# Trawl fishing impacts on the status of seabed fauna in diverse regions of the globe

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# SUPPORTING INFORMATION

**Table S1.** Benthic survey information for each region. For survey maps see Figures S1 – S13.

| Region | Survey Description | Year | Gear Type information | Citation/Source |
|---|---|---|---|---|
| Aleutian Islands (Figure S1) | Bottom-trawl survey of groundfish and invertebrates on the continental shelf and upper continental slope. | 2010 | Standard Poly Nor'eastern high-opening bottom trawl with 27.2 m headrope, 24.9 m footrope with mud-sweep roller gear. Codend mesh size 8.9 cm stretched with 3.2 cm liner. Standard tow 0.75 nmi (1.4 km); 0.25 h at 3 knots (1.54 m $s^{-1}$). | All surveys conducted in strict compliance with NMFS bottom-trawl protocols established by the National Oceanic and Atmospheric Administration. Stauffer, G. (compiler) (2004) NOAA Protocols for Groundfish Bottom Trawl Surveys of the Nation's Fishery Resources. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-F/SPO-65, 205 p.<br><br>von Szalay, P.G., Rooper, C.N., Raring, N.W. & Martin, M.H. (2011) Data Report: 2010 Aleutian Islands bottom trawl survey. U.S. Dep. Commer.,NOAA Tech. Memo. NMFS-AFSC-215, 153 p. |
| Bering Sea (Figure S2) | Bottom-trawl survey of groundfish and invertebrates on the continental shelf and upper continental slope. | 2008, 2009, 2010, | Shelf (2008, 2009, 2010): standard 83-112 Eastern otter trawl with 25.3 m (83 ft) headrope, 34.1 m (112 ft) footrope. Codend mesh size 8.9 cm stretched with 3.2 cm liner. Standard tow 1.5 nmi (2.8 km); 0.5 h at 3 knots (1.54 m $s^{-1}$).<br><br>Upper slope (2008, 2010): standard Poly Nor'eastern high-opening bottom trawl with 27.2 m headrope, 24.9 m footrope with mud-sweep roller gear. Codend mesh size 8.9 cm stretched with 3.2 cm liner. Standard tow 1.25 nmi (2.3 km); 0.5 h at 2.5 knots (1.28 m $s^{-1}$). | All surveys conducted in strict compliance with NMFS bottom-trawl protocols established by the National Oceanic and Atmospheric Administration. Stauffer, G. (compiler) (2004) NOAA Protocols for Groundfish Bottom Trawl Surveys of the Nation's Fishery Resources. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-F/SPO-65, 205 p.<br><br>Lauth, R.R. & Acuna, E. (2009) Results of the 2008 eastern Bering Sea continental shelf bottom trawl survey of groundfish and invertebrate resources. U.S. Dep. Commer., NOAA Tech. Memo.NMFS-AFSC-195, 229 p.<br><br>Lauth, R.R. (2010) Results of the 2009 eastern Bering Sea continental shelf bottom trawl survey of groundfish and invertebrate resources. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-204, 228 p.<br><br>Lauth, R.R. (2011) Results of the 2010 eastern and northern Bering Sea continental shelf bottom trawl survey of groundfish and invertebrate fauna. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-227, 256 p.<br><br>Hoff. G.H & Britt, L.L. (2009) Results of the 2008 eastern Bering Sea upper continental slope survey of groundfish and invertebrate resources. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-197, 294 p.<br><br>Hoff. G.H & Britt, L.L. (2011) Results of the 2010 eastern Bering Sea upper continental slope survey of groundfish and invertebrate resources. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-224, 300 p. |

| Region | Survey Description | Year | Gear Type information | Citation/Source |
|---|---|---|---|---|
| Gulf of Alaska (Figure S3) | Bottom-trawl survey of groundfish and invertebrates on the continental shelf and upper continental slope. | 2009 | Standard Poly Nor'eastern high-opening bottom trawl with 27.2 m headrope, 24.9 m footrope with mud-sweep roller gear. Codend mesh size 8.9 cm stretched with 3.2 cm liner. Standard tow 0.75 nmi (1.4 km); 0.25 h at 3 knots (1.54 m $s^{-1}$). | All surveys conducted in strict compliance with NMFS bottom-trawl protocols established by the National Oceanic and Atmospheric Administration. Stauffer, G. (compiler) (2004) NOAA Protocols for Groundfish Bottom Trawl Surveys of the Nation's Fishery Resources. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-F/SPO-65, 205 p<br><br>von Szalay, P.G., Raring, N.W., Shaw, F. R., Wilkins, M. E. & Martin, M.H. (2010) Data Report: 2009 Gulf of Alaska bottom trawl survey. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-208, 245 p. |
| West Coast USA (Figure S4) | West Coast Groundfish Bottom Trawl Surveys (2003–Present) | 2008, 2009, 2010 | Vessels are equipped with a standard four-panel, single-bridle, Aberdeen-type trawl spread by 5 × 7-ft (1.5 × 2.1-m) steel V doors weighing 590 kg. The headrope and footrope measure 85 and 25.9 and 31.7 m, respectively. | Keller, A. A., J. R. Wallace, and R. D. Methot. 2017. The Northwest Fisheries Science Center's West Coast Groundfish Bottom Trawl Survey: History, Design, and Description. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-136. DOI: 10.7289/V5/TM-NWFSC-136. |
| Kattegat / Western Baltic Sea (Figure S5) | Macrobenthos community data aggregated for the Baltic Sea | 2000–2013 | Mostly Van Veen Grab ( 0.1 $m^2$), sieved on 1 mm screen,<br>1-3 replicates per station | Gogina, M., Nygard, H., Blomqvist, M., Daunys, D., Josefson, A. B., Kotta, J., Maximov, A., Warzocha, J., Yermakov, V., Gra¨we, U., and Zettler, M. L. The Baltic Sea scale inventory of benthic faunal communities. – ICES Journal of Marine Science, 73: 1196–1213. |
| North Sea (Figure S6) | Survey EC Project 98/021, Monitoring Biodiversity of Epibenthos and Demersal Fish in the North Sea and Skagerrak, Monitoring Report 2001 to the Commission of the European Community | 2000 | 2 m beam trawl fitted with a 20 mm mesh and a liner of 2 mm knotless mess fitted inside the codend. The beam trawl was towed for 5 minutes at about 1knot. | Callaway, R., Alsvag, J., de Boois, I., Cotter, J., Ford, A., Hinz, H., Jennings, S., Kroncke, I., Lancaster, J., Piet, G., Prince, P., and Ehrich, S. 2002. Diversity and community structure of epibenthic invertebrates and fish in the North Sea. – ICES Journal of Marine Science, 59: 1199–1214. |
| | North Sea Benthos Project 2000 | 1999–2002 | Van Veen Grab (0.1 $m^2$) Sieving was done on 1mm screens.<br><br>(In some cases 0.1$m^2$ Day or Hamon grabs) | Rees, H. L., Eggleton, J. D., Rachor, E., and Vanden Berghe, E. (Eds). 2007. Structure and dynamics of the North Sea benthos. ICES Cooperative Research Report No. 288. 258 pp. |

| Region | Survey Description | Year | Gear Type information | Citation/Source |
|---|---|---|---|---|
| Benguela / Agulhas South Africa (Figure S7) | Survey region contains Southern Benguela and Agulhas ecoregions of South Africa. Bottom trawl survey by Department of Agriculture, Forestry and Fisheries – Republic of South Africa and South African Environmental Observation Network (SAEON). | 2011 | Otter trawl; four-panel 180 ft German otter trawl, 9 m sweeps and 1.5 t Morgere multipurpose otter boards" as per Atkinson et al. (2011) *Marine Ecology Progress Series*. | Durholtz, M.D. et al. 2011. Cruise report, FRS Africana, V270. FISHERIES/2011/MAR/SWG-DEM/02 January 2011 West Coast Demersal Abundance Survey.<br><br>Fairweather T.P. et al 2011. Cruise Report FRS Africana V 273. FISHERIES/2011/JUL/SWG-DEM/27 April 2011 South Coast Demersal Abundance Survey.<br><br>Atkinson, L.J., Field, J.G. and Hutchings, L., 2011. Effects of demersal trawling along the west coast of southern Africa: multivariate analysis of benthic assemblages. *Marine Ecology Progress Series*, *430*, pp.241-255. |
| Namibia (Figure S8) | Annual Surveys of the Hake Stocks | 2008, 2009, 2010 | A *Gisund Super* two-panel bottom trawl with head length 31 m, footrope 47 m and the vertical net opening 4.5 to 5.5 m. | Kainge, P., Kathena, J., Iitembu, J., Van der Plas, A., Surveys Of The Hake Stocks, Survey No. 2008501: 10 January – 15 February 2008. National Marine Information and Research Centre (NatMIRC) Swakopmund, 2008.<br><br>Kainge, P., Kathena, J., Iitembu, J., Van der Plas, A., Surveys Of The Hake Stocks, Survey No. 2009501: 10 January – 19 February 2009. National Marine Information and Research Centre (NatMIRC) Swakopmund, 2009.<br><br>Kainge, P., Kathena, J., Iitembu, J., Van der Plas, A., Surveys Of The Hake Stocks Survey No. 2010501: 12 January – 21 February 2010. National Marine Information and Research Centre (NatMIRC) Swakopmund, 2010. |
| Chatham / Challenger New Zealand (Figure S9) | Survey area includes New Zealand's Challenger Plateau and Chatham Rise. The Ocean Survey 20/20 Chatham–Challenger Hydrographic Biodiversity and Seabed Habitats Project. | 2007 | Epibenthic Sled (SEL, 1 m mouth width, 25 mm mesh net)<br>Beam Trawl<br>Towed video system (deep towed imaging system, DTIS), | Compton, T. J., Bowden, D. A., Roland Pitcher, C., Hewitt, J. E. and Ellis, N. (2013), Biophysical patterns in benthic assemblage composition across contrasting continental margins off New Zealand. *Journal of Biogeography*, **40**: 75–89. |
| Great Barrier Reef (Figure S10) | Great Barrier Reef Seabed Biodiversity Assessment | 2003 - 2005 | Prawn Trawl (8 fthm Florida Hi'Flyer)<br>Sled (1.5 m Epibenthic Sled) | Pitcher, C.R., Doherty, P., Arnold, P., Hooper, J., Gribble, N., et al. (2007). Seabed Biodiversity on the Continental Shelf of the Great Barrier Reef World Heritage Area. AIMS/CSIRO/QM/QDPI Final Report to CRC Reef Research. 320 pp<br>http://fish.gov.au/reports/Documents/Pitcher_et_al_2007a_GBR_Seabed_Biodiversity_Final_Report.pdf |

| Region | Survey Description | Year | Gear Type information | Citation/Source |
|---|---|---|---|---|
| Gulf of Carpentaria (Figure S11) | Megabenthos survey Southern Surveyor cruise SS 03/90. | 1990 | Dredge (3 m Church Dredge)<br>Grab (0.1 $m^2$ Smith-McIntyre grab) | Long, B.G.; Poiner, I.R., Wassenberg, T.J. (1995). Distribution, biomass and community structure of megabenthos of the Gulf of Carpentaria, Australia. *Mar Ecol Prog Ser* 129, 127-139. http://www.marine.csiro.au/marq/edd_search.Browse_Citation?txtSession=4682<br><br>Long, B.G.; Poiner, I.R. (1994). Infaunal benthic community structure and function in the Gulf of Carpentaria, northern Australia. *Aust J Mar Freshw Res* 45, 293-316. http://www.marine.csiro.au/marq/edd_search.Browse_Citation?txtSession=4679 |
| South East Australia (Figure S12) | South East Fishery (SEF) Ecosystem Study 1993-1996: Benthic Faunal Survey Data | 1993-1996 | Sled (Epi-& infauna combination sled (SEF), Woods Hole Oceanographic Institution (WHOI) Epibenthic Sled)<br>Grab (0.1 $m^2$ Smith-McIntyre) | Bax, N and Williams, A. (2000). Habitat and fisheries production in the South East Fishery ecosystem - Final report to the Fisheries Research and Development Corporation. CSIRO Marine Reaserch, Hobart.<br><br>Williams, A. and Bax, N. (2001). Delineating fish-habitat associations for spatially-based management: an example from the south-eastern Australian continental shelf. Marine and Freshwater Research, 52, 513-536.<br><br>http://www.marine.csiro.au/marq/edd_search.Browse_Citation?txtSession=5248<br><br>O'Hara (2002). Unpublished report, *Benthic assemblages of Bass Strait*. Museum Victoria. Unpublished<br><br>Wilson, R.S., and Poore, G.C.B. (1987). The Bass Strait Survey: biological sampling stations, 1979-1984. Occasional Papers from the Museum of Victoria 3, 1-14**.** |
| Western Australia (Figure S13) | Southern Surveyor Voyage SS 05/2007 - Voyage of discovery - benthic biodiversity of the deep continental shelf and slope in Australia's "North West Region" | 2005 | Beam Trawl (CSIRO modified version of the French IRD design light beam-sled)<br>Sled (Epibenthic Sherman sled)<br>Grab (Smith-McIntyre Grab) | http://www.marine.csiro.au/marq/edd_search.Browse_Citation?txtSession=6937<br>Williams, A., Althaus, F., Dunstan, P.K., Poore, G.C.B., Bax, N.J., Kloser, R.J., McEnnulty, F.R. (2010a). Scales of habitat heterogeneity and megabenthos biodiversity on an extensive Australian continental margin (100–1100 m depths). *Marine Ecology* 31, 222-236.<br><br>http://www.marine.csiro.au/marq/edd_search.Browse_Citation?txtSession=6938<br><br>Williams, A., Dunstan, P., Althaus, F., Barker, B., McEnnulty, F., Gowlett-Holmes, K., Keith, G. (2010b). Characterising the seabed biodiversity and habitats of the deep continental shelf and upper slope off the Kimberley coast, NW Australia. Final report to Woodside Energy Ltd. 30/6/2010. CSIRO Wealth from Oceans, Hobart, Australia. 94pp. |

**Table S2.** A table of depletion (*d*) and recovery rates (R) for benthos groups (full description of values in SI methods).

| **Benthos Class** | ***d*** | ***d upper*** | **R** | **R lower** |
|---|---|---|---|---|
| Anthozoa | 0.097 | 0.229 | 0.679 | 0.358 |
| Ascidiacea | 0.012 | 0.193 | 0.123 | 0.042 |
| Asteroidea | 0.067 | 0.170 | 1.429 | 0.482 |
| Bivalvia | 0.207 | 0.276 | 1.567 | 0.923 |
| Gastropoda | 0.094 | 0.190 | 1.364 | 0.489 |
| Malacostraca | 0.109 | 0.172 | 0.818 | 0.475 |
| Ophiuroidea | 0.137 | 0.239 | 3.955 | 0.727 |
| Polychaeta | 0.127 | 0.194 | 0.879 | 0.538 |

**Table S3.** Results of benthos-group distributions, model performance, trawl swept area ratio (SAR exposure) and benthos status (Pitcher et al., 2017). Note that benthos-groups are not available for every taxonomic class per region, since data need to be available and sufficient for modelling processes as described in Mazor et al., (2017). Benthos status was also calculated for trawled areas of the study region (column: Benthos Status (Trawl)).

