## Appendix. A for

## Reliability of taxonomic sufficiency for simplifying benthic index M-AMBI methodology in a heavily polluted estuary

Hongjun Li\*, Yi Sun, Pengfei Xie, Yanbin Gu, Yuan Liu, Jingfeng Fan, Hao Guo

National Marine Environmental Monitoring Center

\*Corresponding author. *E-mail address:* hjli@nmemc.org.cn

**Supplementary Table S1**

The ecological group (EG) assignment of macrofaunal species collected at the 25 sites in the Liaohe Estuary.

|  |  |  |  |
| --- | --- | --- | --- |
| **Taxon name** | **EG** | **Taxon name** | **EG** |
| **Species** |  |  |  |
| *Glossaulax didyma* | I | *Ophiodromus angustifrons* | II |
| *Acetes chinensis* | I | *Philyra pisum* | II |
| *Amaeana trilobata* | I | *Phyllodoce papillosa* | II |
| *Ampelisca bocki* | I | *Protankyra bidentata* | II |
| *Ampelisca brevicornis* | I | *Siliqua minima* | II |
| *Bullacta exarate* | I | *Terebellides stroemii* | II |
| *Byblis japonicus* | I | *Trachysalambria curvirostris* | II |
| *Cultellus attenuates* | I | *Tritodynamia horvathi* | II |
| *Diastylis tricincta* | I | *Typhlocarcinus villosus* | II |
| *Dosinia biscocta* | I | *Macrophalmus graeffei* | II |
| *Euclymene lombricoides* | I | *Phyllodoce chinensis* | II |
| *Exopalaemon carinicauda* | I | *Aglaophamus sinensis* | II |
| *Mactra chinensis* | I | *Aonides oxycephala* | III |
| *Magelona cincta* | I | *Corophium acherusicum* | III |
| *Magelona japonica* | I | *Gattyana pohaiensis* | III |
| *Meretrix meretrix* | I | *Grandidierella japonica* | III |
| *Moerella iridescens* | I | *Listriolobus brevirostris* | III |
| *Oratosquilla oratoria* | I | *Micropodarke dubia* | III |
| *Temnopleurus hardwickii* | I | *Neanthes japonica* | III |
| *Temnopleurus toreumaticus* | I | *Nectoneanthes oxypoda* | III |
| *Trigonaphera bocageana* | I | *Notomastus latericeus* | III |
| *Oediceroides macrodactyla* | I | *Paranthura japonica* | III |
| *Diopatra chiliensis* | II | *Perinereis nuntia* | III |
| *Dorippe japonica* | II | *Spio martinensis* | III |
| *Eocylichna braunsi* | II | *Sternaspis scutata* | III |
| *Glycera chirori* | II | *Chaetozone setosa* | IV |
| *Glycera rouxii* | II | *Heteromastus filiformis* | IV |
| *Glycinde gurjanovae* | II | *Scapharca kagoshimensis* | IV |
| *Goniada japonica* | II | *Sigambra bassi* | IV |
| *Marphysa sanguinea* | II | *Lumbrineris longifolia* | IV |
| *Nassarius succinctus* | II | *Capitella capitata* | V |
| *Nassarius variciferus* | II | *Potamocorbula laevis* | V |
| *Natatolana japonensis* | II | *Cambaroides dauricus* | NA |
| *Neoeriocheir leptognathus* | II | *Haliplanella luciae* | NA |
| *Nephtys caeca* | II | *Leptonchela gracilis* | NA |
| *Nephtys oligobranchia* | II | *Paratrypauchen microcephalus* | NA |
| *Ophiura kinbergi* | II | *Phasmatodea phasma* | NA |
| *Ophiura sarsii* | II | *Synechogobius ommaturus* | NA |
| *Orchomene breviceps* | II | *Trypauchen vagina* | NA |
| *Paradorippe granulate* | II | *Odontamblyopus rubicundus* | NA |
| *Paralacydonia paradoxa* | II | *Potamocorbula ustulata* | NA |
| *Paramphicteis angustifolia* | II | *Tritodynamia intermedia* | NA |
| **Genus** |  |  |  |
| *Ampelisca* sp. | I | Paradorippe | II |
| Byblis | I | Nephtys | II |
