

IMPACTS BY HEAVY-OIL SPILL FROM NAKHODKA ON INTER-TIDAL ECOSYSTEM (1): AN APPROACH TO IMPACT EVALUATION WITH GEOGRAPHICAL INFORMATION SYSTEM

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A heavy-oil spill from a Russian tanker, Nakhodka, has occurred in the Sea of Japan on 2 January 1997. However, it has been unknown that what influences on a coastal ecosystem appeared from intermediate to long-term period in this region because the Sea of Japan hasn't experienced a large oil spill accident. Since leaked heavy-oil is lighter than seawater, the heavy-oil may influences inter-tidal flora and fauna in the coastal ecosystem. Rocky shore with rich flora and fauna extends along the coast of the Sea of Japan from Kyushu Island to Hokkaido Island through Honshu Island in Japan. The tide range of the Sea of Japan is very small. Monsoon in winter is strong and causes strong wave in the south coast of the Sea of Japan. These physical structures can modify impacts on flora and fauna along the rocky coast by a heavy-oil spill in the Sea of Japan differently from the other region.

This study aimed to evaluate impacts with intermediate temporal scale on the inter-tidal ecosystem caused by heavy-oil pollution from the Nakhodka by using Geographical Information System (GIS). We selected the Imago-Ura Cove, Kasumi, in Hyogo Prefecture, facing the Sea of Japan as a study site to know a natural succession of flora and fauna because human intervention (cleaning operation) to oil pollution in the Imago-Ura Cove was much less than in the other areas. We have continuously examined individual number or coverage of plant at 1 m intervals with 1 m width (1 m²) and animal species at 5 m intervals with 5 m width (25 m²) along the inter-tidal zone at the study site from the autumn of 1997 to the spring of 2001. We observed flora and fauna within the coast length of 70 m and 450 m in autumn and spring, respectively, and mapped these data to a base map of GIS.

Species number of algae in more polluted area was smaller than in less

polluted area just after the accident, and has recovered steadily till the spring of 2001. Numbers of most species of shells such as *Cellana treuma* in more polluted area were much smaller than in less polluted area, and have also recovered till the spring of 2001. On the other hand, number of one species of shell, *Patelloida sacharina*, in polluted area was nearly at the same level as that in less polluted area in the autumn of 1997, but has been decreased till the spring of 2001.

Population of most species of the flora and fauna recovered from damaged state to original one. It is estimated that it takes more than four years that the intertidal ecosystem recover in the rocky coast in the Sea of Japan.