

A study on the levels of natural gross beta radioactivity of some mollusc species and their sediments from Izmir and Aliaga Bays

Hüseyin UYSAL

Ege University Science Faculty, Dept. of Biology, Hydrobiology Section, BORNOVA-IZMIR (Turkey)

Marine ecosystems receive and accumulate natural and artificial radionuclides from many different sources and ways. Radionuclides when entering bays and estuaries precipitate and settle to the bottom where they are taken up by sediments and biota. Thus radioactive pollution in bay and estuarine waters is potentially hazardous to aquatic organisms, since the radioactive elements are absorbed by bottom dwelling and burrowing organisms not only from water, but also from contaminated sediments. Estuaries and bays serve as a nursery ground for most of the young aquatic organisms. Since the immature forms are most sensitive to many kinds of environmental changes, excessive radioactive pollution could reduce fishery resources (RICE *et al.*, 1970). However a large number of marine biologists who are interested in the subject agree that the present radioactive contamination of the marine environment is not at a dangerous level.

In recent years, fast development and the increase in the number of nuclear power reactors, recent accidents and the use of radionuclides in medicine, industry and in scientific research have led to the production of radioactive wastes in large amounts. Ultimately much of this waste reaches the marine environment. For example, the Chernobyl accident on April 26, 1986 has released large quantities of radionuclides into the atmosphere. This contamination was widely distributed over most parts of Europe. This has given the hydrobiologist the possibility of investigating the fate of radionuclides in the mentioned ecosystem. Due to some characteristics of the marine environment which may dilute or disperse radionuclides, the concentration and localization of radioactivity is very important and requires periodic monitoring to be carried out in different locals (SCHREIBER, 1971). During recent years, several regional monitoring studies have been carried out concerning radioactivity levels in different representative species and their Mediterranean environments (GEORGESCU, 1985; AKCAY, 1988, UYSAL, TUNCER, 1986; OZKAYA, 1992).

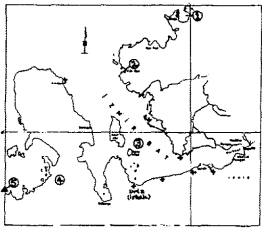


Fig. 1. Sampling stations (+)

In this investigation monitoring has been carried out for the determination of levels of natural gross beta radioactivity in the molluscs; *Mytilus galloprovincialis* Lam. *Tapes decussatus* L., *Cardium edule* L., *Patella* spp., *Venus verrucosa* L., *Natica millepunctata* Lam. and *Sepia officinalis* L. and their surrounding sediments from Izmir and Aliaga Bays. The specimens were collected from different polluted and unpolluted areas of Izmir and Aliaga Bays. The sampling stations are shown on the map in Fig. 1. All samples were washed using clean sea water for the removal of sands and other contaminating materials.

Then sample preparation and measurement procedures were performed according to our previous methods (UYSAL and TUNCER, 1986). All the data were corrected for ⁴⁰K.

The levels of natural gross beta radioactivity in the above mentioned species, which represent different biotopes and environmental conditions, are given in Table 1. As it can be seen from the Table, there are some variations in natural gross beta radioactivity between the species and localities. The concentrations of natural gross beta radioactivity in the molluscs of Izmir Bay are higher than those from the other locality.

Table 1. The levels of natural gross beta radioactivity of some Mollusc species and their sediments in Izmir and Aliaga Bays (Bq/g Ash).

