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BENTHIC POPULATION DYNAMICS AND DIVERSITY IN THE CHANGING SHELF ECOSYSTEMS OF THE BERING AND CHUKCHI SEAS

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The seasonally ice-covered Bering and Chukchi Sea shelves are currently exposed to increasing seawater temperatures and particularly in the Chukchi Sea, major reductions in seasonal sea ice cover. In these Pacific-influenced ecosystems, high biomass, abundance and diversity of benthic organisms are due to high water column production and tight benthic pelagic coupling on the continental shelf. Changes in the sea ice extent, thickness and duration are critical for influencing annual primary production of ice algae and phytoplankton and therefore have consequences for benthic populations that directly influence the functioning of the ecosystem, its trophic dynamics and organic carbon cycling. This study examined structure, function and diversity of benthic macroinfaunal organisms in the high biomass/diversity “hot spot” areas of the northern Bering and Chukchi Seas with a goal of assessing biological vulnerability to increasing temperature and sea ice reduction as well as implications for marine food web changes. Samples were taken in four high diversity and productivity areas (southwest of St. Lawrence Island, the Chirikov Basin north of St. Lawrence Island, in the southeastern Chukchi Sea north of Bering Strait, and within the head of Barrow Canyon) resulting in a collection of about 350 van Veen grabs from depths ranging from 35 to 130 m. Samples were collected at the same stations in 2007 as part of the International Polar Year Canada’s Three Oceans (C3O) project and subsequently in three consecutive years: 2010, 2011 and 2012 as part of the international Distributed Biological Observatory (DBO) program in coordination with C3O. Benthic infaunal diversity, abundance, biomass and production were determined in relationship with physical and chemical data. A longer multi-year data set was also used to compare time-series results over the last 30 years. Changes observed include: a decline and a switch in dominant bivalves species (*Nuculana radiata* and *Ennucula tenuis*), important prey for sea ducks, in the St. Lawrence Island area; a decline in tube dwelling amphipods (*Ampelisca macrocephala* and other *Ampelisca* species) while some tube dwelling polychaetes (*Ampharete* spp.) increased in abundance and biomass in the central Chirikov Basin, historically a foraging area of gray whales. There are also indications of a decline in biomass in the southeastern Chukchi Sea, which is an important foraging area for walruses. Implications of the observed changes for the ecosystem functioning and energy transfer to higher trophic levels are discussed. This study is a contribution to the international DBO (<http://www.arctic.noaa.gov/dbo/index.html>) that is being implemented in the Pacific-influenced Arctic and represents a continuation of benthic time series sampling maintained since the 1980s.