

Spatiotemporal changes in radiocesium concentrations in marine products off Fukushima after the accident

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Introduction

This study was conducted to present spatiotemporal changes in radiocesium (^{134}Cs and ^{137}Cs) concentrations in marine products off Fukushima after the Fukushima Dai-ichi Nuclear Power Plant (FDNPP) accident from 2011 to 2020. Marine species data monitored by Fukushima Prefecture during 2011–2020 and those presented by the Tokyo Electric Power Company during 2012–2020 were compiled to evaluate the decreasing trends of radiocesium concentrations in marine products. Also, demersal fish data published in Wada et al. (2019) were presented to show the actual contamination levels in marine fish in 2016.

Results and conclusion

Monitoring results (Fig. 1a) showed that higher concentrations (max. 14.4 KBq/kg) were observed in shallower waters south of the FDNPP, and concentrations above the Japanese regulatory limit (>100 Bq/kg) have been detected frequently during 2011–2013. Declining trend was much more gradual in demersal fish species compared with pelagic fish or others. However, from 2011 to 2020, percentages of samples below the detection limit increased gradually from 14% to 99.9%. The drastic decrease in radioactivity was supported by the spatiotemporal distribution of radiocesium concentrations in demersal fish during 2011–2015 (Fig. 2), and by the precisely measured data in 2016 (0.234–3.41 Bq/kg)(Fig. 3). Although radiocesium concentrations in marine species have exceptionally been higher in the FDNPP port, the maximum concentrations have significantly decreased from 740 kBq/kg in 2012 to 159 Bq/kg in 2020 (Fig. 1b). **The radiocesium contamination level of marine products off Fukushima has decreased drastically during the 10 years after the FDNPP accident, although it has not still reached an equilibrium state (e.g., higher concentration ratio values).**

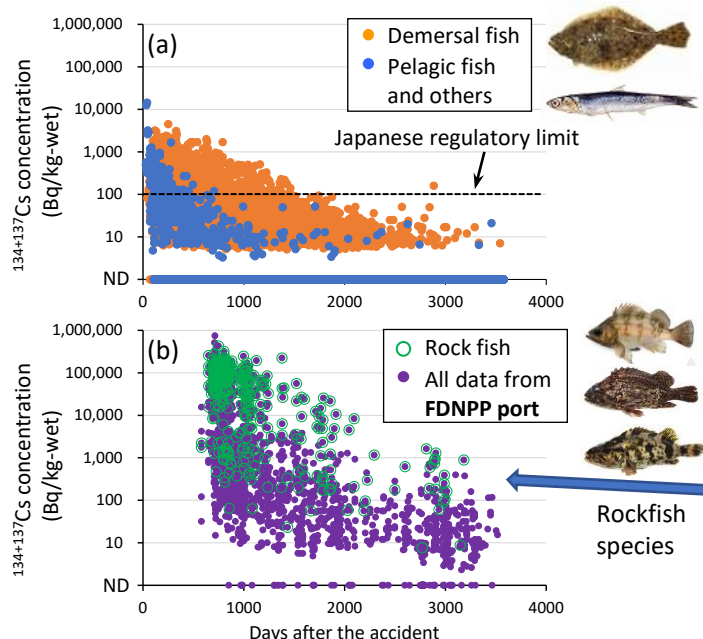


Fig. 1 Radiocesium concentrations in marine products monitored by Fukushima Prefecture (a) and TEPCO (b) during 2011–2020.

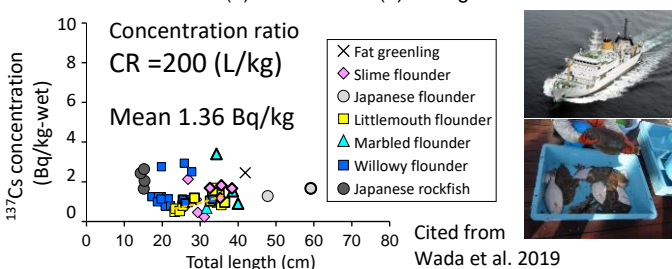
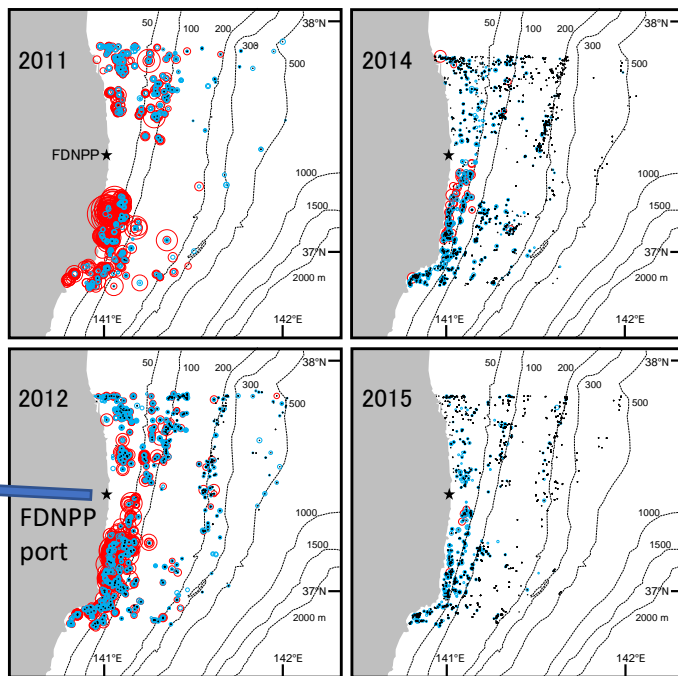


Fig. 3 Relations between total lengths and ^{137}Cs concentrations for demersal fish species collected off Fukushima Prefecture in 2016.



Cited from Wada et al. 2016

Fig. 2

Spatiotemporal changes of radiocesium concentrations of demersal fish expressed by the area of circles in each year of 2011–2015. Red and blue circles respectively show data of >100 Bq/kg and ≤ 100 Bq/kg. Black dots show data below the detection limit.