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Report of Japanese sea-floor visual survey in the southern Emperor Seamounts (southern-ES) in 2021

by

Mai Miyamoto* and Kota Sawada**

* Environmental Management Unit, Environmental Consulting Department, JAPAN NUS CO., LTD.

** Oceanic Resources Group, Fisheries Resources Institute, Japan Fisheries Research and Education Agency, Japan

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Report of Japanese sea-floor visual survey in the southern Emperor Seamounts (southern-ES) in 2021

Mai Miyamoto* and Kota Sawada**

* Environmental Management Unit, Environmental Consulting Department, JAPAN NUS CO., LTD.

** Oceanic Resources Group, Fisheries Resources Institute of Far Seas Fisheries, Japan Fisheries Research and Education Agency

Introduction

Bottom fisheries in the Southern Emperor-Northern Hawaiian Ridge (SE-NHR) seamounts have been conducted since 1967. In the high seas fisheries, assessment and proper management of significant adverse impacts (SAI) of bottom fisheries on vulnerable marine ecosystems (VMEs) has been required in accordance with the 2006 UNGA (United Nations General Assembly) Resolution 61/105 (UNGA 2007). As a responsible fishing nation, Japan has been conducting surveys of the ecosystems in this area since 2006 (Hayashibara and Miyamoto, 2012a; Hayashibara and Miyamoto, 2012b; Hayashibara et al., 2013; Hayashibara et al., 2014; Yonezaki et al., 2015; Yonezaki et al., 2016; Hayashibara and Nishida, 2017; Miyamoto et al., 2018). These survey results have promoted the scientific understanding of seamount fauna (Miyamoto and Kiyota, 2017; Miyamoto et al., 2017a, b), and contributed to the establishment of the conservation and measures of NPFC, including the recent establishment of bottom trawl exclusion areas for VME protection in the Koko and Colahan seamounts (Miyamoto and Takeshige 2020; NPFC 2021).

Our aim of the scientific survey in this year was to collect further information on the dense distribution of cold-water corals and other communities in Koko and Yuryaku seamounts reported by US research paper (Baco et al. 2020, hereafter referred to as “US research”). The potential for SAI of fishing on these communities was discussed at the first NPFC Small Scientific Committee on Bottom Fish and Marine Ecosystems (SSC BF-ME) meeting in 2020. This paper briefly summarizes the results of the seafloor visual observation surveys conducted in the Koko and Yuryaku Seamounts in this year.

Materials and Methods

The sea floor visual survey was conducted by R/V Kaiyo-Maru of the Fisheries Agency of Japan in Southeastern Koko and Yuryaku Seamounts from 28 July to 21 August 2021. Thirty-four sites were set in the Koko Seamount (Fig. 1) and twenty-two sites were set in the Yuryaku Seamount (Fig. 2) based on the survey report from Baco et al. (2020). The depth ranges were 272-532 m in Koko and 475-703 m in Yuryaku.

A drop camera system was applied to observe sea-floor environment. The drop camera system composed a GoPro HERO8 Black digital camera used as video camera, in a 3,000 m pressure resistant GoPro housing (DVH-HERO8-3000) and a deep-sea LED light (SDL-26H) attached to a metal frame. At each survey site, the drop camera was suspended from the vessel with wire, and then lowered down to the seafloor five times to take underwater images on five neighboring locations in a station. At each touchdown, the drop camera system was kept on the seafloor for 2 min. In addition, vertical profiles of water temperature and depth were recorded by a data-logger (DST Centi-TD, Star Oddi Co, LTD.) which is attached to the metal frame of the drop camera system. Cold-water corals were identified to the genus or family level and the number of colonies were counted using video taken by drop camera. Other benthic animals were also identified at the family level if possible, or at higher taxonomic levels, such as order or phylum.

Results

Below we describe the result of our survey. Survey sites were roughly categorized by geographical areas and dominant species (especially corals).

Koko Seamount

No corals and other benthos (K03, K32: Fig.3-1): Corals and other benthic animals weren't observed at these sites.

Some species corals and few benthos (K01, K02: Fig. 3-2): *Stichopathes* sp. (antipatharian coral) and Dendrophylliidae scleractinian coral are sparsely distributed. Several species of fish and benthic animals were observed, but the number of individuals was small.

Some gorgonian corals (K04, K05, K06: Fig 3-3): The distribution of Isididae gorgonian, *Acanella* sp. and Primnoidae gorgonian, *Narella* sp. was confirmed, with 20-50 colonies observed in K04 and a sparse distribution of 5-10 colonies in K05. In some sites, more than 50 colonies of very small (a few cm) hydro-coral, Stylasterina were observed (Fig. 3-3, K06).

Dominated by Antipatharia coral, "*Stichopathes* sp." (K07~K27: Fig. 3-4): Throughout the 17 sites from K07 to K27 (depth ranges of 270 to 411 m), a similar set of coral taxa constitutes the benthic communities, with the antipatharian coral *Stichopathes* sp. being dominant. The gorgonian coral *Thouarella* sp. were also observed 5 to 10 colonies in K13 and K14.

