June, 2011
Fisheries Agency of Japan

# To Secure the Safety of Fishery Products in Japan

[ In response to discharges of radioactive substances to the sea from the TEPCO Fukushima Daiichi Nuclear Power Plant ]

## Summary


Radioactive substances have been detected in seawaters in the vicinity of the TEPCO Fukushima Daiichi Nuclear Power Plant, which originated from discharges of contaminated water, atmospheric fallout and washout with precipitation into the sea.

In response to the critical situation, the Japanese government swiftly introduced monitoring programs to measure the levels of radioactive substances contained in fishery products as well as in seawaters. So far, only a small number of species caught in the area close to the Fukushima NPP show the levels of radioactive substances exceeding the Provisional Regulatory Values*. The Japanese government ensures the safety of fishery products on the market, by imposing suspension of related fishing activities and market distribution as soon as a sampling measurement of a fishery product detects a level exceeding the Provisional Regulatory Values.

[ (*) Indices for restrictions on intake of foods set by the Ministry of Health, Labor and Welfare. Japan's index for Cesium is 500 Bq/kg, which is rather conservative compared to those of other countries (See Attachment 1). ]

Discharges of radioactive substances from the Fukushima NPP into the sea have drastically decreased since early April, and to date, it is estimated that over 99% of the discharges of radioactive substances into the sea occurred during the period March 28th to April 11th. As a matter of fact, most of the recent monitoring

measurements of radioactive substances in seawaters beyond the 30km-radius from the Fukushima NPP have constantly shown results below the detectable levels.

Nevertheless, it is reported that a number of trading companies still firmly refrain from buying fishery products from Japan, and that some governments still maintain excessive restrictions against imports of fishery products from Japan. We would like to draw your attention to and ask due consideration on the current situation and a series of monitoring efforts and control measures that the Japanese government has been taking and enforcing so as to ensure the safety of fishery products on the market.

## Details

### 1. Monitoring programs for fishery products and restriction on fishing activities

#### (1) Provisional Regulatory Values in Japan

For the purpose of food safety, the Japanese government sets the Provisional Regulatory Values (*) for radioactive Iodine and Cesium in fishery products at 2000 Bq/kg and 500 Bq/kg, respectively. Extensive and frequent samplings have been undertaken to ensure that no fishery products containing radioactive Iodine and/or Cesium exceeding the Provisional Regulatory Values are distributed to the market. Please note that Japan's Provisional Regulatory Value for radioactive Cesium (500Bq/kg) is rather conservative compared to those of other countries (i.e.US index is 1,200Bq/kg).

[See Attachment 1: Comparison of indices for restriction on intake of foods]

#### (2) Monitoring programs for fishery products

The Fisheries Agency, in coordination with relevant prefectural governments, has been conducting samplings to measure levels of radioactive substances in fishery products. These samplings have been carried out at major fishing ports at least once a week for each major target species. When a measurement result detects a level exceeding the Provisional Regulatory Values, related fishing activities

involving that species and its landings are immediately suspended.

[See Attachment 2: Basic policy for Inspections on Radioactive Materials in Fishery Products]

Taking into account broad migration of some fish species, the Fisheries Agency, in close coordination with prefectural government and related fisheries organizations, is undertaking samplings of fishery products in wide areas ranging from Hokkaido to Kanagawa-prefecture. The sampling measurement results are immediately posted on the websites of the Ministry of Health, Labor and Welfare (MHLW) and the Fisheries Agency. These sampling results are also made available in English on these websites.

- As of June 29, 767 samples have been measured for levels of radioactive substances, and 57 samples out of 767 showed results exceeding the Provisional Regulatory Values. Please note all these 57 samples, except for 23 samples of freshwater fish, were taken in the coastal waters close to the Fukushima NPP, consisting of limited species; epipelagic small fish (juvinelle Japanese sandlance and juvenile anchovy), coastal bottom fish (Fat greenling, Brown Hakeling and Stone flounder), Invertebrates (Mediterranean mussel, North Sea Urchin, Surf clam and Japanese mitten crab), seaweed (Wakame, Hijiki and Arame seaweed).

  [See Attachment 3: Sampling measurement results for fishery products]
  http://www.jfa.maff.go.jp/e/inspection/index.html
  http://www.mhlw.go.jp/english/topics/2011eq/index.html

(3) Restriction on fishing activities and market distribution

In case where a sampling measurement detects radioactive substances exceeding the Provisional Regulatory Values, related fishing activities in a certain fishing ground and landings of that species are immediately suspended. Such suspension can only be lifted after all the sampling measurements at more than three sampling spots in the last one month show below the Provisional Regulatory Values. Through such restrictive measures, no fishery products with radioactive substances exceeding the Provisional Regulatory Values are distributed to the market.

◆ Situation of fishing activities near Fukushima

As of June 9, the situation of fishing activities in the coastal areas in and around Fukushima is as follows:

- **Fukushima Area**

  No fishing activities have been conducted since the occurrence of the Fukushima NPP accident.

- **Miyagi area**

  Part of fishing activities resumed in early June, after all the sampling results of species to be caught confirmed that their levels of radioactive substances are below the Provisional Regulatory Values.

- **Ibaraki area**

  Fishing activities for juvenile Japanese sandlance have been suspended since sampling measurements showed that the species in this area exceeded the Provisional Regulatory Values. Trawl fishing resumed after all the sampling results of the species to be caught confirmed that their levels of radioactive substances are below the Provisional Regulation Values.

◆ **Samplings for skipjack**

Skipjack, an important species for exports from Japan, migrates every June into the offshore area of the east coast of Japan (240-320km from the coastline). Last week, samplings of skipjack taken in experimental fishing offshore Fukushima confirmed that the levels of radioactive substances were below the Provisional Regulatory Values. Therefore, fishing activities for skipjack in that have become available since 22th June. During the entire fishing season, samplings are to be continuously undertaken at major fishing ports once a week in principle.

## 2. Monitoring programs for seawaters

The Ministry of Education, Culture, Sports, Science and Technology (MEXT) and TEPCO have been conducting monitoring programs to measure the levels of radioactive substances in seawaters and bottom sediment at over 100 sampling stations in the coastal and offshore areas in the vicinity of the Fukushima NPP. The monitoring results of seawaters show a decreasing trend in the levels of radioactive substances. In particular, the results of the recent sampling measurements show that the levels of radioactive substances in seawaters beyond the 30km from the Fukushima NPP have been constantly below the detectable levels*, regardless of the surface, middle, and bottom layers.

(*) The detectable levels in the monitoring by MEXT in the offshore areas are 4Bq/L for Iodine, 6Bq/L for Cesium-134, 9Bq/L for Cesium-137. Those by TEPCO in the area around the NPP are 7Bq/L for Iodine, 15Bq/l for Cs-134 and Cs-137.

[See Attachment 4: Readings of Sea Area Monitoring (MEXT)]

http://www.mext.go.jp/english/incident/1304192.htm

http://www.mext.go.jp/english/incident/1305954.htm

Further, MEXT has conducted simulations of future diffusion and concentration of radioactive substances in seawaters, utilizing the oceanographic prediction system JCOPE-2 with oceanographic data such as ocean currents and water temperature. The recent simulation results show that the levels of radioactive substances have become and will remain below the detectable levels in the offshore areas.

[See Attachment 5: Simulation of Radioactivity Concentrations in the Sea Area (MEXT)]

http://www.mext.go.jp/english/incident/1305758.htm

## 3. For smooth transaction and exports

While the safety of fishery products on the market is secured through the monitoring efforts and restrictive measures explained above, any trade partners may require the certificates of the measurement of radioactive substances. For this, 30 inspection institutes in Japan are available to provide measurement of radioactive substances for particular consignments of fishery products.

[See Attachment 6: List of Inspection Institutes in Japan]

In addition, relevant prefectural governments, with assistance of the Fisheries Agency, are planning to install simplified radiation measuring instruments at major fishing ports so as to introduce screening systems for fish landings there.

[See Attachment 7: Specs of a Simplified Radiation Measuring Instrument]

## 4. Scientific consideration---Middle and long-term impact on fishery products

The major radioactive substances discharged from the Fukushima NPP are radioactive Iodine-131 and Cesium-134 and Cesium-137. The impact of these radioactive substances on saltwater fish is expected to be limited, considering the following scientific facts.

(1)Dilution and diffusion of radioactive materials in the sea

Concentration levels of such radioactive substances are expected to rapidly and significantly decrease by dilution in the massive amount of the seawaters and by disperse with sea water currents/swirls. Radioactive substances released into the sea are to fall down to the bottom sediment while being attached and absorbed into suspended particles, and in the long term, they are considered to be transported to the deep-sea with the average depth of 3,800 meters, lying off the east coast of Japan.

(2)Bio-concentration of radioactive substances in saltwater fish

Radioactive half-life period of Iodine is 8 days. Therefore, even if fish intakes radioactive Iodine into its internal organs, it diminishes very shortly. For this short half-life, the transfer of radioactive iodine from seafood to human bodies is unlikely. With regard to radioactive Cesium, it has a longer half-life period (30 years). However, since Cesium behaves like Potassium in fish bodies, Cesium does not remain concentrated and is to be excreted through the gills and in the urine as the levels of radioactive substances in the surrounding seawater decreases.

The level of radioactive Cesium in fish has a close proportional relationship to that in the surrounding seawater, and it is known that the level of radioactive Cesium in fish is to decrease to around half in 50 days in the surrounding seawater with low levels of radioactive substances. This implies that measurements of radioactive substances in the seawater are important in estimating the levels of radioactive substances in fish. As mentioned above, most of the recent sampling measurements show that the levels of radioactive substances in the seawater at surface, middle, and bottom beyond the 30km-radius from the Fukushima NPP have been constantly below the limits of the detectable levels.

[See Attachment 8: Bio-accumulation or bio-concentration of radio nucleotides through food chain]

## Comparison of indices for restrictions on intake of foods

UNIT:Bq/kg

| | Cs-134, Cs-137 | | | | | I-131 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Drinking Water | Milk & Dairy products | Vegetables | Grain | Meat, Egg, Fish & Others | Drinking Water | Milk & Dairy products | Vegetables (ex: Root crops & Potatos) | Others |
| Codex (*) | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 100 | 100 | 100 | 100 |
| Japan | 200 | 200 | 500 | 500 | 500 | 300 | 300 | 2,000 | 2,000 |
| US | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 | 170 | 170 | 170 | 170 |
| EU | 200 | 200 | 500 | 500 | 500 | 300 | 300 | 2,000 | 2,000 |
| Thai | 500 | 500 | 500 | 500 | 500 | 100 | 100 | 100 | 100 |
| Singapore | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 100 | 100 | 100 | 100 |
| South Korea | 370 | 370 | 370 | 370 | 370 | 300 | 150 | 300 | 300 |
| Hong Kong | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 100 | 100 | 100 | 100 |
| Chinese Taipei | 370 | 370 | 370 | 370 | 370 | 300 | 55 | 300 | 300 |
| Philippines | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Vietnam | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 100 | 100 | 100 | 100 |
| Malaysia | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 100 | 100 | 100 | 100 |
| China | - | 330 | 210 | 260 | Meat, Fish & Crustacean 800<br>Potatos 90 | - | 33 | 160 | Meat and Fishery Product 470<br>Grain 190<br>Potato 89 |

(*) The index (100) by CODEX for Iodine shows a total of Sr-90, Ru-106, I-129, I-131 and U-234.

The index (1000) by CODEX for Cecium shows a total of S-35, Co-60, Sr-89, Ru-103, Cs-134, Ce-144 and Ir-192.

Attachment 1

**Attachment 2**

(Provisional translation)

Press Release

6 May, 2011

Fisheries Agency of Japan

The Fisheries Agency of Japan has established the "Basic Policy for Inspections on Radioactive Materials in Fishery Products", and notified to the relevant Prefectural and Metropolitan Governments and organizations.

## Basic Policy for Inspections on Radioactive Materials in Fishery Products

Inspections on radioactive materials in fishery products have been conducted in response to the emission of radioactive materials from the TEPCO Fukushima Daiichi Nuclear Power Plant. In order to strengthen our inspection on radioactive materials in fishery products, including fish species with their peak fishing season in upcoming months, the Fisheries Agency of Japan has established the "Basic Policy for Inspections on Radioactive Materials in Fishery Products", as follows.

