

## Mussel shell records the impact of a huge tsunami on coastal environment

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Huge tsunami induced by the Pacific Coast of Tohoku Earthquake on 11th March 2011 had devastating effect on shallow marine ecosystems in northern Japan. Nevertheless, a lack of pre-event data often hamper investigations focusing on the impact of the tsunami on ecosystems, as comparisons between pre- and post-event conditions are rarely possible. Here we investigated the impact of the tsunami on the coastal environment based on trace element analysis of the bivalve shell, in which time series environmental information was recorded with its incremental growth. On September 2011, live specimens of the Mediterranean mussel *Mytilus galloprovincialis* were collected from intertidal zone of Otsuchi Bay where was seriously affected by the tsunami. Shells were cut along the maximum growth axis, and the cut surface was polished. We analyzed trace element composition on the shell cross section along the growth direction using LA-ICP-MS. To establish an age model, we also observed micro growth patterns on the etched shell sections. Obtained data were assigned to the age model. Growth periods of analyzed shell portion approximately corresponded to one year from the date of sample collection.

Before the tsunami, shell Mn/Ca ratio was at a low level (<0.006 mmol/mol). Shell Mn/Ca ratio started to increase just after the tsunami, reaching up to 0.06 mmol/mol on 23rd March, then decreased to 0.001 mmol/mol till the end of April 2011. Since then, the shell Mn/Ca ratio was 0.03 mmol/mol or below, but the average Mn/Ca was higher than that before the tsunami. This increase of shell Mn/Ca ratio occurred synchronously with the tsunami and high Mn/Ca ratio continued for half a year after the tsunami. Increased shell Mn/Ca ratio just after the tsunami was likely attributed to suspended terrestrial soil and seafloor sediment in the water column caused by the huge tsunami waves. This study revealed that the tsunami drastically altered the coastal water composition for 40 days, and effect of the tsunami continued for at least half a year.