**Table S1** Concentrations of heavy metals in surface waters of coastal of Zhuhai and comparison with other areas (mg/L).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Area | As | Cd | Cr | Cu | Hg | Pb | Zn | Reference |
| Coastal of Zhuhai | 1.3-2.1  (1.62) | ND-0.19  (0.076) | ND-8.8  (2.69) | 1.0-7.4  (2.43) | ND-0.03  (0.012) | ND-3.24  (0.338) | ND-39.0  (8.93) |  |
| Shandong Peninsula, China | ND-1.86  (0.98) | 0.08-0.73  (0.17) | 0.84-3.56  (2.01) | 0.83-5.38  (2.46) | ND-0.47  (0.04) | 0.52-3.60  (1.51) | 2.22-40.7  (17.2) | Liu et al. 2021 |
| Northern Liaodong Bay, China | 1.92-10.10  (5.46) | 0.1-1.4  (0.66) | NA | 0.7-6.2  (2.86) | 0.01-0.59  (0.14) | 0.6-17.2  (3.98) | 1.2-82.8  (17.76) | Zhang et al., 2017 |
| Meishan Bay, China | 10.35-11.67  (11.15) | 4.62-4.71  (4.65) | 3.89-4.18  (4.23) | 3.06-5.31  (4.23) | 0.06-0.07  (0.06) | 1.19-1.55  (1.34) | 92.40-392.82  (172.05) | Zhang et al., 2020 |
| Xiangshan Bay China | 0.9-8.5  (2.6) | 0.01-1.61  (0.22) | ND-2  (0.7) | 0.2-44.5  (3.4) | ND-0.262  (0.062) | 0.22-8.08  (1.93) | 0.7-65.9  (16.8) | Zhao et al., 2018 |
| Persian Gulf, Iran | 1.0-82.5  (62.78) | 0.06-0.53  (0.35) | 0.75-4.2  (1.03) | 0.08-3.2  (0.3) | 0.08-25.3  (1.51) | 0.08-0.8  (0.7) | 2.1-230  (70.74) | Lahijia et al., 2019 |
| Abu Zenima coast, Egypt | NA | 0.013–0.13  (0.09) | NA | 0.26–0.62  (0.43) | NA | 0.08–1.80  (0.51) | 0.22–0.25  (0.23) | Nour et al., 2020 |
| Tyrrhenian coast, Italy | NA | 0.01-0.62  (0.44) | NA | 0.3-5  (2.2) | NA | 0.04-6.53  (0.44) | 0.07-34.78  (6.71) | Manfra et al., 2005 |

NA: Not available

**Table S2** Evaluation results of benthic biodiversity index and evenness in coastal of Zhuhai.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Site | 2017 | | |  | 2018 | | |
| Species | Diversity Index *H*＇ | Uniformity index *J’* |  | Species | Diversity Index *H*＇ | Uniformity index *J’* |
| 1 | 14 | 2.27 | 0.86 |  | 8 | 1.266 | 0.609 |
| 2 | 12 | 2.39 | 0.96 |  | 9 | 1.647 | 0.750 |
| 4 | 12 | 1.99 | 0.80 |  | 11 | 1.575 | 0.657 |
| 5 | 11 | 0.60 | 0.25 |  | 10 | 1.262 | 0.548 |
| 7 | 9 | 1.74 | 0.79 |  | 10 | 2.175 | 0.945 |
| 8 | 5 | 1.43 | 0.89 |  | 2 | 0.451 | 0.650 |
| 10 | 13 | 2.16 | 0.84 |  | 9 | 1.965 | 0.894 |
| 12 | 8 | 1.64 | 0.79 |  | 14 | 1.494 | 0.566 |
| 13 | 7 | 1.75 | 0.90 |  | 5 | 1.359 | 0.845 |
| 15 | 9 | 1.82 | 0.83 |  | 9 | 0.590 | 0.268 |
| 16 | 9 | 0.66 | 0.30 |  | 7 | 1.226 | 0.630 |
| 17 | 5 | 1.61 | 1.00 |  | 6 | 1.271 | 0.709 |
| 19 | 4 | 0.21 | 0.15 |  | 11 | 2.199 | 0.917 |
| Mean | 9 | 1.56 | 0.72 |  | 9 | 1.421 | 0.691 |
| Range | 4~14 | 0.21~2.39 | 0.15~1.00 |  | 2～14 | 0.451～2.199 | 0.268～0.945 |

