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Special Issue: The Asian Forum for Polar Sciences (AFoPS)*

[Editorial] Recent advance in Asian polar science – Commemorating ten-year activities of the Asian Forum for Polar Sciences (AFoPS)

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The Asian Forum for Polar Sciences (AFoPS) was established in 2004 to encourage and facilitate cooperation for the advance of polar sciences among countries in the Asian region. It commemorated tenth anniversary organizing the AFoPS Symposium on 7 October, 2014 in Port Dickson, Malaysia, hosted by the National Antarctic Research Center (NARC), University of Malaya. This second volume of AFoPS Special Issue includes those presentations submitted to the Symposium and scientific papers from AFoPS countries on wide variety of polar research. This publication is one of the excellent achievements of AFoPS.

The development of the Asian Forum for Polar Sciences (AFoPS)

Yeadong Kim, Jihoon Jeong

The Asian Forum for Polar Sciences (AFoPS), an international forum of Asian polar research institutes, was established for the advancement of polar sciences among its members in 2004. The Forum has served as an important medium of Asian collective endeavors for polar affairs in human and information exchange, research collaboration, and logistics cooperation for the last decade. The historical development of the AFoPS in retrospect can be divided into four phases: inception and establishment (2003–2004), growth and expansion (2005–2007), review and restructuring (2008–2011), and achievements and further measures (2012–2014). The progress of the AFoPS has not been linear and this trend will continue into the next decades. The Forum, however, clearly made achievements in this period of time, realizing multilateral research and logistics cooperation that would have been previously unimaginable; by doing so, it has laid the foundation for the future. Responsible for a great portion of the world's polar activities, the AFoPS will rise to meet the expectations of the world by producing notable research output, initiating international cooperative programs, and supporting non-polar Asian countries with

education and research collaboration. These are the tasks of the AFoPS for the next decade and they require strategy that promotes and facilitates collaboration in a practical way and draws attention of non-polar Asian countries to the polar sciences.

Balloon-borne observations of lower stratospheric water vapor at Syowa Station, Antarctica in 2013

Yoshihiro Tomikawa, Kaoru Sato, Naohiko Hirasawa, Masaki Tsutsumi, Takuji Nakamura

Balloon-borne observations of lower stratospheric water vapor were conducted with the Cryogenic Frostpoint Hygrometer (CFH) in July, September, and November 2013 at Syowa Station (69.0°S, 39.6°E) in the Antarctic. High-precision and high vertical resolution data of water vapor concentration up to an altitude of about 28 km were obtained successfully except for a contamination in the observation of July 2013. A comparison between the CFH and coincident satellite (i.e., Aura/MLS) observations showed a good agreement within their uncertainty. A position of Syowa Station relative to the stratospheric polar vortex edge varied depending on both the observation date and altitude. Temperature and pressure histories of the observed air parcels were examined by 10-day backward trajectories. These analyses clearly demonstrated that most air parcels observed in the lower stratosphere above Syowa Station experienced final dehydration inside the polar vortex. On the other hand, a clear signature of rehydration or incomplete dehydration was also observed around a 25 hPa pressure level in the observation of July 2013.

A new detailed ice thickness and subglacial topography DEM for Dome A, East Antarctica

Xiangbin Cui, Bo Sun, Jingxue Guo, Tiantian Wang, Dong Zhang

A new deep ice core is being drilled at the Chinese Kunlun Station in the Dome A region. As ice thickness and subglacial topography in the area are important factors of estimating ice core age, we investigated this region using ice-penetrating radars in three austral seasons during CHINARE 21, 24 and 29 expeditions. Previous results from radar measurements during CHINARE 21 and 24 played critical role in locating the deep ice core drilling site, basal ice age modeling and study of geomorphology of the Gamburtsev Subglacial Mountains. Recent radio echo sounding in the area during CHINARE 29 improved on the grid's resolution, intended for improving modeling results. All radar data from three austral seasons were processed to build more detailed maps of ice thickness and subglacial topography. The new maps show high resolution ice thickness distribution varying between 1548 m and 3347 m in the area. The small scale subglacial valley glaciated terrain is shown in great detail, such as mountain peaks and ridges, main deep valley and its branches, valley steps and overdeepened concavities. The results are essential for accurate regional ice sheet modeling in the area to study basal processes and ice age modeling, as well as

locating new deep ice core drilling site.

