

Distributions of 40 Rare Vascular Plants in the Alatna River Drainage of the Central Brooks Range, Alaska

Abstract

Forty rare plants were collected beyond their known distribution ranges on the south slope of the Brooks Range given by Hulten (1968). Twenty-two of the 40 species distributions suggest northward post-Pleistocene migration from southern refugia. The habitat preference of *Campanula aurita* and *Cypripedium calceolus* subsp. *parviflorum* for dry south-facing limestone outcrops suggests possible survival as part of the Pleistocene steppe tundra flora.

Introduction

Remote regions of Alaska are receiving more scientific attention which is bridging gaps in species distribution knowledge. Species reported here are important because they were collected beyond the range given by Hulten (1968). They add to recent range extensions for other parts of Alaska (Kelso 1983, Phillips 1983).

Glacial events and vegetation refugia influence the present distribution patterns in the Alatna River drainage. Post-Pleistocene vascular plant migrations into and within the region are dynamic, emphasizing the requirement of contemporary floristic surveys for detailed distribution mapping and phytogeographical interpretation.

The Alatna drainage has received little botanical attention until recently because it has been accessible only by foot, small boat, and aircraft. In recent years access to the area has improved considerably. Jordal (1951) completed a floristic collection along the southern portion of the drainage. Murray (1978) collected around the confluence of the Nahtuk Creek and the Alatna River, and at the Alatna headwaters, and is compiling a summary of the floristic records of the last ten years for the state of Alaska. Cooper (1983) collected in the alpine area of the Arrigetch headwaters.

Collection Area

The Alatna drainage (67°30'N, 154°W) is situated in the newly designated Gates of the Arctic National Park. It transects the northern

latitude white spruce, *Picea glauca* (Moench) Voss, forest-tundra ecotone. The area is covered by the Survey Pass Quadrangle of the U.S. Geographic Society topographic map series (scale 1:250,000). The upper drainage is approximately 90 km wide and 150 km long with bedrock types of granite, metasedimentary limestones, and unmetamorphosed shales and sandstones (Nelson and Grybeck 1980, 1981). Small cirque glaciers in the South Arrigetch, Arrigetch, Awlinskyak, and Unakserak Creek Valleys survive the three major glacial advances which occurred in the southern Brooks Range (Hamilton 1966, 1981, 1982). The climatic regime follows a maritime (west) to continental (east) gradient across the drainage (U.S. Environmental Data Service 1977).

Methods

Plants were collected in the drainage during the summers of 1978, 1981, and 1982. Species occurrences were recorded for the eight main tributaries of the upper Alatna drainage (Figure 1). Specimens were verified by Ron Hartman of the University of Wyoming and David Murray of the University of Alaska. The *Antennaria* species were verified and retained by Ledyard Stebbins of the University of California, Davis. Other voucher specimens are deposited at the RM herbarium in Laramie, Wyoming.

Results

Of the 282 species collected in the Alatna River drainage 40 are range extensions (Table 1). Reported species were found beyond the solid lines and in gaps within the predicted ranges (cf. Hulten 1968). The fact that 14 percent of the

