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Interactive comment on "Multi-compartment kinetic-allometric model of radionuclide bioaccumulation in marine fish" *by* Roman Bezhenar et al.

Anonymous Referee #1

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This paper reported the idea of radionuclide kinetic transfer model of tissue compartments (muscle, bone and organ) associated with growth of fish (multi-compartment kinetic allometric model: MCKA). The result of modelling tests demonstrated that the simulated temporal changes of 134Cs, 57Co, 54Mn and 65Zn levels in whole bodies and muscle of juvenile/adult sea bream, turbot and spotted dog fish reconstructed well the experimental results by Mathews and Fisher, 2008 and Mathews et al., 2008. The test result also exhibited that the bioconcentration factor (BCF) derived by simulation for 134Cs, 57, 60Co, 54Mn and 65Zn levels in whole bodies of juvenile sea bream and turbot agreed to the experimental results by Mathews and Fisher, 2008 and Jeffree et al., 2006. The applied results by MCKA model for temporal levels changes in fish of 60Co

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Discussion paper

and 54Mn at the vicinity of the Forsmark nuclear power plant of Baltic Sea, and 90Sr at Fukushima coasts were shown as being comparatively close to the measured whole-body concentrations in predator fishes than those generated from one-compartment model and tissue target model. The paper demonstrated that the MCKA model applicability to calculate the temporal changes of radionuclide levels in whole body of fish during 20 years. The approach method for evaluation of radionuclides levels in whole body was valuable to assessment of seafood safety in case of whole fish consumption, and possibly the radiation dose to wild life in the environment. The presented result may be worth to publish. However, the values of key parameters were not shown in the paper, which made reader being difficult to understand the rational sequence of modelling procedure. Especially of those bio-chemically different parameters for Cs, Sr and Co, Mn, Zn were not shown. It was insufficient only demonstrating the assimilation efficiency and the allometric parameters in the results. Because of these, the modeling methodology was not easy to understand and also the paper contents being vague. Therefore, the following four points are strongly recommended to revise before publish, to make the paper as being scientifically correct, and also helping reader's understanding.

1) Line 70: To help the reader's understanding, the resulted specific parameter values of ïĄňïĄľïĂ¡1-5. Kw, Kf, k1i=3-5, k2i=3-5 for Cs, Co, Mn, Zn, Sr has to be shown in supplementary Table. The parameter values of ïĄğ for sea bream, talbot, spotted dog fish, herring, pike also have to be shown in supplementary Table if they were decided as similar to AEw and AEf referred in line 214. 2) Line 115: The referred MCKA parameter values in Table S1 has to be associated with Cs, Co, Mn, Zn and Sr, because each metabolism was different resulting specific values. 3) Line 115: if Table S1 values only derived by mass difference of fish size, it has to be mentioned that "We did not consider the change of prey preference along growth in this study", which was referred in line 163-165. 4) Fig. 7 and 8: The salinity of area studied was 3-5 PSU, suggesting the estuary being close to freshwater environment. The description about how the author parameterize to simulate 60Co and 54Man level reconstruction marine fish herring and

freshwater fish pike under such low salinity brackish water environment.

Minor comments

Line 15: “Predicted” read as “Reconstructed” or “Computed”.

Lune 16: “predicted” read as “calculated” or “computed”.

Line 27: “effective recession times” read as “effective half-life”.

Line 29: “Tateda et al., 2013” has to be delated from citation, because of the model is for target tissue (muscle).

Line 35: “Tateda et al., 2013” has to be added in citation, because of the model is for target tissue (muscle).

Line 38, Fig. 1: There were no data of body tissue mass in the referred Yankovitch et al., 2010 (no kidney CR data and body tissue ratio data). The exact citation has to be shown, or the calculation process for Fig. 1 has to be shown in the paper as supporting material.

Table 2: The values for Ag, Cu, Cd and Cr may be not necessary in this paper because of this paper result only demonstrated the simulations of Cs, Co, Mn, An and Sr.

Line 163-165: The description of “The BAF . . .our findings” has to be re-considered, because the modelling in this paper seems not include the change of prey-type associated with fish growth.

Line 165: “1999” read as “1995”

Line 189: “however, . . .greater in the muscle” has to be reconsidered, because the retained levels of blue line A3/Af (muscle) were higher than A4/Af (bone) and A5/Af (organs) for all four nuclides in Fig. 2.

Fig. 4: “Co” read as “57Co and 60Co”.

Fig. 4: The model simulated results of dog fish were not shown.

Line 425: “1999” reads as “1995”

Line 359: “may biologically magnify when transferring upwards into the food chain” read as “level may elevate in the predator fish of the food chain“, because Cs was not accumulative element compared to Hg and Cd.

*** The presented modeling methodology and logic to draw conclusion are reasonable and worth to be published for the Journal paper. However, the defined parameter were not shown in the paper which makes the paper content being not transparent and verifiable. Therefore, the manuscript has to be revised by the listed comments before accept as the paper for this journal.

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