The deepest fish from the Izu-Ogasawara Trench, Japan
-Ring of Fire 2022 Expedition to the Japanese hadal Trench-

Hiroshi KITAZATO

(Tokyo University of Marine Science and Technology, Japan and Danish Center for Hadal Research, Denmark)

Many deep trenches and island arcs are distributed across the western part of the Pacific Ocean. These trench and arc systems are typically found in plate subduction areas where the oceanic plate descends beneath either continental or other oceanic plates. The dynamic features of the Earth's system, including volcanic eruptions and seismic activities, are often strongly expressed in these areas, forming a "Ring of Fire". The rim of the Pacific Ocean is where this Ring of Fire is most typically developed. Plate divergence, collision and subduction processes have been closely interwoven with the evolution of the Earth for much of the planet's history. Geologists are therefore strongly focused on understanding the dynamics of arc-trench systems.

During two months in 2022, we participated in a deep-sea cruise near the Japanese Islands, where hadal trenches run parallel to the island arcs (Fig. 1). This campaign - the "Ring of Fire 2022 Japan Expedition"– was carried out aboard the DSSV Pressure Drop and utilized the HOV Limiting Factor, both owned by Caladan Oceanic LLC. The aims of our research were to understand the kinds of active geological processes that take place within trench systems, the kinds of hadal organisms and ecosystems that exist in the trenches, and how these geological and biological systems interact with each other. Together with Alan Jamieson of the University of Western Australia, we performed 7 submersible dives and 64 lander deployments during the cruise and obtained a large amount of excellent data and samples from the various parts of the Japanese trenches.

The first video images of the deepest fish, a kind of snailfish, were taken at 8336 m depth in the Ogasawara Trench, the deepest point in the Japanese Trenches (Fig. 3). These very clear video images were accepted by the Guinness World Records as evidence for the deepest fish in the world on August 15, 2022 (Fig. 3).

I personally dived to 8001 m depth with the HOV Limiting Factor to the deepest point of the Japan Trench (Fig. 4). I observed a heterogeneous geological and biological terrain along the trench axis towards the landward slope in the deepest part of the Trench (Fig 5). Hadal trenches are not mere dumping grounds for mud; instead, they are diverse environments, both geologically and biologically.

Now, we have certainly opened the door to the hadal worlds of the western Pacific.

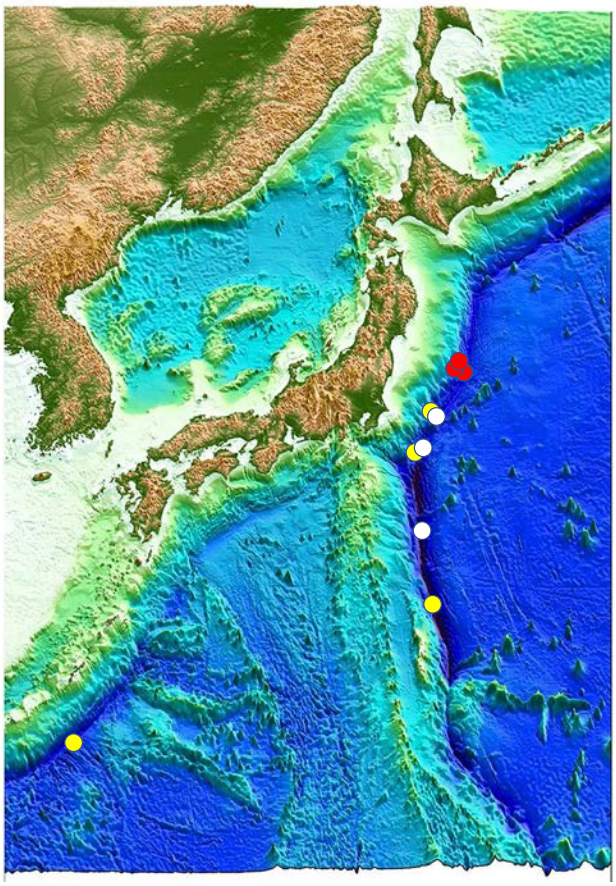

Figure 1 The map shows sites for submersible dives (red) and lander deployments. All sites are located in the Japanese Trenches.

Figure 2. The deepest snailfish in the Ogasawara Trench (Caladan Oceanic / Inkfish LLC). The sediment is semi-consolidated mud.

Figure 3. Guinness World Records™ certificate ceremony at Tokyo University of Marine Science and Technology on April 4, 2023, together with a video image of the snailfish that created the deepest record for any fish. (Photographed by TUMSAT office)

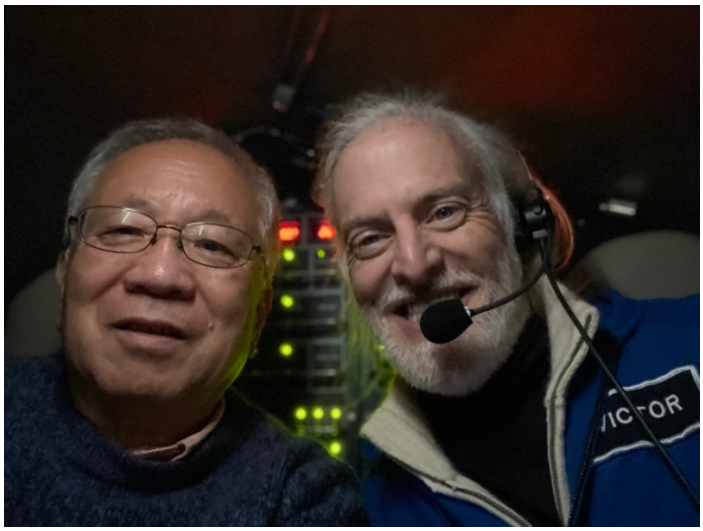

Fig. 4　Snapshot of the author in the cockpit of the submersible, together with Mr. Victor Vescovo, the owner of Caladan Oceanic LLC. The photograph was taken when we arrived at the deepest point of the Japan Trench at 8000 m on Aug 20, 2022. (Self-photographed by Hiroshi).

Figure 5. The left-hand panel shows a stratified mudstone outcrop on the landward slope near the deepest point of the Japan Trench. The rocks appear deformed. We can see a couple of attached organisms, sea anemones or arthropods. The right-hand panel shows the Trench bottom at the deepest point of the Japan Trench. Thick, soft, muddy sediments cover the seafloor. These sediments are thought to have been deposited at the time of the Great East Japan Earthquake on March 11, 2011 by major turbidites resulting from landslides on the landward slope (Kioka et al., 2019). Sea cucumbers of a similar size can be seen on the sediment surface, where they probably consume freshly settled organic material originating from the ocean surface (photographed by Hiroshi Kitazato). The sea cucumbers are thought to have repopulated the newly created sediment surface after the earthquake..