Models

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Toxicokinetics model

Ingestion part

The dynamic of the internal concentration of the contaminant, also known as the toxicokinetics, may be describe by this simple equation:

$$\frac{dC_{j,in}}{dt} = TrIng_{j,tot} - k_{j,out}C_{j,in}$$

$$\frac{dC_{a,in}}{dt} = TrIng_{a,tot} - k_{a,out}C_{a,in}$$

where: - $C_{j,in}$ and $C_{a,in}$ are respectivelly the internal concentration for *juveniles* and *adults* - $TrIng_{j,tot}$ and $TrIng_{a,tot}$ are the trophical ingestion of contaminant for *juveniles* and *adults* respectivelly (see later for details) - $k_{j,out}$ and $k_{a,out}$ the excretion rate of the contaminant for *juveniles* and *adults* respectivelly

Note that since $TrIng_{a,tot}$ is constant, we have:

$$C_{i,in} = \frac{TrIng_{i,tot}}{k_{out}} \left(1 - e^{-k_{i,out}t}\right)$$

About $TrIng_{;tot}$

A juvenile is only exposed to the contaminant through the maternal feeding (milk). Note that a new-born has likely been exposed through maternal gestation, that is, at time $t = 0$ (or birth date) $C_{j,in}(t = birth) = C_{j,init} > 0$.

$$TrIng_{j,tot} = \eta_j \times I_{maternal} \times C_{maternal}$$

And, for n prey species, and adult is exposed to the contaminant through food items:

$$TrIng_{a,tot} = \eta_a \sum_{i=1}^{n} \times I_i \times C_i$$

In both equations, we have: - η_j and η_a the assimilation rate in *juveniles* and *adults*, - I_i: the ingestion rate of item i (e.g., $kg.day^{-1}$), - C_i: the concentration in item i (e.g., $mg.kg^{-1}$).

Ingestion rate:

$$I_i = \phi_i \times B_i$$

- ϕ_i is the proportion of item i in the diet.
- B_i is the Biomass of item i in the diet (e.g., mean biomass of whole or part of ingested individuals of species i).