Response of Long Lake sediments to Antarctic climate: A perspective gained from sedimentary organic geochemistry and particle size analysis

Badanal Siddaiah Mahesh, Anish Kumar Warriar, Rahul Mohan, Manish Tiwari, Anila Babu, Aswathi Chandran, Rajesh Asthana, Rasik Ravindra

Sediments from the pristine lakes of ice-free regions of Antarctica are a great source for proxies to reconstruct the effect of past-climate on the lake evolution and its response to Antarctic climate. A 50 cm long sediment core retrieved from Long Lake, a periglacial lake of Schirmacher Oasis in Dronning Maud Land was measured for elemental (C%, N% and C/N), isotopic ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$) and particle size (sand-silt-clay percent) variation. The radiocarbon dated core spanning the last 48 cal ka BP has been deciphered for the lake's response to Antarctic climate. The C/N ratio (atomic ratio) predominantly indicates that the productivity has been autochthonous for majority of the down-core while the top 0–3 cm indicates that there has been addition of terrestrial organic matter into the lake system owing to longer ice-free conditions. The organic carbon shows significantly lower values (0.2%) throughout the glacial period and major part of the Holocene while the core-top values are consistent with the presence of a microbial mat which is reflected as higher organic carbon (12%). The $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ range from -33 to -9‰ and 2 – 18‰ , respectively. The isotopic signals vary marginally for the entire glacial period (48–8 cal ka BP) suggesting an intense cold period. The gradual increase in C/N ratio, sand content and $\delta^{13}\text{C}$ and decrease in $\delta^{15}\text{N}$ beginning at about 6 cal ka BP suggest that the Long Lake experienced longer ice-free conditions owing to sustained warmer Holocene conditions suggesting that the ice-cover over the Long Lake persisted well through early-Holocene. The sand and silt percent shows inverse correlation likely reflecting the warmer and colder conditions. The Holocene is characterised by higher sand content owing to melting of ice due to warmer conditions. The Long Lake's response to Antarctic climate is reflected in its response to the ice-cover conditions which regulates the productivity and sedimentation in the lake system.

A new species of *Paraproto* (Crustacea: Amphipoda: Phtisicidae) collected from the South Shetland Islands, Antarctica

Ichiro Takeuchi

A new species of amphipod crustacean (Amphipoda: Phtisicidae), *Paraproto mccaini* n. sp. is described based on specimens collected from south of Elephant Island, the South Shetland Islands near the Antarctic Peninsula. This species was first reported as *Paraproto condylata* (Haswell, 1885) [*sensu lato*], recorded from a temperate region of Australia. *P. mccaini* n. sp. is distinct from *P. condylata* [*sensu stricto*] by an elongated head with pereonite 1, presence of a mid-lateral projection on pereonites 2–4, and lack of a distal round projection on the propodus of

gnathopod 2. *Paraproto* differs from *Pseudoprotomima*, the most phylogenetically similar genus, in having gills on pereonites 3 and 4.

Morphology and molecular phylogeny of an Antarctic population of *Paraholosticha muscicola* (Kahl, 1932) Wenzel, 1953 (Ciliophora, Hypotricha)

Jae-Ho Jung, Kyung-Min Park, Gi-Sik Min, Helmut Berger, Sanghee Kim

The morphology of an Antarctic soil population of *Paraholosticha muscicola*, type species of *Paraholosticha*, is described from life and after protargol preparation. The data agree rather well with that of relevant descriptions, but the total variability of several features is relatively high in this species. *Paraholosticha ovata* and *P. lichenicola* are very likely junior synonyms. In addition, we sequenced the SSU rRNA gene of *P. muscicola* and thus we can estimate for the first time the phylogenetic position of a member of the Keronopsidae, the sole hypotrichs that divide in cysts. The molecular data basically support the position derived from morphological concepts, that is, *P. muscicola* branches off outside the Dorsomarginalia because kinety fragmentation and dorsomarginal rows are lacking. However, as in many other molecular analyses, discrepancies with morphology-based hypothesis are present. The misclassification of *Paraholosticha* and its sister-group *Keronopsis* in the Keronidae, with *Kerona pediculus* as type species, is discussed.