### 1. Basic policy for inspection

(1) Inspection of coastal species

(a) From Kanagawa Prefecture to the southern part of Fukushima Prefecture

Based on formation of fishing grounds off the coast of each prefecture, Prefectural Governments should designate areas where inspection is necessary, and conduct sampling once a week in principle (once every two weeks in Kanagawa Prefecture and islands belonging to Tokyo Metropolis), at the main landing ports of each designated area. When sampling is conducted at markets, the area where the fish was caught should be confirmed.

Major species caught in each fishing season should be selected as the target species for inspection, taking into local circumstances into account. They should be selected to cover a wide spectrum of marine habitat such as surface (e.g. Juvenile Japanese sand lance), middle column (e.g. sea bass, sea bream) and bottom (e.g. flounder, conger eel), taking into account that larger amount of radioactive materials has been detected so far in species swimming in the surface (sand lance).

(b) Northern part of Fukushima Prefecture and to the north

Inspection should be conducted before resumption of fishery operations. Decision on whether to resume fishery operations should be based on the analysis results of the inspection.

When fishery operation is resumed, Prefectural Governments should designate areas where inspection is necessary, and conduct sampling once a week in principle (once every two weeks in Iwate Prefecture and to the north), at the main landing ports of each designated area.

Target species for inspection should be selected in accordance with the procedure (a) above.

(2) Migratory species (skipjack, Japanese jack mackerel, Pacific saury, etc.)

Inspections should be conducted through cooperation between relevant fisheries industry organizations and the Prefectural Governments where the fish is landed. (The inspection framework when the fishing grounds of such fish species move northward is under discussion among relevant parties, including industry organizations. Use of Hokusho-maru, a research fishing vessel of the Federation of North Pacific District Purse Seine Fisheries Co-operative Associations of Japan, in this framework will be considered.)

(a) Skipjack

After the formulation of fishing grounds off the coast of Izu Islands and Boso Peninsula (around the middle of May), inspections should be conducted once a week in principle (sampling should be conducted at the fishing ports in Chiba Prefecture where landing of skipjack is expected (namely Choshi and Katsuura fishing ports)).

When formation of fishing grounds off the coast of Fukushima Prefecture (usually 240-320 km off the coast) is expected (around early June), sampling by a trial fishing vessel should be conducted prior to commercial operations. Decision on whether to operate fishery in the area should be based on the analysis results. When fishery operation is to continue, sampling should be conducted once a week in principle at landing ports.

When fishing grounds are formed off the coast of Miyagi Prefecture and to the north, inspections should be conducted once a week in principle.

(b) Sardine and mackerel

While fishing grounds are formed off the coast of Chiba Prefecture, sampling should continue at the fishing ports in Chiba Prefecture where landing of sardine and mackerel is expected (namely Choshi fishing port).

When formation of fishing grounds off the coast of Ibaraki Prefecture is expected (in May), sampling by the research vessel of the Ibaraki Prefectural Fisheries Experimental Station should be conducted, in cooperation with the Ibaraki Prefectural Government. Decision on whether to operate fishery should be based on the analysis results. When fishery operation is to continue, sampling should be conducted once a week in principle at landing ports.

When formation of fishing grounds off the coast of Fukushima Prefecture is expected (in June), sampling should be conducted by a research fishing vessel. The rest of the procedure will be the same as described above.

When fishing grounds are formed off the coast of Miyagi Prefecture and to the north, inspections should be conducted once a week in principle.

(c) Pacific saury and salmon migrating southward

Starting from summer, inspections should be conducted once a week in principle.

**2. Amount of sample**

Sample size should be a sufficient amount to conduct inspection; i.e. 5kg or more per species in principle. The sampling site and date should be recorded.

**3. Additional notes**

Due to the migratory nature of fish, and to varying weather conditions, sampling of target species at the scheduled site and date may not always be possible. Sampling plans should be drawn up with ample flexibility to allow for these conditions.

**4. Publication of inspection results**

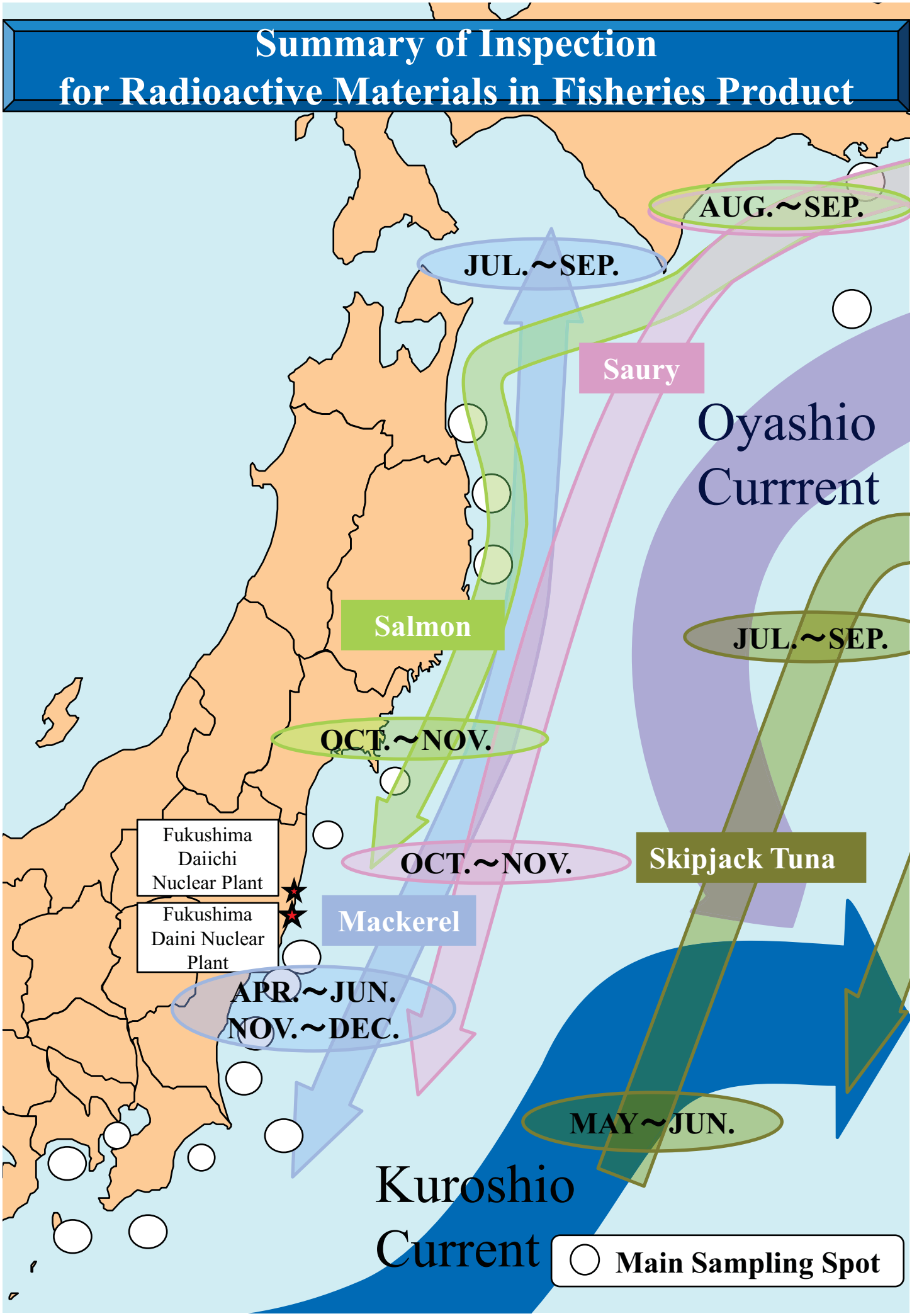
The publication and reporting to the Ministry of Health, Labor and Welfare of inspection results should be conducted by the prefectural Government in whose water the sample is caught, or in which the sampling port is located.

**5. Response to inspection results that exceed the Provisional Regulation Value in migratory species**

When inspection results exceeding the Provisional Regulation Value are detected in migratory species, the industry concerned will be requested to voluntarily refrain from relevant fishing operations around the site where the sample was caught (generally on a prefecture by prefecture basis). Then sampling by a research fishing vessel should be

conducted once a week in principle. Fishery operations could resume only after the inspection results are below the Provisional Regulation Value for 3 consecutive times.

For more information
Resources and Environment Research Division
Fisheries Agency of Japan
+81-3-3502-8487


Summary of Inspection
for Radioactive Materials in Fisheries Product
AUG.～SEP.
JUL.～SEP.
Saury
Oyashio
Currrent
Salmon
JUL.～SEP.
OCT.～NOV.
Fukushima
Daiichi
Nuclear Plant
Fukushima
Daini Nuclear
Plant
OCT.～NOV.
Skipjack Tuna
Mackerel
APR.～JUN.
NOV.～DEC.
MAY～JUN.
Kuroshio
Current
Main Sampling Spot

**Attachment 3**

Fisheries Agency of Japan

# Summary of Monitoring Results

of the levels of Radioactive Substances in Fishery products
(As of June 29, 2011)

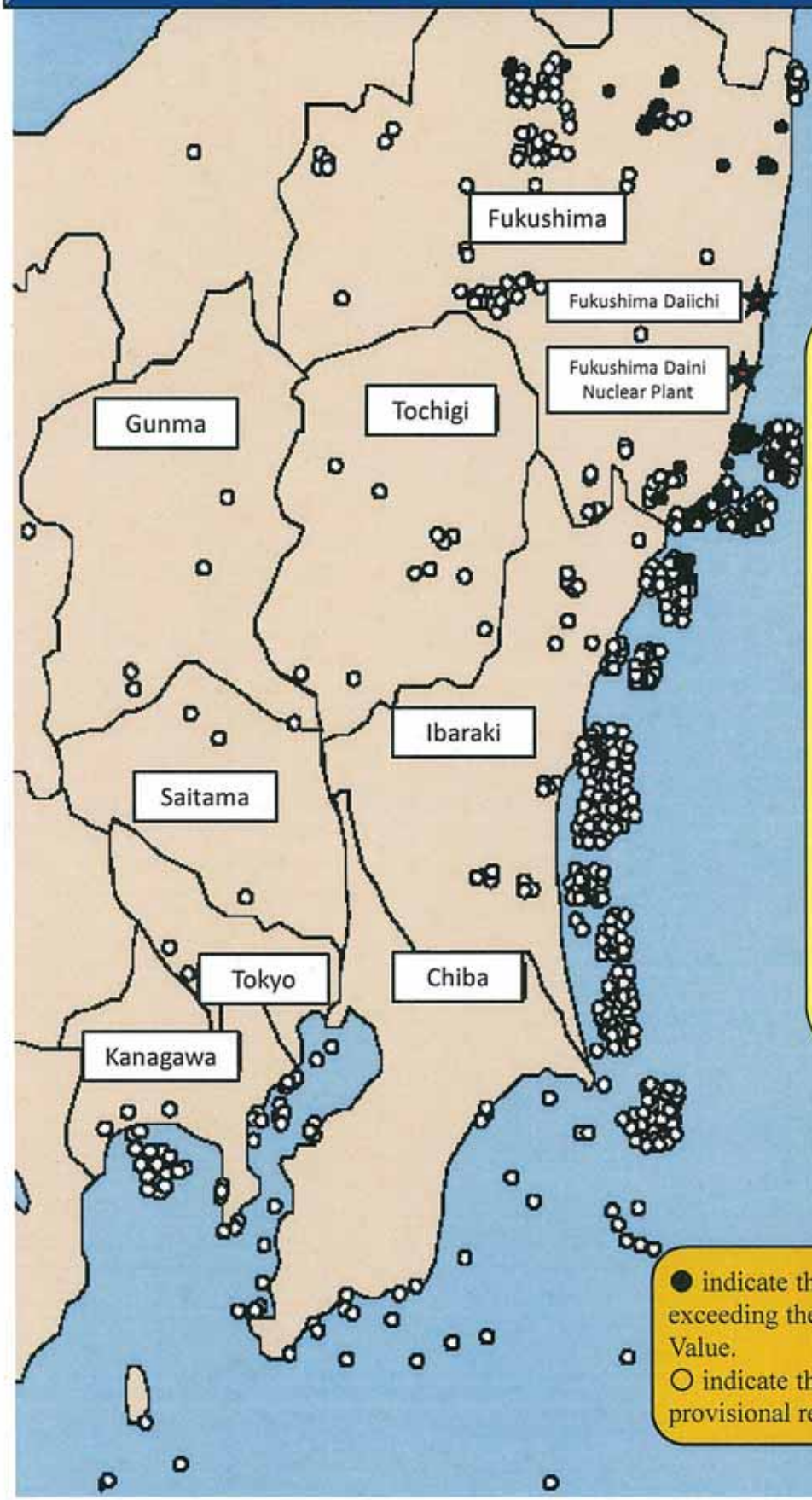
As of June 29, 767 fishery products have been sampled for the measurement the levels of radioactive materials. 57 samples out of the 767 showed the results exceeding the Provisional Regulatory Values.

