

Effects of radioactive contamination on fisheries resources and wildlife

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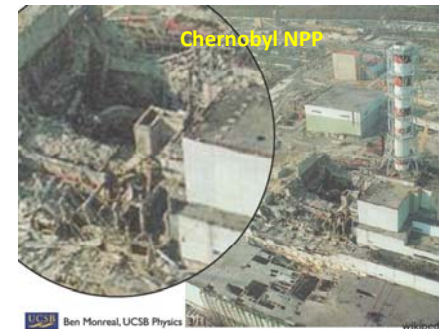
Special thanks to

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Tetsuo Yasutaka 保高徹生,
Daisuke Tsumune 津旨大輔;
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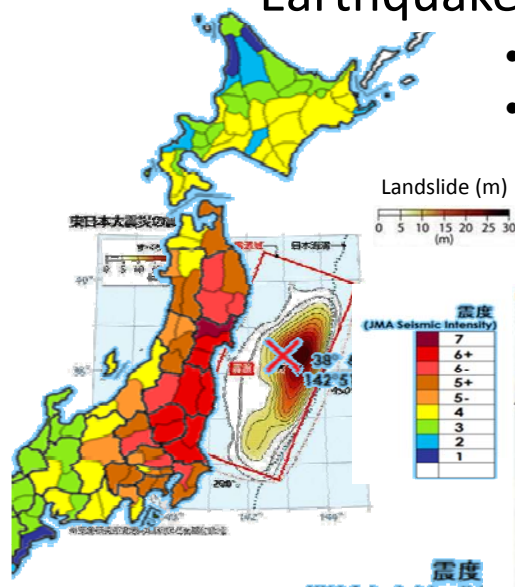


Overview

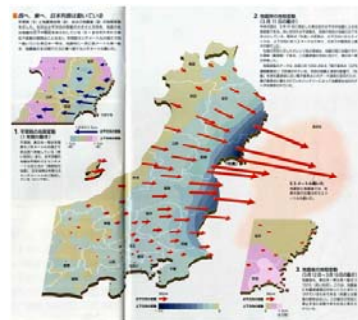
- What happened during March 11-16?
- Monitoring of radiation activities
- Cancer risk
- Radioactive contamination in seafood.



Earthquake 2011.3.11



- 3.11 14:46 Earthquake
- 3.11 15:46 Tsunami attacked on Fukushima-Daiichi NPP



<http://www.imart.co.jp/tohoku-hisachii-jyouhou.html#houshano-oen-saigai>

Ground subsidence



Kesen-Numa Port (photo by N. Hayashi)



Tsunami attacked



Kamaishi city
"ebb" of tsunami

津波の引けで海底露出

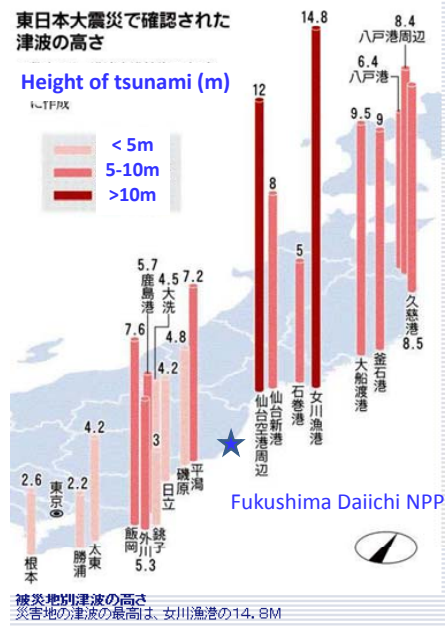
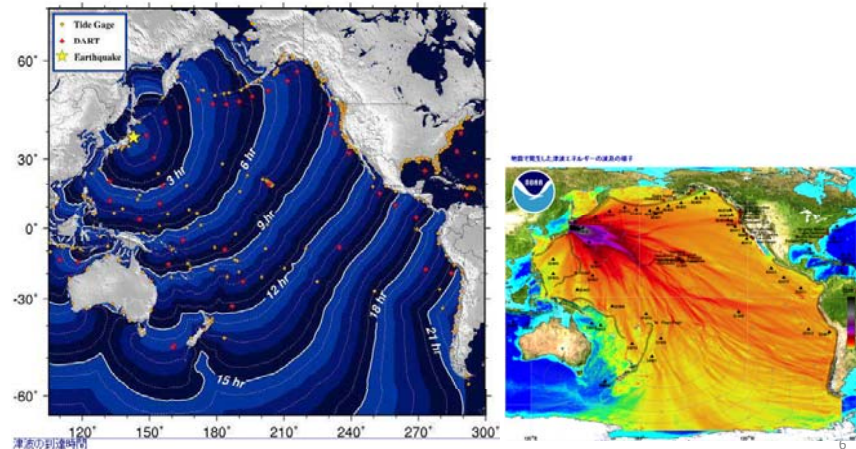


Tsunami overtopped a breakwater.

