anticipated for a number of Benthic Invertebrate and Groundfish species. However, positive effects are anticipated for 17% of species including Inshore Longfin Squid, Butterfish, and Atlantic Croaker. The certainty in directional effect score varied, but was >95% for almost half of the species assessed. However, there were species with low certainty (<66%) in all three directional effect categories. By comparing across the climate vulnerability, potential for distribution change, and directional effect scores, species can be identified that are likely to increase in productivity (e.g., Black Sea Bass) or shift into the region (e.g., Atlantic Croaker) or that are likely to decrease in productivity (e.g., Winter Flounder) or shift out of the region (e.g., Atlantic Mackerel).

Evaluation of Exposure Factors and Sensitivity Attributes

Mean ocean surface temperature change (upper 10 m) and mean surface pH change were determined to be important factors in the climate vulnerability scores (Fig 6). These factors were scored as very high exposure for all species owing to the magnitude of change projected by 2055 (S9 Supporting Information). Mean surface air temperature change (as a proxy for

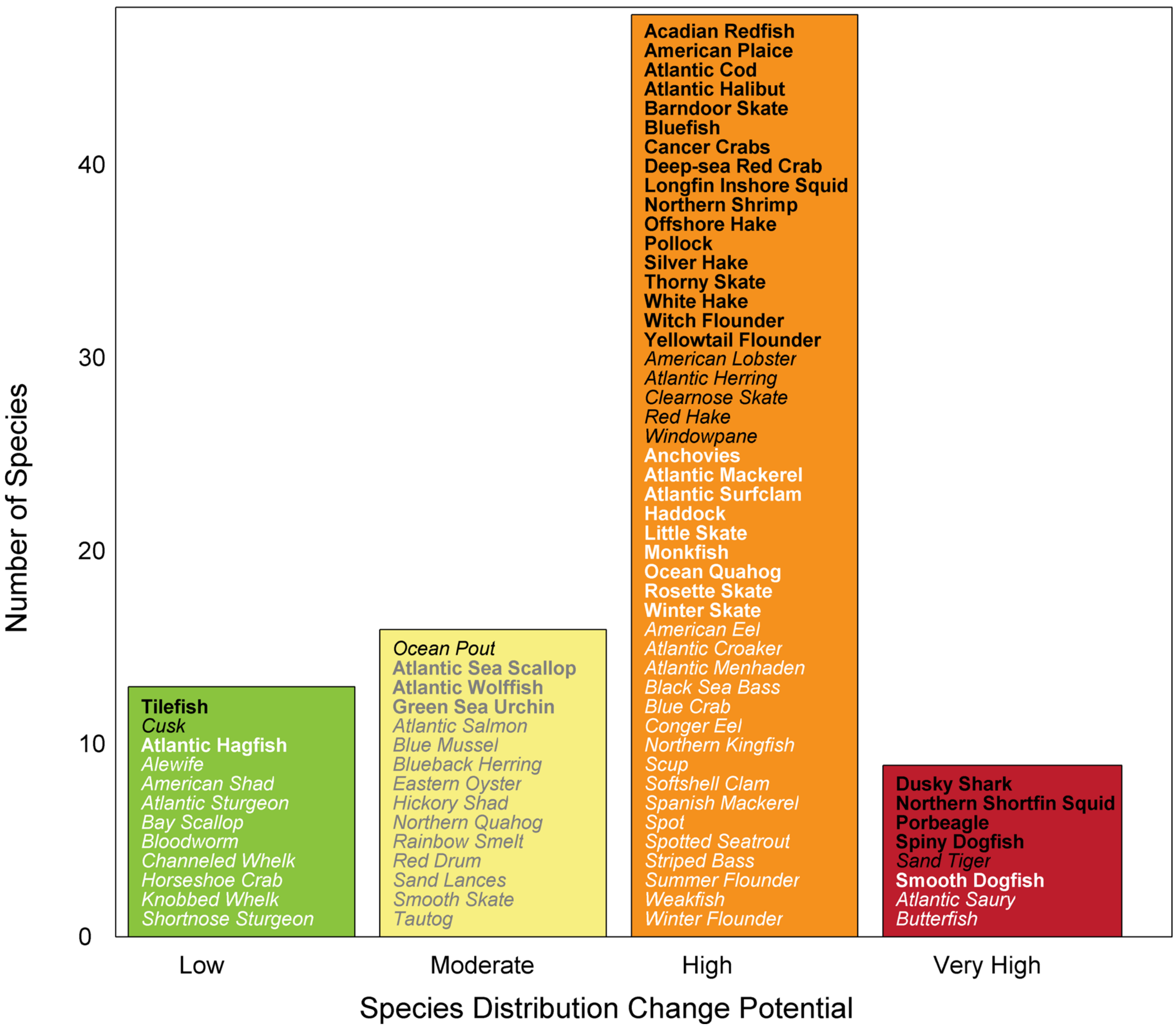

Fig 4. Potential for a change in species distribution. Potential was calculated using a subset of sensitivity attributes. Colors represent low (green), moderate (yellow), high (orange) and very high (red) potential for a change in distribution. Certainty in score is denoted by text font and text color: very high certainty (>95%, black, bold font), high certainty (90–95%, black, italic font), moderate certainty (66–90%, white or gray, bold font), low certainty (<66%, white or gray, italic font).

