Gross beta activity in selected organisms from North Adriatic

by

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The radioactivity might be accumulated in marine organisms by several different processes governed by various factors, such as the concentration of radio-nuclides in sea water, their physico-chemical state, characteristics of sea water, biological properties of organisms and their chemical composition. Only a systematic and complex long term study could lead us to a better understanding of this subject. Therefore as a complementary work to the gamma-spectrometric analyses of the North Adriatic organisms [STROHAL *et al.*, 1968] a broad survey of gross beta activity was undertaken.

Materials and methods

The ashed samples were prepared and powdered as it was described earlier (STROHAL *et al.*, 1968].

Before use the powdered samples were quickly dried at 110° C and then 250 and 500 mg of each sample were deposited into aluminium planchettes of 1 1/4 inch diameter. A few drops of aceton diluted glue were added to uniformly distributed samples, and after the acetone had been evaporated the samples were used for beta counting. Samples and standards (K_2SO_4) were counted in a Nuclear Chicago anti-coincident beta counter assembly with the actual background of about 1.5 cpm. Each planchette was counted for at least 6 $\times$ 10 minutes. The average cpm was corrected for the background and the counter sensibility drift.

The ratios between the activities of 500 and 250 mg standards (b_1/b_2) and samples (a_1/a_2) were calculated and compared. These ratios were assumed to be equal, i.e. in the range of their standard errors, only when the activities of the samples were due to K^{40}. In our system the b_1/b_2 ratio was 1.81 $\pm$ 0.12. According to this statement we understood that samples having $1.69 > a_1/a_2 > 1.93$ contained the activity which was not due only to K^{40}. Certainly, such a procedure is valid only if it is assumed that the self-absorption of beta rays in the standard is not essentially different from the self adsorption in the samples; this was confirmed in separate measurements.

Samples having the a_2 value larger than 10 cpm and $1.69 > a_1/a_2 > 1.93$ were taken for gamma spectrometry measurements. In the cases when the a_2 value was above 1 cpm the decay curves were followed. In samples in which the activity ratio was different from the activity ratio of the standards and in which the activity of the weaker sample was above 1 cpm, the potassium content was determined either radiometrically of flame photometrically. For the radiometric determination of potassium the activity due to the photopeak of 1.46 meV gamma ray was measured.

Results and discussion

The analyses of a great number of biological samples showed that according to our criteria some of them are contaminated (Table 1). The gammaspectrometric analyses of these contaminated samples indicated that the criteria used were too strong and that only the samples with relatively high concentrations of radionuclides were denoted as contaminated.

Generally it was found that the plankton and seaweeds were contaminated. Among the molluscs, with the exception of one mussel sample, only the analysed cephalopods (Loligo, Sepia) were radioactive.

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The activity found in fish was usually low, but it seems that some nectonic species (Scomber, Clupea) accumulate the activity to a considerable extent. Unusually high activity was found in one Diplodus, collected during 1964.

In this area it is most probable that the activities found in the organisms originate mainly from the fallout collected by the North Italian rivers [ŠKRIVANIĆ, 1968; ŠKRIVANIĆ *et al.*, 1968]. It should be pointed out that owing to its high primary phytoplankton productivity [KVEDER & KECKEŠ, 1968] the North Adriatic represents the richest part of the Adriatic Sea as far as fisheries are concerned, and the present low level contamination can seriously be increased by increased fallout deposition and cause a hazard not only for the existing biocenoses but also for the people consuming its products.

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References

KVEDER (S.) & KECKEŠ (S.), 1968. *in press* — Hydrographic and biotical conditions in North Adriatic. V. Primary phytoplankton productivity. *Thalassia jugosl.*, **5**.

ŠKRIVANIĆ (A.), 1968 *in press.* — Hydrographic and biotical conditions in North Adriatic. I. Hydrochemistry and some factors influencing the hydrography. *Thalassia jugosl.*, **5**.

ŠKRIVANIĆ (A.), PUCAR (Z.) & KECKEŠ (S.), 1968 *in press.* — Hydrographic and biotical conditions in North Adriatic. II. Penetration of light into the sea. *Thalassia jugosl.*, **5**.

STROHAL (P.) LULIĆ (S.), KOLAR (Z.), JELISAVCIĆ (O.) & KECKEŠ (S.), 1968. — Gamma-spectrometric analyses of some North Adriatic organisms. *Rapp. Comm. int. Mer Médit.*, **19**, 5, pp. 953-955

TABLE 1.

