A study on the effects of radioactivity on marine products in Fukushima Prefecture

Fukushima Prefecture Fisheries Experiment Station

Fisheries Environment Department, Yoshiharu Nemoto

Study on the Effects of Radiation on Marine Products

A study on the effects of radiation on marine products and the marine environment was launched in April 2011

Objective

The study aims to reveal the effects of radioactive contamination and provide data to support the revival of the fishery industry. The study also aims to provide accurate and scientific information to the general population to promote a better understanding of the safety of marine products.

Marine products	:200 samples/week
Seawater, seabed soil	:Conducted monthly at coastal areas, fishing ports, and the Isone fishery
	Test result data collected from other organizations

Process for measuring radioactivity in marine products

Gathering fish

Fish size measurement

Radiation measurement

Prefectural research and fishing vessels catch fish, and radioactivity is measured after measuring the size of the fish.

Radiation Measurements

- 200 samples/week (saltwater fish)
- Inspected 38,010 samples (as of August 2016)
- Inspected 184 kinds of marine products

All inspection results are updated weekly on the Fukushima Prefecture website, and information is shared with the media.

QR code for Fukushima Pref. Fisheries Division website

Effects of Radiation on Marine Products（Radioactive Cesium）

The results of the study indicate the following.

Right after the accident:

- The impact was large on the shallow sea area to the south of the Fukushima Daiichi nuclear power plant
- There was little impact to the north of the plant and in deep sea areas
- Effects varied widely across fish species

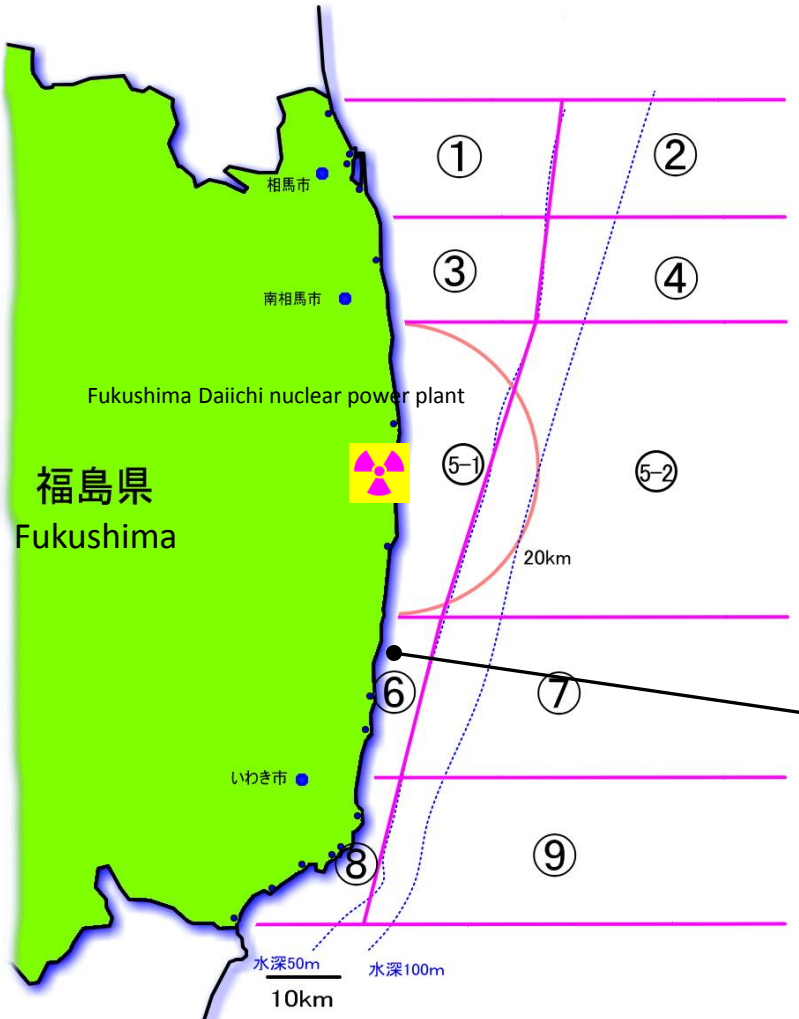
  - **Fish with fast generational turnover**
  - **Deep-sea fish**
  - **Migratory fish**
  - **Seafood other than fish (mollucks, crustaceans, etc.)**