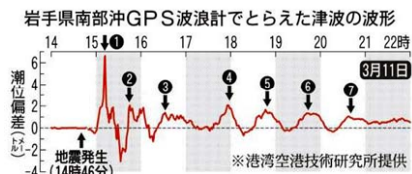
津波 防波堤を超える

Tsunami travel time

Tsunami Travel Times



Height of tsunami



Haramachi Thermal Power Plant was damaged by tsunami



Reaktor	OP	UC	PL	CL
PWR	■	□	□	□
BWR	■	□	□	□
その他	▲	▲	▲	▲

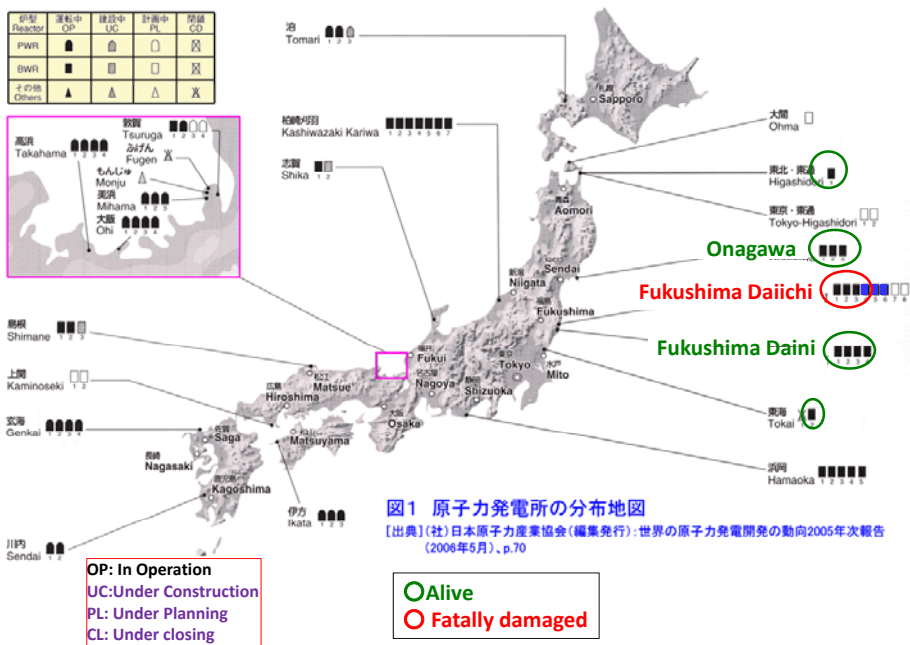


図1 原子力発電所の分布地図
 【出典】(社)日本原子力産業協会(編集発行):世界の原子力発電開発の動向2005年次報告(2006年5月), p.70

http://www.rist.or.jp/atomica/data/dat_detail.php?Title_No=02-05-01-09

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Timetable of Fukushima Daiichi NPP accident

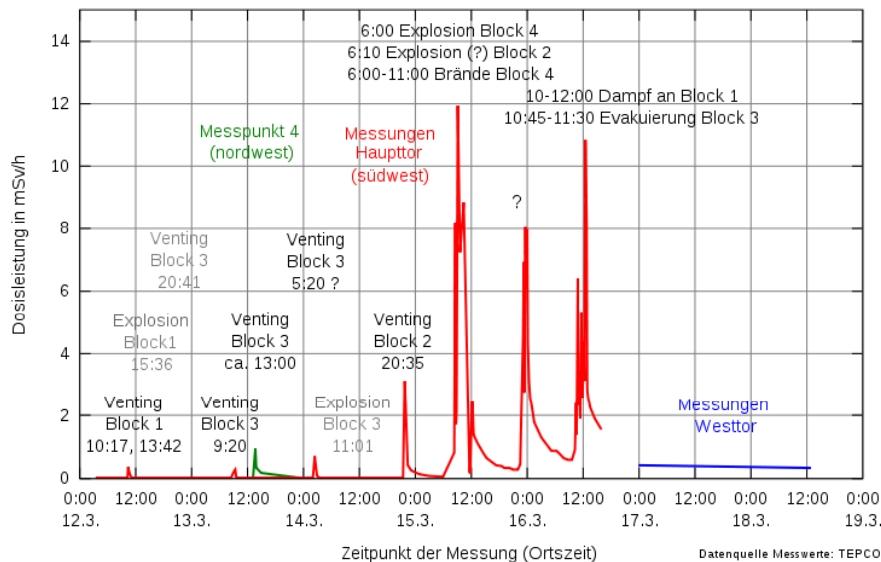
- 3.11 14:46: Nuclear reactors 1, 2, and 3 were automatically shut down by the shake. Reactors 4, 5, and 6 were undergoing routine maintenance and were not operating, (reactor 4 was defueled in November 2010). Units 1 and 2 were not operating correctly and notified the proper officials.
- 3.11 ca 15:46: A 14m tsunami overtopped the seawall (5.7m) disabling the backup diesel generators. The automatic depressurization systems all failed.
- 3.12 15:36: A massive explosion in the outer structure of unit 1 happened, four workers were injured.
- 3.14 11:01: Unit 3 reactor bldg exploded, injuring six workers.
- 3.16 ca14:30 The fuel rod storage pool of unit 4 may have begun boiling. 18:00 Workers had been withdrawn because of the radiation rising to 1000 mSv/h.