Dominated by "Isididae" gorgonian corals (K28~K31: Fig. 3-5): Seafloor topography varied drastically among these sites, including flat bedrock and undulating rock-reefs at depth ranges of 462 to 530m., Around 10 colonies of Isididae gorgonian corals (e.g, *Acanella* sp., *Idsidella* sp. or uniaxial species) were observed per observation. Coral rubbles were deposited at some of the sites (Fig. 3-5, K29).

Yuryaku Seamount

No corals and other benthos (Y01, Y03, Y15, Y16, Y18: Fig. 3-6): Corals and other benthic animals weren't observed at these sites.

Sites with some gorgonian corals (Y13, Y17: Fig. 3-7): In both Y13 and Y17, several species of gorgonian corals including Primnoidae and Acanthogorgiidae were distributed, but the number of colonies were small.

Northwestern sites with some coral species (Y02, Y19~Y22 (around Y02): Fig. 3-8): The seafloor of Y02 and neighboring sites was flat bedrock and steep slope at depth rages of 618 to 622m. The community of seafloor consisted of several coral species such as Primnoidae, Isididae *Isidella* sp. or Plexauridae gorgonians or scleractinian corals *Enallopsammia rostrata*. Our observations suggested that although *E. rostrata* is a potentially reef-building species, they form relatively small and sparse colonies in those sites, not large and dense enough to construct reefs and structures.

Southeastern sites with some coral species (Y04~Y12: Fig. 3-9): Y04 and Y05 are flat bedrock at depth ranges of 466 to 482m. There were several species of corals including relatively large gorgonians *Isidella* sp., Primnoidae corals *Narella* sp. or *Thouarella* sp. or *Enallopsammia* sp. scleractinian corals. Y06~Y12 showed various seafloor topographies such as moderate slope, terrace or flat bedrock, but the taxa composition of corals was similar to those of Y04 and Y05. Some colonies of relatively large Nephtheidae Alcyonacea corals were confirmed at only Y12 among the all sites.

Discussions

In Koko Seamount, the uniaxial antipatharian coral, *Stichopathes* sp. was observed in a wide range of the study area. This is consistent with the result of US research which reported that uniaxial antipatharian corals were frequently observed in the relatively shallow seabed of Koko Seamount. In the northern part of the study area (K04, K05, K06), sparse distributions of gorgonian and scleractinian corals were observed, while in the southeastern part of the study area (K28 to K31), low to medium densities of several corals, including Isididae gorgonian coral were observed, respectively. These species composition of corals observed in this study are similar to that observed by US research, which also reported sparsely distributed and small patches of gorgonian and scleractinian corals. US research reported a high-density community of gorgonian corals in Koko Seamount. In this study, we observed a relatively high community density consisted mainly of Isididae gorgonian corals in K04, but its composition and density differed from that of K05, which is adjacent to K04 and located in the similar depth, suggesting that the relatively dense distribution area is confined.

In Yuryaku seamount, mixed distribution of several coral species was observed at many study sites. In the northwestern part of Yuryaku Seamount around Y02 and on the slope of the southeastern part (Y06 and Y07), we observed dense coral assemblages consisted of gorgonian species. The US research observed a dense community of large Primnoidae and Isididae gorgonians on a steep southeastern slope. This report is consistent with the observations of Y06 and Y07. In this study, we confirmed the community reported by US research and identified an unreported coral community around K02 in Yuryaku Seamount.

In summary, we successfully collected detailed data on benthic communities reported by the US research (Baco et al. 2020). We will compare the results of this study with the US research in detail and possibly use the results for the SAI assessment for these communities.

Acknowledgement

This survey is conducted as a part the Research and assessment program for fisheries resources, the Fisheries Agency of Japan. We wish to express our gratitude to the staff of Fishery Agency of Japan and Japan Fisheries Research and Education Agency, the captain and crew of the R/V Kaiyo-Maru, Dr. Taro Ichii for helpful comments on the manuscript, and Dr. Amy Baco for kindly providing detailed data which helped us design the survey.

