Press Releases

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JAMSTEC
Yamaguchi University
Kochi University

Reported Impact on Benthic Marine Environments Off Shimokita from the 2011 off the Pacific Coast Off Tohoku Earthquake and Tsunami -Unexpected High Benthic Diversity in Ecosystems-

1. Overview

A research team led by Takashi Toyofuku, Senior Scientist, Department of Marine Biodiversity Research at Japan Agency for Marine-Earth Science and Technology (JAMSTEC: Asahiko Taira, President), Kiichiro Kawamura, Associate Professor at Yamaguchi University, and Masashi Murayama, Professor at Kochi University investigated off Shimokita Peninsula ("off Shimokita") for the first time after the area was hit by the tsunami caused by the 2011 off the Pacific Coast Off Tohoku Earthquake ("the 2011 Tohoku earthquake"). It aimed to understand the sediments, biochemical environments and marine benthic communities in the area. The research was carried out in late August 2011, five months after the 2011 Tohoku earthquake, jointly with researchers from France, Netherland, and Finland. As a result, a new type of disturbance was found on the seafloor. The study result will contribute to reproduce past tsunami events.

In the research, the sediments showed variable types and sizes of sand grains that had usually not been observed there, so they are considered to have been deposited in a short period of time. As for foraminiferal assemblages in the sediments, a high diversity was confirmed around the shelf, where more species were present than usual, while a lower diversity with dominance of a monospecific foraminiferal assemblage at the shelf-break where the seafloor slope steepens.

Moreover, a numerical simulation of velocity of the tsunami generated by the 2011 Tohoku earthquake indicated that bottom-water velocities reached 78 cm/s at the outer shelf, which was much faster than those caused by the super Typhoon Songda observed in May 2011 soon after the 2011 Tohoku earthquake. Based on these findings, the research team concluded that the observed sediments are regarded as "tsunamigenic deposits" and tsunami generated by the 2011 Tohoku earthquake caused a large-scale disturbance of marine environments off Shimokita.

There are first reports highlighting the impacts of earthquakes and tsunamis on the seafloor off Shimokita. It is expected to lead to higher accuracy in estimating the sources of past tsunami sediments, providing significant insight into research on history earthquakes.

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These study results have been posted on the Nature Publishing Group's online journal, *Scientific Reports* on December 17th, 2014 (JST).

Title: Unexpected biotic resilience on the Japanese seafloor caused by the 2011 Tōhoku-Oki tsunami

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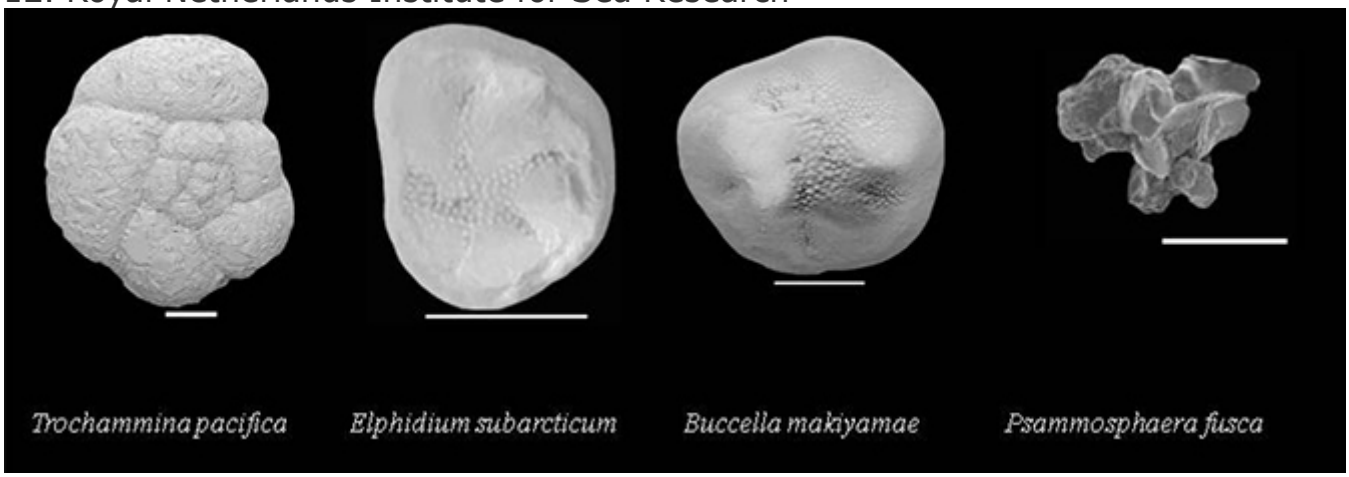

Figure 1: Foraminiferal faunas observed.

