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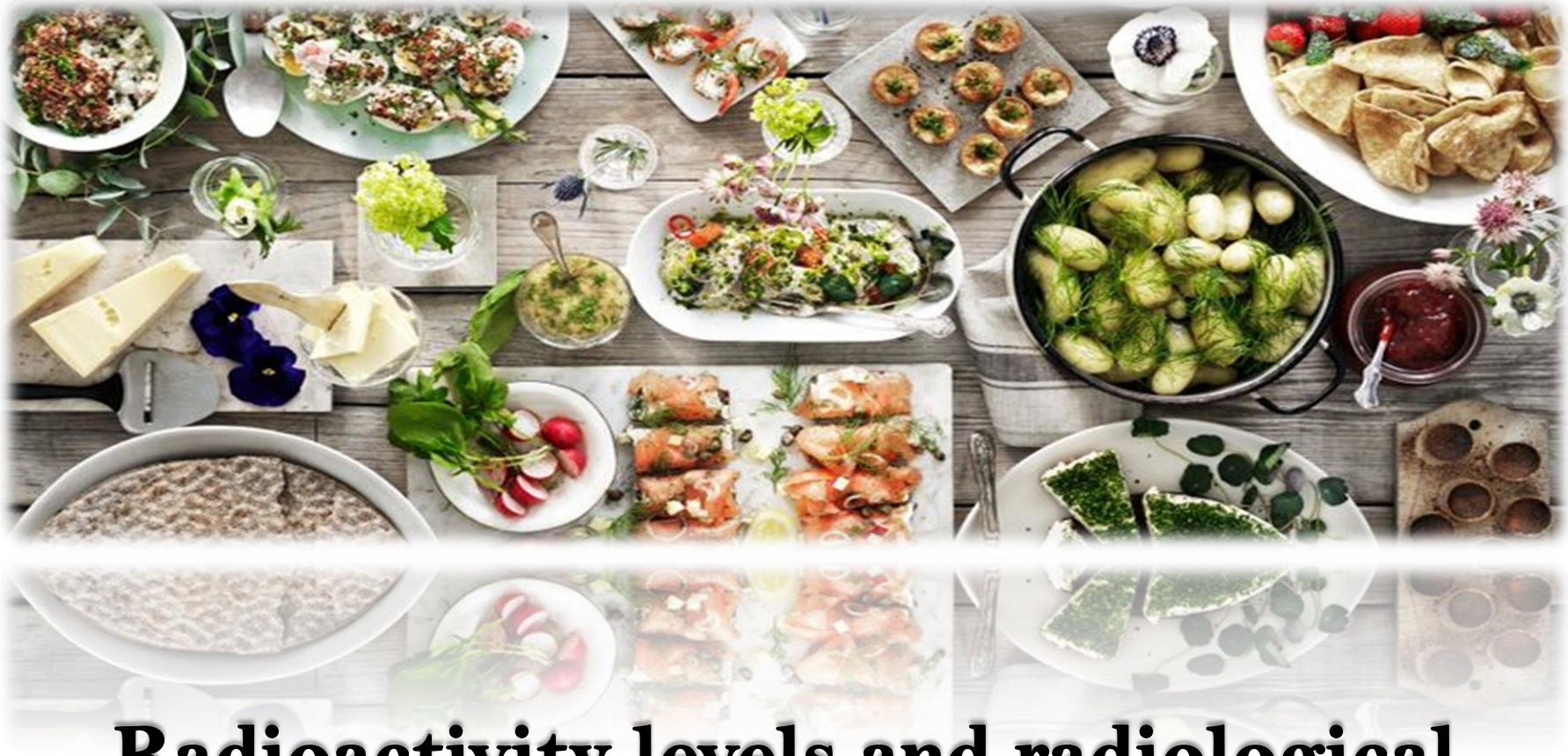
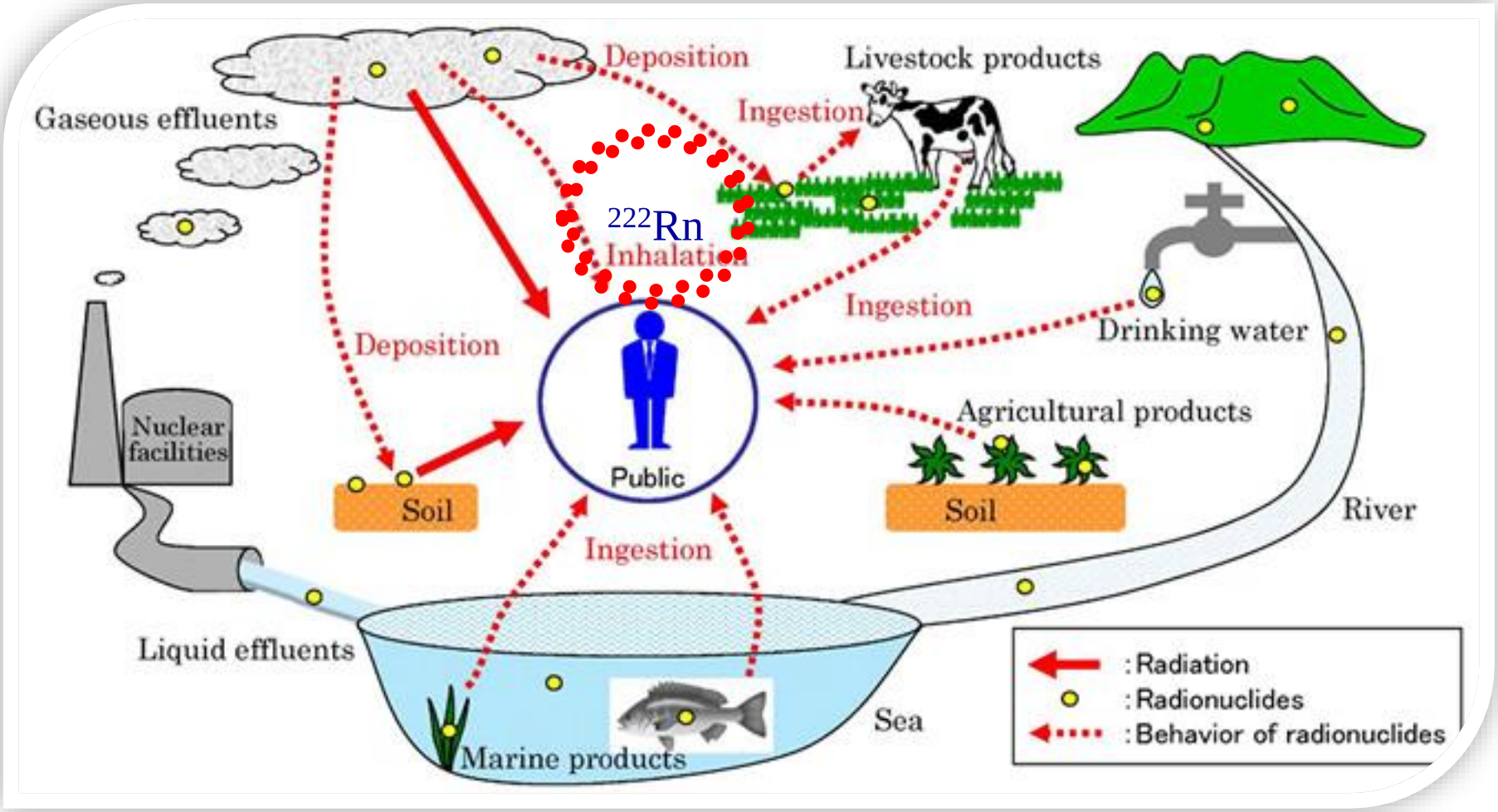
Strål säkerhets myndigheten
Swedish Radiation Safety Authority