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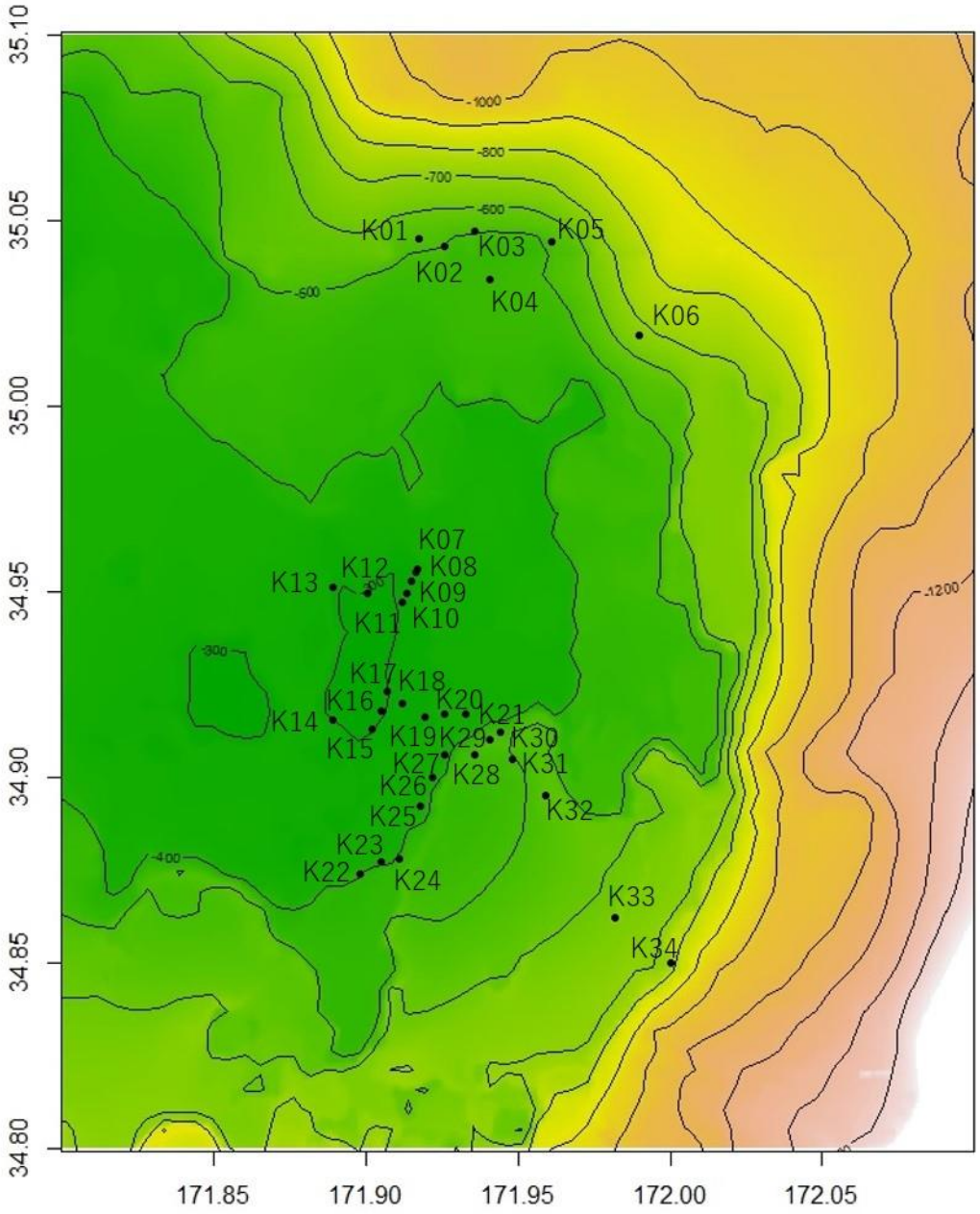

Fig. 1. Survey sites of Koko seamount. Black dots are operation points of the drop camera survey.

