Korea-Chile Collaboration in Antarctic Research

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**Information Paper submitted by the Republic of Korea and Chile**

During the past decade, Chile and the Republic of Korea have been closely cooperating in the field of scientific research and infrastructure operation in the Antarctic Peninsula region with the year-round station King Sejong (Korea), Barton Peninsula and the seasonal station Professor Julio Escudero (Chile-INACH), Fildes Bay, King George Island. The cooperation effort was strengthened based on Memorandum of Understandings (MOUs) between the Chilean Antarctic Institute (INACH) and the Korea Polar Research Institute (KOPRI), which paved way for the establishment of the Korea-Chile Antarctic Cooperation Center in February 2016.

With a shared understanding of the importance of Antarctic region in global climate change, the research groups of both countries have been investigating how the climate change and other drivers (Invasive species, marine pollution) would affect coastal marine and terrestrial ecosystems of the Antarctica and the Southern Ocean. To share the status of on-going research cooperation and explore new research topics, a virtual workshop was hosted by KOPRI and INACH in November 2021. This information paper provides a summary of the joint programs and upcoming plans for new areas of research grouped around seven working groups (WG), and is not a complete description of the joint research efforts from both sides.

***WG1, Paleoceanography***

The Southern Ocean sedimentary records can indicate past atmosphere-ocean-ice interactions in Antarctic marginal seas and its links to the global climate system. Paleoceanography group has plans to acquire sediment core samples during the expedition on Chilean research vessel Karpuj and Korean Icebreaking research vessel Araon. The sediment core samples collected from the Antarctic Peninsula and the Ross sea region respectively, will be able to shed light on the variability in past climatic events and teleconnections through multi-proxy investigation.

***WG2, Role of the Southern Ocean in Storage of Greenhouse Gases***

The role of Southern Ocean as a sink of carbon dioxide is causing ocean acidification and disrupting coastal ecosystems. Furthermore, freshwater discharge from the melting glacier has a sharp impact on the inorganic carbon cycle in the coastal environment. The research reams will jointly perform carbon system monitoring connecting King George Island, Bransfield Strait and Antarctic Peninsula, as well as chemical and biological fluctuations in the coast of the Antarctic Peninsula. It is expected that carbon system monitoring would provide a time series of the Southern Ocean impacted by accelerating glacier melt discharge.

***WG3-4, Monitoring of Biodiversity and Management of Invasive Species***

The impact of climate change on Antarctic ecosystem includes significant disruption of the distribution, abundance and productivity of its inhabiting species, yet our knowledge of the current status remains limited. Meta-analysis of species turnover and its physiological responses by recording habit-based biogeographic syntheses will give us a better understanding of biogeochemical processes and climate driven responses in each trophic species.

In addition, there are on-going efforts to identify and eliminate non-native species in human settlements and its vicinities. The research team, in cooperation with the operators of other Antarctic stations, have analysed water and sediment samples from each research station and reported the results to the CEP. Works are underway to prepare a management plan to prevent the spread and eradicate non-native and invasive species.

***WG5, Earthquake Monitoring***

Recent reports of frequent earthquakes in the South Atlantic sector of the Southern Ocean represent both safety concerns and scientific challenges. Chile and the Republic of Korea are operating research stations in the Antarctic Peninsula, and has been working closely with other operators to ensure early detection of earthquakes using real-time seismic server and bathymetry data. The research team will install and deploy additional observation equipment, so that more real-time and stable earthquake data can be added to those obtained from the Chilean seismic station. The aim is to assist with more timely and accurate earthquake prediction and contribute towards developing emergency response plan.

***WG6, Recovery of Antarctic Marine Fishery Resources***

In order to understand the life cycle of fishes and aquatic invertebrates, thermal, salinity ranges, as well as optimal breeding conditions including reproduction and hatching, the research group will focus on the survival conditions under captivity, and the microbiome comparison between the captive and wild fish found in Antarctica to identify differences due to habitat. The knowledge about the growth of Antarctic species in captivity is one of the key aspects that can contribute greatly towards preparing the new aquariums for the Antarctic International Center (CAI), located in the sector of Sandy Point, Punta Arenas. This building will be more than 22,000 m2 in size, and have spaces for a museum, laboratories, logistics, aquarium, and Antarctic-subantarctic forest. The building will be able to provide support for Antarctic researchers who conducts Antarctic investigation.

***WG7, Monitoring of Marine Pollution***

As King George Island hosts many year-round and summer-only research stations, it is inevitably impacted by movement of human population during field activities. Korean research team has conducted a pilot study of marine litter in the vicinity of Antarctic King Sejong Station, and will be conducting additional field studies on marine litter with their Chilean counterparts in Ardley Island to identify further criteria for data analysis and protocols. The collected marine litter will also be compared with the Sub-Antarctic (Punta Arenas) coastal litter for composition analysis.

***Future Directions***

The workshop identified further activities for improving and reinforcing the cooperation between both institutions, such as: a) to share research platforms and infrastructures for conducting studies discussed by researchers from both countries, b) to promote publication productivity and quality of research, c) to conduct field survey during the 2021-22 Austral summer season based on the discussions from the workshop. Findings from the field and future activities will be dealt in detail through a follow-up workshop later in the year, and will be shared with the greater scientific community through presentations in international conferences, such as the Open Science Conference organized by the Scientific Committee on Antarctic Research (SCAR).