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137 Cs in Marine Organisms - Ten Year Studies in the Greek Marine Environment

H. FLOROU, P. KRITIDIS and M. PROBONAS

National Research Centre for Physical Sciences, Aghia Paraskevi, Athens (Greece)

The artificial as well as the natural radioactivity has been studied by radioanalytical methods and direct γ-spectroscopy in marine organisms collected from an extended network of 30 stations around the Greek peninsula and the Greek Archipelagos of Aegean and Ionian sea.

The occurence of ^{137}Cs in the Greek marine environment was due to the world-wide fallout, the nuclear ships which were visiting Greece during the past years as well as to the indirect effects from the discharges of the nuclear power stations of the neighboring and Mediterranean countries, until 1986, while since April 1986 the Chernobyl nuclear reactor accident introduced a new load of ^{137}Cs to the marine environment verified by the peaks measured in the marine organisms, few days after the accident (Florou et al, 1987).

Tab. 1. Concentrations of ^{137}Cs (Bq.Kg^{-1}W) in marine organisms from the Aegean and Ionian sea (Greece), 1980-1990.

Algae		Fish	
Padina pavonica	0.0-0.4 (1.5)	Sardina pilchardus	0.8-1.4 (6)
Cystoseira	0.0-0.4 (2.0)	Spicara flexuosa	0.2-0.8 (5)
Acetabularia mediterranea	0.06	Boops boops	1.3-2.2 (16) (30)
Jania	0.05 (1.5)	Trachurus Trachurus	0.3-2.3 (2)
Caulerpa prolifera	- (20)	Pagellus erythrinus	0.2-0.5 (4)
Corallina mediterranea	N.D.-0.06(1.5)	Arnoglossus laterna	0.4 (2)
Distyota dichotoma	- (0.2)	Mullus barbatus	0.2-0.3 (5)
Hypnea musciformis	- (0.2)	Merlucius merlucius	0.2-0.4 (3)
Liagora viscida	- (0.5)	Diplodus annularis	- (6, 66)
Sargassum acinarium	0.0 (0.7)	Engraulis encrachicholus	- (5)
Sphaerococcus coronopifolius	- (0.8)	Lithognathus mormyrus	- (6)
Codium bursa	- (0.5)	Sparus auratus	- (6)
Stypocaulon scoparium	0.0-0.3 -	Mugil cephalus	- (6,22)
		Micromesistus potassou	- (5)
		Aulopus filamentosus	0.6 -
		Mustelus sp.	1.3 -
Benthic organisms		**Seagrass**	
Mytilus galloprovincialis	0.3 (6, 33)	Posidonia oceanica	0.8-1.0 (2.4)
Paracentrotus lividus	4	Zostera marina	0.5-1.0
Nephrops norvegicus	0.3		
Macropipus depurator	N.D.	Plankton (total)	(2.0)

W : Wet mass
(x) : Values during the period May-October 1986
N.D. : Not Detected

From the overall view of the data one can note that, in general:

- Primary producers shows a low cesium bioaccumulation which is not affected by the species examined (Florou et al, 1985). The Chernobyl radioactive plume provoked an increase of one to two orders of magnitude in the measured values. Caulerpa prolifera is the alga with the greatest value during this time. (Florou et al, 1987). The adult leaves for Posidonia oceanica have been proved as the tissue of the plant, which shows the greatest values of cesium in comparison with the juvenile leaves, shoots and rhizomes (Florou,1989).

- The different feedings habits and habitatas of the measured fish do not seem to affect the bioaccumulation of cesium under the normal conditions, while for the short period after the Chernobyl accident the different ecological and biological parameters have affected the observed bioaccumulation. Boops boops, Diplodus annularis and Mugil cephalus have showd elevated values of cesium in some stations (Florou, 1987a). The values measured after the accident have increased up to one order of magnitude for a short period, while since 1987 they have been in the same range as before the accident (Florou et al, 1987b).

-Mytilus galloprovincialis, which is known as the mussel watch (Forstner and Wittman 1979), have showed an early response to the cesium impact which has varied according to the ecological parametrs of the sampling stations (Florou et al, 1987a).

-The different synthesis of plankton samples have showed various concentrations of cesium, with the great values in the samples with the phytoplankton as the major part (Florou,1989).

-From the different taxa examined, fish have showed the greatest values of cesium, espesially during the period of the radioactive plume influence.

-It could be necessary for the assessment of the cesium global inventory to the Mediterranean sea, in the framework of GIRMED, some organisms to be established as indicators for the cesium bioaccumulation. Nevertheless, the selected bioaccumulation of cesium among the different organisms should be the main parameter for the choice of the organism-indicators.

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