Radioactivity levels and radiological implications in Swedish market basket

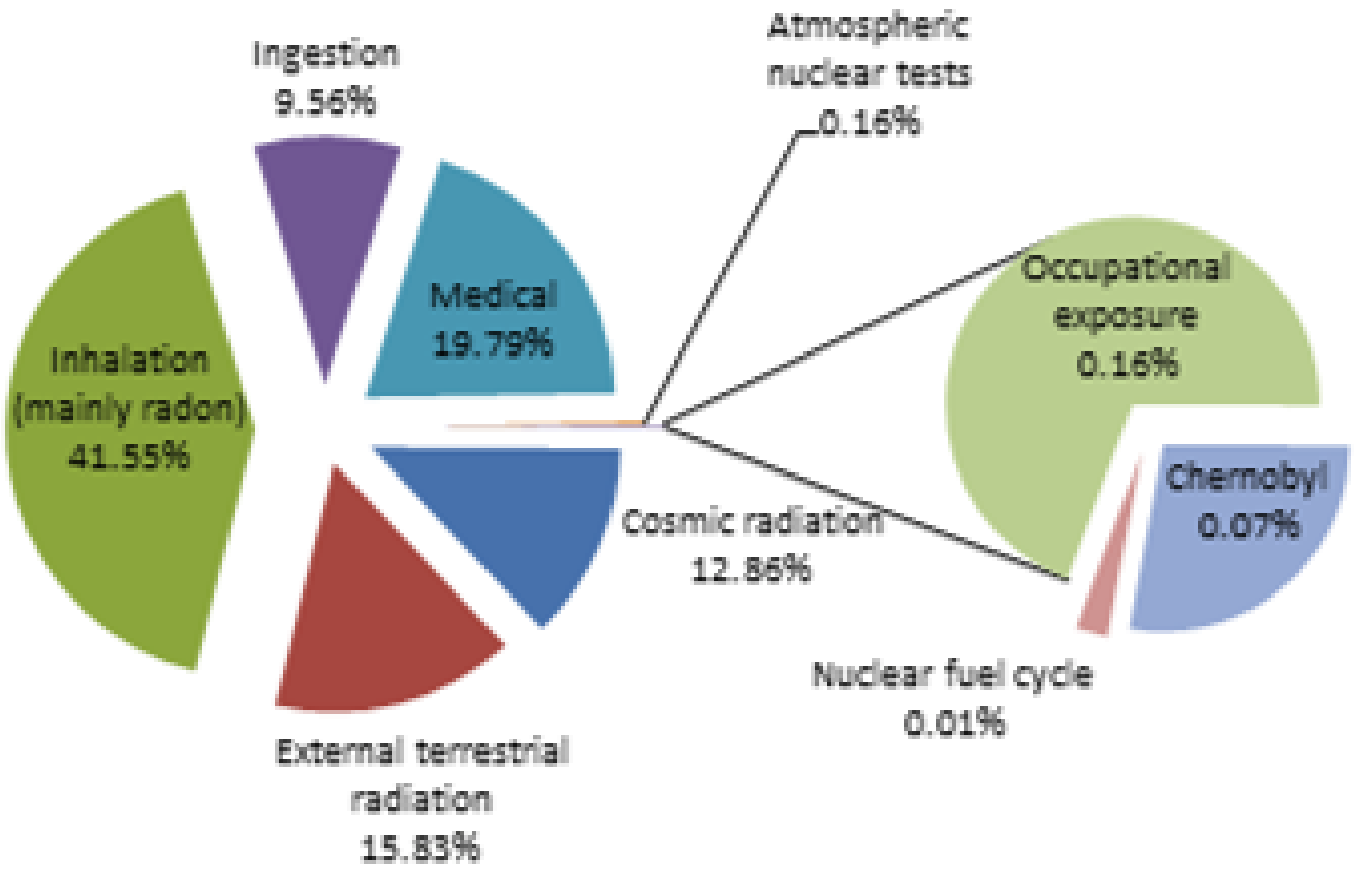
FRANCISCO PIÑERO GARCÍA
E. FORSELL-ARONSSON, M. ISAKSSON, E. HOLM, J. MANTERO, R. THOMAS

Radionuclides transfer pathway



https://www.jaea.go.jp

Average effective annual dose



Source: UNSCEAR 2008

Importance of ^{210}Po

Half life: 138 days

⇩

Alpha Emission: 5.305 MeV

⇩

Specific Activity: 166 TBq/g

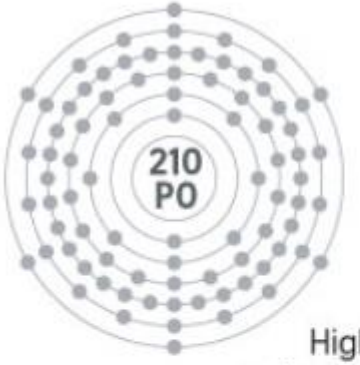
⇩

Coefficient Factor: 1.2 10^{-6} Sv/Bq

⇩

0.02 μg – 4 Sv

POISON:
POLONIUM 210



Highly radioactive

METHOD: CUP OF TEA

ALEXANDER LITVINENKO

Former Russian spy, opponent of Putin

November 2006

- Took tea with another ex-Russian agent in London. Started to feel pain as he went home. Moscow refused to extradite the main suspect.
- Died in the hospital three weeks later.

Radiotoxicity similar to ^{239}Pu and higher than ^{226}Ra

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Chernobyl nuclear accident

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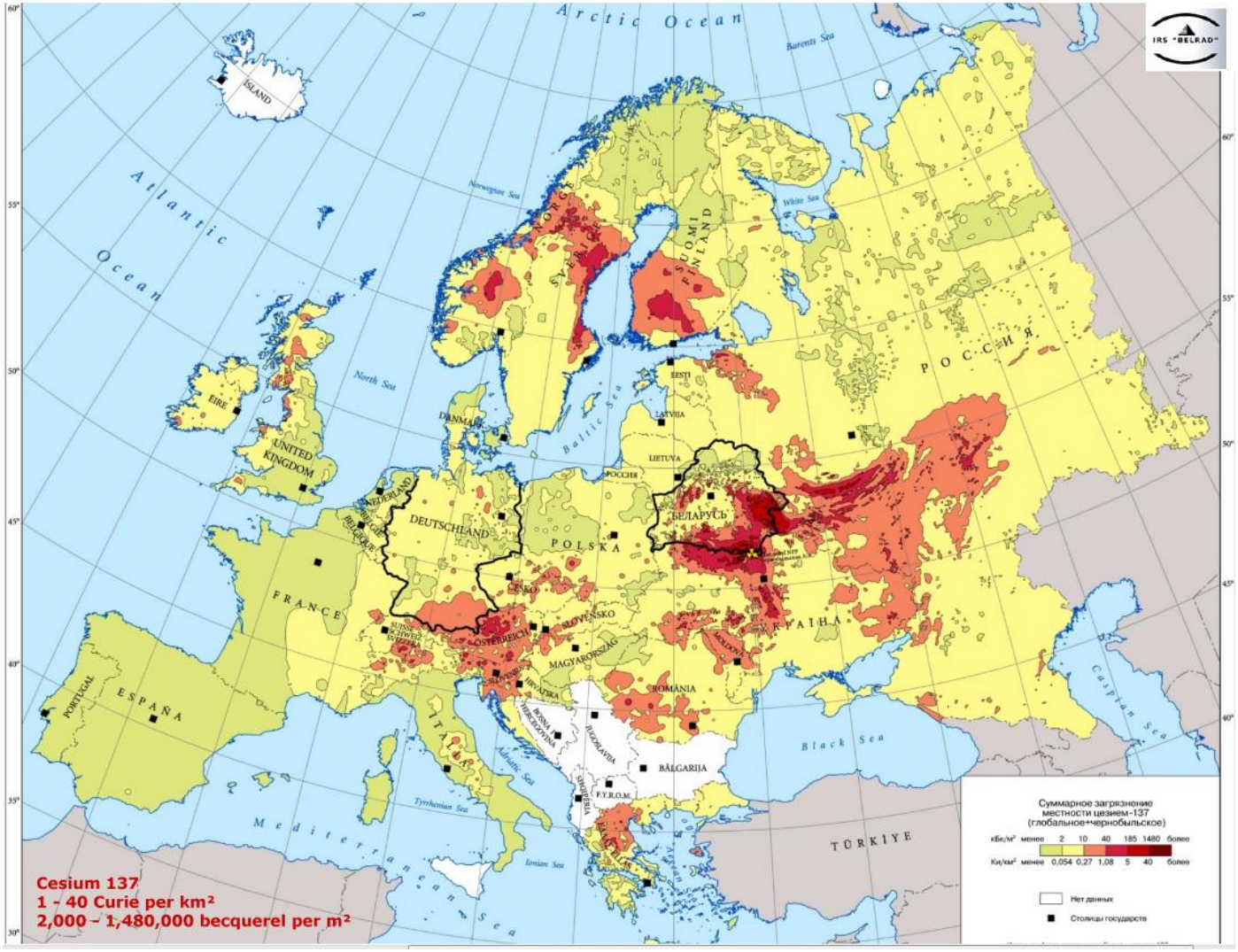
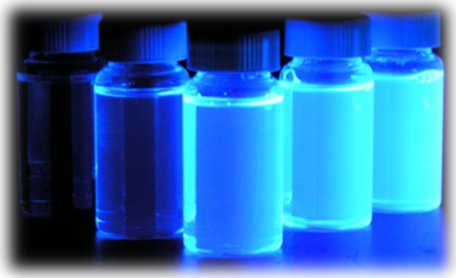