**Table S3** Potential hazard ratio (PAF) in seawater of Zhuhai (%).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time | Research stance | As | Cd | Cr | Cu | Hg | Pb | Zn |
| 2017 | S1 | 0.00 | 3.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| S2 | 0.00 | 3.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| S3 | 0.00 | 3.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| S4 | 0.00 | 3.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| S5 | 0.00 | 3.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| S6 | 0.00 | 3.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| S7 | 0.00 | 3.00 | 0.00 | 2.00 | 0.00 | 0.00 | 1.00 |
| S8 | 0.00 | 3.00 | 0.00 | 2.00 | 0.00 | 0.00 | 1.00 |
| S9 | 0.00 | 3.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| S10 | 0.00 | 3.00 | 0.00 | 2.00 | 0.00 | 0.00 | 1.00 |
| S11 | 0.00 | 3.00 | 0.00 | 2.00 | 0.00 | 0.00 | 1.00 |
| S12 | 0.00 | 3.00 | 0.00 | 3.00 | 0.00 | 0.00 | 1.00 |
| S13 | 0.00 | 3.00 | 0.00 | 2.00 | 0.00 | 0.00 | 1.00 |
| S14 | 0.00 | 3.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| S15 | 0.00 | 3.00 | 0.00 | 2.00 | 0.00 | 0.00 | 2.00 |
| S16 | 0.00 | 2.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| S17 | 0.00 | 3.00 | 0.00 | 3.00 | 0.00 | 0.00 | 1.00 |
| S18 | 0.00 | 4.00 | 0.00 | 2.00 | 0.00 | 0.00 | 1.00 |
| S19 | 0.00 | 3.00 | 0.00 | 3.00 | 0.00 | 0.00 | 1.00 |
| S20 | 0.00 | 3.00 | 0.00 | 2.00 | 0.00 | 0.00 | 2.00 |
| 2018 | S1 | 0.00 | 2.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| S2 | 0.00 | 4.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| S3 | 0.00 | 2.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| S4 | 0.00 | 2.00 | 0.00 | 2.00 | 0.00 | 0.00 | 1.00 |
| S5 | 0.00 | 0.00 | 0.00 | 2.00 | 0.00 | 0.00 | 1.00 |
| S6 | 0.00 | 4.00 | 0.00 | 2.00 | 0.00 | 0.00 | 1.00 |
| S7 | 0.00 | 2.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| S8 | 0.00 | 0.00 | 0.00 | 5.00 | 0.00 | 0.00 | 1.00 |
| S9 | 0.00 | 2.00 | 0.00 | 2.00 | 0.00 | 0.00 | 1.00 |
| S10 | 0.00 | 2.00 | 0.00 | 3.00 | 0.00 | 0.00 | 1.00 |
| S11 | 0.00 | 3.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| S12 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| S13 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| S14 | 0.00 | 2.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| S15 | 0.00 | 3.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| S16 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| S17 | 0.00 | 3.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| S18 | 0.00 | 2.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 |
| S19 | 0.00 | 3.00 | 0.00 | 2.00 | 0.00 | 0.00 | 1.00 |
| S20 | 0.00 | 2.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 |

**Table S4** The informationg of specific marine orgnisms

|  |  |  |
| --- | --- | --- |
| Site | Names | Species |
| 1 | Mouth shrimp mayfly | Crustaceans |
| 2 | Japanese sea-crab | Crustaceans |
| 3 | Japanese sea-crab | Crustaceans |
| 4 | Coilia nasus | Fishes |
| 5 | Japanese sea-crab | Crustaceans |
| 6 | Japanese sea-crab | Crustaceans |
| 7 | Dense Scale Oyster | Shellfishes |
| 8 | Isohye small male fish | Fished |
| 9 | Mouth shrimp mayfly | Crustaceans |
| 10 | Mouth shrimp mayfly | Crustaceans |
| 11 | New Prawns | Crustaceans |
| 12 | Mussel | Shellfishes |

**Reference**

Liu, R., Jiang, W., Li, F., Pan, Y., Wang, C., & Tian, H. (2021). Occurrence, partition, and risk of seven heavy metals in sediments, seawater, and organisms from the eastern sea area of Shandong Peninsula, Yellow Sea, China. Journal of Environmental Management, 279, 111771.

Zhang, A., Wang, L., Zhao, S., Yang, X., Zhao, Q., Zhang, X., & Yuan, X. (2017). Heavy metals in seawater and sediments from the northern Liaodong Bay of China: Levels, distribution and potential risks. Regional Studies in Marine Science, 11, 32-42.

Zhang, M., Chen, G., Luo, Z., Sun, X., & Xu, J. (2020). Spatial distribution, source identification, and risk assessment of heavy metals in seawater and sediments from Meishan Bay, Zhejiang coast, China. Marine Pollution Bulletin, 156, 111217.

Zhao, B., Wang, X., Jin, H., Feng, H., Shen, G., Cao, Y., ... & Zhang, Q. (2018). Spatiotemporal variation and potential risks of seven heavy metals in seawater, sediment, and seafood in Xiangshan Bay, China (2011–2016). Chemosphere, 212, 1163-1171.

Lahijanzadeh, A. R., Rouzbahani, M. M., Sabzalipour, S., & Nabavi, S. M. B. (2019). Ecological risk of potentially toxic elements (PTEs) in sediments, seawater, wastewater, and benthic macroinvertebrates, Persian Gulf. Marine pollution bulletin, 145, 377-389.

Nour, H. E., & El-Sorogy, A. S. (2020). Heavy metals contamination in seawater, sediments and seashells of the Gulf of Suez, Egypt. Environmental Earth Sciences, 79, 1-12.

Manfra, L , & Accornero, A. . (2005). Trace metal concentrations in coastal marine waters of the central mediterranean. Marine Pollution Bulletin, 50(6), 686-692.