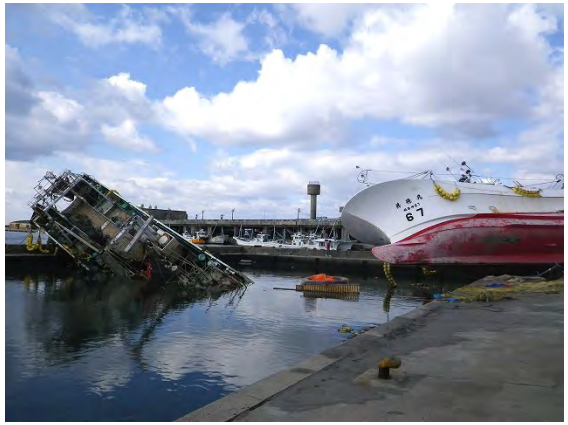
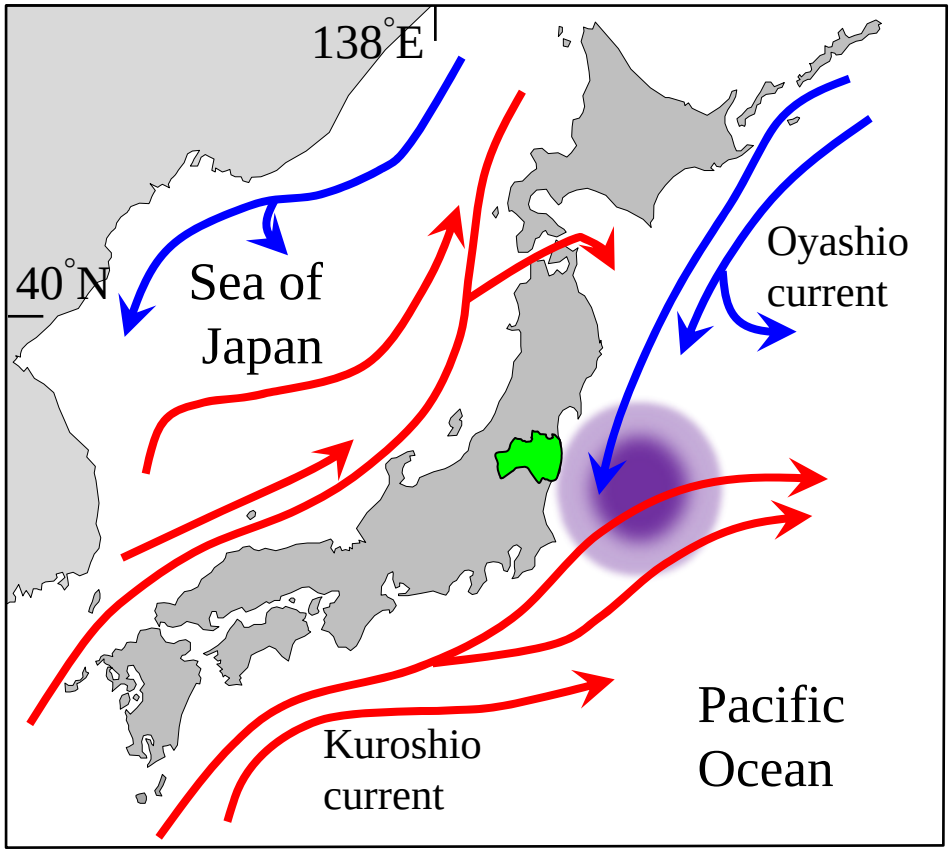
Tsunami disaster and nuclear power plant accident effects on fishery facilities and marine products in Fukushima Prefecture: Present conditions and prospects



Toshihiro Wada, Yoshiharu Nemoto, Sinya Shimamura, Satoshi Igarashi
(Fukushima Prefectural Fisheries Experimental Station)

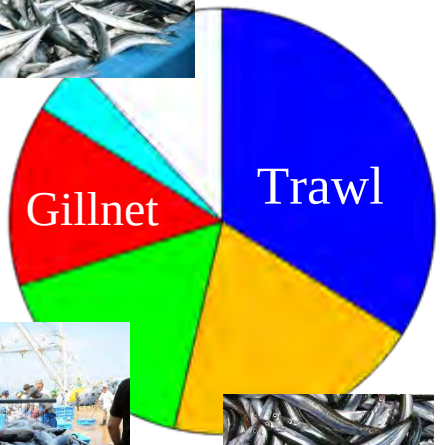
Fukushima's Fishery



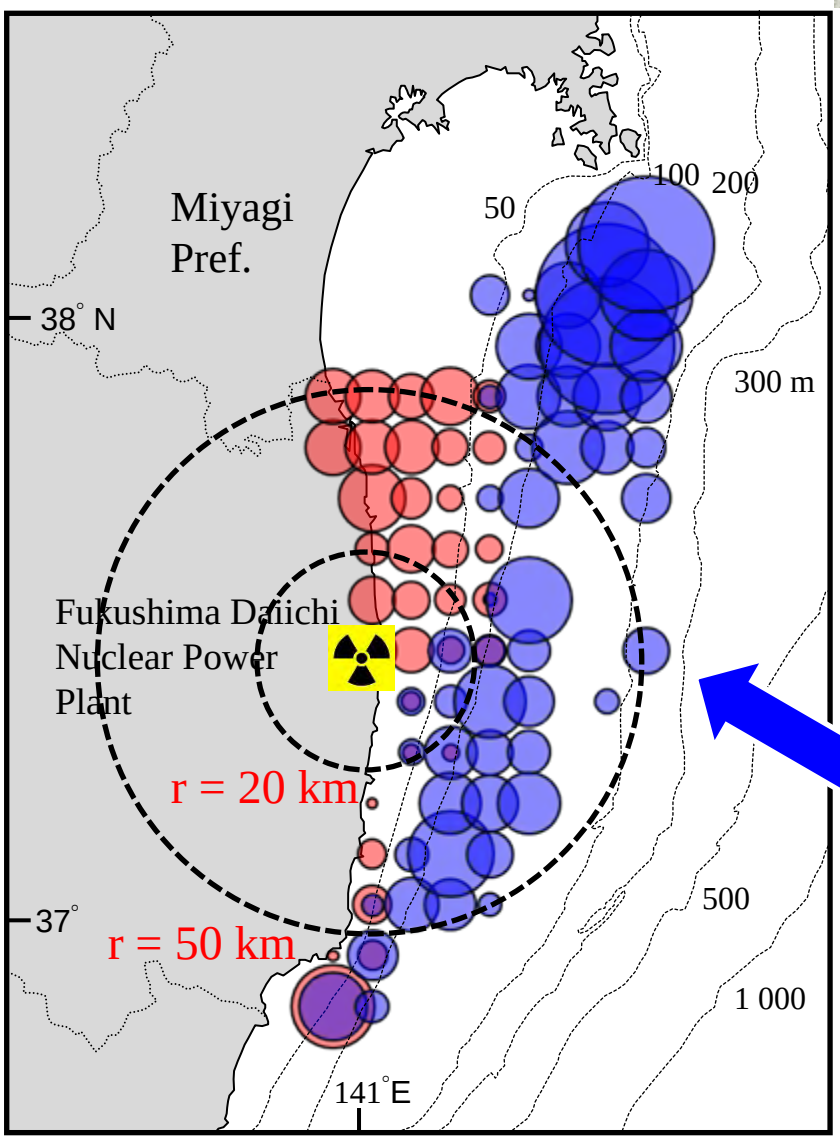
The waters off Fukushima, where the warm Kuroshio current meets the cold Oyashio current, are fertile fishing grounds for various fishing methods such as trawl, boat seine, purse seine, and stick-held dip net.

