

Marine Environmental Changes Caused by Destruction and Reconstruction of the Bay-mouth Breakwater

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Kamaishi Bay, a small bay on the Sanriku ria coast, is located in the northeastern part of Japan. Since the bay had been heavily damaged by a large tsunami associated with an earthquake off Chile in 1960, a bay-mouth breakwater was constructed in the bay by the Japanese government. The bay-mouth breakwater was very huge (about 2 km length) and the deepest in the world (63m depth). In 2011, surprisingly, it was destroyed by the giant tsunami following the Great East Japan Earthquake (hereafter referred to as Great Earthquake). The destroyed bay-mouth breakwater, however, is currently being reconstructed again. We have therefore investigated a sequence of marine environmental changes in the bay, using CTDO (temperature, salinity, depth and dissolved oxygen) data obtained by ship-board observations before the Great Earthquake, just after it, and at present (under the reconstruction of the breakwater). The results are summarized as follows.

Before the Great Earthquake (in 2009), the bay-mouth breakwater had a negative effect on the marine environment in the bay, although it provided a calm environment there. That is, oxygen deficiency occurred at the inner foot of the bay-mouth breakwater during the season of stratification, especially in the fall season, where a stagnant region formed. This is because water exchange between inside and outside the bay was prevented by the bay-mouth breakwater. Just after the Great Earthquake (in 2011), on the other hand, the oxygen deficiency is reduced, since the stagnant water tended to be removed by the water exchange between inside and outside the bay. At present (in and after 2015), however, the oxygen deficiency is reappearing, because the water exchange begins to be prevented again by the bay-mouth breakwater that is being reconstructed. In other words, the marine environment is getting worse again in the lower layer in Kamaishi bay.

Keywords: Water exchange, Bay-mouth breakwater, Kamaishi Bay, Great East Japan Earthquake

