Protection of the Environment

Activities of Committee 5

Third ICRP Symposium, Seoul, Korea
20-22 October 2015

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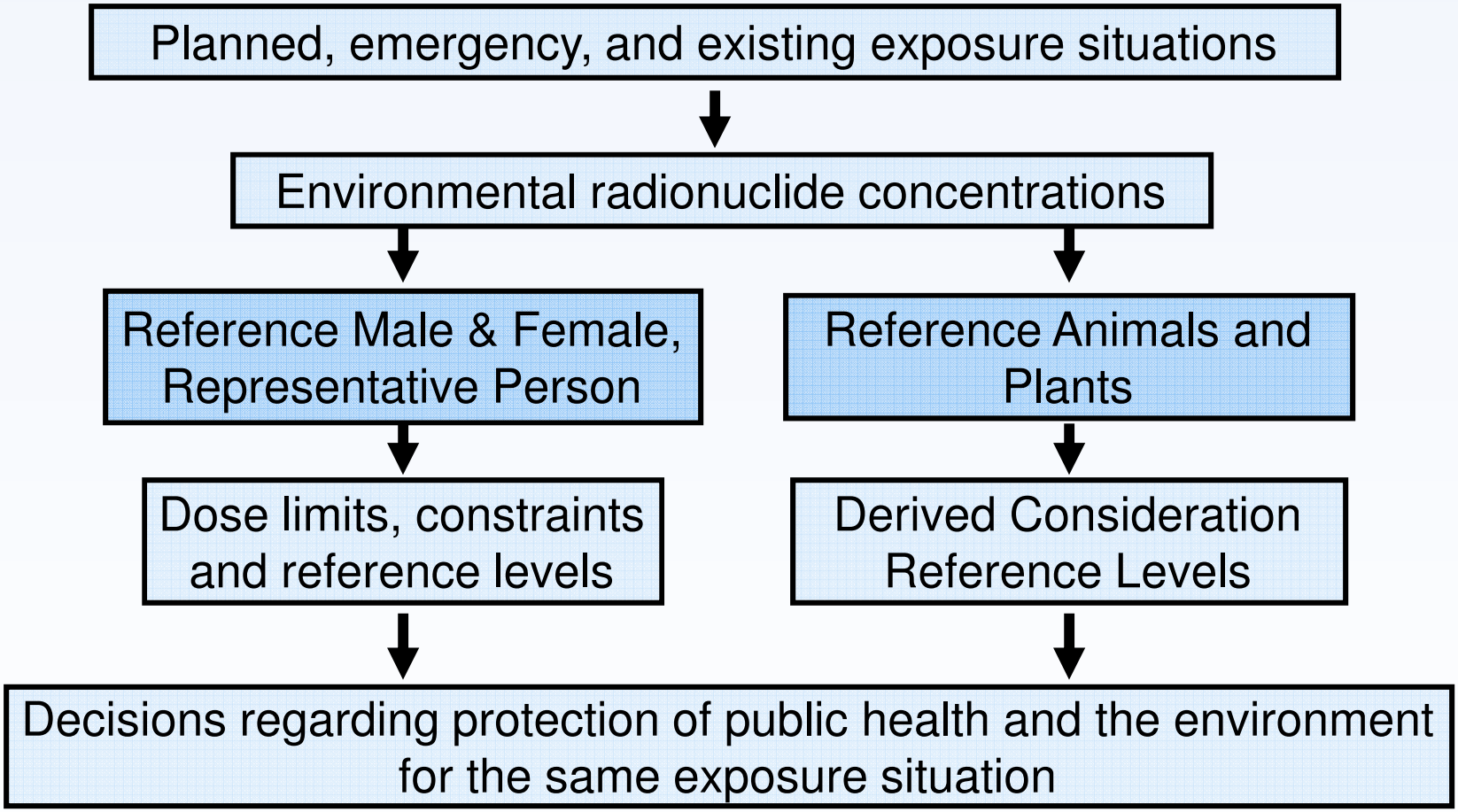
C5 Mission

"*C5 is concerned with radiological protection of the environment. It will aim to ensure that the development and application of approaches to environmental protection are compatible with those for radiological protection of man, and with those for protection of the environment from other hazards*"

Parallel pathways



[*Publication 108*]

