**Table S1.** Concentrations of physicochemical properties (bottom water) in the five sections of Korean coasts

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Section | Sampling site | Water depth | Temperature | Salinity | Dissolved oxygen | Suspended solid | Chlorophyll a | DIN\* | DIP | Si(OH)4 | WQI |
| m | ˚C | psu | mg/L | mg/L | μg/L | mg/L | mg/L | mg/L | - |
| Western-1 | Incheon (n=9) | 7-28 | 23.3±0.5 | 25.2±3.9 | 6.5±0.3 | 66.4±101.4 | 1.5±1.3 | 0.67±0.4 | 0.05±0.0 | 1.12±0.5 | - |
| Asan (n=5) | 9-15 | 22.0±0.4 | 28.9±0.6 | 7.0±0.2 | 16.3±1.7 | 0.9±0.2 | 0.31±0.1 | 0.03±0.0 | 0.59±0.1 | - |
| Taean (n=7) | 7-28 | 21.7±1.4 | 30.2±0.9 | 7.2±0.3 | 17.5±6.9 | 2.5±1.8 | 0.08±0.0 | 0.01±0.0 | 0.22±0.1 | - |
| Boryung (n=2) | 12-23 | 23.9±0.5 | 27.4±0.3 | 8.7±0.1 | 8.6±3.7 | 6.4±4.8 | 0.15±0.1 | 0.01±0.0 | 0.35±0.3 | - |
| Gunsan (n=9) | 9-18 | 24.6±0.9 | 28.3±1.6 | 10.7±1.3 | 7.2±2.5 | 15.6±6.5 | 0.08±0.1 | 0.01±0.0 | 0.15±0.2 | - |
| Garorim Bay (n=4) | 11-16 | 20.9±0.7 | 30.7±0.6 | 7.2±0.2 | 18.6±5.0 | 1.3±0.1 | 0.12±0.1 | 0.02±0.0 | 0.21±0.1 | - |
| Cheonsu Bay (n=8) | 9-24 | 24.7±0.2 | 26.3±0.2 | 6.1±0.4 | 12.0±3.9 | 3.4±1.9 | 0.35±0.1 | 0.03±0.0 | 0.76±0.3 | - |
| Han River estuary (n=3) | 7 | 22.0±0.0 | 8.1±0.0 | 6.1±0.0 | 268.0±0.0 | 4.1±0.0 | 1.69±0.0 | 0.05±0.0 | 2.49±0.0 | - |
| Geum River estuary (n=4) | 10-12 | 24.2±0.4 | 25.8±0.5 | 8.0±0.7 | 6.9±1.2 | 11.4±1.3 | 0.34±0.0 | 0.01±0.0 | 0.64±0.1 | - |
| Western-2 | Yeonggwang (n=2) | 5-8 | 25.0±0.1 | 30.4±0.1 | 10.8±0.7 | 9.3±0.7 | 7.8±7.3 | 0.01±0.0 | < 0.01±0.0 | 0.07±0.0 | - |
| Hampyeong (n=3) | 11-14 | 25.5±0.5 | 27.2±0.8 | 6.2±0.1 | 46.3±39.3 | 1.4±0.4 | 0.45±0.1 | 0.08±0.0 | 0.06±0.0 | - |
| Mokpo (n=3) | 8-29 | 21.5±0.4 | 30.5±0.9 | 6.7±0.1 | 38.0±7.9 | 0.9±0.1 | 0.22±0.1 | 0.03±0.0 | 0.04±0.0 | - |
| Gomso Bay (n=4) | 4-5 | 26.7±0.5 | 28.1±0.7 | 11.1±0.5 | 16.5±11.5 | 26.8±8.0 | 0.04±0.0 | < 0.01±0.0 | 0.05±0.1 | - |