http://en.wikipedia.org/wiki/Timeline_of_the_Fukushima_Daiichi_nuclear_disaster

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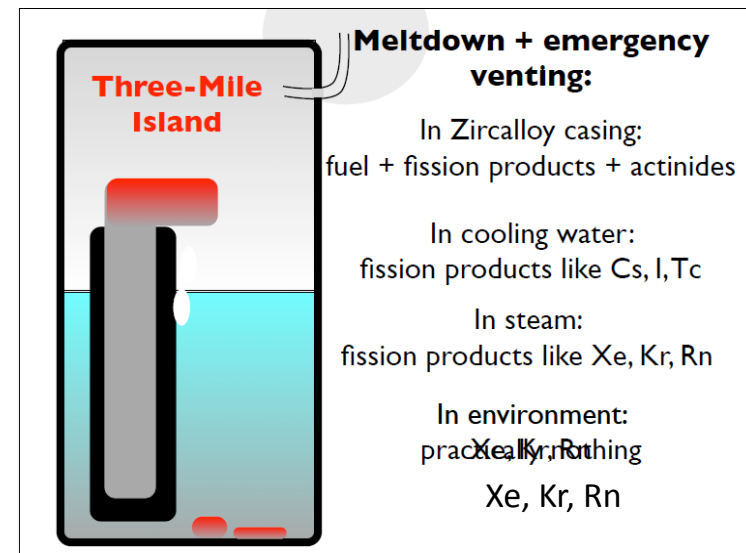
Wikipedia (Japanese site)

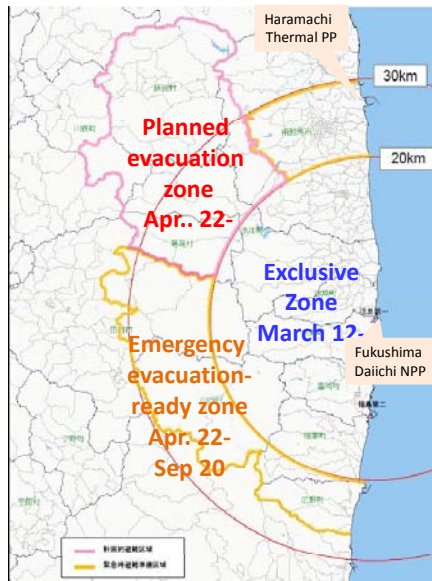
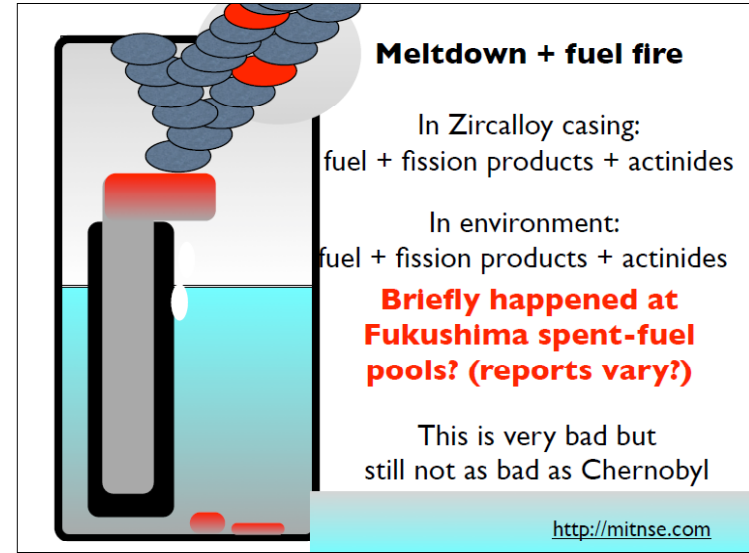
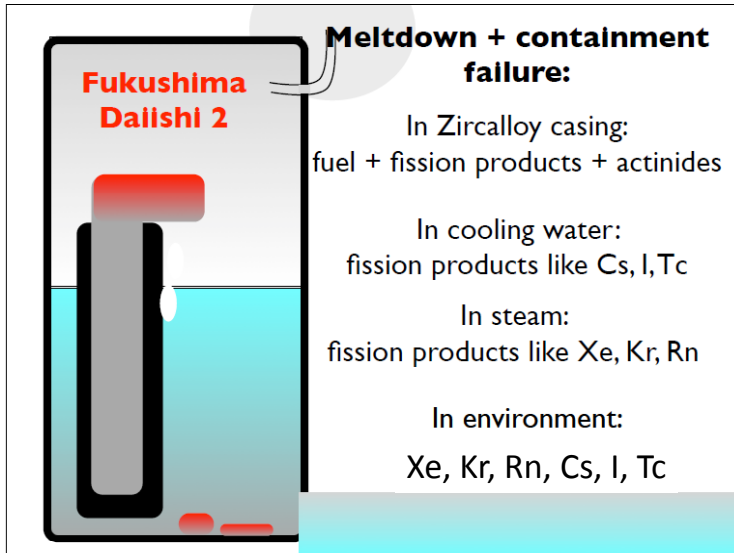
Radiation release on March 14



