# Supplement S1

Table S1.1. Biological traits. Abbreviations: BL, body length; FR, fragility; BD, burrowing depth; MO, motility; AM, age at maturity; LS, life span; OT, offspring type; OS, offspring size; CS, case study (1, Dutch EEZ; 2, Bay of Biscay). See Table 1 for code attributions. References are listed below.

| Taxon | BL | FR | BD | MO | AM | LS | OT | OS | CS | References |
|---|---|---|---|---|---|---|---|---|---|---|
| *Abludomelita obtusata* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 51,162,230,521 |
| *Abra alba* | 2 | 3 | 2 | 2 | 1 | 2 | 3 | 4 | 1 | 124,129,290 |
| *Abra nitida* | 2 | 3 | 3 | 2 | 1 | 2 | 3 | 4 | 1 | 60,129,523 |
| *Abra prismatica* | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 4 | 1 | 124,129,159,320 |
| *Abra tenuis* | 2 | 3 | 3 | 2 | 1 | 2 | 3 | 3 | 1 | 129,134,249,290 |
| *Acanthocardia* sp. | 3 | 1 | 3 | 2 | 2 | 4 | 3 | 4 | 1 | 129,190,319,386 |
| *Acrocnida brachiata* | 5 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 1 | 53,54,179,316,319,320 |
| *Acteon tornatilis* | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 4 | 1 | 129,186,541,542 |
| *Actinauge* sp. | 3 | 1 | 3 | 4 | 3 | 4 | 3 | 3 | 2 | 337 |
| *Aequipecten opercularis* | 3 | 1 | 4 | 1 | 2 | 3 | 3 | 4 | 2 | 55,57,320,396 |
| *Alcyonium digitatum* | 5 | 2 | 4 | 4 | 3 | 4 | 3 | 3 | 2 | 227,228,244,339,468 |
| *Alcyonium glomeratum* | 5 | 2 | 4 | 4 | 3 | 4 | 3 | 3 | 2 | 193,227,228,244,339,468,478,479 |
| *Alitta virens* | 5 | 3 | 1 | 1 | 2 | 2 | 3 | 3 | 1 | 179,278,375 |
| *Alpheus glaber* | 3 | 2 | 4 | 1 | 1 | 2 | 2 | 2 | 2 | 271,350,385,390,420 |
| *Ampelisca brevicornis* | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 105,122,320 |
| *Ampelisca diadema* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 105,190,266,319,322,355 |
| *Ampelisca macrocephala* | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 266,322 |
| *Ampelisca spinipes* | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 266,319,322,417,428,537 |
| *Ampelisca tenuicornis* | 1 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 322,455,489,509 |
| *Ampharete* sp. | 3 | 3 | 2 | 3 | 1 | 1 | 3 | 3 | 1 | 125,199,319,322,402 |
| *Amphipholis squamata* | 3 | 3 | 4 | 2 | 2 | 2 | 1 | 1 | 1 | 155,263,322 |
| *Amphiura chiajei* | 5 | 3 | 2 | 2 | 3 | 4 | 3 | 3 | 1 | 240,351 |
| *Amphiura filiformis* | 5 | 3 | 3 | 2 | 3 | 4 | 3 | 4 | 1 | 52,62,352,509 |
| *Anseropoda placenta* | 4 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 230,337 |
| *Antedon* sp. | 5 | 3 | 4 | 1 | 2 | 2 | 3 | 3 | 2 | 26,141,230,282,285,286,303,325,358 |
| *Antedon petasus* | 5 | 3 | 4 | 1 | 2 | 2 | 3 | 3 | 2 | 26,141,230,282,285,286,303,325,358 |
| *Aonides paucibranchiata* | 2 | 3 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 170,190,319,320,530 |
| *Aphelochaeta marioni* | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 1 | 125,167,202,203 |
| *Aphrodita* sp. | 4 | 2 | 3 | 2 | 2 | 3 | 3 | 4 | 1 | 75,179,190,319,522 |
| *Aphrodita aculeata* | 4 | 2 | 3 | 2 | 2 | 3 | 3 | 4 | 2 | 75,179,190,319,522 |
| *Aporrhais pespelecani* | 3 | 1 | 4 | 2 | 2 | 3 | 3 | 3 | 1,2 | 129,297,322,388 |
| *Aporrhais serresianus* | 3 | 1 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 129,297,322,388 |
| *Arcopagia crassa* | 3 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 1 | 129,190,488 |
| *Arctica islandica* | 4 | 1 | 3 | 4 | 3 | 4 | 3 | 4 | 1 | 69,129,348,416,487 |
| *Aristaeomorpha foliacea* | 4 | 1 | 4 | 1 | 2 | 3 | 3 | 3 | 2 | 112,172,230,378 |
| *Armina loveni* | 2 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 2 | 160 |
| *Asbjornsenia pygmaea* | 1 | 1 | 3 | 2 | 2 | 3 | 3 | 4 | 1 | 129,190,319 |
| *Astarte montagui* | 2 | 1 | 4 | 2 | 2 | 3 | 3 | 3 | 1 | 129,430,450 |
| *Astarte sulcata* | 2 | 1 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 129,430,450 |
| *Asterias* sp. | 5 | 2 | 4 | 2 | 2 | 3 | 3 | 3 | 1 | 50,179,512 |
| *Asterias rubens* | 4 | 2 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 50,179,512 |
| *Astropecten* sp. | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 1 | 179,185,209,322 |
| *Astropecten irregularis* | 4 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 179,185,209,322 |
| *Atelecyclus* sp. | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 1 | 2 | 230,337 |
| *Atelecyclus rotundatus* | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 1 | 2 | 230,337 |
| *Atelecyclus undecimdentatus* | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 1 | 2 | 230,337 |
| *Atlantopandalus propinqvus* | 4 | 2 | 4 | 1 | 2 | 3 | 2 | 1 | 2 | 230,337 |
| *Atrina pectinata* | 5 | 1 | 4 | 4 | 2 | 3 | 3 | 4 | 2 | 89,401,405,427,544 |
| *Balanus crenatus* | 2 | 1 | 4 | 4 | 1 | 2 | 2 | 3 | 1 | 27,404,407 |
| *Bathyporeia elegans* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 176,177,243,322,361 |
| *Bathyporeia gracilis* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 114,177,190,320,361 |

Table S1.1. Continued.

| Taxon | BL | FR | BD | MO | AM | LS | OT | OS | CS | References |
|---|---|---|---|---|---|---|---|---|---|---|
| *Bathyporeia guilliamsoniana* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 114,176,177,243,361 |
| *Bathyporeia pelagica* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 114,176,177,361 |
| *Bathyporeia sarsi* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 114,190,361,510 |
| *Bathyporeia tenuipes* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 114,177,239,319,361 |
| *Bela nebula* | 2 | 1 | 3 | 2 | 1 | 2 | 3 | 3 | 1 | 129,135 |
| *Bodotria arenosa* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 261,264,322,454,539 |
| *Bodotria scorpioides* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 261,264,319,322,454,539 |
| *Branchiostoma lanceolatum* | 3 | 2 | 3 | 1 | 2 | 3 | 3 | 3 | 1 | 36,139,238,293 |
| *Brissopsis lyrifera* | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 4 | 1,2 | 64,173,230,239 |
| *Buccinum humphreysianum* | 3 | 1 | 4 | 2 | 3 | 4 | 3 | 3 | 2 | 66,129,251,252,253,269,270,323,343 |
| *Buccinum undatum* | 3 | 1 | 4 | 2 | 3 | 4 | 3 | 3 | 1,2 | 129,269,270,323 |
| *Bylgides sarsi* | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 1 | 3,322,438 |
| *Calliactis parasitica* | 3 | 1 | 4 | 4 | 3 | 4 | 3 | 3 | 2 | 179,230,337 |
| *Callianassa* sp. | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 243,280,423,424 |
| *Calliostoma granulatum* | 3 | 1 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 179,230,337 |
| *Calocaris macandreae* | 3 | 2 | 1 | 1 | 2 | 3 | 3 | 2 | 2 | 61,230,356 |
| *Cancer bellianus* | 5 | 1 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 34,39,40,71,78,179,230,248,322,331,411,415, 439,457,493,517,535,538 |
| *Cancer pagurus* | 5 | 1 | 1 | 2 | 3 | 4 | 2 | 1 | 2 | 34,40,179,322,535 |
| *Capitella capitata* | 3 | 3 | 3 | 3 | 1 | 1 | 2 | 3 | 1 | 4,46,243,336 |
| *Carcinus maenas* | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 1 | 1 | 35,179,322,342 |
| *Caryophyllia* sp. | 2 | 3 | 4 | 4 | 2 | 4 | 3 | 3 | 2 | 179,230,337 |
| *Caryophyllia smithii* | 2 | 3 | 4 | 4 | 2 | 4 | 3 | 3 | 2 | 179,230,337 |
| *Chaetopterus variopedatus* | 5 | 3 | 1 | 3 | 1 | 2 | 3 | 3 | 1 | 149,156,230,485 |
| *Chaetozone setosa* | 2 | 3 | 2 | 2 | 1 | 2 | 3 | 3 | 1 | 88,230,237,243,319,376 |
| *Chamelea striatula* | 3 | 1 | 3 | 2 | 2 | 4 | 3 | 4 | 1 | 17,129,219,243,534 |
| *Cheirocratus sundevalli* | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 105,261,319,484,521 |
| *Chlorotocus crassicornis* | 3 | 2 | 4 | 1 | 2 | 3 | 2 | 1 | 2 | 337 |
| *Cidaris cidaris* | 3 | 3 | 4 | 2 | 3 | 4 | 3 | 4 | 2 | 337 |
| *Colus gracilis* | 3 | 1 | 4 | 2 | 3 | 4 | 3 | 3 | 2 | 230,337 |
| *Colus islandicus* | 3 | 1 | 4 | 2 | 3 | 4 | 3 | 3 | 2 | 230,337 |
| *Corbula gibba* | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 4 | 1 | 129,247 |
| *Corophium* sp. | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 180,322,334 |
| *Corystes cassivelaunus* | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 1 | 1,2 | 179,226,255,319,322 |
| *Crangon allmanni* | 3 | 2 | 3 | 1 | 2 | 2 | 2 | 1 | 2 | 9,44,230 |
| *Crangon crangon* | 3 | 2 | 3 | 1 | 2 | 3 | 2 | 1 | 1,2 | 108,179,232,397 |
| *Diastylis bradyi* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 138,243,264,322,508 |
| *Diastylis lucifera* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 102,380,389 |
| *Diastylis rathkei* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 389,508 |
| *Dichelopandalus bonnieri* | 3 | 2 | 4 | 1 | 2 | 3 | 2 | 1 | 2 | 230,337 |
| *Diogenes pugilator* | 2 | 1 | 3 | 2 | 1 | 1 | 2 | 2 | 1 | 309,317,318,490 |
| *Donax vittatus* | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 4 | 1 | 19,129 |
| *Doris pseudoargus* | 3 | 2 | 4 | 2 | 1 | 1 | 3 | 3 | 2 | 129,230,486 |
| *Dosinia exoleta* | 3 | 1 | 2 | 2 | 2 | 4 | 3 | 4 | 1 | 129,190,496,499 |
| *Dosinia lupinus* | 3 | 1 | 2 | 2 | 2 | 4 | 3 | 3 | 1 | 129,190,497 |
| *Dyopedos monacantha* | 1 | 2 | 4 | 1 | 1 | 1 | 1 | 2 | 1 | 322,483 |
| *Ebalia* sp. | 2 | 3 | 4 | 2 | 1 | 2 | 2 | 2 | 1 | 230,295,319,445,446 |
| *Ebalia granulosa* | 2 | 3 | 4 | 2 | 1 | 2 | 2 | 3 | 2 | 230,295,319,445,446 |
| *Ebalia tuberosa* | 2 | 3 | 4 | 2 | 1 | 2 | 2 | 3 | 2 | 230,295,319,445,446 |
| *Echinocardium* sp. | 3 | 3 | 2 | 2 | 3 | 4 | 3 | 3 | 1 | 63,81,243 |
| *Echinocardium cordatum* | 3 | 3 | 2 | 2 | 3 | 4 | 3 | 3 | 2 | 63,81,243 |

Table S1.1. Continued.