| Yeongsan River estuary (n=4) | 15-20 | 22.2±0.2 | 27.8±1.5 | 6.4±0.2 | 31.6±11.5 | 0.8±0.1 | 0.43±0.1 | 0.04±0.0 | 0.06±0.0 | - |
| Southern-1 | Wando (n=12) | 7-32 | 20.6±0.9 | 32.5±0.3 | 6.5±0.3 | 14.0±7.4 | 1.3±0.4 | 0.11±0.0 | 0.02±0.0 | 0.03±0.0 | - |
| Jindo (n=4) | 3-34 | 22.2±2.6 | 32.1±0.5 | 6.6±0.1 | 10.3±3.6 | 2.0±1.1 | 0.09±0.0 | 0.02±0.0 | 0.03±0.0 | - |
| Gamak Bay (n=8) | 4-19 | 22.8±1.0 | 30.4±0.7 | 5.6±2.3 | 10.2±5.5 | 5.9±3.8 | 0.08±0.1 | 0.01±0.0 | 0.03±0.0 | - |
| Yeoja Bay (n=5) | 3-15 | 23.8±1.4 | 29.1±1.5 | 5.1±0.8 | 8.1±1.9 | 3.8±2.8 | 0.09±0.0 | 0.01±0.0 | 0.04±0.0 | - |
| Deukryang Bay (n=9) | 3-11 | 24.6±1.3 | 30.3±1.0 | 5.9±0.4 | 10.4±3.2 | 5.1±2.9 | 0.07±0.0 | 0.02±0.0 | 0.04±0.0 | - |
| Doam Bay (n=3) | 4-7 | 24.8±1.2 | 28.2±2.4 | 6.0±0.1 | 22.9±12.2 | 2.1±1.4 | 0.27±0.1 | 0.05±0.0 | 0.08±0.0 | - |
| Seomjin River estuary (n=4) | 9-21 | 20.4±0.4 | 31.4±0.9 | 4.1±0.1 | 11.7±5.4 | 1.7±0.7 | 0.16±0.1 | 0.02±0.0 | 0.06±0.0 | - |
| Southern-2 | Gijang (n=3) | 25-30 | 12.2±1.6 | 34.1±0.1 | 5.6±0.1 | 12.1±0.1 | 0.2±0.0 | 0.15±0.0 | 0.03±0.0 | 0.05±0.1 | - |
| Busan (n=4) | 23-50 | 13.7±2.5 | 33.9±0.3 | 5.5±0.2 | 16.4±11.9 | 1.5±1.5 | 0.20±0.1 | 0.02±0.0 | 0.69±0.3 | - |
| Sacheon (n=3) | 13-23 | 19.7±0.0 | 32.9±0.0 | 4.6±0.0 | 4.8±0.0 | 2.1±0.0 | 0.02±0.0 | 0.01±0.0 | 0.7±0.0 | - |
| Tongyeong-1 (n=11) | 5-28 | 18.8±1.0 | 33.0±0.4 | 3.5±1.5 | 5.7±1.4 | 3.8±3.1 | 0.10±0.1 | 0.02±0.0 | 0.49±0.2 | - |
| Tongyeong-2 (n=5) | 13-30 | 18.1±0.9 | 33.3±0.5 | 4.7±0.0 | 6.7±3.5 | 3.2±2.2 | 0.03±0.0 | 0.02±0.0 | 0.58±0.1 | - |
| Geoje (n=13) | 7-28 | 17.2±1.6 | 33.2±0.8 | 4.8±1.4 | 6.8±3.0 | 2.0±1.8 | 0.09±0.0 | 0.02±0.0 | 0.57±0.3 | - |
| Goseong (n=9) | 3-16 | 21.7±1.8 | 31.8 ±1.4 | 3.7±0.9 | 4.7±1.1 | 2.7±1.6 | 0.03±0.0 | 0.01±0.0 | 0.58±0.1 | - |
