Abstract

The Bering Sea, Aleutian Islands, and Gulf of Alaska yield one of the largest sustainable fishing industries in the world. To ensure continued sustainable practices, the effects of fishing activity on the health of the ecosystem should be studied actively. Bottom-trawl gear is a sustainability concern because it directly interacts with the benthic layer. Impact from bottom-trawl fisheries is difficult to assess, particularly over the long-term. Using fishery-dependent observer data from National Marine Fisheries (NMFS) provides insight on the location and the intensity of fishing effort, which can identify areas most exposed to fishing pressure. In this study, the spatial and temporal extent of Alaskan bottom-trawl fishing effort in the Bering Sea, Aleutian Islands, and Gulf of Alaska as defined by NMFS data collected between 1993 and 2015 was explored in a space-time cube in ArcGIS Pro v1.4.1. The variables analyzed were number of hauls per area and total catch per area. Statistical techniques were used to examine spatiotemporal autocorrelation and clustering in these data. Results indicate that fishing effort was non-randomly clustered over space and time (Moran's I, and exact result and probability). A three-dimensional hot spot analysis shows which areas were most intensely fished and illustrates the long-term trends over the study period. The data were then compared with two external factors, sea ice concentration and closed marine protected areas, to determine the effect of changing regulations and climate on fishing activity. The analysis uses long-term retrospective data to examine changes in fishing effort over time in the Alaskan bottom-trawl fishery. The implementation of new MPA's in previously fished areas caused a shift in fishing effort to the still open border areas. Sea Ice had a limited effect on fishing effort spatial patterns, but certain areas in the Bering Sea exhibited increased fishing effort in years with less sea ice effect.