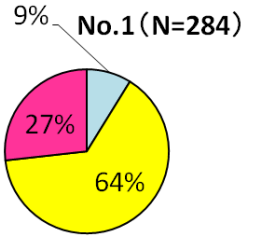
  } **Small effect, or a rapid decrease in cesium concentration**

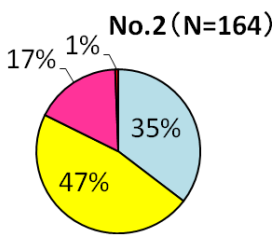
Five years after the accident:

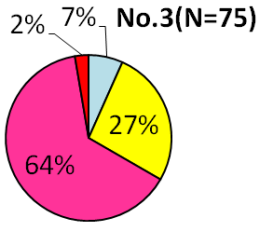
- Radioactive cesium concentrations in all fish species have decreased, and effects of the accident are fading.

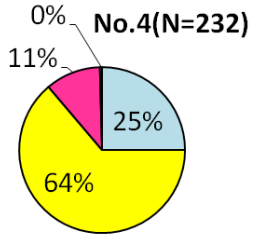
Radioactive Cesium Concentration in Coastal Areas (134Cs+137Cs 2011)

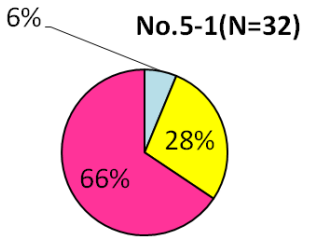


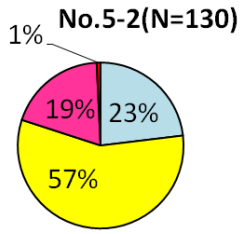


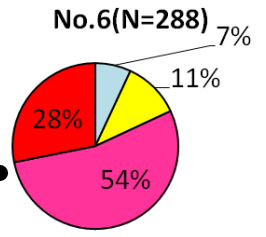


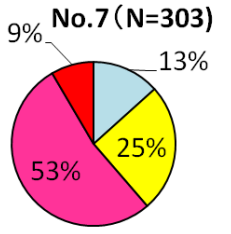


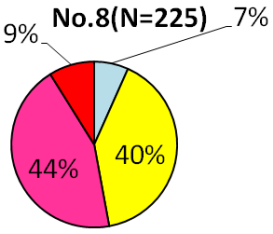


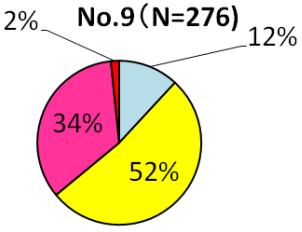












:No detection : Under 100Bq/kg : Over 100Bq/kg : Over 500Bq/kg

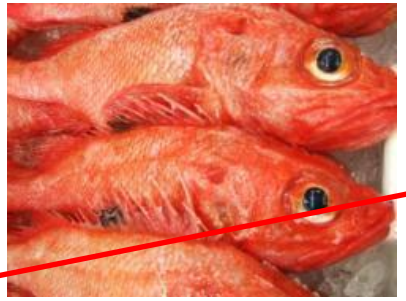
Monitoring inspection results from Fukushima Prefectural Government (Apr. 2011 – Dec. 2011)