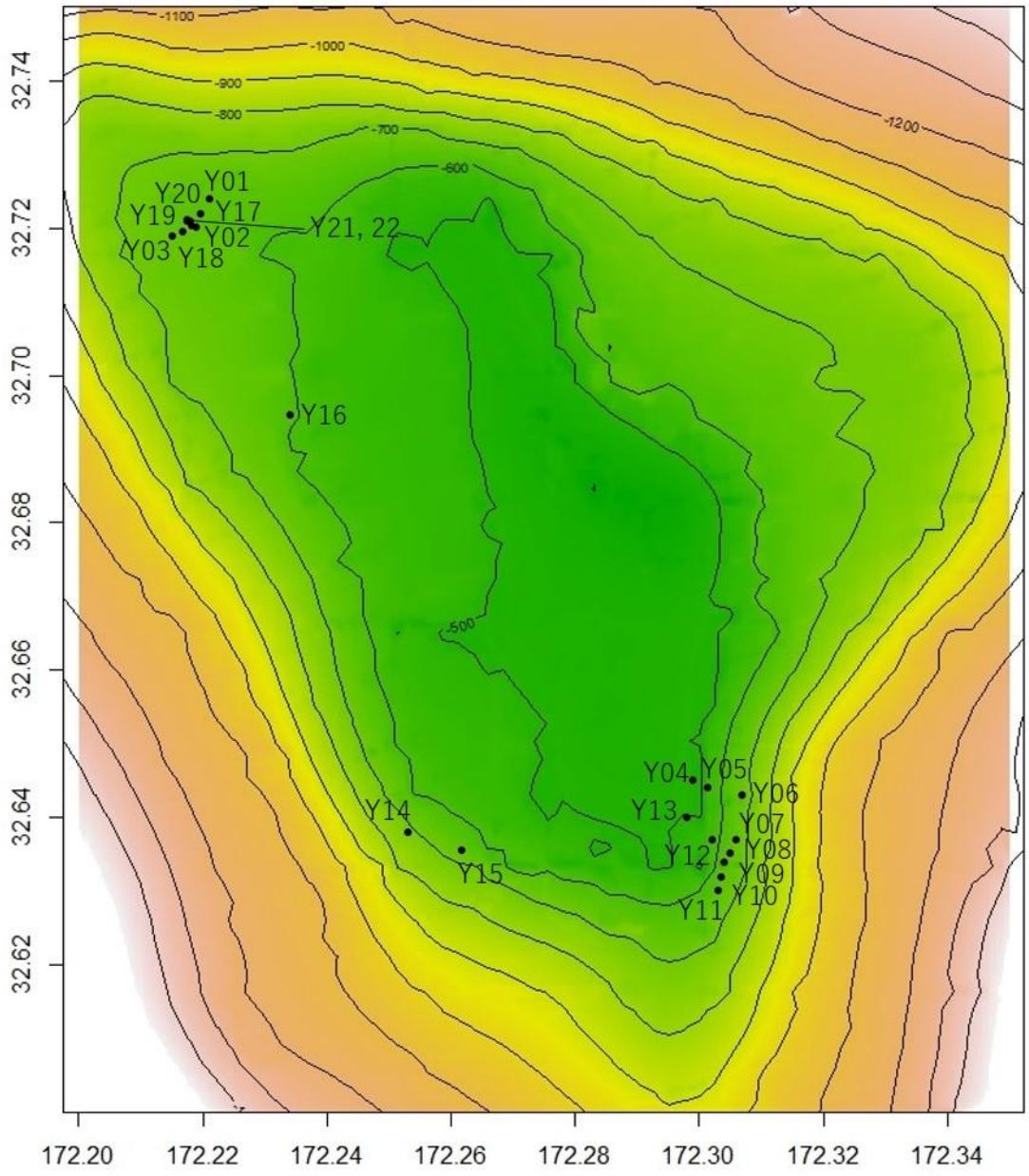

Fig. 2. Survey sites of Yuryaku seamount. Black dots are operation points of the drop camera survey.

Fig. 3-1. Pictures of sea floor taken by the drop camera system at K03 and K32.

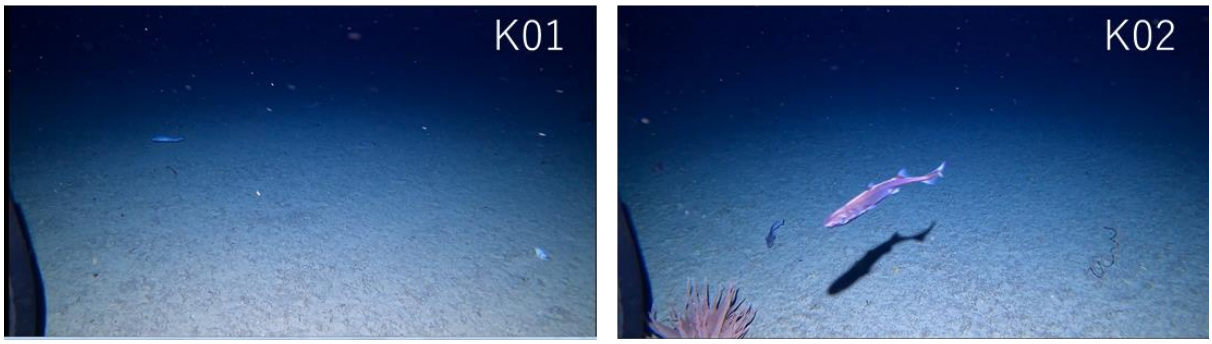

Fig. 3-2. Pictures of sea floor taken by the drop camera system at K01 and K02.