Before the tsunami accident

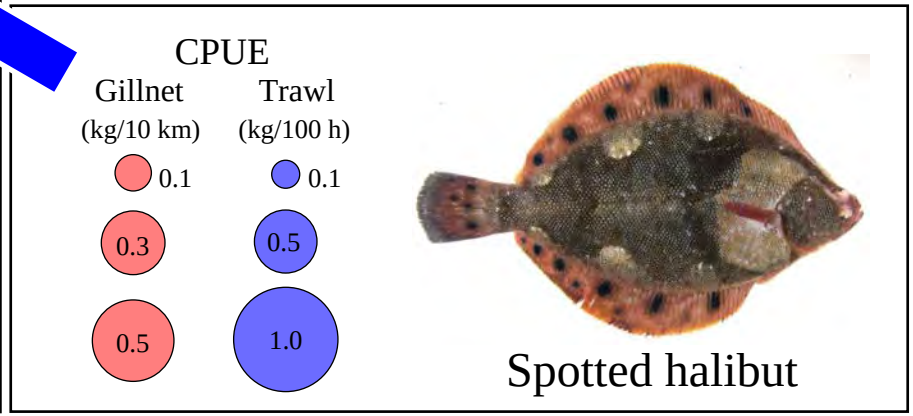
Sales in 2010 (11 billion yen)



- Trawl
- Boat seine
- Purse seine
- Gill net
- Stick-held dip net
- Others



Trawl and gillnet are the most important fisheries in coastal waters off Fukushima.



Spotted halibut

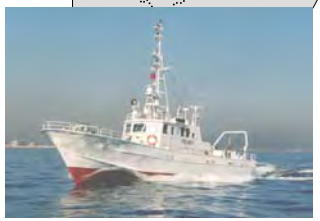
Wada et al. (2012) Aquaculture

Before the tsunami accident

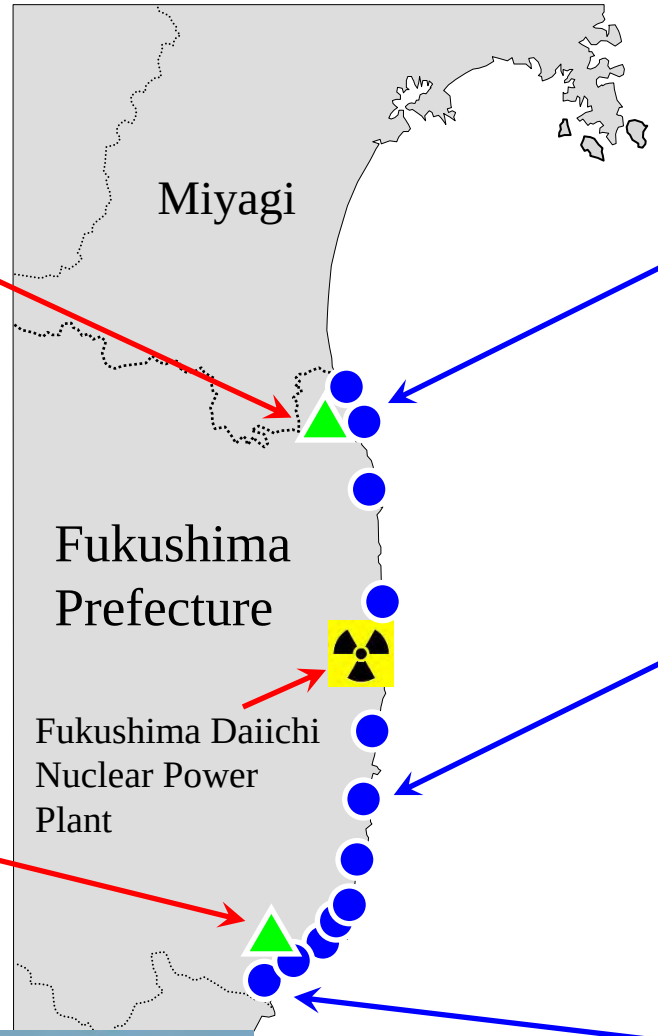
Soma Branch of FFS

Fukushima Prefectural Fisheries Experimental Station (FFS)

