

Supplementary Materials: Quality Indicators and Possible Ecological Risks of Heavy Metals in the Sediments of Three Semi-closed East Mediterranean Gulfs

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Table S1. Geoaccumulation index (I_{geo}) values of heavy metals of sediment samples in the three investigated gulfs, North Aegean Sea, Greece.

| Sampling location | Site | Cu | Pb | Zn | Cr | Ni |
|-------------------|-------|--------|-------|-------|-------|--------|
| Kavala Gulf | KAV1 | -6.83 | -2.65 | -6.40 | -7.50 | -7.89 |
| | KAV2 | -9.28 | -3.58 | -7.20 | -7.99 | -10.80 |
| | KAV3 | -7.15 | -2.65 | -6.62 | -7.41 | -8.54 |
| | KAV4 | -8.18 | -2.73 | -7.11 | -7.64 | -8.78 |
| | KAV5 | -9.16 | -3.03 | -7.04 | -8.00 | -10.17 |
| | KAV6 | -7.68 | -2.55 | -6.77 | -7.38 | -8.48 |
| | KAV7 | -10.45 | -3.10 | -7.41 | -8.01 | -11.69 |
| | KAV8 | -5.34 | -1.37 | -5.92 | -6.90 | -8.01 |
| | KAV9 | -5.59 | -1.46 | -6.29 | -7.33 | -9.80 |
| | KAV10 | -6.62 | -2.36 | -6.83 | -6.41 | -7.63 |
| | KAV11 | -5.33 | -2.48 | -6.31 | -6.35 | -7.40 |
| | KAV12 | -4.63 | -1.95 | -6.14 | -6.63 | -8.05 |
| | KAV13 | -2.83 | -0.09 | -3.00 | -6.23 | -7.88 |
| | KAV14 | -4.79 | -2.76 | -6.32 | -5.20 | -5.99 |
| | KAV15 | -5.52 | -2.76 | -6.20 | -5.65 | -6.14 |
| | KAV16 | -7.39 | -2.96 | -7.14 | -6.78 | -7.77 |
| | KAV17 | -6.05 | -2.43 | -6.51 | -5.99 | -6.61 |
| | KAV18 | -4.87 | -2.18 | -5.93 | -5.75 | -6.16 |
| | KAV19 | -5.60 | -1.90 | -6.20 | -5.86 | -6.40 |
| | KAV20 | -5.30 | -1.43 | -5.79 | -5.63 | -6.04 |
| | KAV21 | -5.11 | -1.72 | -5.76 | -5.55 | -6.07 |
| | KAV22 | -5.25 | -1.75 | -5.88 | -5.48 | -5.99 |
| | KAV23 | -5.70 | -2.21 | -5.96 | -5.72 | -6.22 |
| | KAV24 | -5.35 | -1.76 | -5.89 | -5.56 | -6.01 |
| | KAV25 | -5.23 | -2.05 | -5.93 | -5.01 | -5.79 |
| Strymonikos Gulf | STR1 | -6.08 | -2.46 | -6.51 | -5.45 | -5.75 |
| | STR2 | -6.71 | -3.21 | -7.27 | -5.85 | -6.30 |
| | STR3 | -5.22 | -2.27 | -6.44 | -5.06 | -5.44 |
| | STR4 | -4.70 | -1.54 | -5.92 | -4.99 | -5.27 |
| | STR5 | -4.98 | -1.45 | -6.11 | -5.31 | -5.68 |
| | STR6 | -4.93 | -1.22 | -6.01 | -5.02 | -5.32 |
| | STR7 | -7.29 | -2.86 | -7.57 | -6.80 | -7.08 |
| | STR8 | -5.27 | -1.39 | -6.25 | -5.33 | -5.60 |
| | STR9 | -4.96 | -1.24 | -6.02 | -5.06 | -5.48 |
| | STR10 | -4.91 | -1.02 | -5.81 | -4.87 | -5.27 |
| | STR11 | -4.90 | -1.00 | -5.83 | -4.92 | -5.35 |
| | STR12 | -4.90 | -0.81 | -5.80 | -4.88 | -5.28 |
| | STR13 | -4.90 | -0.80 | -5.74 | -4.80 | -5.22 |
| | STR14 | -7.15 | -1.45 | -7.21 | -6.33 | -6.71 |
| | STR15 | -5.14 | -0.89 | -5.92 | -4.95 | -5.35 |
| | STR16 | -5.13 | -0.82 | -5.91 | -4.98 | -5.38 |
| | STR17 | -4.42 | -0.73 | -5.69 | -5.01 | -5.31 |
| | STR18 | -5.17 | -0.79 | -5.94 | -4.99 | -5.39 |

