



ZINC AND LEAD ACCUMULATION BY *FUCUS DISTICHUS* (FUCALES) IN COASTAL WATERS OF SOUTHEASTERN KAMCHATKA AND COMMANDER ISLANDS DURING 2000-2020



Liliya A. Pozolotina, Anna V. Klimova, Nina G. Klochkova
Kamchatka State Technical University, Petropavlovsk-Kamchatsky, Russian Federation

INTRODUCTION

In the Far Eastern seas of Russia, *Fucus distichus* Linnaeus (1767) is widespread and dominant species of macrophytes in the littoral zone (Fig. 1). This furoid can withstand long-term exposure to different contaminants (heavy metals, petroleum hydrocarbons, phenols) and is a biomonitor of environmental pollution in the Far Eastern seas of Russia. The aim of this study was to determine changes in the content of zinc (Zn) and lead (Pb) in *F. distichus* of Avacha Bay (southeastern Kamchatka) and Bering Island (Commander Islands) for twenty years. Avacha Bay is an anthropogenic impact area, Bering Island is a protected area, where the negative impact of human activity is minimal (Fig. 2).



Figure 1. Plants of *Fucus distichus* in the coastal areas of Avacha Bay (southeastern Kamchatka)

MATERIALS AND METHODS

Fucus distichus recognized as an environmental pollution monitor species. Samples of algae were collected in the period 2000-2020. The material was carried out in the coastal areas of Avacha Bay and Bering Island (Commander Islands) (Fig. 2).

The quantitative content of Zn and Pb was determined by the method of acid digestion of samples and the subsequent determination of the content of metals by the spectrochemical method. The generalization and processing of the obtained data was carried out by statistical methods.

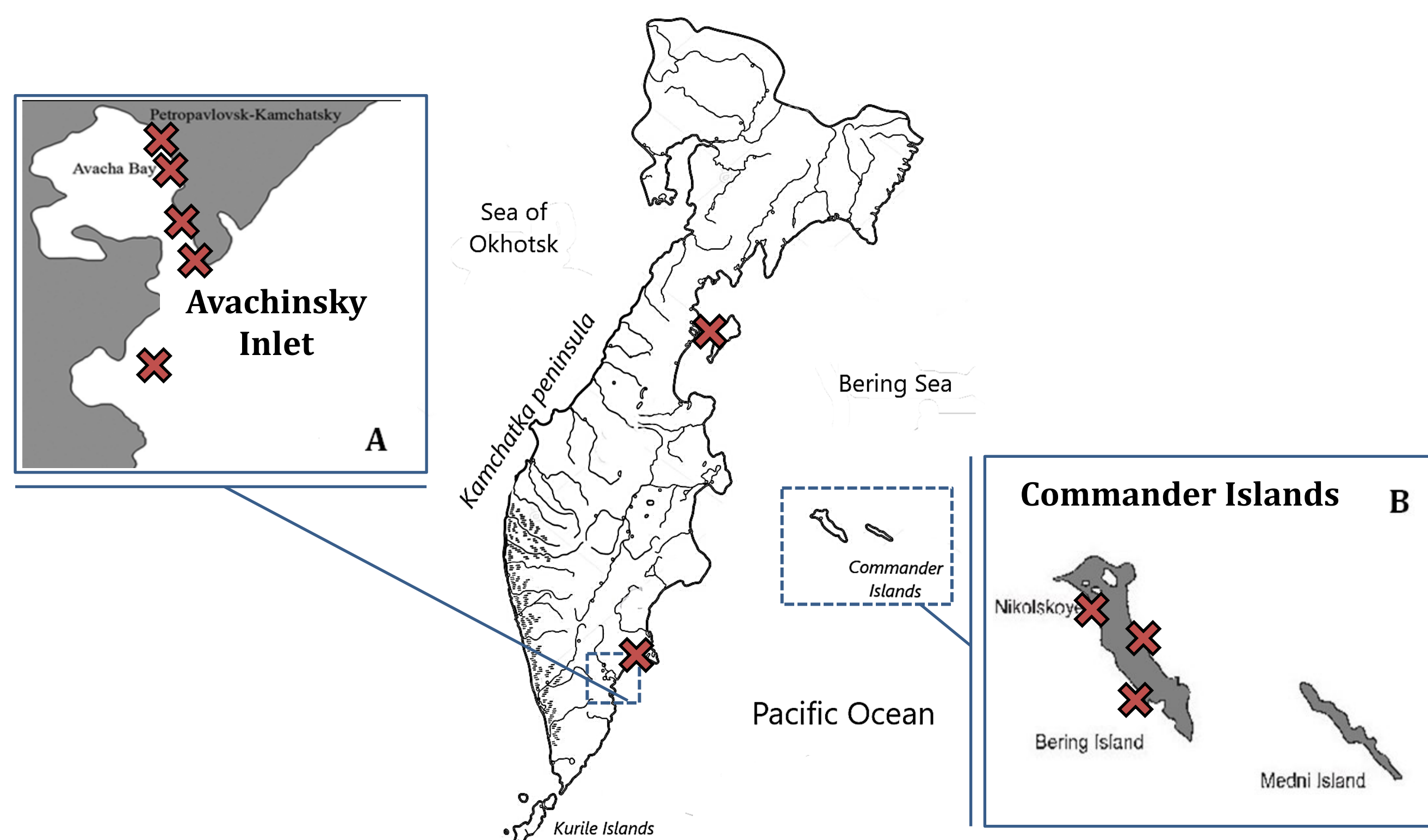


Figure 2. Location of the coastal sample sites. (A) Map of Avacha Bay (Avachinsky Inlet), (B) Map of Bering Island (Commander Islands)

