CRABS IN CRISIS: BIOGEOGRAPHIC DISTRIBUTIONS, ABUNDANCES, AND VULNERABILITIES TO CLIMATE CHANGE OF BRACHYURAN AND LITHODID CRABS FROM THE GULF OF CALIFORNIA TO THE BEAUFORT SEA

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To predict the relative vulnerability of near-coastal species to climate change we analyzed the biogeographic and abundance patterns of the brachyuran or 'True' crabs (n=368) and lithodid or 'King' crabs (n=20) that are found in the twelve MEOW ("Marine Ecosystems of the World") ecoregions between the Gulf of California (GOC) and Beaufort Sea at depths $\leq$ 200 m. To assess the vulnerability of each species we used species trait data queried from the "Coastal Biogeographic Risk Analysis Tool" (CBRAT), a web-based ecoinformatics tool created jointly by the USGS and EPA. Species richness per ecoregion increases steadily from the Beaufort (n=3) to Southern California (n=138) and more than doubles between the Magdalena and the GOC ecoregions (138 and 298 species respectively). We calculated population relative abundance values by analyzing extensive data sets augmented by qualitative data from expert taxonomists. This allowed us to assign 78% of crab species to at least a Rare, Moderate or Abundant classification. Distribution (wide, restricted, endemic, etc.) and abundance patterns (rare everywhere, abundant somewhere, population decline, etc), specialization (habitat, trophic or symbiont), and depth distribution (intertidal or bathyal) were examined for each species to predict the potential for stress or resilience to climate change. The degree of relative climate vulnerably generally follows a south to north pattern with more species rated 'highly vulnerable' in the southern warm temperate ecoregions and 'None Known/Low' in the northern Arctic ecoregions. Out of the 388 total crab species, 170 were assigned a 'high' ranking for climate vulnerability in one or more ecoregions. Traits such as commensalism, intertidal habitat, and endemicity were the three most determinant factors contributing to a high vulnerability rating. The pinnotherid crabs are the family at greatest risk largely because of their symbiotic strategy and generally rare abundances.

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