
Press Releases



November 1, 2013
JAMSTEC

Progress report on QUELLE2013 – an around-the-world voyage by the SHINKAI 6500 Surveys at an area near the Kermadec Trench in the South Pacific Ocean

In an effort to study a variety of marine organisms which have evolved to live in extreme environments, the Japan Agency for Marine-Earth Science and Technology (JAMSTEC), led by President Asahiko Taira, has begun a project called QUELLE2013. This project began in January 2013, using the manned research submersible SHINKAI 6500 and its support vessel YOKOSUKA. QUELLE2013 is a global-scale voyage of scientific surveys and research on ecosystems in hydrothermal vent areas and other unique and extreme environments in the Indian, Atlantic and Pacific oceans.

SHINKAI 6500 has just completed a survey of an area near the Kermadec Trench^{*1}, and has completed all the planned surveys of the QUELLE2013 project, and is scheduled to come back to Japan in early December after another survey around the equatorial Pacific Ocean.

The detailed research results will be released in due course via voyage reports and articles in scientific journals. In this report, we will introduce the just-completed surveys near the Kermadec Trench in the South Pacific Ocean.

1. Objectives of the survey of the Kermadec Trench

The oceanic structure around New Zealand, a country in the southern hemisphere, is similar to the one around Japan. There are areas where seamount chains stretch over several thousand kilometers. In this survey, jointly with the National Institute of Water and Atmospheric Research of New Zealand (NIWA), JAMSTEC has studied organisms living in an area where two large seamount chains meet.

One of the large seamount chains surveyed is the Louisville Seamount Chain - a chain of over 70 seamounts stretching more than 4,300 kilometers from northeast of New Zealand to the southeast. Seamounts in this area were formed around the South Pole, and some 70 million years later, they will subduct into the Kermadec Trench. Thus, in geological times those seamount will soon disappear. The Tonga-Kermadec Arc is located just across the trench with a series of volcanically active seamounts. This is an area where hot water loaded with sulfur and acid can spew out of cracks in the seabed on the volcanoes. Many species cannot survive the chemical mix in this water, but populations of several species can be found which are adapted to the extreme conditions. These organisms rely on bacteria for energy. The bacteria produce energy from hydrogen sulfide and methane contained in the hot water.

In such a very unique environment where the disappearing seamount chain and the volcanically-active seamount chain lie over the trench axis, this survey was conducted to determine if there is any difference in ecosystems between the two seamount chains and, if any, where the difference comes from. For the first time in the world, JAMSTEC and NZ researchers observed the seafloor in this area, using the manned research submersible SHINKAI 6500. The voyage collected data as well as samples of deep-sea species, using high-definition cameras and various measuring instruments. Based on the biological distribution data and the genetic information, JAMSTEC and NIWA scientists plan to continue to work together to unravel the biodiversity patterns of evolution in unique environments.

2. Outline ([see the attached map](#))

(1) The Louisville Seamount Chain at depths of 1,200 – 2,800 meters and the northern Kermadec Arc at depths of 400 – 800 meters

Period: October 26 to 30, 2013

Details:

i) Topographic and geological survey in and around the Louisville Seamount Chain and the northern Kermadec Arc at depths of 300 – 5,000 meters.

- Surveys were conducted during dives of SHINKAI 6500.

- Survey was conducted, using the "DEEP TOW" camera system.

- Outcrops were observed and rock samples were obtained, using SHINKAI 6500.

- Data on the submarine topography, gravity, and magnetism were measured, using instruments on the vessel.

ii) Ecosystem and biodiversity monitoring in the Louisville Seamount Chain and the northern Kermadec Arc at depths of 300 – 5,000 meters.

- Visual observation was conducted from SHINKAI 6500 to study depth distribution of fauna.

- During the survey deep-sea animals were collected using a slurp gun (suction sampler), manipulators, and core samplers.

- Environmental characteristics of habitats were measured, including water depth, water temperature, salinity, dissolved oxygen level, and hydrogen sulfide level.

- Distribution of deep-sea fauna was also investigated using the "DEEP TOW" camera system.

3. Summary of research achievements

(1) Detailed bathymetric charts of the area around the Osbourne, Canopus, and Hinepuia Seamounts were drawn, adding to existing topographic data available. The Osbourne Seamount is located at the northwest end of the Louisville Seamount Chain, while Hinepuia Seamount is located in the northern Kermadec Arc.

(2) The seafloor was observed at the Louisville Seamount Chain for the first time in the world. Many animals were found, including sponges, corals, lobsters, crabs, sea cucumbers, sea urchins, starfish, and fish. Some of the species were successfully sampled.

