



To
The Ministry of Domestic Affairs, Nature and Environment
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Greenland

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Standing Non-Detriment Findings for Exports from Greenland of Products derived from Atlantic walrus (*Odobenus rosmarus rosmarus*)

Since the last Non-Detriment Finding assessment in 2007 substantial new scientific information on the delineation and size of the walrus subpopulations that are exploited in Greenland has become available. Furthermore, essential improvements in the management of walruses in Greenland have been made including reduction in quotas.

In determining the extent to which harvesting of Atlantic walrus (*Odobenus rosmarus rosmarus*) in Greenland for purpose of international trade is potentially negatively impacting natural populations, the following has been considered.

Management

Quotas were introduced by the Greenland Government for the catch of walruses in Greenland in 2006 (Anon. 2006a,b,c). The harvest of walrus is managed through the Ministry of Fishery, Hunting and Agriculture (MFHA, the Government of Greenland, Nuuk) and national regulations are in force to regulate the catch of walruses in Greenland. Amongst other, these regulations address who are allowed to hunt walruses, methods of hunting (e.g. the use of harpoon to retrieve the kill), hunting seasons, and the protection of certain demographic elements (i.e. adult females and calves and young accompanying adult females) and walruses on land (Anon. 2006c).

Quotas are determined by the Greenland Government based on recommendations from the MFHA. Regional quotas are determined for each of the three separate walrus subpopulations ("stocks") that are exploited in Greenland: The *West Greenland-Southeast Baffin Island* and *Baffin Bay* stocks in West Greenland, and the *East Greenland* stock. The catch is monitored using two "parallel" systems: 1) a general reporting system that was introduced in 1993 - *PINIARNEQ* ("The catch") - where each hunter reports his total harvest by month of all species taken by him through the year (September to September), and 2) a separate and specific reporting for each walrus catch. This latter system came into place by the introduction of quotas in 2006. Furthermore, by the introduction of quotas it became mandatory to report each case of struck-and-lost walruses.

Annual quotas set for a three-year period (2007-2009) intended a gradual decrease in the catch of walrus from the W Greenland-SE Baffin Island and the Baffin Bay stock, but unchanged for the East Greenland stock (Anon 2006a,b). Prior to 2009 the quotas addressed reported landed catches and did not compensate for struck-and-loss. In order to incorporate an assumed, but unknown, proportion of walrus that are mortally wounded or killed but not retrieved during the hunt, the quotas for 2009 were reduced to include an estimate of unretrieved struck-and-lost for the W Greenland – SE Baffin Island and the East Greenland stocks. Quotas for the catch in NW Greenland from the Baffin Bay stock were not reduced because MFHA assumed that the hunters that harvest the Baffin Bay stock are more specialised in hunting walrus and have a low struck-and-loss rate (Anon. 2009).

Quotas were issued late December 2010 for the catch of walrus in Greenland during 2010-2012 (Table 1).

Table 1 - Quotas for the catch of walrus in Greenland, 2010-2012

Source: Anon. 2010a						
Area	Stock	Quota			Biological advice	
		2010	2011	2012		
NW	Baffin Bay	64(-16) ¹	64(-12)	64	68 ²	
W	West Grl.-Baffin Island	61	61(-1)	61	89	
E	East Greenland	18	18	18	20	
Total		143	143	143		

¹ Figures in parentheses are reduction in annual quota due to quota excess by 12 November 2010.

² The press release states: "Advice not including estimated loss and catch in Canada/Nunavut from shared stocks.". This is a misunderstanding because the advice are total removals including loss and catch in Canada/Nunavut from the shared stocks (NAMMCO 19-6 SC Report 2010: 129).

The scientific advice to the Greenland Government's management authorities on sustainable catch of walrus in Greenland by subpopulation is provided by the North Atlantic Marine Mammal Commission (NAMMCO). NAMMCO's Scientific Committee has three times (1995, 2005 and 2009) reviewed the available information on Atlantic walrus throughout its range and attempted to evaluate its status by subpopulation. In November 2009 comprehensive assessments of Atlantic walrus subpopulations in Greenland and adjacent areas (Canada/Nunavut and Svalbard/Norway) were made by the NAMMCO Scientific Working Group on Atlantic Walrus (NAMMCO 2009). The assessment was based on the results of extensive co-operative studies conducted by Greenland (and for shared stocks in co-operation with Canada) during 2005-2009 with the specific purpose of determining subpopulation delineation and size. This assessment was evaluated by the scientific committee of NAMMCO on 7 January 2010 and on 19 January 2010 the recommendations on Total Allowable Catch - TAC (i.e. total removals including loss) from each of three Greenland subpopulations became available to the Greenlandic management authorities (NAMMCO 2010a). Until the recommendations became available the Greenlandic management authorities had issued *interim* quotas for 2010 but new quotas were introduced after the new advice became available (Anon. 2010b).

