**Supplement S1**

**Supplementary Table S1** Number of samples of each species at sampling site and distance from the North Sea

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Species** | **Number of samples** | | |  |  |  |  |  |  |  |  |
| **Sampling site No.** | **S1** | **S2** | **S3** | **S4** | **S5** | **S6** | **S7** | **S8** | **S9** | **S10** | **S11** |
| **Distance from the North Sea (km)** | 1134.2 | 1107.2 | 1086.5 | 1045.2 | 915.3 | 882.2 | 856.5 | 848.6 | 818.9 | 765.4 | 741.1 |
| *Squalius cephalus* | 15 | 27 | 19 | 15 | 17 | 4 | 3 | 15 | 31 | 7 | 5 |
| *Rutilus rutilus* |  | 20 | 23 | 9 | 3 | 24 |  | 44 |  | 3 | 8 |
| *Alburnus alburnus* |  | 10 | 6 | 12 |  | 29 | 9 | 15 | 2 | 1 | 2 |
| *Barbus barbus* | 2 | 24 | 13 | 4 |  |  |  |  |  |  |  |
| *Gobio gobio* | 8 | 4 | 2 | 9 | 8 | 8 | 2 | 5 |  | 2 |  |
| *Leuciscus leuciscus* | 3 | 22 | 11 | 6 |  | 5 |  | 1 | 1 |  |  |
| *Chondrostoma nasus* |  | 6 | 15 | 3 |  | 7 |  | 8 |  | 12 | 3 |
| *Perca fluviatilis* | 1 |  |  |  | 5 |  | 4 | 8 |  | 4 | 3 |
| *Leuciscus idus* |  |  |  | 3 |  |  |  | 7 | 3 | 1 | 1 |
| *Cottus gobio* | 7 | 14 | 3 |  |  | 3 |  |  |  |  |  |
| *Gymnocephalus cernua* |  |  |  |  |  |  |  | 7 | 4 |  | 2 |
| *Neogobius melanostomus* |  |  |  |  |  |  |  |  |  | 13 | 18 |
| *Abramis brama* |  |  |  | 5 |  |  |  | 5 |  |  |  |
| *Blicca bjoerkna* |  |  |  |  |  |  |  | 5 |  |  |  |
| *Carassius auratus* |  |  |  |  |  |  |  | 3 | 1 |  |  |
| *Thymallus thymallus* |  | 3 |  |  |  |  |  |  |  |  |  |
| *Barbatula barbatula* | 3 | 1 | 2 |  |  |  |  |  |  |  |  |
| *Salmo trutta* | 4 | 2 |  |  |  |  |  |  |  |  |  |
| *Anquilla anquilla* |  |  |  |  |  |  | 3 |  |  |  |  |
| *Vimba vimba* |  |  |  |  |  |  |  | 2 |  |  |  |

**Supplementary Table S2** Random effect model selection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | AICc | Delta\_AICc | AICcWt | Cum.Wt | LL |
| lmm3: SEAc ~ 1 + (1|site) + (1|species) | 2781.77 | 0 | 0.71 | 0.71 | -1386.85 |
| lmm2: SEAc ~ 1 + (1|site) + (1|species) + (1| egroup) | 2783.79 | 2.03 | 0.26 | 0.97 | -1386.85 |
| lmm1: SEAc ~ 1 + (1|site) + (1|species) + (1|egroup/species) + (1 |egroup) | 2787.87 | 6.1 | 0.03 | 1 | -1386.85 |
| lmm4: SEAc ~ 1 + (1|species) | 2952.2 | 170.43 | 0 | 1 | -1473.08 |
| lmm5: SEAc ~ 1 + (1|site) | 3720.73 | 938.96 | 0 | 1 | -1857.35 |

**Supplementary Table S3** Quantitative community metrics at sampling sites along the Elbe River basin, NR, δ15N range; CR, δ13C range; TA; CD; MNND; and SDNND. NA – not available; \* = p < 0.05.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sampling site** | **NR** | **CR** | **TA** | **CD** | **MNND** | **SDNND** |
| S1 | 2.08 | 1.48 | 0.99 | 1.04 | 1.48 | 0.07 |
| S2 | 1.26 | **6.2\*** | **4.37\*** | 1.56 | 0.96 | **1.2\*** |
| S3 | 2.94 | **4.19\*** | **5.63\*** | 1.58 | 1.02 | **1.03\*** |
| S4 | 1.12 | 2.30 | 1.42 | 0.79 | 0.66 | 0.48 |
| S5 | NA | 0.04 | NA | **1.65\*** | **3.31\*** | NA |
| S6 | 1.93 | 2.62 | 2.69 | 1.19 | 1.00 | 0.20 |
| S7 | NA | NA | NA | NA | NA | NA |
| S8 | **3.95\*** | **5.02\*** | **11.18\*** | **1.77\*** | 1.01 | 0.71 |
| S9 | 1.45 | 1.32 | 0.96 | 0.74 | 0.86 | 0.33 |
| S10 | 1.25 | 0.71 | 0.24 | 0.57 | 0.68 | 0.37 |
| S11 | **3.66\*** | 1.25 | 0.16 | 1.31 | 1.93 | 0.03 |