MareFrame

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ECOSYSTEM APPROACH TO LONG-TERM ENVIRONMENTAL ASSESSMENT

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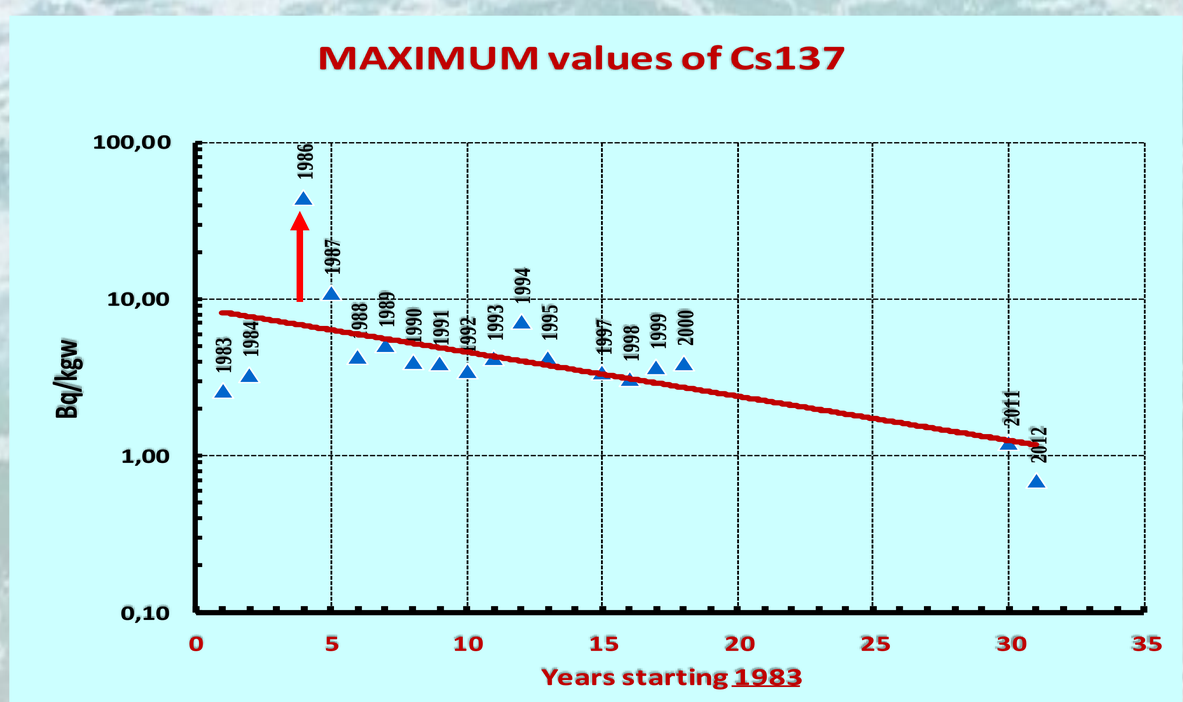
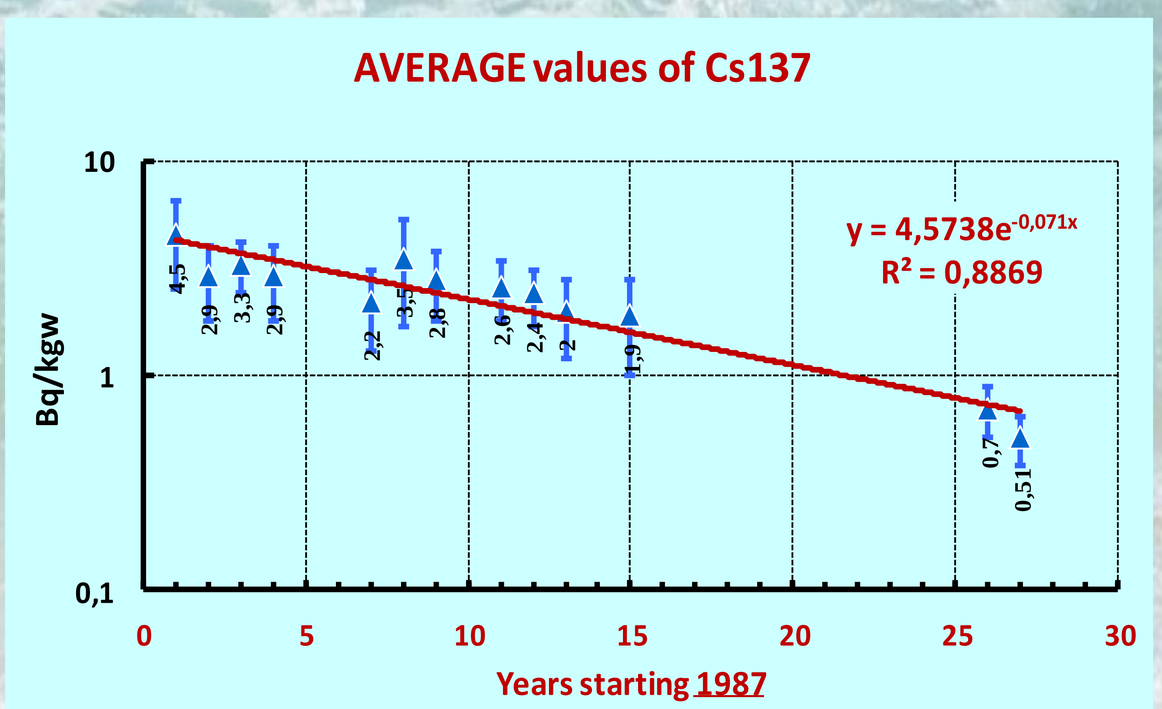
BACKGROUND. Case analysis is done for Cs-137, a fission product, mainly from nuclear power. It has a chronic presence in the environment, from the normal operation of the nuclear power plants. This component is, usually, low. Accidental situations (including testing nuclear weapons) have led to significant inputs of radionuclide into the environment, with a peak at the time of the accident. This is the case of the Chernobyl accident (1986), which sent a large amount of Cs-137 to the north-western part of the Black Sea. Once in the marine environment, the radionuclide entered in the biogeochemical circuit of the substance and marked all the components of the ecosystem. Fish is an important biotic component of the marine ecosystem, constantly interacting with other links of the food chain, but also with its living environment. Its measurement indicated the presence of Cs-137 radionuclide in the marine environment at the time of sampling.

EXPERIMENTAL METHODS. Fish samples have been preleved from Romanian Black Sea sector. After preparation, these have been measured annually by gamma spectrometry in different Romanian laboratories (National Institutes: Meteorological and Hydrological; Marine Research "Grigore Antipa"; Physics and Nuclear Engineering "Horia Hulubei").

RESULTS. The annual measurements data have been published in scientific literature. Now, cumulating all results for all period of time (over 30 years), we obtain the trend and speed of the purification processes. The life of the individual fish can be short, but considering biota as compartment, we can draw interesting conclusions for long time environmental assessment.





Considering removal process same as radioactive decay law, it can be written:

$$\Lambda = \Lambda_0 \times e^{-\lambda ef\ Tef}$$

where,

λ_{ef} = effective decay of radioactivity in biota compartment (fish) and
T_{ef} = effective half time for biota decreasing radioactivity

After short mathematical preparation for halving, result following expression of

$$T_{ef} = \ln 2 / \lambda_{ef}$$

Replacing ours real data (from graphical equations), is obtain the

$$T_{ef\ average} = \underline{9.8\ years}$$