| Taxon | BL | FR | BD | MO | AM | LS | OT | OS | CS | References |
|---|---|---|---|---|---|---|---|---|---|---|
| *Echinocardium pennatifidum* | 3 | 3 | 2 | 2 | 3 | 4 | 3 | 3 | 2 | 63,81,243 |
| *Echinocyamus pusillus* | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 1 | 198,243,304,319,322 |
| *Echinus* sp. | 4 | 3 | 4 | 2 | 2 | 4 | 3 | 3 | 2 | 95,151,165,179,183,230,344 |
| *Echinus esculentus* | 3 | 3 | 4 | 2 | 2 | 4 | 3 | 3 | 2 | 95,151,165,179,183,230,344 |
| *Echinus melo* | 4 | 3 | 4 | 2 | 2 | 4 | 3 | 3 | 2 | 95,151,165,179,183,230,344 |
| *Ensis ensis* | 4 | 3 | 2 | 2 | 3 | 4 | 3 | 4 | 1 | 129,233,319 |
| *Ensis leei* | 4 | 3 | 2 | 2 | 2 | 3 | 3 | 4 | 1 | 129,305,319 |
| *Ensis magnus* | 4 | 3 | 2 | 2 | 3 | 4 | 3 | 4 | 1 | 115,129,179,236 |
| *Ensis siliqua* | 4 | 3 | 2 | 2 | 3 | 4 | 3 | 4 | 1 | 116,129,164,233 |
| *Eteone flava* | 3 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 111,230,284,319,376 |
| *Eteone longa* | 3 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 230,243,409,410 |
| *Eulalia* sp. | 3 | 2 | 4 | 2 | 1 | 3 | 3 | 3 | 1 | 154,190,230,319,322,371 |
| *Eumida sanguinea* | 2 | 2 | 3 | 2 | 1 | 2 | 3 | 4 | 1 | 65,243,319,322 |
| *Eunereis longissima* | 4 | 3 | 4 | 2 | 1 | 1 | 3 | 3 | 1 | 190,322,474 |
| *Eupolymnia nebulosa* | 4 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 1 | 37,38,211,212,320 |
| *Eurydice pulchra* | 1 | 2 | 3 | 1 | 2 | 2 | 1 | 1 | 1 | 181,230,262 |
| *Eusergestes arcticus* | 3 | 2 | 4 | 1 | 2 | 2 | 2 | 1 | 2 | 152,230,327 |
| *Euspira catena* | 3 | 1 | 4 | 2 | 2 | 3 | 3 | 3 | 1 | 18,129,298 |
| *Euspira fusca* | 3 | 1 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 18,129,273,298 |
| *Euspira nitida* | 2 | 1 | 4 | 2 | 2 | 3 | 3 | 3 | 1 | 129,273,298 |
| *Fabulina fabula* | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 4 | 1 | 129,319,518 |
| *Funiculina quadrangularis* | 5 | 3 | 4 | 4 | 3 | 4 | 3 | 2 | 2 | 150,210 |
| *Galathowenia oculata* | 2 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 1 | 174,274,333 |
| *Gammaropsis* sp. | 1 | 2 | 4 | 1 | 1 | 2 | 1 | 2 | 1 | 257,319,322,354 |
| *Gammarus* sp. | 1 | 2 | 4 | 1 | 1 | 2 | 1 | 1 | 1 | 15,103 |
| *Gari fervensis* | 3 | 1 | 3 | 2 | 2 | 3 | 3 | 3 | 1 | 129,131 |
| *Gastrosaccus spinifer* | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 42,179,313,319,410 |
| *Gattyana cirrhosa* | 2 | 2 | 1 | 2 | 2 | 3 | 3 | 3 | 1 | 111,243 |
| *Gilvossius tyrrhenus* | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 148,322,383,480,481 |
| *Glycera* sp. | 5 | 2 | 1 | 1 | 3 | 3 | 3 | 3 | 1 | 73,106,107,319,322,366,533 |
| *Glycymeris glycymeris* | 3 | 1 | 3 | 2 | 3 | 4 | 3 | 3 | 2 | 21,189,230,443 |
| *Gnathophausia* sp. | 3 | 1 | 4 | 1 | 2 | 2 | 1 | 1 | 2 | 335,527 |
| *Goneplax rhomboides* | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 230,337 |
| *Goniada maculata* | 3 | 2 | 3 | 1 | 1 | 2 | 3 | 3 | 1 | 190,243,274,319,320,329 |
| *Gracilechinus* sp. | 3 | 3 | 4 | 2 | 3 | 4 | 3 | 4 | 2 | 67,187,188,230,308,504,505 |
| *Gracilechinus acutus* | 3 | 3 | 4 | 2 | 3 | 4 | 3 | 4 | 2 | 188,230,308,505 |
| *Gracilechinus elegans* | 3 | 3 | 4 | 2 | 3 | 4 | 3 | 4 | 2 | 67,187,188,230,308,504,505 |
| *Harmothoe* sp. | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 1 | 111,118,179,243,319,322,410 |
| *Harpinia antennaria* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 230,243,322,425,521 |
| *Haustorius arenarius* | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 137,142,320,506 |
| *Hediste diversicolor* | 4 | 3 | 1 | 1 | 1 | 2 | 2 | 3 | 1 | 144,158,179,322,444 |
| *Henricia* sp. | 3 | 2 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 179,230,337 |
| *Heteromastus filiformis* | 4 | 3 | 1 | 3 | 2 | 2 | 3 | 3 | 1 | 41,182,453 |
| *Hiatella arctica* | 3 | 1 | 4 | 4 | 2 | 4 | 3 | 4 | 1 | 129,319,449 |
| *Homarus gammarus* | 5 | 1 | 1 | 2 | 3 | 4 | 2 | 1 | 2 | 30,246,359,456,513 |
| *Hyalinoecia tubicola* | 4 | 1 | 4 | 2 | 2 | 2 | 1 | 1 | 2 | 230,337 |
| *Hymenodiscus coronata* | 5 | 3 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 337 |
| *Hypereteone foliosa* | 3 | 2 | 2 | 2 | 1 | 2 | 3 | 3 | 1 | 319,322,376,532 |
| *Idotea linearis* | 2 | 2 | 4 | 1 | 1 | 2 | 1 | 1 | 1 | 179,184,230 |
| *Inachus* sp. | 3 | 2 | 4 | 2 | 2 | 2 | 2 | 1 | 2 | 224,225,294 |
| *Inachus dorsettensis* | 3 | 2 | 4 | 2 | 2 | 2 | 2 | 1 | 2 | 224,225,294 |

Table S1.1. Continued.

| Taxon | BL | FR | BD | MO | AM | LS | OT | OS | CS | References |
|---|---|---|---|---|---|---|---|---|---|---|
| *Inachus leptochirus* | 3 | 2 | 4 | 2 | 2 | 2 | 2 | 1 | 2 | 224,225,294 |
| *Inachus phalangium* | 3 | 2 | 4 | 2 | 2 | 2 | 2 | 1 | 2 | 224,225,294 |
| *Iphinoe trispinosa* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 101,322,454 |
| *Jassa marmorata* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 92,322,429,448 |
| *Jorunna tomentosa* | 3 | 2 | 4 | 2 | 1 | 1 | 2 | 3 | 2 | 179,230,337 |
| *Kellia suborbicularis* | 1 | 3 | 3 | 2 | 2 | 2 | 2 | 4 | 1 | 129,300 |
| *Kurtiella bidentata* | 1 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 1 | 129,230,365 |
| *Laetmonice* sp. | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 230,337 |
| *Lagis koreni* | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 4 | 1 | 125,243,360,482 |
| *Lamellaria perspicua* | 3 | 2 | 4 | 2 | 1 | 1 | 3 | 3 | 2 | 179,230,337 |
| *Lanice conchilega* | 4 | 3 | 2 | 3 | 1 | 2 | 3 | 3 | 1 | 179,199,243,278,319,406 |
| *Laonice* sp. | 4 | 3 | 1 | 3 | 1 | 2 | 3 | 3 | 1 | 47,319,322,458 |
| *Lepas* sp. | 3 | 1 | 4 | 4 | 1 | 1 | 2 | 3 | 2 | 28,206,230 |
| *Lepidonotus squamatus* | 3 | 2 | 4 | 2 | 1 | 3 | 3 | 4 | 1 | 322,398,410 |
| *Leptometra celtica* | 5 | 3 | 4 | 1 | 2 | 2 | 3 | 3 | 2 | 337 |
| *Leptosynapta inhaerens* | 5 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 179,319,322,451 |
| *Limecola balthica* | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 1 | 129,213,287,307 |
| *Liocarcinus* sp. | 3 | 1 | 3 | 1 | 2 | 3 | 2 | 1 | 1,2 | 2,25,56,84,85,91,171,179,229,230,319,322 |
| *Liocarcinus depurator* | 3 | 1 | 3 | 1 | 1 | 3 | 2 | 1 | 2 | 56,171,179,229 |
| *Liocarcinus holsatus* | 3 | 1 | 4 | 1 | 1 | 3 | 2 | 1 | 2 | 2,84,85,91,230 |
| *Liocarcinus marmoreus* | 3 | 1 | 4 | 1 | 2 | 3 | 2 | 1 | 2 | 2,25,56,84,85,91,171,179,229,230,319,322 |
| *Liocarcinus pusillus* | 3 | 1 | 4 | 1 | 2 | 3 | 2 | 1 | 2 | 2,25,56,84,85,91,171,179,229,230,319,322 |
| *Liocarcinus vernalis* | 3 | 1 | 4 | 1 | 2 | 3 | 2 | 1 | 2 | 2,25,56,84,85,91,171,179,229,230,319,322 |
| *Lucinoma borealis* | 3 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 1 | 119,129,214,498 |
| *Luidia* sp. | 5 | 2 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 221,230,502 |
| *Luidia ciliaris* | 5 | 2 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 221,230,502 |
| *Luidia sarsii* | 5 | 2 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 221,230,502 |
| *Lumbrineris* sp. | 5 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 1 | 230,243,319,392,440 |
| *Lutraria lutraria* | 4 | 1 | 1 | 2 | 3 | 3 | 3 | 4 | 1 | 129,268 |
| *Macomangulus tenuis* | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 4 | 1 | 20,29,129,133,190,472 |
| *Macropipus tuberculatus* | 5 | 1 | 3 | 1 | 2 | 2 | 2 | 1 | 2 | 216,230,357,367 |
| *Macropodia* sp. | 3 | 3 | 4 | 2 | 2 | 2 | 2 | 2 | 2 | 179,254,319 |
| *Macropodia rostrata* | 3 | 3 | 4 | 2 | 2 | 2 | 2 | 2 | 2 | 179,254,319 |
| *Macropodia tenuirostris* | 3 | 3 | 4 | 2 | 2 | 2 | 2 | 2 | 2 | 179,254,319 |
| *Mactra stultorum* | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 4 | 1 | 82,129 |
| *Magelona filiformis* | 3 | 3 | 2 | 2 | 1 | 2 | 3 | 3 | 1 | 175,320,322,347,529 |
| *Magelona johnstoni* | 3 | 3 | 2 | 2 | 1 | 2 | 3 | 3 | 1 | 175,319,347,529 |
| *Magelona mirabilis* | 3 | 3 | 2 | 2 | 1 | 2 | 3 | 3 | 1 | 175,347,413,529 |
| *Magelona papillicornis* | 4 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 1 | 175,243,322,347,529 |
| *Maja brachydactyla* | 5 | 1 | 4 | 2 | 2 | 3 | 2 | 1 | 2 | 74,191,217,230 |
| *Maja squinado* | 5 | 1 | 4 | 2 | 2 | 3 | 2 | 1 | 2 | 217,230,292 |
| *Malacoceros fuliginosus* | 3 | 3 | 3 | 1 | 2 | 2 | 3 | 3 | 1 | 47,179,215,319 |
| *Malmgrenia lunulata* | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 1 | 190,322,395,547 |
| *Marthasterias glacialis* | 5 | 2 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 33,179,230,291,387 |
| *Mediomastus fragilis* | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 1 | 190,223,319,410,515 |
| *Megaluropus agilis* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 3 | 1 | 161,176,243,382,484 |
| *Mesopodopsis slabberi* | 2 | 2 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 136,179,400,520 |
| *Mimachlamys* sp. | 3 | 2 | 4 | 4 | 2 | 3 | 3 | 4 | 1 | 55,129,412,452 |
| *Modiolus* sp. | 4 | 1 | 4 | 4 | 3 | 4 | 3 | 4 | 1 | 129,130 |
| *Munida intermedia* | 4 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 208,230,296 |
| *Munida rugosa* | 4 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 86,208,230,296,394,419,421,435,476 |

Table S1.1. Continued.

