

Mussels and Barnacles as indicators of the variation of ^{54}Mn , ^{60}Co AND ^{65}Zn in the Marine Environment

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ABSTRACT

Mussels and barnacles as indicators of the variation ^{54}Mn , ^{60}Co , AND ^{65}Zn in the Marine Environment.

The intertidal byssal mussel *Mytilus californianus* and the oceanic gooseneck barnacle *Lepas anatifera* are efficient indicators of spatial and temporal changes in levels of three radiometals in the marine environment. *Lepas* specimens collected from the northeastern Pacific during the first half of 1964 demonstrated oceanic-to-coastal ratios of ^{54}Mn , ^{60}Co , and ^{65}Zn fallout from the 1961-62 thermonuclear tests of approximately 3: 1, 4: 1, and 2: 1, respectively. Caesium-137 in the surface layers of the two sectors (whose centres lie about 1500 and 300 km west of San Diego) also showed a 3:1 oceanic-to-coastal enhancement of fallout from this source. *Mytilus* specimens collected during 1963-64 along the northeastern Pacific Coast showed a fairly uniform distribution of ^{54}Mn and ^{60}Co between latitudes 46 and 29° north, but dramatically reflected the point source of Hanford-produced ^{65}Zn emanating from the mouth of the Columbia River. Relatively high zinc-65 concentrations, possibly related to this source, were detected in *Mytilus* from northern Baja California, Mexico-1900 km to the south. Except for a late 1963 peak in ^{54}Mn concentrations in southern California *Mytilus*, the ecological half-times of the three nuclides observed in the invertebrates between mid-1963 and late 1964 at specific intertidal, coastal, and oceanic platforms were consistent with radioactive decay rates. This suggests an approximate equilibrium between input and removal of these radiometals in the mixed layer, Mussel and barnacle tissue-to-seawater enrichment factors for the three nuclides exceed 1000. In *Mytilus* 4 to 6 cm in length, size variations had no significant effect on nuclide concentration, but 70% of the ^{60}Co and ^{65}Zn soft-tissue radioactivity was located in the kidneys and digestive glands of this organism. Bay mussels (*M. edulis*) taken from the coastal surf zone showed concentrations similar to those in *M. californianus*, but *M. edulis* in two nearby bays had lower values. Intertidal coastal mussels and gooseneck barnacles recently collected from 14 California stations indicate average 1971 "baseline concentrations" of ^{54}Mn , ^{60}Co , and ^{65}Zn of 0-5, 0-4, and 0-11 pCi/wet kg, respectively.

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