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Arctic Late Cretaceous and Paleocene Plant Community Succession

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The Arctic abounds with Late Cretaceous and Paleocene plant fossils attesting to a thriving, diverse, but now extinct polar ecosystem that sequestered vast amounts of carbon. Through detailed examination of plant remains and their distributions in time and space with respect to their entombing sedimentary facies, it has been possible to reconstruct changes in Arctic vegetation composition and dynamics through the Late Cretaceous and into the Paleocene. Based on over 10,000 leaf remains, fossil wood and palynomorph assemblages from northeastern Russia and northern Alaska and palynological data from elsewhere in the Arctic we identify a number of successional plant communities (SPCs) representing seral development from early (pioneer), through middle to late SPCs and climax vegetation. We recognise that (1) *Equisetites* and some ferns (typically *Birisia,* but after the beginning of the Maastrichtian, *Onoclea*) were obligatory components of the early SPCs; (2) first rare angiosperms (e.g. the dicot *Vitiphyllum multifidum*) appeared in the middle SPCs of the Arctic in the Early – Middle Albian; (3) from late Albian times onwards angiosperms became abundant in the middle SPCs of the Arctic, but were still rare in the earlier and later SPCs; (4) monocots appeared in the Maastrichtian early SPCs; (5) all Arctic Cretaceous late SPCs (and climax vegetation) were dominated by conifers; (6) Arctic SPCs were more numerous and diverse under warm climates than cold; (7) during the Albian and late Cretaceous, advanced (Cenophytic, angiosperm-dominated) plant communities coexisted with those of a more relictual (Mesophytic, dominated by ferns and gymnosperms) aspect, and plants composing these communities did not mix; (8) coal-forming environments (mires) remained conifer, fern and bryophyte dominated throughout the late Cretaceous and Paleocene with little penetration of woody angiosperm components and thus are conservative and predominantly Mesophytic in character; (9) bryophytes and ferns, with some subordinate conifers, make up a persistent raised mire climax community that is most widely developed in late Albian, Cenomanian and Campanian times, with the Campanian exhibiting particularly high levels of bryophyte diversity; (10) general Cretaceous SPC characteristics were maintained into the Paleocene due to migrations from northeastern Russia into the more northerly northern Alaska and the lack of high levels of extinction. The earliest Paleocene communities are, however, poorly understood as yet and temporarily may have had a different character. These observations attest to Arctic vegetation displaying persistent structure and dynamics despite a general late Cretaceous cooling trend and events at the Cretaceous-Paleocene transition.