| Taxon | BL | FR | BD | MO | AM | LS | OT | OS | CS | References |
|---|---|---|---|---|---|---|---|---|---|---|
| *Munida speciosa* | 4 | 1 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 86,230,394,435 |
| *Musculus* sp. | 2 | 2 | 4 | 4 | 2 | 3 | 2 | 3 | 1 | 129,310,338 |
| *Mya arenaria* | 4 | 1 | 1 | 4 | 3 | 4 | 3 | 4 | 1 | 58,59,129 |
| *Mya truncata* | 3 | 1 | 2 | 4 | 3 | 4 | 3 | 4 | 1 | 11,12,129,319 |
| *Mysia undata* | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 4 | 1 | 129,190,328 |
| *Mytilus* sp. | 4 | 1 | 4 | 4 | 2 | 4 | 3 | 4 | 2 | 129,250 |
| *Mytilus edulis* | 3 | 1 | 4 | 4 | 2 | 4 | 3 | 4 | 1,2 | 129,250 |
| *Nassarius reticulatus* | 2 | 1 | 3 | 2 | 3 | 3 | 3 | 3 | 1 | 79,129 |
| *Natatolana borealis* | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 260,265,314,477,484 |
| *Nephrops norvegicus* | 5 | 1 | 1 | 2 | 3 | 3 | 2 | 1 | 1,2 | 166,168,169,495 |
| *Nephtys* sp. | 4 | 2 | 2 | 1 | 2 | 3 | 3 | 3 | 1 | 70,93,140,230,243,274,284,319,320,322,326, 372,373,374,494,546 |
| *Notomastus latericeus* | 5 | 3 | 1 | 2 | 1 | 1 | 3 | 3 | 1 | 170,200,230,524,528 |
| *Nucula nitidosa* | 2 | 1 | 3 | 2 | 2 | 3 | 3 | 3 | 1 | 125,126,129,413,531 |
| *Nucula nucleus* | 2 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 129,319 |
| *Ocenebra erinaceus* | 3 | 1 | 4 | 2 | 2 | 2 | 3 | 2 | 2 | 179,324,460,466 |
| *Ophelia* sp. | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 1 | 274,319,403 |
| *Ophiocomina nigra* | 4 | 3 | 4 | 2 | 3 | 4 | 3 | 3 | 2 | 179,230,337 |
| *Ophiothrix* sp. | 4 | 3 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 127,179,234,469,470 |
| *Ophiothrix fragilis* | 4 | 3 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 127,179 |
| *Ophiothrix luetkeni* | 4 | 3 | 4 | 2 | 2 | 2 | 3 | 3 | 2 | 127,179,234,469,470 |
| *Ophiura* sp. | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 3 | 1,2 | 49,117,179,319,503 |
| *Ophiura albida* | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 49,117,179,319 |
| *Ophiura ophiura* | 3 | 3 | 4 | 1 | 2 | 3 | 3 | 3 | 2 | 49,117,179,319,503 |
| *Orchomenella nana* | 1 | 2 | 4 | 1 | 1 | 1 | 1 | 2 | 1 | 346,484 |
| *Owenia fusiformis* | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 1,2 | 13,125,179,196,322,362 |
| *Oxydromus flexuosus* | 3 | 3 | 3 | 1 | 2 | 2 | 3 | 3 | 1 | 220,381 |
| *Pagurus* sp. | 2 | 1 | 4 | 2 | 2 | 2 | 2 | 1 | 2 | 128,179,275,276,288,321 |
| *Pagurus alatus* | 2 | 1 | 4 | 2 | 2 | 2 | 2 | 1 | 2 | 128,179,275,276,288,321 |
| *Pagurus bernhardus* | 3 | 1 | 4 | 2 | 2 | 3 | 2 | 1 | 1,2 | 128,179,288,321 |
| *Pagurus carneus* | 2 | 1 | 4 | 2 | 2 | 2 | 2 | 1 | 2 | 128,179,275,276,288,321 |
| *Pagurus cuanensis* | 2 | 1 | 4 | 2 | 2 | 2 | 2 | 1 | 2 | 128,179,275,276,288,321 |
| *Pagurus excavatus* | 2 | 1 | 4 | 2 | 2 | 2 | 2 | 1 | 2 | 128,179,275,276,288,321 |
| *Pagurus forbesii* | 2 | 1 | 4 | 2 | 2 | 2 | 2 | 1 | 2 | 128,179,275,276,288,321 |
| *Pagurus prideaux* | 3 | 2 | 4 | 2 | 2 | 2 | 2 | 1 | 2 | 128,179,275,276,288,321 |
| *Palaemon serratus* | 3 | 2 | 4 | 1 | 1 | 2 | 2 | 1 | 2 | 178,179,230,414 |
| *Palinurus elephas* | 5 | 1 | 1 | 1 | 3 | 4 | 2 | 1 | 2 | 207,242 |
| *Palinurus mauritanicus* | 5 | 1 | 1 | 1 | 3 | 4 | 2 | 1 | 2 | 207,242 |
| *Paraonis fulgens* | 3 | 2 | 2 | 2 | 1 | 1 | 3 | 3 | 1 | 157,319,410,418,536 |
| *Parapenaeus longirostris* | 3 | 1 | 4 | 1 | 2 | 2 | 3 | 2 | 2 | 241,272,461 |
| *Parastichopus regalis* | 5 | 1 | 4 | 2 | 3 | 3 | 3 | 3 | 2 | 337 |
| *Parastichopus tremulus* | 4 | 1 | 4 | 2 | 3 | 3 | 3 | 3 | 2 | 337 |
| *Paromola cuvieri* | 5 | 1 | 4 | 2 | 2 | 3 | 2 | 1 | 2 | 337 |
| *Pasiphaea multidentata* | 3 | 2 | 4 | 1 | 2 | 2 | 2 | 1 | 2 | 22,72,96,152,230,327 |
| *Pasiphaea sivado* | 3 | 2 | 4 | 1 | 2 | 2 | 2 | 1 | 2 | 72,96,230,327,526 |
| *Pasiphaea tarda* | 3 | 2 | 4 | 1 | 2 | 2 | 2 | 1 | 2 | 22,152,230,327 |
| *Pecten maximus* | 4 | 1 | 4 | 1 | 2 | 4 | 3 | 4 | 2 | 129 |
| *Pennatula phosphorea* | 4 | 2 | 4 | 4 | 3 | 4 | 3 | 3 | 2 | 230,337 |
| *Peringia ulvae* | 1 | 2 | 3 | 2 | 1 | 2 | 3 | 3 | 1 | 14,129,179,462 |
| *Perioculodes longimanus* | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 31,243,484 |
| *Petricolaria pholadiformis* | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 4 | 1 | 8,129,147,426 |

Table S1.1. Continued.

| Taxon | BL | FR | BD | MO | AM | LS | OT | OS | CS | References |
|---|---|---|---|---|---|---|---|---|---|---|
| *Phaxas pellucidus* | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 1 | 129,299 |
| *Philine aperta* | 3 | 2 | 4 | 2 | 2 | 2 | 3 | 4 | 2 | 179,245 |
| *Philocheras echinulatus* | 2 | 2 | 3 | 1 | 1 | 1 | 2 | 1 | 2 | 230,283,368,369,391 |
| *Philocheras trispinosus* | 2 | 1 | 3 | 1 | 1 | 1 | 2 | 1 | 1 | 230,283,368,369,391 |
| *Pholoe minuta* | 1 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 1 | 87,231,322 |
| *Phoronis* sp. | 3 | 3 | 2 | 3 | 1 | 1 | 3 | 4 | 1 | 153 |
| *Photis longicaudata* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 3 | 1 | 261,345,353,484,525 |
| *Phyllodoce* sp. | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 230,243,302,349 |
| *Pisidia longicornis* | 1 | 3 | 4 | 2 | 1 | 2 | 3 | 3 | 2 | 230,431,459 |
| *Pisione remota* | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 4 | 1 | 146,319,320,471 |
| *Plesionika heterocarpus* | 3 | 2 | 4 | 1 | 2 | 3 | 2 | 1 | 2 | 6,7,94,97,192,241,289,315,377,379,408,434,46 |
| *Plesionika martia* | 3 | 2 | 4 | 1 | 2 | 2 | 2 | 1 | 2 | 241,315 |
| *Poecilochaetus serpens* | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 1 | 132,170,190,319,322 |
| *Polybius henslowii* | 2 | 2 | 3 | 1 | 2 | 2 | 2 | 1 | 2 | 230,337 |
| *Polycheles typhlops* | 3 | 1 | 1 | 1 | 3 | 3 | 2 | 1 | 2 | 1,5,98,242,492 |
| *Polydora* sp. | 2 | 3 | 3 | 3 | 1 | 1 | 2 | 3 | 1 | 16,90,120,179,215,311,322,545 |
| *Pontocrates altamarinus* | 1 | 1 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 31,243 |
| *Pontocrates arcticus* | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 31,32,320 |
| *Pontocrates arenarius* | 1 | 1 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 31,176,320,514 |
| *Pontophilus norvegicus* | 3 | 2 | 3 | 1 | 2 | 2 | 2 | 1 | 2 | 230,337 |
| *Pontophilus spinosus* | 3 | 2 | 3 | 1 | 2 | 2 | 2 | 1 | 2 | 230,337 |
| *Porania pulvillus* | 4 | 1 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 230,337 |
| *Portumnus latipes* | 3 | 3 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 100,230,301,501 |
| *Prionospio* sp. | 3 | 2 | 3 | 3 | 1 | 1 | 3 | 3 | 1 | 319,322,363 |
| *Processa* sp. | 2 | 2 | 3 | 1 | 1 | 2 | 2 | 1 | 2 | 230,337 |
| *Processa canaliculata* | 2 | 2 | 3 | 1 | 1 | 2 | 2 | 1 | 2 | 230,337 |
| *Processa nouveli* | 2 | 2 | 3 | 1 | 1 | 2 | 2 | 1 | 2 | 230,337 |
| *Psammechinus miliaris* | 3 | 3 | 4 | 2 | 2 | 3 | 3 | 4 | 1,2 | 50,179,230,267 |
| *Pseudocuma longicorne* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 101,319,322,454 |
| *Pteria hirundo* | 4 | 1 | 4 | 4 | 3 | 4 | 3 | 4 | 2 | 197,340,341,441,442,464,516 |
| *Pteroeides griseum* | 5 | 2 | 4 | 4 | 3 | 4 | 3 | 3 | 2 | 337 |
| *Pycnogonum litorale* | 2 | 1 | 4 | 2 | 2 | 3 | 1 | 3 | 2 | 23,179,256,491 |
| *Pygospio elegans* | 2 | 3 | 3 | 3 | 1 | 2 | 2 | 3 | 1 | 16,320 |
| *Rissoides desmaresti* | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 235,242,511 |
| *Rostanga rubra* | 2 | 2 | 4 | 2 | 1 | 1 | 3 | 4 | 2 | 83,204,205,230 |
| *Scalibregma inflatum* | 3 | 2 | 1 | 2 | 1 | 1 | 3 | 3 | 1 | 45,143,170,312 |
| *Scaphander lignarius* | 3 | 2 | 4 | 2 | 2 | 2 | 3 | 4 | 2 | 230,337 |
| *Schistomysis* sp. | 2 | 2 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 230,319,330,400,432,433 |
| *Scolelepis squamata* | 3 | 3 | 1 | 1 | 2 | 2 | 3 | 3 | 1 | 47,121,243,465,473 |
| *Scoletoma fragilis* | 5 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 1 | 230,376,507 |
| *Scoloplos armiger* | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 1 | 77,201,243,279,447 |
| *Sergia robusta* | 3 | 2 | 4 | 1 | 2 | 3 | 2 | 1 | 2 | 337 |
| *Sigalion mathildae* | 3 | 2 | 1 | 2 | 3 | 3 | 3 | 3 | 1 | 179,199,243,333 |
| *Solenocera membranacea* | 3 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 337 |
| *Spatangus purpureus* | 4 | 3 | 3 | 2 | 3 | 3 | 3 | 4 | 2 | 179,230,337 |
| *Sphenia binghami* | 2 | 3 | 4 | 4 | 3 | 4 | 3 | 4 | 1 | 129,222,319,540 |
| *Spio decoratus* | 2 | 3 | 3 | 3 | 1 | 1 | 2 | 3 | 1 | 123,199,218,230 |
| *Spio filicornis* | 2 | 3 | 3 | 3 | 1 | 1 | 2 | 2 | 1 | 243,467,475 |
| *Spio martinensis* | 2 | 3 | 3 | 3 | 1 | 1 | 2 | 3 | 1 | 123,215,230,319,475 |
| *Spiophanes bombyx* | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 1 | 47,113,243,413 |
| *Spirobranchus triqueter* | 2 | 1 | 4 | 3 | 1 | 2 | 3 | 4 | 1 | 104,179,281 |

Table S1.1. Continued.

| Taxon | BL | FR | BD | MO | AM | LS | OT | OS | CS | References |
|---|---|---|---|---|---|---|---|---|---|---|
| *Spisula elliptica* | 2 | 1 | 3 | 2 | 2 | 3 | 3 | 4 | 1 | 129,190,319 |
| *Spisula solida* | 3 | 1 | 3 | 2 | 3 | 4 | 3 | 4 | 1 | 129,163,179,259 |
| *Spisula subtruncata* | 2 | 1 | 3 | 2 | 2 | 3 | 3 | 4 | 1 | 68,125,129 |
| *Stichastrella rosea* | 3 | 2 | 4 | 2 | 2 | 3 | 3 | 3 | 2 | 230,337 |
| *Streblospio shrubsolii* | 2 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 1 | 76,230,277,436 |
| *Streptosyllis websteri* | 1 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 1 | 194,230,333 |
| *Synchelidium maculatum* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 31,484,514,543 |
| *Tellimya ferruginosa* | 1 | 3 | 2 | 2 | 1 | 2 | 2 | 4 | 1 | 129,230,300,370 |
| *Terebellides stroemii* | 2 | 3 | 2 | 3 | 1 | 2 | 3 | 3 | 1 | 111,145,170,384 |
| *Tethyaster subinermis* | 5 | 2 | 4 | 2 | 3 | 4 | 3 | 3 | 2 | 337 |
| *Tharyx* sp. | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 1 | 48,125,167,203,393 |
| *Thelepus cincinnatus* | 4 | 2 | 3 | 3 | 1 | 1 | 2 | 3 | 1 | 190,258,332 |
| *Thracia convexa* | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 1 | 10,80,129,319,437 |
| *Thracia phaseolina* | 2 | 3 | 1 | 2 | 2 | 4 | 2 | 3 | 1 | 10,129,319,437 |
| *Thracia pubescens* | 3 | 3 | 2 | 2 | 2 | 4 | 2 | 3 | 1 | 10,129,319,364,437 |
| *Thyasira flexuosa* | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 1 | 43,125,129,306 |
| *Turritella communis* | 3 | 1 | 3 | 2 | 2 | 3 | 3 | 4 | 1,2 | 129,297,322 |
| *Upogebia deltaura* | 3 | 3 | 1 | 2 | 2 | 3 | 2 | 1 | 1 | 319,322,500,519 |
| *Urothoe brevicornis* | 1 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 65,99,132,243,319 |
| *Urothoe marina* | 1 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 65,99,132,179,319 |
| *Urothoe poseidonis* | 1 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 65,99,132,179,243,319 |
| *Venerupis corrugata* | 3 | 1 | 2 | 4 | 2 | 3 | 3 | 4 | 1 | 129 |
| *Venus* sp. | 3 | 1 | 3 | 2 | 3 | 4 | 3 | 4 | 1 | 24,129,178,399 |
| *Venus casina* | 2 | 1 | 3 | 2 | 2 | 3 | 3 | 4 | 2 | 24,129,178,399 |
| *Westwoodilla caecula* | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 32,320 |
| *Xylophaga dorsalis* | 2 | 1 | 3 | 3 | 1 | 1 | 3 | 4 | 2 | 109,110,195,422 |

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# Supplement S2

Variation partitioning

Variation partitioning has been used for a long time in different research fields; Legendre and Legendre (2012) provide a very detailed description of it. This analytical procedure quantifies the amounts of variance from a response variable or matrix explained by several predictor variables or matrices (individual and combinations of those predictors). The procedure is based on partial regression. As an example, here is an illustration from our Dutch case study. We chose the recoverability component RE based on absolute number of taxa given its pertinence: it is strongly correlated with both environmental variables ($R^2_{adj.} = 0.65$) and trawling intensity ($R^2_{adj.} = 0.47$). Figure S2.1 displays the relationships between the raw data (trawling and abiotic data *ln*-transformed).