| **Region** | **Taxa Class** | **Group** | **$R^2$ of model fit** | **OOB $R^2$** | **No. distinct species** | **No. rare species** | **Abundance non-rare** (distinct) | **Abundance of rare** | **Total Abundance** (counts or weights per unit area) | **Trawl SAR Exposure %** | **Trawl SAR Exposure %** (Trawl) | **Benthos Status** | **Benthos Status** (Lower CI) | **Benthos Status** (Trawl) | **Benthos Status** (Lower CI – Trawl) | **Sensitivity** (*d*/R) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aleutian Islands | Anthozoa | 2 | 0.49 | 8.83 | 19 | 4 | 197.99 | 1.21 | 199.20 | 2.19 | 24.06 | 0.9992 | 0.9985 | 0.9860 | 0.9736 | 0.0522 |
| | Ascidiacea | 1 | 0.44 | 8.09 | 1 | 8 | 1.39 | 0.29 | 1.69 | 1.41 | 16.92 | 0.9994 | 0.9982 | 0.9925 | 0.9780 | 0.0365 |
| | | 2 | 0.46 | 18.13 | 9 | 2 | 37.78 | 0.01 | 37.79 | 1.98 | 22.37 | 0.9991 | 0.9974 | 0.9903 | 0.9716 | 0.0406 |
| | Asteroidea | 1 | 0.49 | 5.30 | 26 | 38 | 126.91 | 1.81 | 128.71 | 2.05 | 23.11 | 0.9996 | 0.9988 | 0.9954 | 0.9865 | 0.0162 |
| | | 2 | 0.54 | 6.84 | 27 | 11 | 211.91 | 0.45 | 212.36 | 3.00 | 23.30 | 0.9994 | 0.9982 | 0.9954 | 0.9863 | 0.0177 |
| | Bivalvia | 2 | 0.58 | 24.24 | 3 | 6 | 76.48 | 0.06 | 76.54 | 4.30 | 22.02 | 0.9974 | 0.9957 | 0.9873 | 0.9784 | 0.0546 |
| | Malacostraca | 1 | 0.50 | 14.29 | 16 | 10 | 14.63 | 0.27 | 14.90 | 4.76 | 25.12 | 0.9973 | 0.9953 | 0.9861 | 0.9761 | 0.0527 |
| | | 2 | 0.66 | 38.40 | 12 | 26 | 157.39 | 4.66 | 162.05 | 1.29 | 20.03 | 0.9993 | 0.9987 | 0.9890 | 0.9810 | 0.0463 |
| | Ophiuroidea | 1 | 0.56 | 9.58 | 3 | 3 | 9.24 | 0.02 | 9.25 | 0.66 | 33.93 | 0.9999 | 0.9995 | 0.9951 | 0.9734 | 0.0116 |
| | | 2 | 0.61 | 15.04 | 2 | 9 | 248.34 | 0.07 | 248.42 | 2.50 | 15.67 | 0.9996 | 0.9980 | 0.9979 | 0.9886 | 0.0137 |
| Bering Sea | Anthozoa | 1 | 0.57 | 29.43 | 6 | 2 | 542.86 | 0.05 | 542.91 | 9.66 | 18.64 | 0.9962 | 0.9928 | 0.9914 | 0.9838 | 0.0372 |
| | | 2 | 0.90 | 45.07 | 10 | 9 | 78.52 | 8.99 | 87.51 | 0.67 | 32.07 | 0.9997 | 0.9994 | 0.9885 | 0.9783 | 0.0403 |
| | | 3 | 0.92 | 56.26 | 4 | 0 | 2012.86 | 0.00 | 2012.86 | 18.54 | 35.27 | 0.9932 | 0.9870 | 0.9865 | 0.9745 | 0.0375 |
| | | 4 | 0.63 | 36.07 | 12 | 4 | 495.05 | 1.80 | 496.85 | 5.71 | 17.37 | 0.9978 | 0.9958 | 0.9935 | 0.9876 | 0.0364 |
| | Ascidiacea | 2 | 0.96 | 76.14 | 2 | 2 | 2569.09 | 0.04 | 2569.13 | 9.99 | 13.91 | 0.9977 | 0.9933 | 0.9967 | 0.9904 | 0.0226 |
| | | 3 | 0.97 | 81.24 | 5 | 1 | 9950.35 | 24.14 | 9974.49 | 6.13 | 28.69 | 0.9985 | 0.9957 | 0.9936 | 0.9814 | 0.0237 |
| | Asteroidea | 1 | 0.98 | 90.98 | 4 | 1 | 18973.07 | 0.30 | 18973.37 | 4.51 | 11.99 | 0.9995 | 0.9984 | 0.9984 | 0.9952 | 0.0117 |
| | | 2 | 0.97 | 82.86 | 6 | 3 | 1506.52 | 0.33 | 1506.85 | 6.80 | 15.31 | 0.9991 | 0.9974 | 0.9981 | 0.9944 | 0.0132 |
| | | 3 | 0.96 | 75.97 | 4 | 8 | 1873.96 | 1.38 | 1875.35 | 8.79 | 17.19 | 0.9988 | 0.9964 | 0.9978 | 0.9935 | 0.0135 |

| **Region** | **Taxa Class** | **Group** | **$R^2$ of model fit** | **OOB $R^2$** | **No. distinct species** | **No. rare species** | **Abundance non-rare** (distinct) | **Abundance of rare** | **Total Abundance** (counts or weights per unit area) | **Trawl SAR Exposure %** | **Trawl SAR Exposure %** (Trawl) | **Benthos Status** | **Benthos Status** (Lower CI) | **Benthos Status** (Trawl) | **Benthos Status** (Lower CI – Trawl) | **Sensitivity** (*d*/R) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 4 | 0.98 | 86.86 | 36 | 20 | 894.20 | 3.24 | 897.45 | 4.70 | 18.59 | 0.9994 | 0.9982 | 0.9979 | 0.9937 | 0.0131 |
| | Bivalvia | 2 | 0.93 | 56.89 | 24 | 13 | 428.44 | 2.00 | 430.44 | 8.51 | 22.52 | 0.9970 | 0.9949 | 0.9922 | 0.9868 | 0.0341 |
| | Gastropoda | 1 | 0.73 | 49.01 | 15 | 25 | 162.73 | 0.80 | 163.53 | 4.22 | 17.22 | 0.9992 | 0.9977 | 0.9967 | 0.9908 | 0.0193 |
| | | 2 | 0.96 | 78.28 | 24 | 16 | 6272.45 | 1.87 | 6274.32 | 13.17 | 30.85 | 0.9977 | 0.9935 | 0.9944 | 0.9843 | 0.0178 |
| | | 3 | 0.94 | 65.68 | 23 | 14 | 3529.57 | 10.74 | 3540.31 | 21.57 | 26.58 | 0.9959 | 0.9887 | 0.9954 | 0.9872 | 0.0188 |
| | Malacostraca | 1 | 0.98 | 88.80 | 19 | 17 | 802.95 | 0.63 | 803.58 | 1.88 | 15.48 | 0.9993 | 0.9988 | 0.9942 | 0.9901 | 0.0368 |
| | | 2 | 0.87 | 72.50 | 5 | 7 | 226.30 | 0.02 | 226.32 | 8.68 | 21.45 | 0.9967 | 0.9943 | 0.9924 | 0.9869 | 0.0371 |
| | | 3 | 0.90 | 80.03 | 6 | 8 | 2189.68 | 0.05 | 2189.73 | 4.19 | 19.16 | 0.9986 | 0.9976 | 0.9930 | 0.9879 | 0.0329 |
| | | 4 | 0.93 | 83.48 | 13 | 4 | 7352.23 | 0.01 | 7352.24 | 10.69 | 30.60 | 0.9961 | 0.9933 | 0.9895 | 0.9820 | 0.0370 |
| | | 5 | 0.97 | 85.27 | 16 | 8 | 6213.90 | 1.03 | 6214.93 | 13.09 | 25.46 | 0.9954 | 0.9920 | 0.9917 | 0.9856 | 0.0352 |
| | Ophiuroidea | 1 | 0.72 | 32.30 | 4 | 10 | 390.75 | 0.25 | 391.01 | 1.79 | 11.09 | 0.9998 | 0.9989 | 0.9987 | 0.9932 | 0.0114 |
| | | 2 | 0.95 | 72.54 | 3 | 4 | 6075.34 | 0.78 | 6076.12 | 12.82 | 22.10 | 0.9988 | 0.9937 | 0.9981 | 0.9895 | 0.0091 |
| | Polychaeta | 1 | 0.59 | 37.35 | 4 | 2 | 14.17 | 0.36 | 14.53 | 11.77 | 15.95 | 0.9955 | 0.9927 | 0.9935 | 0.9894 | 0.0385 |
| | | 2 | 0.74 | 44.35 | 5 | 5 | 164.83 | 1.69 | 166.52 | 11.64 | 23.07 | 0.9951 | 0.9920 | 0.9915 | 0.9860 | 0.0406 |
| Great Barrier Reef | Anthozoa | 1 | 0.82 | 6.79 | 8 | 52 | 715.07 | 879.65 | 1594.72 | 4.15 | 27.28 | 0.9985 | 0.9972 | 0.9904 | 0.9818 | 0.0371 |
| | | 2 | 0.90 | 42.88 | 134 | 204 | 10689.20 | 717.61 | 11406.81 | 12.07 | 38.35 | 0.9958 | 0.9921 | 0.9869 | 0.9752 | 0.0388 |
| | Ascidiacea | 2 | 0.90 | 41.98 | 2 | 2 | 16429.20 | 0.26 | 16429.46 | 8.10 | 31.35 | 0.9981 | 0.9943 | 0.9925 | 0.9782 | 0.0289 |
| | Asteroidea | 2 | 0.89 | 34.41 | 39 | 20 | 3260.74 | 35.84 | 3296.59 | 17.83 | 32.16 | 0.9980 | 0.9941 | 0.9957 | 0.9873 | 0.0118 |
| | | 3 | 0.88 | 30.80 | 19 | 22 | 2552.54 | 148.58 | 2701.12 | 14.98 | 38.78 | 0.9983 | 0.9951 | 0.9964 | 0.9894 | 0.0115 |
| | Bivalvia | 1 | 0.86 | 20.38 | 34 | 63 | 6691.88 | 59.50 | 6751.38 | 30.13 | 50.27 | 0.9905 | 0.9838 | 0.9842 | 0.9732 | 0.0319 |
| | | 2 | 0.87 | 21.71 | 40 | 17 | 501.23 | 1.87 | 503.10 | 29.61 | 68.09 | 0.9890 | 0.9813 | 0.9746 | 0.9568 | 0.0335 |
| | | 3 | 0.89 | 32.79 | 91 | 73 | 3448.11 | 169.95 | 3618.06 | 26.04 | 48.08 | 0.9917 | 0.9859 | 0.9848 | 0.9742 | 0.0344 |
| | Gastropoda | 1 | 0.84 | 8.87 | 43 | 111 | 256.33 | 59.48 | 315.81 | 11.95 | 41.860 | 0.9979 | 0.9941 | 0.9926 | 0.9795 | 0.0176 |
| | | 2 | 0.90 | 39.82 | 149 | 287 | 1787.82 | 325.92 | 2113.74 | 13.16 | 38.77 | 0.9978 | 0.9939 | 0.9937 | 0.9825 | 0.0181 |
| | | 1 | 0.87 | 27.40 | 87 | 114 | 546.39 | 29.42 | 575.80 | 6.48 | 31.49 | 0.9978 | 0.9963 | 0.9897 | 0.9822 | 0.0369 |

| Region | Taxa Class | Group | $R^2$ of model fit | OOB $R^2$ | No. distinct species | No. rare species | Abundance non-rare (distinct) | Abundance of rare | Total Abundance (counts or weights per unit area) | Trawl SAR Exposure % | Trawl SAR Exposure % (Trawl) | Benthos Status | Benthos Status (Lower CI) | Benthos Status (Trawl) | Benthos Status (Lower CI – Trawl) | Sensitivity (*d*/R) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Malacostraca | 2 | 0.89 | 40.74 | 81 | 110 | 927.38 | 19.18 | 946.56 | 15.19 | 46.96 | 0.9849 | 0.9812 | 0.9742 | 0.9727 | 0.0345 |
| | | 3 | 0.91 | 48.51 | 127 | 155 | 2543.14 | 37.90 | 2581.05 | 21.44 | 44.39 | 0.9932 | 0.9883 | 0.9861 | 0.9760 | 0.0327 |
| | Ophiuroidea | 1 | 0.82 | 6.01 | 13 | 17 | 76.83 | 9.64 | 86.46 | 9.62 | 43.02 | 0.9991 | 0.9953 | 0.9962 | 0.9791 | 0.0091 |
| | | 2 | 0.87 | 25.96 | 24 | 18 | 355.80 | 13.50 | 369.30 | 3.08 | 30.61 | 0.9997 | 0.9986 | 0.9974 | 0.9859 | 0.0104 |
| | | 3 | 0.90 | 40.63 | 26 | 25 | 2134.84 | 7.54 | 2142.39 | 4.55 | 19.59 | 0.9996 | 0.9977 | 0.9982 | 0.9903 | 0.0100 |
| Gulf of Alaska | Anthozoa | 1 | 0.85 | 34.40 | 4 | 10 | 188.55 | 16.66 | 205.21 | 0.28 | 18.15 | 0.9999 | 0.9997 | 0.9907 | 0.9824 | 0.0497 |
| | | 2 | 0.65 | 53.24 | 11 | 20 | 39.44 | 8.52 | 47.95 | 2.63 | 14.39 | 0.9987 | 0.9976 | 0.9876 | 0.9765 | 0.0428 |
| | | 4 | 0.66 | 35.21 | 7 | 4 | 1115.44 | 0.42 | 1115.86 | 2.50 | 28.12 | 0.9989 | 0.9976 | 0.9933 | 0.9872 | 0.0475 |
| | Ascidiacea | 1 | 0.55 | 8.67 | 2 | 3 | 0.49 | 0.54 | 1.03 | 1.66 | 30.53 | 0.9994 | 0.9982 | 0.9889 | 0.9676 | 0.0341 |
| | | 2 | 0.66 | 20.26 | 10 | 4 | 34.81 | 0.21 | 35.02 | 1.91 | 28.88 | 0.9993 | 0.9979 | 0.9898 | 0.9701 | 0.0376 |
| | Asteroidea | 1 | 0.88 | 31.32 | 23 | 14 | 341.98 | 11.81 | 353.79 | 2.38 | 26.15 | 0.9996 | 0.9987 | 0.9954 | 0.9862 | 0.0166 |
| | | 2 | 0.64 | 30.43 | 22 | 22 | 85.54 | 6.23 | 91.77 | 2.57 | 18.82 | 0.9996 | 0.9988 | 0.9971 | 0.9915 | 0.0150 |
| | | 3 | 0.89 | 35.70 | 12 | 12 | 185.11 | 1.50 | 186.60 | 2.76 | 11.98 | 0.9996 | 0.9989 | 0.9984 | 0.9953 | 0.0135 |
| | Bivalvia | 2 | 0.87 | 27.31 | 7 | 15 | 81.26 | 0.26 | 81.52 | 2.54 | 26.05 | 0.9989 | 0.9981 | 0.9886 | 0.9807 | 0.0486 |
| | Gastropoda | 1 | 0.48 | 20.40 | 5 | 12 | 6.61 | 0.70 | 7.31 | 2.10 | 26.17 | 0.9995 | 0.9987 | 0.9937 | 0.9825 | 0.0217 |
| | | 2 | 0.86 | 19.50 | 18 | 31 | 81.68 | 0.86 | 82.53 | 3.60 | 16.70 | 0.9991 | 0.9975 | 0.9963 | 0.9897 | 0.0232 |
| | Malacostraca | 1 | 0.88 | 31.62 | 21 | 14 | 39.37 | 0.48 | 39.85 | 1.92 | 26.18 | 0.9990 | 0.9985 | 0.9870 | 0.9777 | 0.0494 |
| | | 2 | 0.74 | 30.87 | 9 | 13 | 23.21 | 0.89 | 24.10 | 0.24 | 11.70 | 0.9999 | 0.9998 | 0.9951 | 0.9916 | 0.0402 |
| | | 3 | 0.88 | 29.97 | 5 | 4 | 684.82 | 0.35 | 685.16 | 2.47 | 25.68 | 0.9990 | 0.9984 | 0.9901 | 0.9829 | 0.0399 |
| | | 4 | 0.91 | 48.51 | 11 | 0 | 151.20 | 0.00 | 151.20 | 2.56 | 13.32 | 0.9990 | 0.9984 | 0.9949 | 0.9912 | 0.0384 |
| | Ophiuroidea | 1 | 0.84 | 11.26 | 3 | 1 | 65.30 | 0.02 | 65.31 | 3.75 | 26.40 | 0.9995 | 0.9974 | 0.9967 | 0.9821 | 0.0113 |
| | | 2 | 0.73 | 41.14 | 5 | 5 | 9.02 | 0.03 | 9.05 | 3.52 | 15.08 | 0.9996 | 0.9977 | 0.9983 | 0.9906 | 0.0109 |
| Gulf of Carpentaria | Anthozoa | 2 | 0.88 | 34.67 | 16 | 19 | 263.03 | 145.59 | 408.63 | 2.68 | 21.46 | 0.9984 | 0.9969 | 0.9929 | 0.9866 | 0.0336 |
| | Ascidiacea | 1 | 0.26 | 7.19 | 1 | 18 | 1.18 | 7.23 | 8.42 | 9.02 | 33.59 | 0.9978 | 0.9937 | 0.9919 | 0.9764 | 0.0248 |