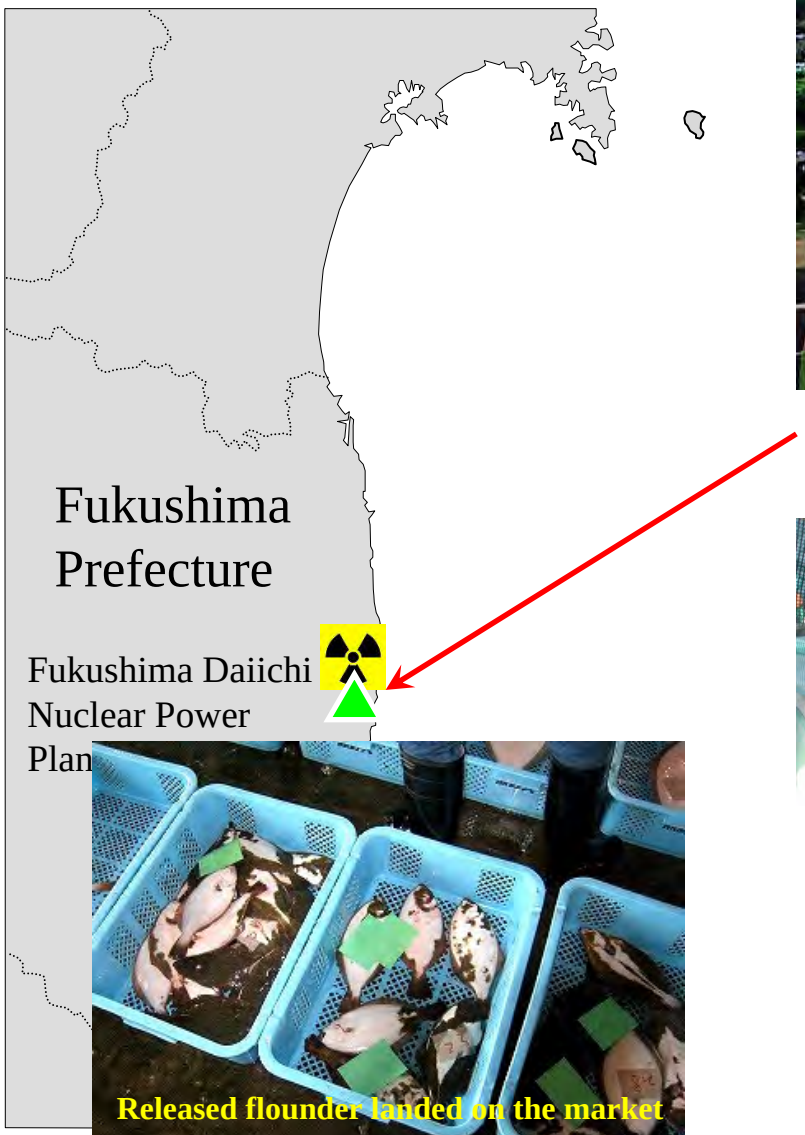
RV *Iwaki-maru* (159t)



RV *Takusui* (30t)



Before the tsunami accident



Community-based stock enhancement of Japanese flounder (Tomiyama et al. (2008) Rev Fish Sci)

Fukushima Prefecture Fish Farming Station

Japanese flounder

Spotted halibut

Ezo abalone

Sea urchin

Drastic alterations after the tsunami and nuclear power plant disasters



Objective

- Effects of the tsunami disaster on fishery facilities in Fukushima
- Effects of the released radioactive substances on fishery products
- Recent and future attempts of FFS
- Present status and future prospects

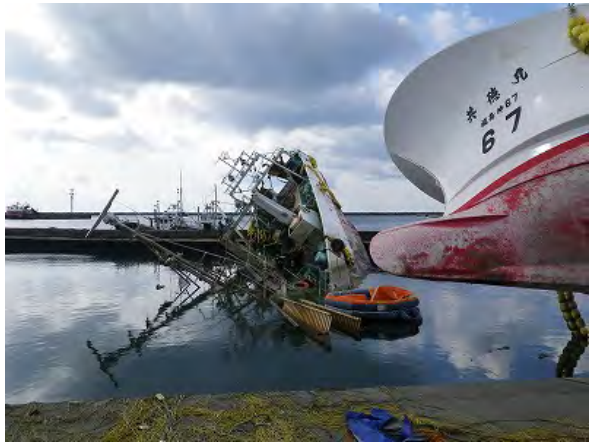
➢ Tsunami damages on fishery facilities

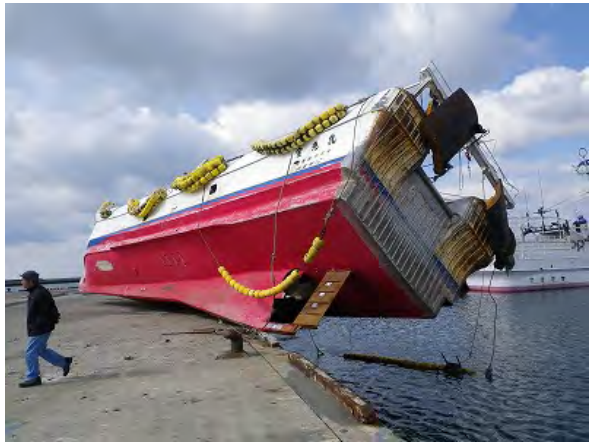
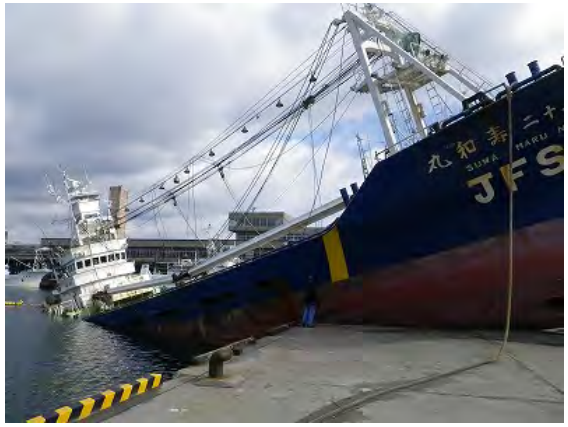





- Parts of all 10 fishing ports and fish markets were destroyed.
- The damages caused by the tsunami disaster amounted to 6.7 billion yen, accounting for 68% of the total damages (99 billion yen)

➢ Tsunami damages to fishery vessels



- In all, 873 fishing vessels, accounting for 74% of all registered vessels, were fully or partly damaged.
- Particularly, large fishing vessels necessary to conduct offshore trawl or purse seine fishing, that were unable to evacuate from the ports, were damaged.

