**S2. Parameterisation of the uptake rate of parasites**

Metal concentrations in parasites can be simulated by the following mass balance equation:

$\frac{dC\_{p}}{dt}=k\_{p}×C\_{t}×\frac{W}{W\_{p}}-n\_{p}×g\_{p}×C\_{p}$ (S7)

where Cp (µg/kg ww) is the metal concentration parasites; *k*p (1/d) is the uptake rate constant by parasites; W­­­ (g) is the whole fish weight; Wp (g) is the weight of parasites; *n*p is the number of parasite individual in the fish host; and *g*p (1/d) is the growth rate constant of parasites. This equation can be re-written as:

$\frac{dC\_{p}}{dt}=k\_{p}×Cf\_{i}-n\_{p}×g\_{p}×C\_{p}$ (S8)

where Cfi (µg/kg wt) represents the fish source:

$Cf\_{i}=C\_{t}×\frac{W}{W\_{p}}$ (S9)

where C*t* (µg/kg wt) is the metal concentration in fish; W (g) is the whole fish weight; and Wp (g) is the weight of parasites in the fish. Because of the insignificant changes in the weight of the whole fish (Table S6), the average of the fish collected at different sampling times were used for the above equation. Using this method, Cfi was relatively constant (Fig S4 and Table S6). Consequently, 210Pb was considered to be taken from a constant source.

**Table A. The growth of chub in weight during a 35-day period**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Day** | **Concentrations in muscle (cpm/g)** | **Estimated concentrations in whole fish (cpm/g)** | **Whole fish weight W (g)** | **Total parasite weight Wp (g)** | **Cfi (cpm/g)** |
| 0 | 5.28 | 5.69 | 9.6 | 4.38**.** 10-3 | 8528.19 |
| 3 | 3.41 | 3.49 | 10.0 | 7.60**.** 10-3 | 8265.48 |
| 10 | 7.55 | 8.33 | 11.6 | 8.10**.** 10-3 | 9682.58 |
| 17 | 3.76 | 3.90 | 12.8 | 6.72**.** 10-3 | 6090.44 |
| 24 | 6.80 | 7.45 | 10.2 | 1.60**.** 10-2 | 6169.36 |
| 31 | 9.09 | 10.14 | 9.7 | 1.30**.** 10-2 | 8892.27 |
| 38 | 12.36 | 13.96 | 9.8 | 1.34**.** 10-2 | 8892.27 |
| Average |  |  | 10.5 |  | 8074.37 |

**Fig A. The time-dependent source of 210Pb from the chub to parasites.** The black line represents the instant source estimated at sampling times and the orange line represents the average value.

Based on the assumption that the source of 210Pb in chub for the parasites was constant, 210Pb concentrations in the parasites could be expressed by the following equation:

$C\_{p}=\frac{k\_{p}}{n\_{p}×g\_{p}}×Cf\_{i}×\left(1-e^{-n\_{p}×g\_{p}×t}\right)$ (S10)

Subsequently, the uptake rate of 210Pb by parasites from the chub was determined based on Equation S10, i.e. by optimising the similarity between the 210Pb concentrations in parasites Cp estimated by Equation S4 and the concentrations measured by Sures et al. [24]. A value of 1.36. 10-3 was determined for *k*p through the non-linear regression analysis using the Sigma Plot. The time-dependent concentrations of 210Pb in parasites modelled and measures are given in Fig S5:

**Fig B. The time-dependent concentrations of 210Pb in parasites modelled (represented by the orange asterisk) and measured (represented by the line) in the study of Sures et al. [24]**