RESULTS AND DISCUSSION

Over the entire period, the Zn content in *F. distichus* varied in the range of 11.6-140.4 $\mu\text{g/g}$ dw in Avacha Bay and 7.8-21.3 $\mu\text{g/g}$ dw for Bering Is (Fig. 3). Over a twenty-year period, there has been an increase in its content in *F. distichus* from all the studied areas. The Pb content in *F. distichus* for the entire period of research varied in the range of 0.5-13.2 $\mu\text{g/g}$ dw in Avacha Bay and 0.4-5.1 $\mu\text{g/g}$ dw for Bering Is. During 2000-2020, the accumulation of Pb by *F. distichus* decreased. In the period 2000-2010, the concentration ranges of Zn in the *F. distichus* of the Avacha Bay and Bering Is. was comparable. In the last decade, significant differences have been observed in the accumulation of these metals by *F. distichus* of Avacha Bay and Bering Is.

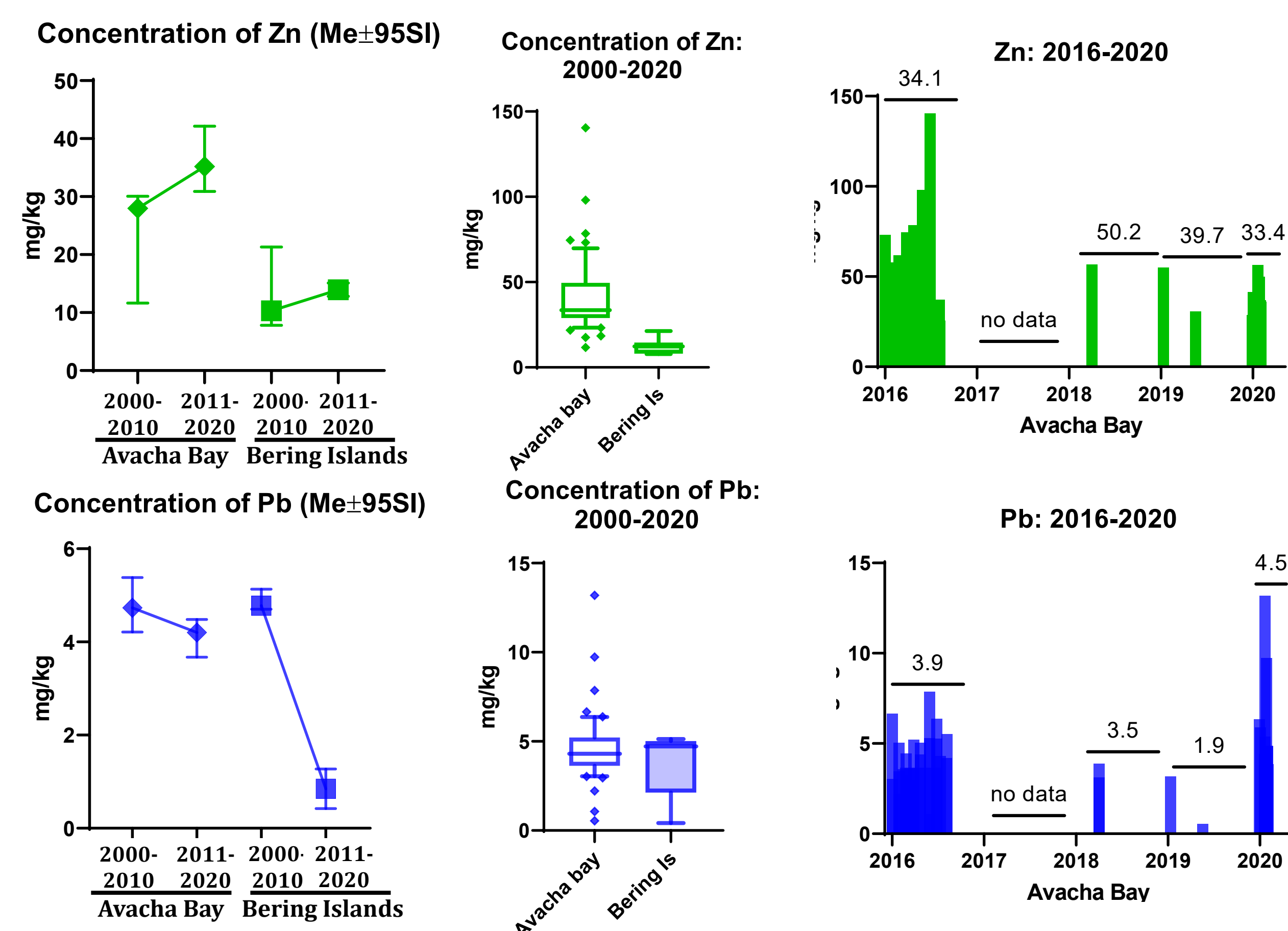


Figure 3. Dynamics of Zn and Pb content in *Fucus distichus* during 2000-2020. Algological material was collected in the coastal areas of Avacha Bay and Bering Island

CONCLUSION

The presented study of the Zn and Pb accumulation over two decades in the brown algae *Fucus distichus* (Fucales) showed the dependence of the accumulation of heavy metals on the growing place of the monitor species. Avacha Bay is characterized as an anthropogenic impact area. In *F. distichus* from Avacha Bay the maximum Zn content was seven times higher than the metal content in algae from the coastal areas of Bering Island. Similarly, the maximum Pb content in the analyzed material from Avacha Bay was more than two and a half times more than from the protected area of Bering Island, where the negative impact of human activity is minimal.