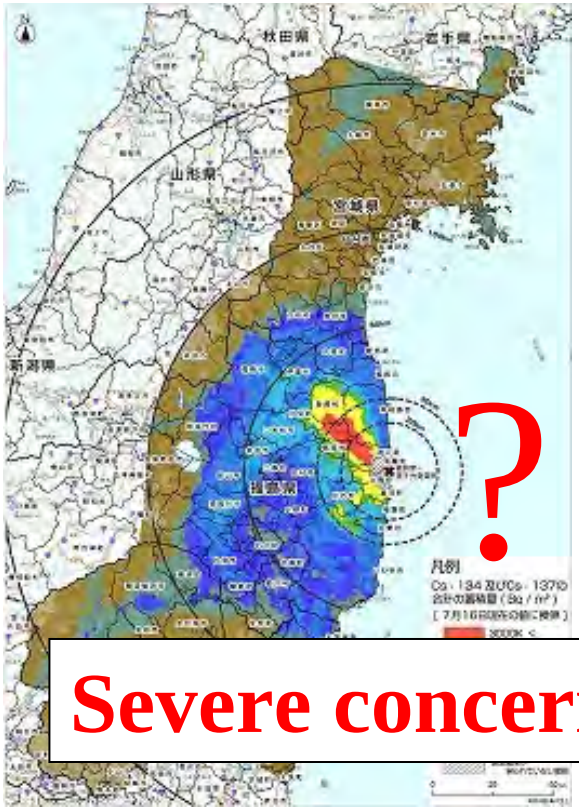
- Tsunami damages on prefectural fisheries facilities

Soma Branch of FFS

RV Iwaki-maru (159t)

Fukushima Prefecture Fish Farming Station

➢ Effects of the released radioactive materials on fishery products



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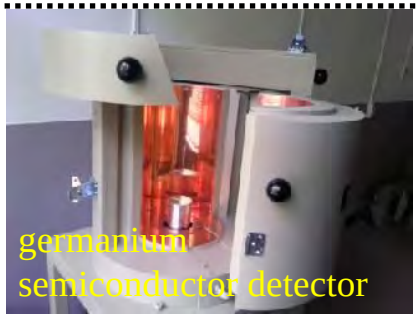
Severe concerns arose for fishery products

- A huge amount of radioactive substances were released to the air and the ocean.
- The total amount of radioactive contaminants that entered the ocean was unknown.
- After the leaking of highly contaminated water from a cracked sidewall of the plant, analyses of seawater sampled near the plant yielded readings of 130,000 Bq/l of I-131, 32,000 Bq/l of cesium-137, and 31,000 Bq/l of cesium-134.
- The largest anthropogenic release ever of radioactive substances in the oceans.

➢ Monitoring of fishery products (see details in a poster session presented by Nemoto et al.)

Flow of monitoring

FFS

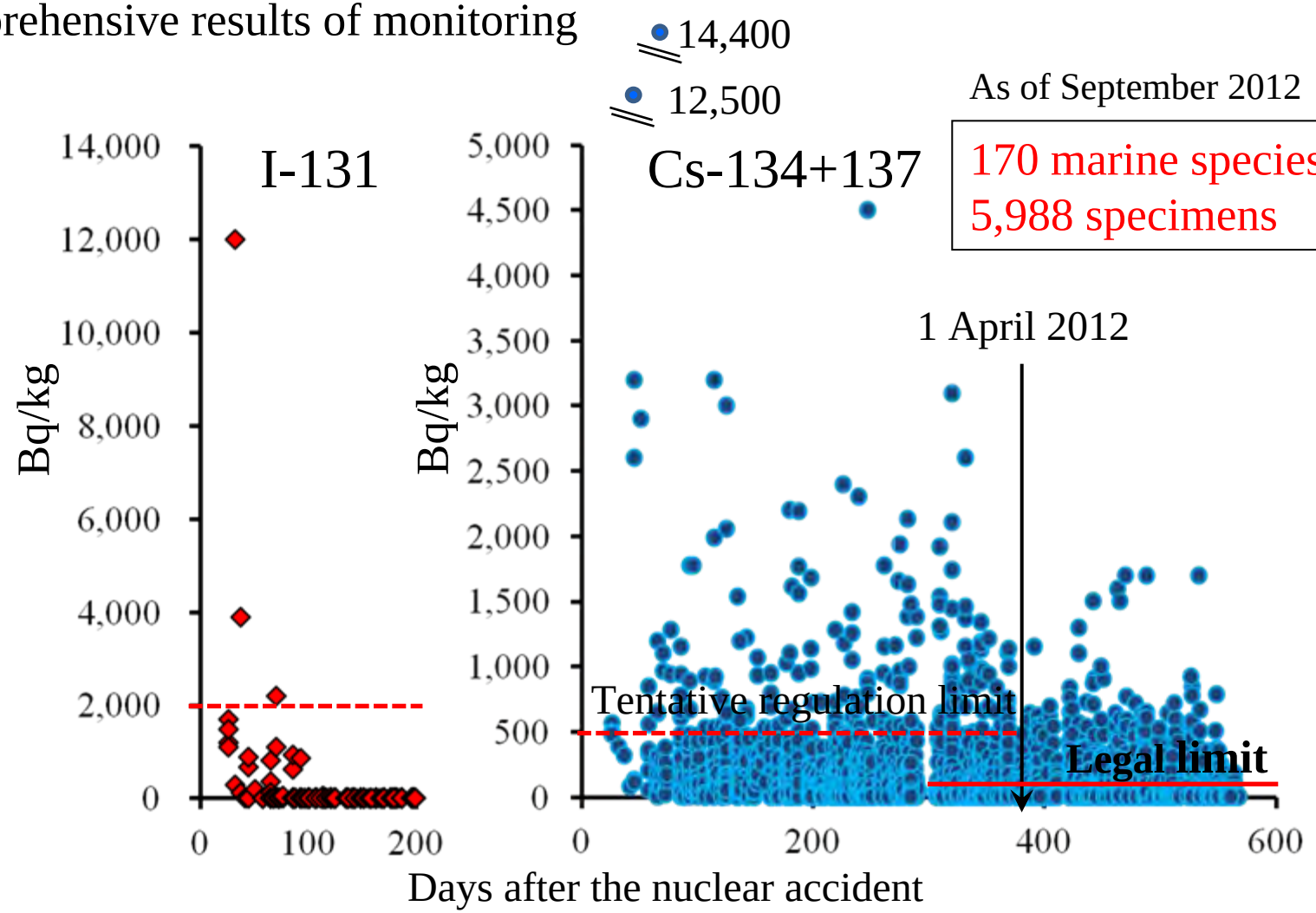


Results were officially announced by the Japanese government, and by the Fukushima prefectural government quickly.