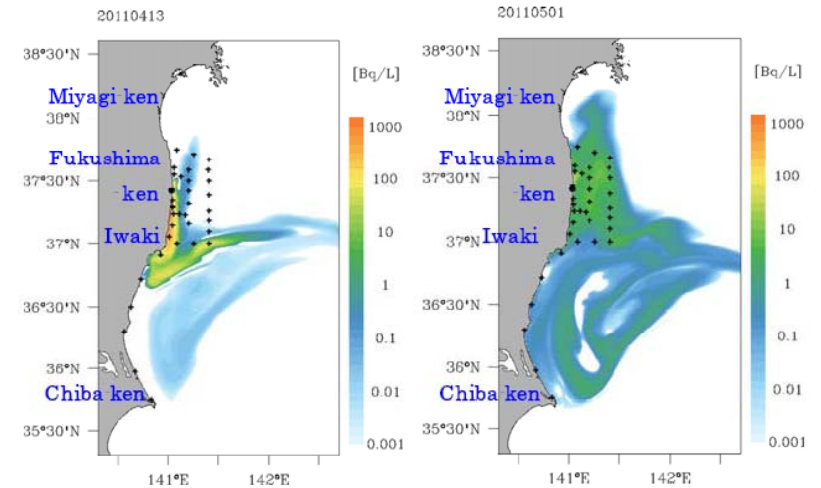
Datenquelle Messwerte: TEPCO

<http://online.itp.ucsb.edu/online/lecture/bmonreal11/>





Flow of contaminated waters



Release of radioactive contamination to seawater



categories	Total emission	Max. concentration
Direct emission	3.5 ± 0.7 PBq	68kBq/L
From Atmosphere	ca.80% of 15PBq	
Planned low-level contaminated water release	0.000042PBq	



Megafloat for cooling water tanks

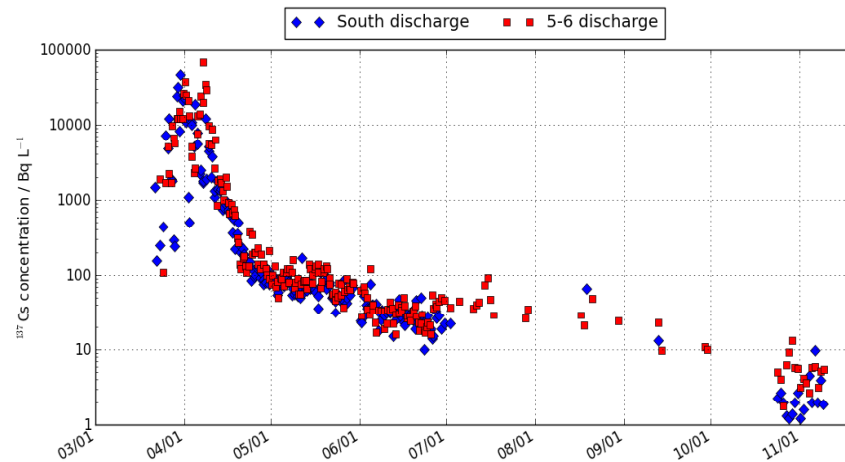


Figure 4 ^{137}Cs concentration at the 5-6 (north) and south discharge canals at 1F NPP (TEPCO).

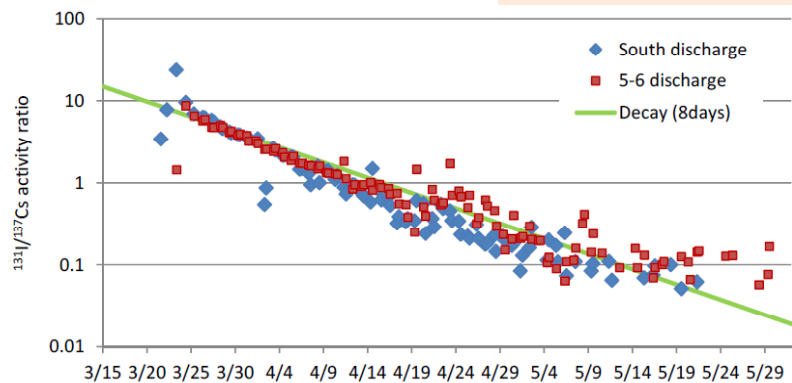


図7 1F NPP 近傍の 5-6 (北) 放水口と南放水口における $^{131}\text{I}/^{137}\text{Cs}$ 放射能比のモニタリング結果(東京電力)。緑の線は半減期 8 日の減衰曲線(3月 26 日の時点で $^{131}\text{I}/^{137}\text{Cs}$ が 5.7)を示す。

Figure 7 $^{131}\text{I}/^{137}\text{Cs}$ ratio at the 5-6 (north) and south discharge canals at 1F NPP (TEPCO). Green line shows the decay curve for half-life of 8 days when the $^{131}\text{I}/^{137}\text{Cs}$ ratio was 15 at March 15.

Major source of Cs-137 release has been stopped!

