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Title: *Linkages between sea-ice coverage, pelagic–benthic coupling, and the distribution of spectacled eiders: Observations in March 2008, 2009, and 2010, northern Bering Sea*

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Icebreaker-based sampling in the northern Bering Sea south of St. Lawrence Island in March of 2008, 2009, and 2010 has provided new data on overall ecosystem function early in the annual productive cycle. While water-column chlorophyll concentrations (<25mg m^{-2} integrated over the whole water column) are two orders of magnitude lower than observed during the spring bloom in May, sea-ice algal inventories of chlorophyll are high (up to 1 g m^{-3} in the bottom 2-cm of sea-ice). Vertical fluxes of chlorophyll as measured in sediment traps were between 0.3 and 3.7 mg m^{-2} d^{-1} and were consistent with the recent deposition (days' to weeks' time scale) of chlorophyll to the surface sediments (0–25 mg m^{-2} present at 0–1 cm). Sediment oxygen respiration rates were lower than previous measurements that followed the spring bloom, but were highest in areas of known high benthic biomass. Early spring release of sedimentary ammonium occurs, particularly southeast of St. Lawrence Island, leading to bottom-water ammonium concentrations of >5 µM. These data, together with other physical, biological, and nutrient data, are presented here in conjunction with observed sea-ice dynamics and the distribution of an apex predator, the Spectacled Eider (*Somateria fischeri*). Sea-ice dynamics in addition to benthic food availability, as determined by sedimentation processes, play a role in the distribution of spectacled eiders, which cannot always access the greatest biomass of their preferred bivalve prey. Overall, the data and observations indicate that the northern Bering Sea is biologically active in late winter, but with strong atmospheric and hydrographic controls. These controls pre-determine nutrient and chlorophyll distributions, water-column mixing, as well as pelagic–benthic coupling.