# A proposal for the allocation of catches for narwhals in Greenland

Mads Peter Heide-Jørgensen[1] and Kristin Laidre[1,2]

[1]Greenland Institute of Natural Resources,
[2]Polar Science Center, APL/University of Washington,

## West Greenland

A major issue with the harvest of narwhals in West Greenland is the unresolved stock structure in combination with large fluctuations in abundance at both summer and wintering grounds. Considering that there is no information that suggests that narwhals from Inglefield Bredning and Melville Bay are one stock it seems unreasonable to merge these stocks for setting quotas for a combined stock. This strategy can especially be risky if a large part of the combined quota is taken from the smaller of the two stocks. Current population models that utilize the trends in abundance estimates and the catch history are not adequate because of the poor precision of the catch statistics and the incomplete surveys in the past.

Here we propose a pragmatic approach to setting catch limits for the four hunting grounds in West Greenland: Qaanaaq, Upernavik, Uummannaq and Disko Bay and south, while keeping the two summering areas separate:

| | Lower 95% | 5% harvest | Catch limit | Allo-cation Uper-navik | Allo-cation Qaanaaq | Allo-cation Uum-mannaq and Disko | Allo-cation Uum-mannaq | Allo-cation Disko |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| West Greenland | 2025 | 0.05 | 101 | | | | | |
| Inglefield Bredning | 5224 | 0.05 | 261 | | 100 | 161 | 100 | 61 |
| Melville Bay | 1461 | 0.05 | 73 | 73 | | | | |
| | | | | | | | | |
| SUM IB+MB | 6685 | | 334 | | | | | |

1. We use the lower 95% CIs of the most recent abundance estimates as a proxy for the minimum population size and we assume a conservative 5% harvest level. Considering the positive signals from all areas from Canada to East Greenland surveyed in the last few years, the incomplete survey coverage in some areas, and the large fluctuations in abundance at both the winter and summering grounds these two critical values are assumed to be conservative.

2. The entire quota from Melville Bay is allocated to Upernavik (and Savissivik) where satellite tracking studies have shown that narwhals from Melville Bay can be taken throughout the year. A quota of 100 narwhals from Inglefield Bredning

is allocated to Qaanaaq (excuding Savissivik) based on the historical level of catches in this area.

3. Similarly a quota of 161 narwhals is allocated to Uummannaq and Disko Bay and south. This is suggested to be divided as 100 whales to Uummannaq and the remaining 61 to the Disko Bay region.

This allocation of catches keeps the total catch level below the sum of catches in Inglefield Bredning and Melville Bay. One risk to this approach is that more than 73 whales could be taken from the Melville Bay summering ground because whales from this area may contribute to the fall and winter catches in Uummannaq and/or Disko Bay.

Most tracking results from Melville Bay suggest the whales from this summering site winter outside the Disko Bay and the Uummannaq fjord (Dietz et al. 1994, Heide-Jørgensen and Laidre 2009). The data also suggest that Disko Bay is a mixing ground for whales from several areas, perhaps even Canada (Palsbøll et al.1997, Heide-Jørgensen and Laidre 2009). The large historical catches in both Disko Bay and Uummannaq also support this idea, as it is unlikely that Melville Bay could supply these two areas with such large catches (Heide-Jørgensen 1994).

| Risk situations | | Catch from MB | Allocation Upernavik | Total removal MB | Expl. level MB |
|---|---|---|---|---|---|
| | | | | | |
| Uummannaq | 50% catch from MB | 50 | 73 | 123 | 0.08 |
| Disko | 50% catch from MB | 31 | 73 | 104 | 0.07 |
| Disko and Uummannaq | 50% catch from MB | 81 | 73 | 154 | 0.11 |

The above table outlines the risk of this situation. If about 50% of the catches in Disko Bay and Uummannaq are taken from the Melville Bay summering stock, then the exploitation level will increase to roughly 11%. This would be lower if only one of the wintering areas takes whales from the Melville Bay.

The catch levels proposed in this minimal realistic approach is not in conflict with the population dynamics analysis in Witting and Heide-Jørgensen (2009) but it takes the following additional information into account:

1. For all areas surveyed during the past 10 years very large abundance estimates have been obtained that summed together approaches 80,000 narwhals for Baffin Bay and adjacent fjords and bays (Richard et al in press, Heide-Jørgensen et al. 2009). Even a small offshore area shows a large abundance (Laidre and Heide-

Jørgensen 2009). All surveys are negatively biased because of incomplete coverage of the distribution of the whales thus there does not appear to be any immediate concern for any stocks in West Greenland. We therefore suggest that a slightly less conservative approach for setting quotas can be used.