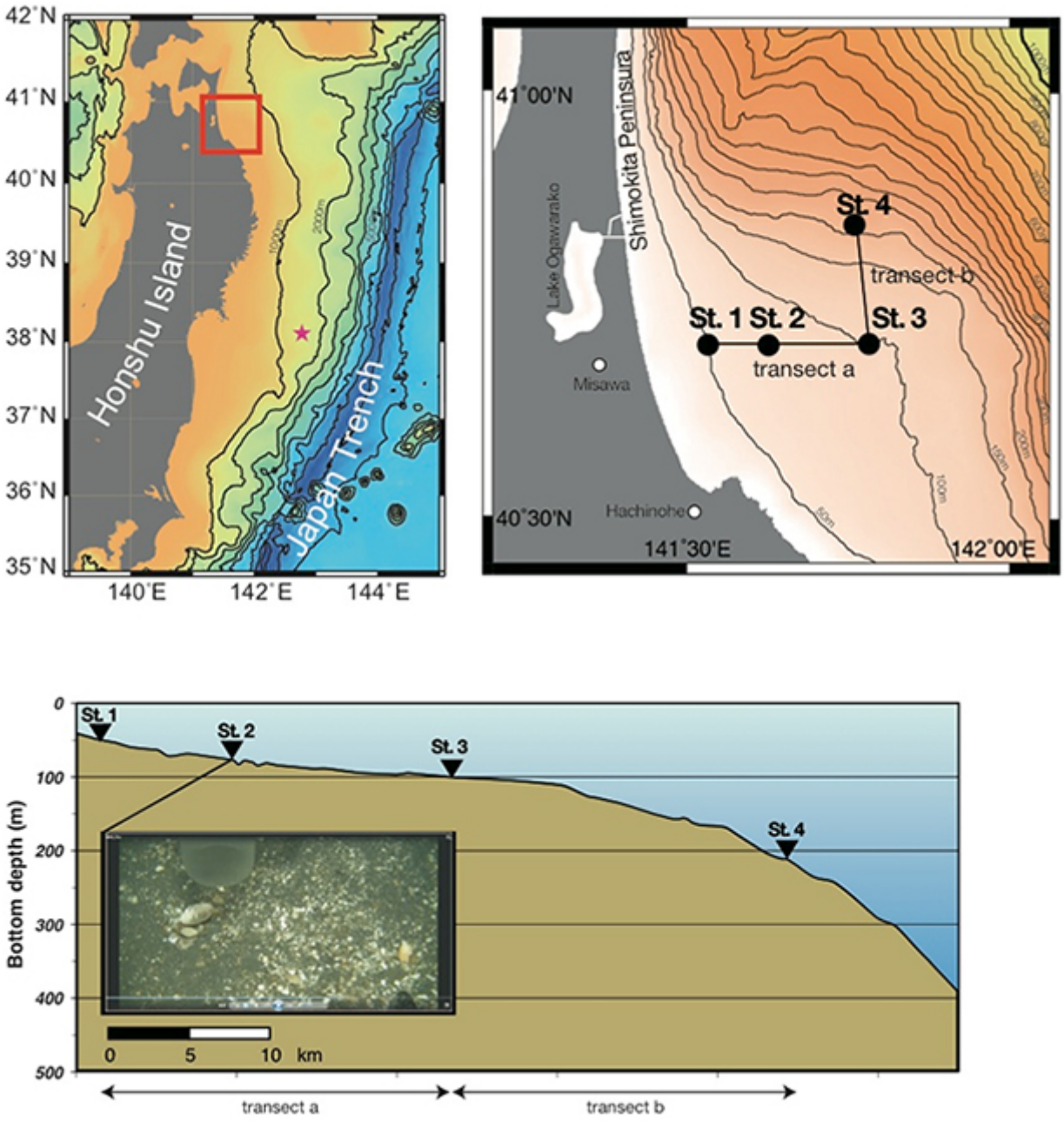

Figure 2: Stations where samples were collected and geological section. Each water depth is: 55m at St1, 81m at St2, 105m at St3, and 211m at St4. At St2, coarse sediments were clearly observed.