| *Schistocomus* sp. | I | Diopatra | II |
| *Amphioplus* sp. | I | Ophiura | II |
| Grandidierella sp. | I | Cultellus | II |
| Trigonaphera | I | Siliqua | II |
| Diastylis | I | Neoeriocheir | II |
| *Pherusa* sp. | I | *Pagurus* sp. | II |
| Bullacta | I | Paralacydonia | II |
| *Liljeborgia* sp. | I | Trachysalambria | II |
| Macrophthalmus | I | Phyllodoce | II |
| Mactra | I | Typhlocarcinus | II |
| Magelona | I | Protankyra | II |
| Euclymene | I | Amaeana | II |
| *Musculus* sp. | I | Orchomene | II |
| Glossaulax | I | Notomastus | III |
| Oediceroides | I | Corophium | III |
| *Ophiothrix* sp. | I | Micropodarke | III |
| Exopalaemon | I | Neanthes | III |
| Leptochela | I | Nectoneanthes | III |
| *Gammaropsis* sp. | I | Perinereis | III |
| Acetes | I | Paranthura | III |
| Oratosquilla | I | *Pinnotheres* sp. | III |
| Moerella | I | Gattyana | III |
| Temnopleurus | I | Sigambra | III |
| *Cavernularia* sp. | I | Aonides | III |
| Terebellides | I | Spio | III |
| Dosinia | I | Sternaspis | III |
| Meretrix | I | Listriolobus | III |
| *Anthopleura* sp. | II | Scapharca | IV |
| Paramphicteis | II | Heteromastus | IV |
| Natatolana | II | Chaetozone | IV |
| Eocylichna | II | *Dodecaceria* sp. | IV |
| Dorippe | II | *Lagis* sp. | IV |
| Marphysa | II | Capitella | V |
| Glycera | II | Potamocorbula | V |
| Glycinde | II | Cambaroides | NA |
| Goniada | II | Paratrypauchen | NA |
| Ophiodromus | II | Odontamblyopus | NA |
| Philyra | II | Synechogobius | NA |
| Lumbrineris | II | Trypauchen | NA |
| Tritodynamia | II | Haliplanella | NA |
| Nassarius | II | Phasmatodea | NA |
| Aglaophamus | II |  |  |
| **Family** |  |  |  |
| Ampeliscidae | I | Actiniidae | II |
| Aoridae | I | Hesionidae | II |
| Cancellariidae | I | Leucosiidae | II |
| Diastylidae | I | Lumbrineridae | II |
| Flabelligeridae | I | Maldanidae | II |
| Liljeborgiidae | I | Nassariidae | II |
| Macrophthalmida | I | Naticidae | II |
| Mactridae | I | Nephtyidae | II |
| Magelonidae | I | Onuphidae | II |
| Mytilidae | I | Ophiuridae | II |
| Oedicerotidae | I | Paguridae | II |
| Opheliidae | I | Paralacydoniidae | II |
| Ophiotrichidae | I | Penaeidae | II |
| Pharidae | I | Phyllodocidae | II |
| Palaemonidae | I | Pilumnidae | II |
| Pectinariidae | I | Polynoidae | II |
| Photidae | I | Pilargidae | II |
| Pinnotheridae | I | Squillidea | II |
| Sergestidae | I | Thalassematidae | II |
| Synaptidae | I | Trichobranchidae | II |
| Tellinidae | I | Varunidae | II |
| Temnopleuridae | I | Haminoeidae | II |
| Terebellidae | I | Corophiidae | III |
| Tryphosidae | I | Gobiidae | III |
| Veretillidae | I | Nereididae | III |
| Veneridae | I | Paranthuridae | III |
| Opheliidae | I | Pasiphaeidae | III |
| Ampharetidae | II | Spionidae | III |
| Amphiuridae | II | Sternaspidae | III |
| Cirolanidae | II | Arcidae | IV |
| Cylichnidae | II | Capitellidae | IV |
| Dorippidae | II | Cirratulidae | IV |
| Eunicidae | II | Corbulidae | IV |
| Glyceridae | II | Cambaridae | NA |
| Goniadidae | II | Haliplanellidae | NA |
| Haminoeidae | II | Phasmatodea | NA |
| **Others** |  |  |  |
| SIPUNCULA | I | BRYOZOA | II |
| Turbellaria | II | Euclymeninae | III |
| NEMERTEA | III |  |  |