Radiometric Studies

α Spectrometry

γ Spectrometry



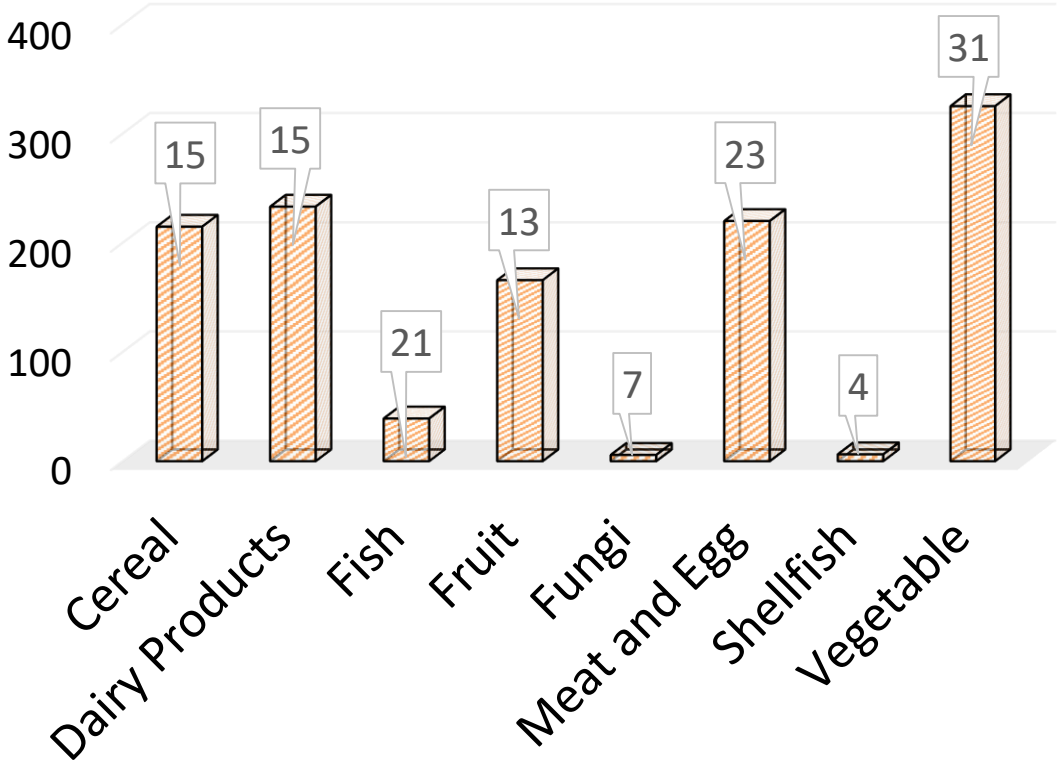
Liquid Scintillation

Swedish Food Habits

Livsmedelsverket
NATIONAL FOOD AGENCY, SWEDEN

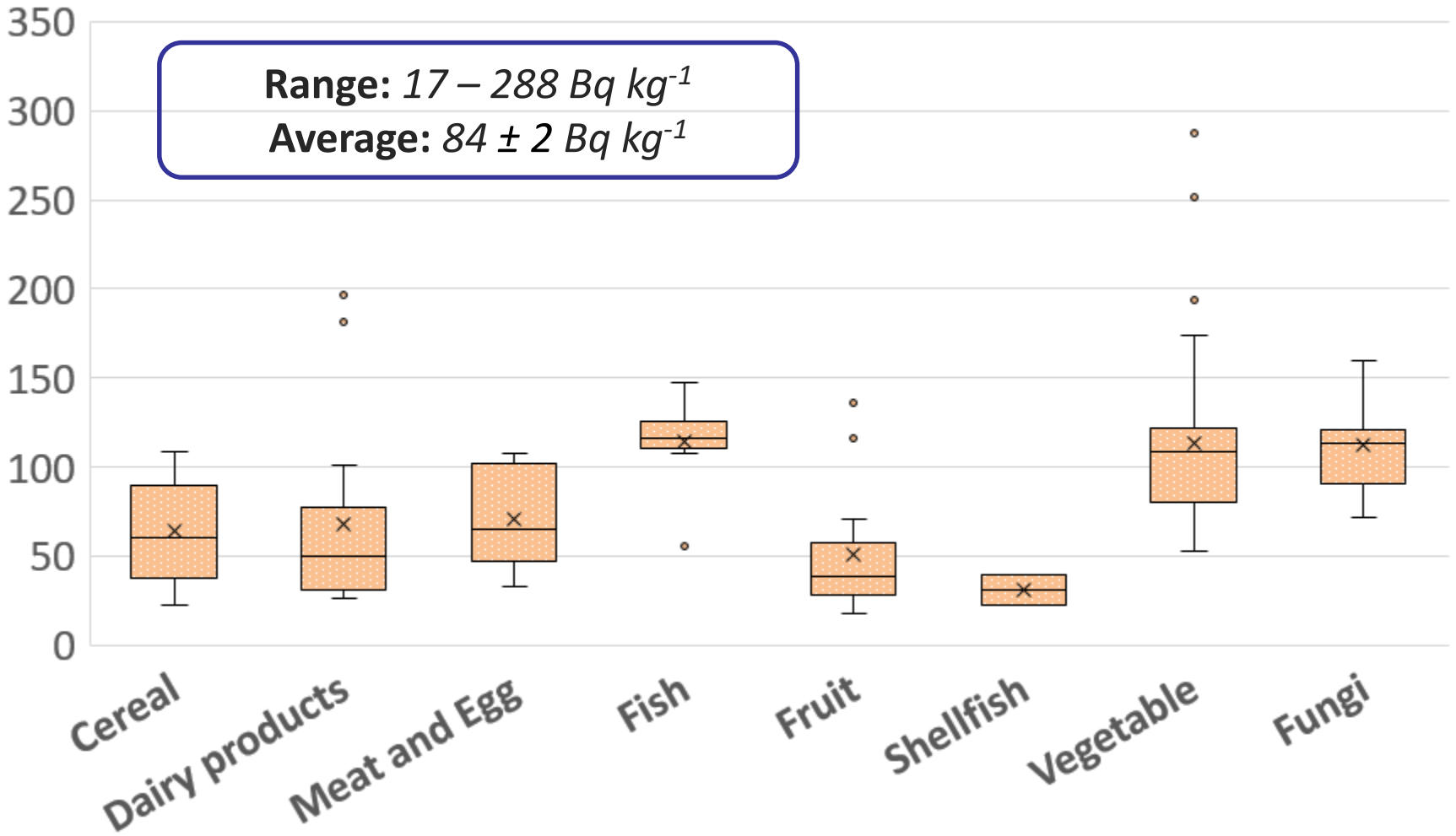
Swedish Board of Agriculture
Jordbruks verket

Swedish Food Consumption (g/day)



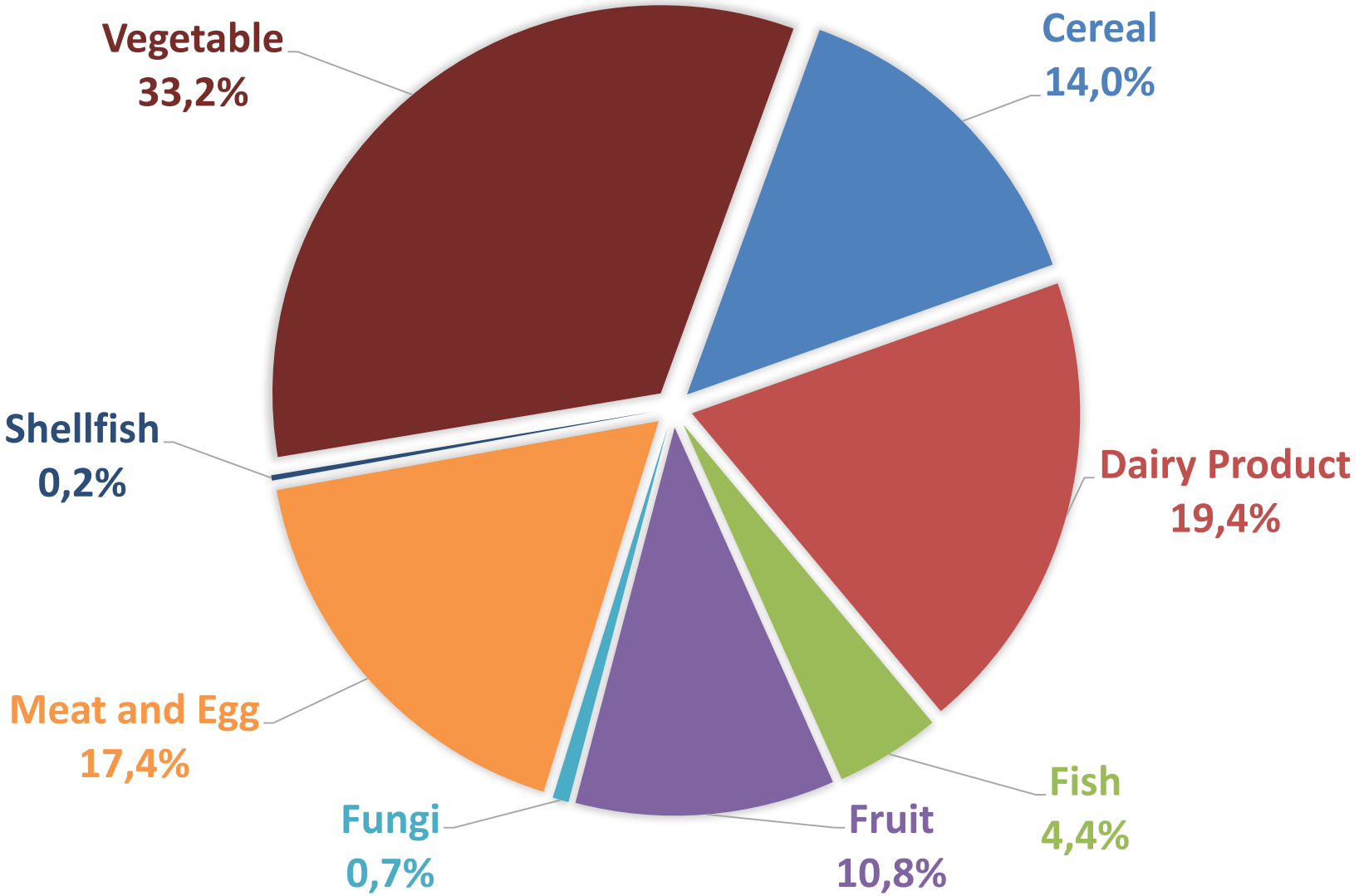
Sampling

^{40}K (Bq/kg)