Quotas issued for the Greenland catch of walrus for the years 2010-2012 allow for a total of 143 walrus to be taken each year (Anon. 2010a). This represents a reduction in the exploitation of walrus in Greenland of ca. 30% since 2006 (i.e. before quotas became into force).

New information on subpopulations status (NAMMCO 2009, 2010a,b) has allowed for setting quotas in Greenland that aim at being sustainable (Anon. 2010). For subpopulations shared with Nunavut/Canada (i.e. the W Greenland-SE Baffin Island and the Baffin Bay stocks) the quotas in Greenland also include estimates of total removals from these stocks in Nunavut (Anon. 2010).

A note on struck-and-loss

It is known that loss from walrus hunting can be substantial in some cases (Born et al. 1995 and references therein, NAMMCO 2005). Hence, any consideration on levels of sustainable take from any walrus population must include an estimate of potential loss (i.e. walrus that are struck and mortally wounded but not retrieved). Modelling of the historical development of walrus population to the present level is based on historical reported catches and also applies an estimate of the fraction struck-and-lost. This is also the case for the three walrus subpopulations harvested by Greenland (Witting & Born 2005, NAMMCO 2010). In the case of these subpopulations, losses were assumed to range between 0 and 30% based on various sources of information (ibid.). However, very little information exists based on systematically collected observations on the actual loss rates in the Greenland walrus hunt. Observations made in the late 1970s in the Qaanaaq area of NW Greenland indicated a loss rate of 15 to 25% (i.e. 1 lost for every 3 retrieved) and observations made in East Greenland indicate an overall loss rate of ca. 23% (Born et al. 1995). Since the introduction of quotas in Greenland in 2006 it has been mandatory to report each struck-and-lost walrus. During 2006-2008 only one walrus was reported struck-and-lost to the MFHA. During an interview survey conducted in 2010 in West and Northwest Greenland experienced walrus hunters were asked specifically about the number of walrus they had landed during 2007, 2008 and 2009 and how many individuals they had lost. Sixty-four of 76 interviewees responded to this question of which ca. 93% said that they do not loose any walrus; the remainder indicated that losses are few and rare. However, during the same survey more than 90% of the answers indicated that the harpoon is not used until after the walrus has been struck by bullets. This is particularly the case when walrus are hunted in the water (GINR unpubl. data). It is GINR's opinion that this hunting method where the harpoon is not used until the walrus is severely wounded and therefore can be approached at close range inevitable means that in some cases losses can be substantial. In summary, the current loss rate is unknown and likely to lie between the close to zero reported by hunters in 2010 and the 15 to 25% observed by scientists in the 1970s. The assessments reviewed by NAMMCO assumed an overall loss rate of 15%, which was considered to be in accordance with the cautionary principle.

Status and exploitation of walrus in Greenland

Since 2005, the Greenland Institute of Natural Resources in cooperation with in particular the National Environmental Research Institute (NERI) in Denmark and the Department of Fisheries and Oceans (DFO) in Canada has conducted a series of studies in order to determine the status of walrus stocks in Greenland and neighboring Nunavut/Canada. The studies have aimed at determining delineation and size of various subpopulations in order to be able to

provide Greenland advice on levels of sustainable take (landed catch and struck-and-lost) from the three walrus stocks that are exploited in Greenland.

If otherwise not stated specifically the following review of the assessment of the status of the three Greenland walrus subpopulations is based on the assessment made by NAMMCO in November 2009 (NAMMCO 2009, 2010a,b).

Atlantic walruses occur in three more or less separate subpopulations in Greenland. Prior to the meeting in the NAMMCO Scientific Working Group on Atlantic Walrus in 2005 these subpopulations were denoted: The West Greenland “winter” subpopulation, the “North Water” subpopulation and the East Greenland subpopulation (NAMMCO 2006). Movement studies, genetic analyses, and a disjunct distribution of walruses associated with a disjunct distribution of suitable walrus habitat (i.e. confined shallow foraging banks and wintering grounds) indicate that there is only very limited exchange among walruses inhabiting these areas (i.e. Central W Greenland, the North Water Polynya area in northern Baffin Bay/Smith Sound, and East Greenland).

