

## **AdvanCing knowledge on the present Arctic Ocean by chemical-phySical, biogeochemical and biological obServAtioNs to preDICT the futuRe chAnges (CASSANDRA)**

M. Azzaro<sup>1\*</sup>, M. Bensi<sup>2</sup>, G. Civitarese<sup>2</sup>, M. Giani<sup>2</sup>, A. Lo Giudice<sup>1</sup>, F. Becherini<sup>1</sup>, D. Borme<sup>2</sup>, W.R.L Cairns<sup>1</sup>, D.M. Cappelletti<sup>1,3</sup>, C. Caroppo<sup>4</sup>, G. Caruso<sup>1</sup>, F. Cerino<sup>2</sup>, A. Cosenza<sup>1</sup>, C. De Vittor<sup>2</sup>, F. Decembrini<sup>1</sup>, T. Diociaiuti<sup>2</sup>, E. Federici<sup>5</sup>, M. Feltracco<sup>6</sup>, I. Gandolfi<sup>7</sup>, V. Kovacevic<sup>2</sup>, R. La Ferla<sup>1</sup>, A. Lupi<sup>1</sup>, G. Maimone<sup>1</sup>, P. Mansutti<sup>2</sup>, M. Mazzola<sup>1</sup>, S. Misericocchi<sup>1</sup>, M. Monti<sup>2</sup>, M. Papale<sup>1</sup>, L. Patrolecco<sup>1</sup>, A.C. Rappazzo<sup>6</sup>, F. Relitti<sup>2</sup>, C. Rizzo<sup>8</sup>, F. Spataro<sup>1</sup>, V. Tirelli<sup>2</sup>, C. Turetta<sup>1</sup>, L. Urbini<sup>2</sup>, L. Ursella<sup>2</sup> and V. Vitale<sup>1</sup>

<sup>1</sup>*Institute of Polar Sciences, Italy*

<sup>2</sup>*National Institute of Oceanography and Applied Geophysics, Italy*

<sup>3</sup>*University of Perugia, Italy*

<sup>4</sup>*Water Research Institute, Italy*

<sup>5</sup>*University of Tuscia, Italy*

<sup>6</sup>*University of Venice, Italy*

<sup>7</sup>*University of Milano-Bicocca, Italy*

<sup>8</sup>*Zoological Station "Anton Dohrn", Italy*

The Arctic and sub-Arctic regions have been warming more than twice as rapidly as the rest of the world for the past 50 years. The Arctic climate has undergone tremendous changes, such as Arctic wetting, reduction of Arctic sea-ice thickness and coverage, decrease of snow cover extent and duration, thawing of permafrost and melting of Greenland ice sheet. The changes in sea-ice conditions in turn accelerate warming, by reduced summer albedo and through the additional heat flux from the ocean as more open water areas are maintained later into the Autumn. This positive feedback effect is among the main processes responsible for the "Arctic Amplification", which is likely to strengthen in the years to come. Arctic and sub-Arctic ecosystems are environmentally sensitive regions, where the impact of global climate change is expected to make marked changes over the next decades and more rapidly than elsewhere. However, many of its consequences have yet to be understood. In this context, the Arctic Ocean and its marginal seas remain profoundly understudied and among the least-known basins in the world ocean, due to their remoteness, hostile weather and the multi-year or seasonal ice-cover. To fill this lack of relevant information, a bottom-up initiative called the Synoptic Arctic Survey (SAS; <https://synopticarcticsurvey.w.uib.no>), with the aim of developing synoptic-scale observations across the Arctic Ocean and its marginal seas, was organized. SAS consists of regional shelf-to-basin ship-based coordinated surveys to generate a comprehensive dataset of essential ocean variables (atmospheric, chemical-physical, biogeochemical and biological) on a quasi-synoptic, spatially distributed basis. SAS aims to take a "picture" of the Arctic Ocean in as much detail as possible and to answer the main scientific question: what is the current state and major ongoing changes in the Arctic marine system? The CASSANDRA project (granted by the Italian Arctic Research Program, PRA) aims at contributing to the Synoptic Arctic Survey (SAS) effort by studying a historical transect to 75° N (CASSANDRA I: 29 August - 14 September 2021) crossing the Greenland Sea Gyre, and the work plan has been designed to contribute to answer this question. Preliminary results of the CASSANDRA I oceanographic cruise will be presented concerning the hydrography of the 75° N transect, ecosystem functioning and productivity, carbon uptake and ocean acidification.