| Region | Taxa Class | Group | $R^2$ of model fit | OOB $R^2$ | No. distinct species | No. rare species | Abundance non-rare (distinct) | Abundance of rare | Total Abundance (counts or weights per unit area) | Trawl SAR Exposure % | Trawl SAR Exposure % (Trawl) | Benthos Status | Benthos Status (Lower CI) | Benthos Status (Trawl) | Benthos Status (Lower CI – Trawl) | Sensitivity (*d*/R) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 | 0.84 | 14.14 | 7 | 4 | 57.56 | 1.42 | 58.99 | 2.33 | 25.80 | 0.9994 | 0.9983 | 0.9935 | 0.9811 | 0.0245 |
| | | 3 | 0.79 | 13.33 | 2 | 2 | 14.90 | 7.24 | 22.16 | 1.59 | 24.66 | 1.0000 | 0.9999 | 0.9999 | 0.9999 | 0.0243 |
| | Asteroidea | 2 | 0.90 | 55.27 | 8 | 12 | 29.47 | 58.29 | 87.77 | 2.43 | 20.19 | 0.9997 | 0.9992 | 0.9978 | 0.9936 | 0.0113 |
| | Bivalvia | 1 | 0.86 | 19.06 | 19 | 31 | 36.57 | 86.27 | 122.85 | 4.02 | 33.65 | 0.9987 | 0.9987 | 0.9889 | 0.9890 | 0.0330 |
| | | 2 | 0.88 | 32.97 | 16 | 16 | 20.03 | 3.76 | 23.80 | 4.33 | 34.64 | 0.9984 | 0.9984 | 0.9872 | 0.9872 | 0.0368 |
| | Gastropoda | 2 | 0.90 | 41.96 | 21 | 45 | 24.34 | 4.77 | 29.11 | 3.80 | 30.40 | 0.9994 | 0.9982 | 0.9950 | 0.9861 | 0.0168 |
| | Malacostraca | 1 | 0.88 | 27.13 | 40 | 53 | 39.43 | 9.08 | 48.52 | 4.17 | 35.74 | 0.9983 | 0.9972 | 0.9872 | 0.9780 | 0.0362 |
| | | 2 | 0.89 | 39.73 | 62 | 75 | 86.74 | 12.19 | 98.94 | 4.21 | 33.70 | 0.9986 | 0.9976 | 0.9889 | 0.9809 | 0.0331 |
| | Ophiuroidea | 1 | 0.89 | 33.70 | 5 | 18 | 4.74 | 2.85 | 7.60 | 4.22 | 33.74 | 0.9996 | 0.9976 | 0.9969 | 0.9833 | 0.0091 |
| | | 2 | 0.88 | 36.45 | 7 | 2 | 4.13 | 0.05 | 4.18 | 3.80 | 30.40 | 0.9997 | 0.9983 | 0.9975 | 0.9863 | 0.0084 |
| | Bivalvia (infauna) | 1 | 0.85 | 18.44 | 3 | 68 | 658.37 | 399.00 | 1057.37 | 4.11 | 32.86 | 0.9984 | 0.9972 | 0.9889 | 0.9811 | 0.0347 |
| | Malacostraca (infauna) | 1 | 0.89 | 38.05 | 25 | 212 | 1748.30 | 961.37 | 2709.67 | 4.33 | 34.60 | 0.9984 | 0.9972 | 0.9884 | 0.9801 | 0.0271 |
| | Polychaeta (infauna) | 1 | 0.66 | 33.62 | 3 | 59 | 337.00 | 490.50 | 827.50 | 4.55 | 33.74 | 0.9980 | 0.9968 | 0.9868 | 0.9784 | 0.0367 |
| | | 2 | 0.93 | 59.24 | 26 | 126 | 2211.20 | 1017.50 | 3228.70 | 4.43 | 30.40 | 0.9980 | 0.9967 | 0.9874 | 0.9794 | 0.0362 |
| Kattergat/ Western Baltic Sea | Bivalvia | 1 | 0.45 | 13.31 | 28 | 15 | 1642.93 | 19.76 | 1662.70 | 136.17 | 243.83 | 0.9411 | 0.9022 | 0.8897 | 0.8168 | 0.0310 |
| | | 2 | 0.48 | 18.88 | 10 | 1 | 32852.16 | 0.41 | 32852.58 | 157.69 | 247.16 | 0.9331 | 0.8891 | 0.9017 | 0.8368 | 0.0401 |
| | Gastropoda | 1 | 0.40 | 17.49 | 11 | 7 | 243.64 | 0.88 | 244.52 | 59.61 | 168.94 | 0.9816 | 0.9506 | 0.9334 | 0.8228 | 0.0165 |
| | | 2 | 0.32 | 13.98 | 6 | 7 | 342.22 | 5.58 | 347.81 | 111.41 | 274.59 | 0.9674 | 0.9136 | 0.9610 | 0.8956 | 0.0203 |
| | Ophiuroidea | 3 | 0.76 | 29.89 | 1 | 1 | 493.62 | 0.01 | 493.63 | 13.32 | 69.91 | 0.9978 | 0.9883 | 0.9920 | 0.9567 | 0.0090 |
| | Polychaeta | 1 | 0.54 | 17.56 | 47 | 50 | 1247.80 | 9.83 | 1257.63 | 83.82 | 211.08 | 0.9455 | 0.9129 | 0.8754 | 0.8020 | 0.0343 |
| | | 2 | 0.22 | 9.94 | 24 | 10 | 824.74 | 3.21 | 827.95 | 127.18 | 262.70 | 0.9216 | 0.8754 | 0.9018 | 0.8429 | 0.0446 |
| Namibia | Malacostraca | 1 | 0.51 | 18.18 | 4 | 7 | 1735.23 | 27.01 | 1762.24 | 132.16 | 295.25 | 0.9588 | 0.9314 | 0.9285 | 0.8771 | 0.0298 |
| | | 2 | 0.26 | 5.30 | 10 | 5 | 2403.33 | 15.66 | 2418.99 | 124.71 | 218.56 | 0.9592 | 0.9299 | 0.9079 | 0.8468 | 0.0312 |
| | | 3 | 0.58 | 31.52 | 5 | 6 | 3098.46 | 10.86 | 3109.32 | 66.24 | 139.39 | 0.9783 | 0.9629 | 0.9128 | 0.8502 | 0.0314 |

| Region | Taxa Class | Group | $R^2$ of model fit | OOB $R^2$ | No. distinct species | No. rare species | Abundance non-rare (distinct) | Abundance of rare | Total Abundance (counts or weights per unit area) | Trawl SAR Exposure % | Trawl SAR Exposure % (Trawl) | Benthos Status | Benthos Status (Lower CI) | Benthos Status (Trawl) | Benthos Status (Lower CI – Trawl) | Sensitivity (*d*/R) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North Sea (Epifuana) | Asteroidea | 1 | 0.61 | 30.07 | 9 | 7 | 8.65 | 1.07 | 9.71 | 184.45 | 158.56 | 0.9733 | 0.9229 | 0.9736 | 0.9243 | 0.0133 |
| | | 2 | 0.91 | 48.73 | 2 | 0 | 110.78 | 0.00 | 110.78 | 99.19 | 103.53 | 0.9809 | 0.9442 | 0.9801 | 0.9416 | 0.0215 |
| | | 3 | 0.81 | 40.45 | 1 | 0 | 39.95 | 0.00 | 39.95 | 150.67 | 196.74 | 0.9750 | 0.9283 | 0.9716 | 0.9179 | 0.0225 |
| | Bivalvia | 1 | 0.74 | 18.53 | 6 | 4 | 1.83 | 0.09 | 1.92 | 150.51 | 122.19 | 0.9194 | 0.8721 | 0.9451 | 0.9125 | 0.0399 |
| | | 3 | 0.69 | 25.64 | 4 | 10 | 7.78 | 2.27 | 10.05 | 68.89 | 225.32 | 0.9529 | 0.9250 | 0.9051 | 0.8494 | 0.0422 |
| | Gastropoda | 1 | 0.82 | 20.71 | 5 | 4 | 2.12 | 0.03 | 2.15 | 169.86 | 133.39 | 0.9612 | 0.8970 | 0.9694 | 0.9201 | 0.0187 |
| | | 2 | 0.74 | 46.24 | 8 | 24 | 94.60 | 0.78 | 95.38 | 118.59 | 186.90 | 0.9727 | 0.9290 | 0.9571 | 0.8859 | 0.0265 |
| | Malacostrac a | 1 | 0.89 | 37.00 | 5 | 14 | 7.40 | 0.06 | 7.46 | 124.18 | 134.70 | 0.9370 | 0.8963 | 0.9316 | 0.8873 | 0.0594 |
| | | 2 | 0.60 | 35.77 | 9 | 8 | 60.19 | 0.34 | 60.53 | 119.32 | 130.29 | 0.9398 | 0.9009 | 0.9342 | 0.8917 | 0.0546 |
| | | 3 | 0.63 | 34.42 | 11 | 8 | 13.23 | 0.29 | 13.52 | 209.90 | 120.43 | 0.9163 | 0.8633 | 0.9527 | 0.9225 | 0.0386 |
| | | 4 | 0.75 | 41.54 | 9 | 13 | 12.95 | 0.09 | 13.05 | 107.10 | 252.57 | 0.9578 | 0.9309 | 0.8986 | 0.8343 | 0.0452 |
| | Ophiuroidea | 1 | 0.78 | 22.90 | 3 | 3 | 5.57 | 0.14 | 5.71 | 121.89 | 118.79 | 0.9867 | 0.9313 | 0.9830 | 0.9088 | 0.0101 |
| | | 2 | 0.82 | 45.22 | 2 | 0 | 67.75 | 0.00 | 67.75 | 114.03 | 132.09 | 0.9837 | 0.9128 | 0.9856 | 0.9251 | 0.0158 |
| | Polychaeta | 2 | 0.46 | 15.43 | 2 | 2 | 12.85 | 0.03 | 12.88 | 202.50 | 247.71 | 0.9110 | 0.8656 | 0.8897 | 0.8331 | 0.0429 |
| North Sea (Infauna) | Anthozoa | 1 | 0.65 | 32.68 | 4 | 10 | 1107.90 | 167.00 | 1274.90 | 89.15 | 103.83 | 0.9500 | 0.9084 | 0.9417 | 0.8931 | 0.0697 |
| | | 2 | 0.75 | 48.91 | 5 | 4 | 2330.58 | 28.00 | 2358.58 | 133.35 | 139.86 | 0.9326 | 0.8809 | 0.9292 | 0.8748 | 0.0492 |
| | Ascidiacea | 1 | 0.56 | 19.59 | 1 | 18 | 46.17 | 115.90 | 162.07 | 63.26 | 80.37 | 0.9773 | 0.9367 | 0.9714 | 0.9199 | 0.0413 |
| | | 2 | 0.61 | 28.67 | 3 | 4 | 147.42 | 40.84 | 188.26 | 144.19 | 155.32 | 0.9545 | 0.8783 | 0.9510 | 0.8686 | 0.0293 |
| | Asteroidea | 1 | 0.32 | 8.92 | 1 | 0 | 87.02 | 0.00 | 87.02 | 134.02 | 160.47 | 0.9770 | 0.9336 | 0.9757 | 0.9295 | 0.0143 |
| | | 2 | 0.58 | 16.39 | 2 | 0 | 779.00 | 0.00 | 779.00 | 150.63 | 143.41 | 0.9785 | 0.9376 | 0.9770 | 0.9333 | 0.0165 |
| | Bivalvia | 1 | 0.84 | 72.72 | 10 | 30 | 2299.76 | 625.47 | 2925.23 | 149.09 | 123.52 | 0.9411 | 0.9032 | 0.9346 | 0.8905 | 0.0433 |
| | | 2 | 0.82 | 67.93 | 26 | 34 | 5801.41 | 346.48 | 6147.89 | 174.64 | 129.00 | 0.9227 | 0.8762 | 0.9427 | 0.9051 | 0.0415 |
| | | 3 | 0.79 | 54.23 | 18 | 6 | 20987.42 | 38.01 | 21025.43 | 117.58 | 159.60 | 0.9378 | 0.8958 | 0.9371 | 0.8965 | 0.0609 |
| | | 4 | 0.85 | 69.79 | 27 | 20 | 29157.45 | 437.49 | 29594.94 | 125.36 | 183.74 | 0.9444 | 0.9079 | 0.9188 | 0.8699 | 0.0491 |
| | Gastropoda | 1 | 0.62 | 31.86 | 4 | 35 | 350.50 | 216.34 | 566.84 | 108.35 | 122.43 | 0.9743 | 0.9293 | 0.9710 | 0.9202 | 0.0279 |

| **Region** | **Taxa Class** | **Group** | **$R^2$ of model fit** | **OOB $R^2$** | **No. distinct species** | **No. rare species** | **Abundance non-rare** (distinct) | **Abundance of rare** | **Total Abundance** (counts or weights per unit area) | **Trawl SAR Exposure %** | **Trawl SAR Exposure %** (Trawl) | **Benthos Status** | **Benthos Status** (Lower CI) | **Benthos Status** (Trawl) | **Benthos Status** (Lower CI – Trawl) | **Sensitivity** (*d*/R) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 | 0.42 | 35.30 | 6 | 50 | 253.46 | 312.87 | 566.33 | 166.91 | 116.02 | 0.9636 | 0.9035 | 0.9718 | 0.9231 | 0.0202 |
| | | 3 | 0.72 | 44.79 | 2 | 4 | 744.62 | 32.50 | 777.12 | 112.88 | 143.86 | 0.9726 | 0.9254 | 0.9679 | 0.9132 | 0.0279 |
| | | 4 | 0.80 | 56.46 | 6 | 20 | 1210.71 | 100.52 | 1311.22 | 140.40 | 176.28 | 0.9687 | 0.9156 | 0.9616 | 0.8979 | 0.0226 |
| | Malacostraca | 1 | 0.96 | 76.72 | 40 | 81 | 12774.85 | 848.57 | 13623.42 | 117.80 | 115.48 | 0.9491 | 0.9157 | 0.9387 | 0.8972 | 0.0542 |
| | | 2 | 0.78 | 52.63 | 11 | 39 | 3649.62 | 152.55 | 3802.17 | 101.37 | 131.34 | 0.9462 | 0.9099 | 0.9435 | 0.9063 | 0.0626 |
| | | 3 | 0.93 | 62.17 | 33 | 16 | 15547.63 | 130.29 | 15677.92 | 119.96 | 123.15 | 0.9437 | 0.9049 | 0.9421 | 0.9022 | 0.0527 |
| | | 4 | 0.76 | 63.22 | 61 | 124 | 5857.33 | 735.59 | 6592.92 | 201.83 | 131.74 | 0.9125 | 0.8592 | 0.9455 | 0.9085 | 0.0407 |
| | | 5 | 0.85 | 64.27 | 13 | 17 | 5117.05 | 64.84 | 5181.89 | 126.00 | 212.78 | 0.9480 | 0.9127 | 0.9076 | 0.8510 | 0.0425 |
| | Ophiuroidea | 1 | 0.77 | 54.16 | 4 | 1 | 2805.13 | 28.00 | 2833.13 | 121.02 | 142.46 | 0.9843 | 0.9190 | 0.9816 | 0.9048 | 0.0160 |
| | | 2 | 0.91 | 50.38 | 6 | 3 | 5729.89 | 35.02 | 5764.91 | 152.81 | 160.12 | 0.9818 | 0.9065 | 0.9810 | 0.9018 | 0.0113 |
| | | 3 | 0.94 | 65.74 | 4 | 0 | 24168.57 | 0.00 | 24168.57 | 134.27 | 139.33 | 0.9863 | 0.9263 | 0.9857 | 0.9234 | 0.0108 |
| | Polychaeta | 1 | 0.78 | 65.22 | 89 | 84 | 46636.68 | 1050.81 | 47687.49 | 161.17 | 109.29 | 0.9289 | 0.8890 | 0.9419 | 0.9073 | 0.0459 |
| | | 2 | 0.79 | 60.67 | 31 | 24 | 50646.57 | 93.82 | 50740.39 | 104.31 | 114.68 | 0.9447 | 0.9117 | 0.9428 | 0.9092 | 0.0583 |
| | | 3 | 0.93 | 58.58 | 32 | 26 | 57107.58 | 199.23 | 57306.81 | 108.98 | 167.97 | 0.9458 | 0.9139 | 0.9259 | 0.8841 | 0.0528 |
| | | 4 | 0.67 | 53.02 | 144 | 158 | 56519.91 | 1265.72 | 57785.63 | 178.76 | 189.22 | 0.9177 | 0.8732 | 0.9127 | 0.8654 | 0.0445 |
| Chatham /Challenger New Zealand | Anthozoa | 1 | 0.86 | 25.64 | 25 | 7 | 29144.21 | 17.60 | 29161.81 | 2.86 | 24.44 | 0.9987 | 0.9974 | 0.9900 | 0.9810 | 0.0405 |
| | | 2 | 0.45 | 23.91 | 17 | 8 | 5455.38 | 34.50 | 5489.88 | 10.66 | 27.50 | 0.9951 | 0.9908 | 0.9888 | 0.9787 | 0.0417 |
| | | 2 | 0.92 | 55.80 | 8 | 16 | 487.90 | 73.27 | 561.18 | 5.89 | 15.28 | 0.9973 | 0.9949 | 0.9939 | 0.9884 | 0.0410 |
| | Asteroidea | 1 | 0.86 | 20.67 | 6 | 56 | 110.79 | 509.73 | 620.52 | 0.33 | 21.81 | 1.0000 | 0.9999 | 0.9971 | 0.9914 | 0.0135 |
| | | 2 | 0.89 | 34.08 | 6 | 18 | 337.82 | 64.65 | 402.47 | 4.88 | 15.05 | 0.9993 | 0.9978 | 0.9980 | 0.9941 | 0.0139 |
| | Asteroidea | 1 | 0.34 | 17.66 | 7 | 8 | 202.09 | 38.93 | 241.03 | 1.29 | 19.75 | 0.9998 | 0.9994 | 0.9974 | 0.9922 | 0.0132 |
| | | 2 | 0.65 | 25.69 | 15 | 4 | 2123.74 | 13.87 | 2137.62 | 5.08 | 16.25 | 0.9992 | 0.9978 | 0.9979 | 0.9937 | 0.0136 |
| | Bivalvia | 1 | 0.86 | 28.40 | 5 | 44 | 67.80 | 185.95 | 253.75 | 10.73 | 26.33 | 0.9955 | 0.9923 | 0.9900 | 0.9831 | 0.0387 |
| | | 2 | 0.90 | 42.60 | 2 | 3 | 123.11 | 5.25 | 128.36 | 2.33 | 19.34 | 0.9991 | 0.9984 | 0.9931 | 0.9883 | 0.0368 |
| | Gastropoda | 1 | 0.87 | 22.16 | 10 | 80 | 335.97 | 257.47 | 593.44 | 3.29 | 26.39 | 0.9998 | 0.9995 | 0.9949 | 0.9858 | 0.0194 |