| | | |
|---|---|---|
| Saltwater fish | 436 (*22) | Juvenile Japanese sandlance(12)<br>White bait(4)<br>Fat greenling (3)<br>Brown Hakeling (2)<br>Stone flounder(1) |
| Invertebrates | 113 (*7) | Mediterranean mussel(1)<br>North Sea urchin(2)<br>Surf clam(3)<br>Japanese mitten crab(1) |
| Seaweed | 34 (*5) | Wakame seaweed(1)<br>Hijiki seaweed(1)<br>Arame seaweed(3)) |
| Processed Seafoods | 14 (*0) | |
| Freshwater fish | 162 (*23) | Ayu sweetfish(10)<br>Land-locked cherry salmon(7)<br>Japanese smelt(2)<br>Japanese dace (3)<br>Whitespotted char(1) |
| Marine Mammals | 8(*0) | |

(*) Figures in brackets show the number of samples with results exceeding the Provisional Regulatory Values

Detailed information on the monitoring results are available on the following website;
http://www.jfa.maff.go.jp/e/inspection/index.html

# Implementation of the inspecion on radioactivity level in fisheries products (No.1)




As of 29 June

All coastal fisheries activities are voluntarily refrained in Fukushima Prefecture.

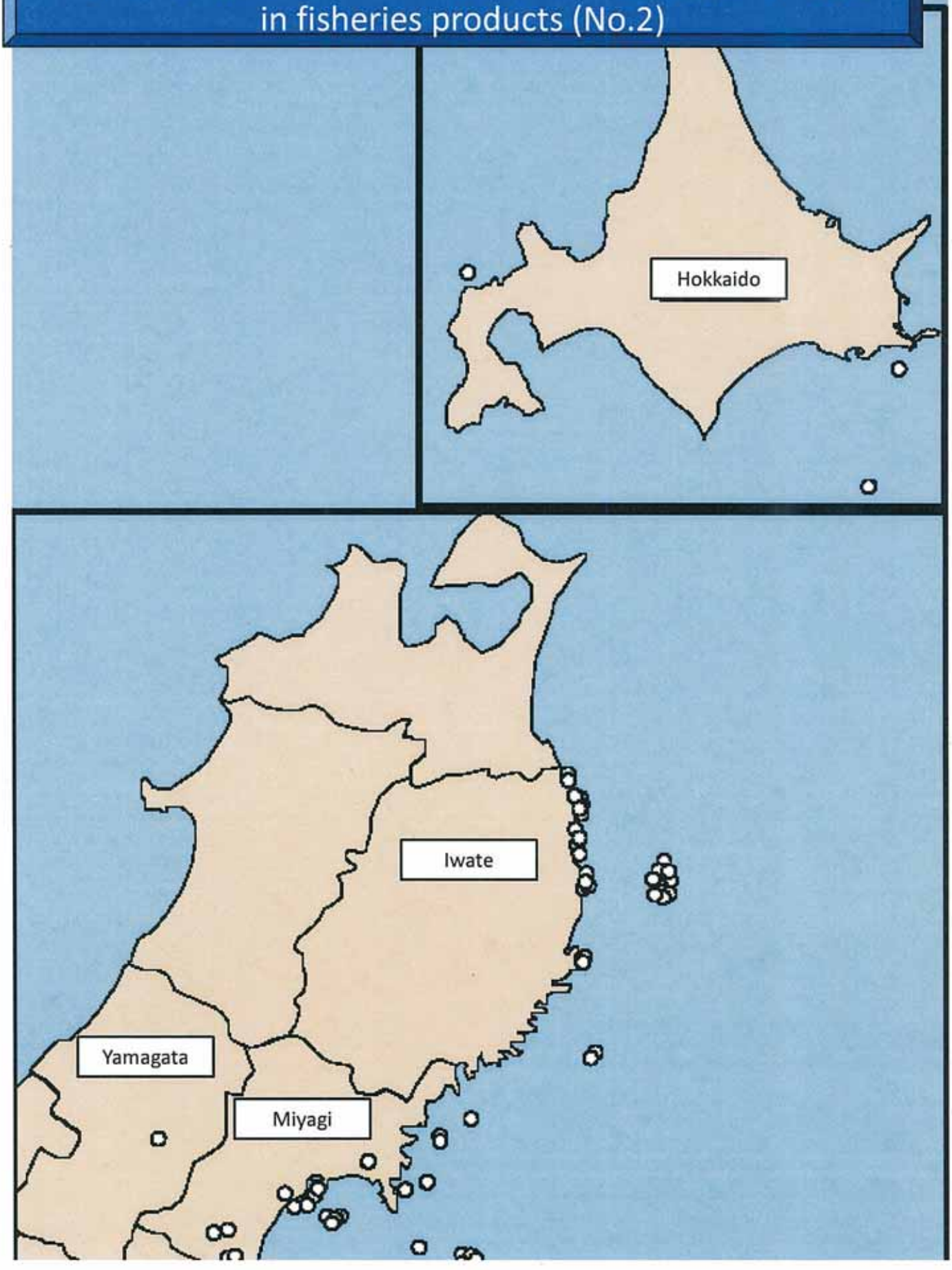
Fish species that exceeded the Provisional Regulation Value

- Japanese sandlance
- whitebait
- ayu sweetfish
- Japanese smelt
- Land-locked cherry salmon
- Mediterranean mussel
- Wakame seaweed
- Hijiki seaweed
- Arame seaweed
- Japanese dace
- Nothern sea urchin
- Surf clam
- Fat greenling
- Brown hakeling
- Stone flounder
- Whitespotted char
- Japanese mitten crab

2011 Fishing season for Japanese sand lance has ended in all the Ibaraki Prefecture area.

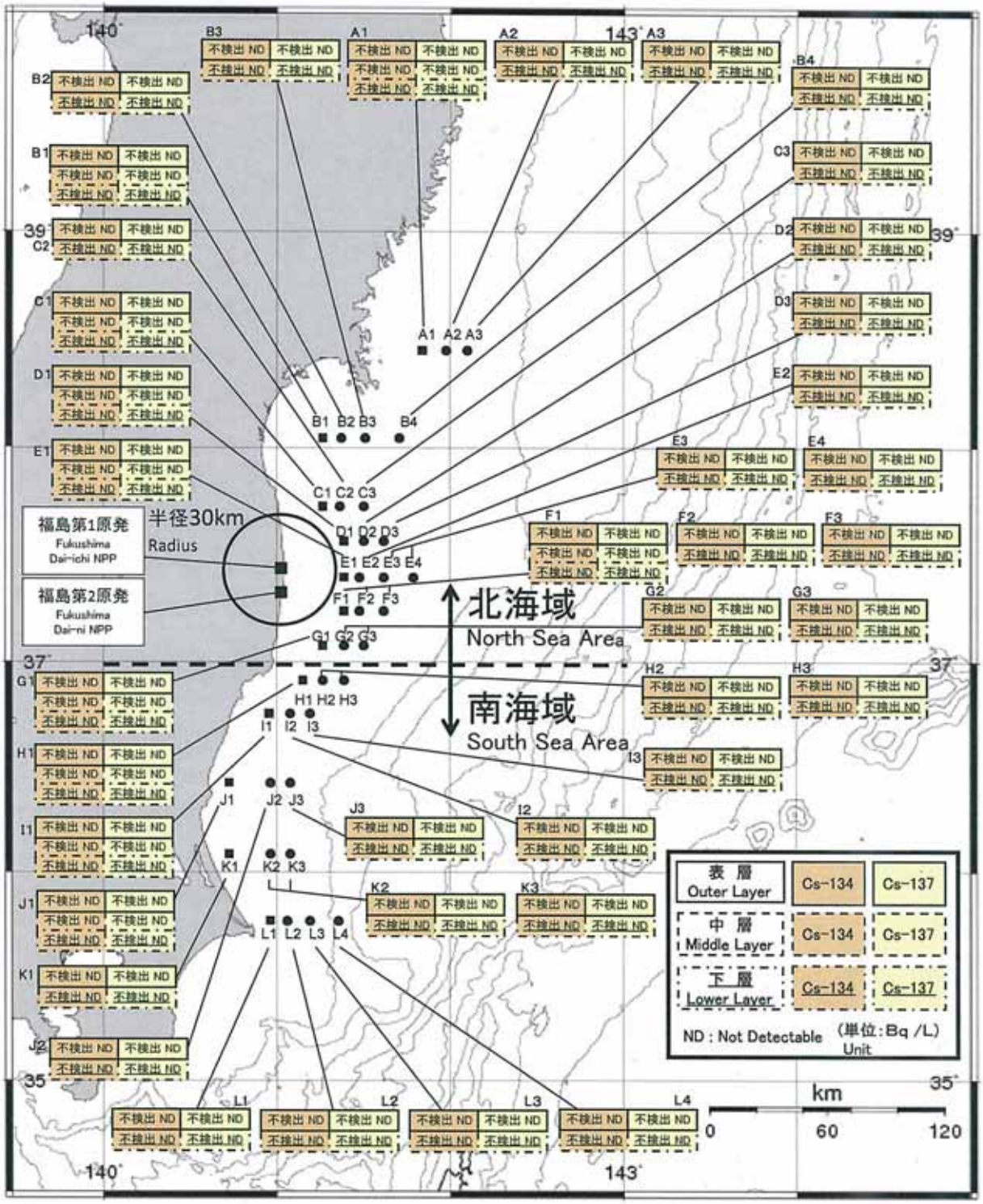
● indicate the inspection results exceeding the Provisional Regulation Value.
○ indicate the inspection results below provisional regulatory value:

# Implementation of the inspecion on radioactivity level in fisheries products (No.2)

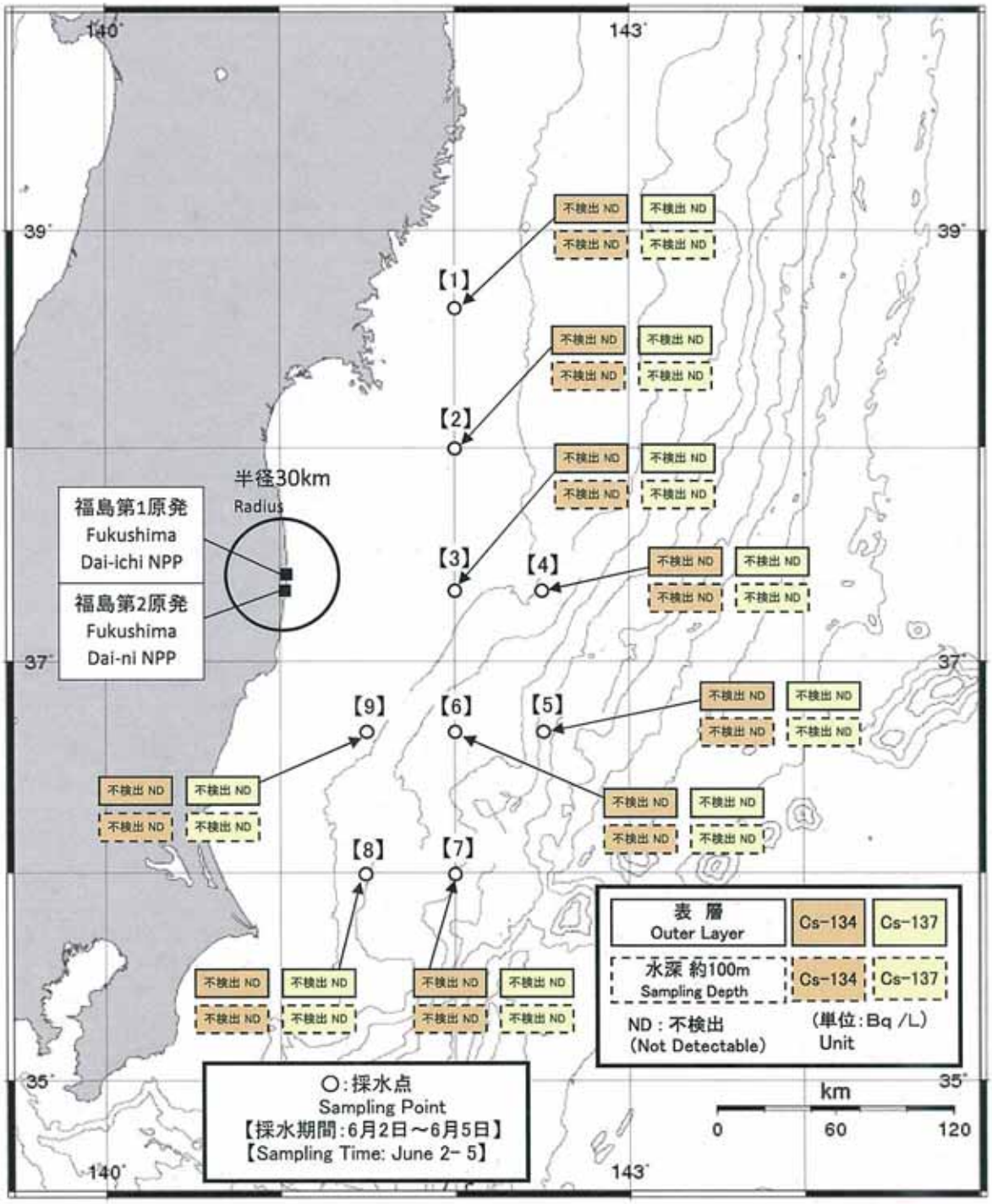


**Attachment 4**

# 海域モニタリング結果（平成23年6月6日～10日採水）
## Readings of Sea Area Monitoring (Jun 6-10, 2011)



# 海域モニタリング結果（平成23年6月2日～6月5日採水）
# Readings of Sea Area Monitoring (June 2- 5, 2011)



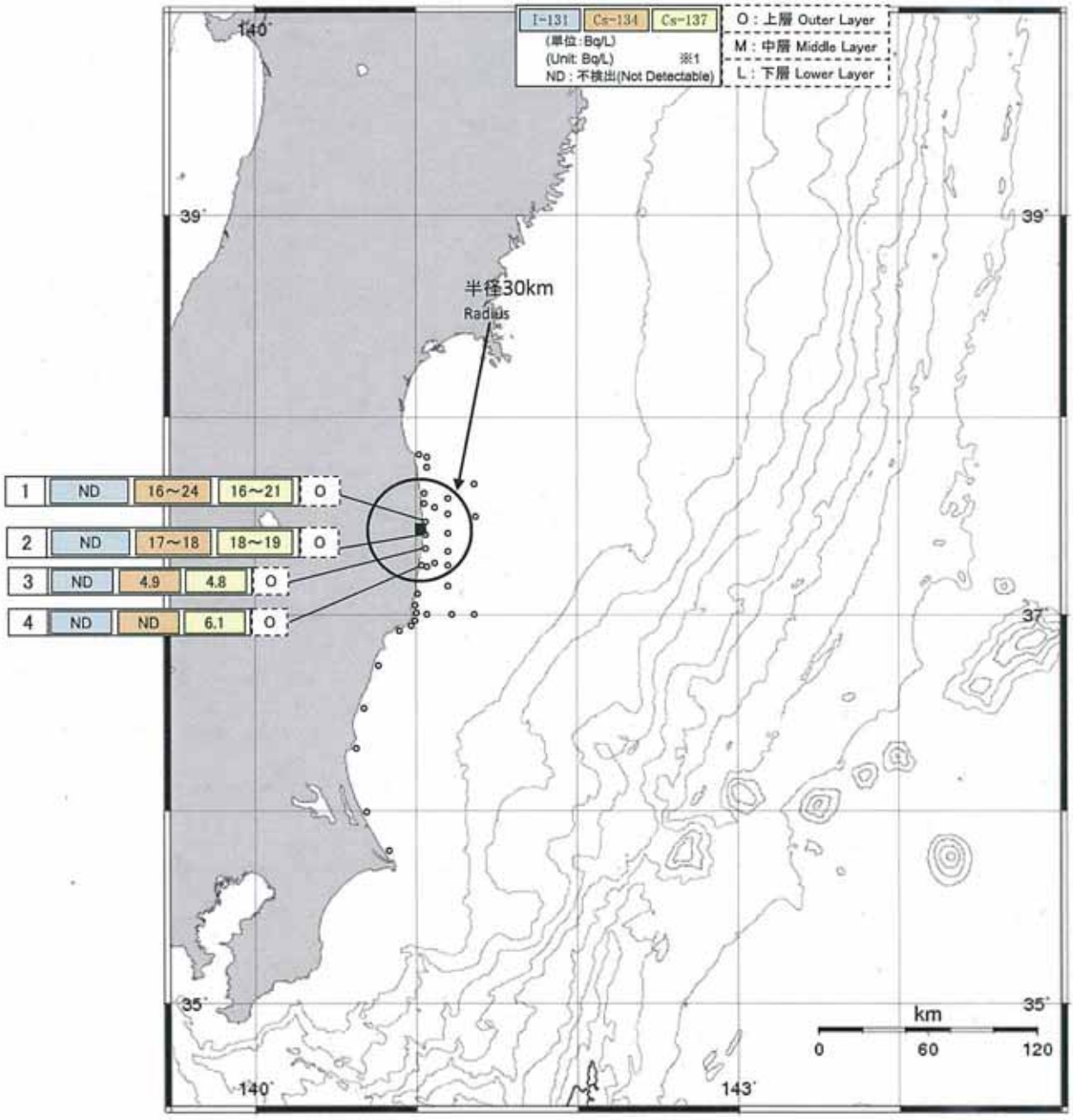

上記測定点の海水温及び塩分濃度については、独立行政法人 海洋研究開発機構の下記Webにて公開している。
The readings of temperatures and salinity levels of seawater at the measurement points are put on the websites of JAMSTEC bellow.
http://www.godac.jamstec.go.jp/monitoringdata/

# 東京電力株式会社福島第一原子力発電所周辺の海水中の放射能濃度分布

(Distribution map of radioactivity concentration in the seawater around TEPCO Fukushima Dai-ichi NPP)

(試料採取日：平成23年6月25日)

(Sampling Date: 2011/6/25)




図中の■は東京電力福島第一発電所を示す

*東京電力(株)の発表(http://www.tepco.co.jp/cc/press/index11-j.html)をもとに文部科学省が作成

(Based on the press release of TEPCO (http://www.tepco.co.jp/cc/press/index11-j.html)

※1 NDの記載は、海水の放射能濃度の検出値が検出限界値(I-131が約3Bq/L、Cs-134が約4Bq/L及びCs-137が約5Bq/L)を下回る場合。

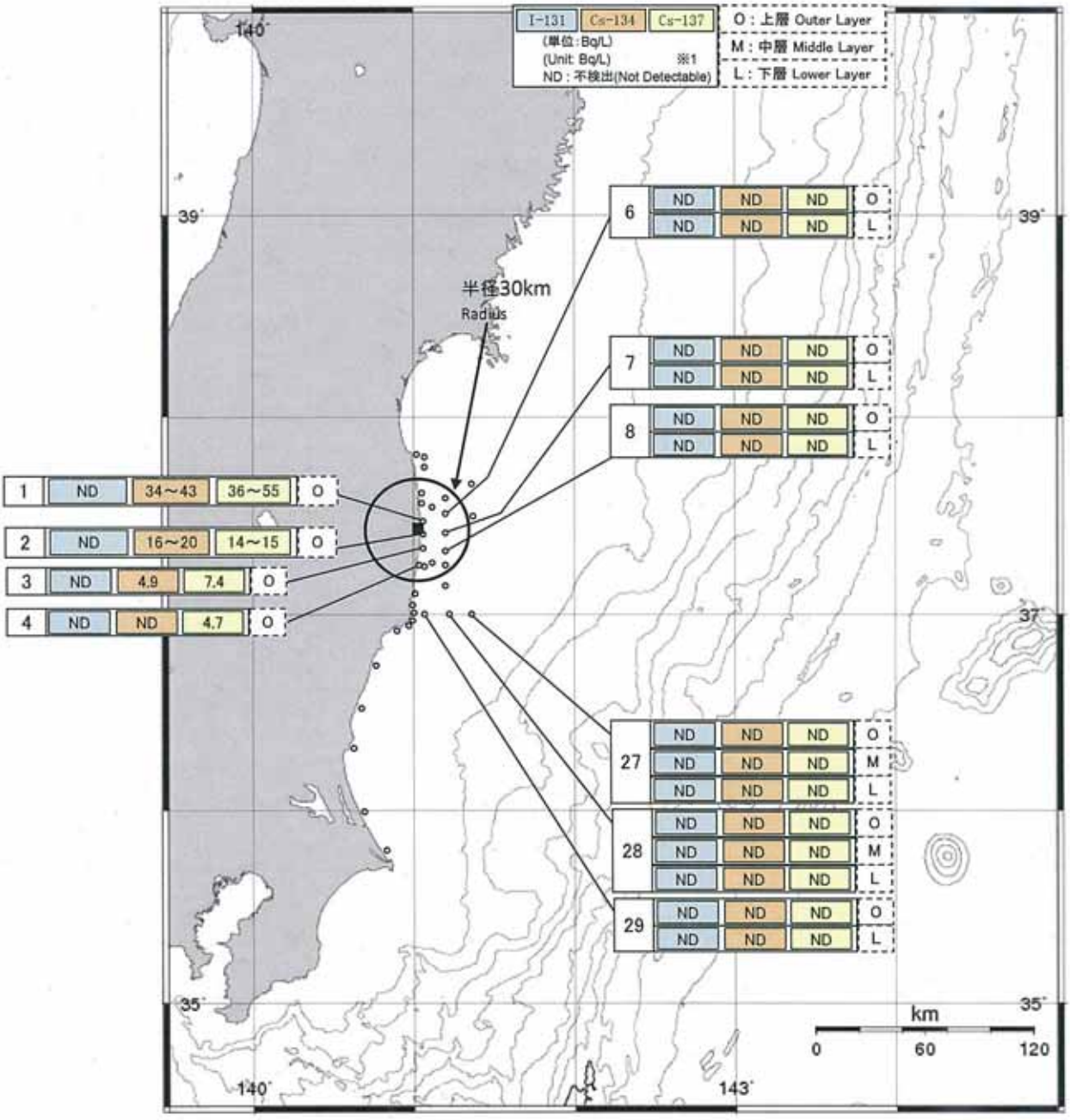
※1 ND indicates the case that the detected radioactivity concentration in sea water was lower than the detection limits of approximately 3Bq/L for I-131, 4Bq/L for Cs-134 and 5Bq/L for Cs-137.

# 東京電力株式会社福島第一原子力発電所周辺の海水中の放射能濃度分布

(Distribution map of radioactivity concentration in the seawater around TEPCO Fukushima Dai-ichi NPP)

(試料採取日：平成23年6月26日)

(Sampling Date: 2011/6/26)




図中の■は東京電力福島第一発電所を示す

*東京電力(株)の発表(http://www.tepco.co.jp/cc/press/index11-j.html)をもとに文部科学省が作成

(Based on the press release of TEPCO (http://www.tepco.co.jp/cc/press/index11-j.html)

※1 NDの記載は、海水の放射能濃度の検出値が検出限界値(I-131が約3Bq/L、Cs-134が約5Bq/L及びCs-137が約5Bq/L)を下回る場合。

※1 ND indicates the case that the detected radioactivity concentration in sea water was lower than the detection limits of approximately 3Bq/L for I-131, 5Bq/L for Cs-134 and 5Bq/L for Cs-137.