Species with Minor Effects or Rapid Decrease in Concentration

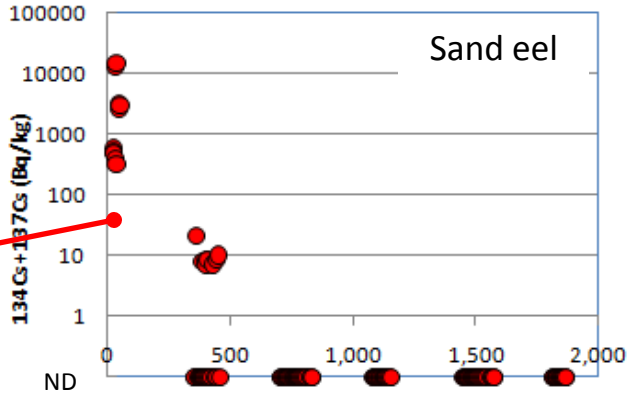
Fish

Migratory fish

Fish with fast generational turnover



Deep-sea fish

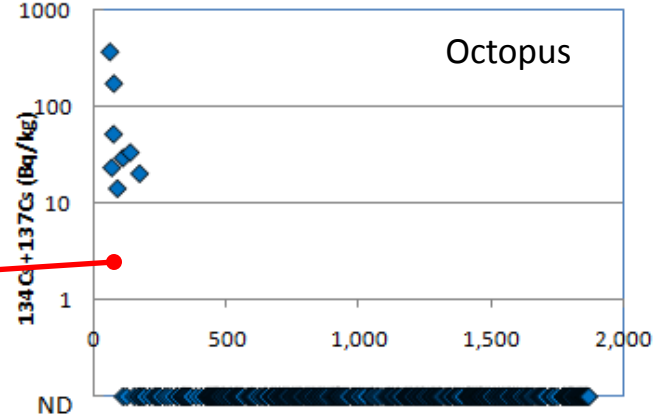


Seafood other than fish

Squid and octopus

Crustaceans

Shellfish

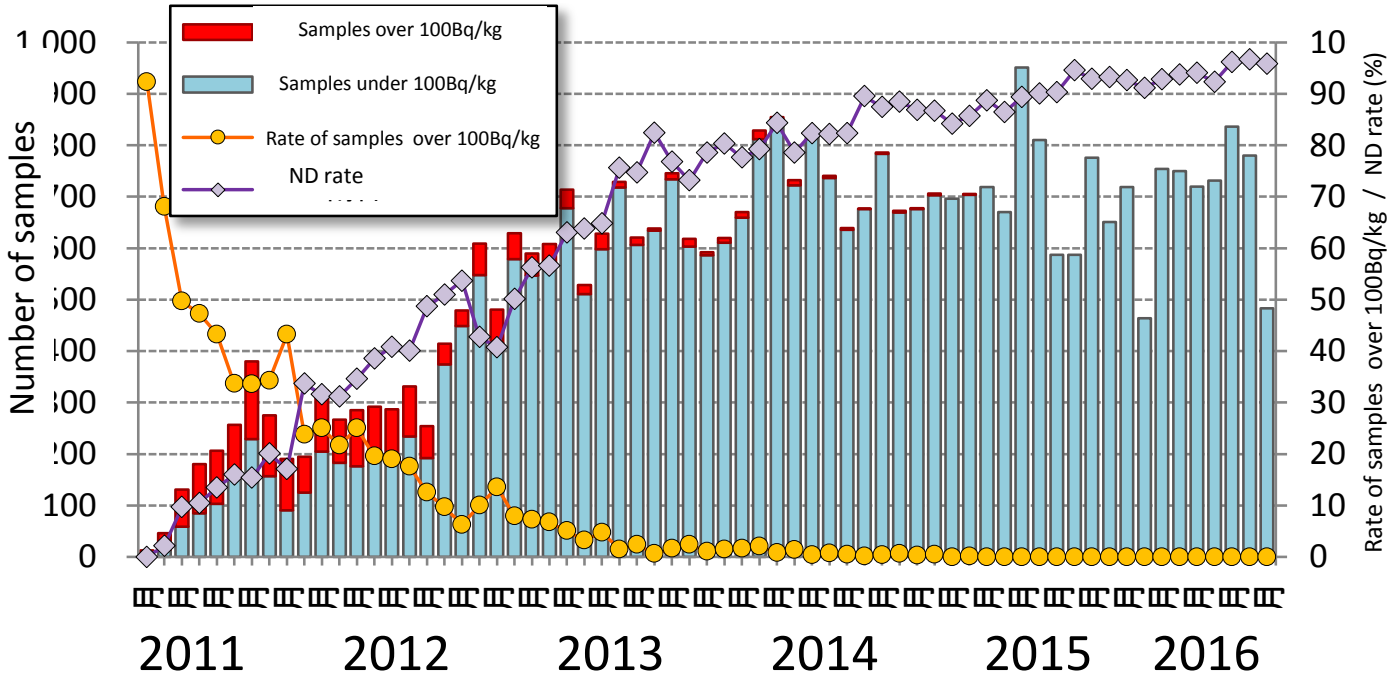


Cesium does not accumulate easily in seafood other than fish.

