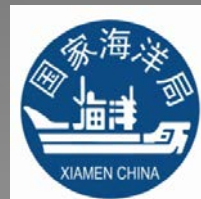


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The effects of acute gamma irradiation on the survival of Chinese black sleeper (*Bostrichthys sinensis*)

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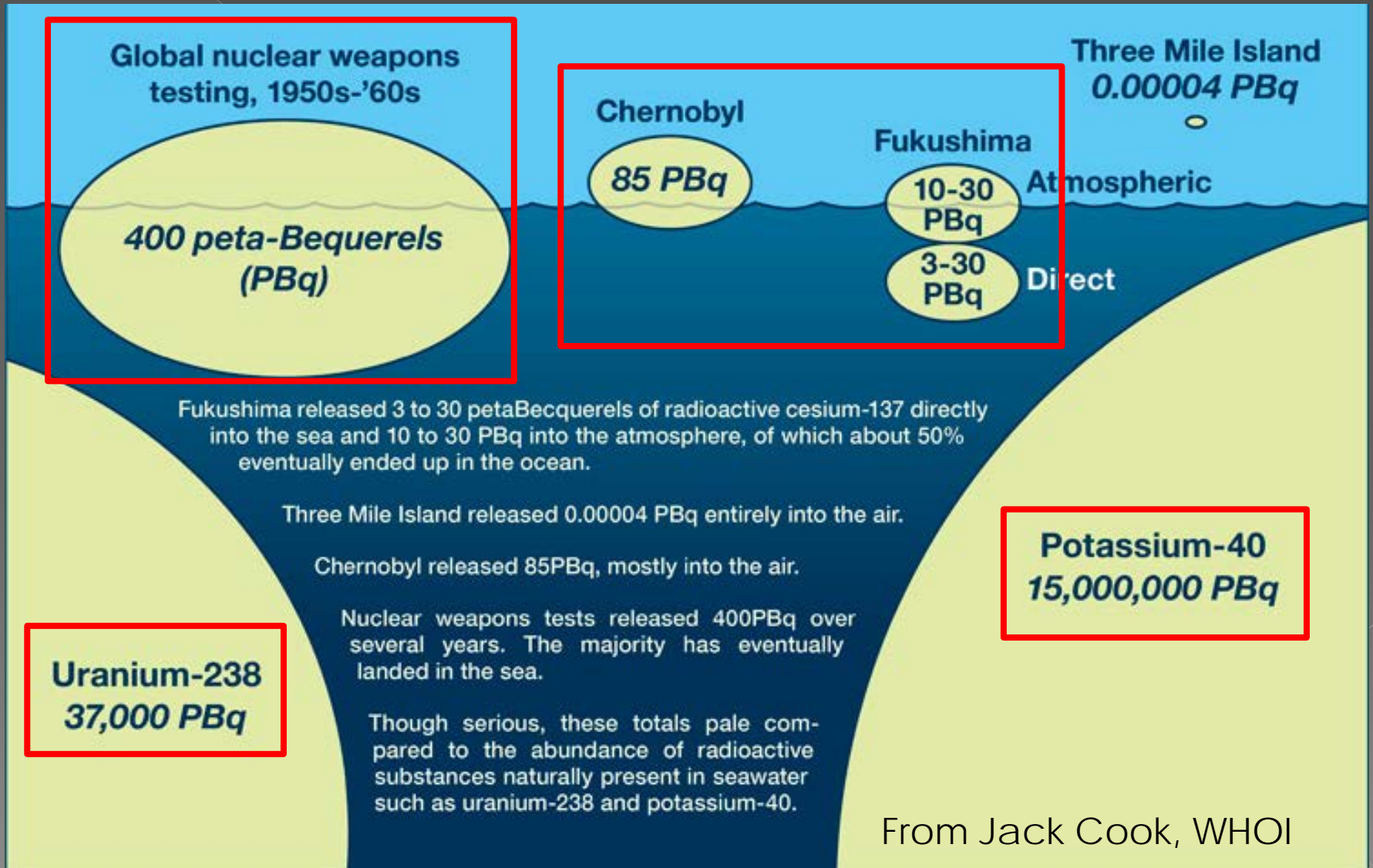