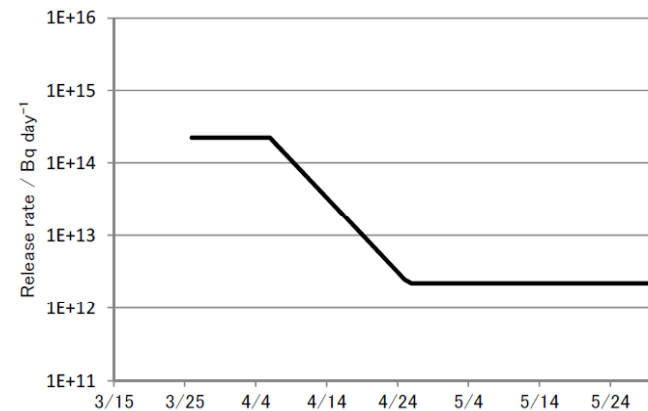


図10 見積もった ^{137}Cs の直接漏洩量の時系列変化
Figure 10 Estimated release rates of ^{137}Cs from observed data and simulation

Key points

- Radioactive contaminations of I-131, Cs-137, Cs-134 are mainly concerned.
- Meltdown occurred in reactors 1, 2 and 3.
- Nuclear fuel fired in unit 4 during March 15-16.
- Major source of atmosphere contamination is explosion of units 1-4 on March 15-16.
- Major source of seawater contamination is emission by a hole into the pit near reactor 2 that was blocked by water glass on April 6 morning.

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<http://yellow.ap.teacup.com/thinkmon/1194.html>

http://pub.ne.jp/newjei/?entry_id=38



Discrimination to radioactive contamination



- Discrimination in even the Kyoto traditional religious events
- Pine woods with prayers' message, almost no contaminated, were rejected to be burn in Kyoto religious event (August 16, 2011)
- Garage sales of agriculture/fisheries products of Fukushima in Fukuoka was cancelled.

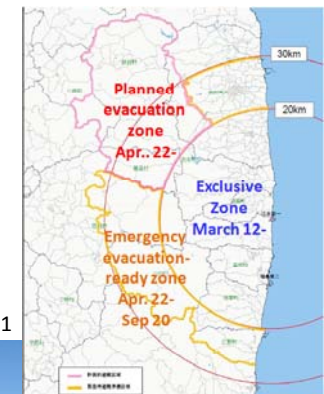


<http://www.asahi.com/national/update/0925/TKY201109250289.html>

Ministry of Agriculture's campaign "Support Eastern Japan by eating foods"



Suspended farms in Iitate village (outside of exclusive zone)



September 2010



September 2011



http://www.iitate-madei.com/village06_2011.html

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Residents were allowed to come back home for 2hrs



一時帰宅で元の自宅付近を歩く人達
写真：一時帰宅を許されたが、家・家財道具はなく廃墟を歩く



一時帰宅で許された一袋の家財を運ぶ人(双葉町)
写真：わずかに一袋に取めた家財を運ぶ

No control of domestic/wild animals



- Snake thief

Problems of wildlife in Japan

- Recent concerns of wildlife management in Japan is not extinction, but **“over-abundance”** of deer, monkeys and boars, all of which inhabits near Fukushima Daiichi NPP.
- Human excluded zone (20km zone) is a **“heaven” of wildlife** despite of radioactive contamination
- Wildlife may threat damage on agriculture outside of the 20km zone.
- We cannot catch them in the 20km zone.

Ecological risk of Chernobyl NPP accident

ナショナルジオグラフィック ニュース
ニューストップ | 動物 | 古代の世界 | 環境 | 文化 | 科学 & 宇宙 | 風変わりニュース | ニュース

哺乳類への影響、チェルノブイリと動物

ツイートする | 共有 | チェック | いいね!



友人に教える

National Geographic News
April 26, 2011

チェルノブイリ原発事故の居住禁止区域内に生息するヘラジカ(2011年3月撮影)。鹿に有蹄類(ゆうていり)の生息数は回復し、突然変異もほとんど見られない。しかし、ヘラジカのような草食動物の場合、体内の放射線物質レベルがかなり高くなっている。規制から外れたエリアでも同様だ。

草食動物は、放射線物質を溜め込む地衣類やキノコ類をよりにする。事故当時、ノルウェーで解体された草食動物の肉から、1キログラムあたり約1万4000ベクレルの放射線が検出された。食用肉の規制線量の2倍を超えており、隣のスウェーデンなら40倍に相当する。心配がないレベルだが、今でもノルウェーのトナカイ肉からは放射線レベルが検出されている。

居住禁止区域内では、食用に追われる恐れのない草食動物のひのびと暮らしている。しかし、絶えず放射線にさらされており、汚染された草や地衣類を通してさらに体内に取り込んでいく。ただし理論上は、害を及ぼすほどの線量率ではない。イギリスにあるボーツマス大学の水域環境学者ジム・スミス氏は、「集団規模で影響は出ないだろう」と話す。

BBC NEWS Watch One-Minute World News

Last Updated: Thursday, 20 April 2006, 05:55 GMT 06:55 UK
E-mail this to a friend | Printable version

Wildlife defies Chernobyl radiation

By Stephen Mulvey
BBC News

It contains some of the most contaminated land in the world, yet it has become a haven for wildlife - a nature reserve in all but name.

The exclusion zone around the Chernobyl nuclear power station is teeming with life.

As humans were evacuated from the area 20 years ago, animals moved in. Existing populations multiplied and species not seen for decades, such as the lynx and eagle owl, began to return.