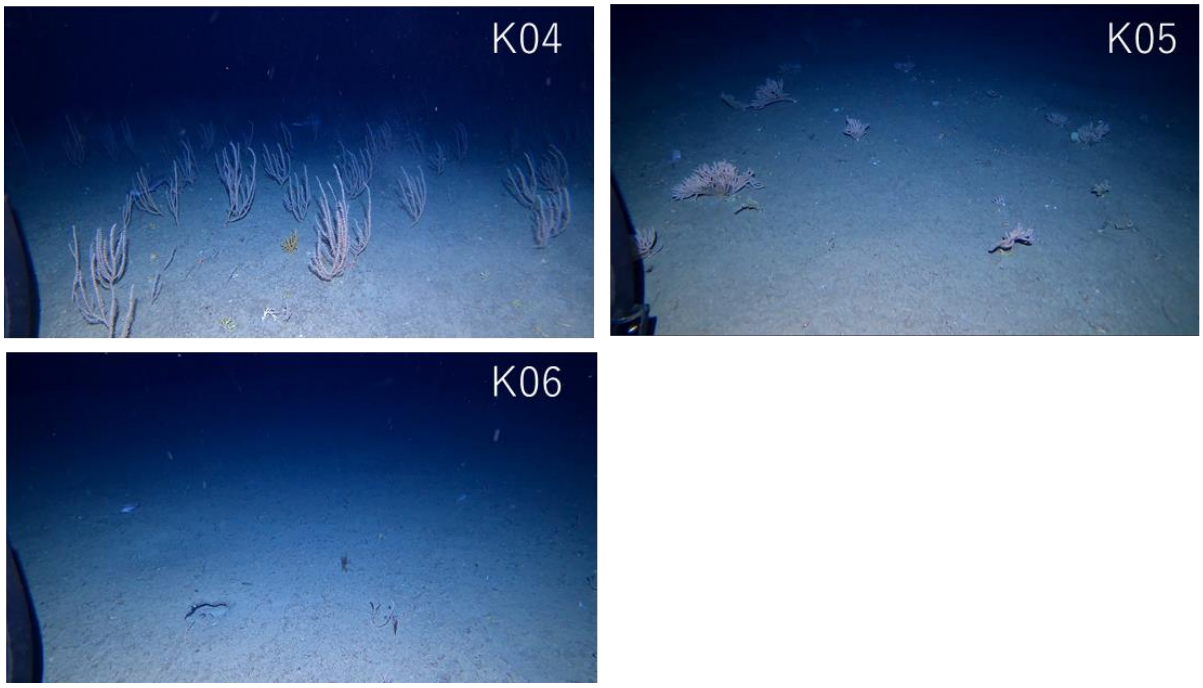

Fig. 3-3. Pictures of sea floor taken by the drop camera system at K04, K05 and K06.

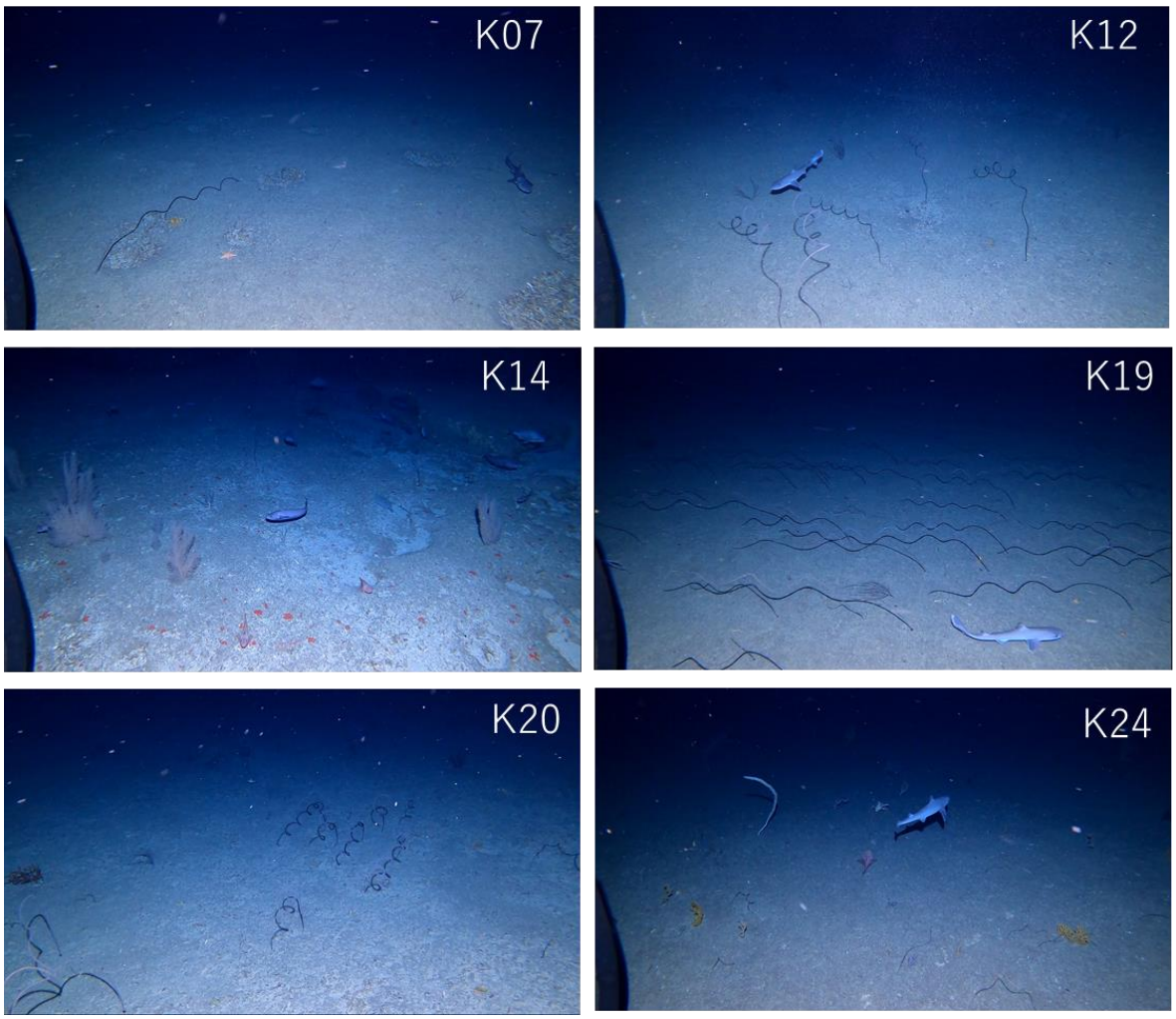

Fig. 3-4. Pictures of sea floor taken by the drop camera system at K07 to K27.