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1. Introduction

Main sources of radioactivity in Ocean

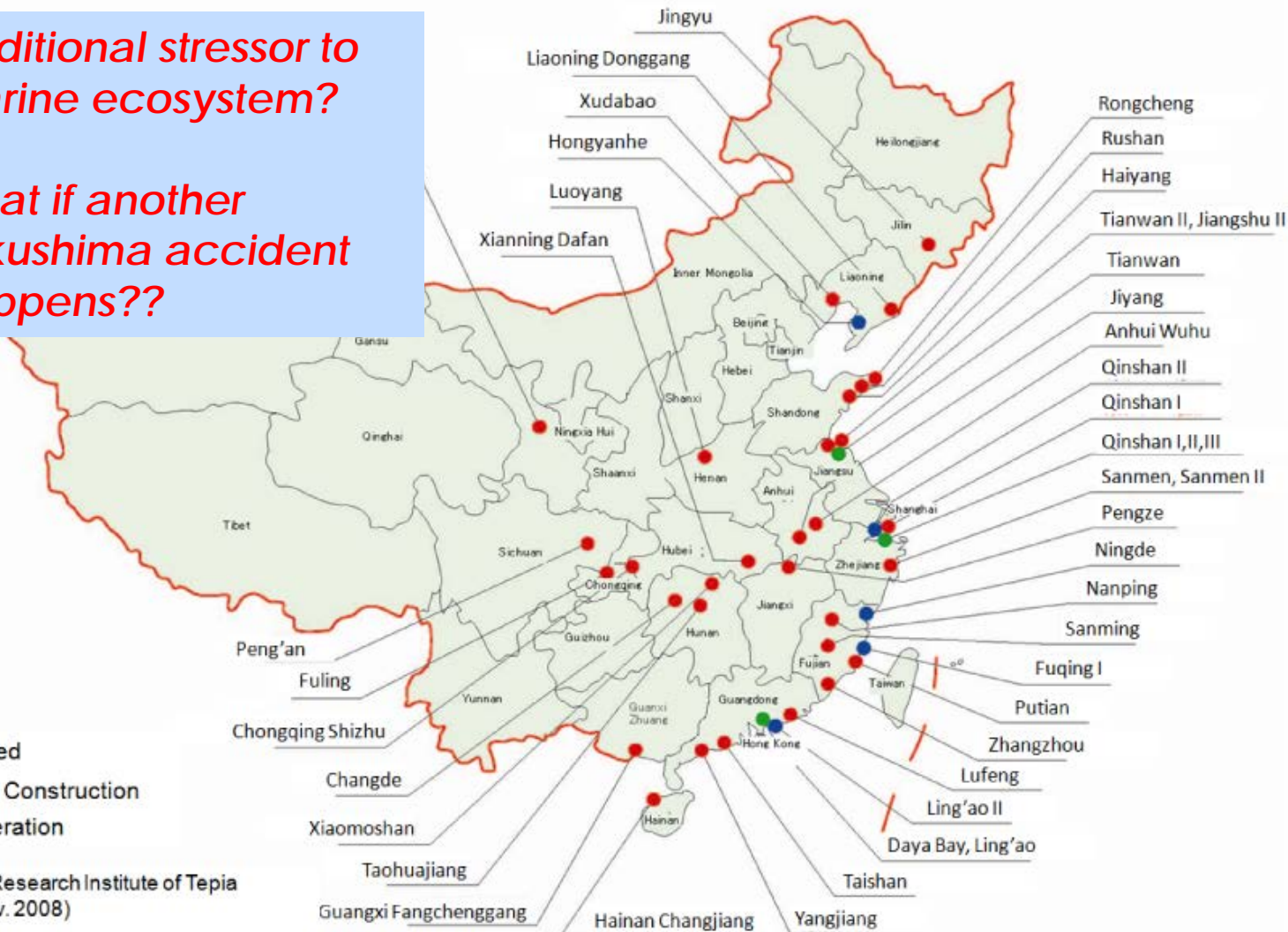


Nuclear Energy Growth

Sites of Nuclear Power Plants in China

Additional stressor to marine ecosystem?

