UNHAPPY FEET: THE REDUCTION OF ADÉLIE AND CHINSTRAP PENGUIN POPULATIONS IN THE WEST ANTARCTIC PENINSULA/SCOTIA SEA

Submitted by ASOC
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Abstract
New and alarming evidence has been published by Trivelpiece et al. recently about the reduction of the populations of Adélie (Pygoscelis adeliae) and chinstrap penguins (Pygoscelis antarctica) in the West Antarctic Peninsula/Scotia Sea area. According to this scientific paper, Adélie and chinstrap penguin populations have declined more than 50% during the last 30 years at study colonies in the South Shetland Islands. This is consistent with the declines in both species throughout the Scotia Sea. Trivelpiece et al. argue that the reduction of the populations of both species could be attributed to changes in the abundance of their main prey, Antarctic krill, which is affected by climate change. In this context, CCAMLR should keep a precautionary approach in the management of the krill fishery to reduce significant impacts on these species. CM 51-07 should be maintained until sufficient information is acquired for its revision.

1. Overview

The West Antarctic Peninsula/Scotia Sea, where the Antarctic krill fishery currently operates, represents an important area for the reproduction of land-based predators of krill (seal and penguins species). It is also one of the fastest warming areas on the planet, with a marked increase in air temperature that has resulted in changes in the dynamics of winter sea-ice. In that region, the mean annual sea-ice extent is inversely related to mean annual air temperature. Thus, in the last 2 decades this area is showing a reduction in the extent and duration of winter sea-ice, which have profound implications on krill productivity. It has been shown that the reproductive success of krill increases following winters of larger ice cover. Some studies indicate that as a result of climate-driven changes, particularly sea-ice reduction, abundance of krill in this area has been reduced by as much as 80% from existing population levels in the 1970s.

Historically, the krill fishery has concentrated on the West Antarctic Peninsula/Scotia Sea region (Subareas 48.1 - 48.3). In 2009, in order to provide a precautionary spatial allocation of krill catches, the Commission took a first step and subdivided the trigger level (620,000 tonnes) resulting in CM 51-07. The main objective of this CM was to avoid concentration of the catch in any one sub-area as the trigger level is approached, thus reducing the risk of localized depletion of krill near land-based predator colonies, including several species of penguins. CM 51-07 was set up as an interim measure and is scheduled to be reviewed in 2011, so as to account for the prey requirements of land-based predators. The trigger level for krill catches was established twenty years ago, and the impacts of climate change, especially the reduction of sea-ice in the West Antarctic Peninsula/Scotia Sea have increased substantially since then.

A recent paper by Trivelpiece et al. (2011), partially supported by the Lenfest Ocean Program of the Pew Charitable Trusts, provides new and alarming evidence about the reduction of populations of Adélie (Pygoscelis adeliae) and chinstrap penguins (Pygoscelis antarctica) in the West Antarctic Peninsula/Scotia Sea area.

According to this paper, the Adélie and chinstrap penguin populations have declined more than 50% during the last 30 years at study colonies in the South Shetland Islands. In general, since 1987 the inter-annual changes seen in Adélie and chinstrap breeding populations have been positively correlated. In the early 1980s the survival to first breeding dropped dramatically and since then recruitment rates for both species have declined. The declines observed on the two main study sites in the South Shetland Islands are consistent with the declines in both species throughout the Scotia Sea during the last 30 years. This includes colonies in the South Orkney Islands and the Antarctic Peninsula, and also in the South Shetland Islands. In the South Shetlands, known to be the center of the distribution of chins, a reduction of up to 75% has been seen in Adélie and chinstrap penguins.

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Early theories postulated that the variability in sea-ice was the principal physical driver in changes in penguin populations through direct physical effect on the habitat. Adélie are known to be ice-loving penguins, whereas the chinstrap is defined as an ice-avoiding species. Following the so called “sea-ice hypothesis”, the reduction in sea-ice during the winter should have had an effect on ice-loving species, resulting in a population decrease. The opposite should have been true for ice-avoiding species. Nevertheless, the authors of this new paper argue that this theory seems unlikely for either species of penguins in the West Antarctic Peninsula/Scotia sea area. According to the authors, this mechanism is not controlling penguin populations anymore; the sea-ice is retreating in the region and both species are declining significantly.

Antarctic krill represents the main prey of most vertebrate species in this region, including Adélie and chinstrap penguins. The correlation between trends in penguin abundance and possible trends in krill biomass could explain why penguin populations increased in the past following exploitation of other predators competing for krill (e.g. fur seals, baleen whales, etc.). According to Trivelpiece et al., the current decrease of Adélie and chinstrap penguin populations could be attributed to changes in the abundance of their main prey, Antarctic krill, which is affected by climate change. Increasing temperatures result in a reduction of sea-ice which has profound effects on krill reproductive success. The local reduction in krill abundance as a result of sea-ice retreat, combined with any increased competition for krill from recovering whale and fur seal populations, could result in less prey availability for these penguin species.

The authors conclude that if the warming trend in the West Antarctic Peninsula/Scotia Sea region continues, winter sea ice will be absent from much of this region in the near future. This is likely to cause further reductions in krill abundance, and will probably result in further declines in Adélie and chinstrap penguin populations. The situation is particularly critical for chinstrap penguins that breed almost exclusively in this region. The sustained contraction of more than 50% in the population’s breeding range is also of concern. In fact, the chinstrap penguin might be one of the most vulnerable species being affected by climate change in Antarctica.

In conclusion, Adélie and chinstrap penguin populations in the Western Antarctic Peninsula / Scotia Sea region are decreasing and chinsstraps are contracting in their breeding range. The observed declines reflect important changes that are occurring in this region of Antarctica. It has been recently argued that the reduction of the populations of both species could be attributed to changes in the abundance of their main prey, Antarctic krill, which is affected by climate change. This rapidly changing, complex ecosystem is clearly out of balance, and much work remains to increase our knowledge and understanding of the underlying reasons.

### 2. Management Implications for CCAMLR

Whatever is driving the decrease in Adélie and chinstrap penguins – either direct physical effect of the reduction in sea-ice extent, the decline in the abundance of krill, or a combination of these – CCAMLR should support a very precautionary approach in the management of the krill fishery to reduce the potential for significant adverse impacts. In a changing ecosystem such as this, the only adjustment that the Convention can exert is through managing fisheries with precautionary limits.

These findings support the need to maintain the precautionary management measures reflected in CM 51-07 until sufficient information is acquired for its revision.