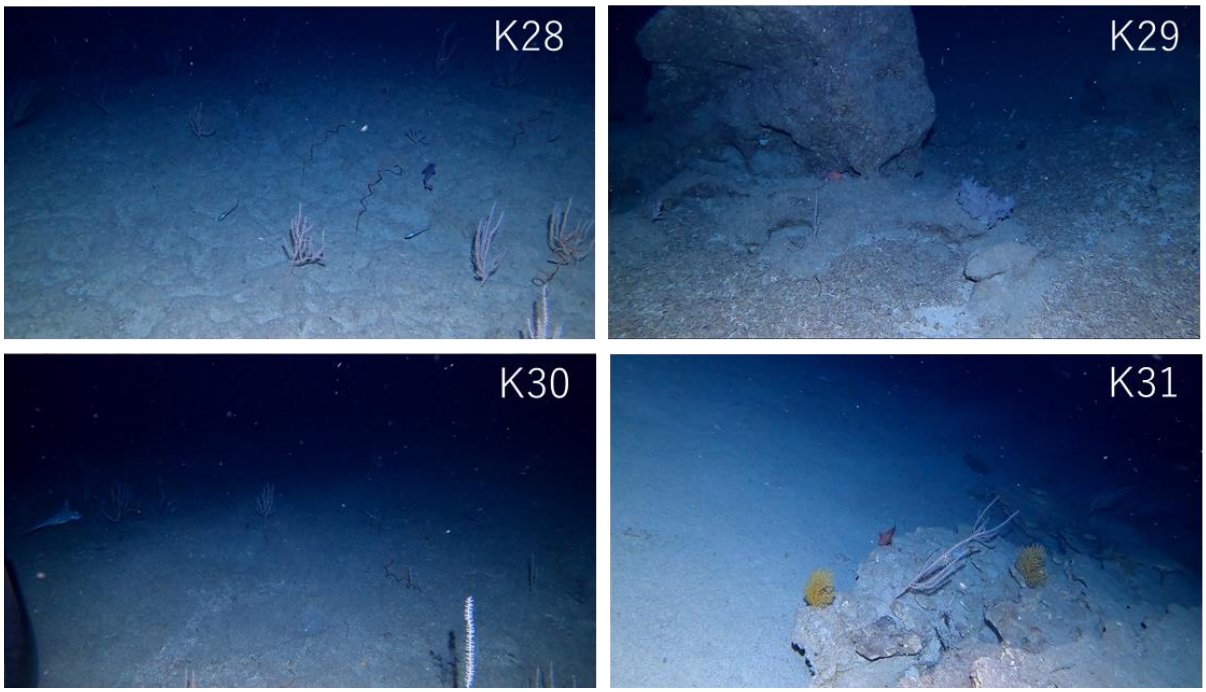

Fig. 3-5. Pictures of sea floor taken by the drop camera system at K28 to K31.