doi:10.1371/journal.pone.0146756.g004

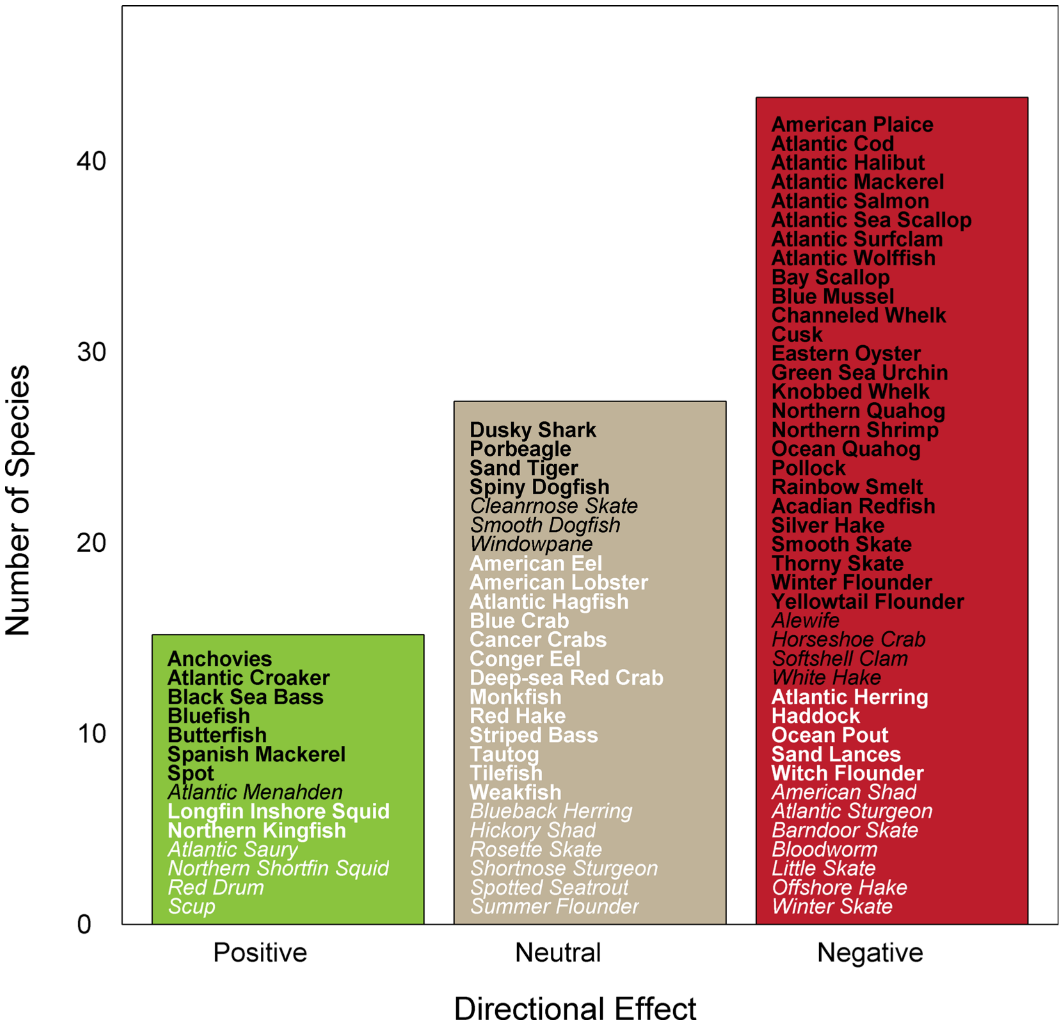

Fig 5. Directional effect of climate change. Colors represent expected negative (red), neutral (tan), and positive (green) effects. Certainty in score is denoted by text font and text color: very high certainty (>95%, black, bold font), high certainty (90–95%, black, italic font), moderate certainty (66–90%, white or gray, bold font), low certainty (<66%, white or gray, italic font).

doi:10.1371/journal.pone.0146756.g005

shallow water temperatures) and to a lesser extent sea-level rise were also important for species that were exposed to these factors (Coastal Fish and Diadromous Fish species). Exposure factors that were not as important in determining vulnerability scores exhibited a lower magnitude of change, particularly the variance of the exposure factors and mean changes in precipitation and ocean surface salinity.

The importance of sensitivity attributes varied across species and there was no subset of dominant attributes (Fig 7). All attributes were scored as very high or high sensitivity for at least one species. There were three attributes that had the strongest influence on climate vulnerability: Population Growth Rate, Adult Mobility, and Stock Status. Removal of the attributes in the sensitivity analysis changed the scores of 14, 10, and 9 species, respectively.

Functional Group Results

The effects of climate change exhibited some consistency across functional groups. In terms of overall climate vulnerability, Diadromous Fish and Benthic Invertebrate species had the