

## Introduction: Life in the Polar Winter — Strategies of Survival

The perception of the polar winter as a period in which organisms have to struggle for survival is common among people living almost exclusively outside the polar regions, even if sometimes in areas with winters resembling the polar winter. It is not surprising that such people have this perception, because humans, by origin, are a tropical species that, although often living in cold climates, can hardly survive outside the tropics without the protection of clothes and housing. For arctic organisms, endemic to and wintering in the far North, the polar winter possibly has a different significance. For these organisms it is often a period of rest, during which they conserve energy and prepare for reproduction in the coming feeding season. Until the last decades of this century, we knew little about the significance of the polar winter for organisms that live there year-round. For migratory species it is obviously a rather intolerable season, but how resident species survive and live through the winter was unknown.

A great deal of the research in polar regions has been focused on the summer season because, until recently, that was the only period in which scientists regularly worked in these regions. Due to harsh conditions, logistic and organizational difficulties and low interest in organisms that are scarce and often difficult to observe, few studies were done during the polar winter. Information about life in the polar regions was mostly gathered in the summer, when conditions are more equable for people and when most arctic life propagates. Only very few scientists could afford to spend the period between two successive summers in the Arctic. Of course, indigenous peoples, such as Inuit, Nentsi and Samojeeds, were acquainted with life in the polar winter, but they were not in a position to communicate with peoples outside the Arctic.

Long after the Inuit and other northern peoples successfully developed their arctic subsistence strategies, the Vikings arrived in the Arctic. They probably were the first Europeans who, as a routine, successfully lived through the polar winter. In the 16th and 17th centuries Europeans frequently sailed into the Arctic to search for a northern passage to China, and they were forced to winter there several times. During the whaling period that followed, volunteers attempted to winter, but information about plants and animals in the polar winter from those expeditions is scarce. In the era of polar expeditions aiming to reach the North Pole, winterings in the second half of the 19th century and the first decades of this century became more frequent. The expedition teams often included scientists who collected information about many different aspects of the polar winter. This mostly pertained to late winter, when the sun had returned, because in the polar night people usually stayed indoors. It is only in the most recent decades that scientific work in the polar winter has been carried out systematically and that long-term studies have been done.

The series of eight papers presented here represents such studies conducted by scholars from different disciplines; they stem from a multidisciplinary symposium organized by the Arctic Centre of the University of Groningen on the occasion of the 375th anniversary of this university in 1989. This Arctic Centre is a platform for polar research in the Netherlands and has a long-term multidisciplinary program in the polar regions. The multidisciplinary character of the centre provided the background for organizing this symposium, where scholars of different disciplines could meet and where winter survival strategies of organisms on different levels of production could be related to each other. This created a unique opportunity to exchange information among scientists of a variety of disciplines.

The guiding question of this symposium was: How do humans and their living resources survive the polar winter? As these resources are both terrestrial and marine, both are discussed when presenting organisms from different trophic levels. The proceedings began with terrestrial primary production, when the characteristics of arctic plants in Lapland are discussed, and with a study of the adaptations of the willow ptarmigan *Lagopus lagopus* of northern Siberia, a plant eater, representing terrestrial secondary production. A paper about winter survival of zooplankton and fish in an arctic fjord in Spitsbergen highlights marine secondary production. Marine tertiary production is illustrated by the winter ecology of the ringed seal *Phoca hispida* in Canada and Spitsbergen. A contribution about the arctic fox *Alopex lagopus* of Spitsbergen, a mammal living off marine and terrestrial production at different trophic levels, concludes the living resources of people.

A paper about the physiological and psychological adaptations of people (a tropical species) to intense cold and long periods of darkness introduces the challenges posed by a hostile environment to humans both to survive and to thrive. This series of papers concludes with

a study of the successes and misfortunes of western Europeans wintering in the High Arctic in the 16th and 17th centuries and an article about Russian trappers during the 18th and 19th centuries wintering in Spitsbergen.

We hope that our symposium and this series of papers will stimulate scientists from different disciplines and countries to communicate and cooperate with each other as they continue to do their research in the Arctic.

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