Locality	Species	Ash W./		Bq/g
		Wet W. %	Dry W. %	
Aliaga Bay (1)	- <i>Mytilus galloprovincialis</i> Lam.	4.10	22.12	0.91
	- <i>Tapes decussatus</i> L.	6.38	33.86	0.51
	- <i>Patella</i> spp.	10.39	36.00	1.14
	- <i>Natica millepunctata</i> Lam.	5.73	31.84	0.36
	- <i>Sepia officinalis</i> L.	10.13	37.08	1.39
	-Sediment	26.73	42.68	0.99
Foça Harbour (2)	- <i>Patella</i> spp.	15.94	37.63	0.66
	-Sediment	38.58	45.56	0.81
Izmir Bay (3)	- <i>Mytilus galloprovincialis</i> Lam.	15.91	29.97	0.95
	+Homa Fishery - <i>Cardium edule</i> L.	4.80	32.89	1.26
	- <i>Patella</i> spp.	5.16	24.08	1.83
	- <i>Sepia officinalis</i> L.	8.68	37.08	3.30
	-Sediment	20.06	39.41	0.95
	+Çaliburnu Fishery - <i>Tapes decussatus</i> L.	6.94	44.77	1.08
	+Bostanlı (Karşıyaka) - <i>Tapes decussatus</i> L.	8.13	43.01	1.51
	-Sediment	28.50	47.00	1.12
	+Çakalburnu Fishery - <i>Tapes decussatus</i> L.	4.51	23.85	1.08
	+Liman reis - <i>Venus verrucosa</i> L.	4.96	30.84	1.33
Ildır (4) Çeşme Harbour (5)	- <i>Mytilus galloprovincialis</i> Lam.	3.41	25.35	1.04
	- <i>Patella</i> spp.	11.40	45.93	0.83
	+Kalabak - <i>Patella</i> spp.	5.88	29.94	0.84
	+Üria (iskele) - <i>Patella</i> spp.	10.38	38.52	0.33
	+Karaburun - <i>Patella</i> spp.	12.56	44.47	1.22
	-Sediment	21.62	46.52	0.36
	- <i>Mytilus galloprovincialis</i> Lam.	2.89	26.23	1.66
	- <i>Patella</i> spp.	6.38	45.40	1.69
-Sediment	27.45	44.39	0.37	

According to our present data the natural gross beta radioactivity of samples varied between 0.33-3.31 Bq/g Ash. There is correlation between radioactivity and discharged volumes and pollution levels in the Izmir and Aliaga Bays. In general, radioactivity was found in low levels and is in good agreement with regional studies performed previously (GEORGESCU *et al.*, 1984; UYSAL, TUNCER, 1986; PARLAK, 1983; AKCAY, 1988).

REFERENCES

AKCAY H. & ARDISON G., 1988. - Radioactive pollution of Turkish biotus one year after the Chernobyl accident. *J. Radionucl. chem.*, letters 128, 4, 273-281.

GEORGESCU I.J., CIOHODARU L., DEMIAN N. & DRAGUTESCU M., 1985. - On the total beta radioactivity of suspended matter, filtered sea water and bed sediments of the Danube river during. *Rapp. Comm. Int. Mer. Médit.* 29(7), 205-207.

PARLAK H., 1983. - Determination of natural gross beta india activity with consideration to the seasonal variations in *Mugil* spp., *Mytilus galloprovincialis* Lam. and *Carcinus mediterraneus* (Czern) living in the fisheries of Izmir Bay. E. U. Faculty of Science, Series B, Vol. VI. Nr. 1, pp 19-28.

OZKAYA A., 1992. - The determination of radioactivity and heavy metals in fishes of Izmir Bay. Master thesis, unpublished. E. U. Inst. of Nuclear Sciences.

OZALPAN A., 1988. - Cernobil'den sonra Türkiye'de çevre ve insan sağlığı. İnsan ve Kainat, Nisan 1988. pp. 25-31.

RICE R.T. & BAPTIST P.J., CROSS A.F., 1970. - Potencial Hazards from radioactive pollution of the estuary. F.A.O. FIR : M.P./ 70/ E-34.

SCHREIBER B.T., TASSI PELATI L. & MEZZADRI G.M., 1971. - Radioecology research in Toronto gulf. part 1: Radiometric measurements on sea water, plankton, benthic organisms and sediments. *Rev. Intern. Oceanogr. Méd.* Tome XXI. pp. 135-165.

UYSAL H. & TUNCER S., 1986. - Etude des niveaux de radioactivité de gross beta naturels dans les sédiments et dans quelques organismes planctoniques et benthiques du golfe d'Izmir. *Rapp. Comm. Int. Mer. Médit.* 30 (2), C-32,42.