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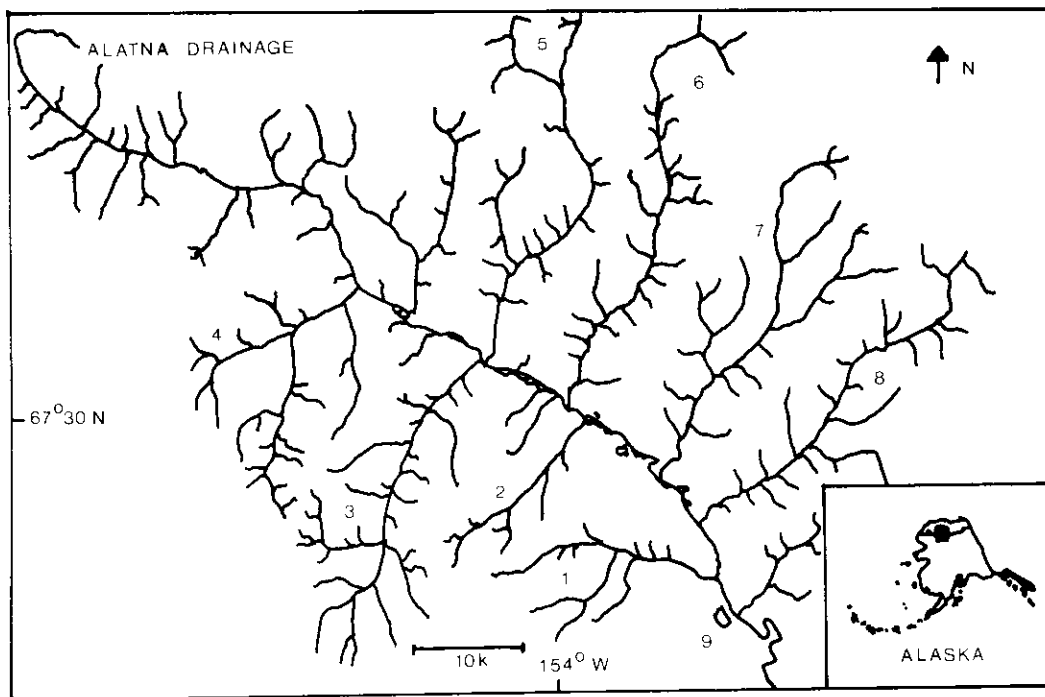


Figure 1. Location of the collection sites within the Alatna River drainage on the south slope of the Brooks Range. The insert shows the position of the Alatna drainage on the latitudinal boundary between the forest and tundra vegetation. The valley sites are: 1—South Arrigetch (67° 26N, 153° 58W), 2—Arrigetch (67° 27N, 154° 05W), 3—Awlinskyak (67° 24N, 154° 40W), 4—Akabluak (67° 33N, 154° 40W), 5— Unakserak (67° 46N, 154°W), 6—Kutuk (67° 44N, 153° 48W), 7—Pingaluk (67° 40N, 153° 30W), 8—Nahtuk (67° 34N, 153° 14W), and 9—along the Alatna River (66° 30N-67° 38N, 153° 15W-154° 30W).

collected flora were found beyond the recorded distribution demonstrates the great potential for finding range extensions in this part of Alaska. A complete list of the 282 species and collection localities is given in Odasz (1983).

Distributions of 22 of the 40 plants show a similar pattern. Their main distribution is south of the Brooks Range. Eleven of these are species limited to North America, 2 are amphi-Pacific, 2 are amphi-Atlantic and 6 are circumpolar plants. The rest of the species have wider distributions in Alaska, occurring in the alpine or on both sides of the Brooks Range.

Discussion

At the higher latitudes, following ice recession, plants moved north and west in Norway (Hulten 1971, Wright 1977) and in Alaska (Hopkins *et al.* 1981). The northward expansion of conifers and associated species in the Alatna drainage, after

deglaciation 10,800 years ago (Hamilton 1982), is supported by recent vegetation (Odasz 1983), palynological (Brubaker *et al.* 1983), pedogenic (Ugolini *et al.* 1981) and radiocarbon (Hamilton and Brubaker 1982, Hopkins *et al.* 1981) data which corroborate earlier observations (Griggs 1934, Marshall 1970).

Such a northward route may have been followed by herbaceous species from ice-free refugia. Plants with main distributions south of the Brooks Range penetrate the altitudinal boundary of the range in favorable sites along drainages. Good examples include: *Mertensia paniculata* var. *paniculata*, *Amerorchis rotundifolia*, *Campanula rotundifolia*, and *Cypripedium calceolus* subsp. *parviflorum*.