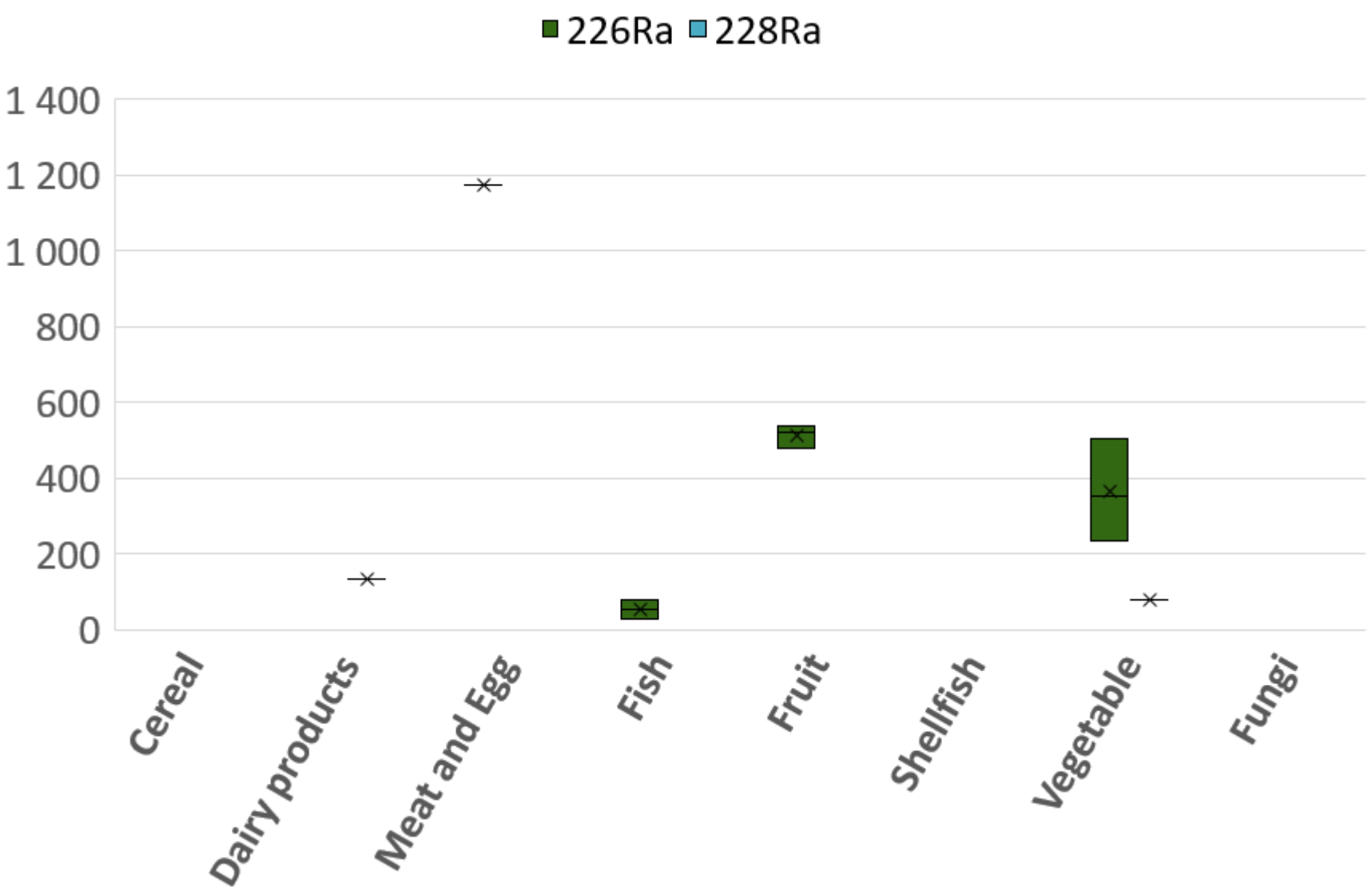

Range: 17 – 288 Bq kg-1
Average: 84 ± 2 Bq kg-1
350
300
250
200
150
100
50
0
Cereal
Dairy products
Meat and Egg
Fish
Fruit
Shellfish
Vegetable
Fungi

^{40}K annual intake distribution

Sweden ^{40}K: 233 ± 9 *Bq y^{-1}*



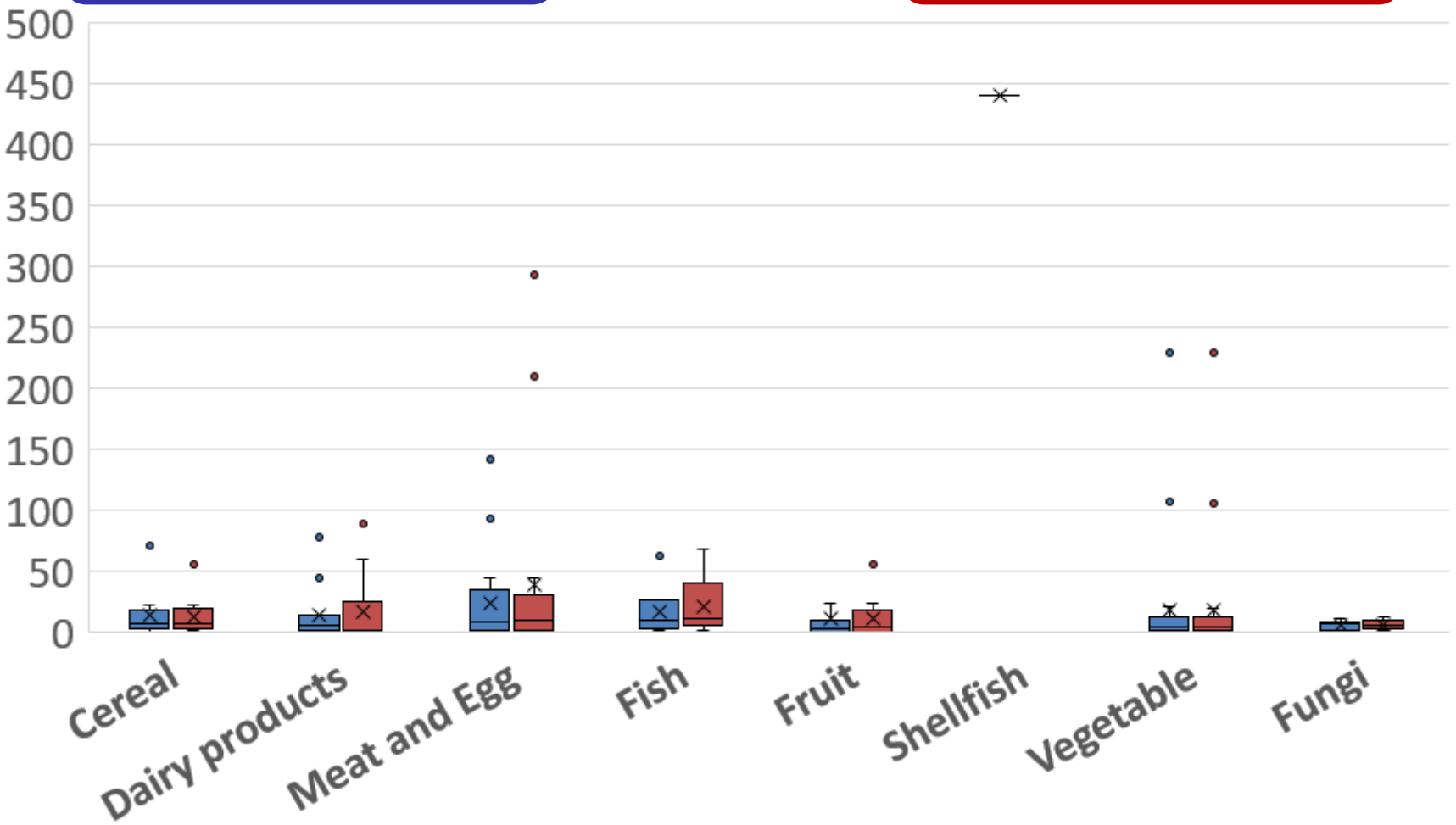
$^{226,\ 228}$Ra (mBq/kg)



^{238,234}U (mBq/kg)