Figure 3: Enlarged photo at 81m deep (upper) and core samples collected (lower). Lots of shelly fragments were found on the sea floor. Core samples also showed different sizes of praticles at 5cm below the surface of the sea. Sandy particles from the upper mixed layer were coarser.

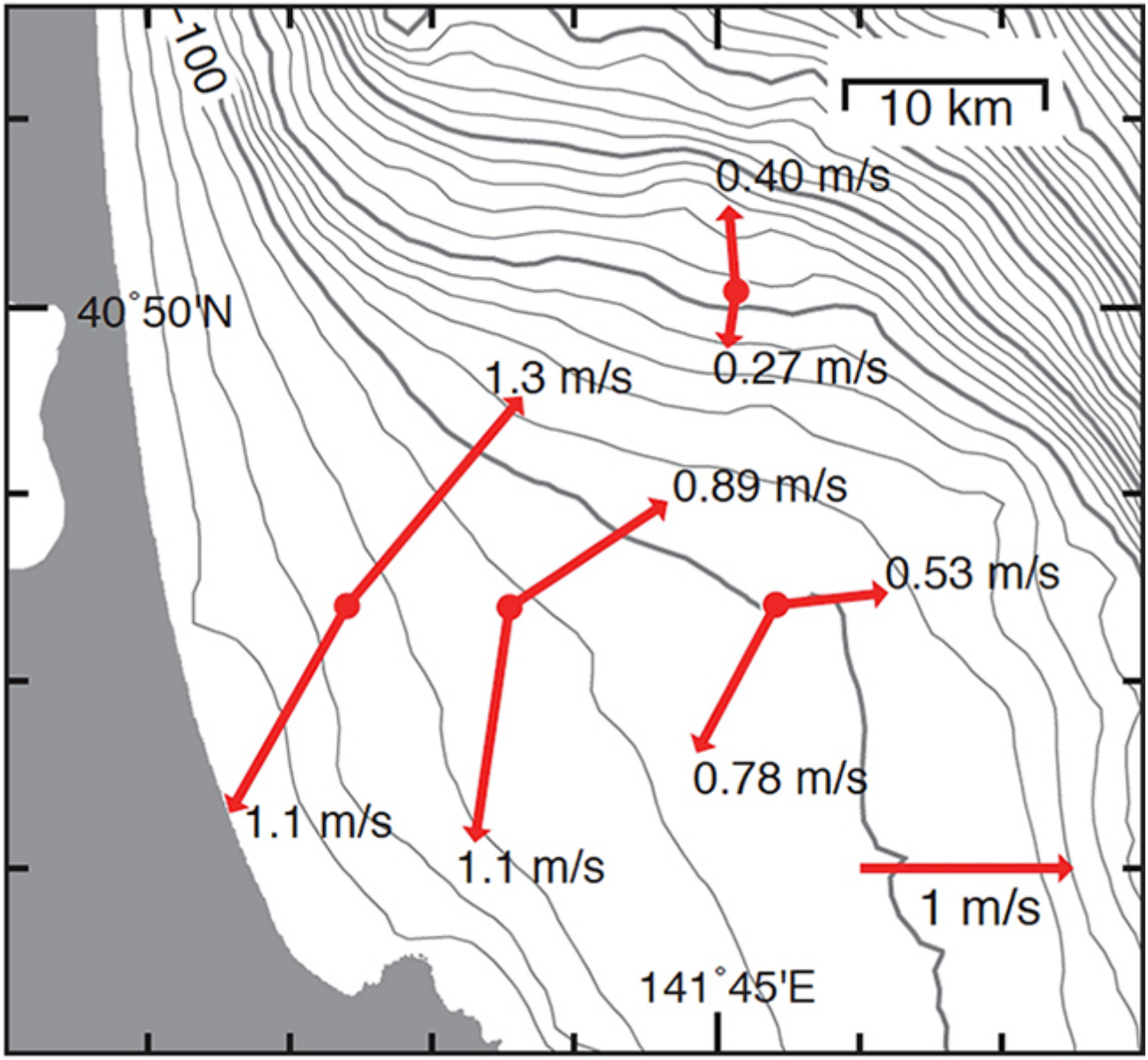

Figure 4: Simulated maximum velocities and directions of incoming and returning flows at the four stations.

