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Comparative assessment of the West Bering Sea and East Bering Sea Large Marine Ecosystems



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ABSTRACT

A comparison between the West and East Bering Sea Large Marine Ecosystems (LMEs) is a study in contrast. These LMEs feature different geographical, bathymetric, and geomorphological settings that determine profound differences between their climate, circulation, frontal pattern, primary production, and fisheries yields. This paper focuses largely on physical factors that affect ecology and fisheries to demonstrate that these physical factors vary dramatically across the Bering Sea.

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1. Introduction

The West Bering Sea (WBS) and East Bering Sea (EBS) Large Marine Ecosystems (LME) occupy vastly different abiotic settings albeit they share a few common features such as their location in the high-latitude North Pacific and their connection to both the Arctic Ocean and open North Pacific. This review is focused on dissimilarities in abiotic environment and their impact on biotic components of the WBS and EBS LMEs.

Comparative assessments of WBS and EBS LMEs are critically important for ecosystem-based management complicated by the WBS LME being largely within the Russian EEZ and the EBS LME being largely within the US EEZ. At the same time, major commercially important stocks, particularly Alaska pollock (*Theragra chalcogramma*) and Pacific cod (*Gadus macrocephalus*), straddle EEZ and LME boundaries. Practical implementation of comparative assessments of WBS vs. EBS LMEs is further complicated by the dearth of English-language publications on WBS. Numerous Russian studies remain largely untapped because of language barrier and limited distribution of Russian domestic publications. Nonetheless, [Aydin et al. \(2002\)](#) conducted a comparison of the eastern and western Bering Sea shelf and slope ecosystems through the use of mass-balance food web models, drawing on numerous Russian sources. To date, this study remains one-of-the-kind.

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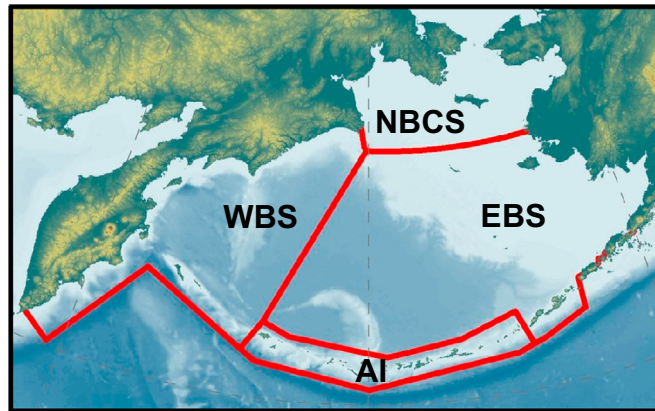


Fig. 1. Large marine ecosystems (LME) of the northern North Pacific (PAME, 2013). AI, Aleutian Islands LME; EBS, East Bering Sea LME; NBCS, Northern Bering-Chukchi Sea LME; WBS, West Bering Sea LME.

2. Boundaries

The WBS and EBS occupy the western and eastern parts of the Bering Sea respectively (Fig. 1). Boundaries of these LMEs have been redefined by PAME (2013). The redefined WBS extends north up to Cape Navarin, south to the tip of Kamchatka, and east to include the Komandorskie (Commander) Islands (for place names see Fig. 2). The redefined EBS LME extends north up to 62°N and south to the Aleutian Islands yet excludes most of the Aleutian Islands. After PAME (2013) redefined LME boundaries, the International Oceanographic Commission (IOC/UNESCO) digitized and released the new boundaries as shape files used in calculations of area-averaged SST of the WBS and EBS LMEs in Section 7 “Sea Surface Temperature.” Precise digital definitions of ecosystem boundaries are critically important when calculating integral area-averaged characteristics of such ecosystems. Examples are area-averaged sea surface temperature (e.g., Belkin, 2009, 2015; also see Section 7) or area-averaged index of oceanic frontal frequency (Belkin and Cornillon, 2005; Belkin et al., 2009). Therefore, caution should be exercised when any comparison between such characteristics is attempted using integral parameters calculated within older boundaries vs. the same parameters calculated within the PAME (2013) boundaries.

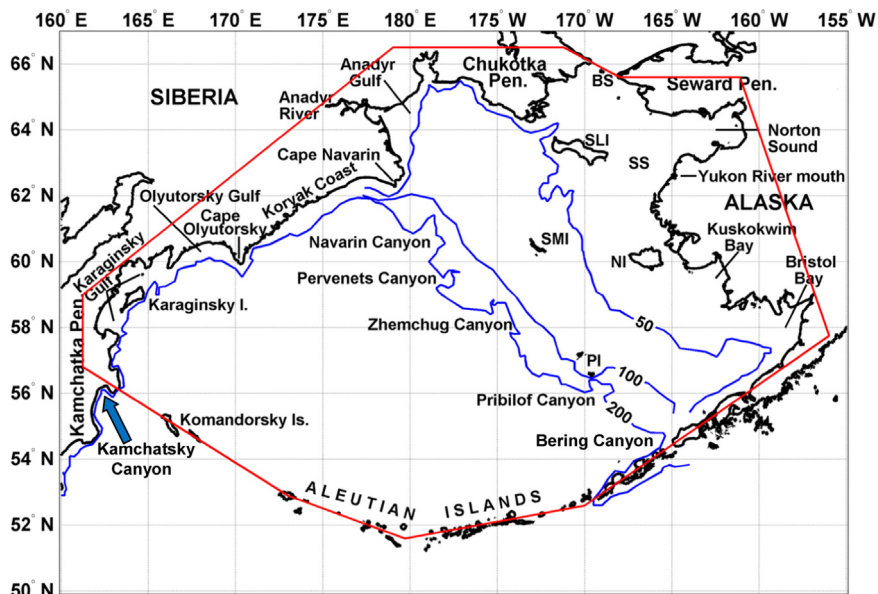


Fig. 2. Base map of the Bering Sea. Blue lines are 50, 100, and 200 m isobaths manually digitized from high-resolution nautical charts. Acronyms: BS, Bering Strait; NI, Nunivak Island; PI, Pribilof Islands; SLI, St. Lawrence Island; SMI, St. Matthew Island; SS, Shpanberg Strait. After Belkin and Cornillon (2005, Fig. 1).

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