What if another Fukushima accident happens??



PACIFIC OCEAN

PAN

ation

Existing studies

From UNSCEAR (2008)

Viruses

Molluscs

Ecosystem (number of references)	Total number of data (%)	Number of data for each exposure duration			Number of data for each exposure irradiation pathway		
		Type	Total number	%	External	Internal	Other ^a
Terrestrial (579)	19 983 (72.6)	Acute	12 273	61.4	11 564	288	421
		Chronic	6 795	34.0	3 449	344	3 002
		Transitory ^b	913	4.57	670	40	203
		Not stated	2	0.03	0	0	2
Freshwater (195)	6 067 (22.0)	Acute	4 526	74.6	4 058	97	371
		Chronic	1 484	24.5	970	20	494
		Transitory	54	0.89	12	2	40
		Not stated	3	0.01	0	0	3
Marine (45)	1 470 (5.4)	Acute	1 116	75.9	995	58	63
		Chronic					
		Transitory					
		Not stated					

**Few data for tropical ecosystem!
No data from China!!**

From Garnier-Laplace (2006)

Objectives

- To examine the effect of acute gamma radiation on the survival and biochemical indicators of a typical fish species in the coastal environment of China
- To provide essential information for radiological risk assessment and relevant stakeholders, including policymakers, nuclear regulators, environmental agencies, nuclear power plant, fisheries departments, marine aquaculture organizations and companies.

Facts about Chinese black sleeper

- ◎ An intertidal species
 - > More presumable pollution from both land and water
- ◎ A facultative air-breathing fish
 - > perfect for irradiation study
- ◎ High economic value



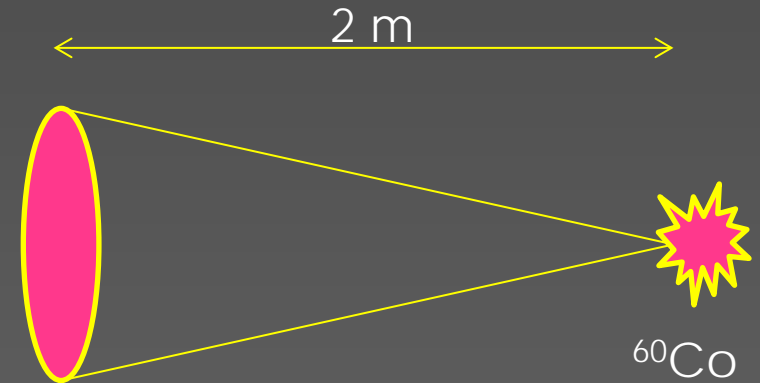
2. Methods

Sampling



Irradiation

- 5 irradiated groups + 1 control group
- ~ 60 individuals in each group
- Co-60 point source
- Single exposure of 3, 6, 12, 24 and 48 Gy (determined by Alanine dosimeter (Aerial, France), respectively
- Dose rate: 1.5 Gy/min