Following analyses of new information on distribution, genetics and movement of individuals tagged with satellite transmitters during 2005-2008 it has been finally concluded that walruses that winter in central West Greenland are a part of a subpopulation that also ranges along southeastern Baffin Island. Hence, in 2009 it was concluded that walruses that winter in W Greenland and walruses occurring all year round along SE Baffin Island are part of one coherent population now denoted “*The West Greenland-Southeast Baffin Island*” subpopulation.

Based on information on movement and distribution the former “North Water” stock that ranges over northern Baffin Bay and into the northeastern Canadian High Arctic was divided into three subpopulations (“stocks”): (1) *The Baffin Bay*, (2) *Western Jones Sound* and (3) *Penny Strait-Lancaster* subpopulations (NAMMCO 2006, 2009). The Baffin Bay stock is harvested by Greenlanders living in NW Greenland (north of Upernavik) and to much less extent by Canadian Inuit from Grise Fiord (Jones Sound, E Ellesmere Island).

Walruses in East Greenland belong to a genetically distinct subpopulation which is geographically confined to East Greenland.

The W Greenland-SE Baffin Island subpopulation

- Walruses belonging to the W Greenland-SE Baffin Island stock occur between fall and spring at the shallow water banks along Central West Greenland between ca. 66° and ca. 70° 30' N.
- It has been suggested that this group of walruses has connection with walruses occurring further north in northern Baffin Bay (i.e. the Baffin Bay stock in the Smith Sound region); cf. Born *et al.* 1995 and references therein. However, genetic studies indicate that there is only a limited male mediated gene flow from W Greenland to the Baffin Bay stock. Furthermore recent analyses found no genetic difference between walruses at SE Baffin Island and in W Greenland whereas there were differences between walruses in SE Baffin Island-W Greenland and those in northern Baffin Bay and those inhabiting Hudson Strait

south of SE Baffin Island. Apparently, walrus from Hudson Strait have some genetic input to the W Greenland-SE Baffin Island stock. However, the current state of knowledge does not permit exact quantification of the rates of influx from one area to the other.

- During March-April 2005, 2006, 2007 and 2008 GINR and NERI deployed a total of 31 satellite transmitters on walrus on their wintering grounds off Sisimiut (ca. 67° N) in central W Greenland. Furthermore, 8 satellite tags were deployed by GINR, NERI and Department of Fisheries and Oceans (DFO, Canada) on walrus at their terrestrial summer haul-outs on SE Baffin Island in August-September 2007. Eight of the transmitters deployed in W Greenland lasted long enough to show spring migration across Davis Strait to SE Baffin Island. In addition the recovery of a flipper tag at the W Greenland walrus wintering ground in April 2009 from a walrus that was tagged in September 2007 on SE Baffin Island supported the notion of a common stock. Two walrus equipped with satellite tags off Sisimiut made an excursion during spring north along the Greenland coast as far as Upernavik before they returned south and one moved to SE Baffin Island. This indicates that some walrus that winter on the W Greenland wintering grounds between 66° and ca. 70° 30' N may be subject to hunting during spring in the Ummannaq and Upernavik areas (i.e. between ca. 71° and ca. 74° 30' N).
- Hence, the conclusion of the genetic studies and the satellite telemetry is that walrus wintering at W Greenland are part of a subpopulation that also occurs all year round at SE Baffin Island.
- During late March – mid April 2006 and during the first half of April 2008 aerial surveys were conducted by GINR over the walrus wintering grounds in W Greenland. The surveys resulted in estimates of abundance that were corrected for animals submerged and hence out of sight using “at surface:dive” data collected by the previously mentioned instrumented walrus. The corrected estimate of the number of walrus on the W Greenland wintering grounds for 2006 was 2791 (95% confidence interval, CI: 1036-7522 walrus), and 3240 walrus (95% CI: 863-12170) for 2008. These two estimates are not statistically significantly different.
- In 2005, 2006, 2007 and 2008 aerial surveys were conducted jointly by DFO and GINR during the “open water” or ice free season over the walrus summering grounds along SE Baffin Island between 62° 10' N and 69° 37' N. In 2007, a boat survey was conducted by DFO, GINR and NERI along the coast of SE Baffin Island where walrus from the W Greenland-SE Baffin Island stock haul out on land during summer. The purpose was to derive an estimate of “minimum number of walrus alive” in these areas. The maximum number of 1056 walrus was obtained on 3-4 September 2007 during the boat survey. This number has not been adjusted for animals at sea and not present on or at the haul-outs during the survey. Studies of walrus behavior in other parts of the Arctic indicate that walrus spend an average of ca. 25% to ca. 40% of their time on land. This indicates that several thousand walrus from the W Greenland-SE Baffin Island stock can be found during summer along SE Baffin Island.

