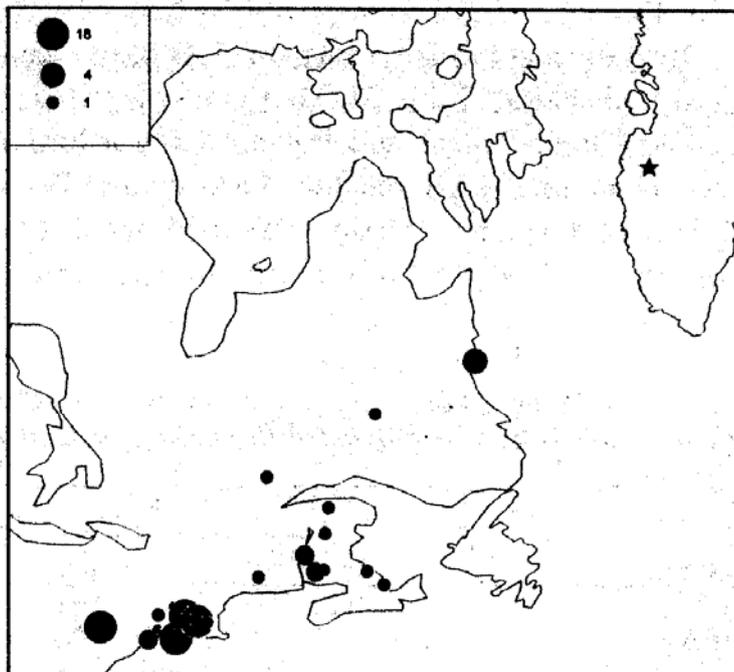
“Band recoveries and resightings of CG neck-collared in Greenland during fall migration indicated that these birds were apparently a part of the North Atlantic Population (Fox *et al.* 1996), which primarily breeds in Labrador and Newfoundland and migrates along the Atlantic coastal zone of Canada and the U.S. as far south as coastal North Carolina. One would therefore assume that newly colonizing birds in Greenland would be derived from this Labrador-Newfoundland stock. However, our telemetry and genetic evidence suggested that a strong linkage to Atlantic Population geese from the southern Ungava Bay region of northern Quebec (eastern Ungava Peninsula) is not as spurious as one might first suspect. Malecki *et*

al. (2001) have suggested that geese breeding in the southern Ungava Bay region may represent a small, transitional subpopulation that favours neither of the migration corridors used by Atlantic or North Atlantic Population geese. Fall movements of these birds, monitored with satellite transmitters, show passage through central Quebec, eastern New York, western Vermont, Massachusetts, and Connecticut to wintering areas in the lower Hudson River drainage of New York, western Massachusetts and Connecticut, and northern New Jersey. Spring movement followed the Hudson River system in New York to Lake Champlain and on to breeding areas in the southern Ungava Bay region.”

“More recent work with satellite transmitters on North Atlantic Population geese (Malecki *et al.*, unpubl. data) indicated that geese breeding in the more westerly portions of Labrador migrated in fall along a more inland pathway to wintering areas along the Atlantic coast; a direct contrast to other birds nesting in Labrador and Newfoundland that travelled south through the coastal maritime region. Spring movements also favoured an inland corridor not unlike that travelled by birds from the southern Ungava Bay region. Six geese similarly marked in west Greenland and monitored during fall and winter 1999 (n = 4) and spring 2001 (n = 3) [Figure 3] also showed this pattern, suggesting strong evidence for a genetic relationship.” – Scribner *et al.* (2003)

Movements from Greenland to North American wintering areas

“Recent recoveries show that birds ringed in Sisimiut [Isungua in 1992 and 1997] cross the Davis Strait in late September, passing Labrador, New Brunswick and Massachusetts en route to the wintering grounds in north-eastern USA, primarily Connecticut, New York and Pennsylvania, though there may be winter movement between these states. Three birds caught in [Isunngua] in 1999 and fitted with satellite transmitters, left Greenland in the latter half of September and all were present on Long Island(New York) by mid November. At the start of February, the three birds continued to southern New Jersey and Delaware (A.D. Fox pers. comm.).” – Lyngs (2003); Kristiansen *et al.* (1999)



Map 12. Recoveries of Canada Geese abroad. The position of Isunngua (SIS) is shown by a star.
Kort 12. Genfund af Canadagæs i udlandet.