Fukushima Agricultural Technology Centre

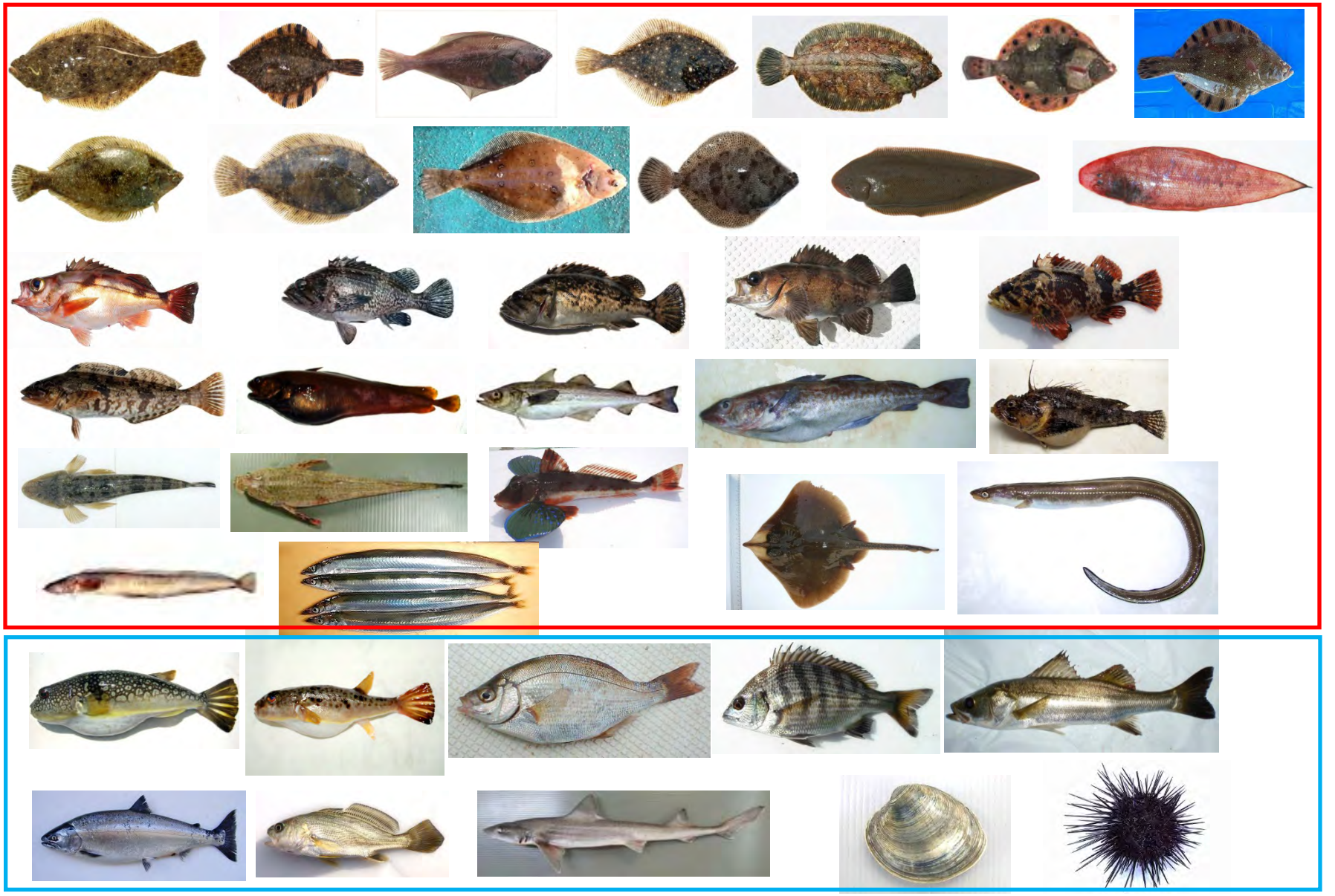
- Since April 2011, FFS has fundamentally inspected about 120 specimens/ week, sampled by fishing vessels or our research vessels.
- These samples were gauged at the Fukushima Agricultural Technology Centre.
- Results were officially announced by the Japanese government, and by the Fukushima prefectural government.
- As of September 2012, **5,988 specimens of 170 species** have been inspected.