RAPs and DCRLs

Wildlife group	Ecosystem[1]	RAP	DCRL, mGy d^{-1} (shaded)		
			0.1-1	1-10	10-100
Large terrestrial mammals	T	Deer			
Small terrestrial mammals	T	Rat			
Aquatic birds	F, M	Duck			
Large terrestrial plants	T	Pine tree			
Amphibians	F, T	Frog			
Pelagic fish	F, M	Trout			
Benthic fish	F, M	Flatfish			
Small terrestrial plant	T	Grass			
Seaweeds	M	Brown seaweed			
Terrestrial insects	T	Bee			
Crustacean	F, M	Crab			
Terrestrial annelids	T	Earthworm			

[1]T, terrestrial; F, freshwater; M, marine

ICRP EP system components

Assessment

EXPOSURE	EFFECT	CONCERN	APPLICATION
Transfer	Mortality Morbidity	Derived Consideration Reference Level DCRL	Planned
Ext/Int exposure & RBE	Reproduction		Emergency
DCC	'Cytogenetic'		Existing
RAP biology	RAP biology	RAP biology	RAP biology

Exposure situation

Manage-ment

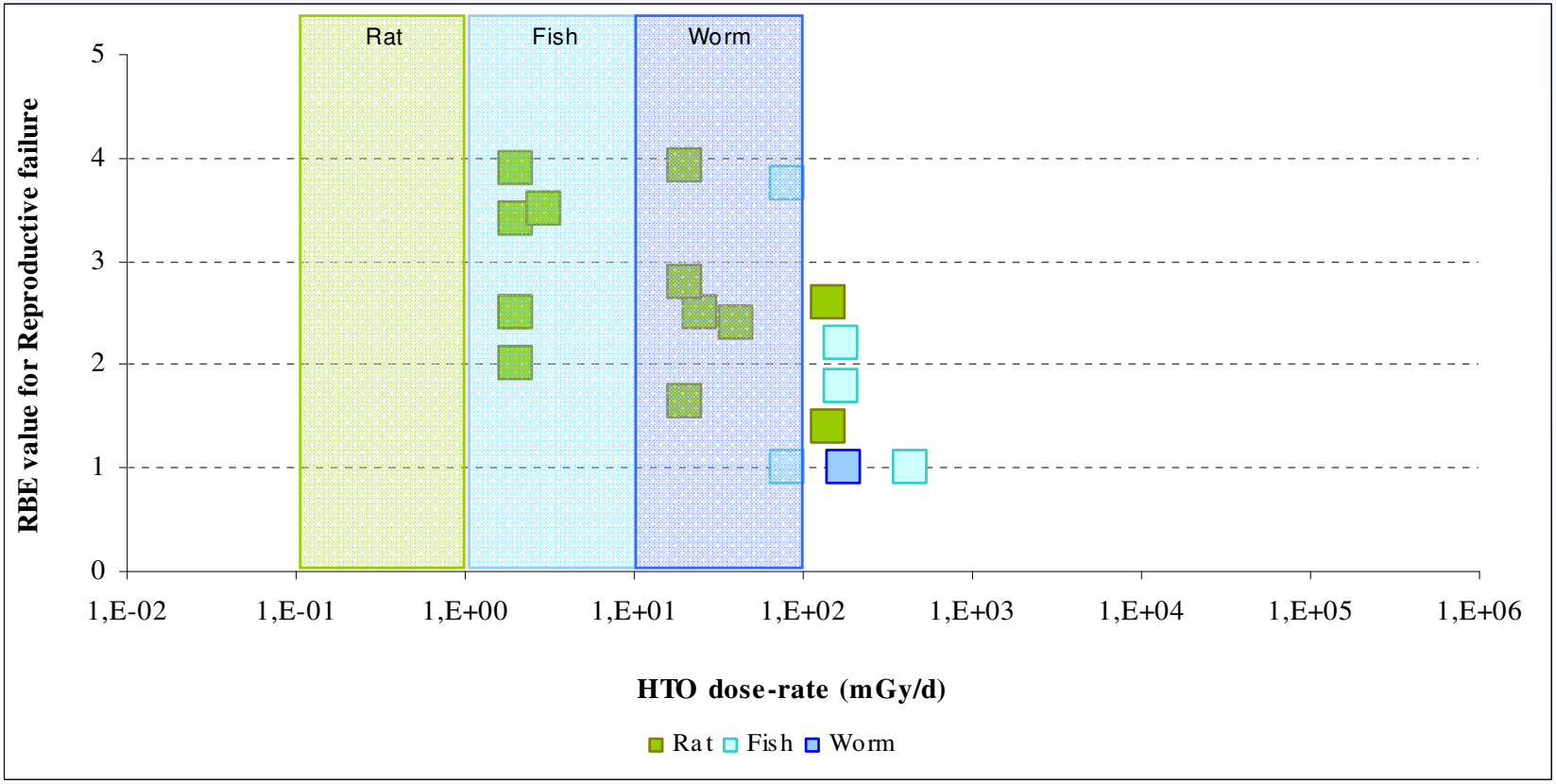
Protection

[*Publications 91, 103, 108,114,124; TGs 72, 74, 99, x*]

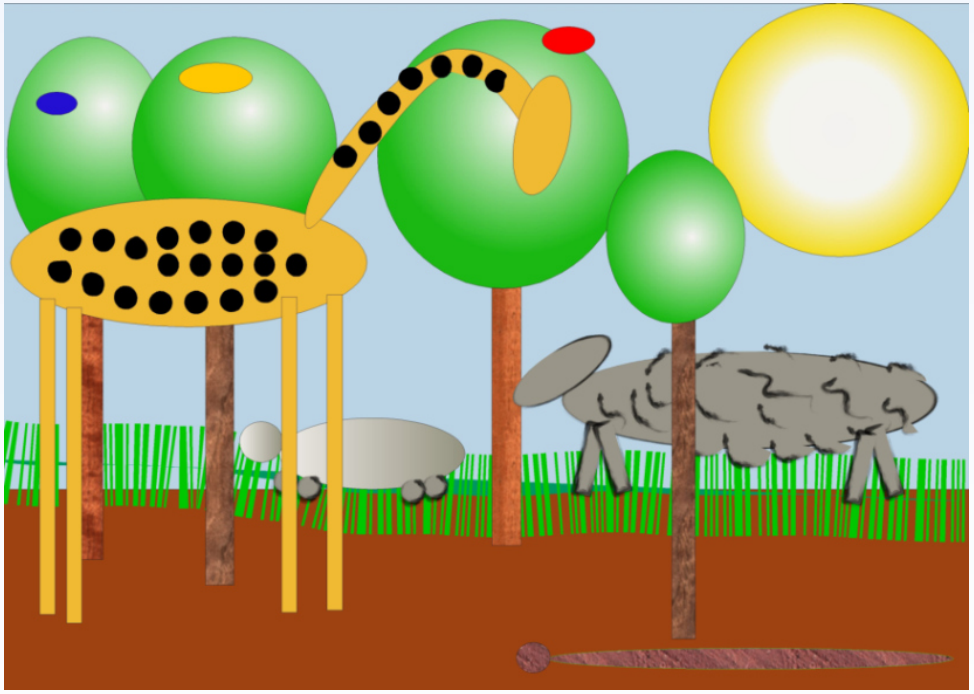
TGs 72 & 74 Dosimetry

Feature	Status
Quantity	absorbed dose (rate) whole body-averaged
Radiation protection endpoints	populations/individuals, mostly but not only 'deterministic' effects
RBE	at moderate and higher doses and dose rates, paucity of data for many RAPs and ecologically relevant endpoints ('mammalian chauvinism)'
Weighting (quality)	no recommendation from ICRP, factors proposed by others
Reference levels for radiation protection purposes	**Derived Consideration Reference Levels** (DCRL) in terms of absorbed dose rates (mGy d^{-1})