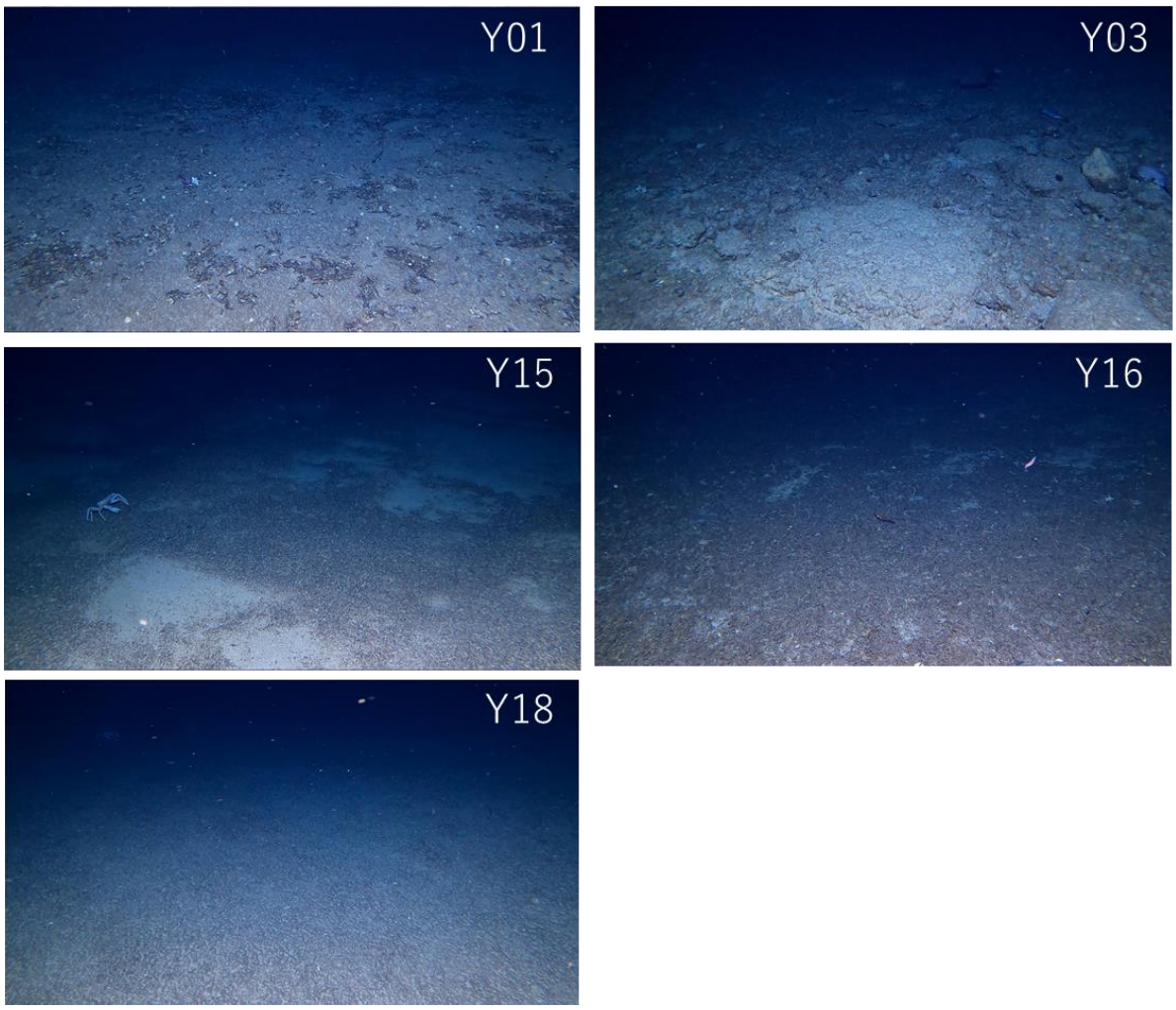

Fig. 3-6. Pictures of sea floor taken by the drop camera system at Y01, Y03, Y15, Y16 and Y18.

Fig. 3-7. Pictures of sea floor taken by the drop camera system at Y13 and Y17.