Comprehensive results of monitoring

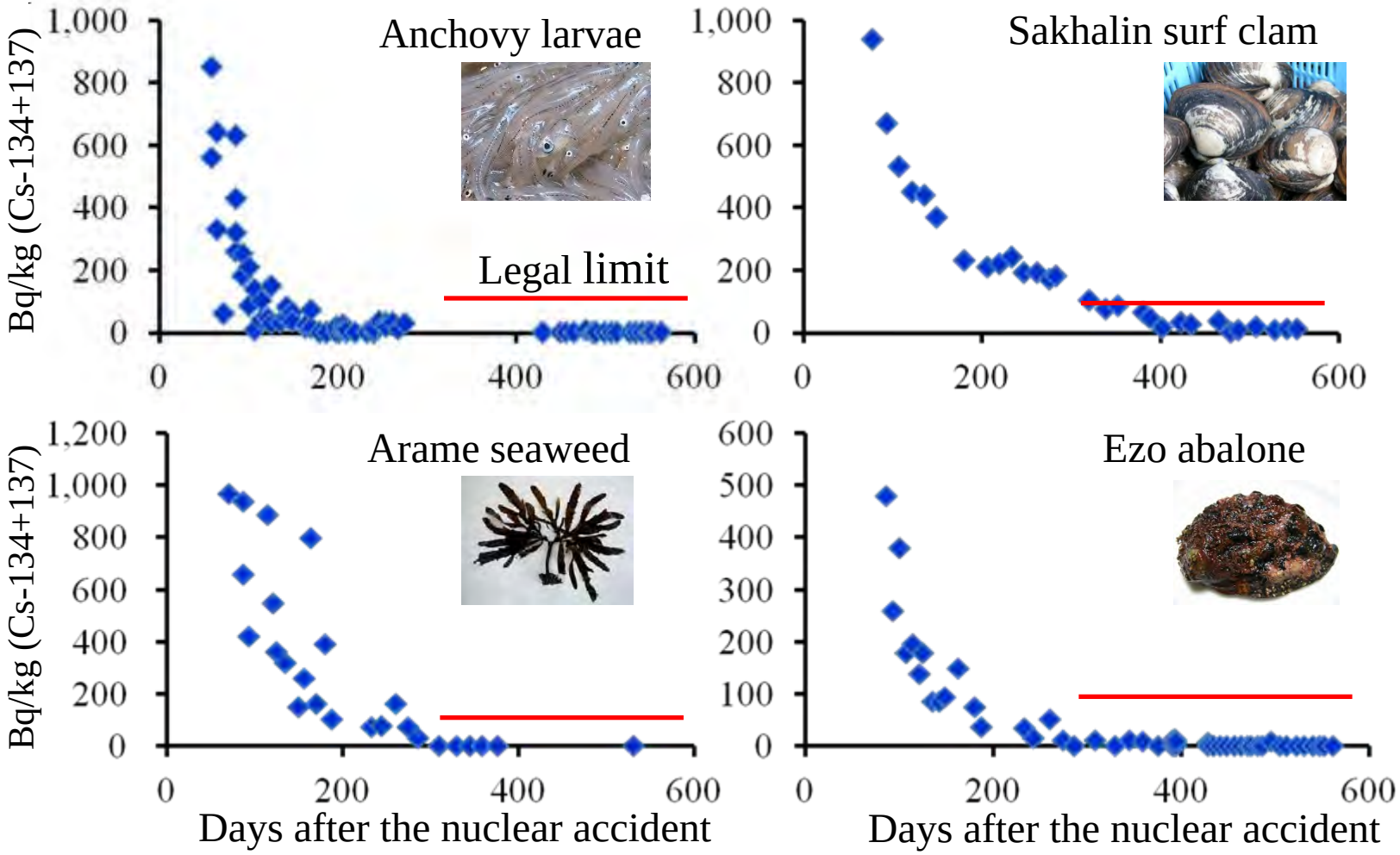


- The nuclear accident has posed severe negative effects on fishery products in Fukushima.
- Only 3 specimens exceeded the tentative regulation limit of I-131 with a short half-life.
- 258 specimens of 27 species exceeded the tentative regulation limit of Cs-134+137.
- 778 specimens of 41 species exceeded the legal limit of Cs enforced in April 2012.
- Cs-137, with a longer half-life of 30 years, is expected to pose the most severe concerns.