Note: EG: ecological group; EGI: The species sensitive to environmental disturbance, EGII: the species indifferent to environmental disturbance, EGIII: the species tolerant to environmental disturbance, EGIV: the second order opportunistic species, EGV: the first order opportunistic species, NA: Not assigned.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Species | | | | Genus | | | | Family | | | |
| Variables | Adj R2 | Pseudo-F | *P* | Variables | Adj R2 | Pseudo-F | *P* | Variables | Adj R2 | Pseudo-F | *P* |
| EGV | 0.091 | 7.525 | 0.001 | EGI | 0.089 | 7.320 | 0.001 | EGI | 0.010 | 8.200 | 0.001 |
| EGI | 0.143 | 4.862 | 0.001 | EGV | 0.159 | 6.346 | 0.001 | EGV | 0.165 | 6.026 | 0.001 |
| EGIV | 0.173 | 3.295 | 0.001 | Sal | 0.191 | 3.468 | 0.001 | Sal | 0.202 | 3.873 | 0.001 |
| NO3 | 0.198 | 2.924 | 0.001 | PO4 | 0.223 | 3.602 | 0.001 | PO4 | 0.238 | 3.988 | 0.001 |
| Sal | 0.223 | 2.987 | 0.001 | EGIII | 0.243 | 2.617 | 0.001 | EGIII | 0.261 | 2.901 | 0.001 |
| EGIII | 0.247 | 2.877 | 0.001 | Sand | 0.261 | 2.417 | 0.003 | NO3 | 0.281 | 2.628 | 0.001 |
| Sand | 0.265 | 2.482 | 0.001 | NO3 | 0.279 | 2.479 | 0.001 | Sand | 0.300 | 2.599 | 0.001 |
| EGII | 0.280 | 2.200 | 0.005 | EGII | 0.294 | 2.276 | 0.001 | EGII | 0.315 | 2.240 | 0.003 |
| PO4 | 0.291 | 1.849 | 0.014 | Silt | 0.304 | 1.816 | 0.011 | EGIV | 0.328 | 2.145 | 0.005 |
| Clay | 0.299 | 1.686 | 0.03 | EGIV | 0.312 | 1.641 | 0.049 | Silt | 0.337 | 1.784 | 0.032 |
| Silt | 0.306 | 1.531 | 0.06 | TOC | 0.315 | 1.227 | 0.238 | Clay | 0.341 | 1.270 | 0.215 |
| NH4 | 0.306 | 1.025 | 0.461 | Clay | 0.315 | 1.026 | 0.453 | TOC | 0.341 | 1.039 | 0.455 |
| TOC | 0.307 | 1.041 | 0.4 |  |  |  |  |  |  |  |  |
| Best Solution | Adj R2 | R2 | Variables | Best Solution | Adj R2 | R2 | Variables | Best Solution | Adj R2 | R2 | Variables |
|  | 0.30685 | 0.445481 | 13 |  | 0.3153 | 0.441711 | 12 |  | 0.34101 | 0.462671 | 12 |

**Supplementary Table S2**

Results of the DistLM analysis used to explore the relationship between macrofauna and environmental variables. P values were obtained using 999 permutations of residuals under the best model.