| Region | Taxa Class | Group | $R^2$ of model fit | OOB $R^2$ | No. distinct species | No. rare species | Abundance non-rare (distinct) | Abundance of rare | Total Abundance (counts or weights per unit area) | Trawl SAR Exposure % | Trawl SAR Exposure % (Trawl) | Benthos Status | Benthos Status (Lower CI) | Benthos Status (Trawl) | Benthos Status (Lower CI – Trawl) | Sensitivity (*d*/R) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2 | 0.90 | 43.98 | 5 | 1 | 842.76 | 0.59 | 843.35 | 6.59 | 18.42 | 0.9986 | 0.9960 | 0.9964 | 0.9900 | 0.0196 |
| | | 3 | 0.75 | 24.53 | 5 | 3 | 1036.18 | 12.58 | 1048.77 | 3.01 | 20.62 | 0.9993 | 0.9981 | 0.9960 | 0.9889 | 0.0194 |
| | Malacostraca | 1 | 0.87 | 22.14 | 8 | 52 | 254.63 | 141.96 | 396.59 | 9.55 | 27.36 | 0.9959 | 0.9930 | 0.9896 | 0.9820 | 0.0387 |
| | | 1 | 0.90 | 42.78 | 14 | 10 | 3407.21 | 45.52 | 3452.73 | 0.89 | 14.74 | 0.9996 | 0.9994 | 0.9947 | 0.9908 | 0.0374 |
| | | 2 | 0.79 | 58.82 | 6 | 6 | 1117.81 | 19.11 | 1136.91 | 0.82 | 18.81 | 0.9997 | 0.9994 | 0.9930 | 0.9880 | 0.0373 |
| | Ophiuroidea | 1 | 0.85 | 10.75 | 8 | 47 | 755.80 | 449.95 | 1205.75 | 5.28 | 13.94 | 0.9994 | 0.9967 | 0.9986 | 0.9925 | 0.0101 |
| | | 1 | 0.66 | 34.15 | 3 | 4 | 192.09 | 42.79 | 234.88 | 0.95 | 21.52 | 0.9999 | 0.9994 | 0.9978 | 0.9883 | 0.0100 |
| | | 2 | 0.91 | 49.26 | 4 | 6 | 826.77 | 13.96 | 840.74 | 0.69 | 11.73 | 0.9999 | 0.9996 | 0.9988 | 0.9937 | 0.0099 |
| | Polychaeta | 1 | 0.84 | 7.20 | 6 | 80 | 341.54 | 523.45 | 864.99 | 1.68 | 20.61 | 0.9992 | 0.9987 | 0.9911 | 0.9854 | 0.0409 |
| | | 1 | 0.86 | 25.42 | 2 | 2 | 36.22 | 0.00 | 36.22 | 0.19 | 30.18 | 0.9999 | 0.9998 | 0.9877 | 0.9799 | 0.0404 |
| | | 2 | 0.81 | 21.80 | 1 | 0 | 2090.31 | 0.00 | 2090.31 | 0.00 | 19.20 | 1.0000 | 1.0000 | 0.9924 | 0.9876 | 0.0439 |
| | | 2 | 0.87 | 28.07 | 18 | 27 | 1523.59 | 87.25 | 1610.84 | 9.46 | 13.19 | 0.9956 | 0.9928 | 0.9945 | 0.9910 | 0.0411 |
| Benguela /Agulhas South Africa | Anthozoa | 1 | 0.60 | 8.82 | 7 | 4 | 1499.66 | 23.41 | 1523.07 | 10.24 | 82.52 | 0.9962 | 0.9928 | 0.9708 | 0.9448 | 0.0381 |
| | | 2 | 0.91 | 62.30 | 7 | 7 | 15777.93 | 135.20 | 15913.13 | 134.43 | 243.91 | 0.9565 | 0.9184 | 0.9238 | 0.8572 | 0.0308 |
| | Ascidiacea | 2 | 0.21 | 7.64 | 2 | 2 | 101.10 | 25.75 | 126.85 | 25.45 | 63.21 | 0.9937 | 0.9817 | 0.9853 | 0.9572 | 0.0234 |
| | Asteroidea | 1 | 0.28 | 12.90 | 3 | 7 | 595.24 | 10.70 | 605.93 | 8.67 | 71.93 | 0.9960 | 0.9882 | 0.9919 | 0.9760 | 0.0113 |
| | | 2 | 0.85 | 49.09 | 2 | 1 | 513.14 | 0.15 | 513.29 | 7.35 | 96.35 | 0.9992 | 0.9975 | 0.9894 | 0.9686 | 0.0108 |
| | | 3 | 0.91 | 48.50 | 2 | 1 | 2541.61 | 19.47 | 2561.08 | 129.32 | 167.31 | 0.9864 | 0.9596 | 0.9829 | 0.9494 | 0.0102 |
| | | 4 | 0.92 | 62.66 | 12 | 3 | 4156.44 | 13.08 | 4169.52 | 27.70 | 103.92 | 0.9971 | 0.9913 | 0.9894 | 0.9686 | 0.0101 |
| | Gastropoda | 1 | 0.91 | 56.34 | 11 | 9 | 794.77 | 4.14 | 798.91 | 67.87 | 34.63 | 0.9895 | 0.9707 | 0.9941 | 0.9836 | 0.0155 |
| | | 2 | 0.90 | 46.40 | 6 | 11 | 649.42 | 10.48 | 659.90 | 17.56 | 161.43 | 0.9968 | 0.9911 | 0.9758 | 0.9325 | 0.0162 |
| | Malacostraca | 1 | 0.81 | 33.23 | 8 | 9 | 1036.91 | 187.42 | 1224.33 | 7.75 | 15.71 | 0.9973 | 0.9954 | 0.9954 | 0.9856 | 0.0317 |
| | | 2 | 0.89 | 78.55 | 11 | 10 | 11577.00 | 153.90 | 11730.90 | 63.15 | 26.06 | 0.9806 | 0.9666 | 0.9916 | 0.9458 | 0.0316 |
| | | 3 | 0.96 | 81.53 | 5 | 0 | 15153.22 | 0.00 | 15153.22 | 0.40 | 106.53 | 0.9999 | 0.9998 | 0.9685 | 0.9920 | 0.0343 |
| | | 4 | 0.91 | 59.75 | 12 | 4 | 96315.68 | 5.91 | 96321.59 | 24.68 | 46.08 | 0.9925 | 0.9871 | 0.9865 | 0.9768 | 0.0292 |

| Region | Taxa Class | Group | $R^2$ of model fit | OOB $R^2$ | No. distinct species | No. rare species | Abundance non-rare (distinct) | Abundance of rare | Total Abundance (counts or weights per unit area) | Trawl SAR Exposure % | Trawl SAR Exposure % (Trawl) | Benthos Status | Benthos Status (Lower CI) | Benthos Status (Trawl) | Benthos Status (Lower CI – Trawl) | Sensitivity (*d*/R) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ophiuroidea | 1 | 0.27 | 8.00 | 1 | 1 | 2276.73 | 0.29 | 2277.02 | 21.76 | 48.46 | 0.9980 | 0.9892 | 0.9959 | 0.9775 | 0.0084 |
| | | 2 | 0.72 | 9.33 | 1 | 5 | 2.06 | 4.48 | 6.54 | 54.31 | 131.90 | 0.9955 | 0.9757 | 0.9896 | 0.9435 | 0.0083 |
| | | 3 | 0.73 | 40.21 | 4 | 0 | 163.48 | 0.00 | 163.48 | 18.51 | 73.59 | 0.9985 | 0.9918 | 0.9942 | 0.9688 | 0.0076 |
| | Polychaeta | 1 | 0.56 | 11.51 | 4 | 3 | 303.65 | 3.55 | 307.19 | 14.22 | 87.67 | 0.9951 | 0.9920 | 0.9710 | 0.9528 | 0.0341 |
| | | 2 | 0.95 | 72.86 | 1 | 0 | 298.72 | 0.00 | 298.72 | 42.82 | 82.05 | 0.9859 | 0.9770 | 0.9738 | 0.9572 | 0.0337 |
| South East Australia | Bivalvia | 2 | 0.80 | 19.97 | 5 | 35 | 16.60 | 23.01 | 39.61 | 13.23 | 45.68 | 0.9958 | 0.9929 | 0.9856 | 0.9808 | 0.0345 |
| | Gastropoda | 1 | 0.61 | 41.96 | 3 | 207 | 2.34 | 86.89 | 89.24 | 12.07 | 46.38 | 0.9981 | 0.9937 | 0.9925 | 0.9791 | 0.0173 |
| | Malacostrac a | 1 | 0.82 | 57.82 | 18 | 127 | 24.25 | 30.12 | 54.37 | 11.59 | 44.84 | 0.9963 | 0.9937 | 0.9858 | 0.9756 | 0.0326 |
| | | 2 | 0.59 | 7.86 | 10 | 105 | 108.22 | 47.29 | 155.52 | 7.36 | 36.52 | 0.9977 | 0.9960 | 0.9885 | 0.9802 | 0.0349 |
| | | 3 | 0.74 | 40.39 | 25 | 161 | 43.20 | 39.32 | 82.53 | 6.22 | 39.97 | 0.9980 | 0.9966 | 0.9873 | 0.9782 | 0.0341 |
| | | 4 | 0.73 | 38.82 | 24 | 142 | 29.38 | 53.56 | 82.94 | 16.79 | 54.11 | 0.9947 | 0.9909 | 0.9831 | 0.9709 | 0.0336 |
| | Ophiuroidea | 1 | 0.18 | 6.44 | 1 | 5 | 1.00 | 2.15 | 3.15 | 18.07 | 54.04 | 0.9986 | 0.9921 | 0.9956 | 0.9763 | 0.0086 |
| | | 2 | 0.71 | 11.21 | 8 | 24 | 7.86 | 2.33 | 10.19 | 14.66 | 49.94 | 0.9988 | 0.9936 | 0.9960 | 0.9779 | 0.0087 |
| | | 3 | 0.75 | 19.65 | 11 | 22 | 29.13 | 3.01 | 32.14 | 11.03 | 44.87 | 0.9991 | 0.9951 | 0.9963 | 0.9800 | 0.0087 |
| | Polychaeta | 1 | 0.37 | 8.41 | 4 | 19 | 18.16 | 3.79 | 21.96 | 13.69 | 49.43 | 0.9954 | 0.9925 | 0.9832 | 0.9727 | 0.0362 |
| | | 2 | 0.78 | 26.04 | 4 | 50 | 12.15 | 5.34 | 17.50 | 13.02 | 50.11 | 0.9956 | 0.9928 | 0.9830 | 0.9723 | 0.0362 |
| | | 3 | 0.82 | 33.92 | 15 | 16 | 21.06 | 6.89 | 27.95 | 15.38 | 52.36 | 0.9948 | 0.9916 | 0.9823 | 0.9711 | 0.0362 |
| | | 4 | 0.74 | 22.11 | 20 | 59 | 30.31 | 12.24 | 42.56 | 11.12 | 46.05 | 0.9962 | 0.9938 | 0.9843 | 0.9743 | 0.0363 |
| Western Australia (Epifauna) | Anthozoa | 1 | 0.51 | 12.10 | 6 | 225 | 12.04 | 136.98 | 149.02 | 2.16 | 28.34 | 0.9993 | 0.9987 | 0.9907 | 0.9823 | 0.0345 |
| | | 2 | 0.55 | 29.36 | 4 | 9 | 45636.69 | 5428.65 | 51065.35 | 0.37 | 23.79 | 0.9998 | 0.9997 | 0.9931 | 0.9869 | 0.0370 |
| | Asteroidea | 1 | 0.82 | 21.79 | 10 | 0 | 4.01 | 0.00 | 4.0143 | 1.27 | 25.71 | 0.9998 | 0.9996 | 0.9972 | 0.9917 | 0.0121 |
| | Bivalvia | 1 | 0.36 | 23.94 | 7 | 244 | 10.14 | 791.52 | 801.66 | 2.34 | 25.21 | 0.9993 | 0.9988 | 0.9922 | 0.9867 | 0.0333 |
| | | 2 | 0.74 | 48.53 | 1 | 0 | 84.66 | 0.00 | 84.66 | 0.38 | 26.07 | 0.9999 | 0.9998 | 0.9919 | 0.9863 | 0.0326 |
| | Gastropoda | 1 | 0.70 | 16.00 | 8 | 300 | 2.08 | 1653.76 | 1655.84 | 1.35 | 39.26 | 0.9998 | 0.9994 | 0.9937 | 0.9823 | 0.0166 |
| | | 2 | 0.93 | 74.29 | 6 | 65 | 43.92 | 8.63 | 52.56 | 0.51 | 21.33 | 0.9999 | 0.9998 | 0.9966 | 0.9906 | 0.0166 |

| Region | Taxa Class | Group | $R^2$ of model fit | OOB $R^2$ | No. distinct species | No. rare species | Abundance non-rare (distinct) | Abundance of rare | Total Abundance (counts or weights per unit area) | Trawl SAR Exposure % | Trawl SAR Exposure % (Trawl) | Benthos Status | Benthos Status (Lower CI) | Benthos Status (Trawl) | Benthos Status (Lower CI – Trawl) | Sensitivity (*d*/R) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Malacostraca | 1 | 0.95 | 74.29 | 73 | 741 | 224.89 | 1978.74 | 2203.64 | 0.12 | 25.62 | 0.9999 | 0.9999 | 0.9919 | 0.9862 | 0.0331 |
| | | 2 | 0.88 | 48.5 | 44 | 223 | 130.13 | 84.48 | 214.62 | 0.56 | 23.88 | 0.9998 | 0.9997 | 0.9926 | 0.9872 | 0.0330 |
| | Ophiuroidea | 1 | 0.61 | 29.51 | 19 | 232 | 1360.98 | 151.93 | 1512.92 | 3.55 | 28.75 | 0.9997 | 0.9984 | 0.9976 | 0.9873 | 0.0087 |
| | | 2 | 0.93 | 68.47 | 15 | 60 | 21.11 | 10.75 | 31.87 | 0.56 | 23.17 | 0.9999 | 0.9998 | 0.9981 | 0.9899 | 0.0084 |
| | Polychaeta | 1 | 0.85 | 25.15 | 2 | 43 | 18.79 | 5.25 | 24.04 | 0.01 | 9.33 | 0.9999 | 0.9999 | 0.9968 | 0.9949 | 0.0346 |
| | | 2 | 0.42 | 26.50 | 2 | 9 | 2.31 | 3.64 | 5.95 | 4.14 | 26.93 | 0.9986 | 0.9977 | 0.9909 | 0.9851 | 0.0366 |
| Western Australia (Infuana) | Malacostraca | 1 | 0.77 | 37.81 | 0 | 494 | 0.00 | 1423.00 | 1423.00 | 0.15 | 23.79 | 0.9999 | 0.9999 | 0.9926 | 0.9873 | 0.0346 |
| | | 2 | 0.79 | 40.48 | 3 | 158 | 106.00 | 675.00 | 781.00 | 0.86 | 28.34 | 0.9997 | 0.9996 | 0.9913 | 0.9850 | 0.0334 |
| | Polychaeta | 1 | 0.65 | 13.92 | 1 | 29 | 37.00 | 155.00 | 192.00 | 1.20 | 24.11 | 0.9996 | 0.9993 | 0.9918 | 0.9866 | 0.0381 |
| | | 2 | 0.68 | 13.48 | 2 | 11 | 61.00 | 46.00 | 107.00 | 0.10 | 17.29 | 0.9999 | 0.9999 | 0.9943 | 0.9907 | 0.0365 |
| | | 3 | 0.78 | 30.20 | 3 | 12 | 146.00 | 101.00 | 247.00 | 0.73 | 23.98 | 0.9998 | 0.9996 | 0.9918 | 0.9867 | 0.0382 |
| West Coast USA | Anthozoa | 2 | 0.92 | 56.45 | 9 | 1 | 3372.91 | 1.07 | 3373.98 | 6.15 | 9.29 | 0.9979 | 0.9960 | 0.9962 | 0.9928 | 0.0361 |
| | | 3 | 0.56 | 18.78 | 8 | 2 | 15.70 | 0.36 | 16.07 | 0.58 | 21.81 | 0.9998 | 0.9996 | 0.9915 | 0.9839 | 0.0412 |
| | | 4 | 0.93 | 61.61 | 18 | 5 | 2739.14 | 3.64 | 2742.78 | 13.01 | 8.22 | 0.9949 | 0.9904 | 0.9972 | 0.9947 | 0.0392 |
| | Asteroidea | 1 | 0.67 | 51.62 | 6 | 3 | 1519.13 | 0.28 | 1519.41 | 10.25 | 11.28 | 0.9988 | 0.9964 | 0.9986 | 0.9958 | 0.0124 |
| | | 2 | 0.88 | 34.34 | 16 | 8 | 1243.04 | 10.97 | 1254.00 | 6.81 | 7.98 | 0.9991 | 0.9975 | 0.9990 | 0.9969 | 0.0131 |
| | | 3 | 0.91 | 48.85 | 16 | 3 | 3551.60 | 0.45 | 3552.05 | 6.15 | 16.35 | 0.9992 | 0.9976 | 0.9979 | 0.9937 | 0.0130 |
| | | 4 | 0.68 | 56.92 | 15 | 6 | 1779.51 | 18.17 | 1797.67 | 9.05 | 14.10 | 0.9988 | 0.9965 | 0.9983 | 0.9951 | 0.0130 |
| | Gastropoda | 1 | 0.45 | 7.88 | 1 | 5 | 4.22 | 2.16 | 6.37 | 18.87 | 27.20 | 0.9964 | 0.9899 | 0.9948 | 0.9855 | 0.0192 |
| | | 3 | 0.90 | 44.05 | 8 | 3 | 568.45 | 2.30 | 570.74 | 7.04 | 31.41 | 0.9988 | 0.9965 | 0.9939 | 0.9830 | 0.0186 |
| | | 4 | 0.94 | 63.19 | 9 | 4 | 600.69 | 0.33 | 601.01 | 22.56 | 13.28 | 0.9956 | 0.9878 | 0.9977 | 0.9935 | 0.0192 |
| | Malacostraca | 1 | 0.50 | 30.29 | 16 | 10 | 152.19 | 2.58 | 154.77 | 15.98 | 37.10 | 0.9940 | 0.9897 | 0.9862 | 0.9762 | 0.0367 |
| | | 2 | 0.95 | 73.01 | 15 | 3 | 4706.20 | 14.98 | 4721.18 | 15.89 | 19.17 | 0.9942 | 0.9901 | 0.9930 | 0.9880 | 0.0361 |
| | | 3 | 0.77 | 58.29 | 14 | 11 | 875.64 | 1.92 | 877.56 | 4.41 | 11.77 | 0.9985 | 0.9974 | 0.9960 | 0.9931 | 0.0345 |
| | | 4 | 0.87 | 77.98 | 8 | 6 | 10839.80 | 1.99 | 10841.79 | 10.40 | 13.15 | 0.9967 | 0.9944 | 0.9959 | 0.9929 | 0.0336 |

| **Region** | **Taxa Class** | **Group** | **$R^2$ of model fit** | **OOB $R^2$** | **No. distinct species** | **No. rare species** | **Abundance non-rare** (distinct) | **Abundance of rare** | **Total Abundance** (counts or weights per unit area) | **Trawl SAR Exposure %** | **Trawl SAR Exposure %** (Trawl) | **Benthos Status** | **Benthos Status** (Lower CI) | **Benthos Status** (Trawl) | **Benthos Status** (Lower CI – Trawl) | **Sensitivity** (*d*/R) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ophiuroidea | 1 | 0.83 | 15.40 | 5 | 4 | 271.38 | 0.16 | 271.54 | 9.41 | 8.13 | 0.9991 | 0.9952 | 0.9992 | 0.9958 | 0.0093 |
| | | 2 | 0.41 | 5.42 | 3 | 0 | 44.86 | 0.00 | 44.86 | 2.60 | 7.50 | 0.9998 | 0.9987 | 0.9993 | 0.9961 | 0.0096 |
| | | 4 | 0.86 | 29.08 | 2 | 0 | 196.14 | 0.00 | 196.14 | 5.01 | 24.91 | 0.9995 | 0.9974 | 0.9977 | 0.9874 | 0.0095 |