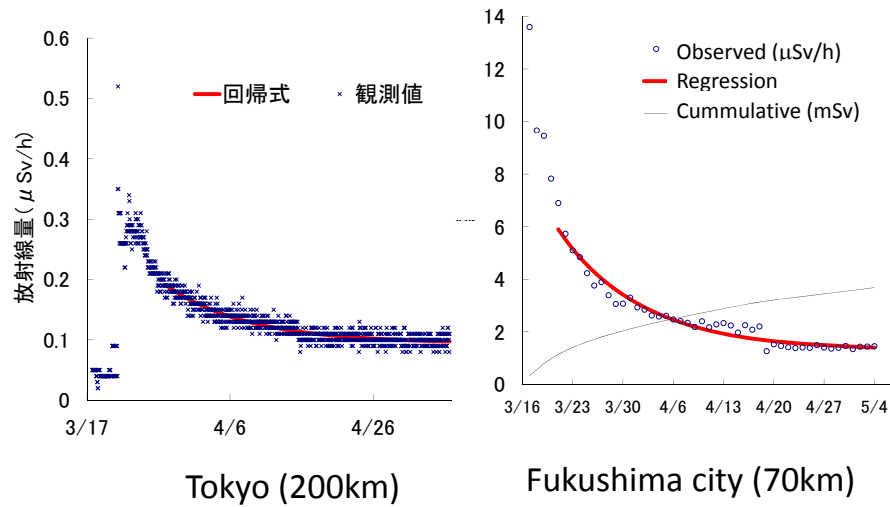
There are even tantalising footprints of a bear, an animal that has not trodden this part of Ukraine for centuries.

"Animals don't seem to sense radiation and will occupy an area regardless of the radiation condition," says radioecologist Sergey Gaschak.

"A lot of birds are nesting inside the sarcophagus," he adds, referring to the steel and concrete shield erected over the reactor that exploded in 1986.

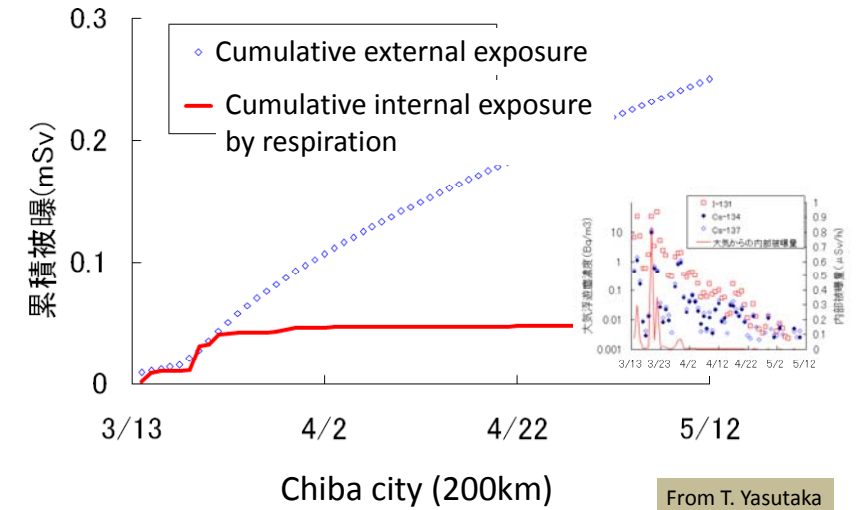
Przevalski's horses are breeding in the zone (Picture: Sergey Gaschak)

Air contamination (external exposure)