(3) At Hinepuia Seamount located in the northern Kermadec Arc, a new hydrothermal vent field was discovered. Vent-associated communities including *Bathymodiolus* mussels, *Symphurus* flat fish, and other species were found there. These observations are important in understanding the continuity and evolution of biological communities in the area and along the Kermadec-Tonga Arc.

(4) Geological features were observed and rock samples were obtained. This made it possible to compare volcanic composition and zones between the northern Kermadec Arc and the Louisville Seamount Chain.

4. Future schedules

- November 3 to 4 YOKOSUKA and SHINKAI 6500 are open to the public in Auckland, New Zealand
- Mid-November Surveys are conducted in and around the equatorial Pacific Ocean.
- Early-December YOKOSUKA and SHINKAI 6500 arrive at the Yokosuka Headquarters, Japan.

*The above schedules are subject to change due to weather, work progress or other conditions.

*1 The Kermadec Trench is a large oceanic trench off the east coast of the Kermadec Islands in the South Pacific Ocean with a maximum depth of 10,047 meters. The trench is the third deepest trench after the Mariana and Tonga trenches. The Kermadec Arc, which includes many active submarine volcanoes, runs parallel (landward) to the trench, and the Louisville Seamount Chain intersects it from the eastern side.

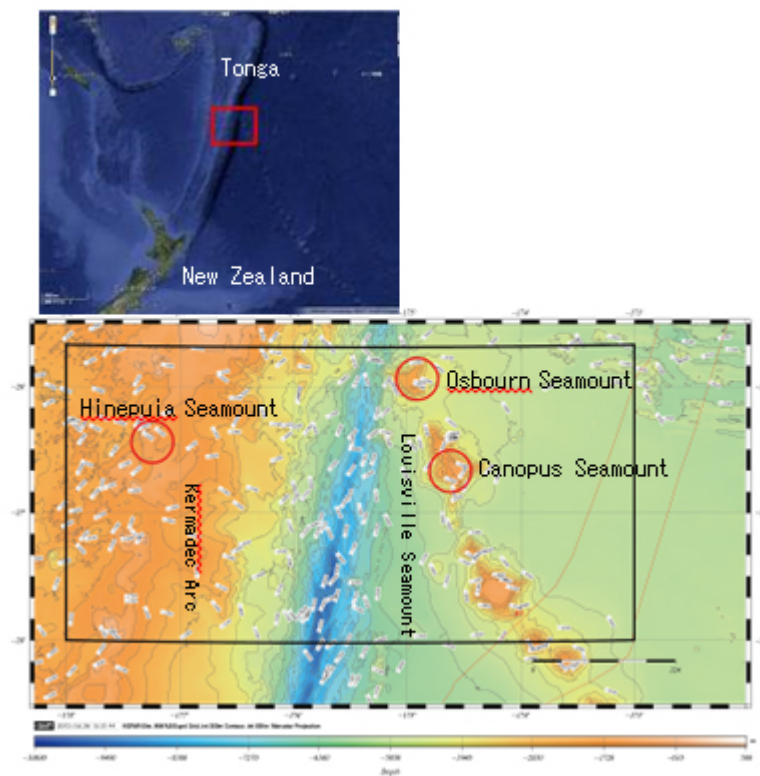


Figure 1. Map of this research area. Red circles indicate seamounts surveyed during this cruise.