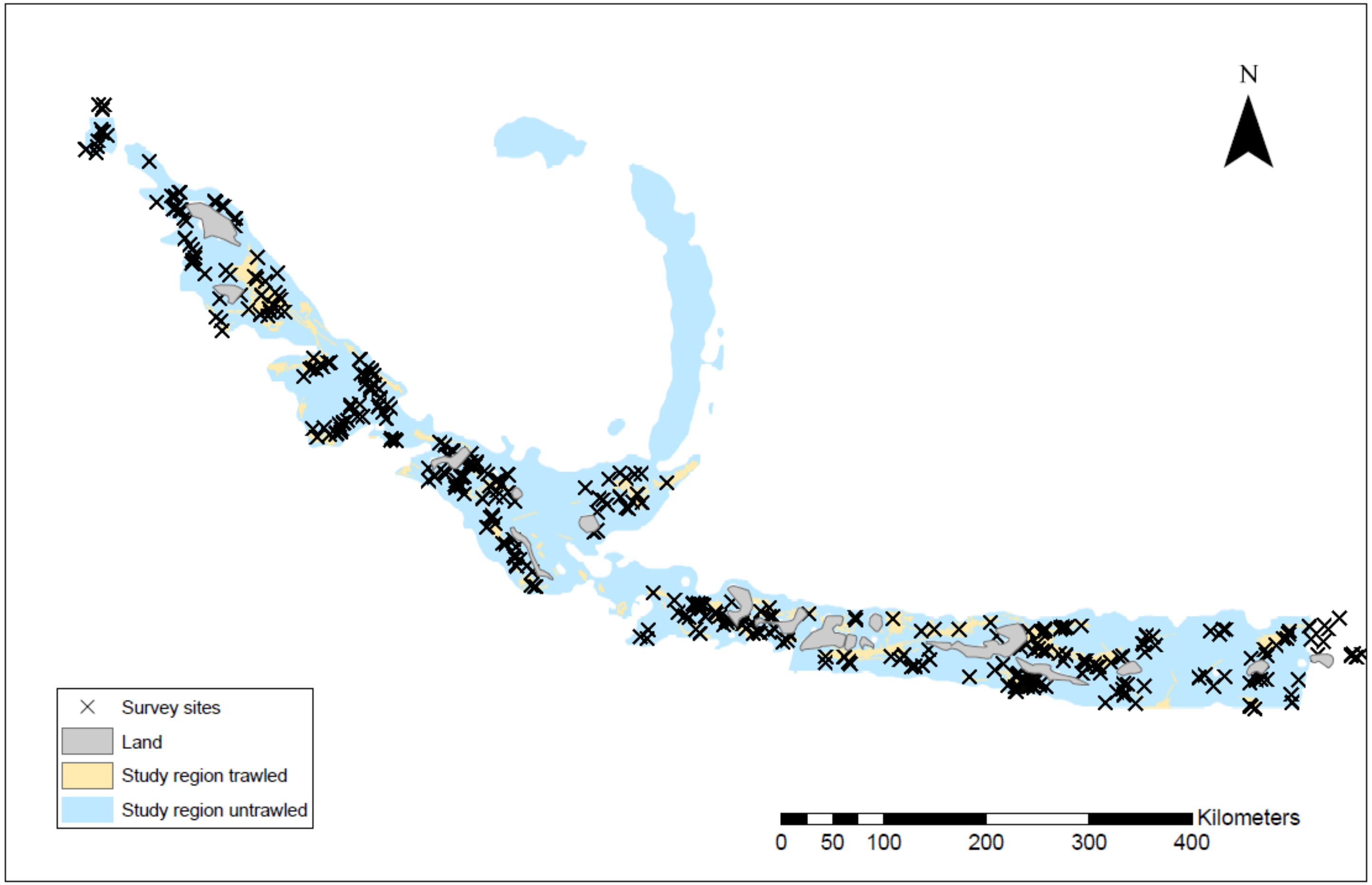


**Figure S1**. Aleutian Islands study region that was used for predicting benthic invertebrate distributions. Samples of benthic invertebrates were taken at survey sites (see Table S1 for survey details) and the area of the study region that is trawled (>0) follows Amoroso et al. (2018).

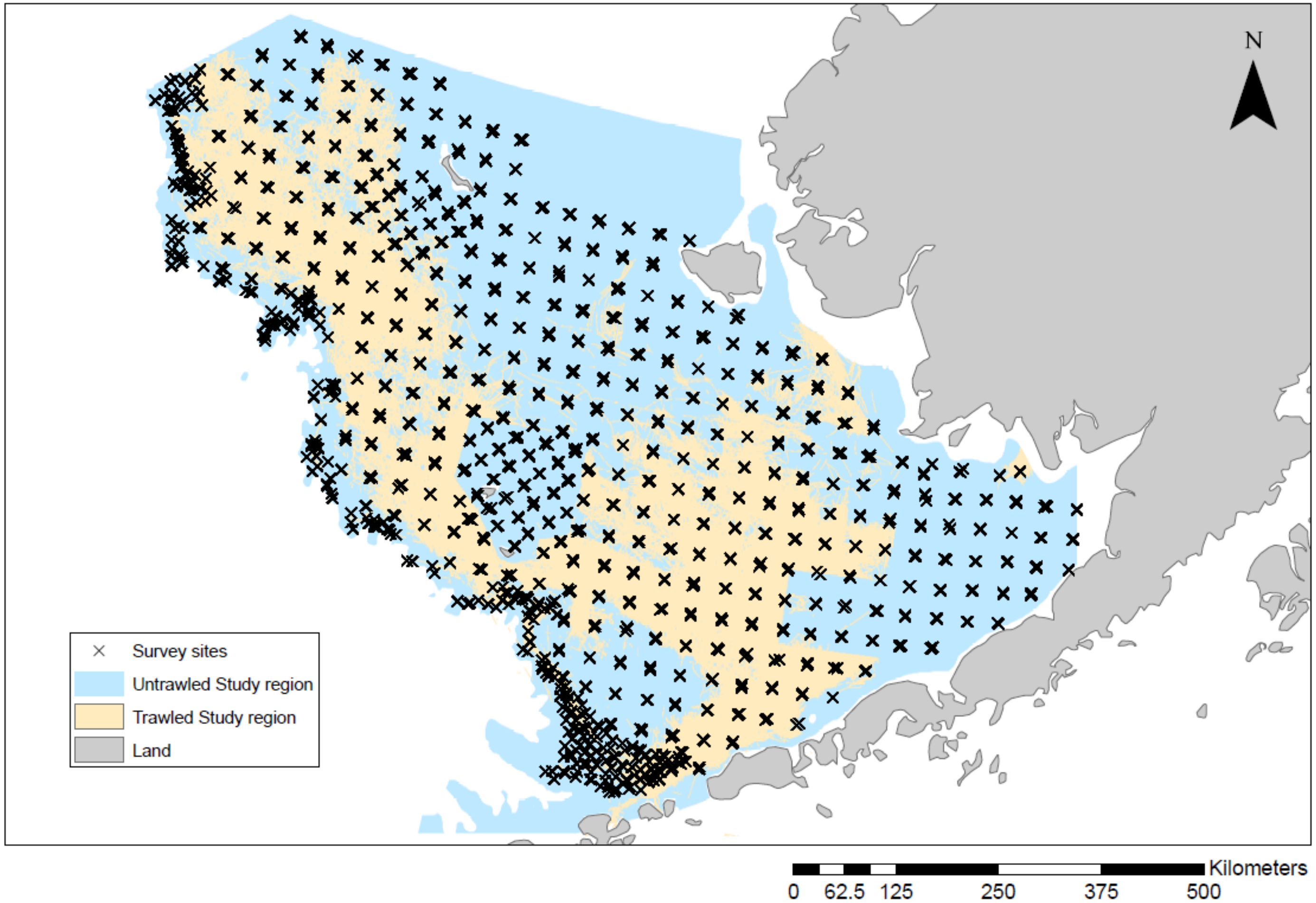


**Figure S2**. The Bering Sea study region that was used for predicting benthic invertebrate distributions. Samples of benthic invertebrates were taken at survey sites (see Table S1 for survey details), and the area of the study region that is commercially trawled (>0) follows Amoroso et al. (2018).

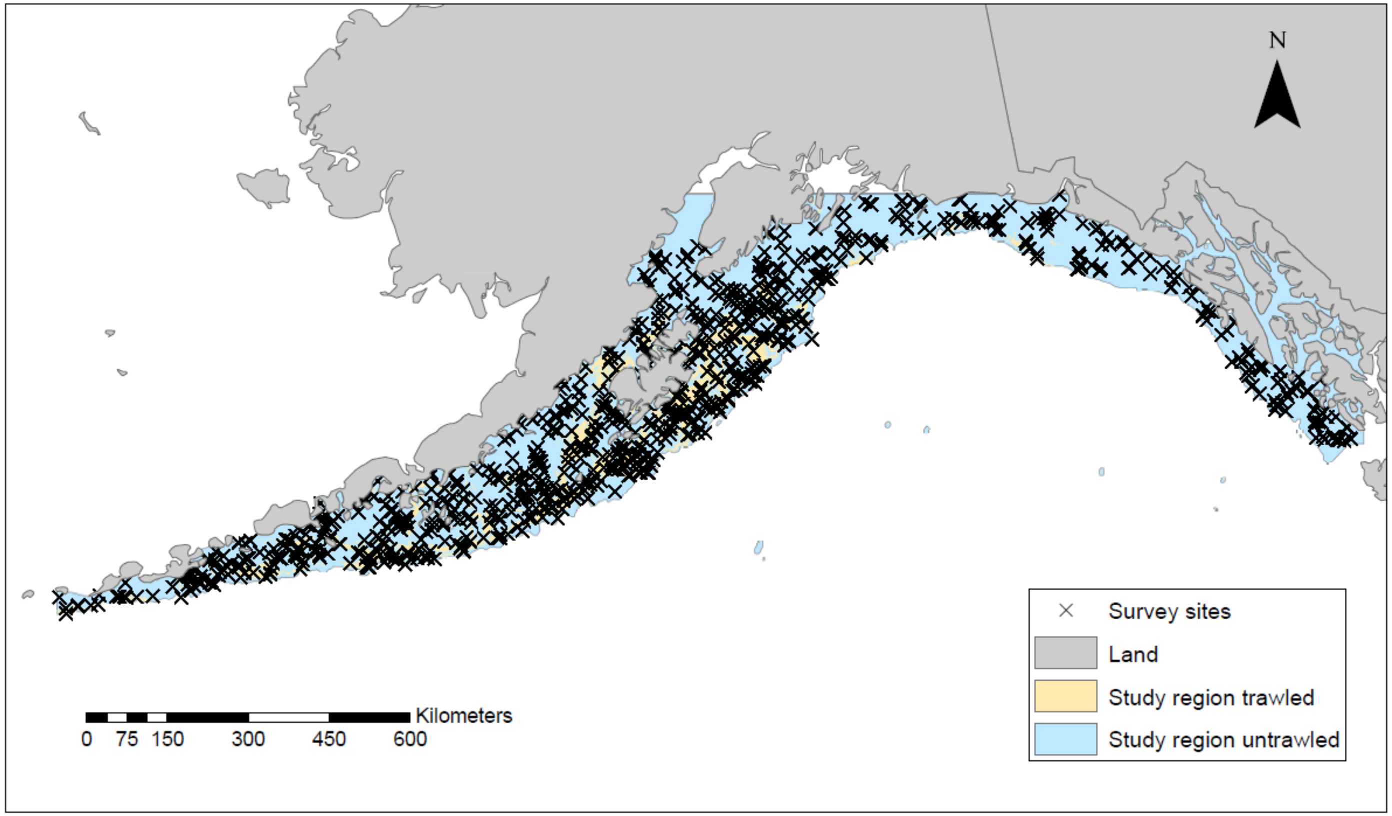


**Figure S3**. The Gulf of Alaska study region that was used for predicting benthic invertebrate distributions. Samples of benthic invertebrates were taken at survey sites (see Table S1 for survey details), and the area of the study region that is commercially trawled (>0) follows Amoroso et al. (2018).


**Figure S4**. West Coast USA study region that was used for predicting benthic invertebrate distributions. Samples of benthic invertebrates were taken at survey sites (see Table S1 for survey details), and the area of the study region that is commercially trawled (>0) follows Amoroso et al. (2018).

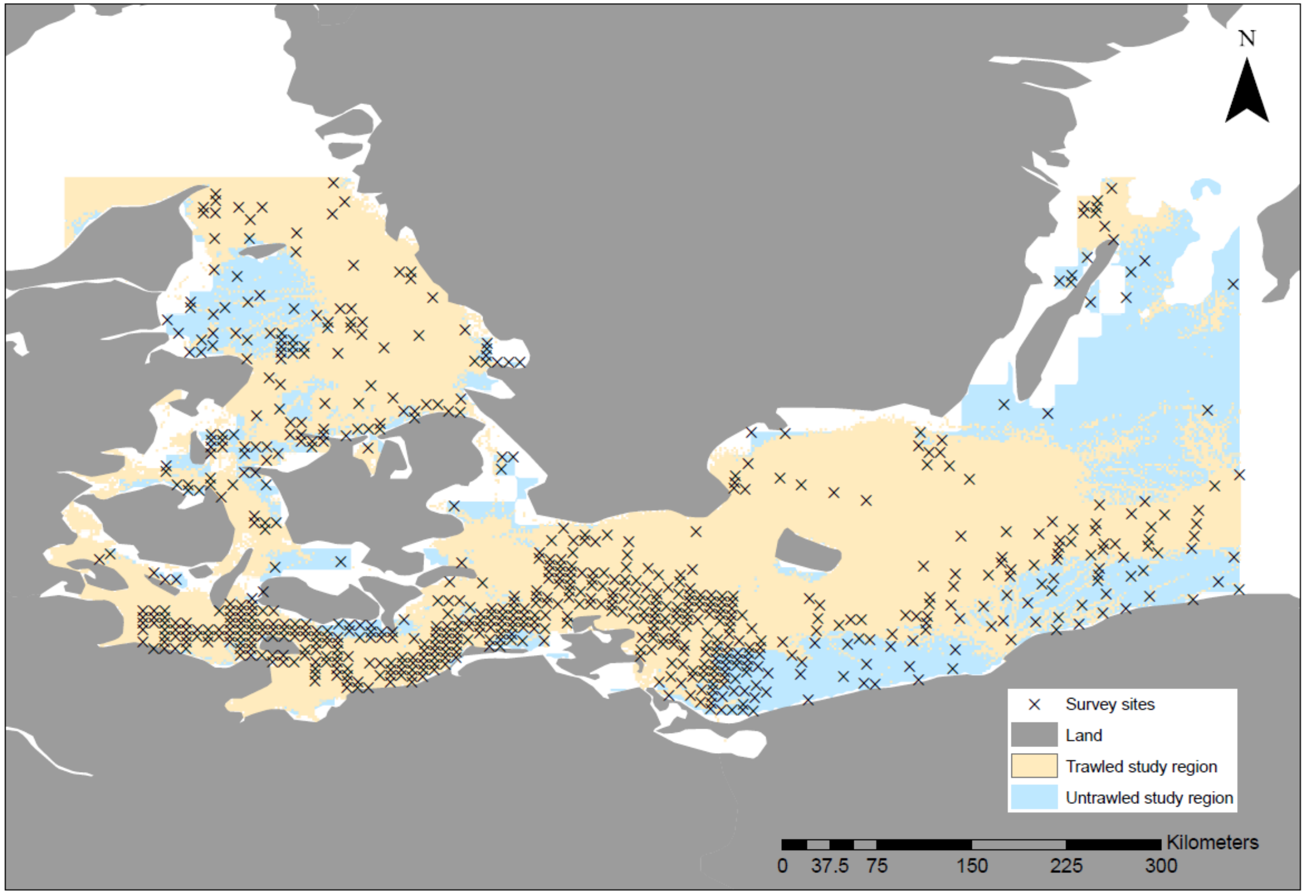


**Figure S5**. The Kattegat/Baltic Sea study region that was used for predicting benthic invertebrate distributions. Samples of benthic invertebrates were taken at survey sites (see Table S1 for survey details), and the area of the study region that is commercially trawled (>0) follows Amoroso et al. (2018).