Relatively high antibiotic resistance among heterotrophic bacteria from arctic fjord sediments than water – Evidence towards better selection pressure in the fjord sediments

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The objective of this study was to determine the prevalence of antibiotic resistance among aerobic heterotrophic bacteria and coliform bacteria from water and sediment of Kongsfjord. The study was based on the assumption that arctic fjord environments are relatively pristine and offer very little selection pressure for drug resistant mutants. In order to test the hypothesis, 200 isolates belonging to aerobic heterotrophic bacteria and 114 isolates belonging to coliforms were tested against 15 antibiotics belonging to 5 different classes such as beta lactams, aminoglycosides, quinolones, sulpha drugs and tetracyclines. Resistance to beta lactam and extended spectrum beta lactam (ESBL) antibiotics was considerably high and they found to vary significantly ($p < 0.05$) between heterotrophic and coliform bacteria. Though the coliforms showed significantly high level of antibiotic resistance against ESBL's extent and diversity of antibiotic resistance (as revealed by multiple antibiotic resistance index and resistance patterns), was high in the aerobic heterotrophic bacteria. Most striking observation was that isolates from fjord sediments (both heterotrophic bacteria and coliforms) in general showed relatively high prevalence of antibiotic resistance against most of the antibiotics tested,

indicating to better selection pressure for drug resistance mutants in the fjord sediments.

Potential changes in feeding behavior of Antarctic fish, *Pseudotrematomus bernacchii* (Boulenger, 1902) on the East Ongul Island, Antarctica

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The feeding habits of the Antarctic fish *Pseudotrematomus bernacchii* (Previous name: *Trematomus bernacchii*) under the fast ice around Japanese Syowa Station were investigated in the summers of 2004/2005 and 2009/2010. The results showed that amphipods and krill were the major prey. However, there was a significant difference in the proportions of larger invertebrates such as squids, octopus and other crustaceans found in the fish stomachs between 2009/2010 and the previous years. Moreover, the percentage of amphipods and krill in fish stomachs declined over the 5-year period in all fish size classes. Several factors including sea ice melting, habitat and environmental changes might have influenced the pattern of feeding behavior.

Chinstrap penguin foraging area associated with a seamount in Bransfield Strait, Antarctica

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Identifying marine features that support high foraging performance of predators is useful to determine areas of ecological importance. This study aimed to identify marine features that are important for foraging of chinstrap penguins (*Pygoscelis antarcticus*), an abundant upper-trophic level predator in the Antarctic Peninsula region. We investigated the foraging locations of penguins breeding on King George Island using GPS-depth loggers. Tracking data from 18 birds (4232 dives), 11 birds (2095 dives), and 19 birds (3947 dives) were obtained in 2007, 2010, and 2015, respectively. In all three years, penguins frequently visited an area near a seamount (Orca Seamount) in Bransfield Strait. The percentage of dives (27.8% in 2007, 36.1% in 2010, and 19.1% in 2015) and depth wiggles (27.1% in 2007, 37.2% in 2010, and 22.3% in 2015) performed in this area was higher than that expected from the size of the area and distance from the colony (8.4% for 2007, 14.7% for 2010, and 6.3% for 2015). Stomach content analysis showed that the penguins fed mainly on Antarctic krill. These results suggest that the seamount provided a favorable foraging area for breeding chinstrap penguins, with high availability of Antarctic krill, possibly related to local upwelling.