TG 72 on RBE

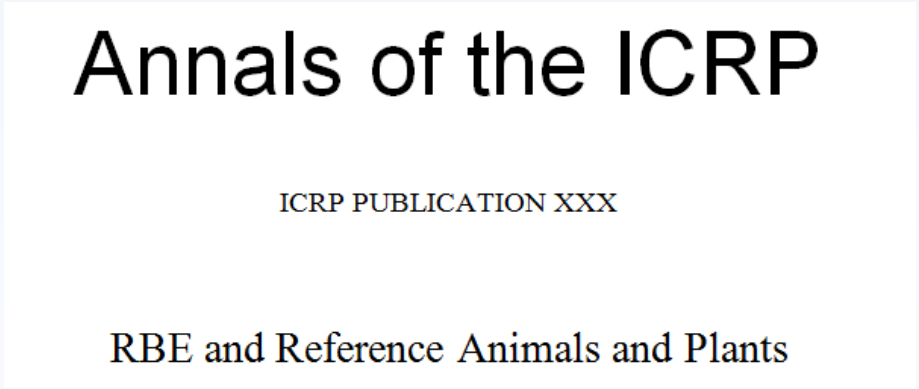

Rat
Fish
Worm
RBE value for Reproductive failure
0
1
2
3
4
5
1,E-02
1,E-01
1,E+00
1,E+01
1,E+02
1,E+03
1,E+04
1,E+05
1,E+06
HTO dose-rate (mGy/d)
Rat
Fish
Worm

Improved Dosimetry, TG74

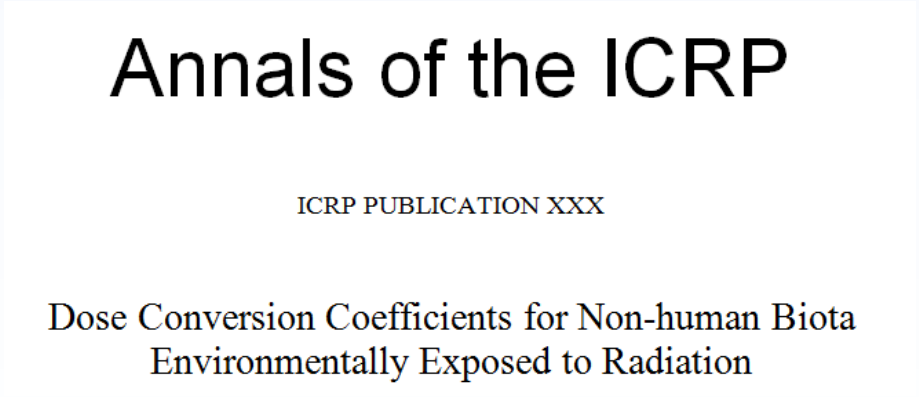


- **Purpose**
  - Expand data to *Publication 107*
  - Expand exposure scenarios
  - Explore allometric relationships
  - Develop a ‘DCC calculator’

