Supplement

S1 Calculation of equilibrium constant.

The calculation of the equilibrium constant Eq_A (mL g^{-1}) was done for sediment from incubation cores of Dortsman and Zandkreek. The Eq_A value was determined from batch adsorption experiments.

S1.1 Sensor calibration

A fluorescence spectrophotometer (Varian Cary Eclipse fluorescence spectrophotometer) was calibrated with a dilution series of uranine. Uranine solutions of 0 µg/L, 2 µg/L, 5 µg/L, 10 µg/L, 15 µg/L and 20 µg/L were prepared by diluting a starting concentration of 1 mg L^{-1} of uranine salts (sodium fluoresceine - $C_{20}H_{10}NaO_5^-$) in 0.2 µm filtered Oosterschelde water. The fluorescence (RFUB) of each concentration was determined in 10 mm × 10 mm cuvettes, for an excitation wavelength λ_{exc} of 494 nm, and an emission wavelength λ_{emi} of 513 nm (Gerke et al., 2013). This delivered the following calibration line (Eq. S1) with $R^2 = 0.998$:

$$RFUB = 0.565 + 3.085 \cdot Concentration\ (\mu g\ L^{-1}) \quad \text{(S1)}$$

S1.2 Sediment adsorption

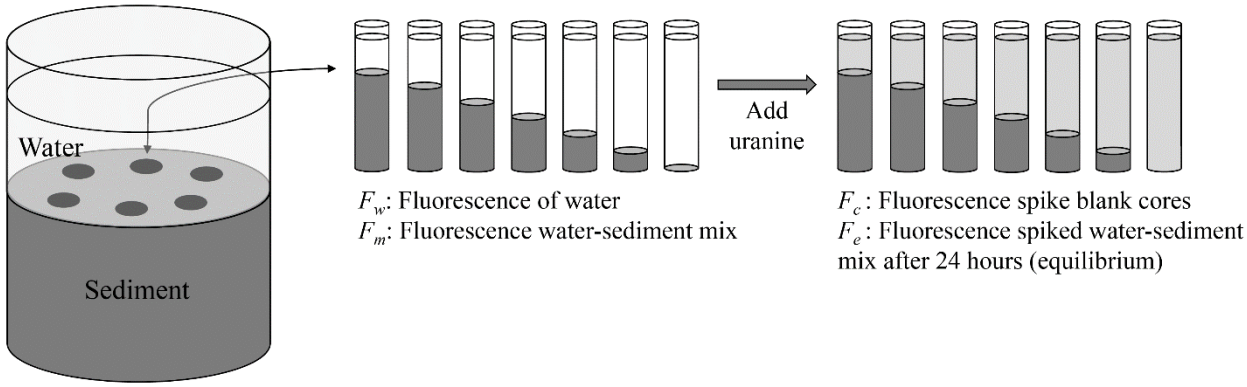

Figure S1: Batch adsorption experiment design, and explanation of the measured fluorescence values.

Additional Ø 14 cm sediment cores were collected from Zandkreek, and Dortsman for batch adsorption experiments. These cores were left to left to equilibrate for 48 hours with the same setup as per materials and methods in the main manuscript. Subsequently 7 subcores (3.6 cm diameter) were collected with increasing amounts of sediment, starting from 0 cm of sediment

(only overlying water) (Fig. S1). An initial sample was taken from the overlying water and measured as the F_w (RFUB water). Subsequently the subcores were vigorously shaken for 1 minute, and left on a shaking table for 12 hours (in previous tests it became clear that substances could leech out of the sediment, thus affecting the fluorescence reading. With this step it is ensured that all substances are in equilibrium), after which a second sample was taken as the F_m value (RFUB sediment-water mixture). The overlying water in the cores was then spiked with uranine, with 3 mL of a 1 mg L^{-1} uranine stock solution, and cores were vigorously shaken for 1 minute. The F_c (RFUB of the initial spike) was calculated afterwards, from the water volume in the core (overlying water volume + porewater volume), and the spike concentration. The cores were then placed on the shaking table, to keep the overlying water in movement, for 24 hours. After 24 hours the fluorescence was measured again to obtain F_e values (RFUB equilibrium). After the experiment, the overlying water was collected, and the volume determined. Also the sediment was collected, and freeze dried to acquire the sediment mass Msed. The difference between the wet, and the dried sediment mass was used to calculate the total volume of water (Vol) in the core.

Throughout this experiment each measurement was performed by removing a volume of 10 mL of sample, into a 15 mL centrifuge tube. The sample was then centrifuged for 6 minutes at 1500 rpm to remove colloids from suspension, which affect the fluorescence reading in a non-replicable way. The extracted sample was then added again to the core.