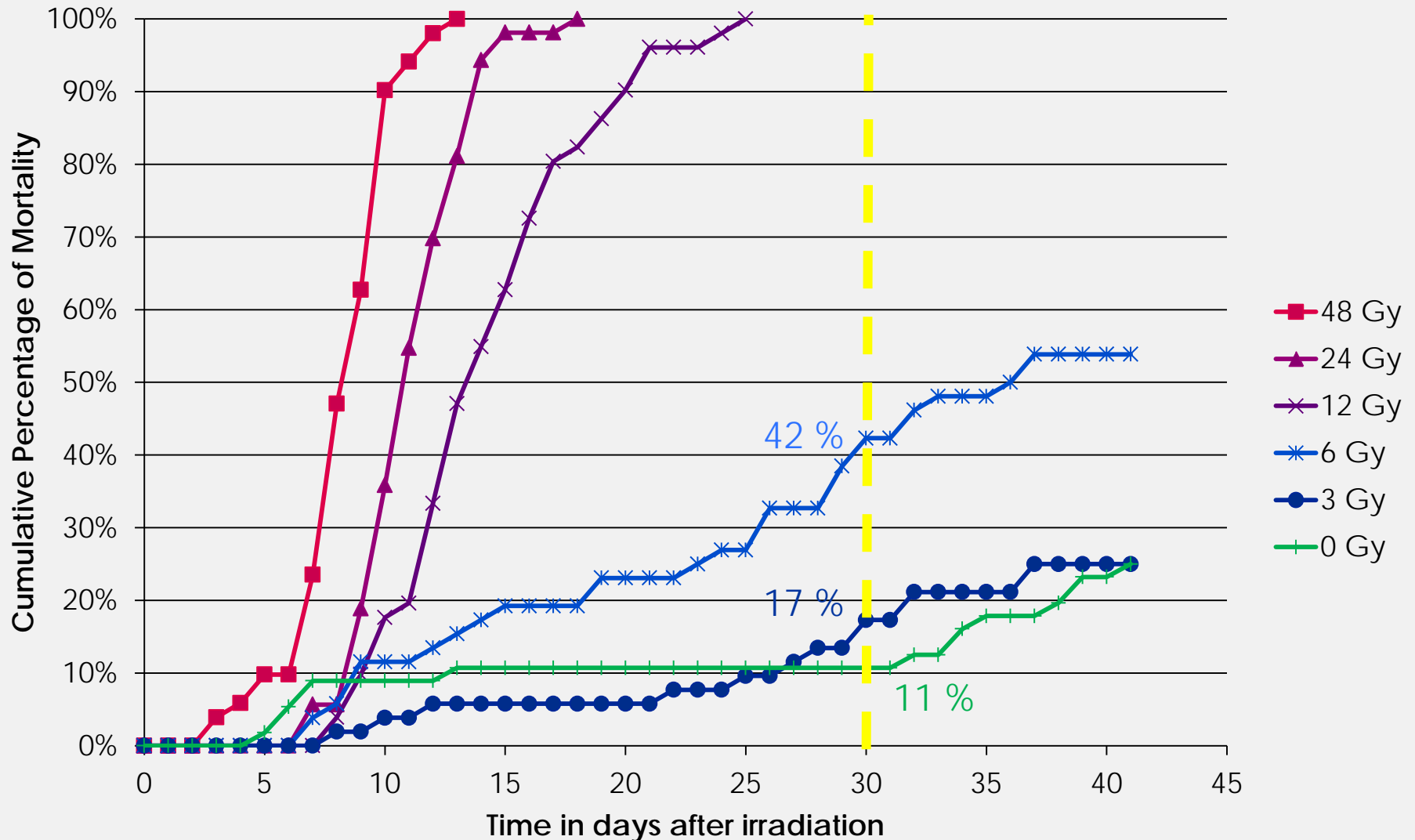
Culturing

- 25 ~ 26 °C
- Sterilized local seawater
- Fed with shrimp twice a week



3. Results and Discussion

Cumulative Percentage of Mortality



LD_{50,30} Calculation Formulas

- Karber's Method:

$$\lg LD_{50} = x_k - d \left[\sum_{i=1}^k p_i - (3 - p_1 - p_k) / 4 \right]$$

- > Where: x_k – the log value of maximum dose
- > d – the log value of dose difference
- > p_i – mortality in group i

- 95 % confidence Interval:

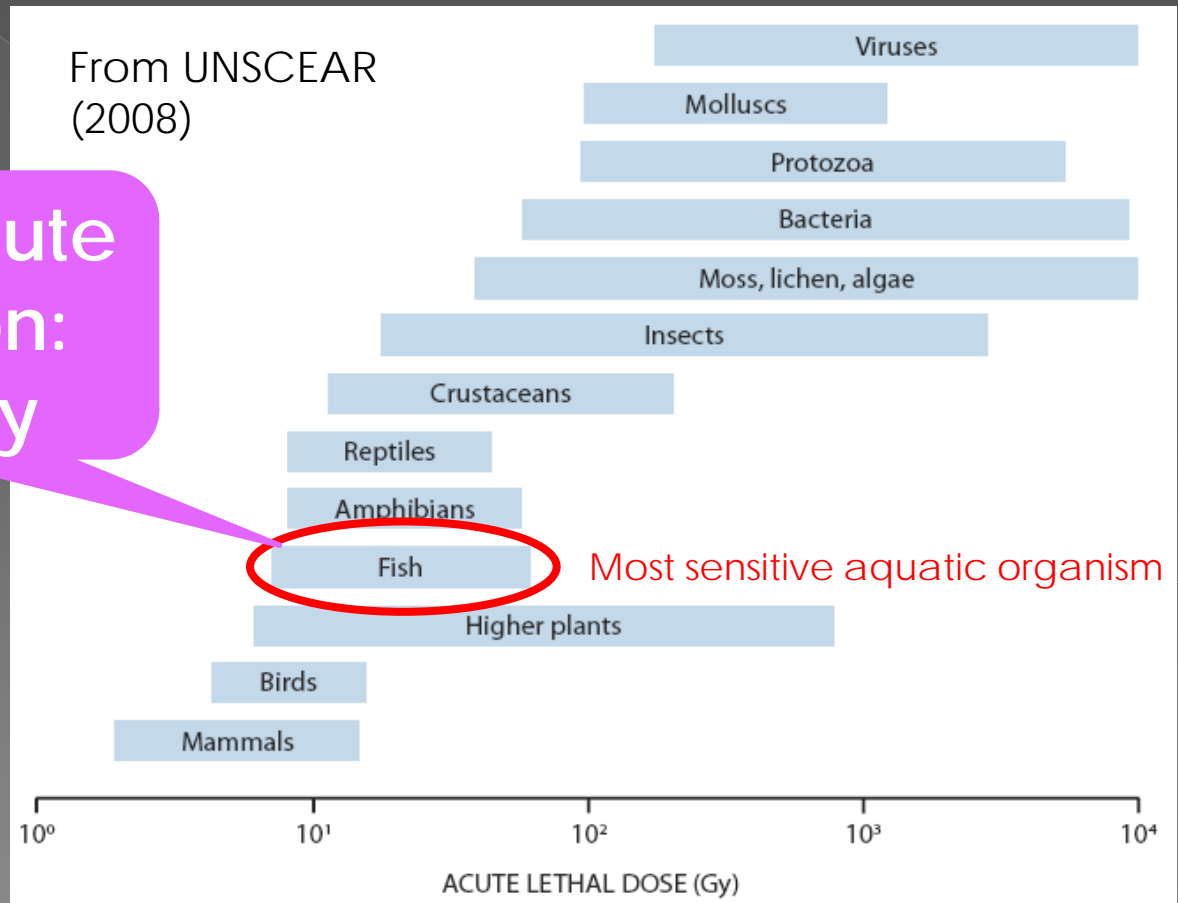
$$\lg^{-1} (\lg LD_{50} \pm 1.96 S_{\lg LD_{50}})$$

$$S_{\lg LD_{50}} = d \sqrt{\sum \frac{p_i(1-p_i)}{n_i}}$$

Estimated LD₅₀

● LD₅₀ = 7.1 Gy (6.3 ~ 7.9 Gy)

LD₅₀ for acute irradiation:
10-25 Gy



4. Conclusion and prospects

Conclusion

- $LD_{50,30}$ for the acute irradiation on Chinese black sleeper was estimated to be 7.1 Gy, with a 95 % confidence interval of 6.3 Gy to 7.9 Gy, which is lower than the previous value summarized by UNSCEAR. More experiments are needed to confirm the above result.

The way forward...

- DNA deficiency tests
- Chronic radiation experiment
- Other local species

Thank You!

谢谢(Xiè xiè)!