- During 1993-2006 (i.e. prior to quotas taking effect), the reported landed catch of walrus in West Greenland south of ca. 76° N (i.e. south of the Qaanaaq area) averaged 170/year (sd=58, range=73-241, n=14 years) (MFHA *in litt.* 2009). This does not include losses which are unknown but believed to be substantial in some cases (Born et al. 1995 and references therein).
- Quotas for the West Greenland walrus stock in 2007, 2008 and 2009 were 80, 65, 50 animals (Anon. 2006a,b), respectively. However, a total of only 43, 28 and 33 walrus were reported landed in West Greenland from this stock in 2007, 2008 and 2009 (Ugarte, in press). On average ca. 63% of the quotas was taken during the three-year period.
- In the reporting period between 2006 (when quotas were introduced) and 2008 only one walrus was reported struck-and-lost by the hunters to the MFHA. The MFHA considered this to be an implausibly low rate for struck-and-lost and it was decided to reduce the walrus quota for 2009 in West Greenland by ca. 25% to 38 to incorporate potential loss in total removals (NAMMCO 2009, NAMMCO. 2010a,b).
- After new information on the size of the W Greenland-SE Baffin Island stock became available the quota for 2010 - 2012 for the removal of walrus in West Greenland was set at 61 per year. Struck-and-lost rates in W Greenland are not known. However, the quota issued by the Greenland management authorities assumes an overall loss rate of 15% in the hunt from the W Greenland-SE Baffin Island stock (Anon. 2010), resulting in an assumed total removal of 70 animals if the total quota of 61 is taken.
- Walrus are hunted along SE Baffin Island mainly during the period May-November (Stewart 2008) – i.e. when they are absent from W Greenland. During 1989-2008 the reported catch of walrus on SE Baffin Island in the communities Iqaluit, Qikiqtarjuaq, Pangnirtung and Clyde River that harvest from the W Greenland-SE Baffin Island stock was reported to average 32/year (sd=19.4, range=2-71, n=20 years). During 1999-2008 (10 years) the reported catch averaged 22 walrus/year (sd=12.9, range:2-43), and during 2004-2008 (5 years) the catch averaged 15/year (sd=12.1, range:2-34). This is likely a minimum estimate of total removals because in some years catches were not reported. Furthermore struck-and-lost is not included (COSEWIC 2006; DFO unpublished data 2009). When setting quotas for 2010 the Greenland Government assumed that the catch in SE Baffin Island averages 16 walrus/year (Anon. 2010).
- Using recent abundance estimates, historical catches and estimates of non-reported kills (struck-and-lost) in an age- and sex-structured population dynamic model with density regulation an assessment was made in November 2009 of the three walrus subpopulation that are exploited by Greenland. For subpopulations shared with Canada the catches reported in Nunavut (and estimates of stuck-and-lost) were included in the modeling of trends in subpopulations. The modeling assumed that struck-and-lost ranged between 0 and 30%.
- The assessment estimated that the W Greenland-SE Baffin Island stock of walrus declined from a carrying capacity of 9000 (90% CI: 5900-14000) walrus in

1900 to an abundance of 3200 (90% CI:1790–5430) individuals in 1960, after which time the population has been relatively stable with a local maximum of 4500 (90% CI: 3650-5550) walrus in 1993 and a 2010 abundance of ca. 3200 (90% CI: 2300-4400). The current yearly replacement yield was estimated at 130 (90% CI: 61-190) walrus.

- Based on this assessment it was estimated that a total removal (catch plus loss) of between 53 and 108 walrus/year from the W Greenland-SE Baffin Island would have more than 50% probability of allowing the subpopulation to increase towards historical level assuming that females constitute 68% of the catch. If females constitute 20% of the catch the annual removal of 80-154 walrus would have more than 50% probability of allowing the stock to increase.
- NAMMCO recommended that future removals be set for an assumed female fraction of 68%, given an acceptable protection level larger than or equal to 70%. Therefore, the recommendation was a total combined removal (reported catch plus struck-and-lost) in W Greenland and SE Baffin Island of between 89 (70% probability of increase) and 53 (95%) walrus per year.
- The 2010-2012 quota for the total removals of walrus in W Greenland from the W Greenland-SE Baffin Island stock is 61 walrus per year. Furthermore it is assumed that the reported yearly catch in SE Baffin Island from the same stock is 16 (Anon 2010). If a loss rate of 15% is assumed also to apply in Nunavut, the quotas in Greenland assume a total removal in 89 walrus per year from the W Greenland-SE Baffin Island stock or ca. 2.8% of the estimate of the number of walrus wintering in West Greenland. It is assumed that walrus populations may have an annual net growth rate of up to ca. 5% (Born et al. 1995 and references therein).
- A combined W Greenland-Nunavut/Canada removal of ca. 89 walrus per year from the W Greenland-SE Baffin Island stock is well below (68% of) the estimate of the annual replacement yield of 130 animals. Furthermore, it is in accordance with the NAMMCO recommended protection level indicating that a total of 89 walrus can be removed (landed catch and struck-and-lost) annually from the W Greenland-SE Baffin Island stock while there is a 70% probability that the stock will increase.

