Global Warming and Canada’s Shipping Lanes: An Oceanographer’s View†

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INTRODUCTION

Canada has the longest coastline of any country in the world, and has thousands of miles of sea lanes in subpolar and polar climates. Climatic factors such as extreme low temperatures, poor visibility, and the presence of ice severely affect shipping on Canada’s east coast and in the north. Consequently, much of Canada’s shipping has an Arctic character that it shares only with other polar nations.

The earth’s climate warmed significantly in the 20th century, and the observed warming is expected to continue.1 Forecasts indicate that climate warming in northern latitudes over the next 50 to 100 years may be significantly above the global average. Scientists addressing the Royal Society in 1995 said that if forecasts are correct, “it is in the Arctic that we can expect to observe global warming at its most powerful.”2

The completion of the Third Assessment in 2000 by the Intergovernmental Panel on Climate Change (IPCC) is an appropriate time for Canada to examine the potential impact of global climate change on its shipping industry. “Global warming” suggests positive impacts for Canadian shipping, with the possibility of moderating the coldest winter temperatures and reducing the extent and thickness of sea ice. Summer navigating seasons might be longer, and year-round shipping might occur where it is only seasonal today. New shipping routes, such as the Northwest Passage, could open up for seasonal, or eventually, year-round navigation. Transpolar shipping

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might even become possible. Some of the indirect effects of climate warming, however, coupled with the nature of Canada’s northern geography, could lessen or delay these positive impacts.

The following is a brief examination of the potential impact of global warming on Canada’s ocean shipping lanes. The article starts by identifying the important environmental factors in Canadian shipping and briefly describes Canada’s shipping lanes in the late 20th century. Observed and forecast climate changes are presented and their potential impact on Canadian shipping is discussed. The article closes with a summary and conclusions.

ENVIRONMENTAL FACTORS IN CANADIAN SHIPPING

The principal environmental factors affecting navigation are sea state, wind, currents, visibility, and the presence of sea ice and icebergs. Air and sea temperatures affect navigation indirectly as factors in the formation of fog, and with wind, in the structural icing of ships. The extremes of wind, sea state, currents, and poor visibility found in Canadian waters are formidable, but are not unique in the world. Ships making voyages on the high seas regularly encounter similar or worse conditions. The factor that is unique in northern and polar shipping is the presence of ice. For part or all of the year, sea ice blocks or severely restricts navigation by filling channels, gulfs, bays, and inlets, and forming barriers along open coasts (Fig. 1). Icebergs constitute hazards to navigation that even powerful icebreakers must avoid absolutely. This article focuses on the possible impact of global warming on the occurrence of sea ice and icebergs in Canadian waters.

CANADA’S SHIPPING LANES

Canada’s international maritime trade is conducted through ports in British Columbia, Atlantic Canada, the Great Lakes, the St. Lawrence River and Gulf, Hudson Bay, and the Arctic. Domestic shipping interconnects ports throughout these regions. The northern character of Canadian marine shipping is most evident in the Gulf of St. Lawrence, Newfoundland, and Labrador, and in the Arctic and sub-Arctic north of the 55th parallel. This section describes shipping and ice conditions in those regions. Shipping routes and place names can be found in Water Transportation Infrastructure.3

Dates given here for the appearance of various ice conditions are based on the 30-year (1969–1998) biweekly median ice concentration maps com-