

## Coral reefs on the border

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Japan extends from 20°25' to 45°33' N and from 122°56' to 153°59' E; the western, eastern and southern most localities support coral reef islands. The western-most island is Yonaguni Island, which consists of reef limestone terraces surrounding Tertiary sedimentary rock. Contemporary coral reefs are mainly fringing reefs, often 50 to 200 m wide (refer to Chapter 6-1-7c). The eastern-most island, Minamitorishima (Fig. 1), is the only island on the Pacific plate east of the Izu-Ogasawara trench. Coral reefs were formed around a volcanic island, which eventually subsided because of gradual subsidence of the western Pacific plate beneath the Philippine Sea plate. The island was formerly an atoll that became a landform of table reef due to the subsidence. The island consists of a 5 to 8 m high rim with a central depression 1 m below sea level. The

contemporary reef that fringes the island is 50 to 300 m wide. The rim is considered to be an emergent reef, based on its karst landforms (Nagaoka 1987), or an island formed by consolidated bioclastic sand and gravel (Yagi *et al.* 1992). Officers from the Meteorological Agency and the Defense Agency reside on the island.

The southern-most island is Okinotorishima (Fig. 2). It is on a submerged arc comprising the Kyushu-Palau ridge. A volcanic island, formed on the ridge before the Miocene (24 million years ago) and subsequently submerged, allowed coral reef to grow. The reef is a table reef, with its long axis running 4.5 km east-west and 1.7 km wide (north-south); its central depression is 5.5 m deep at its maximum. There are two islands on the reef flat 1.5 m above

mean sea level. The islands have been described as foraminifera and coral limestone (Tayama 1952), which implies they are Pleistocene limestone remnants. These islands are now protected from waves by an artificial bank. Three other islands have been described, but appear to be boulders thrown onto the reef by heavy storms.

The coral reef islands on the border are highly regarded because they define the territory of Japan. In particular, after the 200-nautical-mile exclusive economic zone was determined by the 'U.N. Convention on the Law of the Sea', one island has an economic zone of 430,000 km square (Fig. 3). The Senkaku Archipelago, 150 km to the north of Iriomote Island, has uplifted Holocene coral reefs (Konishi *et al.* 1979). There are territorial issues with China over this archipelago (Fig. 4).

Despite their importance in identifying Japan's territorial boundaries, there is little information on how these reefs formed and on the present status of the reefs. The islands on the table reefs of Minamitorishima and Okinotorishima are either remnant limestone deposits and/or consolidated bioclastics. To preserve these islands and protect them from storms and sea level rise, it is necessary to conduct research on their present status and understand how they were formed, which may in turn lead to eco-technology that elucidates island forming processes.



Fig.3. Exclusive Economic Zone of Japan  
Okinotorishima, a solitary island at the southernmost of Japan, covers larger Economic Zone than the land area of Japan (more than 370,000 km<sup>2</sup>). Original Map is from Japan Coast Guard's official home page.

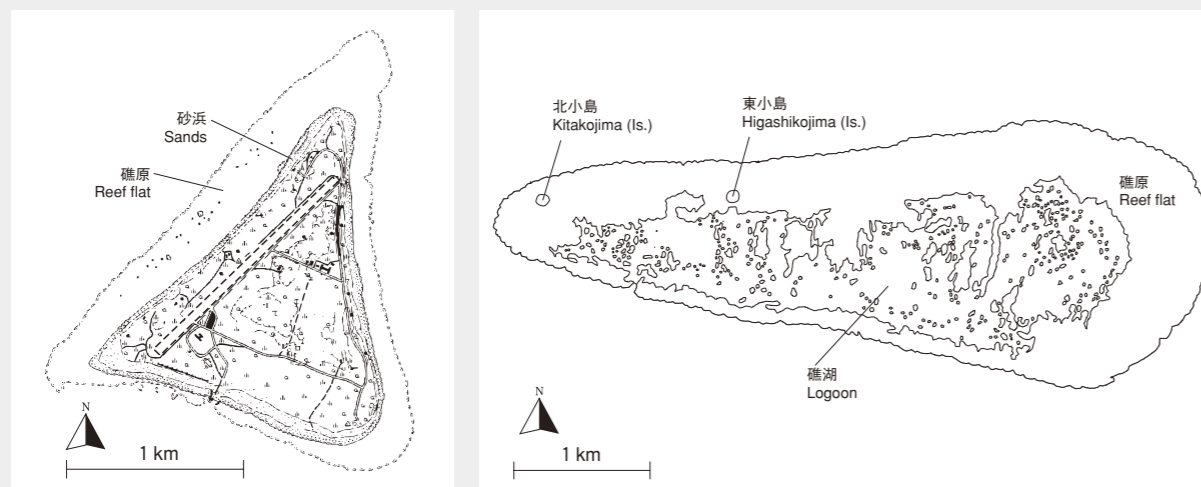


Fig. 1. Topographic map of Minamitorishima (Is.). Fig. 2. Topographic map of Okinotorishima (Is.).



Fig. 4. Satellite image (Landsat ETM+) of Uotsurijima (Is.) in Senkaku Islands.