| | | | | | | |
|---------------|-------|-------|-----------------|-------|-------|--------|
| | STR19 | -5.22 | -0.80 | -6.50 | -5.67 | -5.88 |
| | STR20 | -7.68 | -1.92 | -7.35 | -6.58 | -7.20 |
| | STR21 | -4.98 | -0.90 | -5.86 | -4.92 | -5.30 |
| | STR22 | -6.68 | -0.90 | -6.44 | -6.30 | -6.53 |
| | STR23 | -5.35 | -0.95 | -6.01 | -5.13 | -5.54 |
| | STR24 | -4.74 | -0.76 | -6.00 | -5.82 | -6.28 |
| | STR25 | -7.08 | -2.74 | -8.40 | -7.67 | -8.26 |
| Ierissos Gulf | IER1 | -5.74 | -0.89 | -6.04 | -5.30 | -5.70 |
| | IER2 | -4.44 | 1.03* | -4.41 | -4.62 | -4.87 |
| | IER3 | -4.27 | 1.24 * | -4.08 | -4.49 | -4.79 |
| | IER4 | -4.49 | 0.07 | -4.98 | -5.46 | -5.80 |
| | IER5 | | -1.84 | -7.70 | -8.44 | -10.37 |
| | IER6 | -2.61 | 2.85 ** | -3.21 | -4.03 | -4.26 |
| | IER7 | -3.96 | 1.66* | -3.79 | -4.47 | -4.62 |
| | IER8 | -2.41 | 3.37 *** | -3.15 | -5.10 | -6.44 |
| | IER9 | -4.23 | 1.19 * | -4.24 | -4.65 | -5.03 |
| | IER10 | -7.04 | -2.03 | -7.17 | -6.80 | -7.59 |

Bolded values indicate site pollution according to the Müller's scale (*moderate, ** moderate/strong, *** strong pollution).

Table S2. Potential risk factor (PRFi) and potential ecological risk index (PERI) of heavy metals in sediment samples of three investigated gulfs, North Aegean Sea, Greece.