2. Furthermore, summer satellite tracking shows whales are relatively stationary on the summering ground (Heide-Jørgensen and Laidre 2009) and no mixing of whales between Inglefield Bredning and Melville Bay has been observed. Fall and winter tracking over four years has shown that none of the 16 tagged whales from Melville Bay visited the hunting grounds in Uummannaq in November (Dietz et al. 1994, Heide-Jørgensen and Laidre 2009). Thus it seems unlikely that Melville Bay is a major contributor to the fall hunt in Uummannaq, by far the season with the largest catches.
3. There is good evidence that Melville Bay whales do contribute to the catches in Disko Bay from one out of 16 whales that went deep inside the bay. However, this is likely not the only source of whales for this harvest, as there is evidence from both genetic studies and from satellite tracking that Disko Bay is a mixing ground with an occasional influx of whales from Canada (Heide-Jørgensen and Laidre 2009, Palsbøll et al. 1997).
4. Finally, the winter index series in West Greenland may not be a good indicator of the narwhal abundance in the area. The lowest index value in 25 years (38) was obtained in 2006 during a winter with the lowest sea ice concentrations in the past 50 years (Heide-Jørgensen et al. in press). The survey area was virtually free of sea ice for the first time during the time series of surveys conducted back to 1981, and given the clear evidence for narwhals preference to overwinter over deep water in areas covered with pack ice, as well as the extreme high densities observed offshore (Laidre and Heide-Jørgensen 2009) it is likely whales have reacted to this situation by moving out of the index area into the deeper parts of Baffin Bay. A similar response to sea ice changes has been documented for belugas (Heide-Jørgensen et al. in press), and therefore suggest that the winter index is not a good indicator of narwhal abundance.

**East Greenland**

We propose a similar approach in East Greenland using a quota based on 5% of the lower 95% CI of the abundance estimate (2,541) in both Scoresby Sound and Tasiilaq. The survey did not cover any offshore areas where narwhals may have been found and it did not cover the areas north of Scoresby Sound, where considerable numbers of narwhals occur (NERI unpublished data). Nothing is known about the stock delineation of narwhals in East Greenland, but there is a clear seasonal pattern of occurrence which could be interpreted as movements between areas. In Scoresby Sound the major part of the harvest is taken in the summer, whereas in Tasiilaq the summer hunt takes place in Kangerlussuaq from where narwhals occur in a continuum north to Scoresby Sound (Heide-Jørgensen et al. 2009). In Tasiilaq proper, narwhals occur in low numbers in summer but can be taken at almost all other seasons as evidenced in an ice entrapment of about 30 whales in February 2008 far into the Sermilik Fjord (not reported in Heide-Jørgensen 2009). This seasonal shift in occurrence from Scoresby Sound to

Tasiilaq indicates north-south movements as also seen along the east coast of Baffin Island.

**References**

Dietz, R. and Heide-Jørgensen, M.P. 1995. Movements and swimming speed of narwhals (*Monodon monoceros*) instrumented with satellite transmitters in Melville Bay, Northwest Greenland. Canadian Journal of Zoology 73:2106-2119.

Heide-Jørgenen, M.P. 1994. Distribution, exploitation and population status of white whales (*Delphinapterus leucas*) and narwhals (*Monodon monoceros*) in West Greenland. Meddr. Grønland 39: 135-150.

Heide-Jørgensen, M.P. 2009. Reconstructing catch statistics for narwhals in Greenland 1862 to 2008. NAMMCO/SC/16-JCNB/SWG/2009-JWG/7

Heide-Jørgensen, M.P., K.L. Laidre,. 2009 Update on satellite tracking of narwhals in Baffin Bay. NAMMCO/SC/16-JCNB/SWG/2009-JWG/19

Heide-Jørgensen, M.P., K.L. Laidre, M.L. Burt, D.L. Borchers, R.G. Hansen, M. Rasmussen and S. Fossette. 2009 Abundance of narwhals (*Monodon monoceros*) in Greenland 1862 to 2008. NAMMCO/SC/16-JCNB/SWG/2009-JWG/20

Heide-Jørgensen, M. P., Laidre, K. L., Borchers, D., Stern H. & M. Simon. In press The effect of sea ice loss on beluga whales (Delphinapterus leucas) in West Greenland. Polar Research in press and NAMMCO/SC/16-JCNB/SWG/2009-JWG/6

Palsbøll, P., Heide-Jørgensen, M.-P., and Dietz, R. 1997. Genetic studies of narwhals, *Monodon monoceros*, from West and East Greenland. Heredity 78(1997): 284-292.

Richard, P., Laake, J.L., Hobbs, R.C., Heide-Jørgensen, M.P., Asselin, N. and Cleator, H. In press. Baffin Bay narwhal population distribution and numbers: aerial surveys in the Canadian High Arctic, 2002-2004. *Submitted to Arctic 5 Feb 2009*

Witting, L. and M.P. Heide-Jørgensen. 2009. Assessment runs for West Greenland narwhal. NAMMCO/SC/16-JCNB/SWG/2009-JWG/9