# 東京電力株式会社福島第一原子力発電所周辺及び茨城県沿岸の海水中の放射能濃度分布

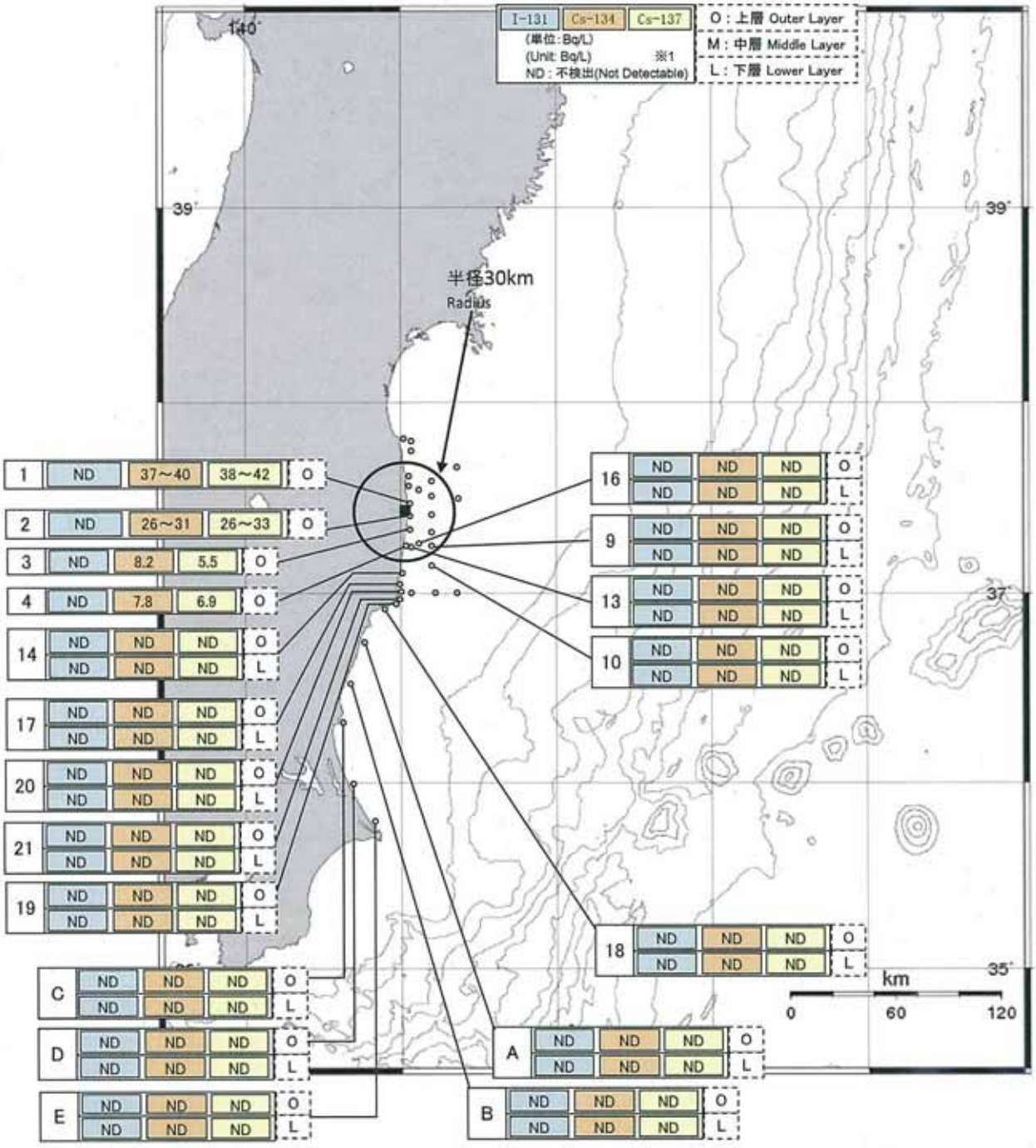
(Distribution map of radioactivity concentration in the seawater around TEPCO Fukushima Dai-ichi NPP and coast of Ibaraki Prefecture)

(試料採取日：茨城県沿岸　平成23年6月24日～25日)

(Sampling Date: Coast of Ibaraki Prefecture 2011/6/24-2011/6/25)

(試料採取日：東京電力福島第一原子力発電所周辺　平成23年6月27日)

(Sampling Date: Around TEPCO Fukushima Dai-ichi NPP 2011/6/27)




図中の■は東京電力福島第一発電所を示す

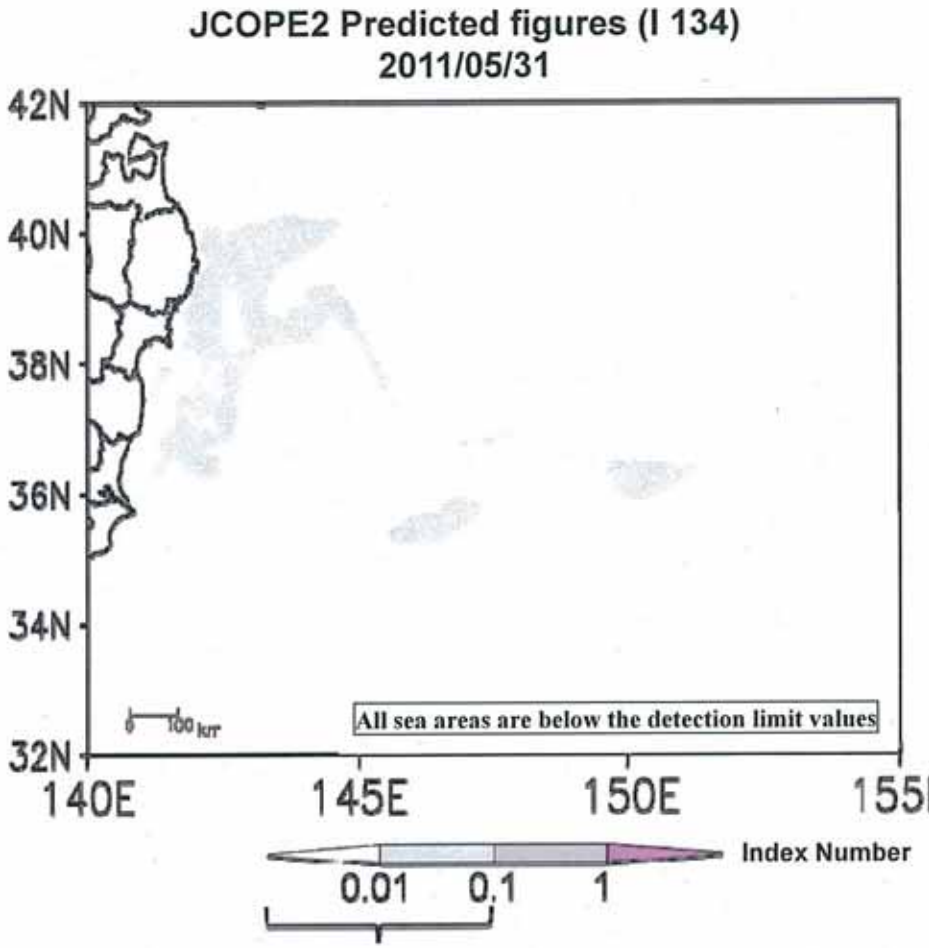
*東京電力(株)の発表(http://www.tepco.co.jp/cc/press/index11-j.html)をもとに文部科学省が作成

(Based on the press release of TEPCO (http://www.tepco.co.jp/cc/press/index11-j.html)

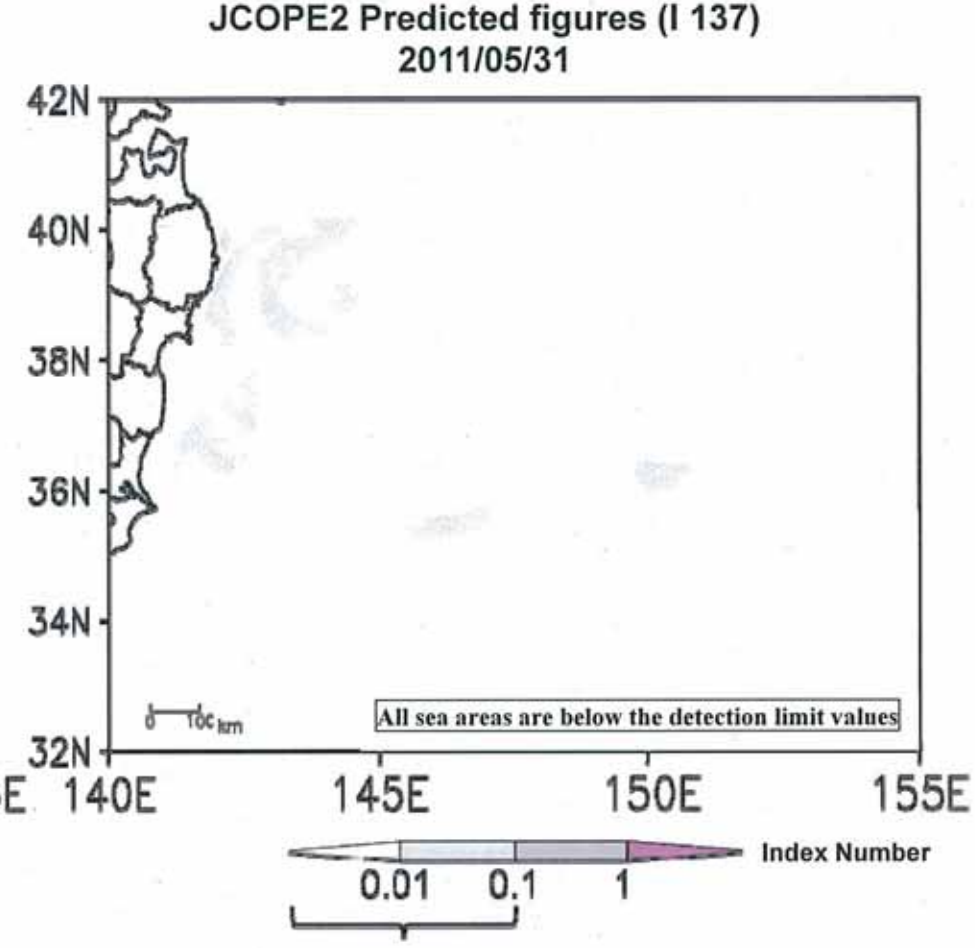
※1 NDの記載は、海水の放射能濃度の検出値が検出限界値(東京電力福島第一発電所周辺についてはI-131が約4Bq/L、Cs-134が約4Bq/L及びCs-137が約5Bq/L、茨城県沿岸についてはI-131が約7Bq/L、Cs-134が約17Bq/L及びCs-137が約16Bq/L)を下回る場合。

※1 ND indicates the case that the detected radioactivity concentration in sea water was lower than the detection limits of approximately 4Bq/L for I-131, 4Bq/L for Cs-134 and 5Bq/L for Cs-137 for around TEPCO Fukushima Dai-ichi NPP, approximately 7Bq/L for I-131, 17Bq/L for Cs-134 and 16Bq/L for Cs-137 for coast of Ibaraki Prefecture.