Monitoring inspection results from Fukushima Prefectural Government (Apr. 2011 - May 2011)

Overall Trends

- ☐ Radioactive cesium concentrations have clearly decreased in all fish species
- ☐ No findings have exceeded the standard since April 2015
- ☐ No cesium has been detected in 90% of the measurements since July 2015



Monitoring inspection results from Fukushima Prefectural Government (Apr. 2011 – Aug. 2011)

Sand eel fry
(restrictions
lifted in June 2012)

Pacific cod
(restrictions lifted in
January 2015)

Number of fish species with shipping restrictions

50
45
40
35
30
25
20
15
10
5
0

Total number (44 species)

Flounder
(restrictions lifted in June
2016)

16 species

Flat-head flounder
(restrictions lifted in October 2013)

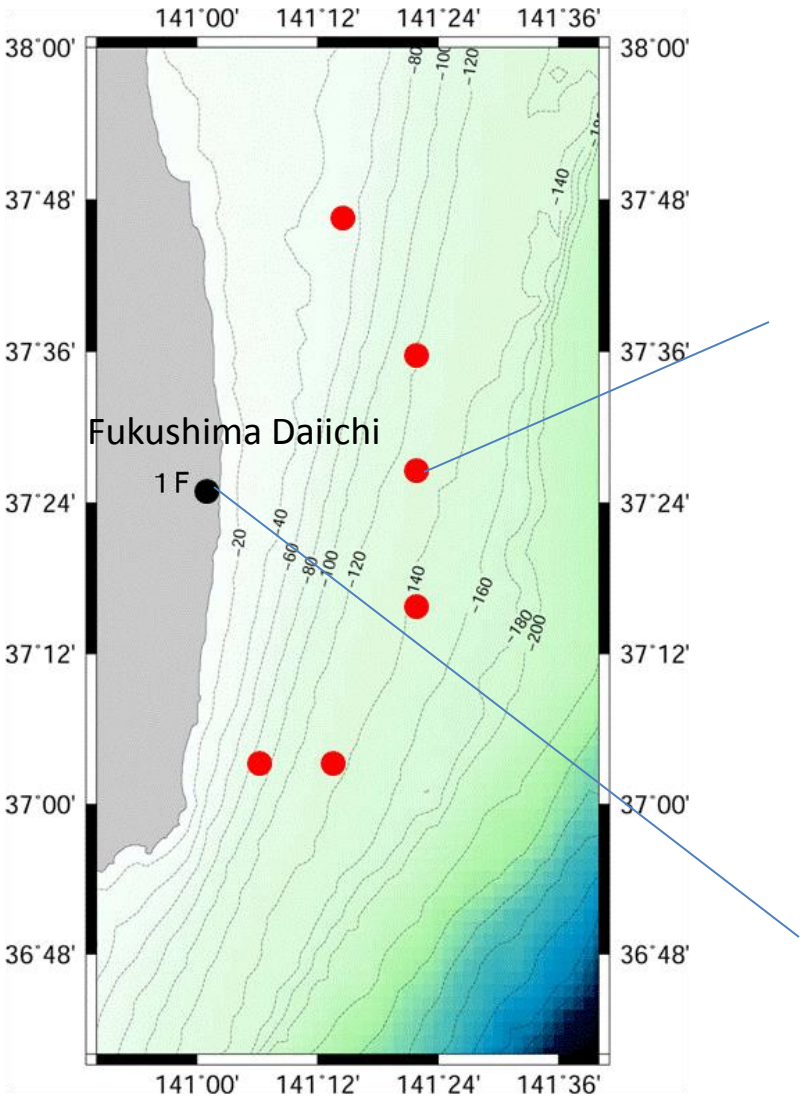
2011 2012 2013 2014 2015 2016

Shipment restrictions on marine products in Fukushima Prefecture

(Restrictions are different for sand eel fry and adult sand eel)