List of 40 species of which the Japanese government has banned shipments

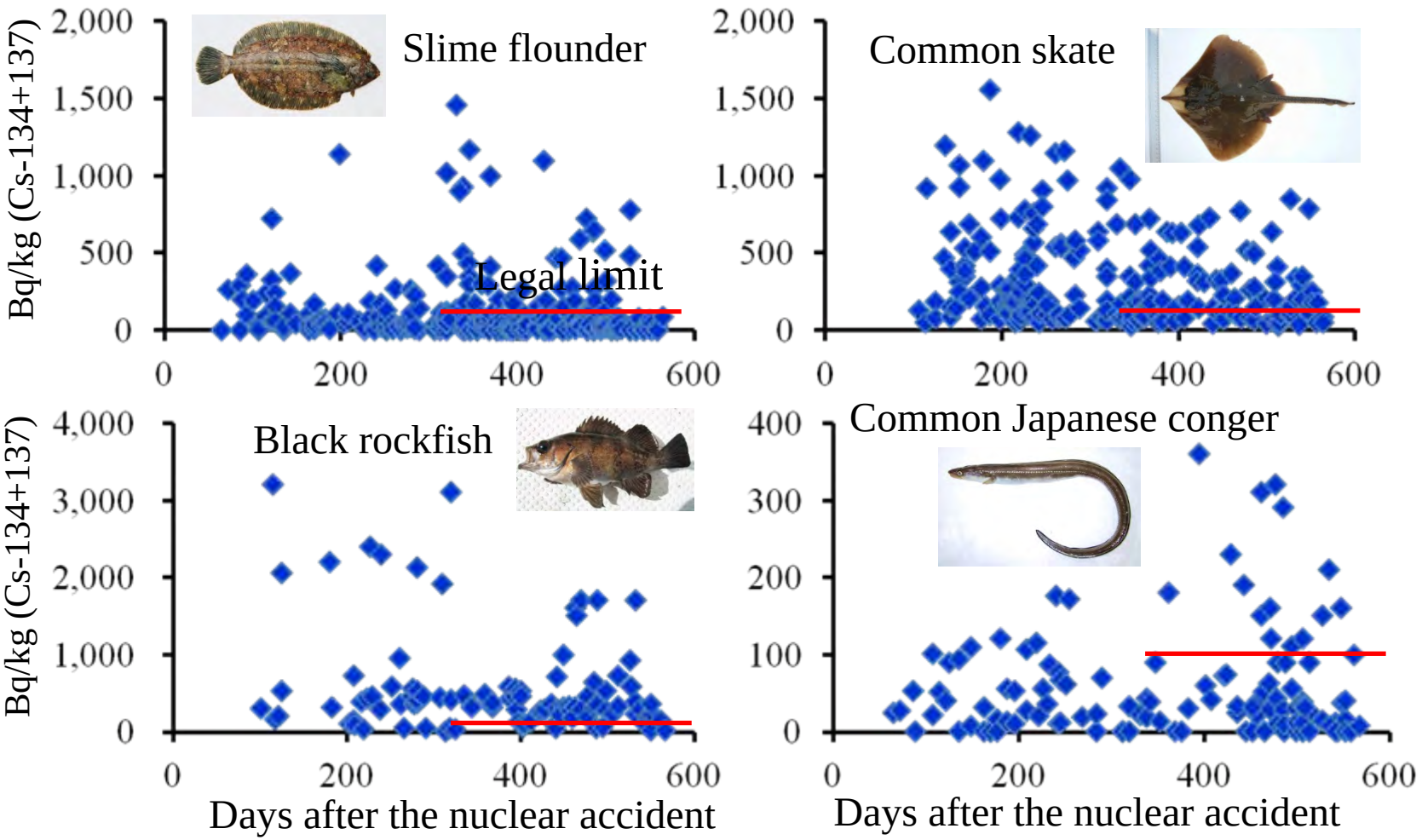


➢ Representative species that showed a clear declining tendency of radioactive cesium (134+137)



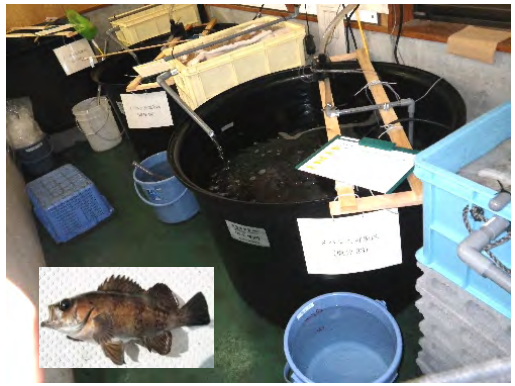
- Some species showed a clear declining tendency of radioactive cesium.
- These species were presumably contaminated mainly by the highly contaminated seawater that flowed around the coastal waters immediately after the nuclear accident.

➢ Representative species that did not show a clear declining tendency

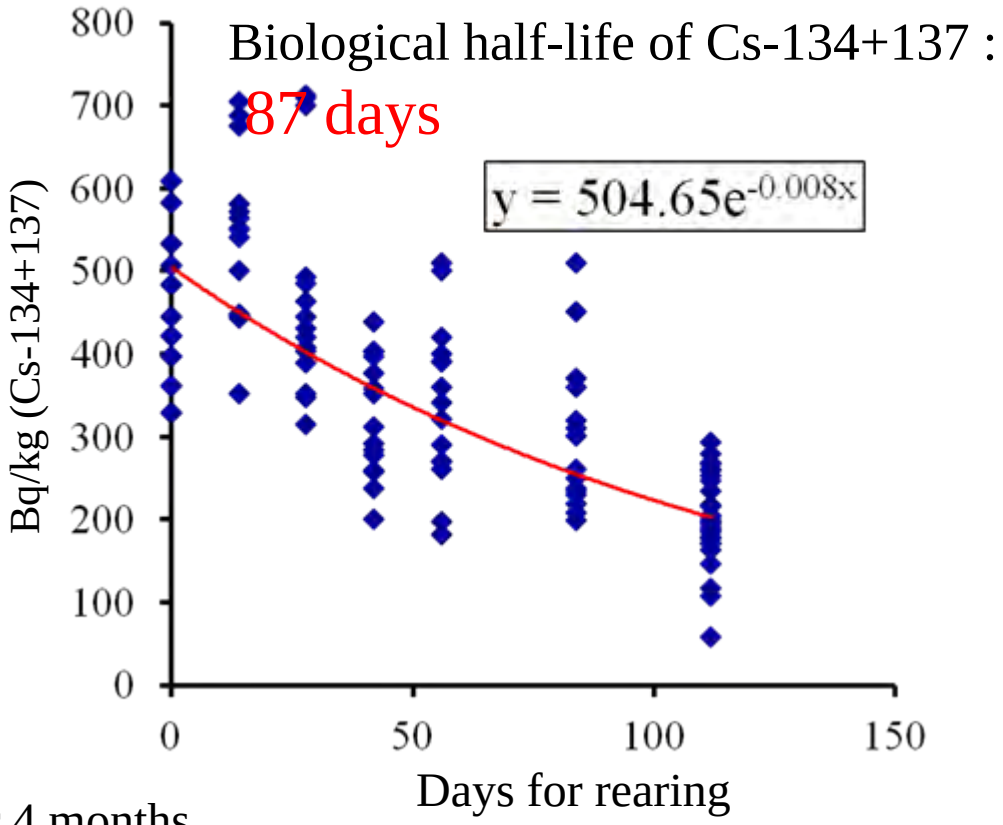


- Some species did not show the clear declining tendency of radioactive cesium, irrespective of the shorter half-life of cecium-134, which consisted the half of the total radioactive cesium immediately after the nuclear accidents.
- A plausible possibility is that radioactive cesium can move up the food chain.

Rearing experiment of black rockfish (in collaboration with FRA)



Feeding on non-contaminated krill for 4 months



- The biological half-life of radioactive cesium in muscles of black rockfish is estimated as 87 days, indicating that the concentration at the present time should be decreased to 1% of the initial value after exposure.
- However, the concentration of the rockfish sampled from field has not shown a clear declining tendency, which strongly demonstrates that radioactive cesium has been bioaccumulated through the food web.