Range: *0.4 – 440 Bq kg^{-1}*
Average: *21 ± 3 Bq kg^{-1}*

Range: *0.3 – 536 Bq kg^{-1}*
Average: *26 ± 4 Bq kg^{-1}*



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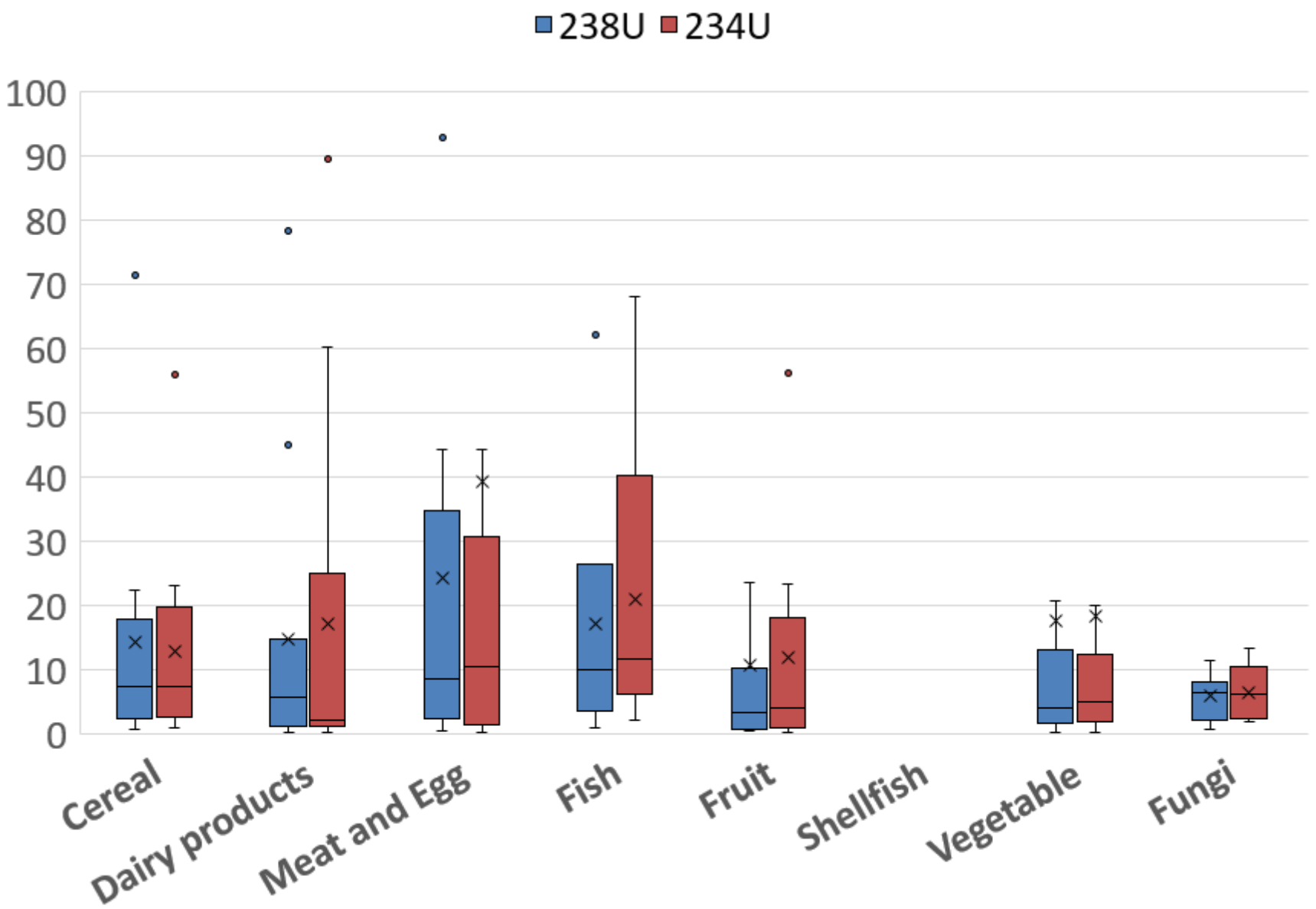
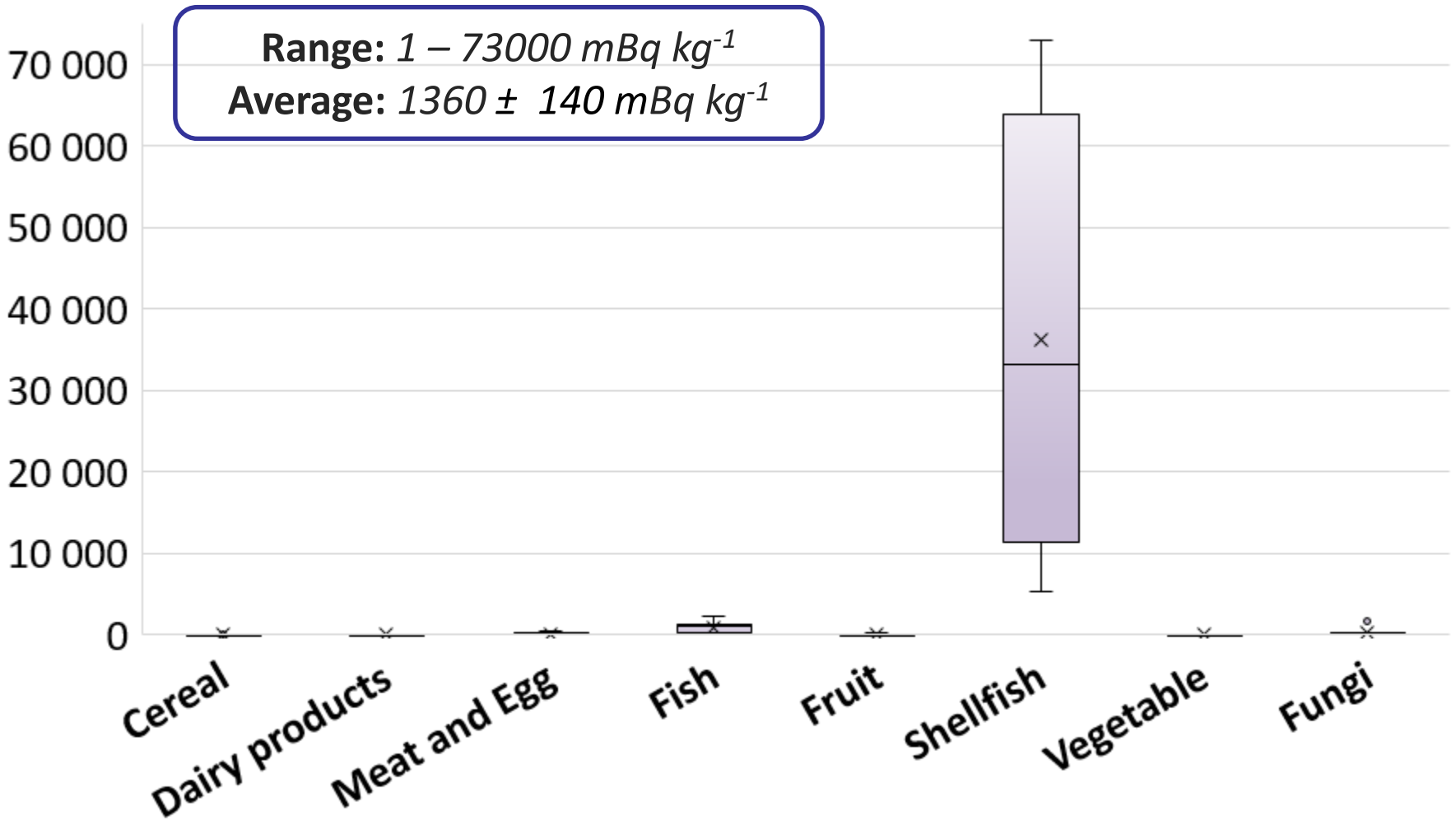
^{238,234}U (mBq/kg)