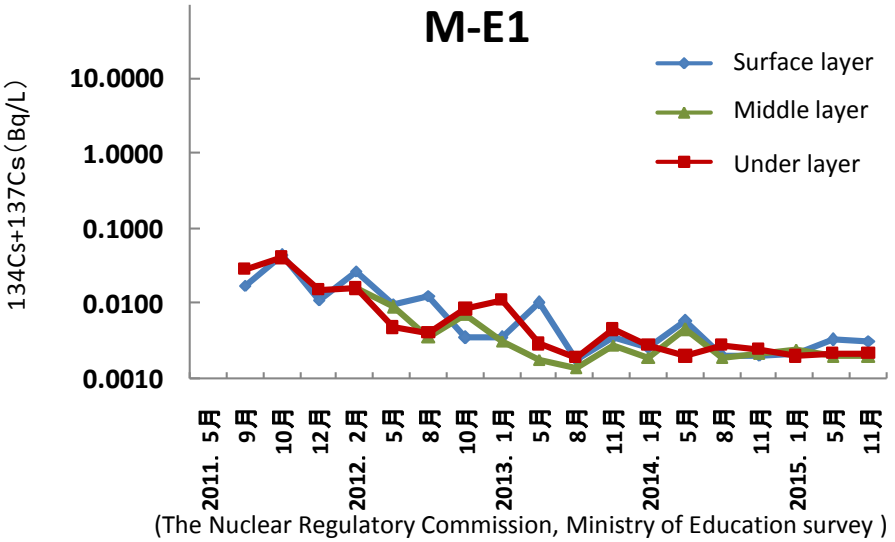
Radioactive Cesium Concentration in Seawater

Offshore concentration is recovering to 0.002Bq/L (Cs137), the level before the accident.



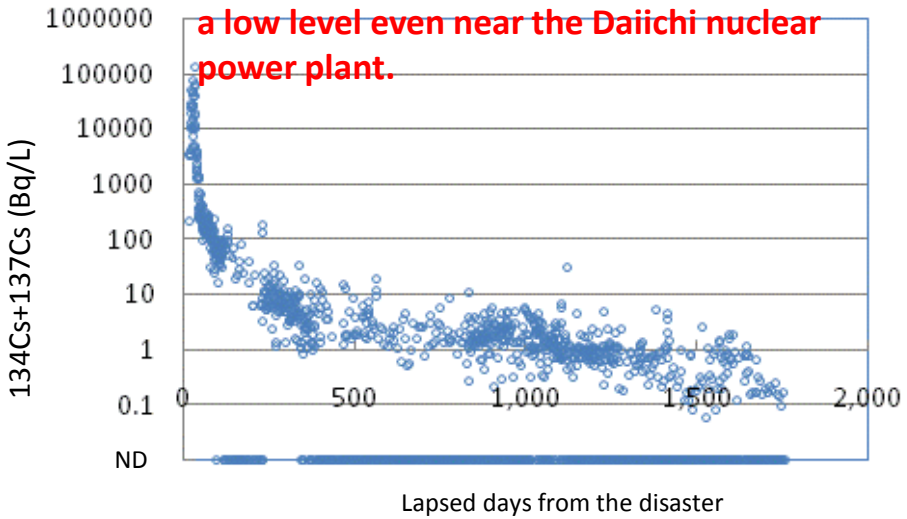
Measurement locations map

●: Measurement location



(The Nuclear Regulatory Commission, Ministry of Education survey)