【[Figure 3-1] Simulation of Radioactivity Concentrations by JCOPE2 (May 31)
( based on data up to May 20)




Below the detection limit values



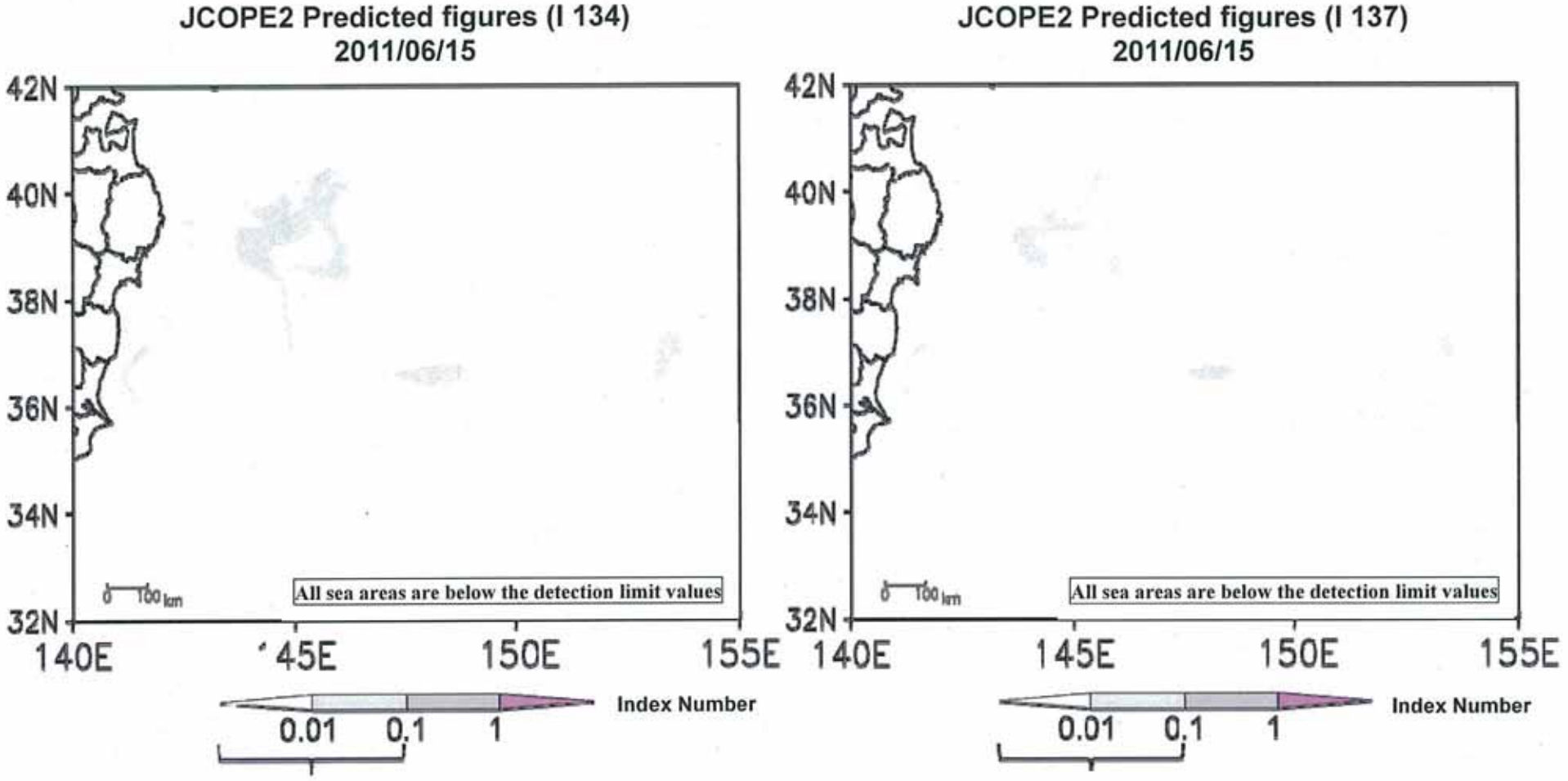

Below the detection limit values

{Note: The index numbers in the figure show how many times the maximum radioactivity concentrations predicted at each point are higher than the effluent concentration limits for nuclear facilities determined by regulations (Cs134: 60Bq/L, Cs137: 90Bq/L).}

*Currently, detection limit values are 6Bq/L(Cs134) and 9Bq/L(Cs137) in monitoring of sea areas near Fukushima Dai-Ichi NPP by the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

Attachment 5

【[Figure 3-2] Simulation of Radioactivity Concentrations by JCOPE2 (June 15)
( based on data up to May 20)



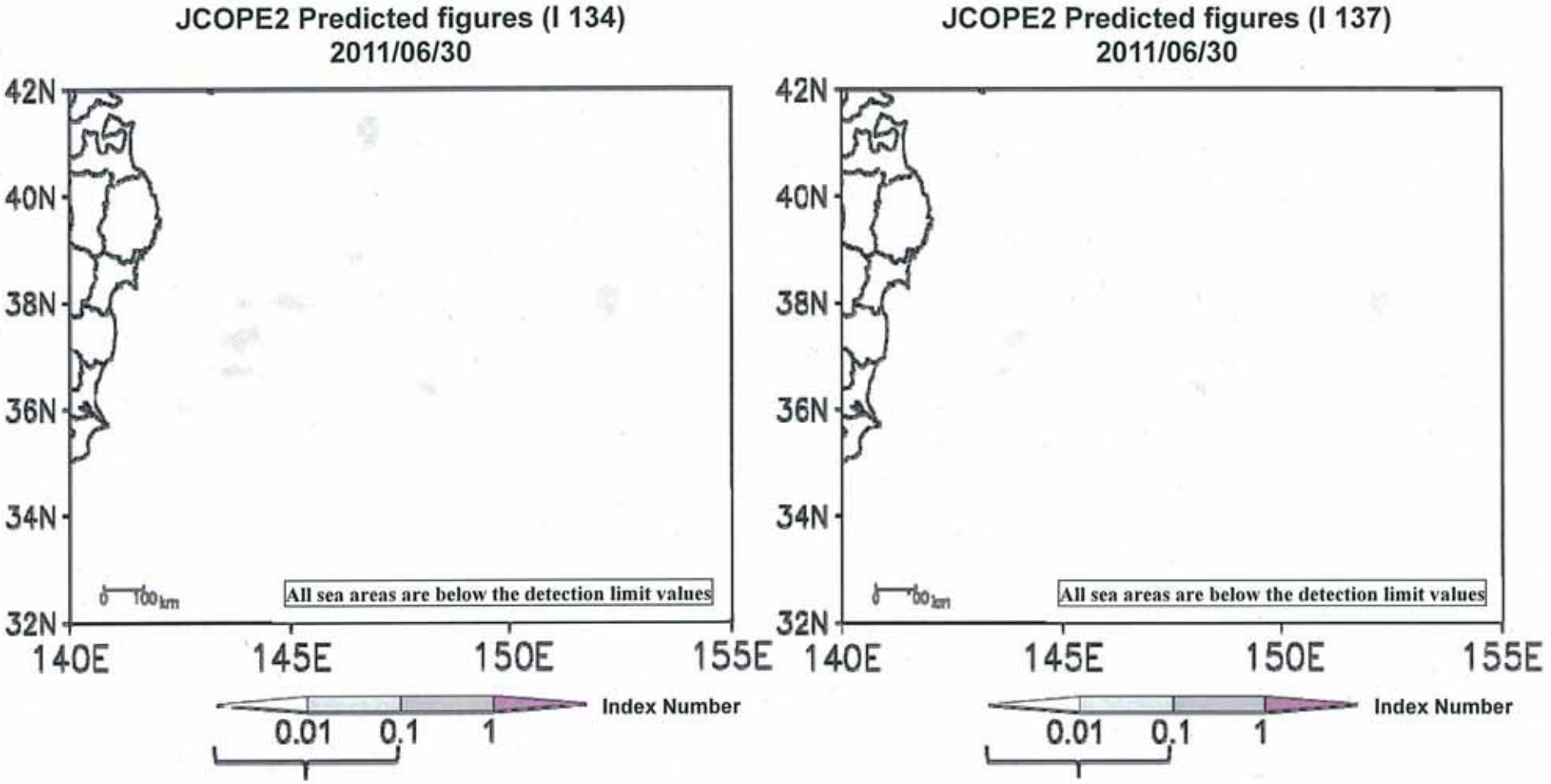

Below the detection limit values

Below the detection limit values

{Note: The index numbers in the figure show how many times the maximum radioactivity concentrations predicted at each point are higher than the effluent concentration limits for nuclear facilities determined by regulations (Cs134: 60Bq/L, Cs137: 90Bq/L).}

*Currently, detection limit values are 6Bq/L(Cs134) and 9Bq/L(Cs137) in monitoring of sea areas near Fukushima Dai-Ichi NPP by the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

【[Figure 3-3] Simulation of Radioactivity Concentrations by JCOPE2 (June 30)
( based on data up to May 20)



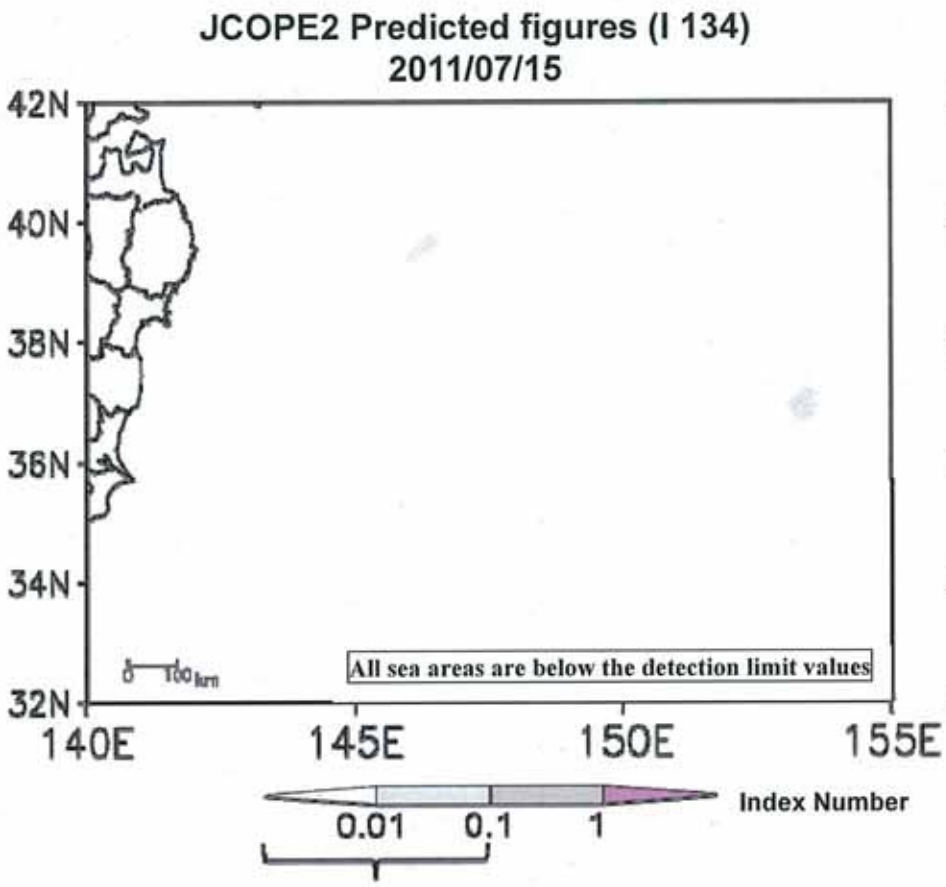

Below the detection limit values

Below the detection limit values

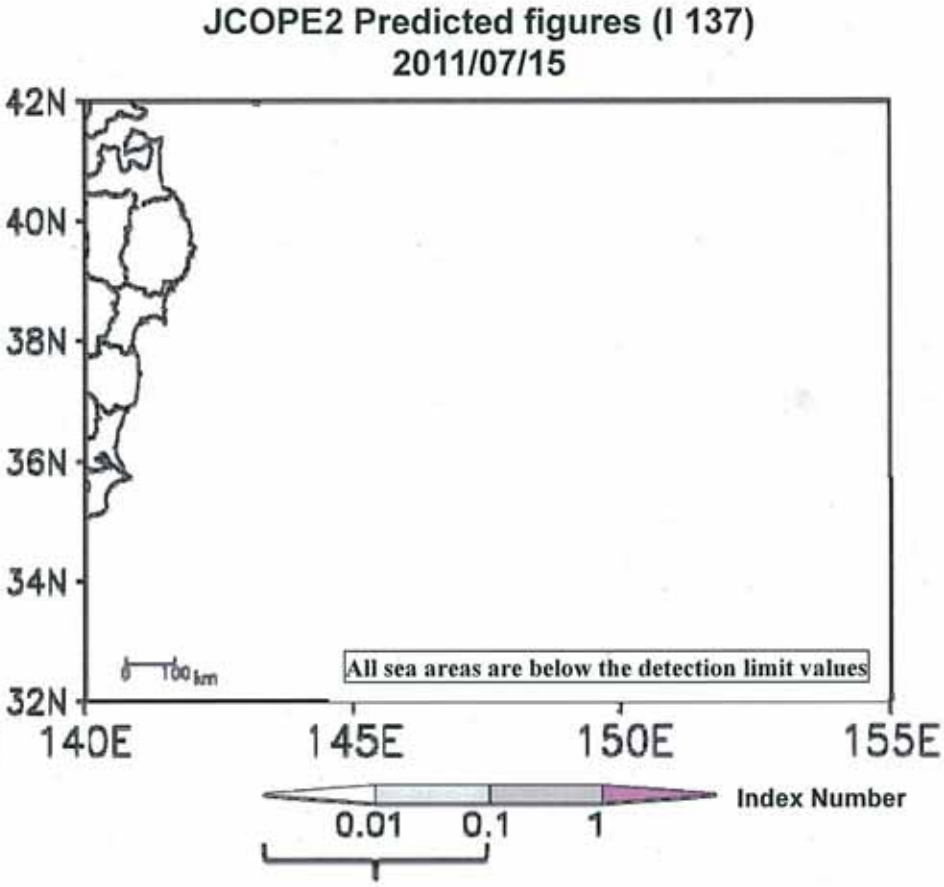
{Note: The index numbers in the figure show how many times the maximum radioactivity concentrations predicted at each point are higher than the effluent concentration limits for nuclear facilities determined by regulations (Cs134: 60Bq/L, Cs137: 90Bq/L).}

