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TITLE: Post-Drilling Changes in Seabed Landscape and Megabenthos in a Deep-Sea Hydrothermal System, the Iheya North Field, Okinawa Trough

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ABSTRACT:

There has been an increasing interest in seafloor exploitation such as mineral mining in deep-sea hydrothermal fields, but the environmental impact of anthropogenic disturbance to the seafloor is poorly known. In this study, the effect of such anthropogenic disturbance by scientific drilling operations (IODP Expedition 331) on seabed landscape and megafaunal habitation was surveyed for over 3 years using remotely operated vehicle video observation in a deep-sea hydrothermal field, the Iheya North field, in the Okinawa Trough. We focused on observations from a particular drilling site (Site C0014) where the most dynamic change of landscape and megafaunal habitation was observed among the drilling sites of IODP Exp. 331. No visible hydrothermal fluid discharge had been observed at the sedimentary seafloor at Site C0014, where Calyptogena clam colonies were known for more than 10 years, before the drilling event. After drilling commenced, the original Calyptogena colonies were completely buried by the drilling deposits. Several months after the drilling, diffusing high-temperature hydrothermal fluid began to discharge from the sedimentary subseafloor in the area of over 20 m from the drill holes, ?artificially? creating a new hydrothermal vent habitat. Widespread microbial mats developed on the seafloor with the diffusing hydrothermal fluids and the galatheid crab *Shinkaia crosnieri* endemic to vents dominated the new vent community. The previously soft, sedimentary seafloor was hardened probably due to barite/gypsum mineralization or silicification, becoming rough and undulated with many fissures after the drilling operation. Although the effects of the drilling operation on seabed landscape and megafaunal composition are probably confined to an area of maximally 30 m from the drill holes, the newly established hydrothermal vent ecosystem has already lasted 2 years and is like to continue to exist until the fluid discharge ceases and thus the ecosystem in the area has been altered for long-term.

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