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Research activities in marine radioecology.

Studies were conducted in co-operation with the Department of Nuclear Engineering, Technion⁺⁺ on the radiological impacts of radioactive release from nuclear facilities into aquatic environment. The research was performed on the behaviour of fallout radionuclides e.g. Sr-90 and Cs-137 in natural marine environment. Laboratory experiments were carried out on the uptake and loss of Zn-65 by the prawn, Palaemon elegans.

The eastern Mediterranean where the studies were conducted is inhabited by biota of Atlantic and Indo-Pacific origin, and is characterized by high temperatures and salinities as well as a low productivity. The constantly changing balance in the pelagic and benthic ecosystems of the subtropical Levant Basin, is caused by the influx of species by the way of the Suez Canal. This results in passage of radionuclides through a variety of food chains reaching finally invertebrates and fishes.

(1) Ecological Conditions

These studies form a description of the benthic ecosystem on the Israeli continental shelf accompanied by measurements of temperature, salinity and the description of the edaphic conditions with the purpose of determining indicator species important in understanding the behaviour of radionuclides (Gilat and Shafrir, 1973) .

(2) Radionuclides in the Environment

The Cs-137 concentrations in sea water and biota were determined using a low level Ge(Li) gamma spectrometry system

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designed for studies of environmental radioactivity (Laichter, 1973; Lewis and Shafrir, 1971; Shafrir, Laichter and Gilat, 1971).

The ^{137}Cs concentrations obtained for surface waters and a number of profiles in the Levant Basin down to a depth of 1,000 m show variations by a factor of ten (0.65 - 0.07 pCi / kg) . Maximum concentrations are found at the depth level of 100 - 300 m.

The ^{137}Cs concentration factors measured in benthic invertebrates and in pelagic, benthic and coastal fishes were found to be within a similar range of values ($10 - 10^2$) .

The activity of caesium-137 in biota taken on the continental shelf of Israel in the Mediterranean was determined in species of the following taxonomic groups : Anthozoa, Crustacea (Decapoda), Mollusca, Echinodermata and Teleostei . The values obtained for ^{137}Cs concentration in the above mentioned organisms lay within the range of 0.004 - 0.166 pCi/g dry weight in benthic Invertebrates, and 0.018 - 0.102 pCi/g in Teleostei .

Sediment samples show Cs-137 activity of 0.12 - 1.34 pCi/g dry weight (Gilat, Laichter and Shafrir, 1975) .

(3) Radiotracer Experiments

The uptake and loss of zinc-65 from sea water by the prawn, Palaemon elegans and the clam, Tapes decussatus were followed in laboratory experiments, and the methodology used was discussed in literature (Cross, Renfro and Gilat, 1975) . The prawns were collected from the coastal rock pools in the Mediterranean and experiments performed at the FTU in Haifa. The experiments with clams were carried out at the International Laboratory of Marine Radioactivity (I.A.E.A.) - Oceanographic Museum, Monaco (Gilat, 1975).

The results of studies with Palaemon indicate that ^{65}Zn is concentrated to higher levels by the exoskeleton than by the soft tissues . At the end of 600 hours of uptake in aquaria by the prawns, the ratio of zinc-65 concentrated by the exoskeleton and the muscle was 0.74 - 2.36 .

The experiments were carried out during the summer and winter seasons , and the temperature of sea water in the aquaria fluctuated between 16 and 22° C . An increase in temperature caused a more rapid uptake of zinc-65 by the prawns .

At the time when the equilibrium was reached after 200 hours of uptake, the concentration factor for ^{65}Zn by Palaemon was 50 - 70 .

The loss of ^{65}Zn by the prawn, Palaemon in non-radioactive sea water shows that at least two compartments are involved in the process. One compartment is characterized by a rapid loss of zinc-65 at the beginning and passes abruptly into the other, (at the end of 200 hours when the experiment was discontinued), with a gradual decrease in radioactivity (Gilat, 1975) .

The ecological studies in the eastern Mediterranean were carried out on board the research vessel and the laboratory experiments with zinc-65 were performed by the staff of FTU and supervised by Dr E.Gilat . The determinations of ^{90}Sr and ^{137}Cs in sea water, biota and sediments were performed by the staff of NET and supervised by Professor N.H. Shafrir.

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Paper presented by C.N. Murray (Euratom)

Discussion

No comment.