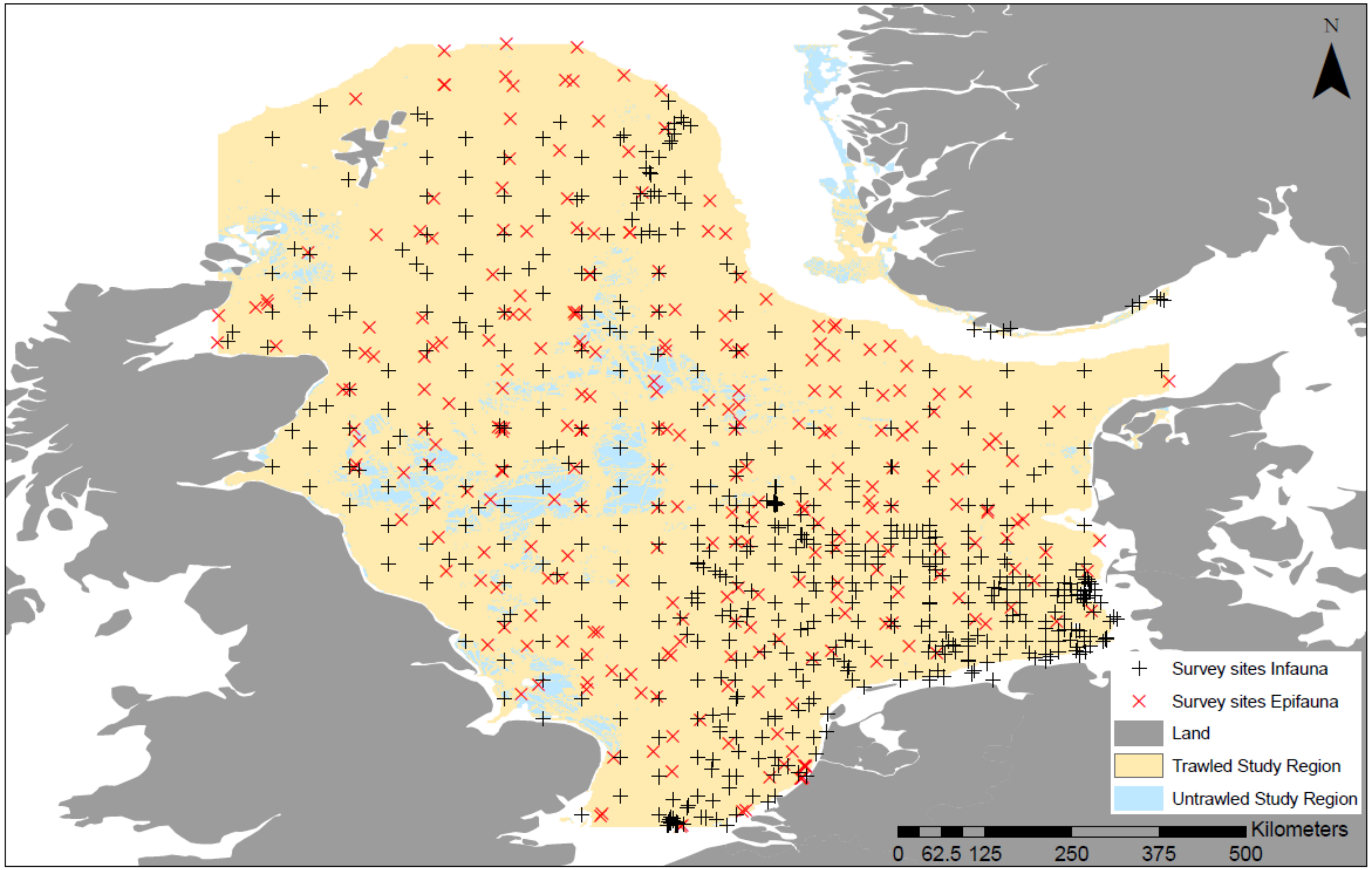


**Figure S6**. The North Sea study region that was used for predicting benthic invertebrate distributions. Samples of benthic invertebrates were taken for infauna and epifauna at survey sites (see Table S1 for survey details), and the area of the study region that is commercially trawled (>0) follows Amoroso et al. (2018).

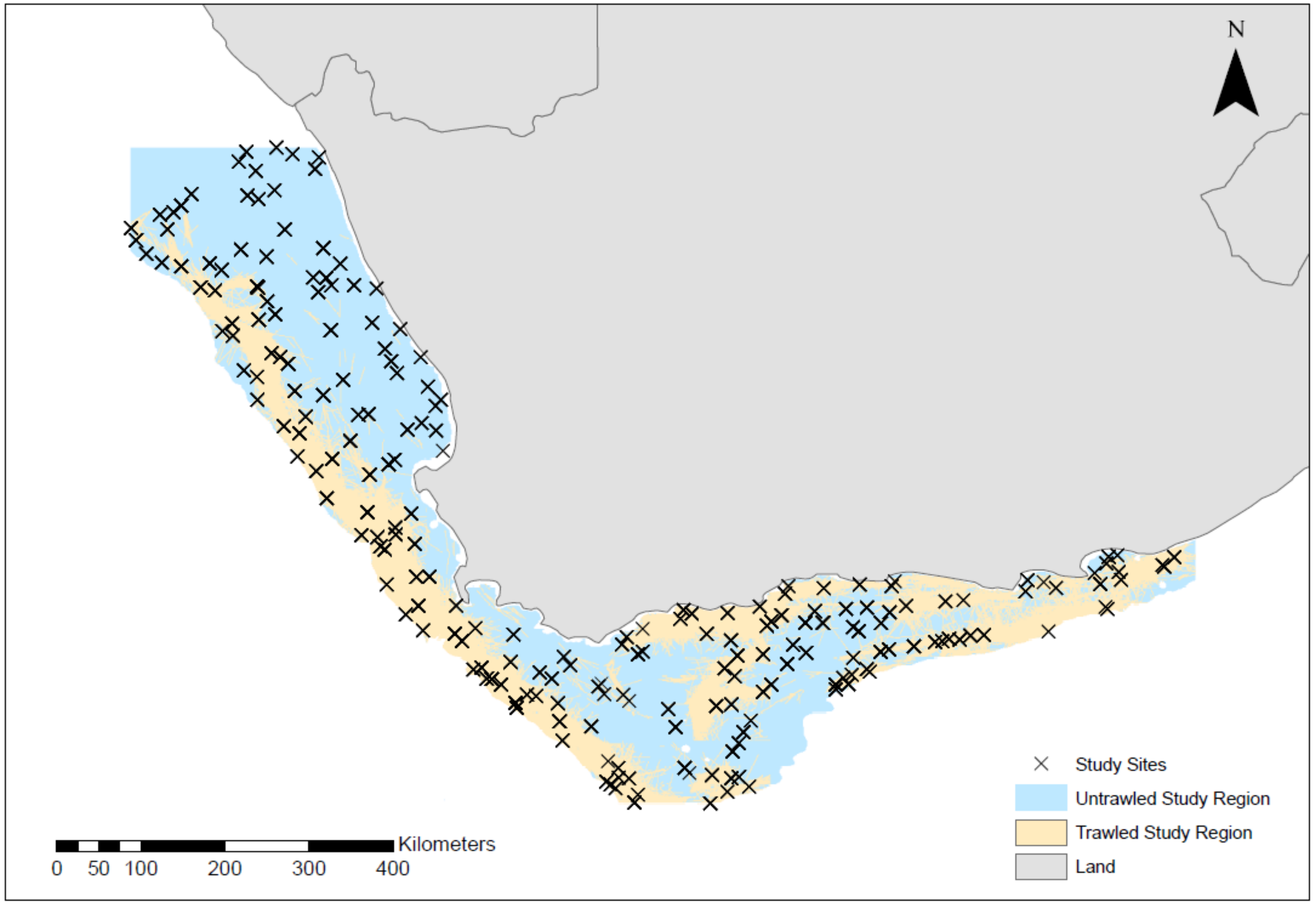


**Figure S7**. Southern Benguela and Agulhas ecoregions of South Africa (Benguela–Agulhas SA) study region that was used for predicting benthic invertebrate distributions. Samples of benthic invertebrates were taken at survey sites (see Table S1 for survey details), and the area of the study region that is commercially trawled (>0) follows Amoroso et al. (2018).

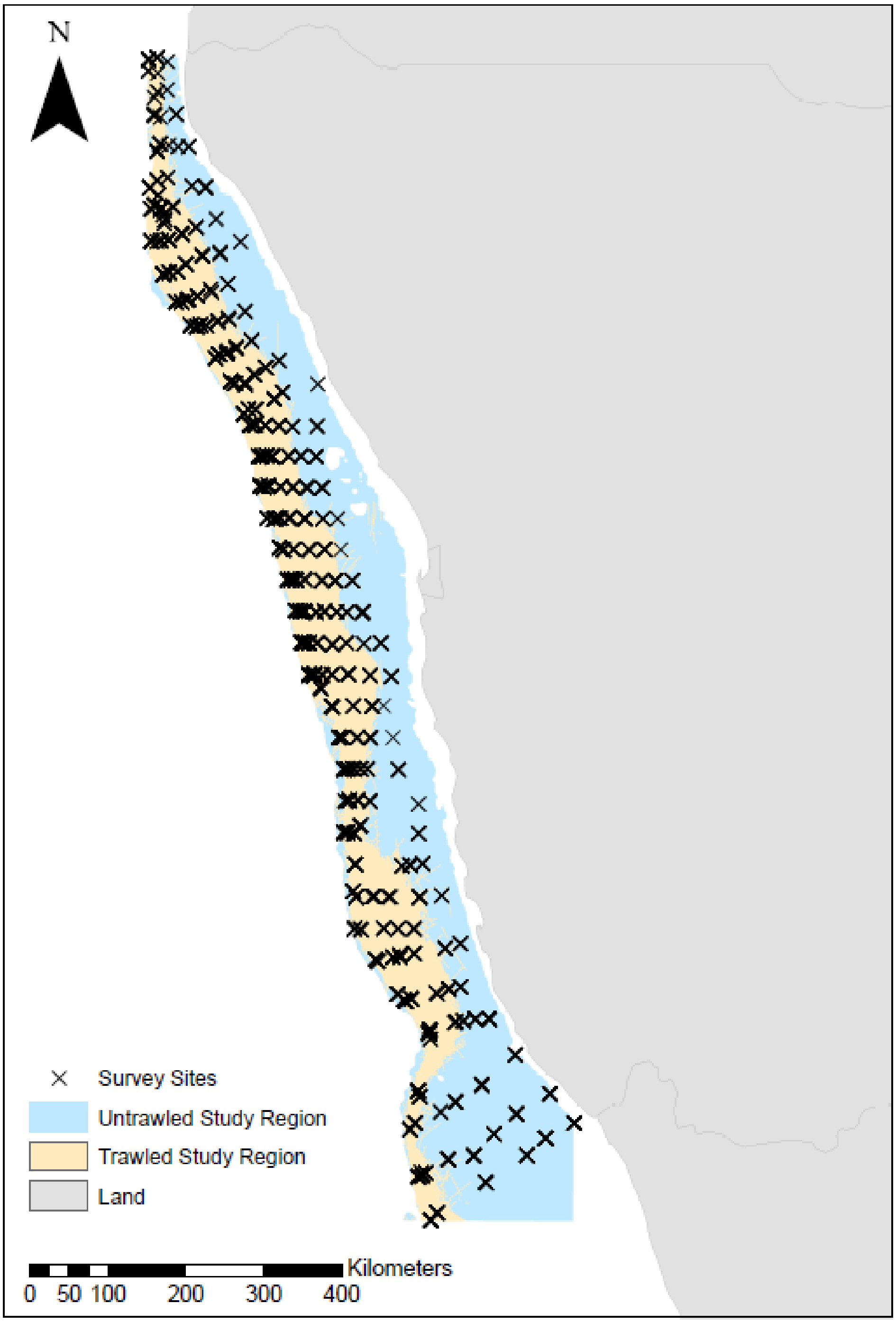


**Figure S8**. Namibia study region that was used for predicting benthic invertebrate distributions. Samples of benthic invertebrates were taken at survey sites (see Table S1 for survey details), and the area of the study region that is commercially trawled (>0) follows Amoroso et al. (2018).

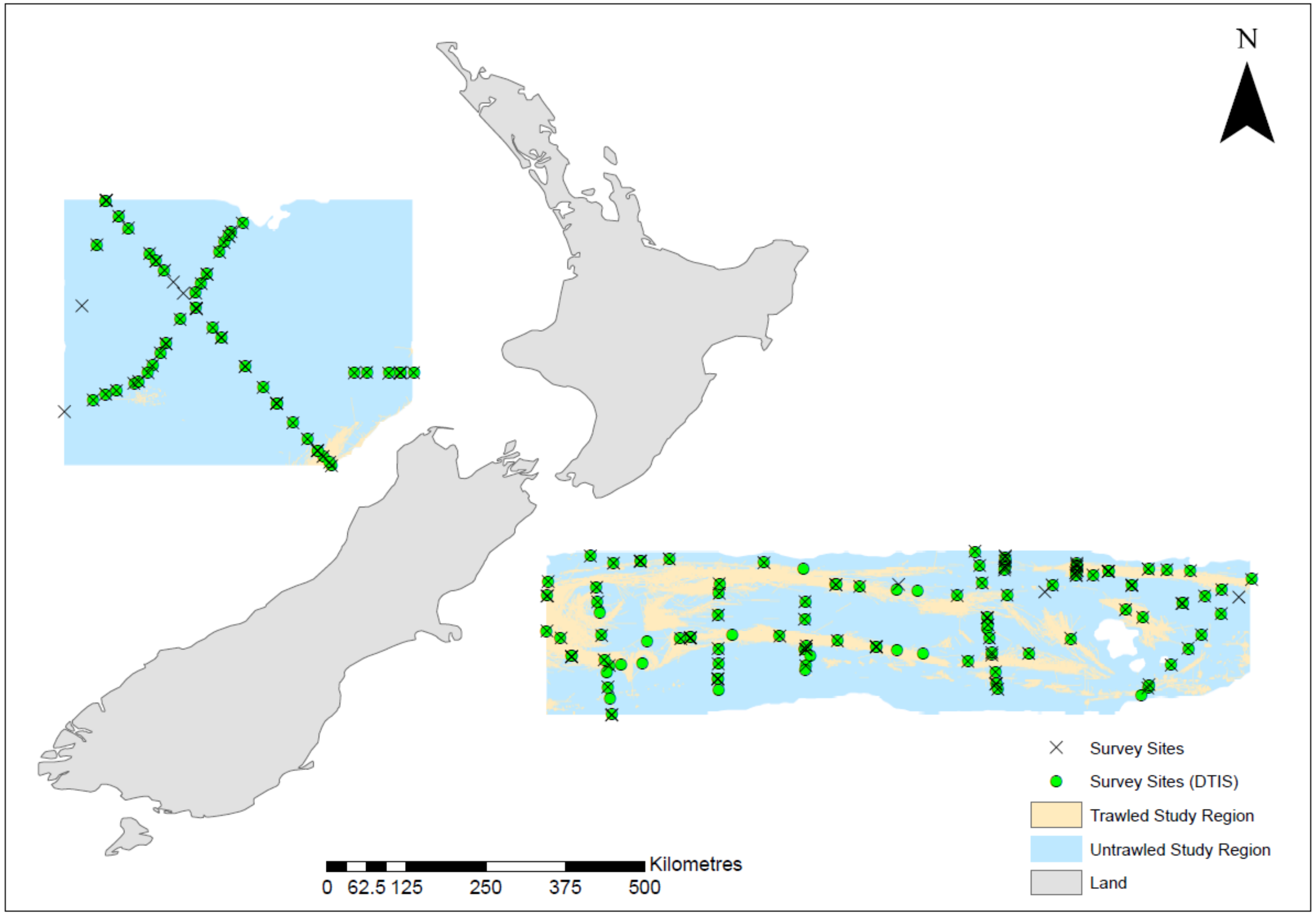


**Figure S9**. The Challenger Plateau and Chatham Rise New Zealand (Chatham–Challenger NZ) study region that was used for predicting benthic invertebrate distributions. Samples of benthic invertebrates were taken at survey sites across Challenger Plateau and Chatham Rise (see Table S1 for survey details), where sites in green indicate those using the Deep Tow Imaging System (DTIS) used for benthic imaging. The area of the study region that is commercially trawled (>0) follows Amoroso et al. (2018).