TG72 & 74 Reports



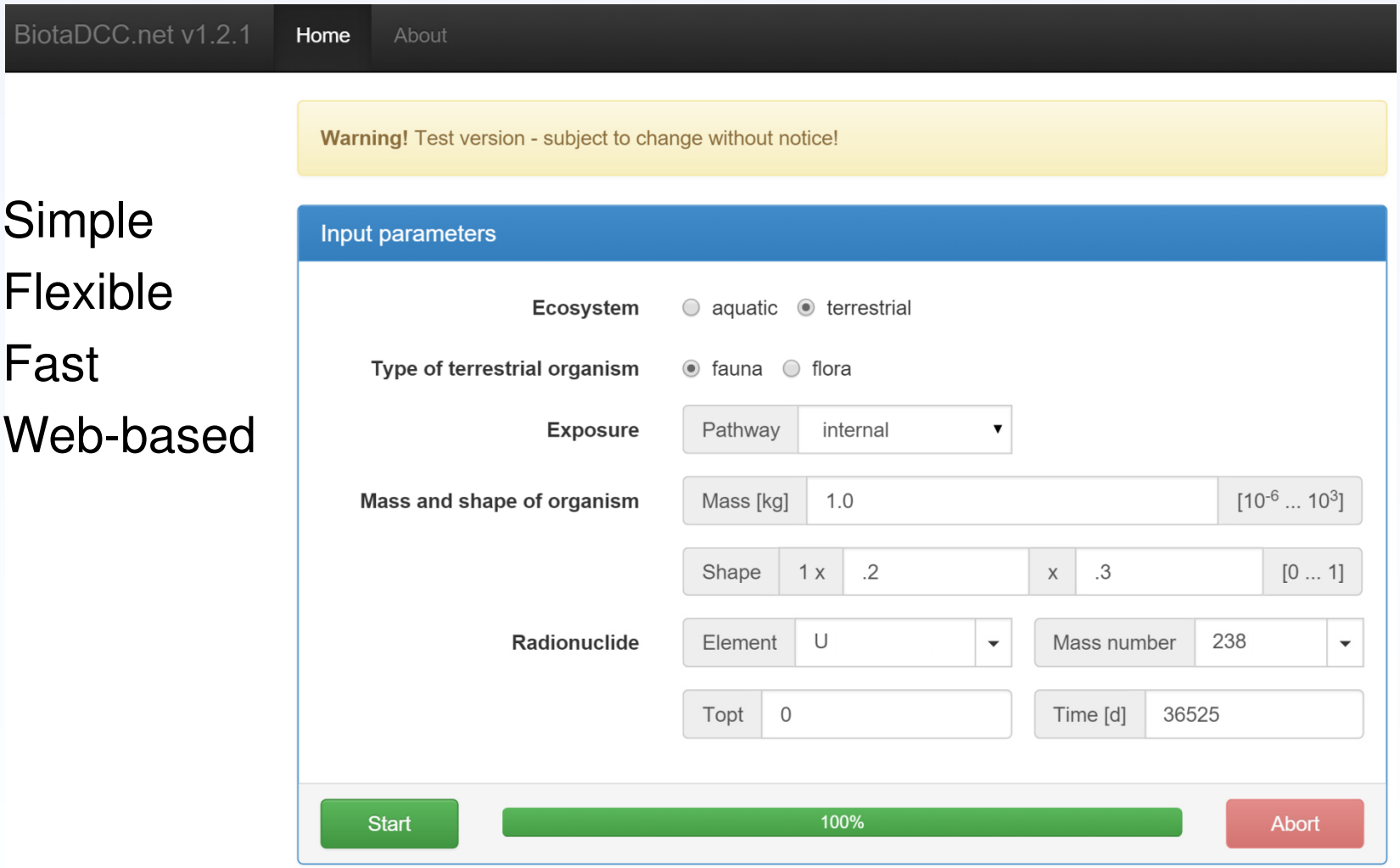
- **TG72 Main Report**
  - Annex A: RBE – general
  - Annex B: Tritium
  - Annex C: Alpha



- **TG74 Main Report**
  - Annex A: Radon
  - Annex B: Allometric relationships
  - Appendix C: DCCs

Software tool BiotaDCC

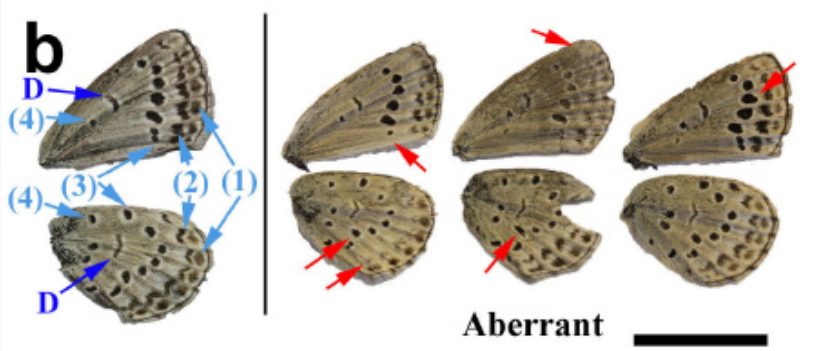
- Simple
- Flexible
- Fast
- Web-based



Post-March 11 reports

Phenotypic modification in butterflies

Hiyama et al, Sci. Rep. 2, 570; DOI:10.1038/srep00570 (2012)



Loss of leader shoot in Japanese fir trees

Sci. Rep. 5, 13232; DOI: 10.1038/srep13232 (2015)

Population impact on barn swallows

Scientific American Feb 2015


NUCLEAR FALLOUT

The Swallows of Fukushima

We know surprisingly little about what low-dose radiation does to organisms and ecosystems. Four years after the disaster in Fukushima, scientists are beginning to get some answers