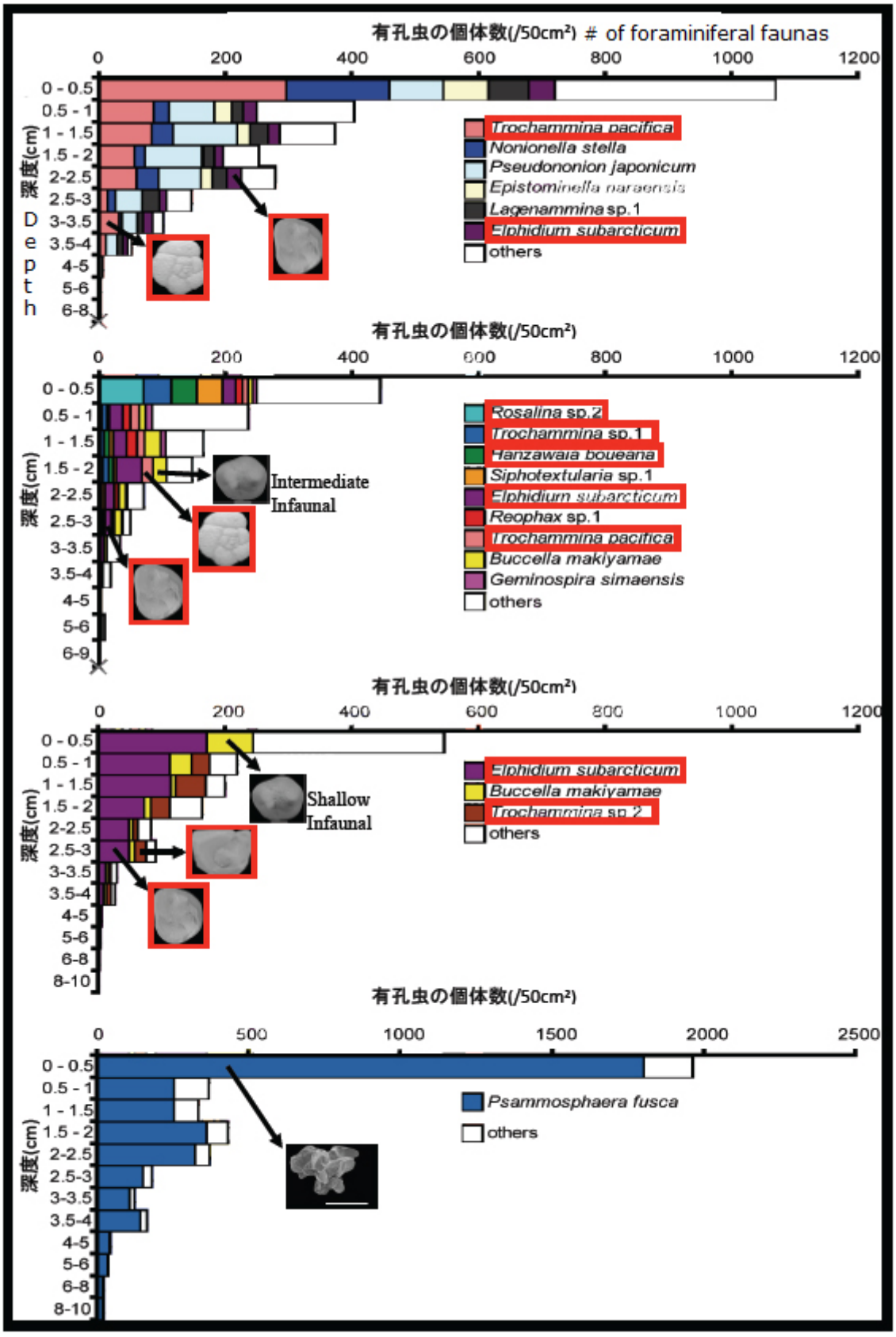

Figure 5: Depth Distribution of foraminiferal assemblages collected at each station. The horizontal axes indicate the number of individuals, the vertical ones the depth in sediments, and the colors different species. At 55m, 81m and 105m depth, species usually living only on surface layers were observed at a few centimeters beneath of the sediments (species in the red frameworks). At the 211m depth a single genus dominates the surface layer (shown by blue bar chart). It seems that a new benthic assemblage has just started to be established.

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