The Baffin Bay subpopulation

- Genetic studies indicate that walrus occurring in NW Greenland (i.e. in the eastern part of the northern Baffin Bay-Smith Sound area) differ from those in W Greenland. Information obtained from satellite telemetry (Stewart 2008) indicates that what was former thought to constitute one coherent subpopulation occupying the North Water Polynya (northern Baffin Bay-Smith Sound) and adjacent areas in the Canadian High Arctic, likely are three separate stocks: (1) The North Water proper now denoted the *Baffin Bay* subpopulation (i.e. walrus in northern Baffin Bay-Smith Sound-southern Kane Basin), (2) the *western Jones Sound* (Nunavut) and (3) *Penny Strait-Lancaster Sound* (Nunavut). Population sub-structuring in

the former “North Water” population was also indicated by genetic analysis. The *Baffin Bay* subpopulation is exploited by Greenlanders living in the Qaanaaq area in NW Greenland and to an unknown but likely rather low extent also by subsistence hunters living in Grise Fjord (Jones Sound, E Ellesmere Island) in Nunavut.

- In mid-July 2009 GINR deployed a total of 10 satellite tags to walrus in northern Smith Sound in order to collect information on “at surface:dive” time. This information was used to correct aerial survey estimates of the size of the Baffin Bay stock to include walrus that were not available for detection because they were submerged.
- During May 2009, an aerial survey to determine the number of walrus in the Baffin Bay during late winter and spring was conducted by GINR. Furthermore, during August 2009 an aerial survey was conducted jointly by GINR and DFO along Ellesmere Island in the Smith Sound-Kane Basin area to determine the number of walrus in this stock during the open water season. The spring aerial survey resulted in an estimate of total abundance (i.e. corrected for submerged walrus) of 2676 walrus (95% CI: 1140 – 4920). Adjusting for walrus that were not available for detection, the estimate of abundance of the northern Baffin Bay stock in the Kane Basin-Smith Sound area during August 2009 was 1616 walrus (95% CI: 876-2980). These two estimates of abundance are not statistically significantly different. NAMMCO concluded that for a variety of technical reasons the spring estimate of abundance may have tended to overestimate true abundance to an unknown extent whereas the summer survey estimate may represent an underestimate of abundance because not all the potential summering areas were covered. Hence, it was decided to combine the two estimates of abundance for the assessment of the status of the Baffin Bay stock (NAMMCO 2009).
- During May 2010 GINR conducted a second aerial survey over the winter range of the Baffin Bay walrus population in Kane Basin and Smith Sound. In connection with this survey 8 satellite tags were deployed on walrus in Smith Sound to derive an area and population-specific surface:submergence correction factor. The data are currently being analyzed. Results of the 2010-survey are not available and must also first be validated by NAMMCO before being used for management.
- The reported landed catch of walrus in NW Greenland from the Baffin Bay subpopulation during 1993-2006 averaged 126/year (sd= 55, range: 67-265/year) (MFHA *in litt.* 2009). During this period the annual catch decreased significantly. The reason for this trend is not clear. It may reflect a population decline or a combination of factors such as a decrease in hunting effort caused by a change in distribution and availability of walrus due to a climate-change induced decrease in sea ice (Born et al. 2010) and/or a decrease in number of hunters hunting walrus (Born, unpublished data).
- The Greenland walrus quotas for the Baffin Bay stock for the three-year period 2007- 2009 were 90, 80 and 75, respectively (Anon. 2006,a,b). The reported catch in 2007, 2008 and 2009, respectively, was 80, 66 and 91 walrus (MFHA *in litt.*

2009; Ugarte *in press*). On average ca. 97% of the quotas during the three-year period were taken. After new information on the size of the Baffin Bay stock became available to the MFHA the quota for 2010-2012 for the total removal of walrus in Northwest Greenland (i.e. the eastern Smith Sound area) was set at 64 walrus/year.

