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Seasonal patterns of climate and vegetation growth are expected to be altered by global warming. In alpine environments, the reproduction of birds and mammals is tightly linked to seasonality; therefore such alterations may have strong repercussions on recruitment. We used the normalized difference vegetation index (NDVI), a satellite-based measurement that correlates strongly with aboveground net primary productivity, to explore how annual variations in the timing of vegetation onset and in the rate of change in primary production during green-up affected juvenile growth and survival of bighorn sheep (Ovis canadensis), Alpine ibex (Capra ibex), and mountain goats (Oreamnos americanus) in four different populations in two continents. We indexed timing of onset of vegetation growth by the integrated NDVI (INDVI) in May. The rate of change in primary production during green-up (early May to early July) was estimated as (1) the maximal slope between any two successive bimonthly NDVI values during this period and (2) the slope in NDVI between early May and early July. The maximal slope in NDVI was negatively correlated with lamb growth and survival in both populations of bighorn sheep, growth of mountain goat kids, and survival of Alpine ibex kids, but not with survival of mountain goat kids. There was no effect of INDVI in May and of the slope in NDVI between early May and early July on juvenile growth and survival for any species. Although rapid changes in NDVI during the green-up period could translate into higher plant productivity, they may also lead to a shorter period of availability of high-quality forage over a large spatial scale, decreasing the opportunity for mountain ungulates to exploit high-quality forage. Our results suggest that attempts to forecast how warmer winters and springs will affect animal population dynamics and life histories in alpine environments should consider factors influencing the rate of changes in primary production during green-up and the timing of vegetation onset.

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