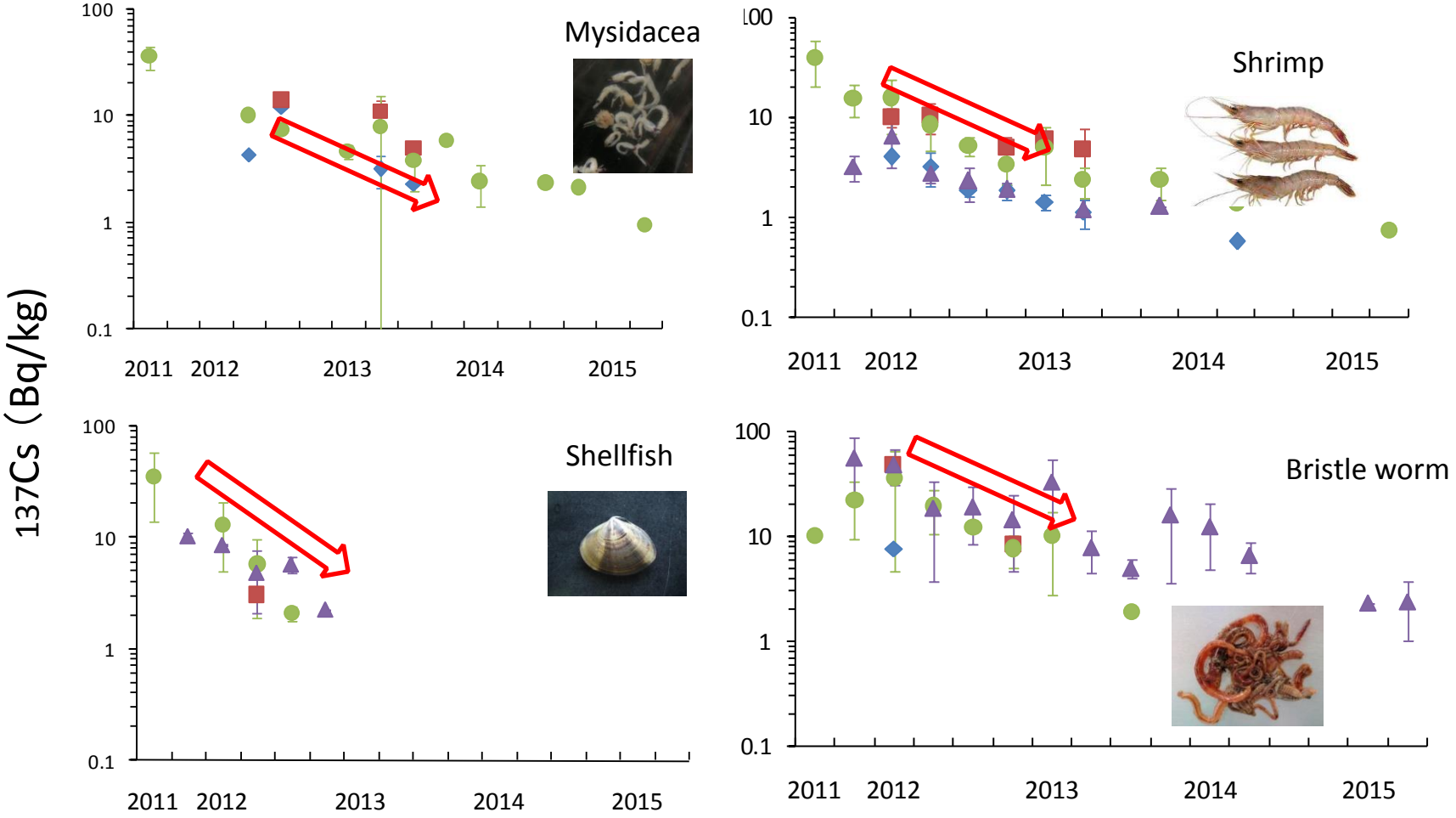
The impact on fish and shellfish has fallen to a low level even near the Daiichi nuclear power plant.



(According to a study by TEPCO)

Radioactive Cesium Concentration in Species Eaten by Fish

Radioactive cesium concentration in species eaten by fish decreased, and the effects are small.