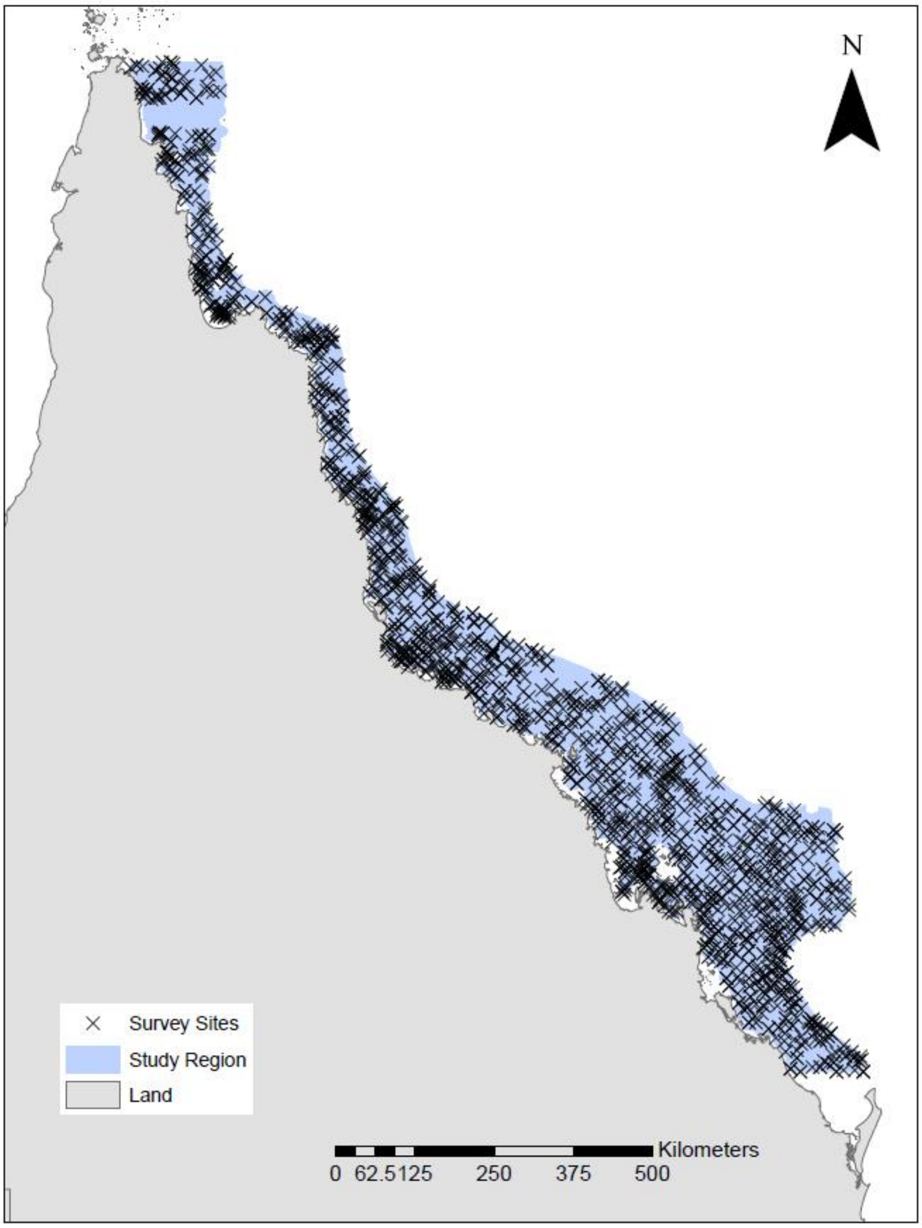


**Figure S10**. The Great Barrier Reef study region that was used for predicting benthic invertebrate distributions. Samples of benthic invertebrates were taken at survey sites (see Table S1 for survey details). As described in Amoroso et al. (2018) the trawl data cannot be presented without breaching confidentiality of fishers as there are a very low number of trawl vessels operating in this region (for more details on processing trawl effort data see Amoroso et al. 2018).

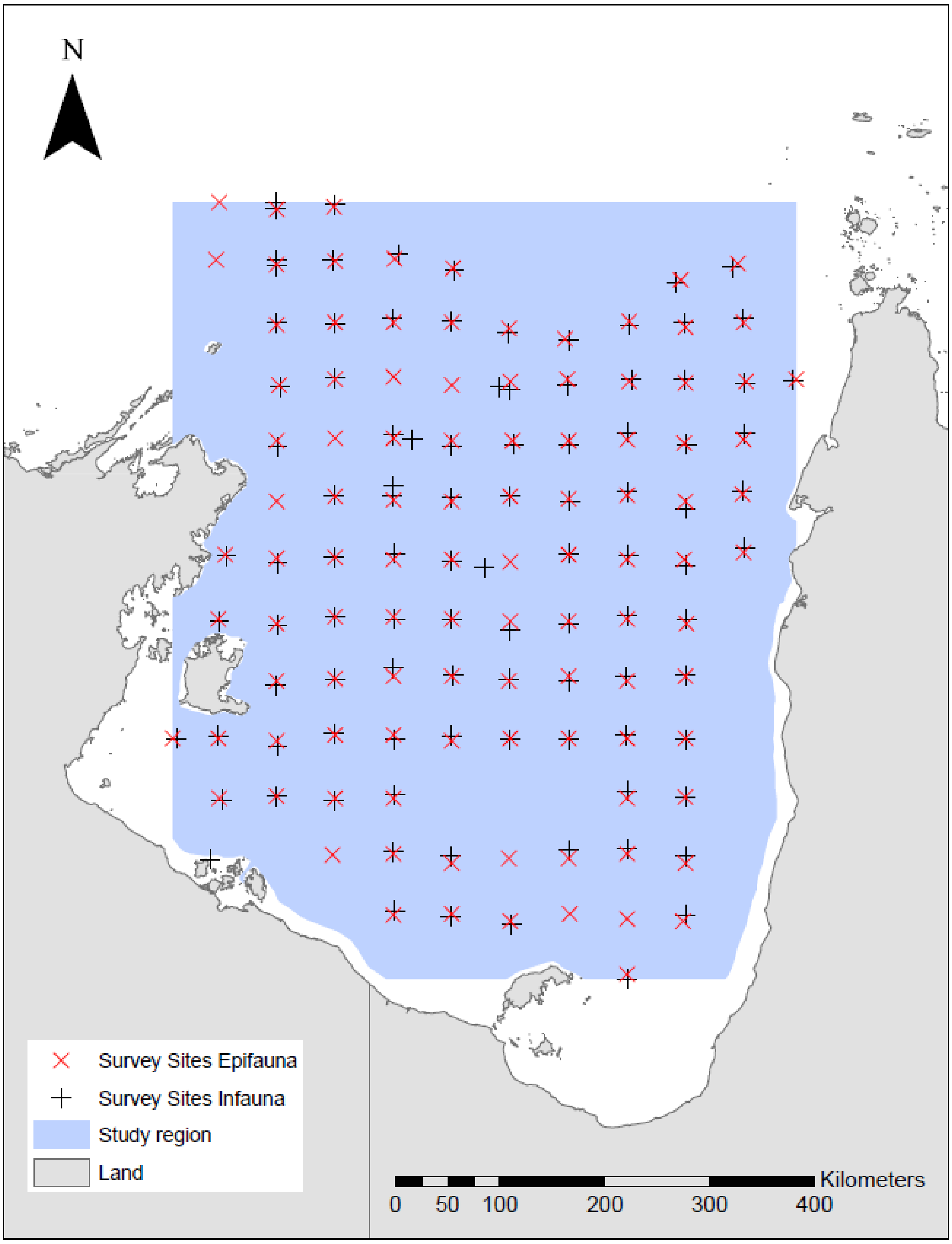


**Figure S11**. Gulf of Carpentaria study region that was used for predicting benthic invertebrate distributions. Samples of benthic invertebrates were taken at survey sites for both epifauna and infauna (see Table S1 for survey details). As described in Amoroso et al. (2018) the trawl data cannot be presented without breaching confidentiality of fishers as there are a very low number of trawl vessels operating in this region (for more details on processing trawl effort data see Amoroso et al. 2018).

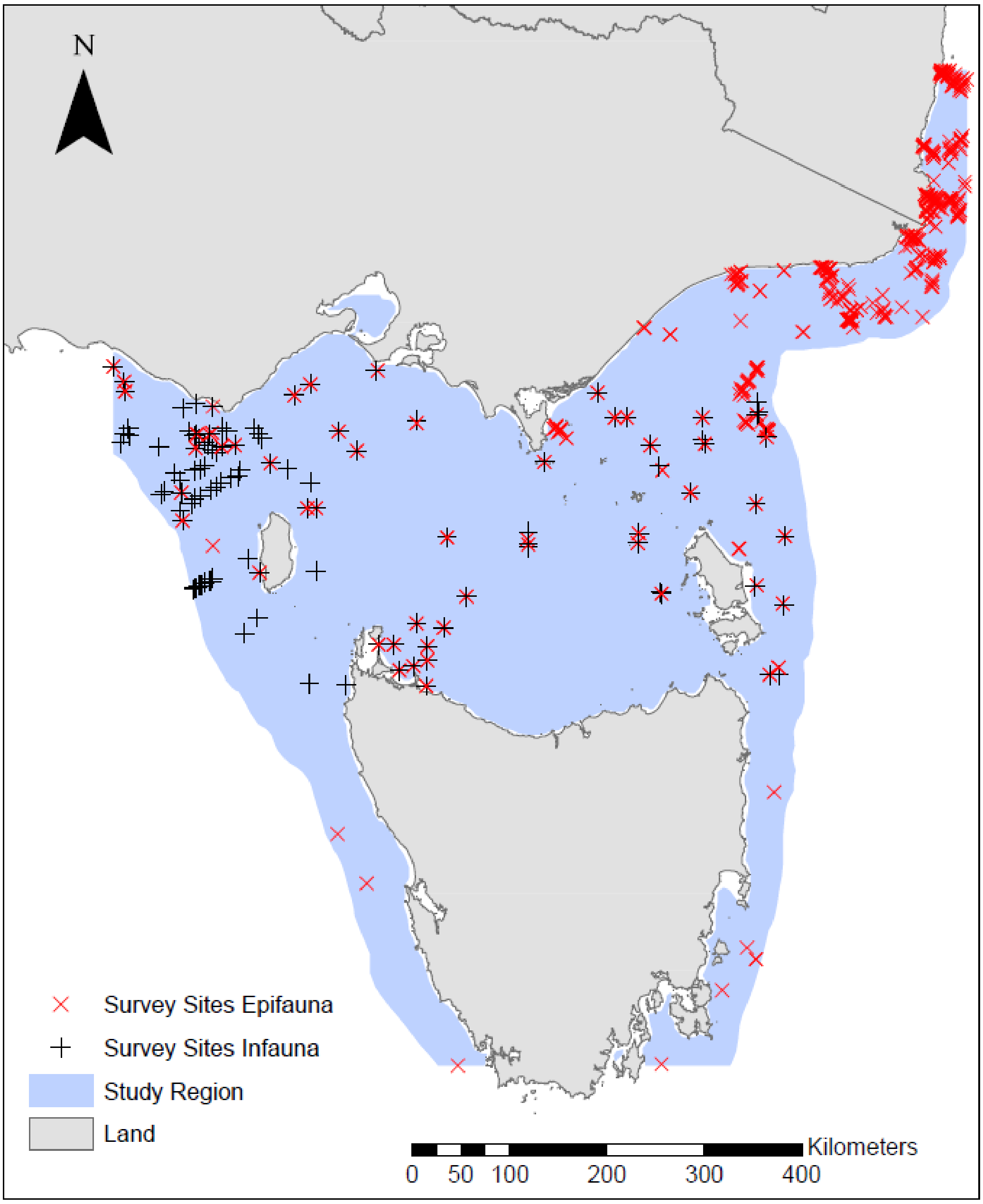


**Figure S12**. South East Australia study region that was used for predicting benthic invertebrate distributions. Samples of benthic invertebrates were taken at survey sites for infauna and epifauna (see Table S1 for survey details). As described in Amoroso et al. (2018) the trawl data cannot be presented without breaching confidentiality of fishers as there are a very low number of trawl vessels operating in this region (for more details on processing trawl effort data see Amoroso et al. 2018).

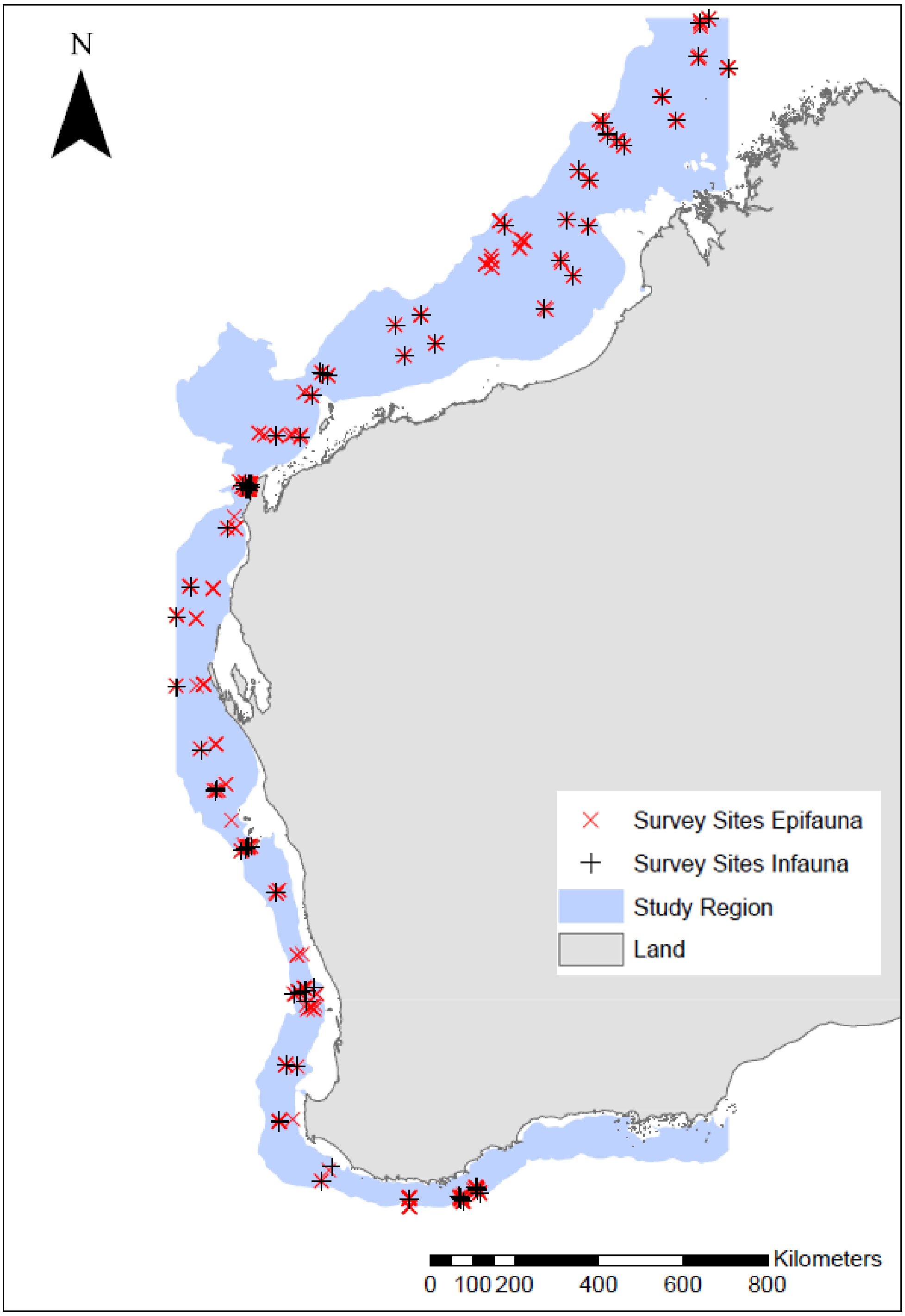


**Figure S13**. Western Australia study region that was used for predicting benthic invertebrate distributions. Samples of benthic invertebrates were taken at survey sites for infauna and epifauna (see Table S1 for survey details). As described in Amoroso et al. (2018) the trawl data cannot be presented without breaching confidentiality of fishers as there are a very low number of trawl vessels operating in this region (for more details on processing trawl effort data see Amoroso et al. 2018).

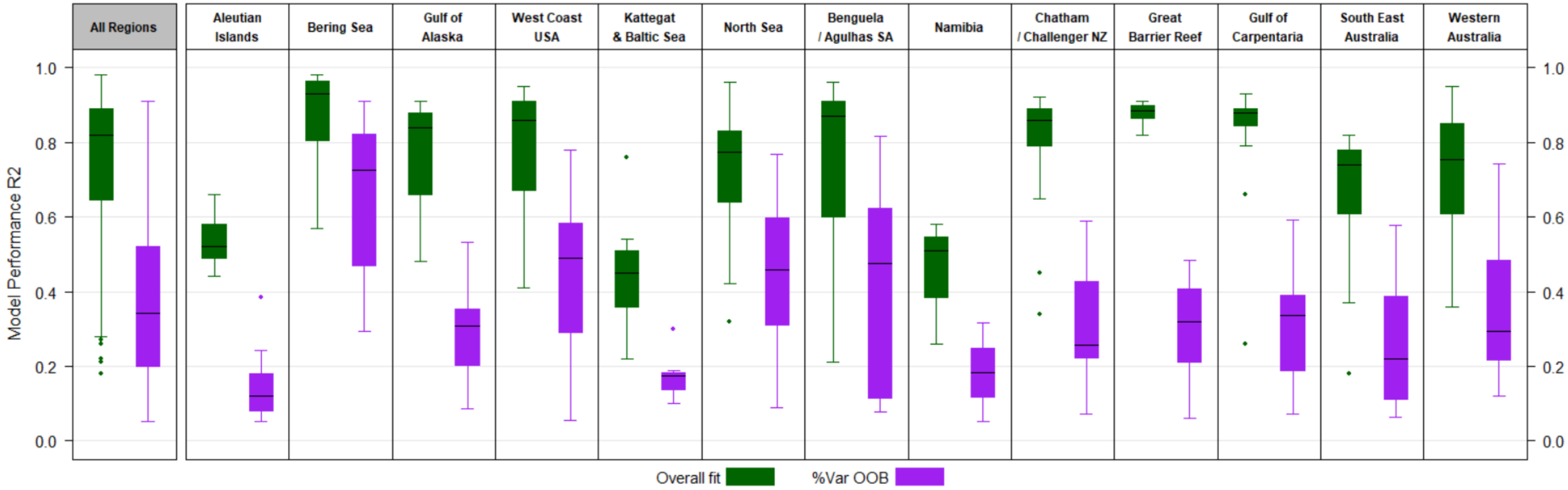


**Figure S14.** Performance of benthos-group distribution models by region showing $R^2$ of overall fit of predicted against observed values (green) and cross-validated out-of-bag $R^2$ values (%Var OOB; purple). The median value is indicated by a black line.