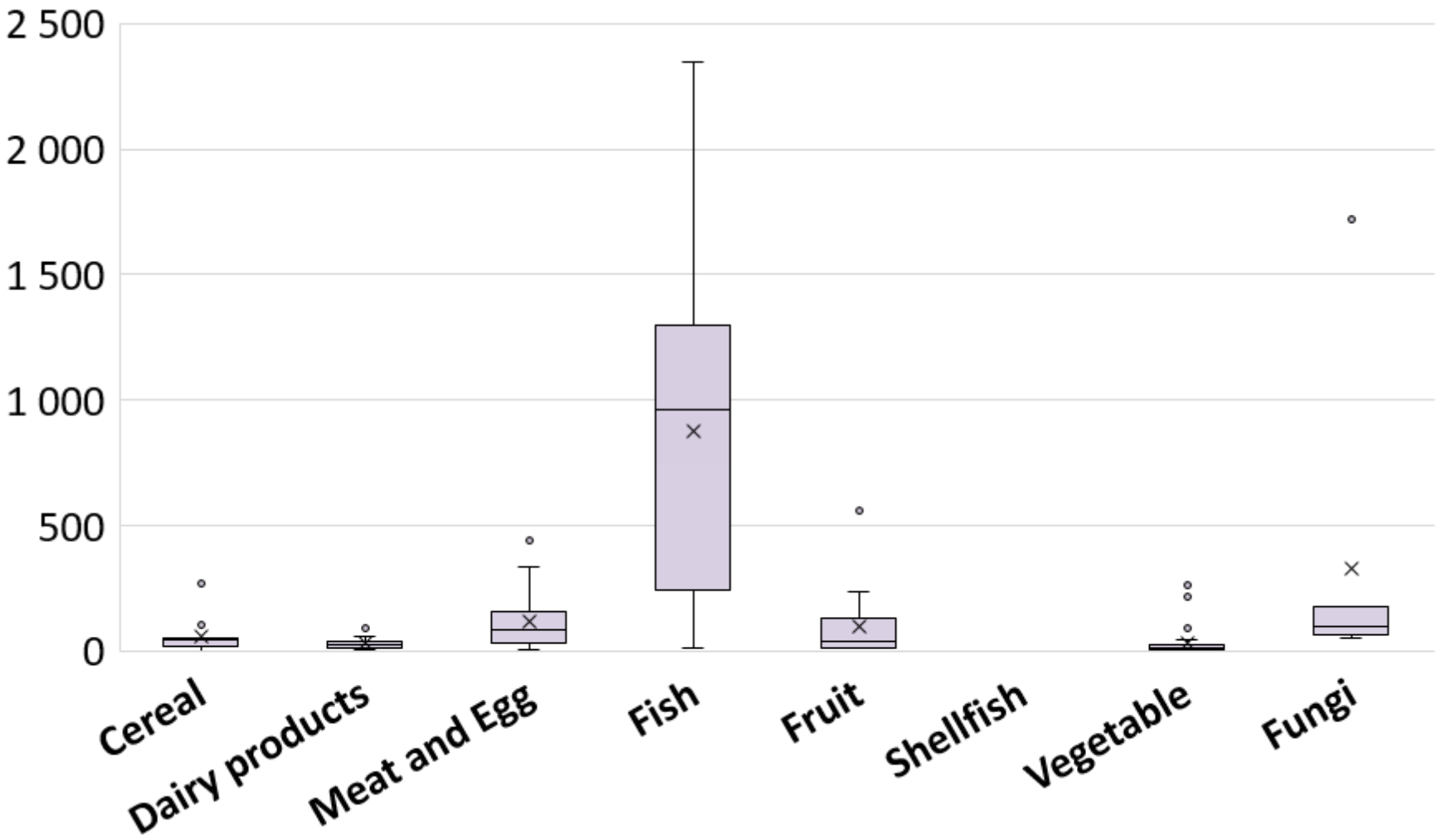
Strål säkerhets myndigheten
Swedish Radiation Safety Authority



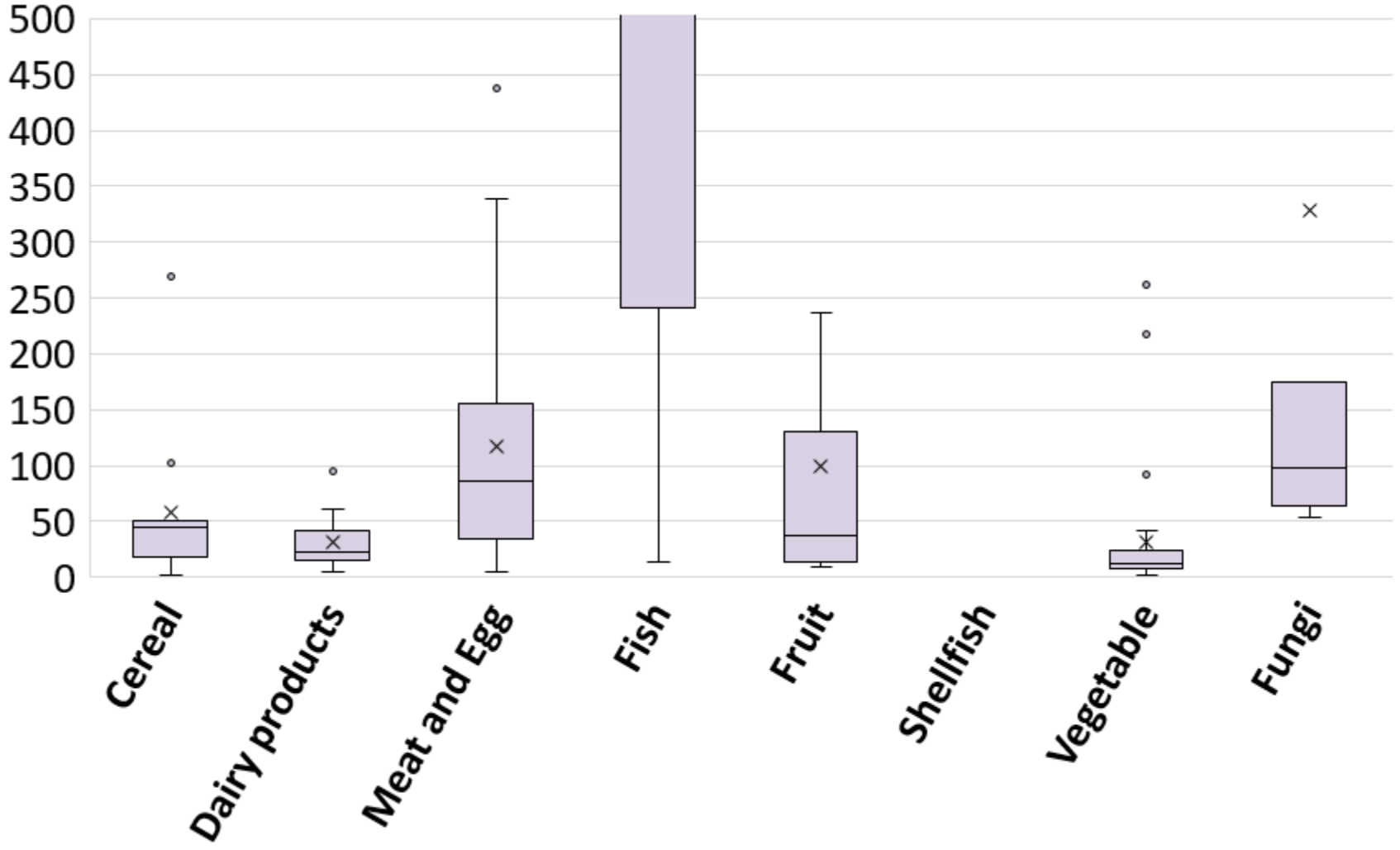
^{210}Po (mBq/kg)


Range: 1 – 73000 mBq kg-1
Average: 1360 ± 140 mBq kg-1
70 000
60 000
50 000
40 000
30 000
20 000
10 000
0
Cereal
Dairy products
Meat and Egg
Fish
Fruit
Shellfish
Vegetable
Fungi

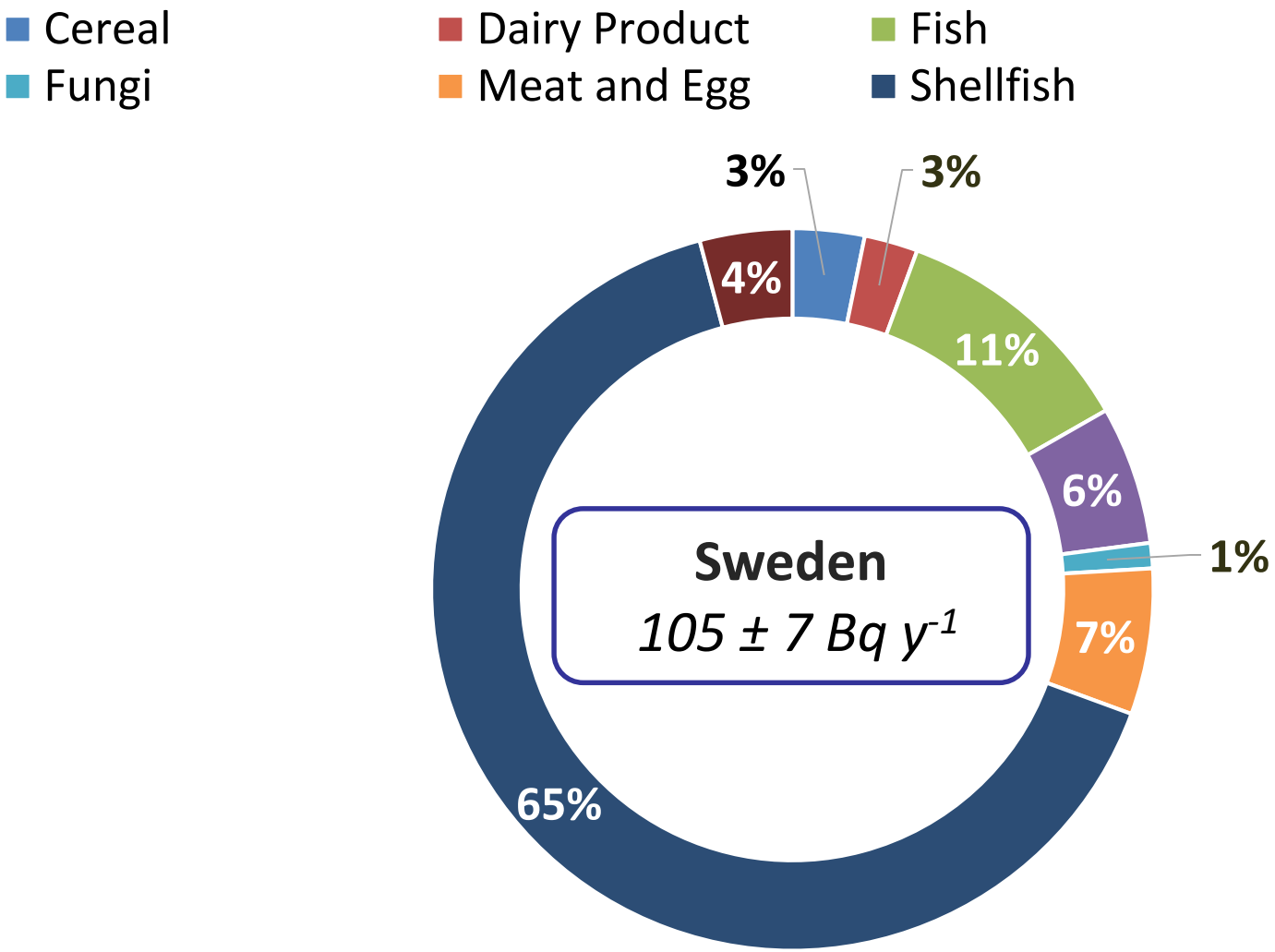
^{210}Po (mBq/kg)