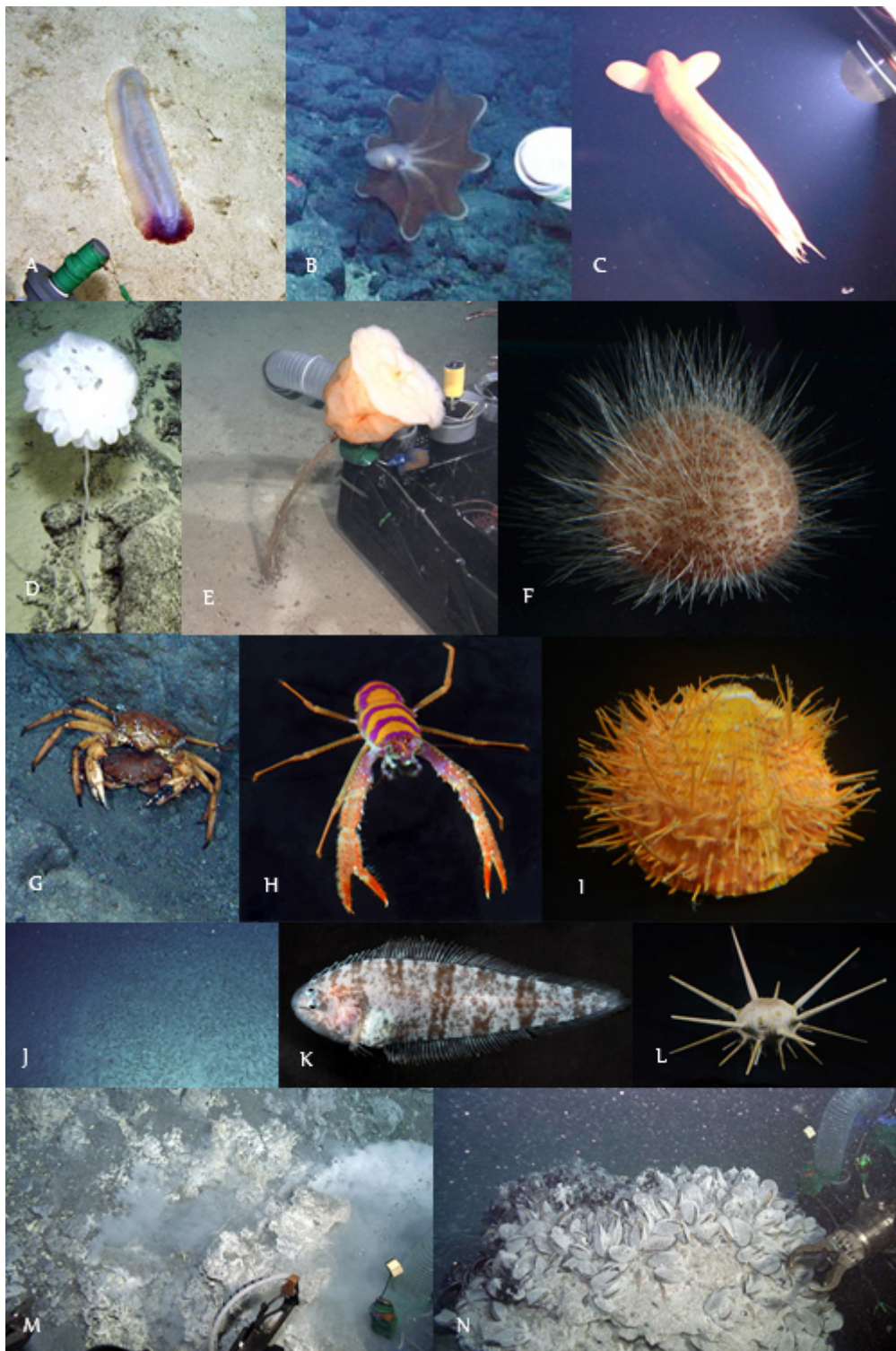


Figure2. Photos Benthic animals observed or captured at the Louisville Seamount Chain and northern Kermadec Arc from 347 to 2,250m depths.

- A) Elaspodid holothurian (sea cucumber) observed at 2,022m depth on Canopus Seamount, Louisville Seamount Chain.
- B) Opisthoteuthid octopus observed at 1,336m depth on Canopus Seamount, Louisville Seamount Chain.
- C) Opisthoteuthid octopus observed at 1,409m depth on Canopus Seamount, Louisville Seamount Chain.
- D) Hyalonematid sponge observed at 2,202m depth on Canopus Seamount, Louisville Seamount Chain.

- E) Hyanonematid sponge captured at 1,411m depth on Canopus Seamount, Louisville Seamount Chain.
- F) Spatangoid sea urchin observed at 2,244m depth on Canopus Seamount, Louisville Seamount Chain.
- G) A pair of Geryonid crabs observed at 723m depth on Hinepuia Seamount, northern Kermadec Arc.
- H) Munidid squat lobster *Babamunida callista* (Macpherson, 1994) captured at 436m depth from Hinepuia Seamount, northern Kermadec Arc.
- I) Spondylid bivalve captured at 499m depth at Hinepuia Seamount, northern Kermadec Arc.
- J) Dense patch of *Symphurus* flat fish observed at 347m depth on Hinepuia Seamount, northern Kermadec Arc.
- K) *Symphurus* flat fish captured at 347m depth from Hinepuia Seamount, northern Kermadec Arc.
- L) Cidarid sea urchin captured at 499m depth on Hinepuia Seamount, northern Kermadec Arc.
- M) Hydrothermal vent field found at 369m depth at Hinepuia Seamount, northern Kermadec Arc.
- N) A patch of *Bathymodiolus* mussels found at 337m depth on Hinepuia Seamount, northern Kermadec Arc.

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