Dose rates, Okuma Town, June 2011

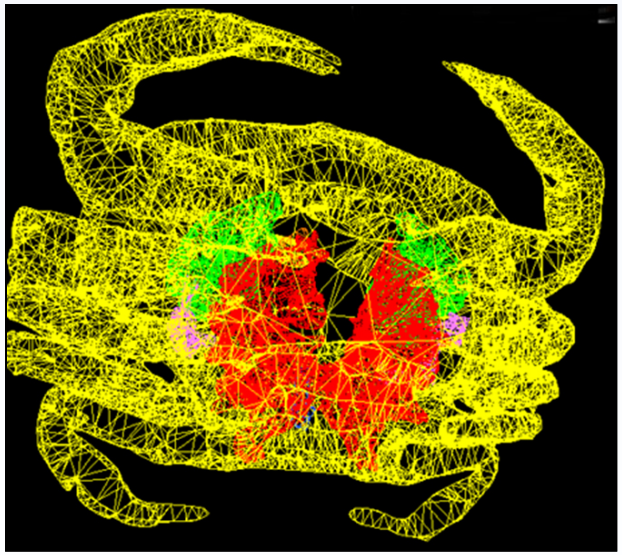
RAP	Dose-rate estimate	Lower end DCRL	Ratio of estimate to benchmark
	μGy/h		
Bee	18	400	0.04
Deer	71	4	17.8
Duck	21	4	5.3
Earthworm	46	400	0.11
Frog	18	40	0.45
Pine tree	17	4	4.3
Rat	46	4	11.5
Wildgrass	26	40	0.65

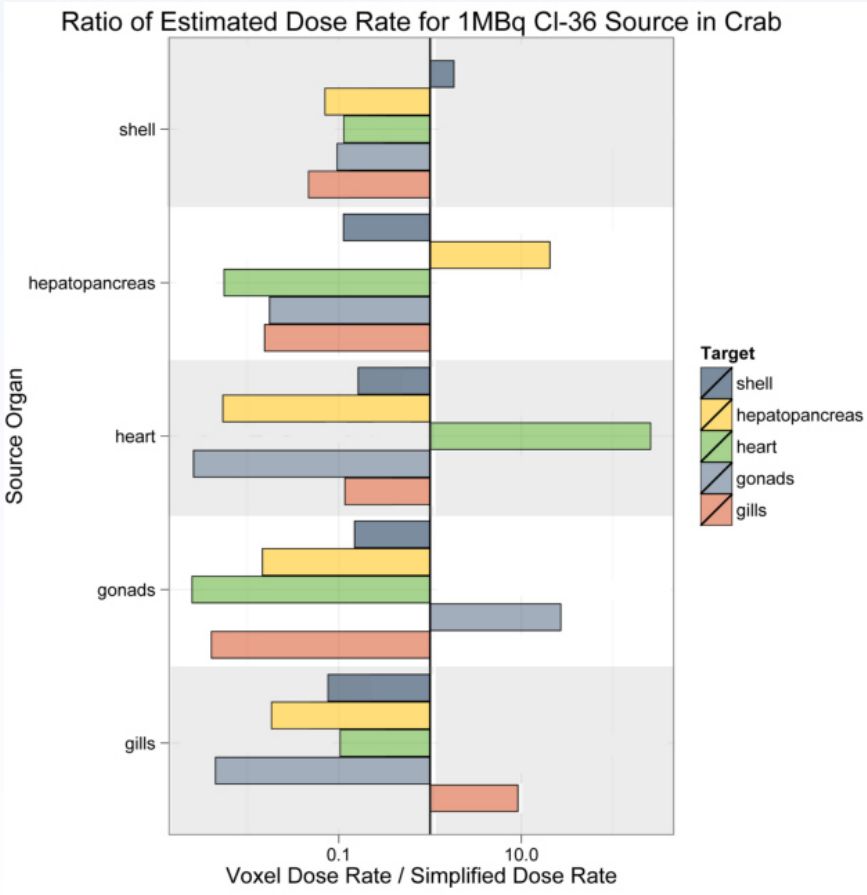
[UNSCEAR 2013, Vol I, Scientific Annex A]

TG99 'monographs'

Compilation of data on biology, life cycle, stable element ratios, exposure scenarios, transfer, effects, models, conclusions.