- Walrus from the Baffin Bay stock are also hunted by Inuit living in Grise Fiord in Jones Sound (Nunavut/Canada). During 1977-2002 an average of 10 walrus/year (sd=6.6, range: 2-25 walrus, n=25) were reported from Grise Fiord. During 1993-2002 (10 years) and during 1998-2002 (5 years) an average of 10 walrus/year (sd=6.7, range: 2-24 walrus) and 9 walrus/year (sd=6.7, range: 2-24 walrus), respectively, were reported from this community (COSEWIC 2006). The reported catch showed a decreasing trend in recent years with some years of no reporting. An unknown fraction of this catch is taken in eastern Jones Sound from the Baffin Bay stock (the remainder is taken from the western Jones Sound stock). The Greenland management authorities assumed that the total removal of walrus from the Baffin Bay by Grise Fjord hunters averages 4/year (Anon. 2010).
- In the NAMMCO assessment of the Baffin Bay stock it was projected to have declined almost linearly from an estimated carrying capacity population level of ca. 10000 (90% CI: 6900-16000) in 1900, to an abundance of 2100 (90% CI: 1500-3100) walrus in 2010. Current yearly replacement yield was estimated at 84 walrus (90% CI: 31-140).
- The NAMMCO Scientific Working Group on Walrus noted that the estimate of current depletion level for the Baffin Bay stock, however, is more uncertain than the estimates for the two other walrus stocks in Greenland owing to the great uncertainty about historical catches from this stock. The historical catch series is an important parameter driving the modeled historical development of the stock.
- Based on this assessment it was estimated that a total removal from the Baffin Bay subpopulation of between 35 and 83 walrus/year would have more than 50% probability of allowing the stock to increase to historical level assuming that females constitute 50% of the catch. If adult females constitute 20% of the catch the annual removal of 45-108 walrus would have more than 50% probability of allowing this subpopulation to increase.
- The NAMMCO Scientific Working Group on Atlantic walrus recommended that future removals be set for an assumed female fraction of 50%, given an acceptable protection level larger than or equal to 70%. Therefore, the recommendation was a total combined removal in NW Greenland and in Jones Sound (Nunavut) between 68 (70% probability of increase) and 35 (95% probability of increase) walrus per year (NAMMCO 2009).
- The 2010-quota for the total removal in NW Greenland from the Baffin Bay stock of 64 walrus was reduced to 48 because the 2009-quota was exceeded by 16. Similarly, the 2011 quota of 64 has been reduced to 52 due to the fact that the 2010-*de facto* quota was exceeded (i.e. 60 walrus were reported landed in 2010) (Table 1). Furthermore it is assumed that the total removal from the same stock is

4 in Grise Fiord (Anon 2010). Hence, the quota in Greenland assumes a removal of 56 walrus from the Baffin Bay stock in 2011, or 2 to 2.5% of the estimate of the total stock. The quota does not include struck-and-loss. If assuming a 15% loss, the estimated total annual removals may amount to ca. 66 animals in 2011 (ca. 3% of population size).

- A combined NW Greenland-Nunavut/Canada total removal of ca. 66 walrus in 2011 from the Baffin Island stock is ca. 79% of the estimate of the annual replacement yield of 84. Assuming no loss, *de facto* quota of 52 (plus 4 taken in Nunavut), or a total removal of 66 assuming 15% loss, it is also in accordance with the NAMMCO recommended protection level indicating that a total of 68 walrus can be removed annually from the Baffin Bay stock while there is still a 70% probability that the stock will increase.
- The quota planned for 2012 is 64. If this quota is all landed, and a catch of 4 walrus in Nunavut and 15% loss are assumed, the projected removals for 2012 would be 78 walrus. Such level of removals would result in a probability of population increase lower than the one recommended by NAMMCO. A total removal of 78 walrus will, however, still be lower than the estimated annual average replacement yield of 84.