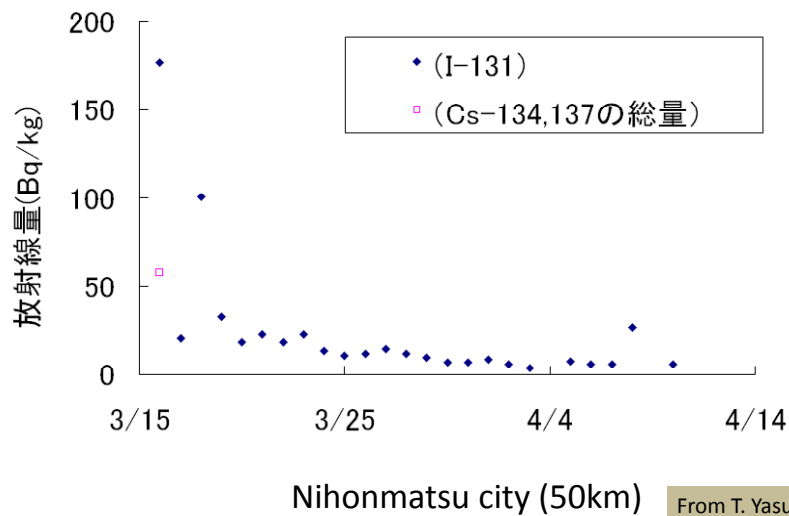


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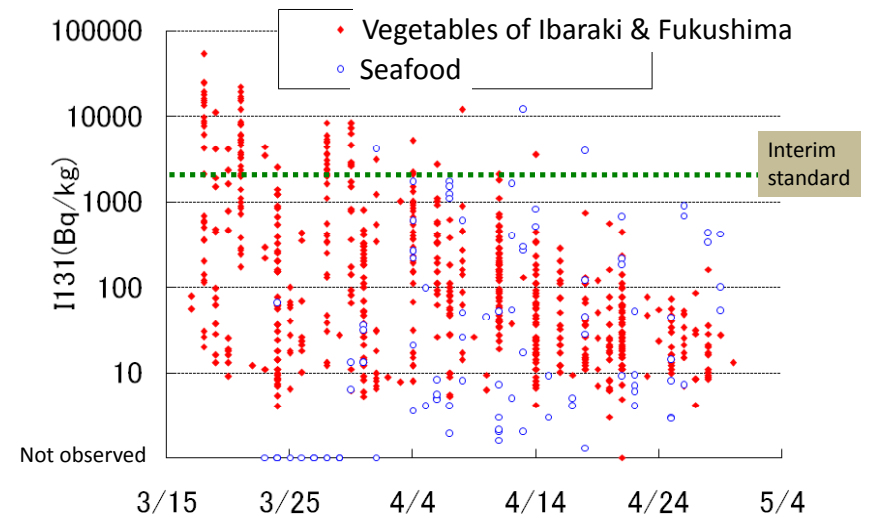
Internal exposure by respiration



Soil contamination

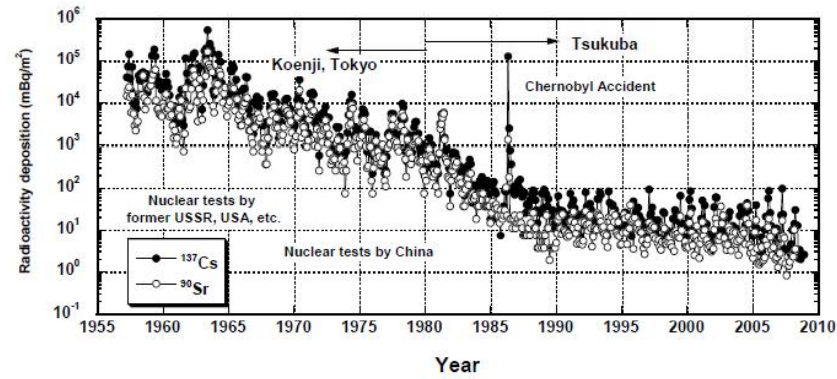


Contamination of food products



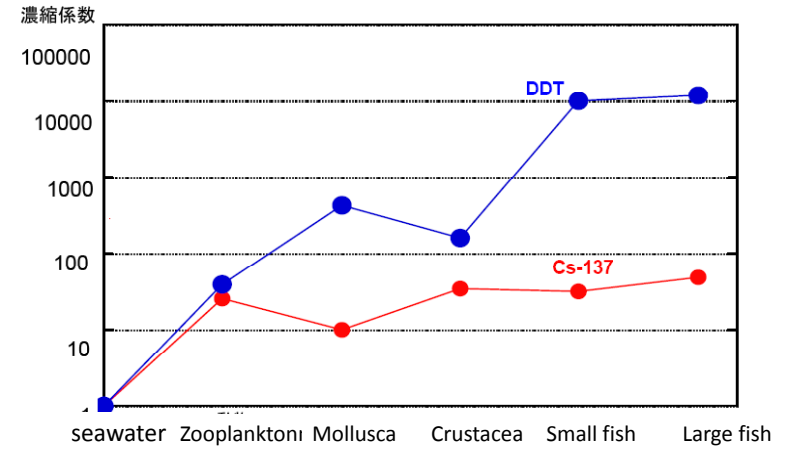
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History of Radioactivity deposition in Tokyo/Tsukuba