Vlad the crab

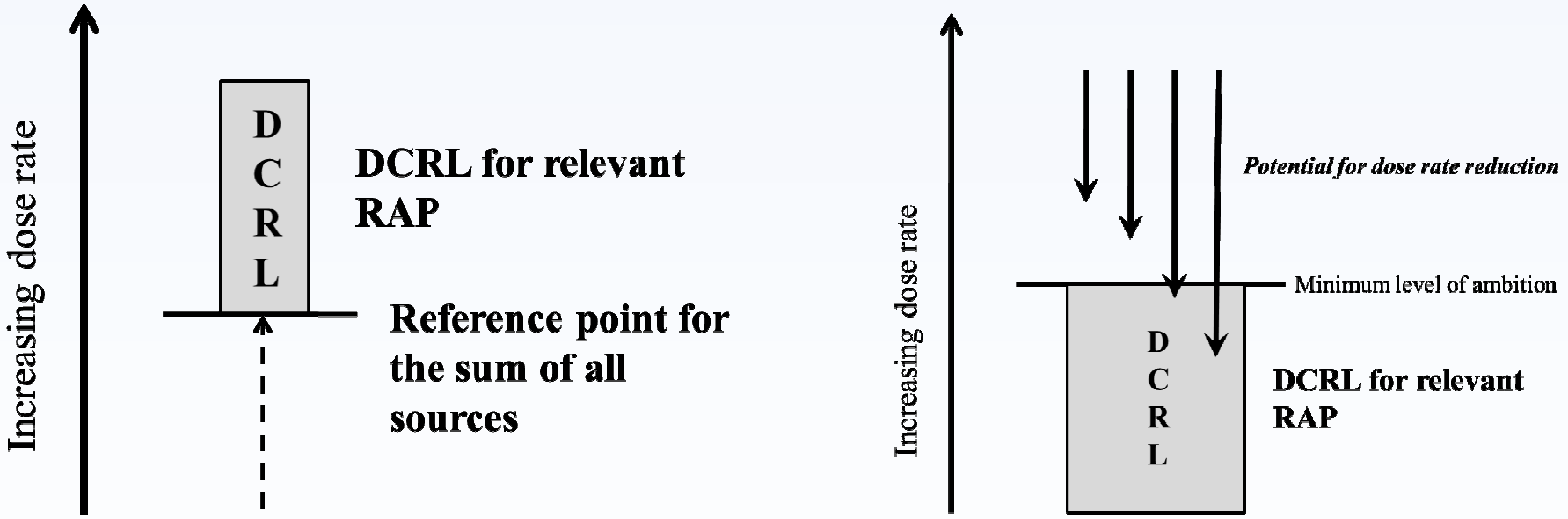




Higley et al. *Ann ICRP 44* (2015) pp 313-330

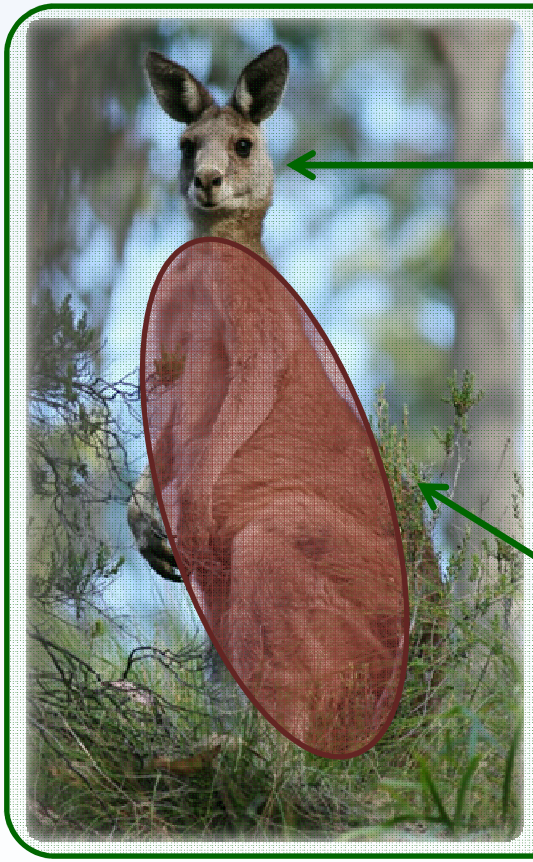
Application

Planned and existing exposure situations



[*Publication 124*]

Application TG?

