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Atmospheric forcing, sea-ice, and ocean current impacts on zooplankton abundance in the western Arctic Ocean

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Linkages between zooplankton abundance, ocean and ice processes, and atmospheric forcing on the northern Alaskan coast near Barrow, AK, are being explored through biological-physical modeling using the outputs of a pan-arctic ice-ocean circulation model of 1/12˚ resolution and forced by realistic air-sea fluxes and wind stress during the last decade. Euphausiids, an important prey of bowhead whales in the fall at Barrow, AK, must be transported there from the Bering Sea since at present it is believed that they are not endemic. The influence of extrinsic (Pacific) input of these organisms to the region is explored. Transport experiments show four potential trajectories and a 6 month mean transit time of euphausiids from Bering Strait to Barrow. For euphausiids seeded at the surface, the probability of reaching Barrow is only 1% in 1997 but 10% in 2002. Subsurface seeded euphausiids travel faster than surface ones, and the majority reach Barrow one month earlier in 2002 than in 1997. Westward winds during the spring followed by northward winds in summer give the highest transport success. In 1998 however, favorable winds are counteracted by the heavy ice cover. In

addition, the behavior of the local food web is examined with a one-dimensional coupled physical-biological model including the main zooplankton species. Cruise data from spring and summer 2002 and 2004 are used to calibrate and validate the model, and simulations are conducted for four contrasting years. The impact of ice-cover and atmospheric forcing variability on primary and secondary production will be quantified.