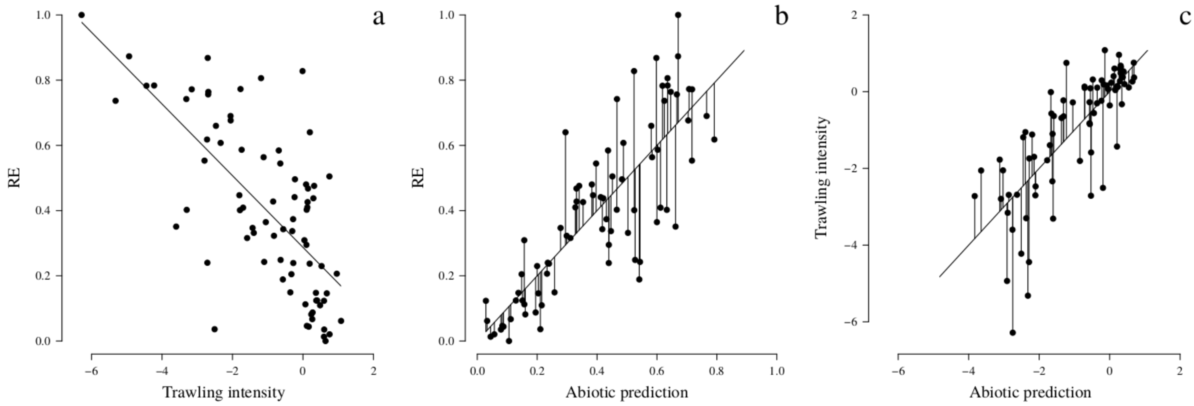


Fig. S2.1. Relationships between recoverability (RE, based on absolute taxon density), trawling intensity and abiotic variables. In b and c, abiotic prediction is the predicted value from the multiple regression of RE (b) and trawling intensity (c) on abiotic descriptors; vertical segments represent residual values of these relationships.

Trawling intensity, RE and abiotic descriptors are all strongly correlated to each other. It follows that there are two possible sources of RE variation, trawling and habitat characteristics. While habitat preferences of benthic organisms are to be expected, one cannot conclude immediately that trawling does affect benthos. Here, trawling effort is distributed according to habitat characteristics (b), but the relationship in (a) does not show if trawling affects RE within a habitat (i.e. in the way one would use a controlled experiment to establish cause-effect relationships between varying levels of trawling intensity and responses of benthos within specific environments). Hence, trawling intensity and abiotic descriptors jointly explain some of the RE variance, called "confounding effect" (here, 0.45 %, Table S5.1). However, abiotic descriptors do not fully explain RE and trawling variances as indicated by residuals in (b) and (c). These residuals reflect an element of variation in which there is no environmental effect, as illustrated in Figures S2.1a and S2.1b. The two sets of residuals are used as new variables, independent of environmental effect to assess the true effect of trawling intensity (Fig. S2.2c).

As indicated in Table 2 and Table S5.1, the amount of RE variance explained by trawling intensity, when controlling for the abiotic variation, is $R^2_{adj.} = 0.02$. This very low value results from the division of the explained variance in Figure S2.2c by the total variance of RE in Figure S2.1a. Consequently, from RE (Fig. S2.1a) to RE | Abiotic prediction (Fig. S2.2c), a large amount of variance is removed: 45 % from the confounding effect plus 20 % from Abiotic prediction | trawling intensity (environmental effect independent from trawling effect, see Table S5.1), leaving only 100 – (45 + 20) = 35 % of RE variance for which one tries to find an effect of trawling intensity, itself constrained by abiotic variables.

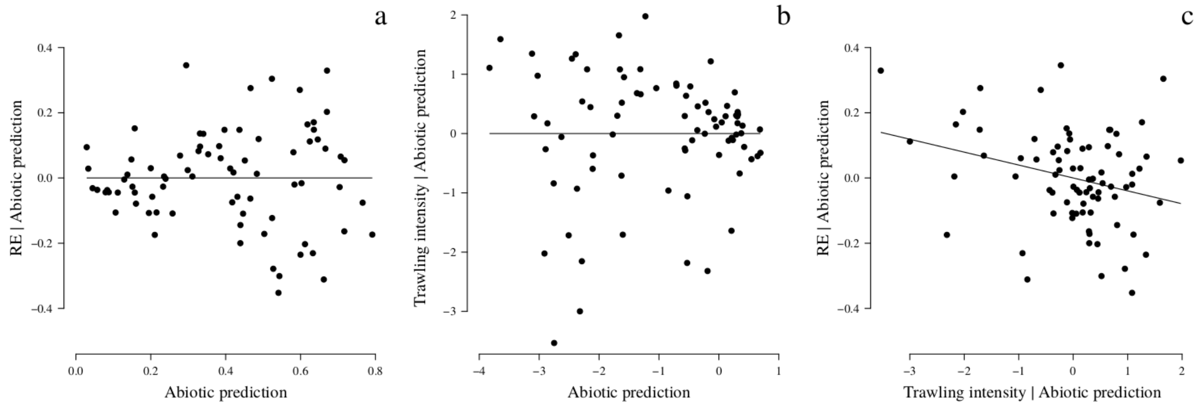


Fig. S2.2. a and b) Relationships between residual values from Figures S2.1b and S2.1c and abiotic prediction (the symbol "|" means "when controlling for"). These two sets of residuals are used in (c) to assess the response of RE to trawling intensity in the absence of abiotic interference (i.e. organism habitat preferences and habitats preferably trawled). c) Partial regression of the two variables of interest.

The greater the confounding effect, the lower the amount of explain variance that can be expected from the partial regression (Fig. S2.2c). However, the sign of variation of the final relationship is not affected by variance removal if there is a real effect, and it keeps all its functional meaning. The pure effect of trawling intensity on the response variable here, as expected according to our mechanistic rationale, is clearly negative, as indicated by the partial *r*-correlation coefficient equalled to –0.28 ($p$ = 0.009). The very conservative nature of this approach ensures the rejection of false or unrelated effects in spite of variance removal.

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Legendre, P., and Legendre, L. 2012. Numerical ecology, Third Edition. Elsevier, 1006 p.

# Supplement S3

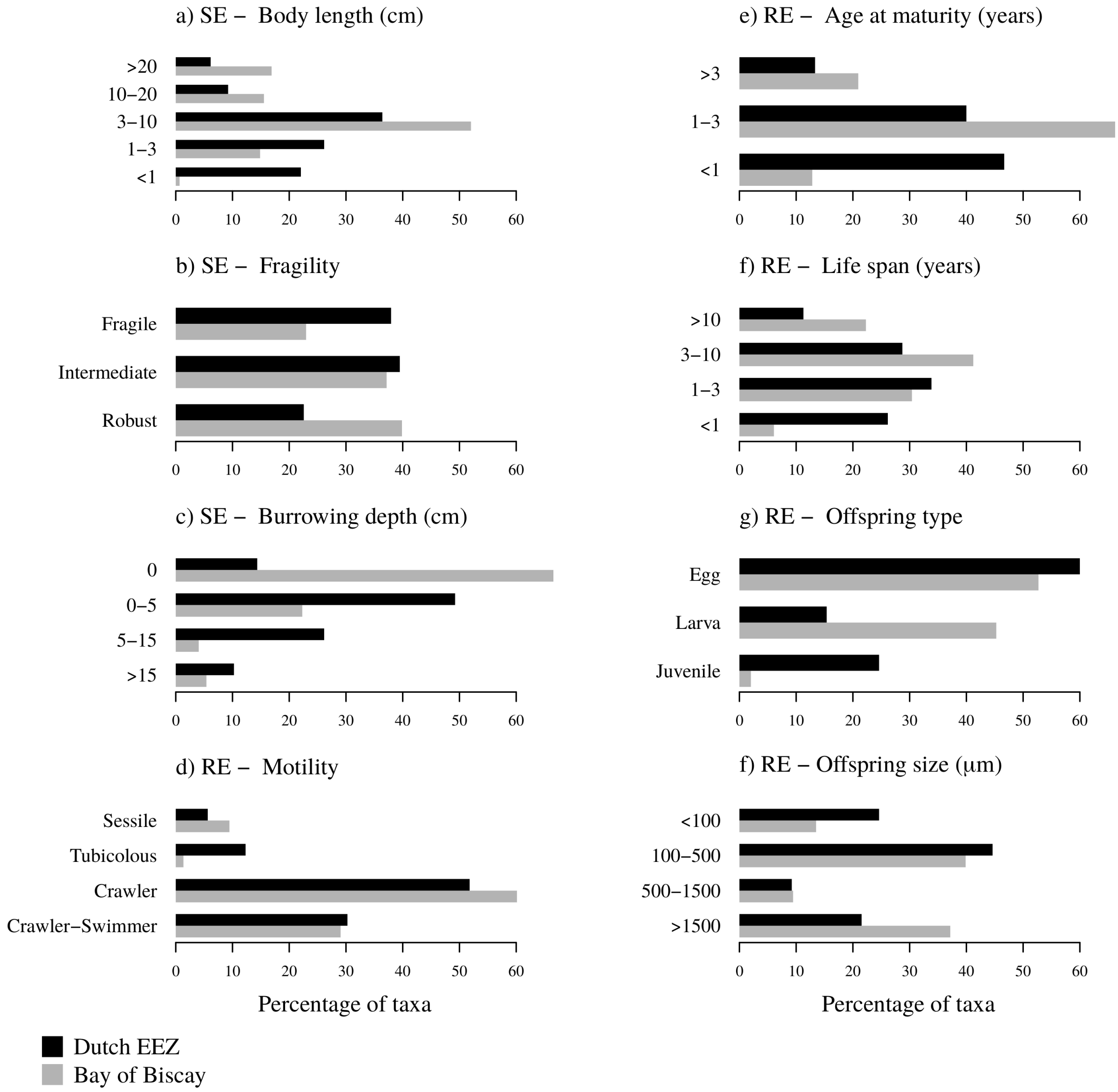


Fig. S3.1. Proportions of taxa for each biological trait modality in each of the two faunas.

