

Effects of oil pollution on tidal flat and sandy beach ecosystems ----- Deterioration of seawater infiltration by the penetration of oils into the sediments -----

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The purpose of this study is to clarify the effects of wave and tidal actions on the penetration of spilled oils stranded on tidal flats or sandy beaches and to evaluate the influence of the penetrated oil on seawater infiltration using tidal flat and sandy beach simulators. The simulator used was composed of tidal flat or sandy beach, wave maker, tide controlling device, temperature controlling system and computer controlling system. The infiltrations of seawater and oils into tidal flat or sandy beach sediments were determined either by visualization using transparent glass beads as sandy beach sediments or by using coloured seawater and oils.

Penetration of the spilled oil into the sediments was significantly different from that of seawater. Seawater infiltrated into the sediments both by wave action and tidal fluctuation, while oils penetrated by tidal movement only. Oils with high viscosity like fuel oil C remained mainly at the surface to form thick layer, whereas that with low viscosity like crude oil penetrated into deeper sediments.

The penetrated oil significantly decreased the rate of seawater infiltration into the sediments. The rate was dependent on the highest concentration of oil along the depth of the sediments. The rate decreased with the increase in the clogged interstitial volume by oil in the sediments. The deterioration of seawater infiltration by oil may result in the reduction of dissolved oxygen and organic matter supply to benthic organisms, and therefore, may damage tidal flat and sandy beach ecosystems.