S1.3 Calculations

The adsorbed equilibrium concentration (µg uranine adsorbed g^{-1} dry sediment) is calculated by dividing the initial spike concentration (F_c - F_w) minus the equilibrium concentration (F_e - F_m) by the sediment concentration in each subcore:

$$q_{ads} = \frac{((F_c - F_w) - (F_e - F_m)) \times \mathrm{Vol}}{\mathrm{Msed}} \quad \text{(S2)}$$

The water equilibrium concentration (µg uranine L^{-1}):

$$C_e = Fe - Fm \quad \text{(S3)}$$

The equilibrium constant (mL g^{-1}) is then the amount of uranine adsorbed by the sediment, divided by the equilibrium concentration in the water:

$$Eq_A = \frac{q_{ads}}{C_e} \quad \text{(S4)}$$

Eq_A in mL g^{-1}

S1.4 Results

Table S1: Eq_A calculated form the batch adsorption tests, with the respective sediment concentrations.

Dortsman		Zandkreek	
cSed (g L^{-1})	**Eq_A (mL g^{-1})**	**cSed (g L^{-1})**	**Eq_A (mL g^{-1})**
398.7	0.0161	329.4	0.0431
364.5	0.0559	309.7	0.0536
490.3	0.004	493.3	0.0416

550.3	0.0221	676.7	0.0757
744.6	0.0836	831.5	0.0211
818.3	0.0128	956.1	0.0153
Average ± sd:	0.0324 ± 0.0308	**Average ± sd:**	0.0417 ± 0.022

Table S1 shows the results of the batch adsorption tess. Because of the similarity between Eq_A calculated for both sediments, and the small influence this parameter has based on the sensitivity analysis, the parameter value was fixed on an average value of 0.05 mL g^{-1}.

S2 Species scores.

Table S2: Scores for the BPc (BPc_R: reworking score, BPc_M: mobility score, BPc_Ft: feeding type), and for IP (IPc_Ft = feeding type, IPc_D = injection pocket depth).

Taxa	BPc_R	BPc_M	BPc_Ft	Ipc_Bt	Ipc_Ft	Ipc_D
Abra alba	2	2	S	1	1	3
Abra prismatica	2	2	S	1	1	3
Abra tenuis	2	2	S	1	1	3
Actiniaria	2	2	S	1	2	1
Ammothea hilgendorfi	2	2	S	1	3	1
Arenicola marina	3	2	UC	3	3	4
Ascidiacea	1	1	E	1	1	1
Asterias rubens	1	3	E	1	2	1
Bathyporeia sp.	2	3	S	1	3	1
Capitella capitata	3	2	UC	3	3	4
Carcinus maenas	5	4	R	1	2	1
Cerastoderma edule	2	2	S	1	1	2
Cirripedia	1	1	E	1	1	1
Corophium sp.	2	4	S	2	3	2
Crangon crangon	2	4	S	1	2	1
Crepidula fornicata	1	1	E	0	0	0
Ensis sp.	2	2	S	1	1	4
Eteone longa	4	3	B	1	2	1
Eunereis longissima	4	4	B	3	3	3
Gattyana cirrhosa	4	3	B	1	2	2
Glycera sp.	4	3	B	3	2	2
Glycera tridactyla	4	3	B	3	2	2
Hediste diversicolor	4	4	B	3	3	4
Hemigrapsus sp.	5	4	R	1	3	1
Heteromastus filiformis	3	2	UC	3	3	4
Lanice conchilega	3	1	DC	3	3	4

Limecola balthica	2	2	S	1	3	3
Malacoceros sp.	3	2	UC/DC	3	3	4
Malmgrenia darbouxi	4	3	B	1	2	4
Mediomastus fragilis	3	2	UC	3	3	3
Melinna cristata	3	1	UC/DC	3	3	2
Mya sp.	2	2	S	1	1	4
Mysta picta	4	3	B	1	2	1
Mytilus edulis	1	1	E	1	1	1
Nematoda	2	2	S	1	1	1
Nemertea	4	3	B	2	2	2
Neoamphitrite figulus	3	1	UC/DC	3	3	2
Nephtys hombergii	4	3	B	3	2	1
Nereididae	4	3	B	3	2	1
Notomastus sp.	3	2	UC	3	3	4
Ocenebra sp.	2	4	S	1	2	1
Oligochaeta	4	3	B	3	3	2
Ophiura ophiura	2	2	S	1	3	1
Peringia ulvae	2	3	S	1	3	1
Pholoe baltica	2	2	S	1	2	1
Phyllodoce mucosa	4	3	B	1	2	1
Platynereis dumerilii	4	4	B	3	3	4
Polychaeta	4	3	B	3	3	3
Polydora ciliata	3	1	UC/DC	1	1	2
Pygospio elegans	3	1	UC/DC	3	3	3
Ruditapes philippinarum	2	2	S	1	1	4
Scoloplos armiger	4	3	B	3	3	4
Scrobicularia plana	2	2	S	1	1	4
Sthenelais boa	4	3	B	1	2	1
Streblospio benedicti	3	2	UC/DC	1	2	1
Tellinoidea	2	2	S	1	1	3
Terebellidae	3	1	DC	3	3	3
Tharyx sp.	2	2	S	3	3	2
Urothoe sp.	2	3	S	3	3	3

Supplementary references

Gerke, K.M., Sidle, R.C., Mallants, D., 2013. Criteria for selecting fluorescent dye tracers for soil hydrological applications using Uranine as an example. J. Hydrol. Hydromechanics 61, 313–325. doi:10.2478/johh-2013-0040