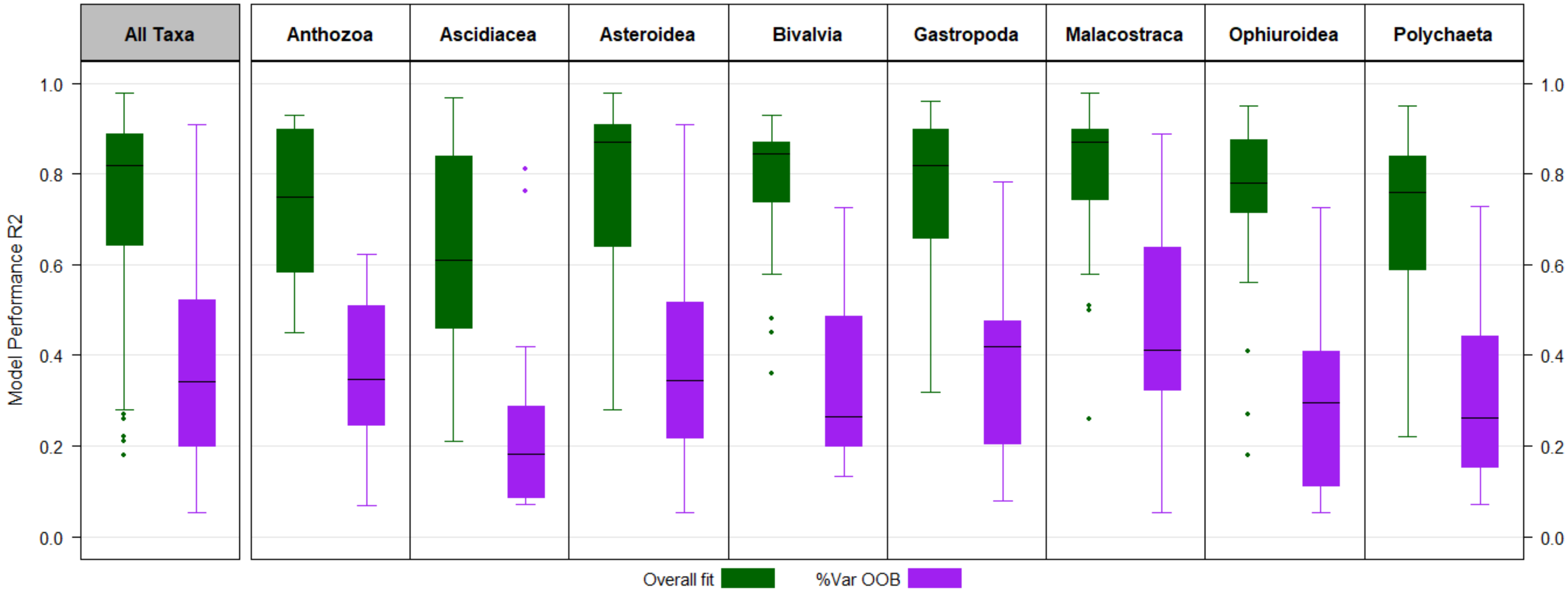


**Figure S15.** Performance of benthos-group distribution models by taxa showing $R^2$ of overall fit of predicted against observed values (green) and cross-validated out-of-bag $R^2$ values (%Var OOB purple). The median value is indicated by a black line.

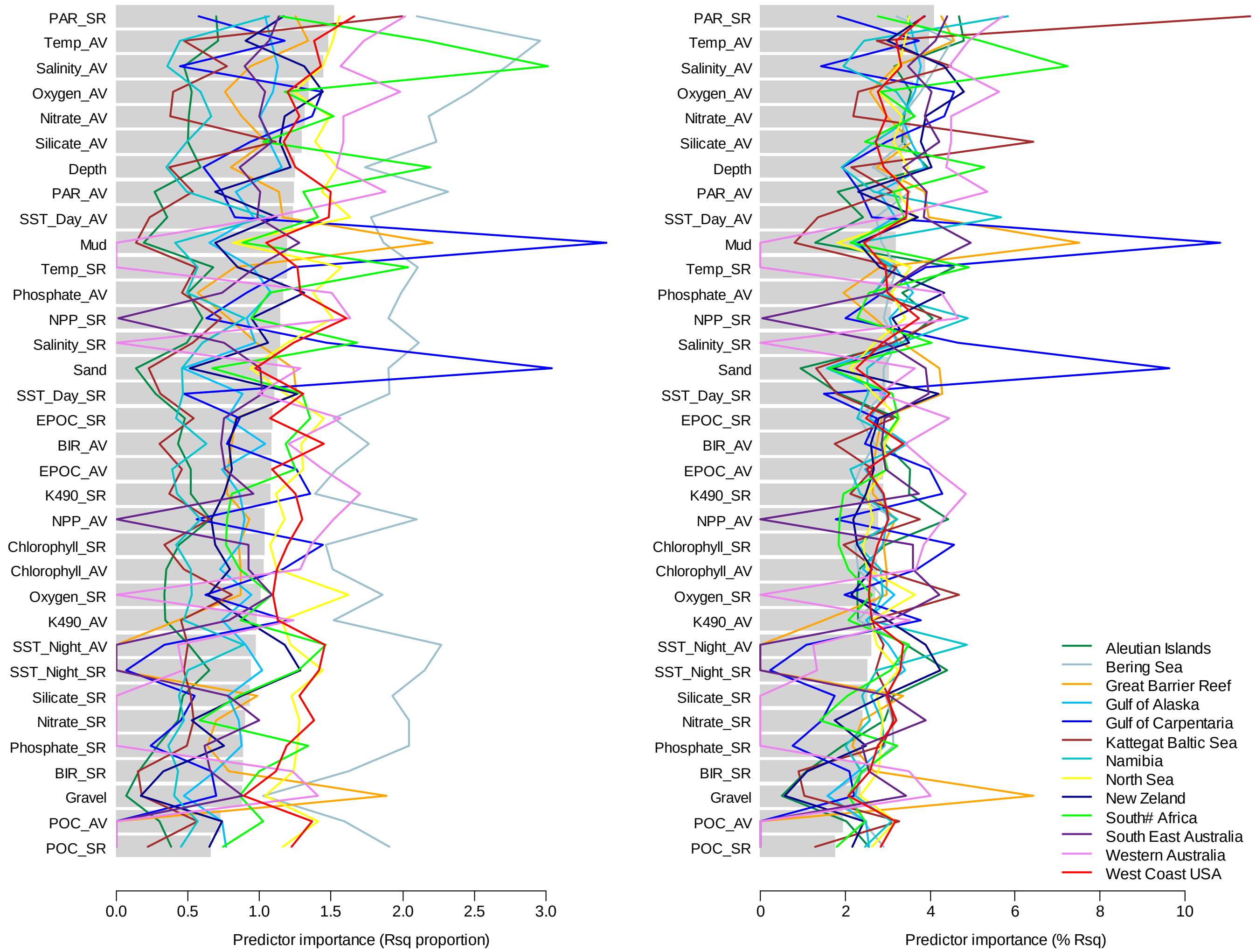


**Figure S16.** Importance of environmental predictors across all benthos-group models (grey bars) and per region (coloured lines). These were obtained by scaling variable importance (%IncMSE) to a) proportion of model OOB $R^2$, and b) percent contribution of model OOB $R^2$. See Table 2 for a list of the predictors and their descriptions.

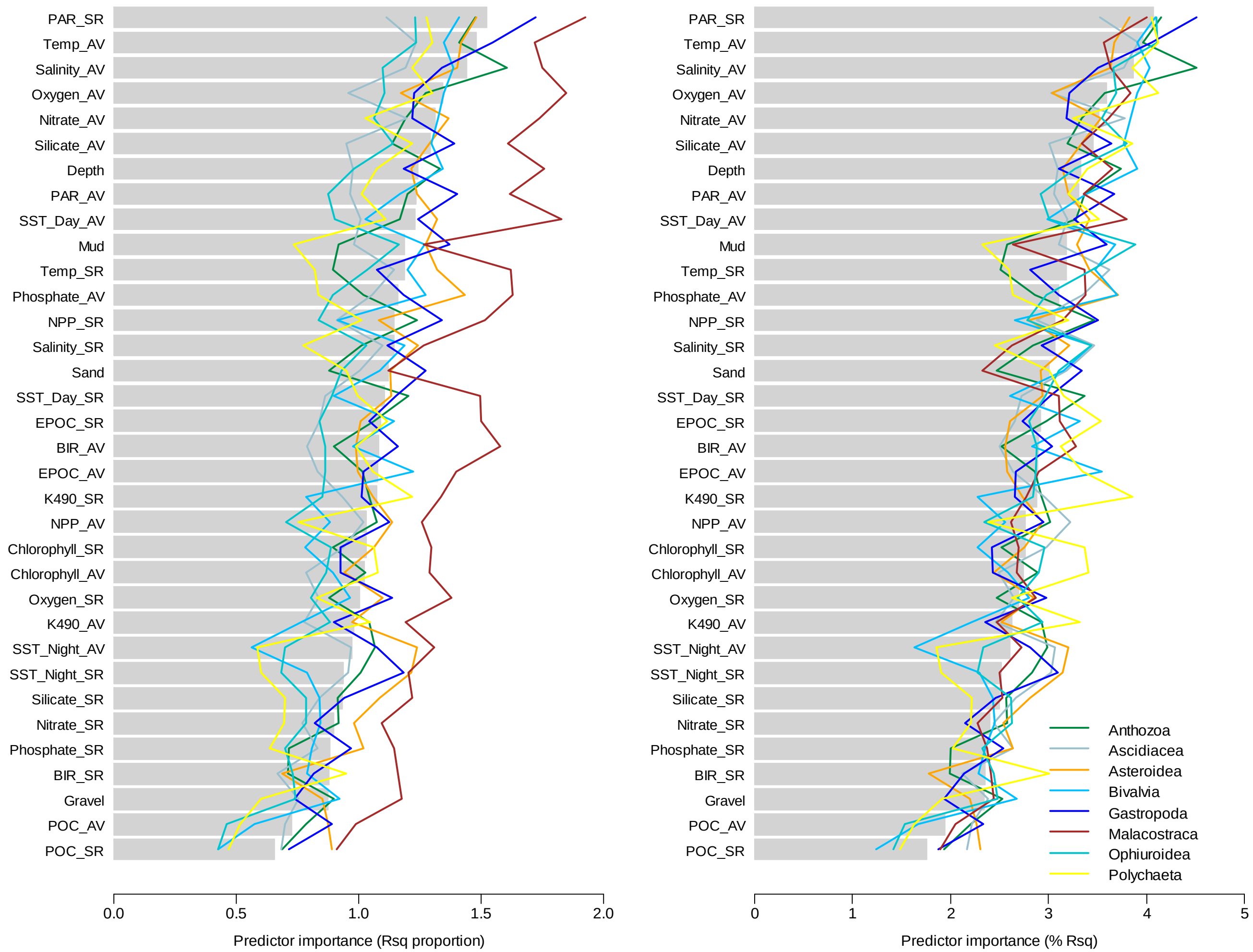


**Figure S17.** Importance of environmental predictors across all benthos-group models (grey bars) and per taxa Class (represented by coloured lines). These were obtained by scaling variable importance (%IncMSE) to a) proportion of model OOB $R^2$, and b) percent contribution of model OOB $R^2$. See Table 2 for a list of the predictors and their codes and descriptions.

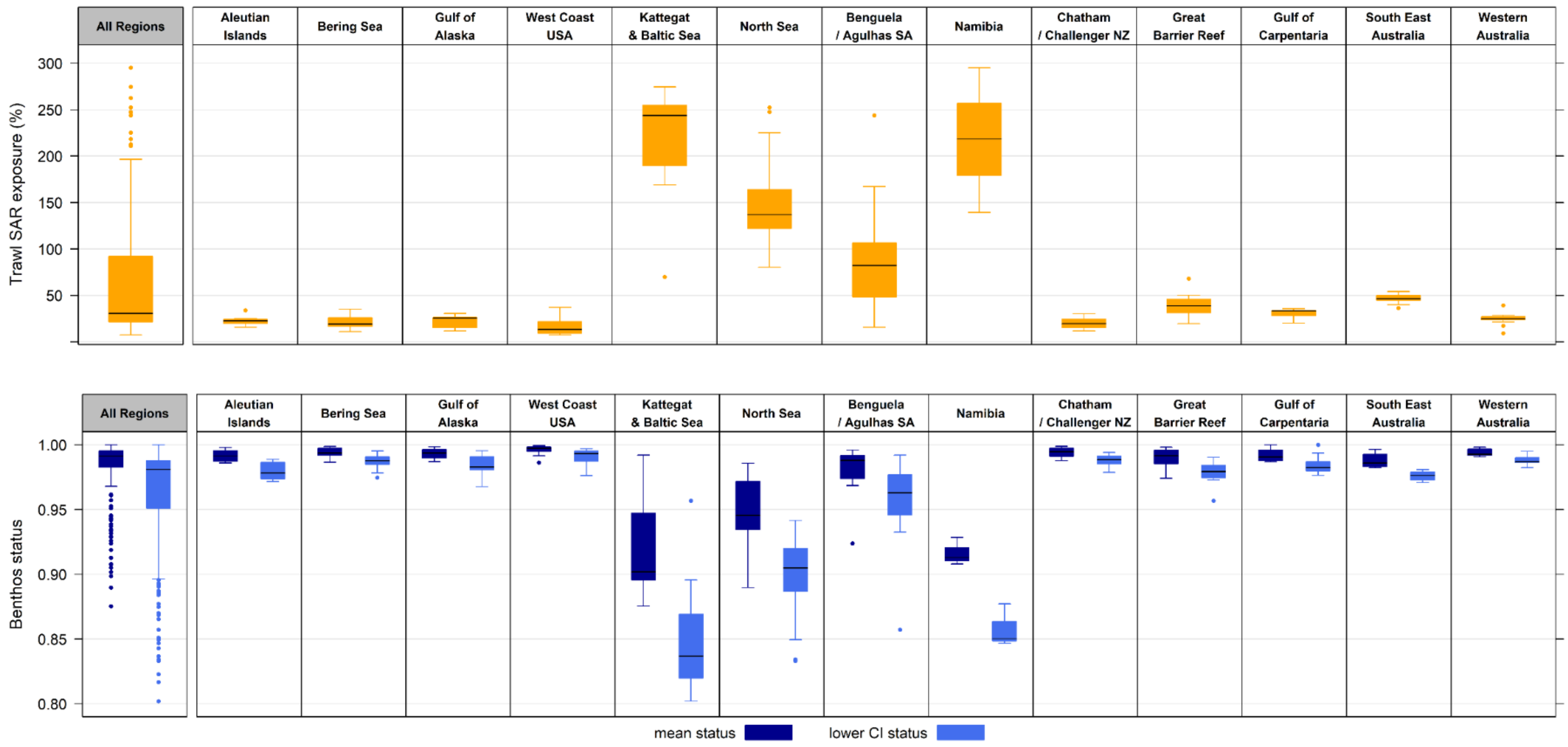


**Figure S18.** Box plots show the changes to trawl (SAR exposure) and relative status of benthos-groups using mean values and lower confidence interval for recovery when considering only trawled grounds (trawl effort >0) in our study regions (Figure S1 – S13). The black lines represent the median value.

**SI Methods:** Calculating depletion and recovery

Trawl depletion rates differ by gear types and by habitats. To account for this, the benthos class-level average depletion rates from Sciberras et al. (2018) were scaled for different gear types in proportion to the average gear depletion rates from Hiddink et al. (2017). The gear scaling of depletion was relative to the weighted-mean depletion rate of gears, where the weightings were the gear frequencies in the Sciberras et al. (2018) analysis. Similarly, the benthos class-level average depletion rates were also scaled for different habitat types according to the depletion rates for gravel, sand and mud averaged across gears from Pitcher et al. (in review, Table S3), where the habitat scaling of depletion was relative to the weighted-mean depletion of habitat frequencies in the Sciberras et al. (2018) analysis. Recovery rates were derived from the taxonomic class-level trawl-impact log response-ratios (lnRR) in Figure S1 of Hiddink et al., (2020), using the approach developed in Hiddink et al. (2017) and Pitcher et al. (in review). In this case, the equation for estimating recovery rates $R$ was: $R=dF/(1-\exp(bF))$, where $d$ is the Class-level depletion value from Sciberras et al. (2018) (Table S.X), $b$ is the lnRR standardised by trawl intensity (as swept-area ratio, SAR), and $F$ is the trawl intensity (SAR) for which $R$ is to be determined (here, $F=10^{-6}$ to estimate $R$ for effectively untrawled biota). The average SAR of studies analysed in Figure S1 of Hiddink et al. (2020) was 3.36, thus $b$=lnRR/3.36.

Recovery rates also vary with the sediment composition of habitats. To account for this, the benthos class-level average recovery rates were scaled for the percentage of gravel, sand and mud fractions of sediments according to the relationship developed by Pitcher et al. (in review, Table S4, Fig. S3B and Fig. S4). The habitat scaling of recovery was relative to the estimated recovery rate corresponding to the average sediment composition of studies included in the Hiddink et al., (2020) analysis (i.e. $R$=0.437 at 28.8% gravel, 52.3% sand and 18.8% mud). Thus, the equation for sediment scaling ratio for recovery rates $R$ was:

R_scaling_ratio = ($F$/(1-10^((a*(%gravel+1)+b*(%sand+1)+c*(%mud+1))*$F$))) / 0.437, where $F=10^{-6}$ and a = -0.0145, b = -0.0083, c = -0.0061 (Pitcher et al. in review, Table S4). The R scaling ratio ranged between ~0.67 for 100% gravel sediments up to ~1.56 for 100% mud sediments, with sand dominated sediments being intermediate.