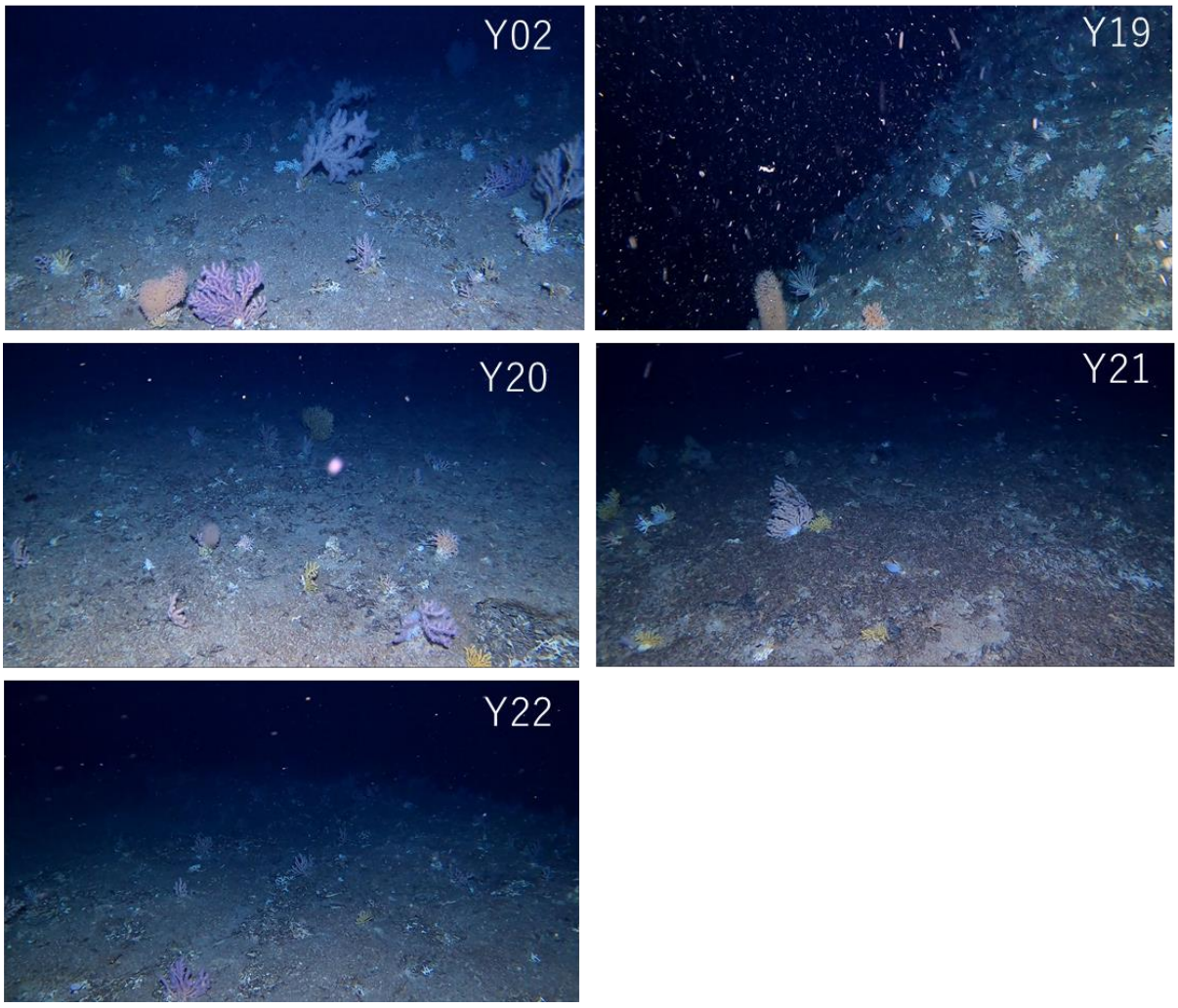

Fig. 3-8. Pictures of sea floor taken by the drop camera system at Y02 and Y19 to Y22.

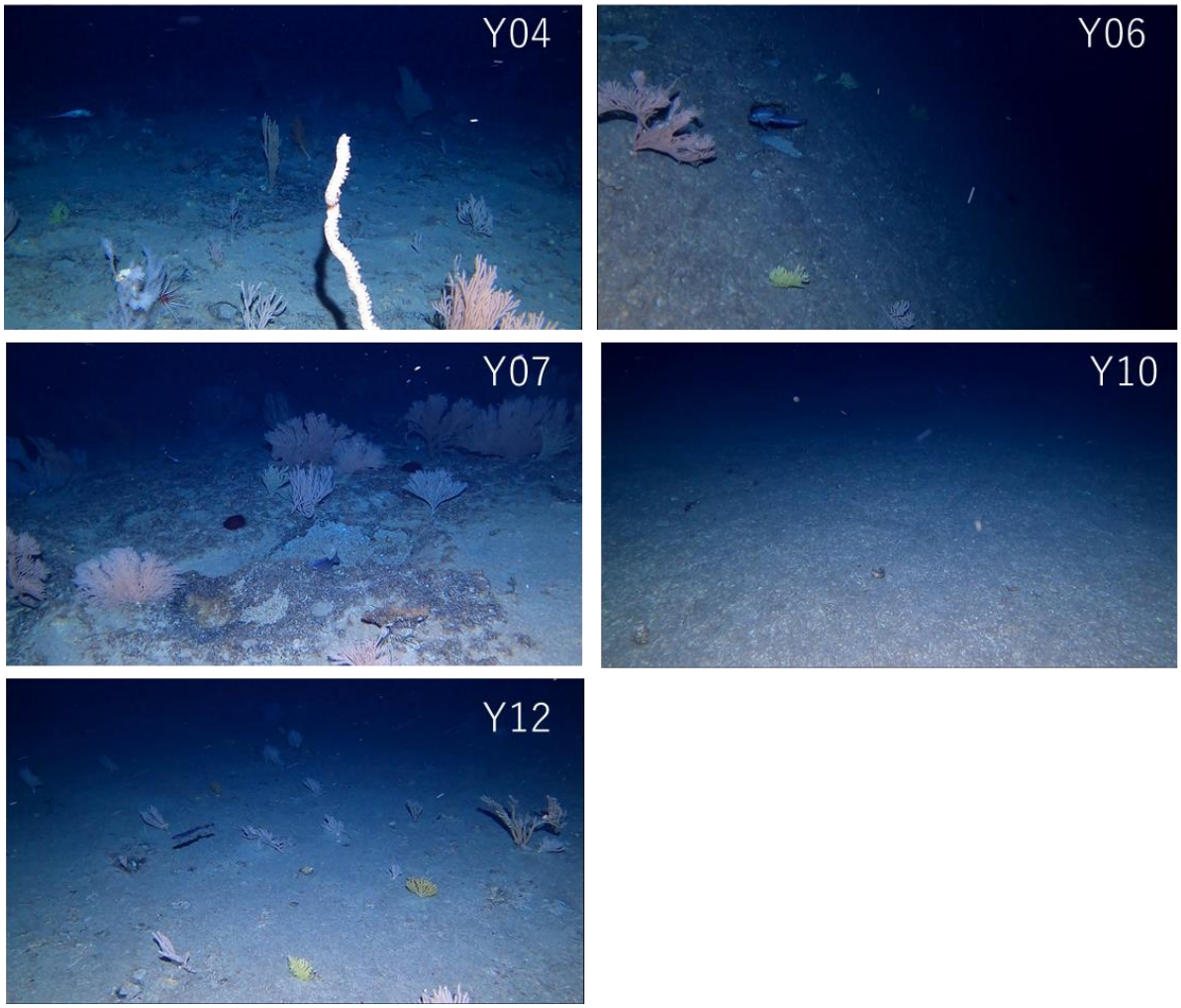

Fig. 3-9. Pictures of sea floor taken by the drop camera system at Y04 to Y12.