# Supplement S4

Table S4.1. Pearson's *r* correlation coefficients between traits within each case study. Rejection level: $^{***}$, $p < 0.001$; $^{**}$, $p < 0.010$; $^{*}$, $p < 0.050$

| | | Body length | Fragility | Burrowing depth | Motility | Age at maturity | Life span | Offspring type | Offspring size | SE |
|---|---|---|---|---|---|---|---|---|---|---|
| Dutch EEZ | Fragility | 0.19 ** | | | | | | | | |
| | Burrowing depth | − 0.34 *** | − 0.23 ** | | | | | | | |
| | Motility | 0.38 *** | 0.04 | 0.01 | | | | | | |
| | Age at maturity | 0.50 *** | − 0.12 | − 0.18 * | 0.27 *** | | | | | |
| | Life span | 0.48 *** | − 0.18 * | − 0.08 | 0.34 *** | 0.80 *** | | | | |
| | Offspring type | 0.59 *** | 0.07 | − 0.19 ** | 0.55 *** | 0.51 *** | 0.54 *** | | | |
| | Offspring size | 0.38 *** | 0.03 | − 0.08 | 0.57 *** | 0.45 *** | 0.47 *** | 0.81 *** | | |
| | SE | 0.47 *** | 0.58 *** | 0.20 ** | 0.20 ** | 0.12 | 0.12 | 0.29 *** | 0.18 * | |
| | RE | 0.29 *** | − 0.16 * | − 0.05 | 0.46 *** | 0.68 *** | 0.54 *** | 0.33 *** | 0.41 *** | 0.02 |
| Bay of Biscay | Fragility | − 0.04 | | | | | | | | |
| | Burrowing depth | − 0.10 | 0.12 | | | | | | | |
| | Motility | 0.13 | 0.00 | 0.17 * | | | | | | |
| | Age at maturity | 0.42 *** | − 0.05 | − 0.18 * | 0.27 ** | | | | | |
| | Life span | 0.37 *** | − 0.02 | − 0.10 | 0.33 *** | 0.73 *** | | | | |
| | Offspring type | 0.17 * | 0.27 ** | 0.19 * | 0.39 *** | 0.28 ** | 0.38 *** | | | |
| | Offspring size | 0.09 | 0.25 ** | 0.24 ** | 0.47 *** | 0.17 * | 0.29 *** | 0.82 *** | | |
| | SE | 0.36 *** | 0.80 *** | 0.30 *** | 0.05 | 0.11 | 0.08 | 0.34 *** | 0.27 ** | |
| | RE | 0.22 ** | 0.06 | 0.12 | 0.64 *** | 0.63 *** | 0.52 *** | 0.45 *** | 0.46 *** | 0.13 |

# Supplement S5

Table S5.1. Complete output of variation partitioning for the Dutch EEZ. Symbols: "|", conditional effect; "∩", confounding effect between environmental variables and trawling intensity (intersection). AM, age at maturity; BD, burrowing depth; BL, body length; FR, fragility; LS, life span; MO, motility; OS, offspring size; OT, offspring type; RE, recoverability; SE, sensitivity. Partial *r* indicates the Pearson's *r*-correlation coefficient between the response variable and trawling intensity when controlling for the effect of abiotic variables; it also indicates the sign of variation of the relationship.

| Density | Component | Response variable | Abiotic | Trawling | Abio. + Trawl. | Abio. \| Trawl. | Abio. ∩ Trawl. | Trawl. \| Abio. | Partial *r* |
|---|---|---|---|---|---|---|---|---|---|
| Absolute biomass | Individual traits | BL | 0.38 | 0.05 | 0.38 | 0.32 | 0.06 | ns | ns |
| | | FR | 0.40 | ns | 0.40 | 0.38 | 0.02 | ns | ns |
| | | BD | 0.25 | 0.06 | 0.24 | 0.19 | 0.06 | ns | ns |
| | | MO | 0.37 | 0.07 | 0.36 | 0.29 | 0.08 | ns | ns |
| | | AM | 0.32 | ns | 0.31 | 0.30 | 0.02 | ns | ns |
| | | LS | 0.30 | ns | 0.30 | 0.27 | 0.04 | ns | ns |
| | | OT | 0.34 | 0.04 | 0.34 | 0.30 | 0.05 | ns | ns |
| | | OS | 0.27 | 0.10 | 0.28 | 0.19 | 0.08 | ns | ns |
| | Sensitivity | BL×FR | 0.36 | 0.05 | 0.35 | 0.30 | 0.05 | ns | ns |
| | | BL×BD | 0.25 | 0.09 | 0.24 | 0.16 | 0.09 | ns | ns |
| | | FR×BD | 0.28 | 0.05 | 0.29 | 0.24 | 0.04 | ns | ns |
| | | SE | 0.26 | 0.10 | 0.27 | 0.18 | 0.09 | ns | ns |
| | Recoverability | MO×OT | 0.29 | 0.08 | 0.28 | 0.20 | 0.09 | ns | ns |
| | | MO×OS | 0.25 | 0.13 | 0.26 | 0.13 | 0.12 | ns | ns |
| | | OT×OS | 0.26 | 0.09 | 0.27 | 0.19 | 0.08 | ns | ns |
| | | MO×OT×OS | 0.24 | 0.12 | 0.25 | 0.13 | 0.11 | ns | ns |
| | | RM | 0.26 | 0.05 | 0.27 | 0.22 | 0.04 | ns | ns |
| | | RM×MO | 0.25 | 0.06 | 0.26 | 0.20 | 0.05 | ns | ns |
| | | RM×OT | 0.23 | 0.05 | 0.25 | 0.19 | 0.04 | ns | ns |
| | | RM×OS | 0.19 | 0.12 | 0.23 | 0.11 | 0.08 | 0.04 | −0.24 |
| | | RM×MO×OT | 0.23 | 0.06 | 0.25 | 0.18 | 0.05 | ns | ns |
| | | RM×MO×OS | 0.19 | 0.13 | 0.23 | 0.10 | 0.09 | 0.04 | −0.26 |
| | | RM×OT×OS | 0.19 | 0.11 | 0.22 | 0.11 | 0.08 | 0.04 | −0.24 |
| | | RE | 0.19 | 0.13 | 0.23 | 0.10 | 0.09 | 0.04 | −0.25 |
| | Vulnerability | SE+RE | 0.26 | 0.12 | 0.28 | 0.16 | 0.10 | ns | ns |
| | | SE×RE | 0.23 | 0.24 | 0.26 | ns | 0.20 | 0.04 | −0.25 |
| Absolute number of individuals | Individual traits | BL | 0.75 | 0.19 | 0.75 | 0.55 | 0.20 | ns | ns |
| | | FR | 0.67 | 0.20 | 0.66 | 0.46 | 0.20 | ns | ns |
| | | BD | 0.61 | 0.20 | 0.61 | 0.41 | 0.20 | ns | ns |
| | | MO | 0.71 | 0.24 | 0.70 | 0.46 | 0.24 | ns | ns |
| | | AM | 0.75 | 0.27 | 0.75 | 0.48 | 0.28 | ns | ns |
| | | LS | 0.69 | 0.29 | 0.68 | 0.39 | 0.30 | ns | ns |
| | | OT | 0.68 | 0.23 | 0.67 | 0.44 | 0.24 | ns | ns |
| | | OS | 0.66 | 0.24 | 0.65 | 0.41 | 0.25 | ns | ns |
| | Sensitivity | BL×FR | 0.74 | 0.19 | 0.74 | 0.55 | 0.19 | ns | ns |
| | | BL×BD | 0.74 | 0.20 | 0.74 | 0.53 | 0.21 | ns | ns |
| | | FR×BD | 0.66 | 0.19 | 0.66 | 0.47 | 0.19 | ns | ns |
| | | SE | 0.73 | 0.18 | 0.73 | 0.54 | 0.19 | ns | ns |
| | Recoverability | MO×OT | 0.70 | 0.26 | 0.70 | 0.44 | 0.26 | ns | ns |
| | | MO×OS | 0.71 | 0.27 | 0.70 | 0.43 | 0.28 | ns | ns |
| | | OT×OS | 0.69 | 0.26 | 0.68 | 0.42 | 0.26 | ns | ns |
| | | MO×OT×OS | 0.71 | 0.29 | 0.71 | 0.42 | 0.29 | ns | ns |
| | | RM | 0.77 | 0.24 | 0.77 | 0.53 | 0.24 | ns | ns |
| | | RM×MO | 0.76 | 0.39 | 0.76 | 0.37 | 0.39 | ns | ns |
| | | RM×OT | 0.76 | 0.24 | 0.75 | 0.51 | 0.25 | ns | ns |
| | | RM×OS | 0.80 | 0.31 | 0.80 | 0.48 | 0.32 | ns | ns |
| | | RM×MO×OT | 0.75 | 0.41 | 0.75 | 0.35 | 0.40 | ns | ns |
| | | RM×MO×OS | 0.76 | 0.47 | 0.78 | 0.31 | 0.45 | 0.02 | −0.31 |
| | | RM×OT×OS | 0.80 | 0.31 | 0.79 | 0.48 | 0.32 | ns | ns |
| | | RE | 0.75 | 0.47 | 0.77 | 0.30 | 0.45 | 0.02 | −0.32 |
| | Vulnerability | SE+RE | 0.79 | 0.29 | 0.79 | 0.50 | 0.29 | ns | ns |
| | | SE×RE | 0.81 | 0.35 | 0.82 | 0.47 | 0.35 | ns | ns |

Table S5.1. Continued.

| Density | Component | Response variable | Abiotic | Trawling | Abio. + Trawl. | Abio. \| Trawl. | Abio. ∩ Trawl. | Trawl. \| Abio. | Partial *r* |
|---|---|---|---|---|---|---|---|---|---|
| Absolute number of taxa | Individual traits | BL | 0.71 | 0.20 | 0.71 | 0.50 | 0.21 | ns | ns |
| | | FR | 0.66 | 0.21 | 0.65 | 0.44 | 0.21 | ns | ns |
| | | BD | 0.61 | 0.19 | 0.61 | 0.42 | 0.18 | ns | ns |
| | | MO | 0.73 | 0.28 | 0.73 | 0.45 | 0.28 | ns | ns |
| | | AM | 0.65 | 0.28 | 0.65 | 0.37 | 0.28 | ns | ns |
| | | LS | 0.64 | 0.28 | 0.64 | 0.35 | 0.29 | ns | ns |
| | | OT | 0.68 | 0.24 | 0.67 | 0.44 | 0.24 | ns | ns |
| | | OS | 0.66 | 0.26 | 0.66 | 0.40 | 0.26 | ns | ns |
| | Sensitivity | BL×FR | 0.70 | 0.18 | 0.70 | 0.52 | 0.18 | ns | ns |
| | | BL×BD | 0.68 | 0.18 | 0.68 | 0.51 | 0.18 | ns | ns |
| | | FR×BD | 0.63 | 0.17 | 0.63 | 0.46 | 0.17 | ns | ns |
| | | SE | 0.66 | 0.13 | 0.66 | 0.53 | 0.13 | ns | ns |
| | Recoverability | MO×OT | 0.73 | 0.29 | 0.73 | 0.44 | 0.30 | ns | ns |
| | | MO×OS | 0.74 | 0.32 | 0.73 | 0.42 | 0.32 | ns | ns |
| | | OT×OS | 0.69 | 0.27 | 0.69 | 0.42 | 0.27 | ns | ns |
| | | MO×OT×OS | 0.74 | 0.33 | 0.73 | 0.41 | 0.33 | ns | ns |
| | | RM | 0.64 | 0.23 | 0.64 | 0.41 | 0.24 | ns | ns |
| | | RM×MO | 0.66 | 0.41 | 0.67 | 0.26 | 0.40 | ns | ns |
| | | RM×OT | 0.63 | 0.23 | 0.62 | 0.39 | 0.24 | ns | ns |
| | | RM×OS | 0.68 | 0.30 | 0.67 | 0.37 | 0.31 | ns | ns |
| | | RM×MO×OT | 0.65 | 0.42 | 0.66 | 0.24 | 0.41 | ns | ns |
| | | RM×MO×OS | 0.66 | 0.47 | 0.68 | 0.20 | 0.45 | 0.02 | −0.28 |
| | | RM×OT×OS | 0.67 | 0.30 | 0.67 | 0.37 | 0.30 | ns | ns |
| | | RE | 0.65 | 0.47 | 0.67 | 0.20 | 0.45 | 0.02 | −0.28 |
| | Vulnerability | SE+RE | 0.72 | 0.25 | 0.71 | 0.46 | 0.25 | ns | ns |
| | | SE×RE | 0.74 | 0.37 | 0.74 | 0.37 | 0.37 | ns | ns |
| Relative biomass | Individual traits | BL | 0.10 | 0.05 | ns | ns | 0.06 | ns | ns |
| | | FR | 0.36 | ns | 0.36 | 0.37 | 0.00 | ns | ns |
| | | BD | 0.34 | ns | 0.37 | 0.34 | 0.00 | 0.03 | −0.20 |
| | | MO | 0.55 | 0.14 | 0.55 | 0.41 | 0.14 | ns | ns |
| | | AM | 0.10 | ns | 0.13 | 0.14 | 0.00 | ns | ns |
| | | LS | 0.19 | ns | 0.22 | 0.23 | 0.00 | ns | ns |
| | | OT | 0.31 | ns | 0.34 | 0.35 | 0.00 | ns | ns |
| | | OS | 0.32 | 0.06 | 0.42 | 0.36 | 0.00 | 0.11 | −0.41 |
| | Sensitivity | BL×FR | 0.24 | 0.10 | 0.24 | 0.15 | 0.09 | ns | ns |
| | | BL×BD | 0.25 | 0.07 | 0.30 | 0.22 | 0.03 | 0.04 | −0.27 |
| | | FR×BD | 0.28 | 0.06 | 0.37 | 0.30 | 0.00 | 0.08 | −0.36 |
| | | SE | 0.21 | 0.16 | 0.32 | 0.16 | 0.05 | 0.11 | −0.39 |
| | Recoverability | MO×OT | 0.38 | 0.13 | 0.39 | 0.26 | 0.12 | ns | ns |
| | | MO×OS | 0.32 | 0.19 | 0.39 | 0.20 | 0.12 | 0.07 | −0.33 |
| | | OT×OS | 0.32 | 0.04 | 0.40 | 0.36 | 0.00 | 0.08 | −0.37 |
| | | MO×OT×OS | 0.31 | 0.16 | 0.36 | 0.20 | 0.11 | 0.05 | −0.30 |
| | | RM | 0.12 | ns | 0.18 | 0.17 | 0.00 | 0.06 | −0.28 |
| | | RM×MO | 0.19 | ns | 0.24 | 0.21 | 0.00 | 0.06 | −0.29 |
| | | RM×OT | 0.15 | ns | 0.21 | 0.20 | 0.00 | 0.06 | −0.29 |
| | | RM×OS | 0.12 | 0.08 | 0.25 | 0.17 | 0.00 | 0.13 | −0.40 |
| | | RM×MO×OT | 0.20 | ns | 0.26 | 0.23 | 0.00 | 0.06 | −0.30 |
| | | RM×MO×OS | 0.16 | 0.10 | 0.29 | 0.18 | 0.00 | 0.12 | −0.40 |
| | | RM×OT×OS | 0.13 | 0.08 | 0.25 | 0.17 | 0.00 | 0.12 | −0.39 |
| | | RE | 0.17 | 0.10 | 0.28 | 0.18 | 0.00 | 0.12 | −0.39 |
| | Vulnerability | SE+RE | 0.23 | 0.16 | 0.37 | 0.21 | 0.02 | 0.14 | −0.44 |
| | | SE×RE | 0.14 | 0.31 | 0.29 | ns | 0.16 | 0.15 | −0.43 |