The East Greenland subpopulation

- Studies on genetics and movement involving satellite telemetry indicate that walrus occurring in East Greenland constitute a separate subpopulation.
- In late July – early August 2009 GINR and NERI deployed a total of 12 satellite transmitters to walrus in Northeast Greenland in order to collect information on at “surface:dive” time. Surface:dive” time and “presence:absence at haul-out” data obtained from eight adult male walrus that were monitored with satellite transmitters in the area simultaneous with the aerial surveys were used to correct estimates of abundance of walrus in East Greenland.
- To determine the abundance of walrus, aerial surveys were conducted by GINR and NERI over the walrus main distribution area in East Greenland (74°N and 81°45’N) during 12-19 August 2009. The corrected estimate of walrus in their prime distribution area in East Greenland was 1429 (95% CI: 616-3316 walrus). This is likely an underestimate of true population size (NAMMCO 2009).
- The reported catch of walrus in East Greenland during 1993-2006 averaged 18/year (sd=18, range: 1-60/year) (MFHA *in litt* 2009). In some years anomalous high catches have been reported in PINIARNEQ. The majority of the walrus landed in East Greenland are males.
- The Greenland quotas for the take of walrus from the East Greenland subpopulation for the three-year period 2007- 2009 were 30 in each year. Reported catches for 2007, 2008 and 2009 were respectively 10, 9, and 4 walrus (MFHA *in litt*

2009). To incorporate struck-and-lost the quota was reduced to 23 for 2009. The 2010-2012 quota for East Greenland is 18 per year (Anon. 2010a,b), allowing for a loss of ca. 13% and a total removal of 20 walruses. This quota is expected to have little effect on the actual catch which is considerable lower.

- According to the NAMMCO assessment the East Greenland walrus stock declined from a carrying capacity level of 1600 (90% CI:1000-2500) individuals in 1889 to a maximal depletion of 0.73 (90% CI: 0.48-0.91) in 1909. Since this time the population is thought to have increased slowly and steadily to an estimated depletion ratio of 0.96 (90% CI: 0.80-0.99) in 2010 with a corresponding abundance of 1500 (90% CI: 940-2400) individuals. Given the currently low relative depletion, the current yearly replacement yield is also low (12 walruses with a 90% CI:10-16).
- According to the NAMMCO assessment total annual removals between 12 and 26 walruses will have an estimated probability from 50 to 95% of being sustainable given a female fraction in the removals of 10%.
- NAMMCO recommended that quotas for future total removals be set for an acceptable protection level larger than or equal to 70% which correspond to a total annual removal of 20 walruses in East Greenland.
- A total removal of 20 walruses in 2010 from the East Greenland stock is in accordance with a protection level of 70% as recommended by NAMMCO.
- It must be noted that the estimate of 1500 for the total population is considered to be an under-estimate, and that the reported catches for the last three years have been much lower than 18.

Hunt, trade and export

- In certain parts of Greenland in particular in the Sisimiut-Disko Island area in Central West Greenland and in Qaanaaq area in NW Greenland the catch of a walruses is still considered important in the local subsistence economy. The meat is eaten by humans and in NW Greenland hide and meat of walrus is important for feeding the sledge dogs. Hence, providing food for local consumption is an important incentive of the catch for the subsistence hunters.
- Export of walrus products from Greenland constitute whole skulls, tusks (pairs in the maxilla or single), penis bones and crafted parts of walrus tusks and jaw bone. The most valuable hunting products of walrus in Greenland seen from a trade point of view are the tusks. In all parts of Greenland some tusks are traded and exported. During the four-year period 2006-2009 a total of 59, 15, 52 and 49 export permits for skulls and tusks were issued from Greenland. In addition, export permits for crafted items containing walrus product constituted 1332, 864,

833 and 675 in 2006, 2007, 2008 and 2009, respectively (Table 2). Due to the fact that handicrafts constitute a variety of relatively small items it is not possible to determine what the number of exported crafted parts represents in terms of individual walrus. Overall the export of walrus products has showed a declining trend during later years.

- The value of the products other than skulls and tusks is variable and depends on the price of the handicraft in which they are a part. Trade in other parts than tusks is considered not to be the primary incentive for catch of walrus in Greenland. However, income from selling various products of walrus is part of the subsistence economy in particular in Central West, NW and E Greenland. Therefore, it cannot entirely be excluded that trade of crafted walrus products is a contributory factor in the incentive to catch walrus.

Year	Type of product			Total
	Skulls	Tusks	Other	
2006	26	33	1332*	1391
2007	6	9	864	879
2008	34	18	833	885
2009	19	30	675	724

*: Variuos handicraft such as figurines.

Table 1: Export of walrus products from Greenland (2006-2009) under CITES regulations. Source: The CITES authority (Greenland Government, Nuuk) *in litt.* 2010.