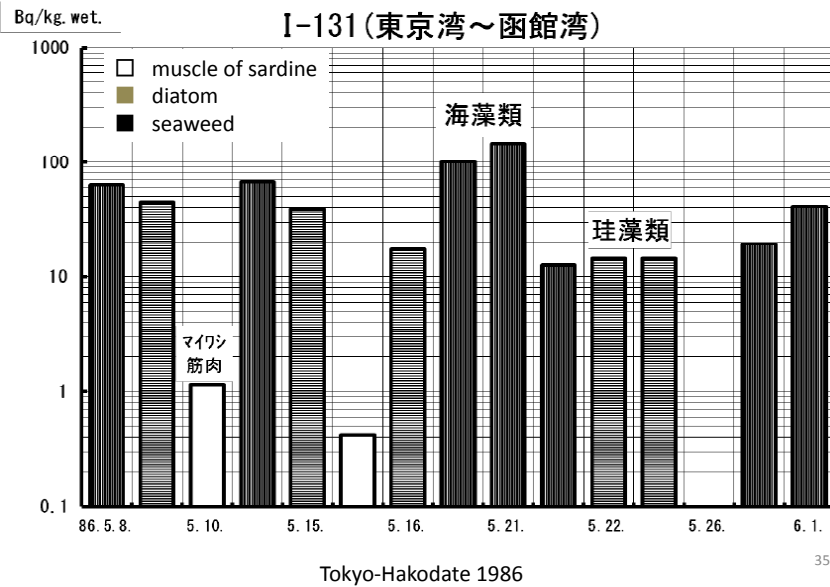
Biomagnification

$$\text{濃縮係数} = \frac{\text{生物中の濃度}}{\text{海水中の濃度}}$$



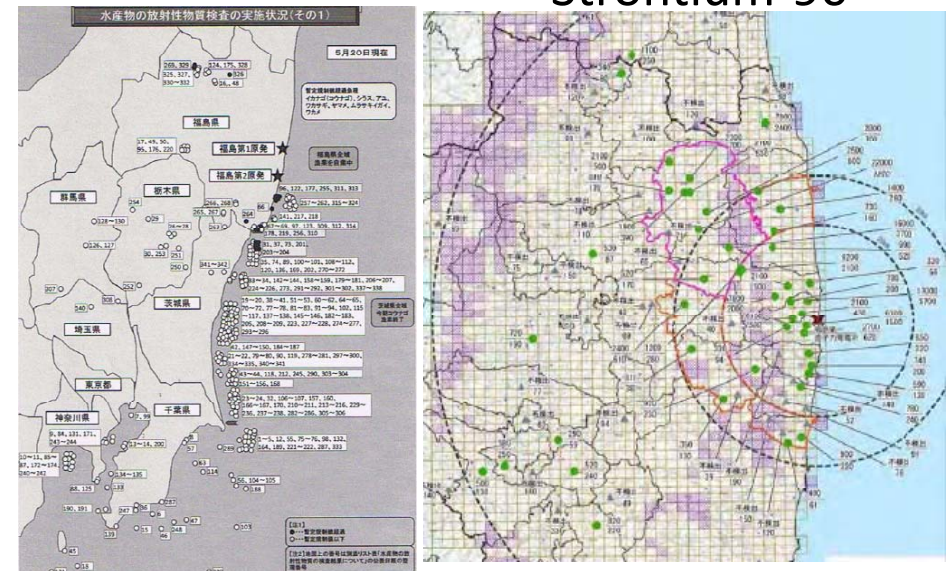
・食物連鎖を通じて、魚類のCs-137濃縮係数はあまり大きくならない。

Contamination due to Chernobyl



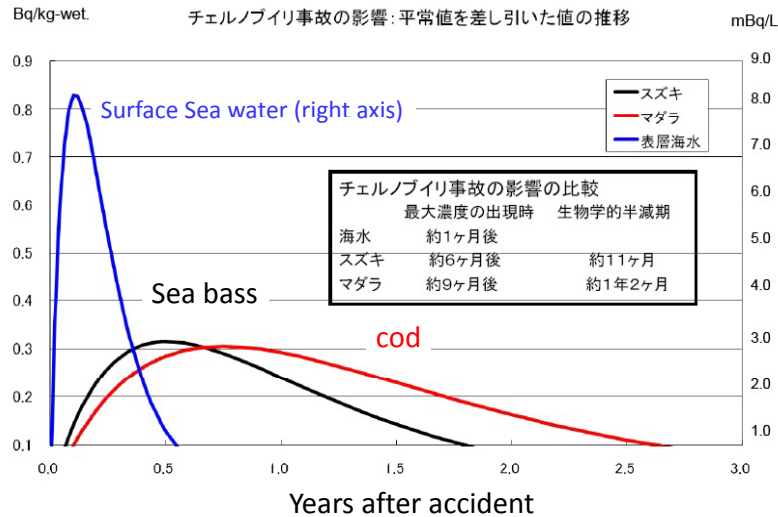
Monitoring of fish/seafood

Strontium-90



How long should we mind? Lessons from Chernobyl

Cs-134/137



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Total exposure (mSv/yr) and cancer risk (%)

- Major source of exposure is external at least >20km far from Fukushima Daiichi NPP.
- Exposure from foods depends on person (to buy or not products of Fukushima)

Place	External	Respiration	Drink	Foods	soil	Total (mSv/yr)	Cancer Risk (%)
Fukushima city	8.0	~1.0	0.03	1.01	<0.5	11	0.06
Tokyo	0.13	~0	~0	0.37	~0	0.5	0.003

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Conclusion

- I-131 Physical half-life period (HLP) = 8 days. **Seaweeds** may be highly contaminated, but it is effective to prevent I-131 from thyroid.
- Cs: Biological HLP = ca. 50 days. **Some ground fish is still contaminated**. Check inspection data! Keep the interim standard (500Bq/kg for Cs-134 & Cs-137, 2kBq/kg for I-131)
- Sr-90: Physical HLP = 28.8yrs; accumulated into bones. Japanese do not eat bone of tunas!
- Pu: very low concentration.

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Conclusions by Ben Monreal (March 14)

- The worst general-public effects of Chernobyl were *stress/fear*; HUGE education/communication failure
- You have the information: count the millisieverts and decide how to respond
- My feeling: the worst-case radiation hazards from Fukushima are mitigatable and local
 - (early evacuation + controls on ¹³¹I in food)
- My feeling: the global radiation hazard is nil.
 - The best way to reduce worldwide low-level radiation releases is ... stop burning coal
- Save your energy for those affected by the tsunami and "50 plant workers" at Fukushima

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