Table S5.1. Continued.

| Density | Component | Response variable | Abiotic | Trawling | Abio. + Trawl. | Abio. \| Trawl. | Abio. ∩ Trawl. | Trawl. \| Abio. | Partial *r* |
|---|---|---|---|---|---|---|---|---|---|
| Relative number of individuals | Individual traits | BL | 0.30 | 0.10 | 0.33 | 0.23 | 0.06 | 0.04 | −0.25 |
| | | FR | 0.22 | 0.10 | 0.26 | 0.16 | 0.06 | 0.03 | −0.24 |
| | | BD | 0.46 | 0.06 | 0.46 | 0.40 | 0.06 | ns | ns |
| | | MO | 0.50 | 0.05 | 0.50 | 0.44 | 0.05 | ns | ns |
| | | AM | 0.60 | 0.16 | 0.60 | 0.44 | 0.16 | ns | ns |
| | | LS | 0.40 | 0.21 | 0.43 | 0.21 | 0.19 | 0.03 | −0.25 |
| | | OT | 0.32 | 0.11 | 0.35 | 0.24 | 0.09 | 0.03 | −0.23 |
| | | OS | 0.36 | 0.12 | 0.37 | 0.25 | 0.11 | ns | ns |
| | Sensitivity | BL×FR | 0.33 | 0.17 | 0.37 | 0.20 | 0.13 | 0.05 | −0.29 |
| | | BL×BD | 0.49 | 0.21 | 0.53 | 0.32 | 0.17 | 0.03 | −0.28 |
| | | FR×BD | 0.38 | 0.22 | 0.39 | 0.17 | 0.21 | ns | ns |
| | | SE | 0.45 | 0.25 | 0.49 | 0.25 | 0.20 | 0.04 | −0.30 |
| | Recoverability | MO×OT | 0.44 | 0.06 | 0.44 | 0.38 | 0.06 | ns | ns |
| | | MO×OS | 0.40 | 0.05 | 0.40 | 0.36 | 0.04 | ns | ns |
| | | OT×OS | 0.43 | 0.13 | 0.45 | 0.32 | 0.11 | ns | ns |
| | | MO×OT×OS | 0.39 | 0.05 | 0.39 | 0.34 | 0.05 | ns | ns |
| | | RM | 0.60 | 0.19 | 0.61 | 0.41 | 0.19 | ns | ns |
| | | RM×MO | 0.68 | 0.27 | 0.68 | 0.42 | 0.26 | ns | ns |
| | | RM×OT | 0.58 | 0.21 | 0.59 | 0.38 | 0.20 | ns | ns |
| | | RM×OS | 0.60 | 0.23 | 0.61 | 0.38 | 0.22 | ns | ns |
| | | RM×MO×OT | 0.66 | 0.28 | 0.67 | 0.39 | 0.27 | ns | ns |
| | | RM×MO×OS | 0.64 | 0.28 | 0.65 | 0.37 | 0.27 | ns | ns |
| | | RM×OT×OS | 0.60 | 0.23 | 0.61 | 0.38 | 0.22 | ns | ns |
| | | RE | 0.64 | 0.28 | 0.65 | 0.37 | 0.27 | 0.02 | −0.23 |
| | Vulnerability | SE+RE | 0.52 | 0.26 | 0.55 | 0.29 | 0.23 | 0.03 | −0.29 |
| | | SE×RE | 0.50 | 0.23 | 0.53 | 0.29 | 0.21 | 0.02 | −0.25 |
| Relative number of taxa | Individual traits | BL | 0.53 | ns | 0.53 | 0.50 | 0.03 | ns | ns |
| | | FR | 0.34 | ns | 0.34 | 0.34 | 0.00 | ns | ns |
| | | BD | ns | ns | ns | ns | 0.01 | ns | ns |
| | | MO | 0.66 | 0.21 | 0.67 | 0.46 | 0.20 | ns | ns |
| | | AM | 0.48 | 0.19 | 0.47 | 0.28 | 0.19 | ns | ns |
| | | LS | 0.45 | 0.25 | 0.46 | 0.21 | 0.24 | ns | ns |
| | | OT | 0.51 | 0.10 | 0.51 | 0.41 | 0.11 | ns | ns |
| | | OS | 0.42 | 0.17 | 0.42 | 0.25 | 0.17 | ns | ns |
| | Sensitivity | BL×FR | 0.48 | ns | 0.47 | 0.47 | 0.01 | ns | ns |
| | | BL×BD | 0.63 | ns | 0.63 | 0.60 | 0.03 | ns | ns |
| | | FR×BD | 0.26 | ns | 0.25 | 0.26 | 0.00 | ns | ns |
| | | SE | 0.51 | ns | 0.51 | 0.51 | 0.00 | ns | ns |
| | Recoverability | MO×OT | 0.60 | 0.22 | 0.61 | 0.39 | 0.21 | ns | ns |
| | | MO×OS | 0.60 | 0.27 | 0.61 | 0.34 | 0.25 | ns | ns |
| | | OT×OS | 0.53 | 0.18 | 0.53 | 0.35 | 0.18 | ns | ns |
| | | MO×OT×OS | 0.58 | 0.27 | 0.60 | 0.33 | 0.26 | 0.02 | −0.24 |
| | | RM | 0.35 | 0.09 | 0.34 | 0.25 | 0.10 | ns | ns |
| | | RM×MO | 0.53 | 0.39 | 0.57 | 0.18 | 0.35 | 0.04 | −0.31 |
| | | RM×OT | 0.27 | 0.08 | 0.26 | 0.19 | 0.09 | ns | ns |
| | | RM×OS | 0.37 | 0.18 | 0.37 | 0.19 | 0.18 | ns | ns |
| | | RM×MO×OT | 0.49 | 0.39 | 0.53 | 0.15 | 0.34 | 0.04 | −0.31 |
| | | RM×MO×OS | 0.48 | 0.44 | 0.55 | 0.11 | 0.37 | 0.06 | −0.37 |
| | | RM×OT×OS | 0.35 | 0.17 | 0.34 | 0.17 | 0.17 | ns | ns |
| | | RE | 0.47 | 0.44 | 0.54 | 0.10 | 0.37 | 0.07 | −0.37 |
| | Vulnerability | SE+RE | 0.63 | 0.15 | 0.65 | 0.50 | 0.14 | ns | ns |
| | | SE×RE | 0.66 | 0.32 | 0.67 | 0.35 | 0.31 | ns | ns |

Table S5.2. Complete output of variation partitioning for the Bay of Biscay. Symbols: "|", conditional effect; "∩", confounding effect between environmental variables and trawling intensity (intersection). AM, age at maturity; BD, burrowing depth; BL, body length; FR, fragility; LS, life span; MO, motility; OS, offspring size; OT, offspring type; RE, recoverability; SE, sensitivity. Partial *r* indicates the Pearson's *r*-correlation coefficient between the response variable and trawling intensity when controlling for the effect of abiotic variables; it also indicates the sign of variation of the relationship.

| Density | Component | Response variable | Abiotic | Trawling | Abio. + Trawl. | Abio. \| Trawl. | Abio. ∩ Trawl. | Trawl. \| Abio. | Partial *r* |
|---|---|---|---|---|---|---|---|---|---|
| Absolute biomass | Individual traits | BL | 0.01 | 0.03 | 0.06 | 0.03 | ns | 0.04 | −0.21 |
| | | FR | 0.02 | 0.08 | 0.10 | 0.02 | 0.01 | 0.08 | −0.34 |
| | | BD | 0.03 | 0.07 | 0.11 | 0.03 | ns | 0.07 | −0.30 |
| | | MO | 0.03 | 0.08 | 0.12 | 0.04 | ns | 0.08 | −0.32 |
| | | AM | 0.03 | 0.04 | 0.08 | 0.04 | ns | 0.05 | −0.22 |
| | | LS | 0.03 | 0.04 | 0.08 | 0.04 | ns | 0.05 | −0.23 |
| | | OT | 0.03 | 0.07 | 0.10 | 0.03 | ns | 0.07 | −0.30 |
| | | OS | 0.05 | 0.09 | 0.14 | 0.05 | 0.01 | 0.08 | −0.35 |
| | Sensitivity | BL×FR | 0.02 | 0.09 | 0.10 | 0.01 | 0.01 | 0.09 | −0.36 |
| | | BL×BD | 0.03 | 0.09 | 0.11 | 0.02 | ns | 0.08 | −0.34 |
| | | FR×BD | 0.03 | 0.09 | 0.12 | 0.02 | 0.01 | 0.08 | −0.35 |
| | | SE | 0.03 | 0.09 | 0.11 | 0.02 | 0.01 | 0.09 | −0.36 |
| | Recoverability | MO×OT | 0.07 | 0.11 | 0.17 | 0.06 | 0.01 | 0.10 | −0.38 |
| | | MO×OS | 0.09 | 0.10 | 0.18 | 0.08 | 0.01 | 0.09 | −0.38 |
| | | OT×OS | 0.07 | 0.11 | 0.16 | 0.05 | 0.01 | 0.09 | −0.40 |
| | | MO×OT×OS | 0.10 | 0.12 | 0.20 | 0.09 | 0.02 | 0.10 | −0.41 |
| | | RM | 0.06 | 0.03 | 0.10 | 0.07 | ns | 0.04 | −0.19 |
| | | RM×MO | 0.07 | 0.05 | 0.13 | 0.08 | ns | 0.06 | −0.26 |
| | | RM×OT | 0.09 | 0.07 | 0.16 | 0.09 | ns | 0.07 | −0.30 |
| | | RM×OS | 0.13 | 0.07 | 0.20 | 0.13 | 0.01 | 0.06 | −0.31 |
| | | RM×MO×OT | 0.11 | 0.09 | 0.19 | 0.11 | 0.01 | 0.08 | −0.35 |
| | | RM×MO×OS | 0.15 | 0.07 | 0.22 | 0.15 | 0.01 | 0.07 | −0.33 |
| | | RM×OT×OS | 0.15 | 0.10 | 0.23 | 0.13 | 0.02 | 0.08 | −0.38 |
| | | RE | 0.17 | 0.10 | 0.25 | 0.15 | 0.02 | 0.08 | −0.39 |
| | Vulnerability | SE+RE | 0.08 | 0.12 | 0.18 | 0.06 | 0.01 | 0.11 | −0.41 |
| | | SE×RE | 0.04 | 0.06 | 0.09 | 0.03 | 0.01 | 0.05 | −0.29 |
| Absolute number of individuals | Individual traits | BL | ns | 0.05 | 0.07 | 0.02 | ns | 0.06 | −0.22 |
| | | FR | ns | 0.08 | 0.08 | ns | ns | 0.08 | −0.28 |
| | | BD | 0.02 | 0.06 | 0.09 | 0.03 | ns | 0.07 | −0.24 |
| | | MO | ns | 0.10 | 0.11 | 0.01 | ns | 0.10 | −0.34 |
| | | AM | 0.06 | 0.05 | 0.12 | 0.07 | ns | 0.06 | −0.23 |
| | | LS | 0.03 | 0.04 | 0.08 | 0.04 | ns | 0.05 | −0.20 |
| | | OT | 0.02 | 0.07 | 0.10 | 0.02 | ns | 0.08 | −0.28 |
| | | OS | 0.03 | 0.12 | 0.14 | 0.02 | 0.01 | 0.11 | −0.38 |
| | Sensitivity | BL×FR | ns | 0.11 | 0.12 | ns | ns | 0.11 | −0.35 |
| | | BL×BD | ns | 0.10 | 0.10 | ns | ns | 0.10 | −0.32 |
| | | FR×BD | ns | 0.10 | 0.10 | ns | ns | 0.10 | −0.32 |
| | | SE | ns | 0.13 | 0.13 | ns | ns | 0.12 | −0.38 |
| | Recoverability | MO×OT | 0.02 | 0.12 | 0.14 | 0.02 | 0.01 | 0.11 | −0.38 |
| | | MO×OS | 0.03 | 0.12 | 0.14 | 0.02 | 0.01 | 0.11 | −0.37 |
| | | OT×OS | 0.04 | 0.14 | 0.17 | 0.03 | 0.01 | 0.13 | −0.43 |
| | | MO×OT×OS | 0.04 | 0.13 | 0.16 | 0.02 | 0.01 | 0.12 | −0.41 |
| | | RM | 0.15 | 0.04 | 0.20 | 0.16 | ns | 0.05 | −0.21 |
| | | RM×MO | 0.06 | 0.07 | 0.14 | 0.07 | ns | 0.08 | −0.28 |
| | | RM×OT | 0.14 | 0.10 | 0.23 | 0.13 | ns | 0.09 | −0.32 |
| | | RM×OS | 0.12 | 0.11 | 0.23 | 0.11 | 0.01 | 0.10 | −0.36 |
| | | RM×MO×OT | 0.07 | 0.09 | 0.16 | 0.07 | ns | 0.09 | −0.33 |
| | | RM×MO×OS | 0.09 | 0.09 | 0.18 | 0.09 | ns | 0.08 | −0.32 |
| | | RM×OT×OS | 0.14 | 0.14 | 0.26 | 0.12 | 0.02 | 0.12 | −0.41 |
| | | RE | 0.10 | 0.10 | 0.19 | 0.09 | 0.01 | 0.10 | −0.36 |
| | Vulnerability | SE+RE | 0.02 | 0.14 | 0.15 | 0.01 | ns | 0.14 | −0.40 |
| | | SE×RE | 0.02 | 0.06 | 0.08 | 0.02 | ns | 0.07 | −0.32 |

