

An assessment of Greenland walrus populations

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Recent abundance estimates were combined with historical catches and an age- and sex-structured population dynamic model to perform Bayesian assessments of the walrus (*Odobenus rosmarus*) populations in West Greenland, the North Water in northern Baffin Bay, and East Greenland. The model assumed density-regulated dynamics and pre-harvest populations in population-dynamical equilibrium. It projected the populations under the influence of the catches to estimate the historical trajectories and the current population status. It was found that the West Greenland and North Water populations have been heavily exploited during the last century with the current abundance being at least only a few per cent of the historical abundance. Apparently these populations are still being exploited above sustainable level. The East Greenland population was heavily exploited after 1800 and during the first half of the 20th century and was depleted to approximately 60% of pre-harvest population size in 1933. After protective measures were introduced in the 1950s this population has increased to a current level close to the abundance in 1800, and the present exploitation appears to be sustainable.

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Introduction

The management of an exploited population of wild animals is often faced with the dilemma between incomplete knowledge on the dynamics and status of the population and the need to determine sound levels of exploitation. If knowledge was complete the implications of a given harvest could be calculated exactly, and it would be relatively easy to set the exploitation to a level where management objectives would be met. In reality, however, the uncertainty trade-off implies that a given harvest can at best be associated with a certain probability that the management goals for the population will be met. In this paper we apply a Bayesian statistical model to the incomplete data on the three exploited populations of Atlantic walrus (*Odobenus rosmarus rosmarus*) in Greenland, in order to estimate the historical development of the populations, their current status, and sustainable exploitation levels.

The three populations of Atlantic walrus in West, Northwest, and East Greenland have been subject to exploitation for centuries. First at a limited scale by Inuit and then by European whalers and sealers, who fished heavily on the populations. From the beginning of the 20th

century Greenlanders hunted walrus with increasing effort after the introduction of fire-arms and motorized vessels. The populations are still exploited for subsistence purposes, and for some there are indications of over-exploitation (Born *et al.*, 1995; NAMMCO, 1995). Hence, it seems warranted to attempt an assessment of the present status of the Greenland walrus populations in the light of historical and current exploitations.

The “West Greenland” population of walrus occurs from fall to spring at the edge of the Baffin Bay pack ice from c. 66° N to 70° 30' N (Born *et al.*, 1994, 1995; Figure 1). Further north in Baffin Bay and South Sound walrus occur almost year-round in the North Water polynya and adjacent areas. They are, however, absent from the coastal areas of NW Greenland during the open water season in August–September when they summer along the eastern and southern coast of Ellesmere Island (Canada) and in the Canadian High Arctic archipelago (Born *et al.*, 1995). Walrus in these areas are referred to as “the North Water” population (Born *et al.*, 1995). Walrus occur year-round along the eastern coast of Greenland where they mainly are distributed inside the National Park of North and Northeast Greenland north of the entrance to Sussendyt Sound (c. 71° N) (Born *et al.*, 1995, 1997). There is only