*Currently, detection limit values are 6Bq/L(Cs134) and 9Bq/L(Cs137) in monitoring of sea areas near Fukushima Dai-Ichi NPP by the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

【[Figure 3-4] Simulation of Radioactivity Concentrations by JCOPE2 (July 15)
( based on data up to May 20)




Below the detection limit values




Below the detection limit values

{Note: The index numbers in the figure show how many times the maximum radioactivity concentrations predicted at each point are higher than the effluent concentration limits for nuclear facilities determined by regulations (Cs134: 60Bq/L, Cs137: 90Bq/L).}

*Currently, detection limit values are 6Bq/L(Cs134) and 9Bq/L(Cs137) in monitoring of sea areas near Fukushima Dai-Ichi NPP by the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

# List of Inspection Institutes for Radioactive Substances in Foods

| No. | Inspection Institute (Japaese) | Inspection Institute (English) | Inspection Equipment | Status |
|---|---|---|---|---|
| 1 | 京都市衛生環境研究所 | - | Germanium Semiconductor Detector | In operation |
| 2 | 香川県産業技術センター | KAGAWA PREFECTURAL INDUSTRIAL TECHNOLOGY CENTER | Germanium Semiconductor Detector | Start in mid-July |
| 3 | 長崎県環境保健研究センター | Nagasaki Prefectural Institute for Environmental Research and Public H | Germanium Semiconductor Detector | Start in early-August |
| 4 | (財)食品環境検査協会 | Japan Inspection Association of Food and Food Industry Environment | Germanium Semiconductor Detector | In operation |
| 5 | (財)日本分析センター | Japan Chemical Analysis Center | Germanium Semiconductor Detector | In operation |
| 6 | (財)日本冷凍食品検査協会 | Japan Frozen Foods Inspection Corporation | Germanium Semiconductor Detector | In operation |
| 7 | (財)日本食品分析センター | Japan Food Reserch Laboratories | Germanium Semiconductor Detector | In operation |
| 8 | (社)青森県薬剤師会衛生検査センター | Aomori Pharmaceutical Association | NaI Scintillation Counter | In operation |
| 9 | (財)千葉県薬剤師会検査センター | - | Germanium Semiconductor Detector | In operation |
| 10 | (財)日本乳業技術協会 | Japan Dairy Technical Association | Germanium Semiconductor Detector | In operation |
| 11 | (財)新日本検定協会 | Shin Nihon Kentei Kyokai | Germanium Semiconductor Detector | In operation |
| 12 | (財)北海道薬剤師会公衆衛生検査センター | - | NaI Scintillation Counter<br>Germanium Semiconductor Detector | In operation<br>Start in early July |
| 13 | (財)新潟県環境衛生研究所 | Environmantal Science Reserch Niigata | Germanium Semiconductor Detector | In operation |
| 14 | (社)新潟県環境衛生中央研究所 | Niigata Environment Hygiene Central Laboratory Co. | Germanium Semiconductor Detector | In operation |
| 15 | (社)日本食品衛生協会食品衛生研究所 | Japan Food Hygiene Association Institute of Food Hygiene | Germanium Semiconductor Detector | In operation |
| 16 | (一般社団法人)日本海事検定協会 | Nippon Kaiji Kentei Kyokai | Germanium Semiconductor Detector | In operation |
| 17 | (株)島津テクノリサーチ | Shimadzu Techno-Reserch | Germanium Semiconductor Detector | In operation |
| 18 | (社)熊本県薬剤師会医薬品検査センター | Kumamoto Pharmaceutical Association | Germanium Semiconductor Detector | Start in early-July |
| 19 | (株)エフイーエーシー | FEAC | Germanium Semiconductor Detector | Start in early-July |

Attachment 6

| | | | | |
|---|---|---|---|---|
| 20 | (財)日本穀物検定協会 | Japan Grain Inspection Association | Germanium Semiconductor Detector | Start in early-July |
| 21 | (株)ユニチカ環境技術センター | UNITIKA ENVIRONMENTAL TECHNICAL CENTER | Germanium Semiconductor Detector | Start in early-July |
| 22 | 一般財団法人 山形県理化学分析センター | Research Laboratory of Science,Yamagata prefecture | Germanium Semiconductor Detector | Start in early-July |
| 23 | (財)宮城県公衆衛生協会 | - | Germanium Semiconductor Detector | Start in early-July |
| 24 | (財)食品分析開発センターSUNATEC | Food Analysis Technology Center | Germanium Semiconductor Detector | Start in early-July |
| 25 | (株)日本食品エコロジー研究所 | Japan Institute of Foods Eology | Germanium Semiconductor Detector | Start in early-July |
| 26 | (株)北陸環境科学研究所 | - | Germanium Semiconductor Detector | Start in early-July |
| 27 | (社)大分県薬剤師会検査センター | | Germanium Semiconductor Detector | Start in mid-July |
| 28 | (株)静環検査センター | Seikan | Germanium Semiconductor Detector | Start in early-July |
| 29 | (財)東京顕微鏡院 | - | Germanium Semiconductor Detector | Start in late-July |
| 30 | 日本環境科学㈱ | Japan Environment Science CO., LTD. | Germanium Semiconductor Detector | Start in late-July |

**Attachment 7**

## ACTIVITY MEASUREMENT

### Activity Monitor LB 2045/LB 742

Modern gamma spectroscopy system for nuclide-specific activity measurements in foodstuffs, liquids, bulk goods in Bq/l

- Detection limit approx. 1 Bq/l
- Connection for scintillator probes
- 3 different energy ranges
- Spectrum presentation (1024 channels)
- One or two energy windows
- Nuclide library
- Storage of spectra or ROI data
- Half-life correction
- Weight entry and spillover correction.

Intuitive user guidance: operation via softkeys on the display

Several service functions are available: background measurement, energy calibration and spectrum recording

### Measurement/Spectrum

| | |
|---|---|
| ADC | 1024 channels, 7 µs max. conversion time |
| Energy ranges | 0-256 keV, 0-1024 keV, 0-2048 keV |
| Energy calibration | non-linear empirical function |
| Region of interest | max. 2 ROIs |
| Nuclide library | max. 50 nuclides |

### Data Acquisition/Computer

| | |
|---|---|
| Processor | Motorola MC68340 32 bit 16 MHz |
| Display/Touch panel | Graphical LC display 320 x 240 pixels |
| Memory | max. 70 spectra or 800 ROI values |
| Serial interface | RS232 |

### General Specifications

| | |
|---|---|
| High voltage supply | 0-1300 Volt, polarity positive, resolution 12 bit |
| Power supply (wide-range input) | 85-264 VAC, 47-65 Hz |
| Protection class | IP 54 |
| Temperature range | -5°C to +40°C |
| Relative humidity | 0% to 90% (no condensation) |
| External dimensions | 245 x 145 x 325 mm (W x H x T) |
| Weight | 3.3 kg |

### SZ 50 U 8S8/2E-X scintillation probe

| | |
|---|---|
| Detector | NaI crystal 2" x 2" with photomultiplier and voltage divider |
| Resolution | 7.5 % (FWHM) for $^{137}$Cs 661 keV |
| External diameter | 65 mm |
| Complete cable set | 2 m |

### Shielding LB 7428 A

Lead chamber for 2" probes
50 mm lead shielding for 0.4 l Marinelli beakers

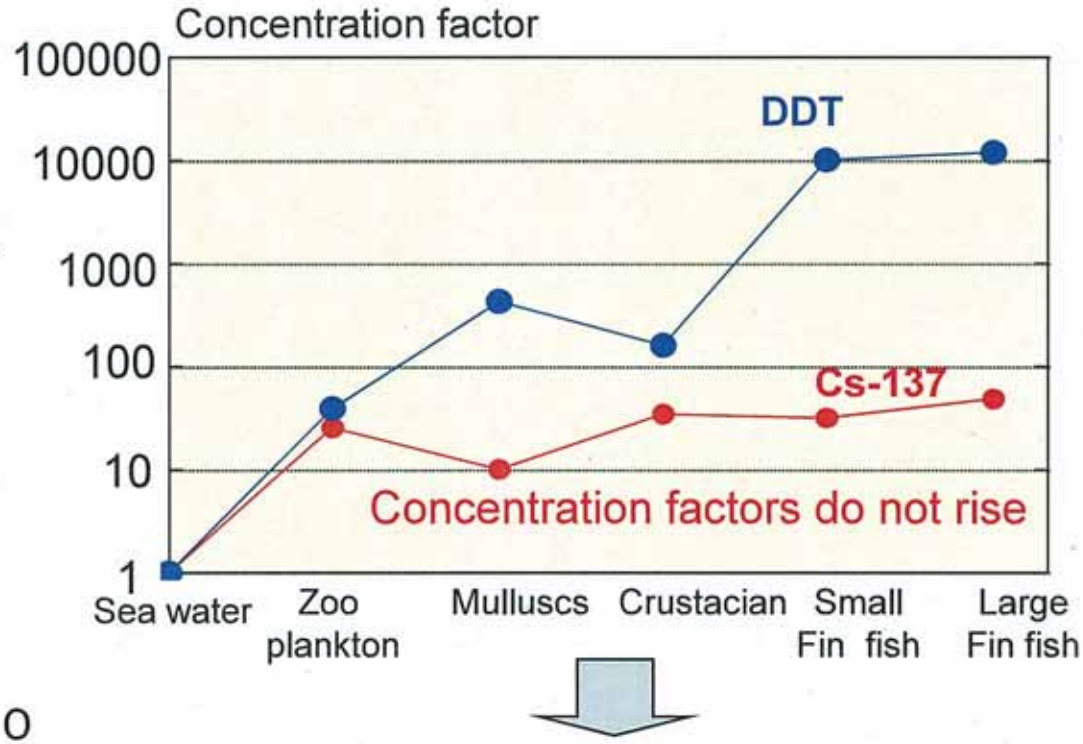
| | |
|---|---|
| Weight | approx. 75 kg |

**Berthold Technologies GmbH & Co. KG • Calmbacherstraße 22 • 75323 Bad Wildbad, Germany**
**Tel: (+49) 7081-177-0 • Fax: (+49) 7081-177-100 • nuclear@Berthold.com • www.Berthold.com**

# Bio-accumulation or bio-concentration of radionucleotides through food chain

$$\text{Concentration factor} = \frac{\text{Concentration in fish body}}{\text{Concentration in sea water}}$$

| Materials | Concentration Factor of marine fish |
|---|---|
| Cs | 5～100 |
| I | 10 |
| U | 10 |
| Pt | 3.5 |
| Hg | 360～600 |
| DDT | 12000 |
| PCB | 1200～1000000 |




- Very low Concentration Factors

- Bio-accumulation or bio-concentration of radionucleotides through food chain is not increasing.

Why are not accumulated ?

Referance:
Fujio Kasamatsu
bio-concentration Edit. N. Yamagata、
Radioisotopes 48, 1999.