Table S5.2. Continued.

| Density | Component | Response variable | Abiotic | Trawling | Abio. + Trawl. | Abio. \| Trawl. | Abio. ∩ Trawl. | Trawl. \| Abio. | Partial *r* |
|---|---|---|---|---|---|---|---|---|---|
| Absolute number of taxa | Individual traits | BL | ns | 0.06 | 0.08 | 0.03 | ns | 0.07 | −0.24 |
| | | FR | ns | 0.08 | 0.08 | ns | ns | 0.08 | −0.29 |
| | | BD | 0.03 | 0.06 | 0.10 | 0.04 | ns | 0.06 | −0.25 |
| | | MO | ns | 0.10 | 0.11 | ns | ns | 0.10 | −0.35 |
| | | AM | 0.05 | 0.06 | 0.12 | 0.06 | ns | 0.07 | −0.25 |
| | | LS | 0.03 | 0.04 | 0.09 | 0.04 | ns | 0.06 | −0.21 |
| | | OT | 0.02 | 0.08 | 0.11 | 0.03 | ns | 0.08 | −0.29 |
| | | OS | 0.03 | 0.13 | 0.15 | 0.02 | 0.01 | 0.12 | −0.39 |
| | Sensitivity | BL×FR | ns | 0.11 | 0.12 | ns | ns | 0.12 | −0.36 |
| | | BL×BD | ns | 0.10 | 0.11 | 0.01 | ns | 0.11 | −0.33 |
| | | FR×BD | ns | 0.10 | 0.10 | ns | ns | 0.10 | −0.33 |
| | | SE | ns | 0.13 | 0.13 | ns | ns | 0.13 | −0.39 |
| | Recoverability | MO×OT | 0.01 | 0.12 | 0.12 | ns | 0.01 | 0.11 | −0.38 |
| | | MO×OS | 0.02 | 0.11 | 0.12 | 0.01 | 0.01 | 0.11 | −0.38 |
| | | OT×OS | 0.04 | 0.14 | 0.17 | 0.03 | 0.02 | 0.13 | −0.42 |
| | | MO×OT×OS | 0.02 | 0.13 | 0.14 | ns | 0.01 | 0.12 | −0.40 |
| | | RM | 0.12 | 0.06 | 0.19 | 0.13 | ns | 0.07 | −0.26 |
| | | RM×MO | 0.04 | 0.07 | 0.12 | 0.04 | ns | 0.08 | −0.30 |
| | | RM×OT | 0.11 | 0.11 | 0.22 | 0.11 | ns | 0.11 | −0.35 |
| | | RM×OS | 0.11 | 0.12 | 0.22 | 0.09 | 0.01 | 0.11 | −0.38 |
| | | RM×MO×OT | 0.04 | 0.09 | 0.13 | 0.04 | ns | 0.09 | −0.33 |
| | | RM×MO×OS | 0.06 | 0.09 | 0.15 | 0.06 | ns | 0.08 | −0.33 |
| | | RM×OT×OS | 0.11 | 0.14 | 0.24 | 0.09 | 0.02 | 0.12 | −0.41 |
| | | RE | 0.06 | 0.10 | 0.15 | 0.06 | ns | 0.09 | −0.35 |
| | Vulnerability | SE+RE | ns | 0.14 | 0.15 | 0.01 | ns | 0.14 | −0.41 |
| | | SE×RE | 0.02 | 0.05 | 0.09 | 0.03 | ns | 0.06 | −0.27 |
| Relative biomass | Individual traits | BL | 0.10 | ns | 0.10 | 0.10 | ns | ns | ns |
| | | FR | 0.06 | 0.06 | 0.10 | 0.04 | 0.02 | 0.04 | −0.24 |
| | | BD | 0.08 | 0.06 | 0.11 | 0.05 | 0.03 | 0.03 | −0.24 |
| | | MO | 0.07 | 0.05 | 0.11 | 0.06 | 0.01 | 0.04 | −0.25 |
| | | AM | 0.10 | ns | 0.10 | 0.10 | ns | ns | ns |
| | | LS | 0.23 | ns | 0.23 | 0.23 | ns | ns | ns |
| | | OT | 0.16 | 0.10 | 0.22 | 0.12 | 0.04 | 0.06 | −0.33 |
| | | OS | 0.10 | 0.08 | 0.14 | 0.07 | 0.03 | 0.05 | −0.29 |
| | Sensitivity | BL×FR | 0.04 | 0.08 | 0.10 | 0.02 | 0.02 | 0.06 | −0.28 |
| | | BL×BD | 0.07 | 0.10 | 0.13 | 0.03 | 0.03 | 0.07 | −0.32 |
| | | FR×BD | 0.07 | 0.07 | 0.11 | 0.05 | 0.03 | 0.04 | −0.26 |
| | | SE | 0.05 | 0.09 | 0.11 | 0.03 | 0.02 | 0.06 | −0.29 |
| | Recoverability | MO×OT | 0.12 | 0.08 | 0.17 | 0.09 | 0.03 | 0.05 | −0.32 |
| | | MO×OS | 0.09 | 0.06 | 0.13 | 0.07 | 0.02 | 0.03 | −0.26 |
| | | OT×OS | 0.14 | 0.11 | 0.20 | 0.10 | 0.04 | 0.06 | −0.34 |
| | | MO×OT×OS | 0.12 | 0.08 | 0.16 | 0.09 | 0.03 | 0.05 | −0.30 |
| | | RM | 0.09 | ns | 0.09 | 0.09 | ns | ns | ns |
| | | RM×MO | 0.07 | ns | 0.07 | 0.07 | ns | ns | −0.10 |
| | | RM×OT | 0.16 | 0.03 | 0.18 | 0.15 | 0.01 | 0.02 | −0.21 |
| | | RM×OS | 0.16 | 0.02 | 0.17 | 0.15 | 0.01 | 0.02 | −0.19 |
| | | RM×MO×OT | 0.11 | 0.03 | 0.14 | 0.10 | 0.01 | 0.03 | −0.23 |
| | | RM×MO×OS | 0.13 | 0.03 | 0.15 | 0.12 | 0.01 | 0.02 | −0.20 |
| | | RM×OT×OS | 0.18 | 0.06 | 0.22 | 0.16 | 0.02 | 0.04 | −0.30 |
| | | RE | 0.14 | 0.05 | 0.17 | 0.13 | 0.02 | 0.03 | −0.26 |
| | Vulnerability | SE+RE | 0.11 | 0.12 | 0.20 | 0.08 | 0.03 | 0.09 | −0.36 |
| | | SE×RE | 0.03 | 0.04 | 0.06 | 0.02 | 0.01 | 0.03 | −0.20 |

Table S5.2. Continued.

| Density | Component | Response variable | Abiotic | Trawling | Abio. + Trawl. | Abio. \| Trawl. | Abio. ∩ Trawl. | Trawl. \| Abio. | Partial *r* |
|---|---|---|---|---|---|---|---|---|---|
| Relative number of individuals | Individual traits | BL | 0.14 | ns | 0.14 | 0.14 | ns | 0.01 | ns |
| | | FR | 0.04 | 0.08 | 0.11 | 0.03 | 0.01 | 0.07 | −0.28 |
| | | BD | 0.11 | 0.03 | 0.13 | 0.10 | 0.01 | 0.03 | −0.20 |
| | | MO | 0.08 | 0.07 | 0.14 | 0.07 | 0.02 | 0.05 | −0.29 |
| | | AM | 0.07 | ns | 0.08 | 0.08 | ns | ns | −0.09 |
| | | LS | 0.09 | ns | 0.09 | 0.09 | ns | ns | ns |
| | | OT | 0.13 | 0.06 | 0.17 | 0.11 | 0.01 | 0.05 | −0.27 |
| | | OS | 0.15 | 0.13 | 0.24 | 0.11 | 0.04 | 0.10 | −0.38 |
| | Sensitivity | BL×FR | 0.05 | 0.15 | 0.18 | 0.04 | 0.02 | 0.13 | −0.39 |
| | | BL×BD | 0.13 | 0.13 | 0.24 | 0.11 | 0.02 | 0.11 | −0.37 |
| | | FR×BD | 0.04 | 0.12 | 0.13 | 0.02 | 0.02 | 0.10 | −0.35 |
| | | SE | 0.04 | 0.17 | 0.19 | 0.02 | 0.02 | 0.15 | −0.42 |
| | Recoverability | MO×OT | 0.08 | 0.09 | 0.14 | 0.05 | 0.03 | 0.06 | −0.31 |
| | | MO×OS | 0.06 | 0.08 | 0.11 | 0.03 | 0.02 | 0.06 | −0.30 |
| | | OT×OS | 0.18 | 0.16 | 0.29 | 0.13 | 0.05 | 0.11 | −0.41 |
| | | MO×OT×OS | 0.08 | 0.10 | 0.14 | 0.05 | 0.03 | 0.07 | −0.32 |
| | | RM | 0.13 | ns | 0.13 | 0.13 | ns | ns | ns |
| | | RM×MO | ns | 0.02 | 0.03 | ns | ns | 0.02 | −0.17 |
| | | RM×OT | 0.17 | 0.07 | 0.22 | 0.16 | 0.01 | 0.05 | −0.30 |
| | | RM×OS | 0.14 | 0.09 | 0.21 | 0.12 | 0.02 | 0.07 | −0.34 |
| | | RM×MO×OT | 0.02 | 0.05 | 0.06 | 0.02 | 0.01 | 0.04 | −0.24 |
| | | RM×MO×OS | 0.04 | 0.05 | 0.08 | 0.04 | 0.01 | 0.04 | −0.24 |
| | | RM×OT×OS | 0.18 | 0.13 | 0.27 | 0.14 | 0.04 | 0.09 | −0.40 |
| | | RE | 0.05 | 0.06 | 0.10 | 0.04 | 0.01 | 0.05 | −0.28 |
| | Vulnerability | SE+RE | 0.04 | 0.20 | 0.20 | 0.01 | 0.03 | 0.17 | −0.45 |
| | | SE×RE | 0.02 | 0.05 | 0.07 | 0.02 | ns | 0.05 | −0.22 |
| Relative number of taxa | Individual traits | BL | 0.12 | 0.10 | 0.22 | 0.12 | 0.01 | 0.09 | −0.35 |
| | | FR | 0.06 | 0.11 | 0.15 | 0.04 | 0.02 | 0.08 | −0.32 |
| | | BD | 0.11 | 0.11 | 0.18 | 0.07 | 0.04 | 0.07 | −0.30 |
| | | MO | 0.09 | 0.10 | 0.15 | 0.05 | 0.03 | 0.06 | −0.31 |
| | | AM | 0.09 | 0.09 | 0.15 | 0.06 | 0.03 | 0.06 | −0.31 |
| | | LS | 0.06 | 0.02 | 0.06 | 0.05 | 0.01 | 0.01 | −0.14 |
| | | OT | 0.16 | 0.18 | 0.27 | 0.09 | 0.06 | 0.12 | −0.42 |
| | | OS | 0.15 | 0.17 | 0.26 | 0.09 | 0.06 | 0.11 | −0.41 |
| | Sensitivity | BL×FR | 0.07 | 0.16 | 0.21 | 0.05 | 0.02 | 0.14 | −0.40 |
| | | BL×BD | 0.12 | 0.20 | 0.27 | 0.07 | 0.04 | 0.15 | −0.44 |
| | | FR×BD | 0.06 | 0.14 | 0.17 | 0.03 | 0.03 | 0.11 | −0.37 |
| | | SE | 0.06 | 0.18 | 0.21 | 0.03 | 0.03 | 0.15 | −0.42 |
| | Recoverability | MO×OT | 0.08 | 0.10 | 0.15 | 0.04 | 0.04 | 0.07 | −0.33 |
| | | MO×OS | 0.07 | 0.10 | 0.13 | 0.03 | 0.03 | 0.06 | −0.31 |
| | | OT×OS | 0.17 | 0.19 | 0.29 | 0.10 | 0.06 | 0.12 | −0.44 |
| | | MO×OT×OS | 0.07 | 0.11 | 0.14 | 0.04 | 0.04 | 0.07 | −0.33 |
| | | RM | 0.14 | 0.04 | 0.17 | 0.13 | 0.01 | 0.03 | −0.21 |
| | | RM×MO | 0.03 | 0.04 | 0.06 | 0.02 | 0.01 | 0.03 | −0.20 |
| | | RM×OT | 0.15 | 0.12 | 0.24 | 0.12 | 0.04 | 0.08 | −0.36 |
| | | RM×OS | 0.13 | 0.12 | 0.22 | 0.10 | 0.04 | 0.09 | −0.36 |
| | | RM×MO×OT | 0.05 | 0.06 | 0.09 | 0.03 | 0.01 | 0.04 | −0.24 |
| | | RM×MO×OS | 0.06 | 0.05 | 0.10 | 0.04 | 0.01 | 0.04 | −0.24 |
| | | RM×OT×OS | 0.15 | 0.15 | 0.25 | 0.10 | 0.05 | 0.10 | −0.40 |
| | | RE | 0.06 | 0.07 | 0.11 | 0.04 | 0.02 | 0.05 | −0.26 |
| | Vulnerability | SE+RE | 0.07 | 0.19 | 0.23 | 0.04 | 0.03 | 0.16 | −0.43 |
| | | SE×RE | 0.03 | 0.05 | 0.08 | 0.03 | ns | 0.05 | −0.21 |

# Supplement S6

Figure S6.1. Interpolated absolute organism densities in the Dutch EEZ. From left to right, sensitivity (SE; a, e and i), recoverability (RE; b, f and j), vulnerability SE + RE (c, g and k) and vulnerability SE × RE (d, h and l). From top to bottom, biomass, number of individuals and number of taxa. Values are multiplications of organism densities by standardised scores. High values express either high sensitivity, slow recovery or high vulnerability.

