

Latitudinal and bathymetrical species richness patterns in the NW Pacific and adjacent Arctic Ocean

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To better understand the species latitudinal and depth gradients in the NW Pacific and its adjacent Arctic Ocean, distribution records of all marine species were extracted from the Ocean Biogeographic Information System (OBIS) and Global Biodiversity Information Facility (GBIF), merged, cleaned, and taxonomically cross-matched with the World Register of Marine Species (WoRMS). We analysed 324,916 distribution records of 17,414 species from 0 to 10,900 m depth, latitude 0 to +90 degrees, and longitude +100 to +180 degrees. Species richness per c. 50 000 km² hexagonal cells were used to calculate alpha (average), gamma (total) and ES50 (estimated species for 50 records) per latitudinal band and depth zone.

ES50, gamma, and alpha species richness decreased significantly with latitude and depth. The highest number of records (73%) was of shallow water species (0 to 500 m). The Philippines and Palau Islands had the highest species richness (more than 13,000 per hexagon). Gamma species richness and mean sea surface temperature (SST) per each 5-degree latitudinal bands were significantly correlated with Ocean Area (km²) ($r = 0.89$) and SST ($r = 0.52$). The latitudinal gamma and alpha diversity increased from the equator towards the mid-latitudes (5-10°N), with a sharp increase in latitude 10°N, then further decreased at higher latitudes. The latitudes 60-70°N had the lowest gamma and alpha diversity where there is almost no ocean area available.

Keywords: latitudinal; bathymetrical; species richness; NW Pacific; Arctic Ocean