Data on the gross beta activity determinations.
The samples were considered as " contamined " according to the criteria given in the text

sample	" contamined " / analysed	sample	" contaminated " / analyzed
Enteromorpha intestinalis (L.) Link.	1/2	*Ophiotrix quinquemaculata* Delle Chiaje	0/2
Ulva lactuca L.	1/2	*Ascidia virginea* Müller	0/1
Acetabularia mediterranea Lamour.	0/1	*Ascidia* sp.	0/2
Padina pavonia (L.) Gail.	1/2	*Microcosmus sulcatus* Coyebert	0/5
Scytosiphon lomentaria (Lyngb.) J. Ag.	1/1	*Scyllium stellare* Gthr.	0/1
Fucus virsoides J. Ag.	5/10	*Raja clavata* L.	0/2
Cystoseira barbata (Good. et Woodw.) C.Ag.	5/5	*Clupea sprattus* L.	1/2
Cystoseira adriatica Sauvag.	0/1	*Clupea pilchardus* Art. Walb.	1/5
Callithamnion corymboum (Smith.) Lyngb.	0/4	*Engraulis encrasicholus* Cuv.	1/2
Mycale sp.	0/1	*Conger conger* Cuv.	0/1
Verongia aerophoba Schmidt	0/1	*Belone belone* Brünn.	0/3
Tethya aurantium Pall.	0/1	*Merluccius merluccius* L.	0/1
Leander serratus Penn.	0/2	*Trachurus mediterraneus* Ltkn.	0/4
Leander sp.	0/1	*Trachurus trachurus* L.	0/1
Maia verrucosa Milne Edw.	0/1	*Mullus barbatus* L.	0/1
Maia squinado Herbst	0/3	*Mullus surmuletus* L.	0/2
Xantho hydrophilus Herbst	0/1	*Diplodus annularis* L.	1/5
Pilumnus hirtellus L.	0/2	*Sargus vulgaris* Geoffr.	0/1
Eriphia spinifrons Herbst	0/1	*Pagellus erythrinus* L.	0/4
Pachygrapsus marmoratus Fabr.	0/3	*Pagellus mormyrus* L.	0/1
Patella coerulea L. (only soft tissues)	0/5	*Chrysophrys aurata* Cuv.	0/1
Patella coerulea L. (only shells)	0/2	*Cantharus cantharus* L.	0/3
Gibbula adriatica Philippi	0/5	*Boops boops* L.	0/4
Cerathium vulgatum Bruguiere	0/1	*Boops salpa* L.	0/5
Aporrhais pes-pelecani L.	0/1	*Oblata melanura* L.	0/5
Murex trunculus L.	0/1	*Dentex dentex* L.	0/1
Arca noe L. (only shells)	0/1	*Maena maena* L.	0/3
Mytilus galloprovincialis Lam. (only soft tissues)	2/11	*Maena smaris* (L.) Zei	0/1
Mytilus galloprovincialis Lam. (only shells)	0/8	*Coris julis* Gthr.	0/2
Chlamys opercularis L. (only soft tissues)	0/2	*Crenilabrus pavo* C.V.	0/2
Chlamys varius L.	0/1	*Crenilabrus* sp.	0/1
Ostrea edulis L. (only soft tissues)	0/4	*Trachinus draco* L.	0/2
Pinna pectinata L. (only soft tissues)	0/1	*Blennius* sp.	0/1
Pinna pectinata L. (only shells)	0/1	*Scorpaena scrofa* L.	0/3
Sepia officinalis L.	1/3	*Scorpaena porcus* M.	0/1
Loligo vulgaris Lam.	3/3	*Trigla lineata* L. Gm.	0/1
Bryozoe sp.	0/1	*Mugil auratus* Risso	0/1
Holothuria tubulosa Gmelin	0/1	*Mugil saliens* Risso	0/2
Holothuria forscali Delle Chiaje	0/2	*Scomber scomber* L.	4/4
Sphaerechinus granularis Lam. (only soft tisuses)	0/1	*Scomber colias* L. Gm.	1/1
Sphaerechinus granularis Lam. (only shells)	0/1	*Gymnosarda pelamis* L.	0/3
Psammechinus microtuberculatus Blainville	0/1	*Plankton* (phyto + zoo)	3/5
Paracentrotus lividus Lam.	0/2	*Zooplankton*	2/2
Astropecten aurantiacus Linné	0/1		