| Jinhae Bay (n=27) | 10-31 | 17.8±1.4 | 32.9±0.5 | 1.7±1.7 | 13.0±5.2 | 0.4±0.4 | 0.24±0.1 | 0.05±0.0 | 1.07±0.4 | - |
| Masan Bay (n=6) | 7-15 | 19.2±2.9 | 30.7±2.7 | 3.1±1.7 | 12.9±4.8 | 3.6±3.1 | 0.19±0.0 | 0.02±0.0 | 0.7±0.2 | - |
| Jinju Bay (n=3) | 3-6 | 21.7±0.3 | 25.9±3.9 | 4.8±0.6 | 5.1±0.6 | 5.9±2.4 | 0.06±0.0 | < 0.01±0.0 | 0.68±0.5 | - |
| Nakdong River estuary (n=6) | 14-36 | 15.8±1.0 | 33.8±0.7 | 5.2±0.3 | 18.5±22.3 | 1.1±2.1 | 0.15±0.0 | 0.03±0.0 | 0.58±0.1 | - |
| Eastern-1 | Goseong (n=1) | 132 | 3.5±0.0 | 33.9±0.0 | 7.7±0.0 | 2.0±0.0 | 0.4±0.0 | 0.17±0.0 | 0.03±0.0 | 0.39±0.0 | - |
| Sokcho (n=1) | 89 | 6.2±0.0 | 33.8±0.0 | 6.9±0.0 | 1.0±0.0 | 0.6±0.0 | 0.11±0.0 | 0.0.2±0.0 | 0.28±0.0 | - |
| Yangyang (n=1) | 68 | 8.2±0.0 | 33.9±0.0 | 7.4±0.0 | 1.4±0.0 | 0.3±0.0 | 0.08±0.0 | 0.01±0.0 | 0.23±0.0 | - |
| Gangneung (n=1) | 80 | 6.1±0.0 | 33.9±0.0 | 7.8±0.0 | 1.0±0.0 | 0.1±0.0 | 0.13±0.0 | 0.02±0.0 | 0.31±0.0 | - |
| Samcheok (n=1) | 106 | 5.0±0.0 | 34.0±0.0 | 6.3±0.0 | 1.0±0.0 | 0.3±0.0 | 0.18±0.0 | 0.03±0.0 | 0.44±0.0 | - |
| Jukbyeon (n=1) | 120 | 5.3±0.0 | 34.0±0.0 | 6.2±0.0 | 4.2±0.0 | 0.1±0.0 | 0.19±0.0 | 0.03±0.0 | 0.47±0.0 | - |
| Uljin (n=1) | 109 | 5.8±0.0 | 34.0±0.0 | 7.8±0.0 | 0.8±0.0 | 0.1±0.0 | 0.20±0.0 | 0.03±0.0 | 0.52±0.0 | - |
| Hupo (n=1) | 101 | 5.9±0.0 | 34.1±0.0 | 7.3±0.0 | 6.8±0.0 | 0.3±0.0 | 0.21±0.0 | 0.04±0.0 | 0.64±0.0 | - |
| Yeongdeok (n=1) | 62 | 12.4±0.0 | 34.3±0.0 | 5.3±0.0 | 2.0±0.0 | 0.2±0.0 | 0.21±0.0 | 0.03±0.0 | 0.62±0.0 | - |
| Ganggu (n=1) | 88 | 8.3±0.0 | 34.2±0.1 | 7.1±0.0 | 2.4±0.0 | 0.2±0.0 | 0.19±0.0 | 0.03±0.0 | 0.52±0.0 | - |
| Weolpo (n=1) | 50 | 12.7±0.0 | 34.3±0.0 | 5.0±0.0 | 1.2±0.0 | 1.6±0.0 | 0.14±0.0 | 0.02±0.0 | 0.49±0.0 | - |
| Guryong (n=2) | 50-82 | 10.3±3.5 | 34.2±0.1 | 6.1±0.9 | 1.8±0.6 | 0.2±0.1 | 0.20±0.01 | 0.03±0.0 | 0.59±0.0 | - |

\* indicates the sum of nitrite (NO2-), nitrate (NO3-) and ammonium (NH4+)