Conclusion on non-detrimental findings for export

- In Greenland the hunting of walrus is part of the traditional culture. Walrus are mainly hunted for subsistence purpose (i.e. local food). Commercial export of walrus products (handicrafts of ivory and jawbone etc. and whole skulls and tusks) is a source of income in the hunting communities but is not considered to be a main incentive for the hunt.
- Abundance estimates (2006, 2007, 2008) indicate that the combined W Greenland-SE Baffin Island subpopulation numbers at least 3000 individuals. The current combined W Greenland-Nunavut/Canada removal (i.e. including estimated loss) of 89 walrus in 2011 (ca. 2.8% of total subpopulation size) is in accordance with recommendation from NAMMCO. This removal has an assumed likelihood of 70% of allowing the population to grow towards historical levels. The projected total yearly removals for 2011 and 2012 constitute ca. 68% of replacement yield from the current subpopulation. The catches for the period 2007-2010 are also within the levels recommended by NAMMCO.

- Abundance estimates obtained in 2009 indicate that the Baffin Bay stock of walrus numbers at least 2000 individuals. The combined NW Greenland-Nunavut/Canada catches in 2011 (excluding loss) of 56 walrus (ca. 2.5% of total subpopulation size) is in line with recommendation from NAMMCO. Assuming 15% losses, a total removal of 66 walrus in 2011 will have an expected likelihood of 70% of allowing the population to grow towards historical levels. An assumed total removal of 66 walrus constitutes ca. 79% of the estimated annual replacement yield of 84.
- However, the catches of the Baffin Bay Stock for the period 2007-2010 likely resulted in a total removal higher than the maximum of 68 walrus per year recommended by NAMMCO. The projected catches for 2012 (64 from Northwest Greenland and 4 from Nunavut) can also result in removals higher than recommended, if the struck-and-loss rate is larger than zero. For instance, 68 walrus landed and a loss rate of 15% would result in a total removal from the population of 78. This removal is lower than but close to estimated average annual replacement yield and higher than recommended by NAMMCO.
- The data from a 2010-aerial survey of the Baffin Bay population are currently being analyzed. When results are available they will be submitted to NAMMCO for examination and validation in 2011 and new assessment of the status of this population will be available.
- An abundance estimate from 2009 indicates the presence of a minimum of 1500 walrus in the East Greenland subpopulation. The current quota (including estimated loss) of 20 walrus per year constitutes ca. 1.2% of the total population and is therefore considered to be within sustainability. This removal has an assumed likelihood of 70% of being sustainable. Actual catches are lower than quotas, with less than 10 reported caught per year since 2007. This population which has its main distribution in the National Park in East and North Greenland far from human habitation is thought to have been growing since the 1950s and to be approaching historical carrying capacity level.
- The current quotas for the catch of walrus in Greenland have been adjusted to new information (2009) on population size of the three walrus stocks that are harvested in Greenland. The 2010-2012 quotas in Greenland are adjusted for the fact that the two subpopulations that are shared with Nunavut/Canada are also harvested there. The total removals for the West Greenland-Southeast Baffin Island stock and for the East Greenland stock are considered to be within sustainable limits that will allow exploited stocks to grow to historical population levels (i.e. before they were severely reduced). Furthermore, the legal restrictions to walrus hunting practice in Greenland including an increased protection of adult females and calves aim at securing that walrus are exploited sustainably in Greenland.
- Whether the catch in the Baffin Bay stock is within the recommended levels or not depends on assumptions about the loss rate, which is at the moment unknown. If the loss rate is close to zero, the catch could be considered sustainable, as in the other two stocks. A higher loss rate would mean total removals higher than the recommended by NAMMCO.

- There is no tagging-system in place that will allow for distinction as to whether a walrus product originates from Northwest Greenland (Baffin Bay stock), West Greenland, or East Greenland.
- The current uncertainty about the actual exploitation rate of the Baffin Bay stock relative to stock size hampers any decision about a NDF.
- The fact that a system is not in place in Greenland that allows for distinguishing walrus products coming from any of the three subpopulations that are harvested in Greenland complicates the overall situation.
- Nevertheless, the facts that
 1. Greenland's quotas for the catch in Central West and East Greenland have been adjusted and are within sustainable levels,
 2. the current and assumed total removal of walruses from Baffin Bay stock is less than estimated annual replacement yield, and
 3. the modelling of current depletion rate in Baffin Bay stock suffers from insufficient historical catch data,

make the Greenland Institute of Natural Resources conclude that the current exploitation of walrus in Greenland and the current export of walrus products from Greenland are not detrimental to the three subpopulations that range in Greenland.

- GINR's conclusion may be reviewed when more information about time series of abundance, the 2010-estimate of abundance for the Baffin Bay subpopulation, quantitative information on struck-and-loss rates or new catch statistics from Nunavut or Greenland become available.

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CITES Scientific Authority
Greenland

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