(Lyngs 2003)

Most recent recoveries and sightings of 123 CG ringed in Isunngua, July 2008:

	October	November	December
Quebec	2 shot		
New Brunswick	4 shot		
Maine	5 seen		2 seen
New Hampshire	2 seen	1 seen	
Massachusetts			
Connecticut		10 seen	
New York			
Pennsylvania			
Delaware			
Maryland		2 shot	

North American research

Field studies in northern Quebec were initiated in 1997 following a precipitous decline in the Atlantic population (AP) of CG. This decline culminated in closure of sport hunting in parts of the US and Canada in 1995. Prior to 1997, the status of AP geese was measured with banding and other surveys on the wintering grounds in the US. Prior to the mid-1980s, when resident population (non-migratory) CG were less abundant, wintering ground surveys were reasonably accurate in determining the status of AP geese. However, with the tremendous increase of resident CG after 1985 and their inherent mixing with AP geese on the wintering grounds, it became necessary to begin monitoring the status of AP geese on their breeding grounds. — Nichols (2001)

Legal status and policy jurisdictions

CG in North America are managed on an international basis by the Flyway Councils, which include Provincial, State and Federal representation (Blohm *et al.* 2006). The Atlantic Flyway Council maintains Management Plans for both the Atlantic and North Atlantic Populations of CG. The most recent versions of these plans were published in 2008 (AP Management Plan 2008; NAP Management Plan 2008).

There is no formal international relationship between Greenland, Canada or USA regarding the management of shared populations of migratory waterbirds.

Management objectives in North America

Atlantic Population

“The overall management goal is to maintain the Atlantic Population of CG and their habitats at a level that provides optimum opportunities for people to use and enjoy geese on a sustainable basis. The population objective believed necessary to achieve this goal is to achieve and maintain an index of 225,000 breeding pairs of AP CG in the Ungava region of northern Québec. The objective in this plan is significantly higher than that established in the 1996 Action Plan for AP CG, which was focused on re-opening of a sport harvest season. The population objective requires continued population growth, assumes that the AP can be maintained at this higher level and reflects a desire to expand AP harvest opportunities using an adaptive management approach.”

“Harvest regulations may be liberalized under the current plan, subject to close monitoring of harvest rates and the spring breeding pair index. Regulations will be developed on a regional basis within the flyway to reflect differences in proportions of AP and Resident Population geese in the harvest. An added benefit will be the additional harvest exerted upon RP Canada geese where the two populations overlap. The long-term decline of AP Canada geese in the

southern Atlantic Flyway presents a unique harvest-management dilemma. Modifications in framework opening dates will be the primary means used to promote the long-term viability of this southern migrating group of geese.

“Population models are being developed to predict and evaluate population response to management actions that affect harvest, survival, and growth rates. All parties recognize the need to support and maintain a long-term harvest strategy for AP CG that ensures (a) the conservation of the population, (b) the conservation of habitat, (c) provides for equitable harvest opportunity among users, (d) provides for the subsistence harvest of geese by Aboriginal peoples, and (e) prevents the population from causing significant harm to agricultural or ecological resources or becoming too large to control via sport harvest.

“The spring breeding pair index will be used for monitoring status and for use in annual discussions of harvest regulations. The spring breeding pair index is expected to increase toward 225,000 pairs even as harvest regulations are modestly liberalized. If the 3-year mean spring pair index falls below 150,000, more restrictive regulations will be considered. The index accounts for roughly 90% of the total estimated number of breeding AP geese.” – AP Management Plan (2008)

North Atlantic Population

“The primary management goal for the NAP is to maintain the NAP at or above levels observed during 2001-2005. This population level allows for the maximum benefit to society in agreement with International treaties, and will provide for a sustainable sport harvest of ~40,000 NAP geese/year in the Atlantic provinces of Canada and maximum opportunity for harvest of Atlantic Flyway Resident Population (AFRP) CG in the U.S.” – NAP Management Plan (2008)

ISSUES FOR DISCUSSION:

- Genetics and movements suggest that Greenland breeding birds are part of the AP (Scribner *et al.* 2003). However, the recently published AP Management Plan (March 2008) makes no reference to a possible Greenlandic component to the population. Monitoring AP population status is based on spring indices in Canada and thus always will exclude consideration of any Greenland breeding birds.
- The NAP Management Plan more fully discusses birds from Greenland and the range of the population is defined as including Greenland. However, Greenlandic birds are not included within population models: “the contribution of geese from Greenland to the NAP has not been well established, and has not been reflected in monitoring programs to date.”
- There is need for these two Management Plans to rationalise their approaches to Greenland breeding Canada Geese and include the significant numbers now occurring there within appropriate population assessment and harvest regimes.