| Sampling location | Site | PRFi | | | | | PERI |
|-------------------|-------|------|-------|------|------|------|-------|
| | | Cu | Pb | Zn | Cr | Ni | |
| Kavala Gulf | KAV1 | 0.07 | 1.20 | 0.02 | 0.02 | 0.01 | 1.31 |
| | KAV2 | 0.01 | 0.63 | 0.01 | 0.01 | 0.00 | 0.66 |
| | KAV3 | 0.05 | 1.20 | 0.02 | 0.02 | 0.01 | 1.29 |
| | KAV4 | 0.03 | 1.13 | 0.01 | 0.02 | 0.01 | 1.19 |
| | KAV5 | 0.01 | 0.92 | 0.01 | 0.01 | 0.00 | 0.95 |
| | KAV6 | 0.04 | 1.28 | 0.01 | 0.02 | 0.01 | 1.36 |
| | KAV7 | 0.01 | 0.87 | 0.01 | 0.01 | 0.00 | 0.90 |
| | KAV8 | 0.19 | 2.90 | 0.02 | 0.03 | 0.01 | 3.15 |
| | KAV9 | 0.16 | 2.72 | 0.02 | 0.02 | 0.00 | 2.92 |
| | KAV10 | 0.08 | 1.46 | 0.01 | 0.04 | 0.02 | 1.60 |
| | KAV11 | 0.19 | 1.34 | 0.02 | 0.04 | 0.02 | 1.60 |
| | KAV12 | 0.30 | 1.95 | 0.02 | 0.03 | 0.01 | 2.31 |
| | KAV13 | 1.06 | 7.06 | 0.19 | 0.04 | 0.01 | 8.35 |
| | KAV14 | 0.27 | 1.11 | 0.02 | 0.08 | 0.05 | 1.53 |
| | KAV15 | 0.16 | 1.11 | 0.02 | 0.06 | 0.04 | 1.39 |
| | KAV16 | 0.04 | 0.96 | 0.01 | 0.03 | 0.01 | 1.06 |
| | KAV17 | 0.11 | 1.40 | 0.02 | 0.05 | 0.03 | 1.60 |
| | KAV18 | 0.26 | 1.66 | 0.02 | 0.06 | 0.04 | 2.04 |
| | KAV19 | 0.15 | 2.01 | 0.02 | 0.05 | 0.04 | 2.28 |
| | KAV20 | 0.19 | 2.78 | 0.03 | 0.06 | 0.05 | 3.10 |
| | KAV21 | 0.22 | 2.27 | 0.03 | 0.06 | 0.04 | 2.63 |
| | KAV22 | 0.20 | 2.23 | 0.03 | 0.07 | 0.05 | 2.56 |
| | KAV23 | 0.14 | 1.62 | 0.02 | 0.06 | 0.04 | 1.89 |
| | KAV24 | 0.18 | 2.21 | 0.03 | 0.06 | 0.05 | 2.53 |
| | KAV25 | 0.20 | 1.81 | 0.02 | 0.09 | 0.05 | 2.18 |
| Strymonikos Gulf | STR1 | 0.11 | 1.36 | 0.02 | 0.07 | 0.06 | 1.61 |
| | STR2 | 0.07 | 0.81 | 0.01 | 0.05 | 0.04 | 0.98 |
| | STR3 | 0.20 | 1.55 | 0.02 | 0.09 | 0.07 | 1.93 |
| | STR4 | 0.29 | 2.58 | 0.02 | 0.09 | 0.08 | 3.07 |
| | STR5 | 0.24 | 2.74 | 0.02 | 0.08 | 0.06 | 3.14 |
| | STR6 | 0.25 | 3.21 | 0.02 | 0.09 | 0.07 | 3.65 |
| | STR7 | 0.05 | 1.03 | 0.01 | 0.03 | 0.02 | 1.14 |
| | STR8 | 0.19 | 2.86 | 0.02 | 0.07 | 0.06 | 3.21 |
| | STR9 | 0.24 | 3.18 | 0.02 | 0.09 | 0.07 | 3.60 |
| | STR10 | 0.25 | 3.70 | 0.03 | 0.10 | 0.08 | 4.16 |
| | STR11 | 0.25 | 3.75 | 0.03 | 0.10 | 0.07 | 4.20 |
| | STR12 | 0.25 | 4.28 | 0.03 | 0.10 | 0.08 | 4.73 |
| | STR13 | 0.25 | 4.31 | 0.03 | 0.11 | 0.08 | 4.78 |
| | STR14 | 0.05 | 2.75 | 0.01 | 0.04 | 0.03 | 2.88 |
| | STR15 | 0.21 | 4.04 | 0.02 | 0.10 | 0.07 | 4.45 |
| | STR16 | 0.21 | 4.26 | 0.03 | 0.09 | 0.07 | 4.66 |
| | STR17 | 0.35 | 4.53 | 0.03 | 0.09 | 0.08 | 5.08 |
| | STR18 | 0.21 | 4.33 | 0.02 | 0.09 | 0.07 | 4.73 |
| | STR19 | 0.20 | 4.32 | 0.02 | 0.06 | 0.05 | 4.64 |
| | STR20 | 0.04 | 1.99 | 0.01 | 0.03 | 0.02 | 2.08 |
| | STR21 | 0.24 | 4.02 | 0.03 | 0.10 | 0.08 | 4.46 |
| | STR22 | 0.07 | 4.02 | 0.02 | 0.04 | 0.03 | 4.18 |
| | STR23 | 0.18 | 3.88 | 0.02 | 0.09 | 0.06 | 4.23 |
| | STR24 | 0.28 | 4.44 | 0.02 | 0.05 | 0.04 | 4.83 |
| | STR25 | 0.06 | 1.13 | 0.00 | 0.01 | 0.01 | 1.21 |
| Ierissos Gulf | IER1 | 0.14 | 4.05 | 0.02 | 0.08 | 0.06 | 4.35 |
| | IER2 | 0.35 | 15.29 | 0.07 | 0.12 | 0.10 | 15.93 |
| | IER3 | 0.39 | 17.77 | 0.09 | 0.13 | 0.11 | 18.49 |
| | IER4 | 0.33 | 7.86 | 0.05 | 0.07 | 0.05 | 8.37 |
| | IER5 | 0.00 | 2.10 | 0.01 | 0.01 | 0.00 | 2.11 |
| | IER6 | 1.23 | 54.10 | 0.16 | 0.18 | 0.16 | 55.83 |
| | IER7 | 0.48 | 23.73 | 0.11 | 0.14 | 0.12 | 24.58 |
| | IER8 | 1.41 | 77.54 | 0.17 | 0.09 | 0.03 | 79.24 |
| | IER9 | 0.40 | 17.14 | 0.08 | 0.12 | 0.09 | 17.83 |
| | IER10 | 0.06 | 1.84 | 0.01 | 0.03 | 0.02 | 1.95 |

Bolded values indicate site considerable risk.