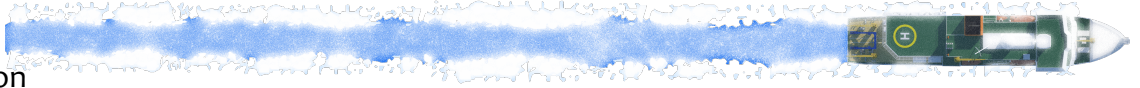




International Workshop on Arctic Ocean Observation:
Future Collaboration by Research Vessels and Icebreakers
November 17-18, 2023 @ IINO CONFERENCE CENTER, Tokyo, Japan.



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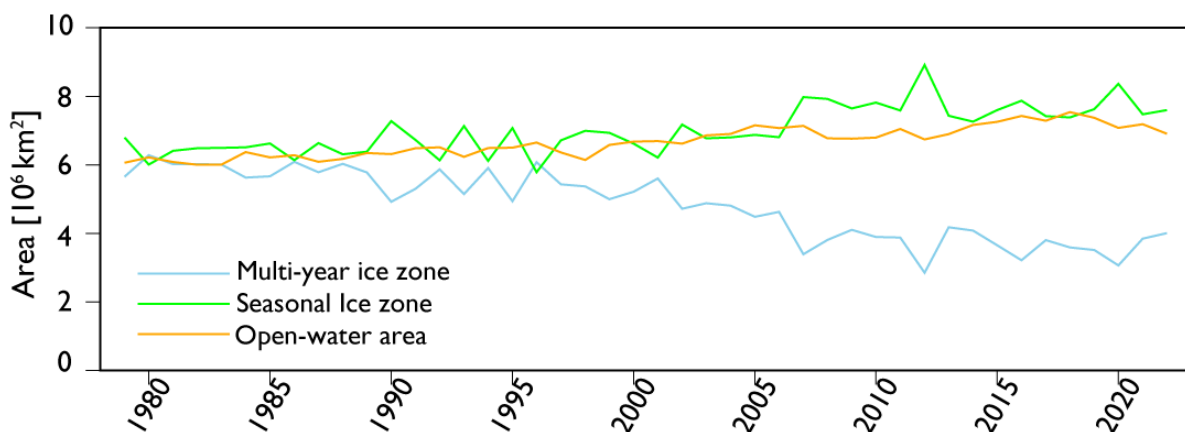
Expectations for Observations Using Japanese Icebreaking Research Vessel: From the Perspective of Marine Ecosystem Research

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Abstract

Satellite observations over the past four decades have revealed that nearly half of the area of multi-year ice zone in the Arctic Ocean has been lost, while the area of seasonal ice zone has exhibited an increase (Figure 1). Consequently, there is no doubt that significant alterations in the interannual and seasonal dynamics of sea ice, alongside noteworthy shifts in its role within marine ecosystems and biogeochemical cycles. The decrease in sea ice and associated ocean warming is widely recognized as a catalyst for the "borealization" of the Arctic marine ecosystem, marked by the distributional shift of subarctic organisms originating from the subarctic Atlantic and Pacific Oceans. Alternatively, polar regions exhibit universal and distinct phenomena, such as polar nights and midnight suns. Organisms are currently encountering an entirely novel Arctic marine environment for the first time. I am deeply intrigued by the mechanisms through which these organisms adapt to this rapidly evolving habitat. In Japan, the research vessel *Mirai*, which is a non-icebreaker ship, has led the Japanese Arctic Ocean observation for over 20 years and supported the accumulation of scientific findings. On the other hand, there is a great need for vessels with icebreaking capabilities to capture the rapidly changing marine environment of the Arctic Ocean and to conduct safe observations in icy regions. Therefore, there are high expectations for the Japanese new icebreaker from both scientific research requirements and safety considerations. However, to maximize its functionality, it should be used as an international observation platform as planned. In the realm of Arctic marine ecosystem research in Japan, for example, there is less participation of researchers in the study of higher trophic levels, fish and marine mammals, compared to the researchers of lower trophic level organisms. To comprehensively understand the state of marine ecosystems, such as the predator-prey relationship, it is imperative to conduct research encompassing trophic levels from the primary producers to marine mammals through international collaboration.





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Figure 1 Inter-annual variabilities of the area of multi-year ice zone (sky blue), seasonal ice zone (green) and open-water (orange) in the Arctic (>65°N) from 1979–2022, based on SMMR and SSMI observation.