Mertensia paniculata is abundant in moist, shaded treelimit stands and on gravel bars in only the Awlinskyak site and one other site 25 km south of the Awlinskyak-Alatna Rivers confluence.

TABLE 1. Rare species and range extensions. Nomenclature follows Hulten (1968). For a detailed description of habitat and location see Odasz (1983).

Lycopodiaceae
<i>Lycopodium alpinum</i>
<i>Lycopodium complanatum</i>
Aspidiaceae
<i>Dryopteris dilatata</i> subsp. <i>americana</i>
Juncaginaceae
<i>Triglochin palustris</i>
Cyperaceae
<i>Carex aurea</i>
<i>Carex concinna</i>
<i>Carex krausei</i>
Orchidaceae
<i>Cypripedium calceolus</i> subsp. <i>parviflorum</i>
<i>Amerorchis rotundifolia</i>
<i>Listera borealis</i>
Betulaceae
<i>Betula papyrifera</i> subsp. <i>humilis</i>
Ranunculaceae
<i>Ranunculus gelidus</i> subsp. <i>grayi</i>
Brassicaceae
<i>Draba cana</i>
<i>Draba longipes</i>
<i>Parrya nudicaulis</i>
Saxifragaceae
<i>Saxifraga oppositifolia</i> subsp. <i>smalliana</i>
<i>Saxifraga flagellaris</i> subsp. <i>setigera</i>
<i>Saxifraga spicata</i>
<i>Saxifraga nivalis</i>
Rosaceae
<i>Rubus arcticus</i> subsp. <i>acaulis</i>
<i>Potentilla biflora</i>
<i>Potentilla virgulata</i>
<i>Geum glaciale</i>
<i>Dryas drummondii</i>
Fabaceae
<i>Astragalus nutzotinensis</i>
<i>Oxytropis campestris</i> subsp. <i>jordalii</i>
<i>Oxytropis deflexa</i> var. <i>foliolosa</i>
<i>Oxytropis koyukukensis</i>
Pyrolaceae
<i>Moneses uniflora</i>
Ericaceae
<i>Ledum palustre</i> subsp. <i>groenlandicum</i>
<i>Oxycoccus microcarpus</i>
Gentianaceae
<i>Gentiana propinqua</i> subsp. <i>propinqua</i>
Boraginaceae
<i>Mertensia paniculata</i> var. <i>paniculata</i>
Scrophulariaceae
<i>Castilleja pallida</i> subsp. <i>elegans</i>
Campanulaceae
<i>Campanula aurita</i>
Asteraceae
<i>Erigeron acris</i> var. <i>elatus</i>
<i>Antennaria monocephala</i> subsp. <i>monocephala</i>
<i>Antennaria isolepis</i>
<i>Crepis elegans</i>

According to Hulten (1968) this boreal species is limited to woods and riverbanks and covered an extensive area to the south before the maximum Wisconsin glaciation. Subsequently it expanded into the ice free areas (Hulten 1937). *Amerorchis rotundifolia* was found only on the moist hummocks close to Kutuk Lake. It has a similar history to *M. paniculata* (Hulten 1937).

Campanula aurita and *Cypripedium calceolus* subsp. *parviflorum* were found on steep south-facing limestone bluffs above the Alatna River. The *Cypripedium* subspecies was found to the south along the Bettles River by Harmes in 1973 and may occur along the limestone belt of the southern Brooks Range (Murray personal communication). The present distribution and ability of these two species to persist in cold, xeric sites suggest their possible survival in the Pleistocene steppe tundra vegetation.

The *Antennaria isolepis* collection bridges the wide distribution gap from the Yukon River to the Colville River on the Arctic slope.

Exotic and weedy species are also expected to invade the Alatna drainage of the Gates of the Arctic National Park. Visitation from surrounding settlements, airports and regions outside of Alaska increases the potential for species introduction. (Hence: check your cuffs!)

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