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Regime shifts in the Arctic North Atlantic during the Neoglacial revealed by seabirds and precipitation isotopes on Bjørnøya, Svalbard

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The northeastern North Atlantic Ocean, and the Norwegian and Greenland Seas are subject to large hydrographic changes. These variations can influence oceanic heat transport to the Arctic, meridional overturning circulation, and atmospheric circulation patterns and thereby impact global climate patterns. Marine records suggest that numerous large-scale changes in the hydrography of the northern North Atlantic took place during the middle to late Holocene. We report a record of nitrogen and hydrogen isotope measurements from a lake sediment core from Bjørnøya, Svalbard (74.38°N, 19.02°E) that documents major regime shifts in the climate of the northern North Atlantic during the past 6,000 years. Bjørnøya is the nesting ground for one of the largest seabird populations in the North Atlantic. As top predators in the marine ecosystem, seabirds (and their guano) are enriched in 15N; during spring and summer months they deliver isotopically enriched nitrogen to nesting areas. We developed a record of seabird population changes on Bjørnøya based on the nitrogen isotope composition of sediments in a core collected from lake Ellasjøen. The record reveals multiple multicentennial scale changes in δ15N values (varying between $\sim$8-12‰ that track past changes in the size of seabird populations. From the same sediment core, we also developed a record of δD of precipitation, using δD values of sedimentary n-alkanes. Past intervals with the largest inferred bird populations correspond with the most enriched δD of precipitation, which we interpret to represent a more Atlantic climate. Periods with reduced seabird populations correspond with intervals with more negative δD of precipitation and representing a more Arctic climate. Together, the nitrogen and hydrogen isotope records signify regime shifts in the oceanography, marine ecosystem, and atmospheric circulation of the northern North Atlantic that are related to variations in the strength of the subpolar gyre.