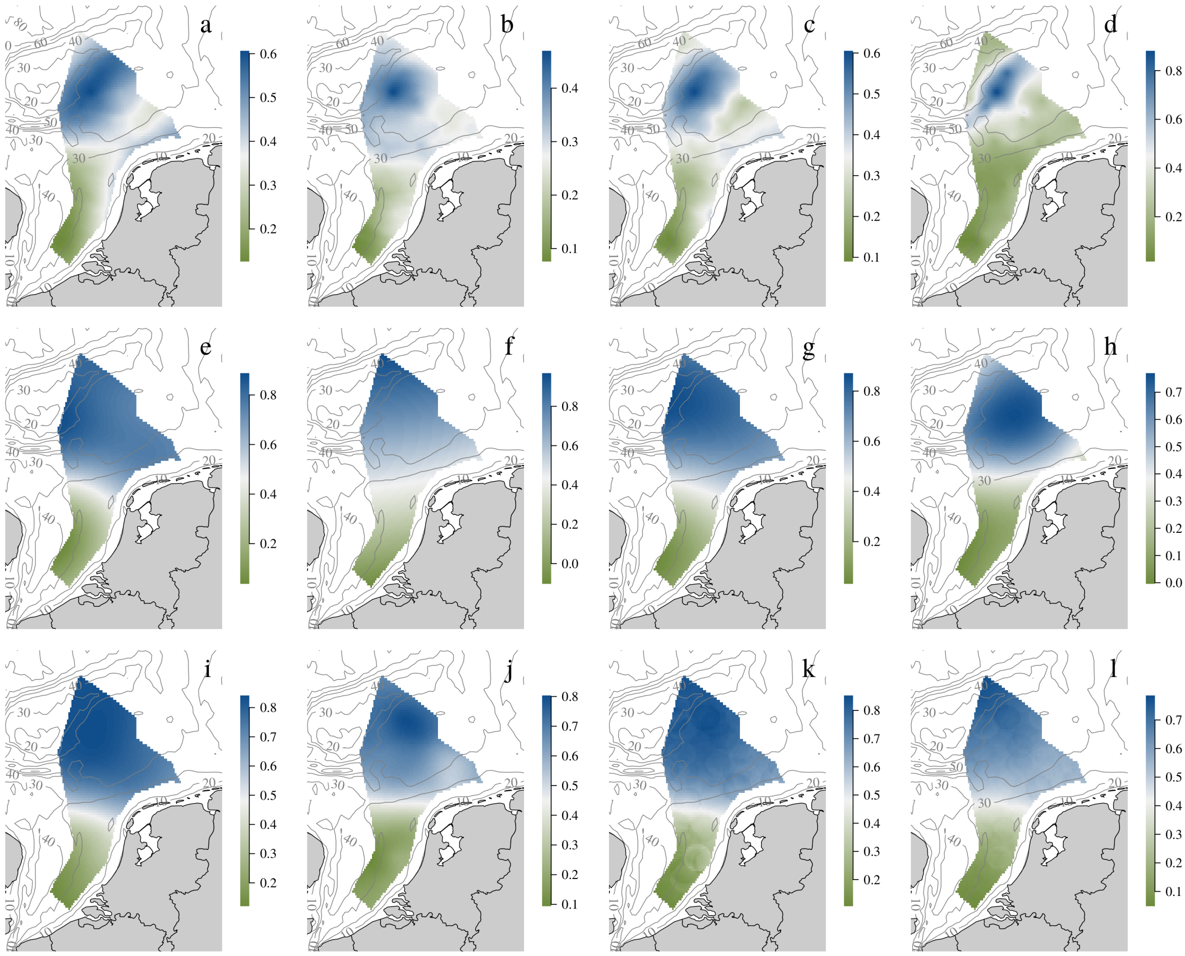

Figure S6.2. Interpolated relative organism densities in the Dutch EEZ. From left to right, sensitivity (SE; a, e and i), recoverability (RE; b, f and j), vulnerability SE + RE (c, g and k) and vulnerability SE × RE (d, h and l). From top to bottom, biomass, number of individuals and number of taxa. Values are multiplications of organism densities by standardised scores. High values express either high sensitivity, slow recovery or high vulnerability.

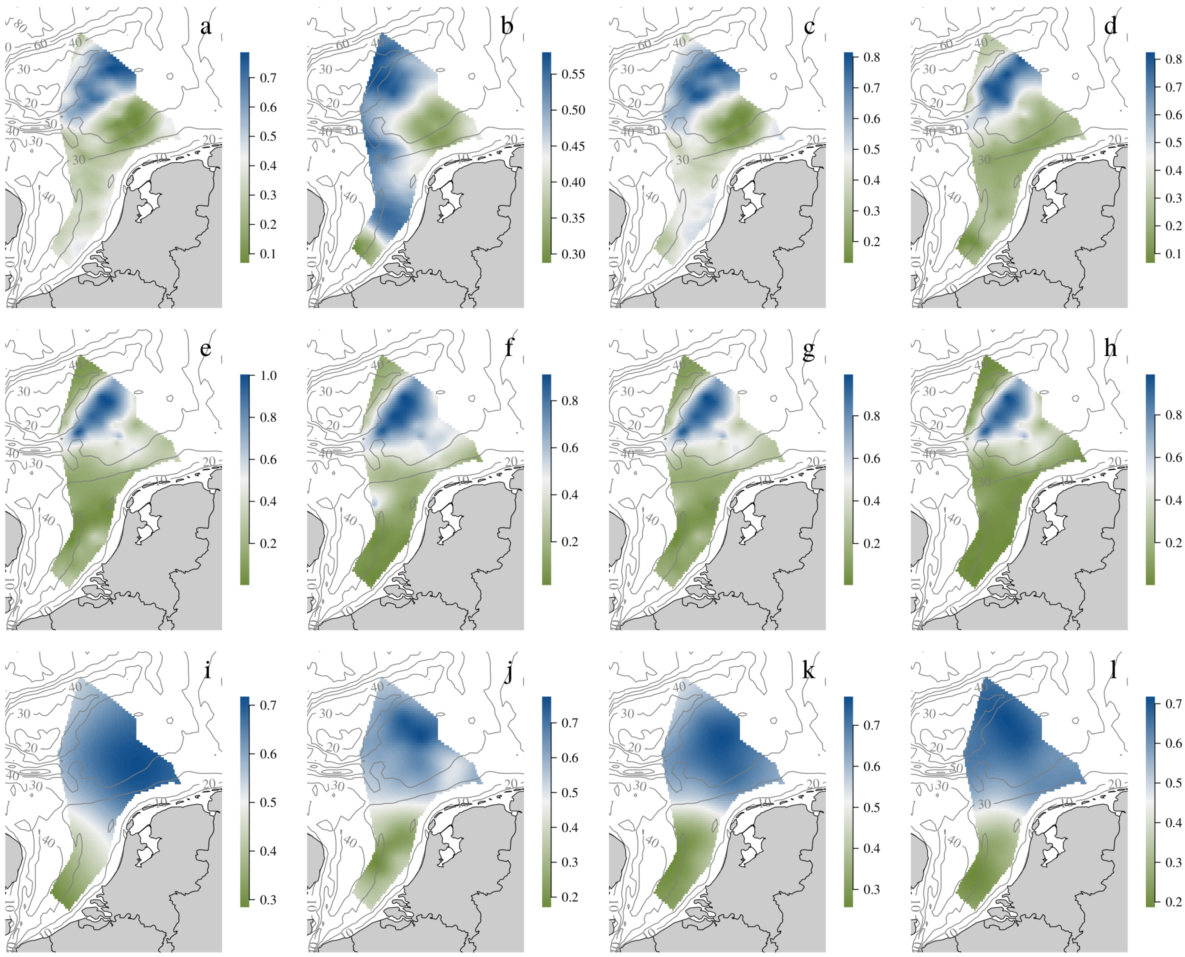

Figure S6.3. Interpolated absolute organism densities in the Bay of Biscay. From left to right, sensitivity (SE; a, e and i), recoverability (RE; b, f and j), vulnerability SE + RE (c, g and k) and vulnerability SE × RE (d, h and l). From top to bottom, biomass, number of individuals and number of taxa. Values are multiplications of organism densities by standardised scores. High values express either high sensitivity, slow recovery or high vulnerability.

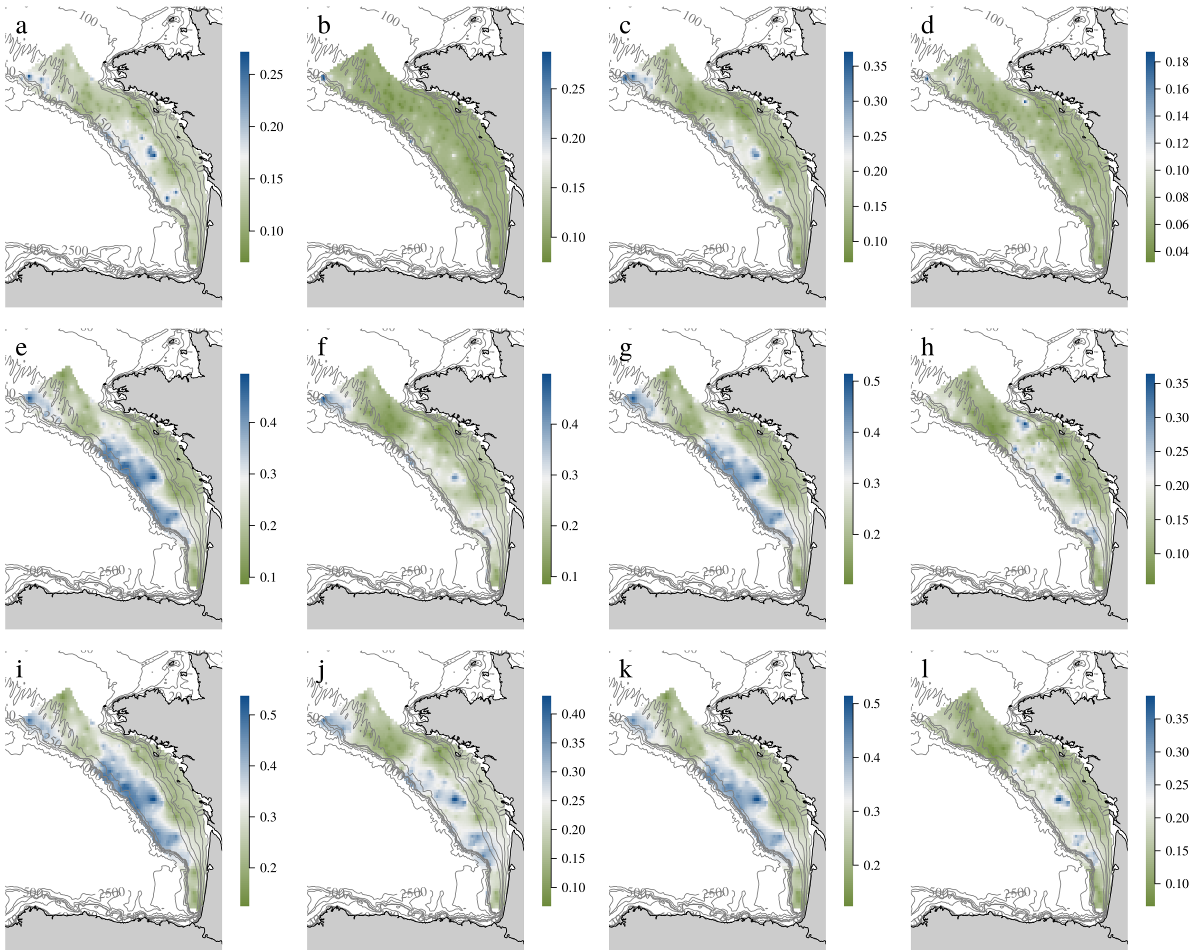

Figure S6.4. Interpolated relative organism densities in the Bay of Biscay. From left to right, sensitivity (SE; a, e and i), recoverability (RE; b, f and j), vulnerability SE + RE (c, g and k) and vulnerability SE × RE (d, h and l). From top to bottom, biomass, number of individuals and number of taxa. Values are multiplications of organism densities by standardised scores. High values express either high sensitivity, slow recovery or high vulnerability.