

**Fukushima Dai-ichi and the Ocean: 10 years of study and insight Abstract Submission Form : Entry # 64**

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**Session**

Biological uptake of radionuclides

**Abstract Title (English, limited to 300 characters)**

Tuna transport of Fukushima-derived radiocesium across the North Pacific, and application to improved understanding of trans-Pacific migration rates

**Abstract (English)**

In 2012, we reported unequivocal evidence that Pacific bluefin tuna (*Thunnus orientalis*) transported Fukushima-derived radionuclides across the entire North Pacific Ocean from Japan to California. Analysis of California-caught tunas showed  $^{134}\text{Cs}$  ( $4.0 \pm 1.4 \text{ Bq kg}^{-1}$ ) and elevated  $^{137}\text{Cs}$  ( $6.3 \pm 1.5 \text{ Bq kg}^{-1}$ ) in fifteen individuals caught in August 2011. Pre-Fukushima bluefin and post-Fukushima yellowfin showed no  $^{134}\text{Cs}$  and background  $^{137}\text{Cs}$  concentrations ( $\sim 1 \text{ Bq kg}^{-1}$ ), ruling out elevated uptake prior to 2011 or in local California waters. These findings indicated that Pacific bluefin tuna can rapidly transport radionuclides from a point source in Japan to distant ecoregions and revealed a new tool to trace migration origin (using the presence of  $^{134}\text{Cs}$ ) and potentially migration timing (using  $^{134}\text{Cs}$ : $^{137}\text{Cs}$  ratios) in highly migratory marine species in the Pacific Ocean. We subsequently applied this tool to assess trans-Pacific migration dynamics of the heavily overfished Pacific bluefin tuna. We combined Fukushima-derived radiotracers with bulk and amino acid-stable isotope analysis to distinguish recent migrants from residents of the eastern Pacific Ocean. The proportion of recent migrants to residents decreased in older year classes, though the proportion of older PBFT that recently migrated across the Pacific was greater than previous estimates. Ultimately, in combination with similar followup studies in the West Pacific, this tool contributed to the discovery that the proportion of trans-Pacific migrating bluefin tunas had been drastically underestimated. The Fukushima tracer has thus ground-truthed other methodologies (e.g., SIA) that can now be used to better quantify the movements of migratory species between the Eastern and Western North Pacific.