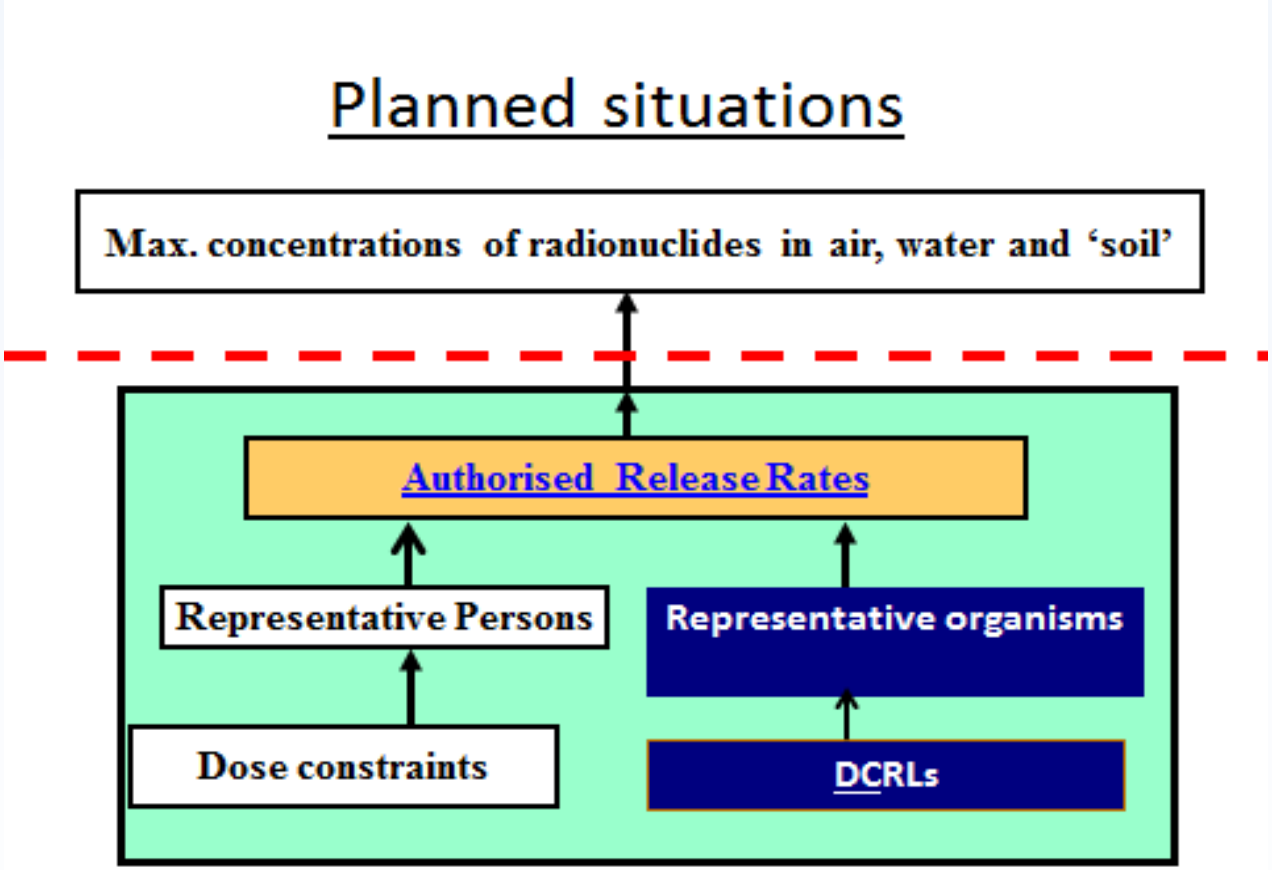


Representative Organism:
A typical organism representative of its environment (kangaroo).

Reference Animal:
A numerical approximation of organisms within a certain group of wildlife (large herbivorous mammal)

[ARPANSA Safety Guide SG-1(draft 2015)]

Application TG?



[Source: Jan Pentreath]

Summary – the *evolution* of ICRP EP

Element	P91	P108	P114	P124	TG72	TG74	TG99	TGx
Ethics/systems	X							
RAPs biology		X					X	
Transfer			X				X	
Exposure/DCC		X				X	X	
RBE/'weighting'					X		X	
Effects		X					X	
Application				X				X

Committee 5

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