➢ Recent and future attempts of FFS

FFS

Cooperative organizations

Fisheries Research Agency

FRA
Fisheries Research Agency

Universities

国立大学法人
東京海洋大学
Tokyo University of Marine Science and Technology

東北大学
TOHOKU UNIVERSITY

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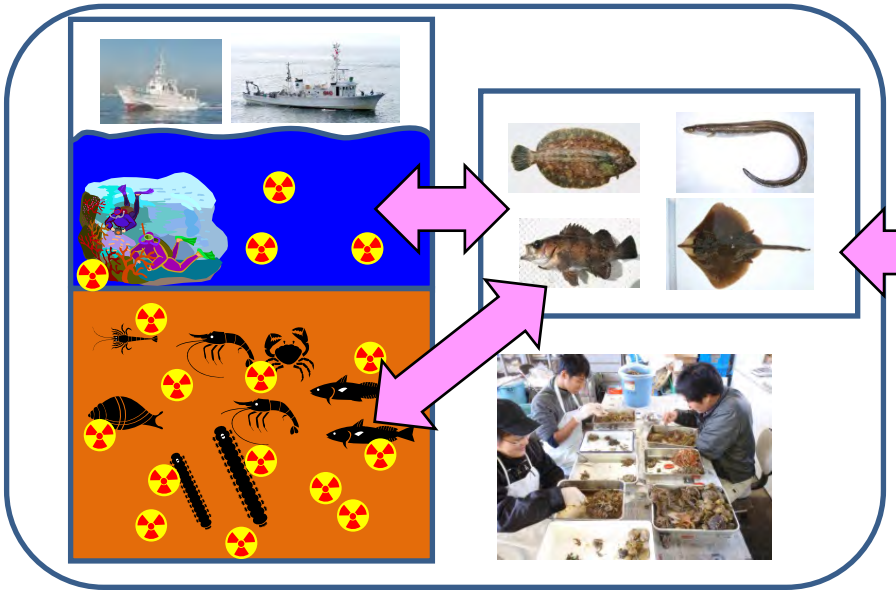
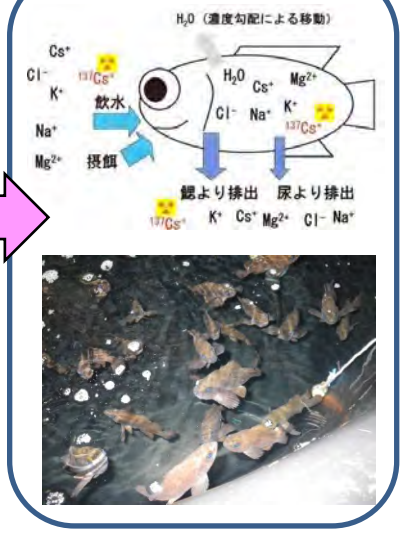


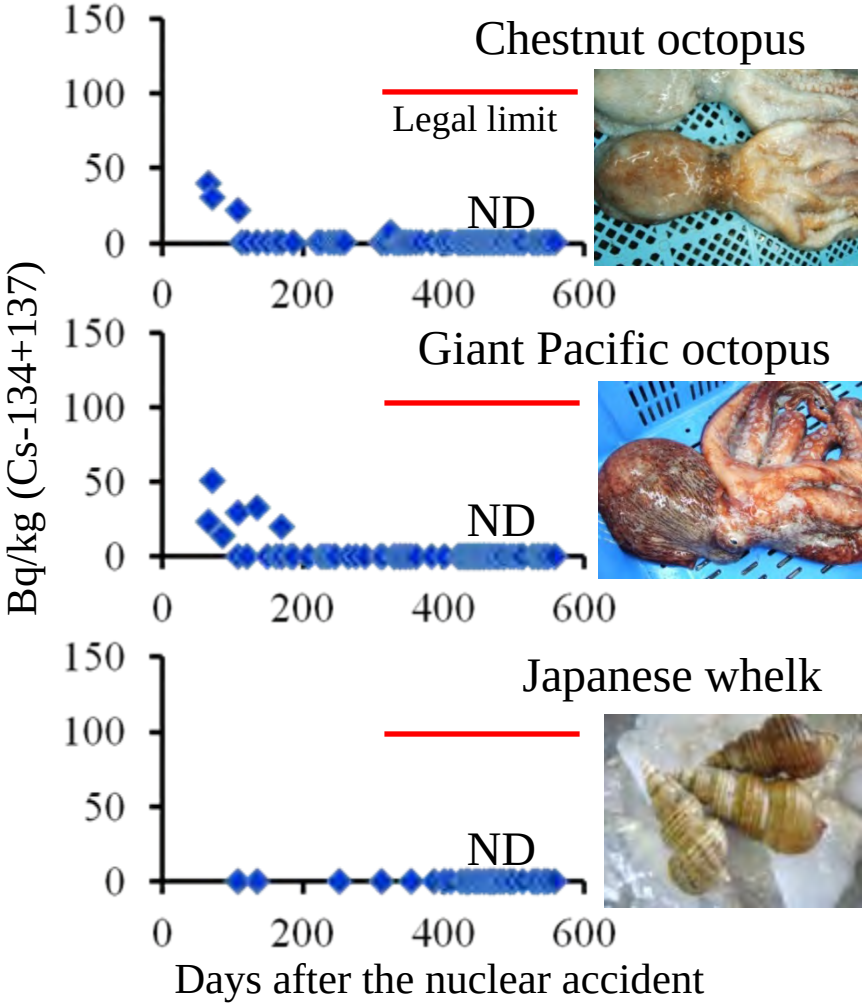
Field surveys



Rearing experiments

- Clarification of intake/discharge mechanisms for radioactive substances to predict or simulate the declining time span, which will be helpful to restart the coastal fishery, and to safeguard the safety of consumers.

➢ Present status and prospects



Trial fishing at Soma, northern Fukushima

- Since June 2012, fishery vessels in Soma, 50 km north from the nuclear plant, restarted fishing on a trial basis, and caught two types of octopus and a whelk, selected because not even trace amount of radioactive cesium have been detected recently.

- Present status and prospects

June 2012

September 2012

- Octopuses and whelks were sold at supermarkets in Fukushima, and quickly sold out.
- After September, Hair crab and Japanese common squid were added to the targets.

➢ Present status and prospects

The Tokyo Electric Power Company announced that Greenlings caught within 20 km of the nuclear power plant on 1 August showed a record-high 25,800 Bq/kg, indicating that radioactive contamination around the area remains severe.

We will continue to struggle with these difficult situations
in the hope that Fukushima's Fishery will certainly revive someday
as long as the fertile fishing grounds off Fukushima exist.

Photograph of Soma fish market in 2007

Thank you for your attention