2 500
2 000
1 500
1 000
500
0
Cereal
Dairy products
Meat and Egg
Fish
Fruit
Shellfish
Vegetable
Fungi

^{210}Po (mBq/kg)


500
450
400
350
300
250
200
150
100
50
0
Cereal
Dairy products
Meat and Egg
Fish
Fruit
Shellfish
Vegetable
Fungi

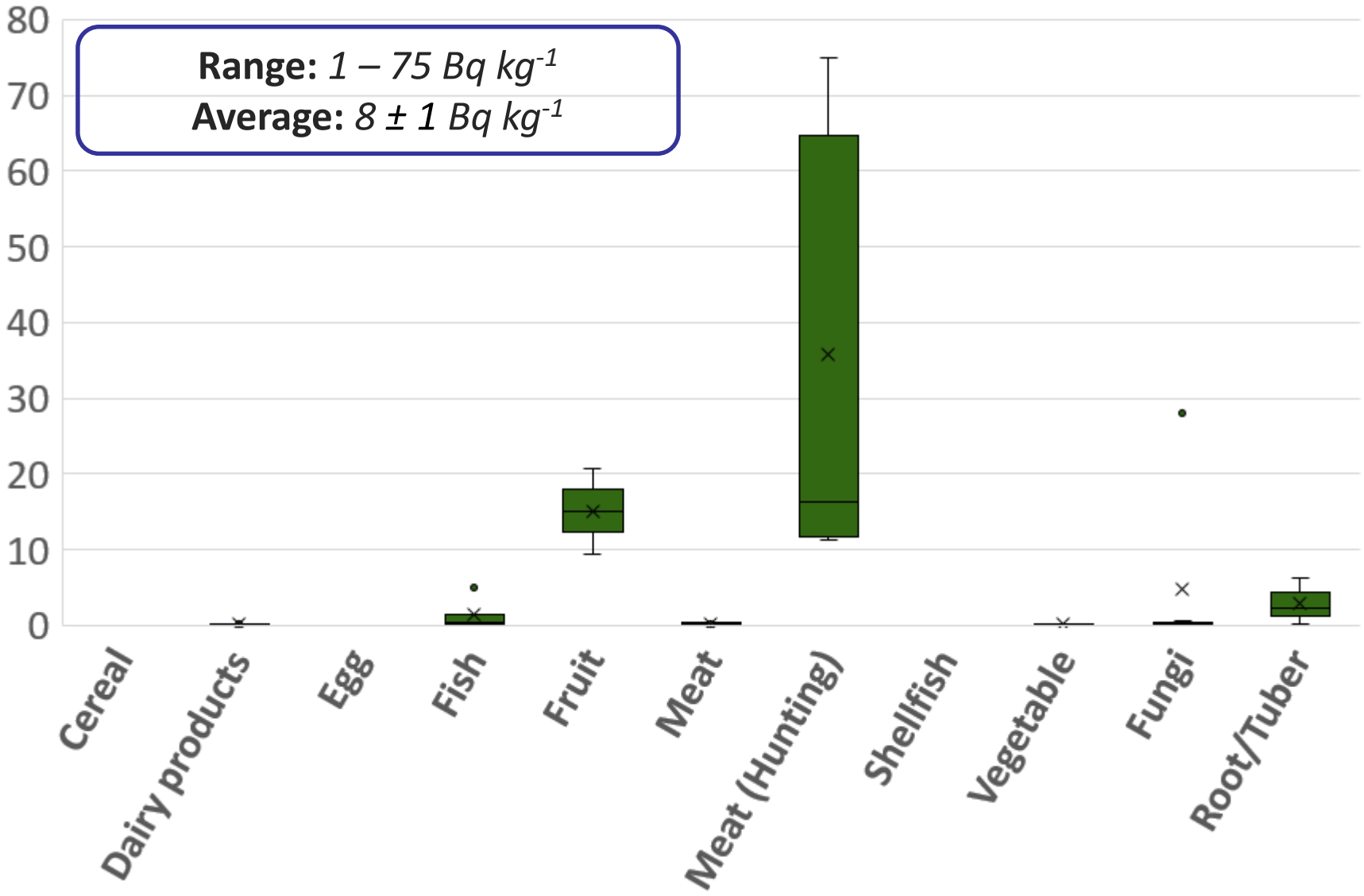
^{210}Po annual Intake (mBq/kg)



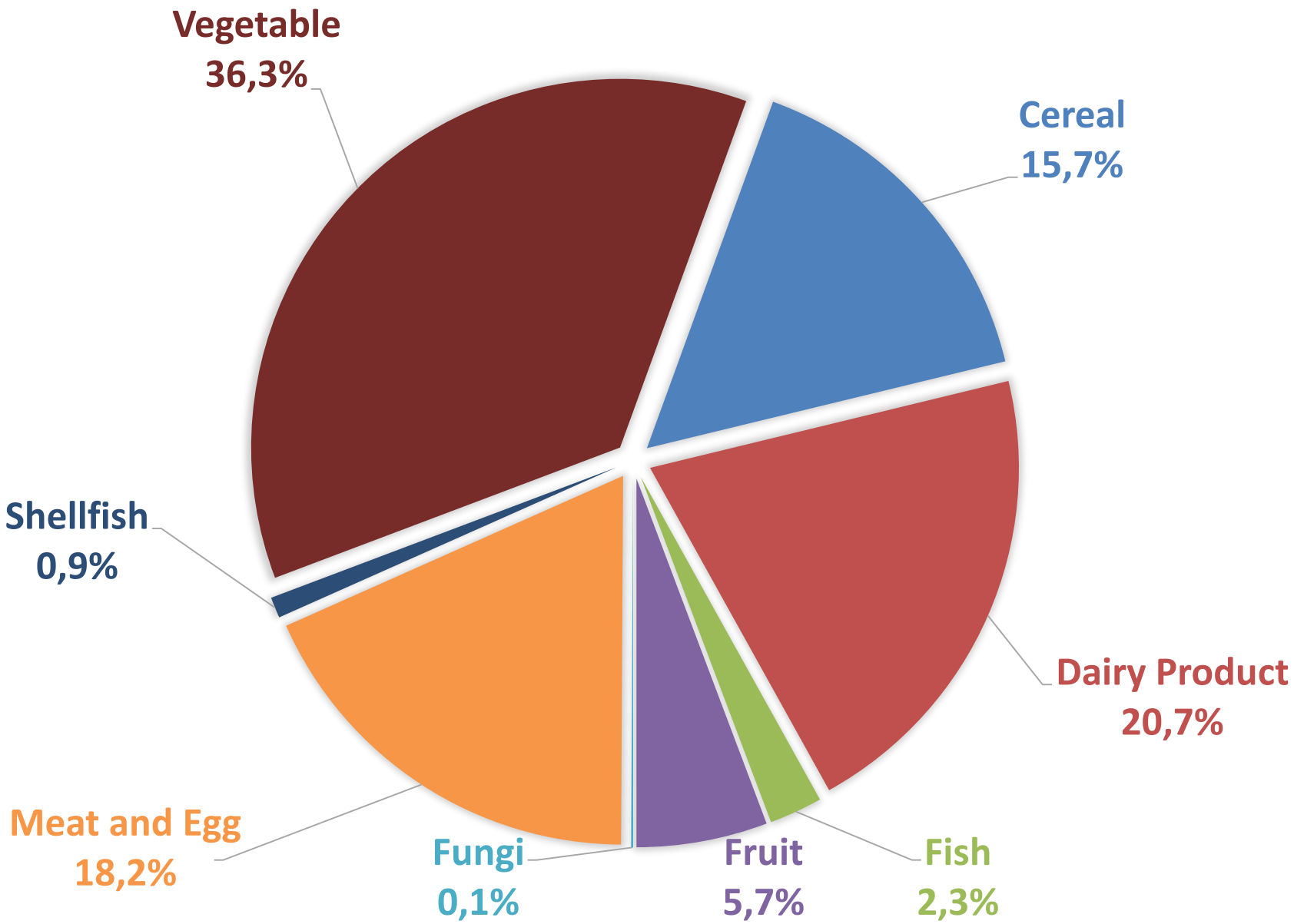
World: 58 *Bq y^{-1}* **Europe:** 40 *Bq y^{-1}*

