

Distribution and density of megabenthos around methane seep off Joetsu, eastern margin of the Japan Sea.

Hideki Numanami[1]; Ryo Matsumoto[2]; Katsunori Fujikura[3]; Hideaki Machiyama[4]; Mineo Hiromatsu[5]; Mikio Satoh[6]; Tada-nori Goto[7]

[1] Tokyo Kasei-Gakuin Univ; [2] Earth and Planetary Sci., Univ. of Tokyo; [3] XBR, JAMSTEC; [4] KOCHI/JAMSTEC; [5] Earth Interior Dynamics, Chiba Univ; [6] GSJ,AIST; [7] JAMSTEC

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A number of pockmarks, mounds, magnificent flares of gas plumes have been observed on the Umitaka Spur and the Joetsu Knoll off Joetsu in the eastern margin of Japan Sea during cruises of UT-04 (2004) to UT-07 (2007) by R & T/V Umitaka-maru. And the deep-tow survey (KY05-08 in 2005) and dives of ROV Hyper-Dolphin (NT05-09 in 2005, NT06-19 in 2006 and NT07-20 in 2007) have discovered seafloor gas hydrates and benthic communities in the Umitaka Spur and the Joetsu Knoll. Dominant species in these areas were seems to be red snow crab, *Chionoectes japonicus*, and Zoarcid fishes. In the present study, in order to accurately estimate the population densities of *C. japonicus* and Zoarcid fishes in the Umitaka Spur, *in situ* investigation was carried out using the deep tow TV camera array.

Population densities were analyzed based on video images in the investigation in 2005 (KY05-08). In the present study, video images of two track lines (DT-3C & DT-5C) were analyzed. The deep tow TV camera array was used to observe remotely and record the video images in real time. In order to maintain constant altitude from sea floor, a 4 m long chain with a 20 cm sinker is hung below the TV camera. The observable swath was approximately 4 m wide, based on comparison with the chain and sinker. It is known that the distribution of benthos is affected by the bottom sediment. Therefore, the bottom condition classify into three types, such as silty sediments (SS), silty sediments and carbonate crusts (SC) and carbonate crusts with bacterial mats (CB). Population densities were calculated for these three types respectively. In addition to the deep tow TV camera array's image, distributions of megabenthos were observed also from the Hi-Vision image by investigation by the ROV Hyper-Dolphin (NT 07-20) in October, 2007.

Water depth of survey area was ca. 900 m, and water temperature was 0.3°C near the bottom. The deep tow TV camera array covered survey areas of 8671.5 m² in DT-3C and 4953.1 m² in DT-5C. In the track line of DT-3C, the large-scale CB area was found within the northern and southern mounds on the Umitaka Spur. And the SC area was in the slope of a reverse gourd type pockmark. SS accounted for 81.9% of the survey area of the DT-3C. 15.6% of survey area was CB, and 2.9% was SC. In DT-5C, the large-scale CB area was found between northern mound and southern mound, and also was found within the southern mound. 90.6% of survey area in the DT-5C was SS, and 9.2% was CB.

Population densities of *C. japonicus* were calculated for the two track lines and were 70.8 individuals/1000m² in DT-3C and 57.3 individuals/1000m² in DT-5C. Compared to bottom conditions, 224.1 and 260.2 individuals/1000m² was observed in CB, 71.4 individuals/1000m² in SC, and 41.5 and 34.7 individuals/1000m² in SS. Moreover, past methane venting topography was found within the southern mound, and the large-scale bacterial mat was developed on the periphery. Population density of *C. japonicus* in this area was remarkably high, such as 263.47 to 303.11 individuals/ m². Estimates of the population density of *C. japonicus* using *in situ* observation methods have been reported previously, the results including 1.5 to 75 individuals/ m² in the Japan Sea (Hashimoto & Hotta, 1985; Tujimoto, 1999; Matsuzawa & Hashimoto, 1987; Fujikura *et al.*, 2000). Although the population density in the silty sediment bottom in this study was the same as that of the highest value of a previous report. In contrast, the population density in carbonate crusts with bacterial mats bottom in this study was 4.5 to 161 times higher than values of previous reports. And it is known that bacterial mats and carbonate crusts will be dependent on the methane seep. It was suggested that there is high relationship between the high-density distribution of *C. japonicus* and the methane seep.