Research needs and priorities (in the context of interactions with Greenland Whitefronts

1. Early season studies of ecology and inter-specific interactions between Canada and White-fronted Geese.
2. Extensive aerial survey in the pre-breeding period to assess numbers and densities of both species in the period when interactions are likely to be occurring.
3. Further ringing to develop robust estimates of survival of Greenland Canada Geese to assist in modelling future population development.

References

- AP Management Plan 2008. [A Management plan for the Atlantic Population of Canada Geese](#). Canada Goose Committee Atlantic Flyway Migratory Game Bird Technical Section. 52 pp.
- Blohm, R.J., Sharp, D.E., Padding, P.I., Kokel, R.W. & Richkus, K.D. 2006. [Integrated waterfowl management in North America](#). *Waterbirds around the world*. Eds. G.C. Boere, C.A. Galbraith & D.A. Stroud. The Stationery Office, Edinburgh, UK. pp. 199-203.
- Boertmann, D. 1994. An annotated checklist of the birds of Greenland. *Meddelelser om Grønland, Bioscience* 38: 1-63.
- Boertmann, D. & Gladher, C. 1999. *Grønlandske gåsebestande – en oversigt*. Faglig rapport fra Danmarks Miljøundersøgelser No. 276. 59 pp. [Review of status of goose populations breeding in Greenland; GWfG = pp. 20-25].
- Fox, A.D., Gladher, C., Mitchell, C., Stroud, D.A., Boyd, H. & Frikke, J. 1996. [North American Canada Geese \(*Branta canadensis*\) in west Greenland](#). *Auk* 113: 231-232.
- Glahder, C.M., A.D. Fox, Stroud, D.A. & Mitchell, C.R. 1996. North American Canada Geese in west Greenland. *Wetlands International Goose Specialist Group Bulletin* 7: 23-25.
- Jarrett, N.S. 1999. *An investigation of inter-specific competition and habitat exploitation of moulting geese in West Greenland. Final report to sponsors of The West Greenland Goose Project 1998*. B.Sc. thesis, University of Newcastle. 57 pp.
- Kristiansen, J.N. 1997. Diet of Canada Geese and White-fronted Geese in Isungua, West Greenland. *Dansk Ornithologisk Forenings Tidsskrift* 91: 130-132.
- Kristiansen, J.N. & Jarrett, N.S. 2001. Nest sites of the newly established Canada Goose population in West Greenland. *Dansk Ornithologisk Forenings Tidsskrift* 95: 173-176.
- Kristiansen, J.N. & Jarrett, N.S. 2002. Inter-specific competition between Greenland White-fronted Geese *Anser albifrons flavirostris* and Canada Geese *Branta canadensis* interior moulting in West Greenland. *Ardea* 90: 1-13.
- Kristiansen, J.N., Fox, A.D. & Jarrett, N.S. 1999. [Resightings and recoveries of Canada Geese *Branta canadensis* ringed in west Greenland](#). *Wildfowl* 50: 199-203.
- Levermann, N. & Raundrup, K. undated. *Do the Greenland white-fronted geese stand a chance against the invasive Canadians?* Unpublished report, Biologisk Institut, Copenhagen University. 28 pp. [In Danish]
- Levermann, N., Raundrup, K. & Poulsen, M. in draft. Do the Greenland White-fronted Geese stand a chance against the invasive Canadians?
- Lyngs, P. 2003. Migration and winter ranges of birds in Greenland. *Dansk Ornithologisk Forenings Tidsskrift* 97: 1-167. [GWfG pp. 24-29]
- Malecki, R.A., B. D. J. Batt, B.D.J. & Sheaffer, S.E. 2001. Spatial and temporal distribution of Atlantic population Canada Geese. *Journal of Wildlife Management* 65: 242-247.
- Malecki, R.A., Fox, A.D. & Batt, B.A. 2000. [An aerial survey of nesting Greenland White-fronted and Canada Geese in West Greenland](#). *Wildfowl* 51: 49-58.
- NAP Management Plan 2008. [Management plan for the North Atlantic Population of Canada Geese](#). Canada Goose Committee, Atlantic Flyway Technical Section. 31 pp.
- Nichols, T. 2001. Canada Goose banding in the arctic. www.nj.gov/dep/fgw/gooseart.htm
- Salomonsen, F. 1950. *Grønlands Fugle. The Birds of Greenland*. Munkgaard, Copenhagen. 609 pp.
- Salomonsen, F. 1967. *Fuglene på Grønland*. Rhodos, København. 342 pp.
- Scribner, K.T., Malecki, R.A., Batt, B.D.J., Inman, R.L., Libants, S. & Prince, H.H. 2003. [Identification of source population for Greenland Canada Geese: genetic assessment of a recent colonization](#). *Condor* 105: 771-782.