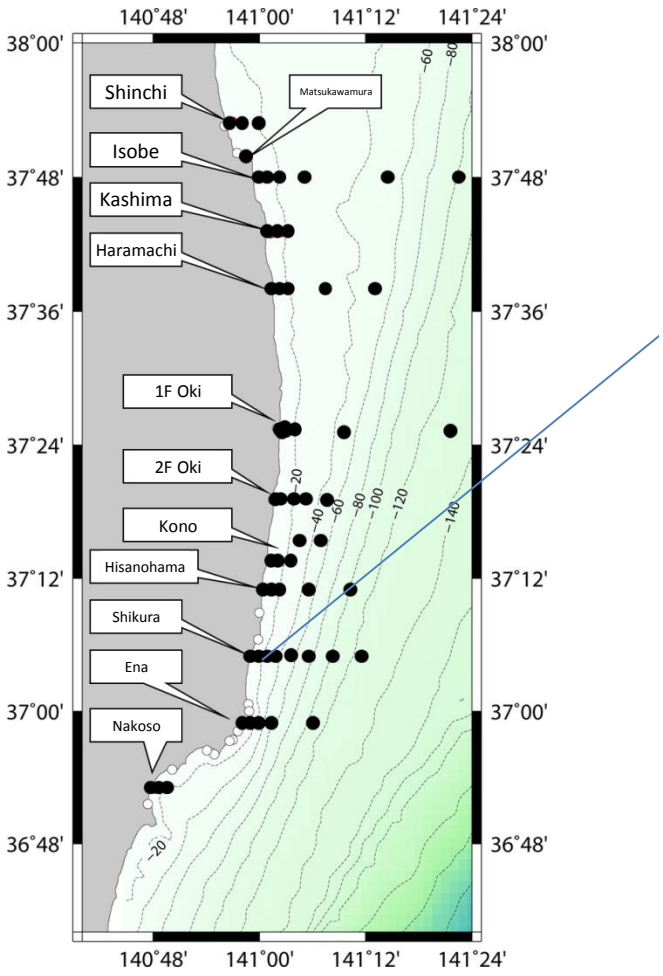


◆(Fukushima's northern coast) ■(Central coast)
●(Southern coast) ▲(Southern sea areas)

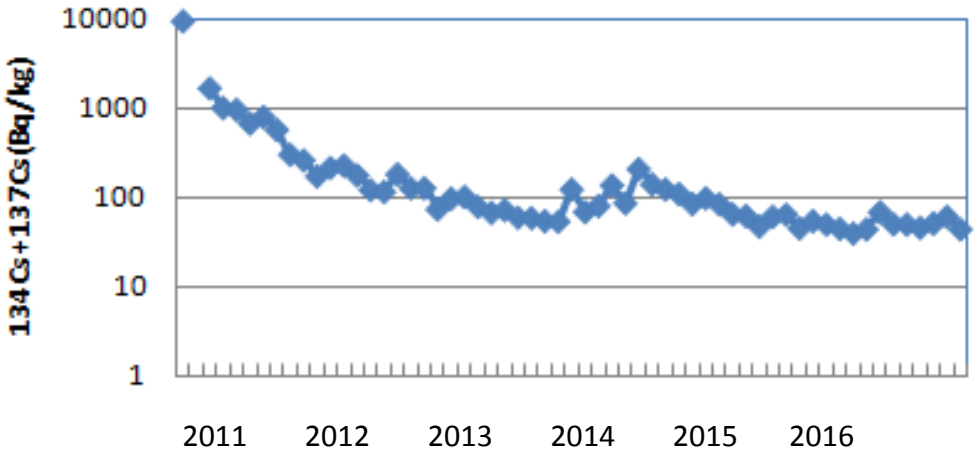
According to a study by Fukushima Prefecture Fisheries Experiment Station (2011-2015)

Marine Soil

After the accident, a high concentration of 9,271Bq/kg was found in the shallow sea near Iwaki. However, the concentration is decreasing as time passes.



Measurement locations of marine soil in shallow sea areas



20m deep water offshore of Shikura

According to a study by Fukushima Prefecture Fisheries Experiment Station (2011-2016)

*The effects of cesium absorbed from sand or soil by organisms are very small.

(Japan Fisheries Research and Education Agency Radioactivity Impact Research Report, 2015)

Summary

- The effects of radiation on marine products have been small, and there is virtually no detectable radiation at present
- Even low levels of radiation have only been measured in a limited number of fish species
- The marine environment is returning to the state it was in prior to the accident
- Shipment restrictions will likely be lifted in the future

Contribution to the study results on fisheries reconstruction

◇ Test operation has been resumed for fish species while ensuring safety by monitoring, and it has been broadened through watching the status thereafter.

June 2012, Started test operation for 2 kinds of octopus and offshore snails

Restriction of shipments: 44 species maximum→16 species
Target species for test operation are expanded

Sep. 2016, Target species for test operation has expanded to 92.

◇ Monitoring and related performances of radioactivity studies have been informed to consumers and fisheries parties to dispel harmful rumors.