Attachment 8

# Iodine and Cesium

- Iodine .....solid/gaseous（sublimation nucleotide）

  I-131　(Half life time: 8.04 days)

- Cs.....solid , behaves like potassium :

  does not accumulate to specific organs

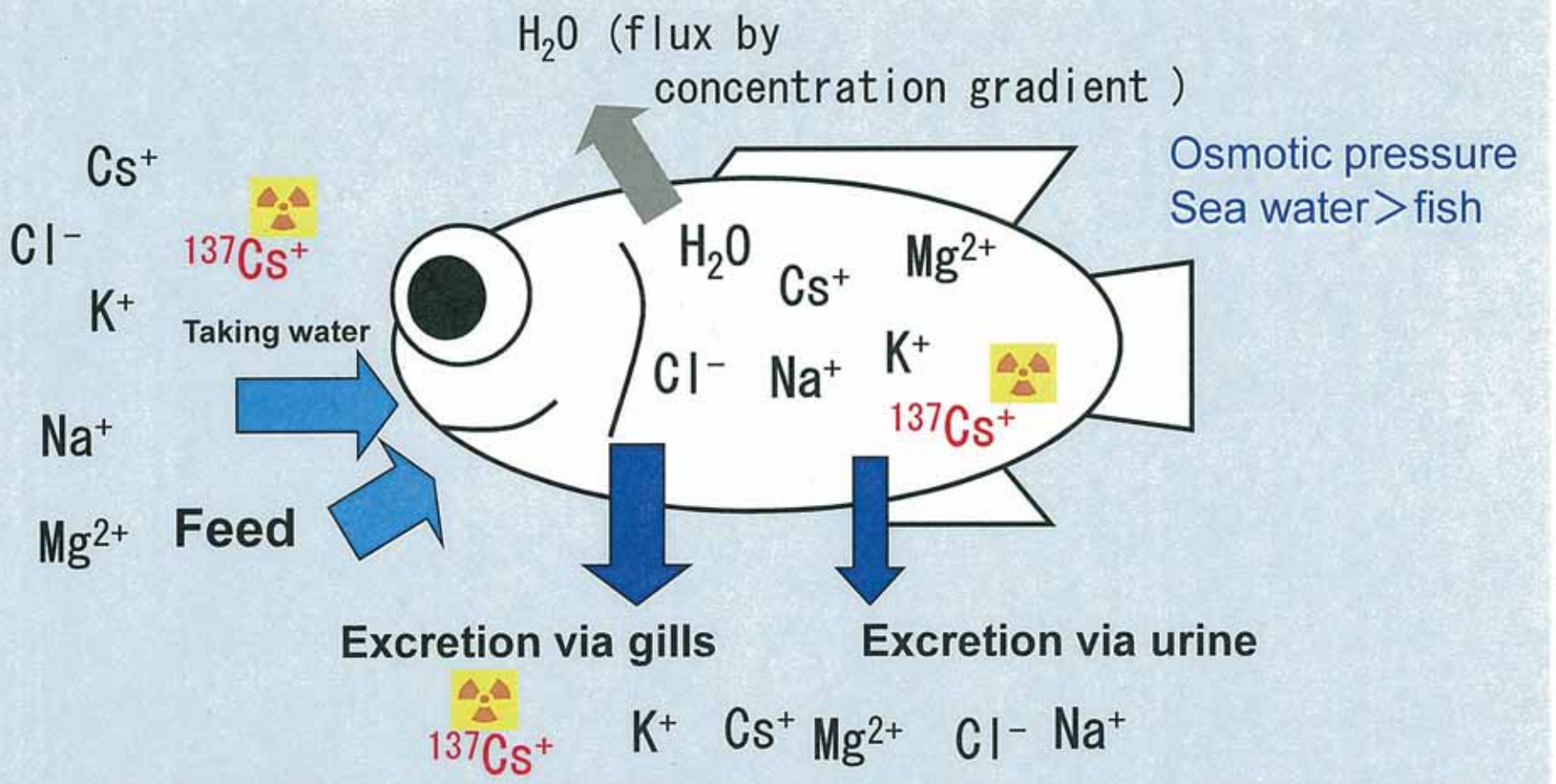
  Cs-137 (Half life time :30.1years),

  Cs-134 (Half life time: 2.07years)

Periodic table

| | 1A | 2A | 3A | 4A | 5A | 6A | 7A | 8 | | | 1B | 2B | 3B | 4B | 5B | 6B | 7B | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | H | | | | | | | | | | | | | | | | | He |
| 2 | Li | Be | | | | | | | | | | | B | C | N | O | F | Ne |
| 3 | Na | Mg | | | | | | | | | | | Al | Si | P | S | Cl | Ar |
| 4 | K | Ca | Sc | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ga | Ge | As | Se | Br | Kr |
| 5 | Rb | Sr | Y | Zr | Nb | Mo | Tc | Ru | Rh | Pd | Ag | Cd | In | Sn | Sb | Te | I | Xe |
| 6 | Cs | Ba | * | Hf | Ta | W | Re | Os | Ir | Pt | Au | Hg | Tl | Pb | Bi | Po | At | Rn |
| 7 | Fr | Ra | ** | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| * | La | Ce | Pr | Nd | Pm | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | | | |
| ** | Ac | Th | Pa | U | Np | Pu | Am | Cm | Bk | Cf | Es | Fm | Md | No | Lr | | | |

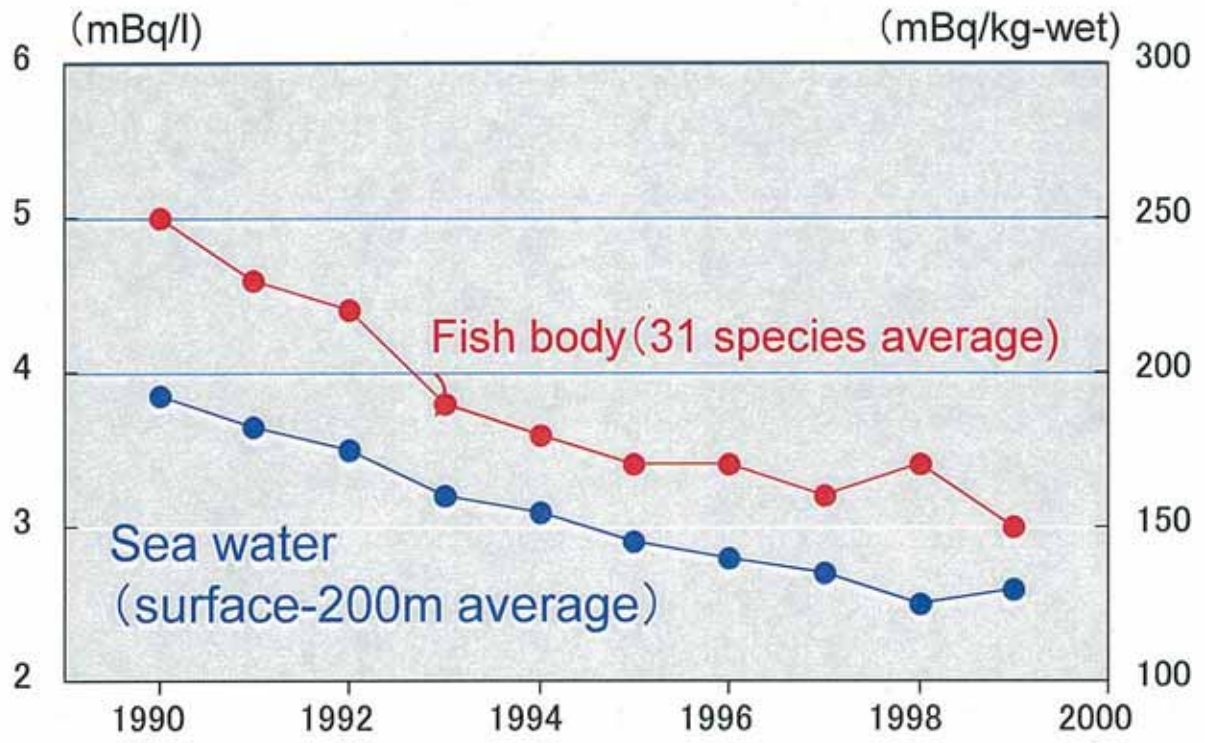
# The flow of salts in marine fish body




- Radionucleotides excrete, not accumulate.
- The concentration in fish is depend on the concentration of environmental water .

(Ref: Fundamental physiology of fish Edit. K. Aida)

# Comparison of Cs-137 concentration between sea water and fish body

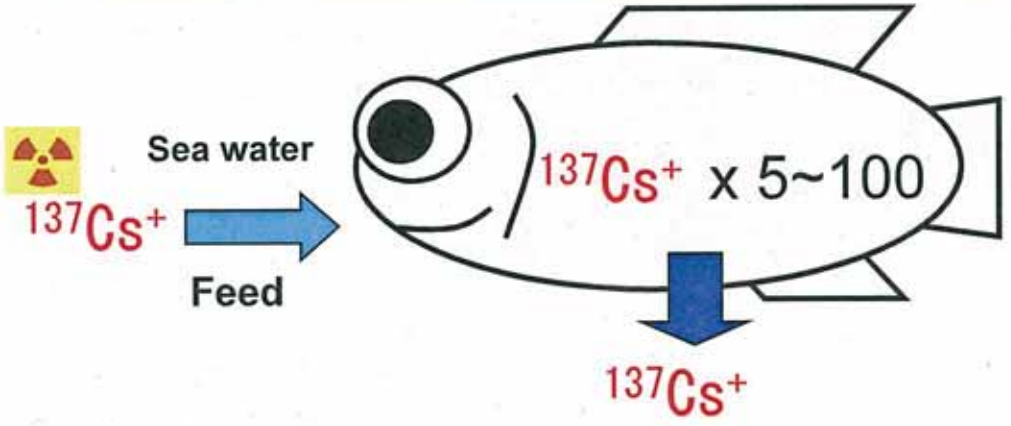



Cs-137 concentration annual changes in Japan coast

- Fish body concentration depends on sea water concentration

(Ref. : F. Kasamatsu Aquabiology 122, 1999)

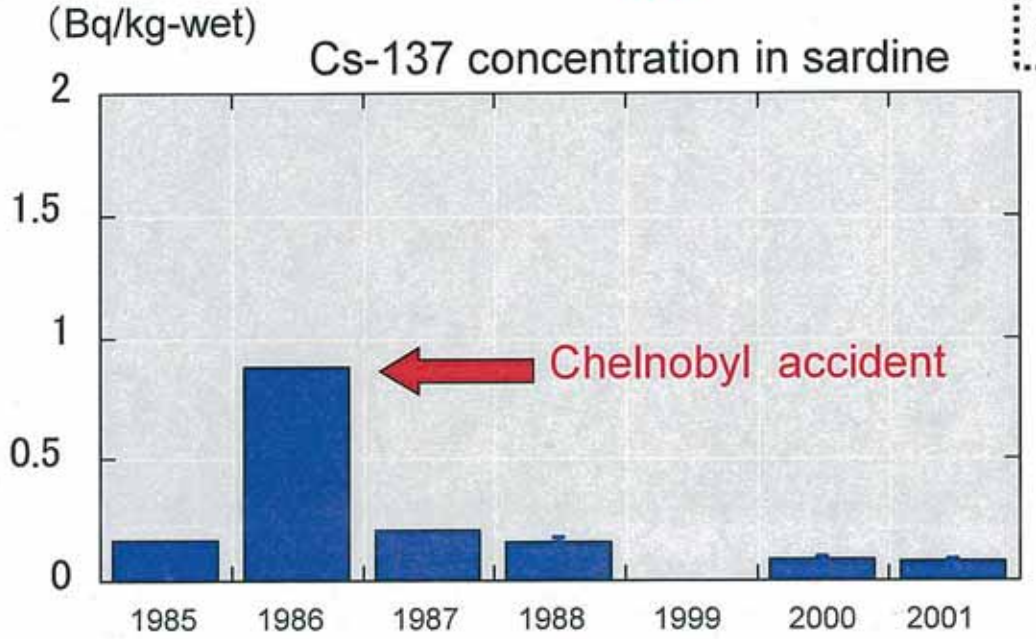
# Excretion of radio nucleotides




Biological half time of

Cs-137＝50 days

The half of Cs-137 is excrete in 50days. (Laboratory work result)




- In natural condition Cs-137 excretes quickly.

Ref:
K. Yoshida 、JCAC 34, 1999.
F. Kasamatsu、Radioisotopes 48, 1999.