Source: UNSCEAR

^{137}Cs (Bq/kg) Anthropogenic 90Sr

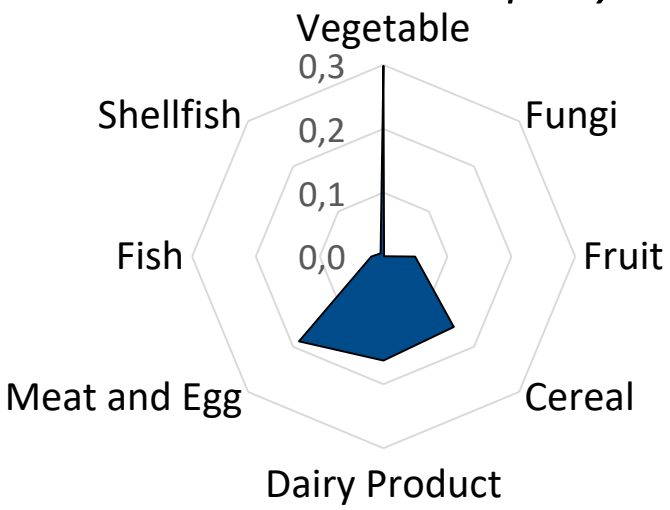


^{137}Cs annual Intake (mBq/kg)

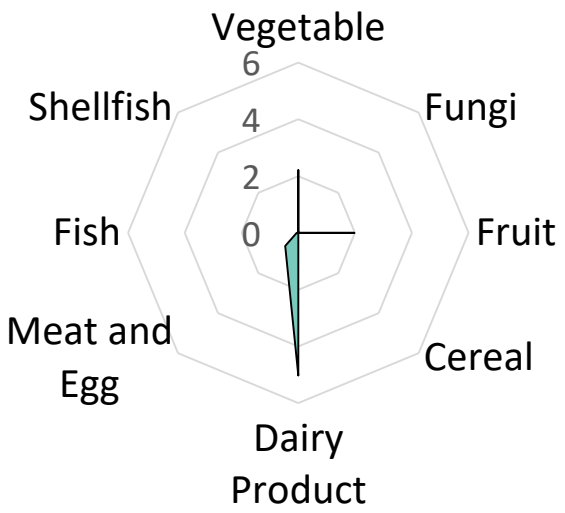


Committed effective dose (μSv y^{-1})

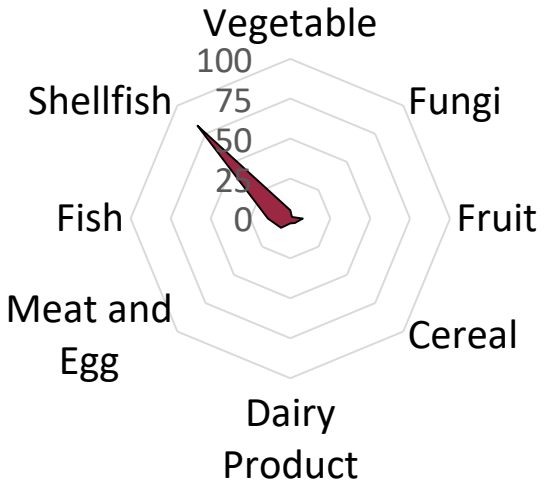
^{238,234}**U:** *0.9 ± 0.1 μSv y^{-1}*



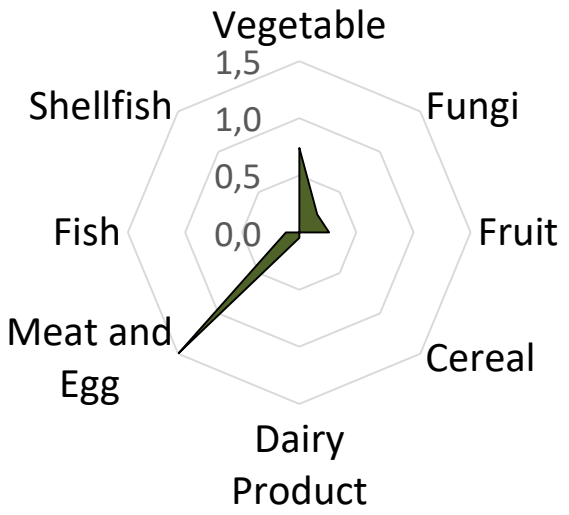
$^{226, 228}$**Ra:** *10 ± 3 μSv y^{-1}*



^{210}**Po:** *126 ± 9 μSv y^{-1}*

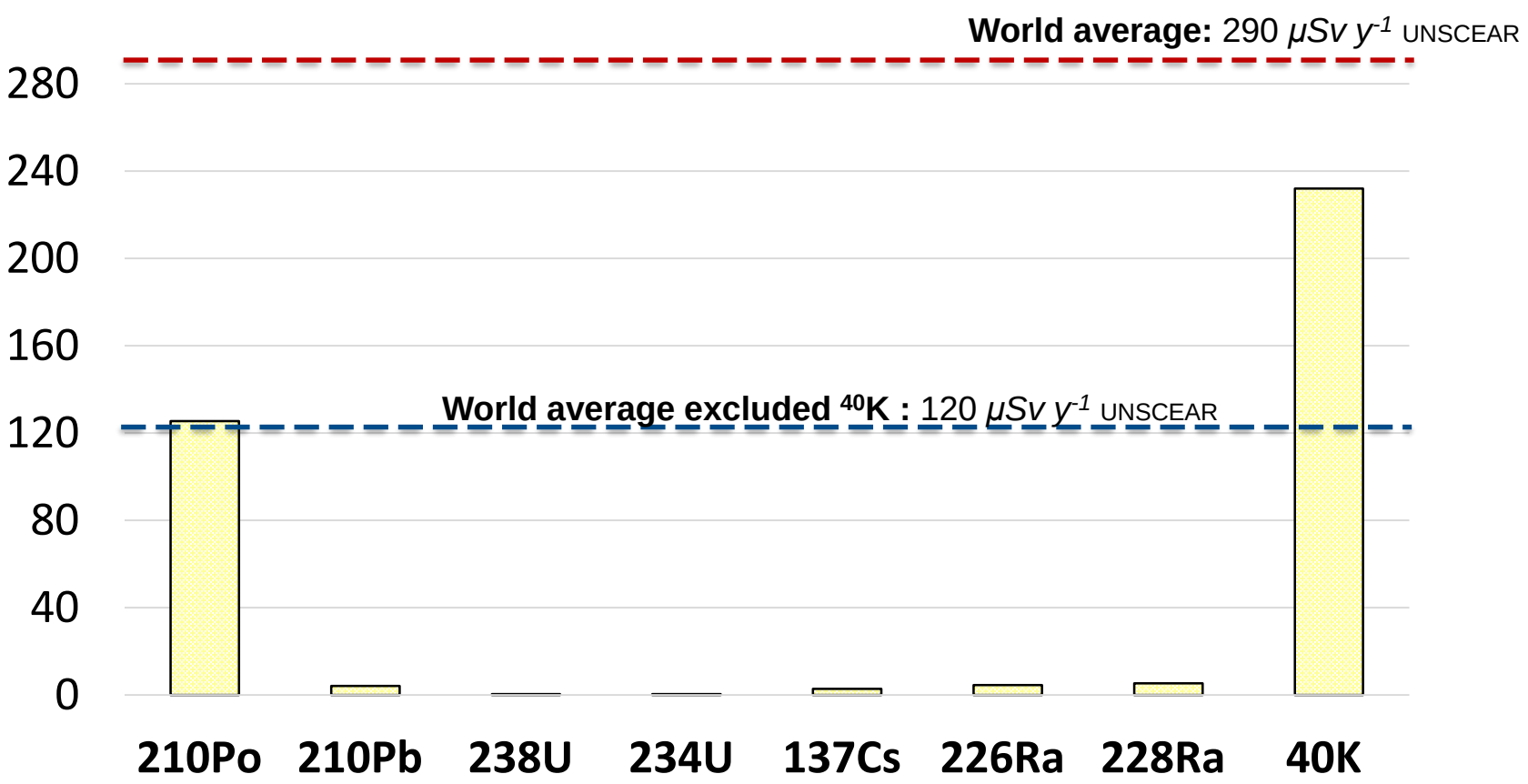


^{137}**Cs:** *3 ± 1 μSv y^{-1}*



Committed effective dose ($\mu Sv\ y^{-1}$)

Committed effective dose intake: *375 ± 21 µSv y^{-1}*
Committed effective dose intake (^{40}K excluded): *143 ± 13 µSv y^{-1}*



Total Dose exposure in Sweden
Whole population: *4.2 mSv y^{-1} (9 %) –* ***never Smokers:*** *2.5 mSv y^{-1} (15%)*

Take home message

- ^{210}Po has the highest contribution, in particular, **seafood** intake is the main pathway for the **bioaccumulation** of ^{210}Po.
- Population, living in Sweden, with **high consumption** of **seafood, gathered food and game** should be considered for dose assessment.
- Even if foods contain only small amounts of radioactive elements, a **risk** might emanate due to a **high consumption** such as **milk, potato, carrot**.

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