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NOTES ON CRYPTOGAMIC PLANTS OF UTAH:
RANGE EXTENSIONS AND SPECIES NEW TO THE STATE
FROM CAPITOL REEF NATIONAL PARK

John R. Spence¹

Key words: cryptogamic plants, Capitol Reef National Park, Utah, Wayne County, Garfield County.

A recent floristic survey of Capitol Reef National Park, situated in Wayne and Garfield counties in south central Utah, has added many species to its flora (Heil 1990), including numerous rare and endangered species. Because of the great diversity in landforms, elevations, and attendant topographic relief, portions of the Waterpocket Fold in the park have been found to harbor a remarkable number of rare species as well as disjuncts from other areas in the state and the western U.S. (Spence 1987). Several of these are bryophytes, which as a group have less well known distributions in the western U.S. than the vascular plants (Spence 1988).

Additional fieldwork during the 1989–90 season has located several species either new to the state or to Wayne County and Capitol Reef National Park. These include the fern *Dryopteris filix-mas*, and the mosses *Abietinella abietina* and *Leskeella nervosa*. A major range extension is also noted for the moss *Isopterygium pulchellum*. Below, each of the new reports is discussed, along with habitat information, associated species, and regional significance.

The park has a semiarid climate, with hot summers and moderately cold winters. At park headquarters in Fruita (1675 m), average annual precipitation is 18.3 cm, with about 30% falling as late-summer (July–August) thunderstorms. The average July maximum temperature is 19.1 C, while the average January minimum is –21.9 C (park service data, 1948–1986).

Abietinella abietina (Hedw.) Fleisch.

UTAH: Wayne Co., Capitol Reef National Park, on dry, shaded Kaibab limestone under *Pseudotsuga menziesii*, middle part of Fremont Gorge, with *Symphoricarpos oreophilus* and *S. longiflorus*. Ele. 1800 m, 38°16'N, 111°17'W, T29S R6E Sec. 21. October 6, 1989. Spence 4104 (deposited in park herbarium).

This is the first report of living material of this species for Utah. The closest known locality for *Abietinella abietina* is a population in Dinosaur National Monument, Moffat County, Colorado (Flowers 1973). The park locality is an unusual habitat for the species, as it is in a relatively low-elevation, semiarid canyon. In the Pacific Northwest *Abietinella* is common at montane and subalpine elevations in the drier parts of the Cascade and Coast mountains (Lawton 1971). The species is found occasionally on dry rock over a wide elevational range in Colorado (Weber 1973).

The stand of Douglas-fir under which the moss was found may be relictual, as it is isolated elevationally from the main forest populations in south central Utah, which usually occur above 2100 m. The distribution and nature of this, as well as other isolated Douglas-fir stands on the Colorado Plateau (e.g., Brotherson et al. 1985, Tuhy and MacMahon 1988), suggest that they may be late Pleistocene–early Holocene relicts. The presence of *Abietinella abietina*, a boreal-arctic moss most common at montane to subalpine elevations in the western U.S., supports this. Remarkably, Betancourt (1984) has

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reported rare macrofossil material of *Abietinella* from Allen Canyon and Fishmouth Caves, ca. 140 km to the southeast of Capitol Reef National Park and near the Abajo Mountains, with radiocarbon ages of 3000–11,000 years and 3700 years, respectively. At least in the Allen Canyon Cave sequence, all packrat middens with *Abietinella* macrofossils also contained *Pseudotsuga menziesii* material.

Isopterygium pulchellum
(Hedw.) Jaeg. & Sauerb.

UTAH: Wayne Co., Capitol Reef National Park. On dry, shaded vertical face of Wingate Sandstone, side canyon of Cohab Canyon, near campground. With *Fissidens bryoides* and *Pseudoleskeella tectorum*. Ele. 1750 m, 38°17'N, 111°14'W, T29S R6E Sec. 23. November 2, 1989. Spence 4118. Also on dry Navajo Sandstone in shaded, humid crevice, just south of Blowout Flats, northeast of Golden Throne. With *Dryopteris filix-mas*, *Desmatodon obtusifolius*, *Pohlia nutans*, and *Amblystegium serpens* var. *juratzkanum*. Ele. 2000 m, 38°14'N, 111°11'W, T30S R7E Sec. 4. May 24, 1990. Spence 4135a (both deposited in park herbarium).

Isopterygium pulchellum has been reported once before from Utah (Summit County, Uinta Mountains, at an elevation of 2713 m; Flowers 1973). In western North America, it is most common on humid, shaded wood and soil in coniferous forests and is restricted to high-elevation spruce-fir forests in the southern Rocky Mountains (Ireland 1969, Lawton 1971, Weber 1973). The habitat the plants grew in, shaded Navajo and Wingate sandstones in a semiarid climate, is highly unusual for this species. The plants were restricted to the deepest, most heavily shaded recesses of cracks and are probably never exposed to direct sunlight. They appear to survive only because of a combination of shading and funneling of precipitation into the cracks from rock faces above.

Leskeella nervosa (Brid.) Loeske

UTAH: Wayne Co., Capitol Reef National Park. On thin, dry, shaded soil on ledge of Navajo Sandstone, amphitheater directly north of Pioneer Register and west of Capitol Gorge Tanks. With *Petrophytum caespitosum* and *Selaginella mutica*. Ele. 1800 m, 38°16'N, 111°17'W, T30S R7E Sec. 9. October 24, 1989. Spence 4109a (deposited in park herbarium).

In a recent revision of *Pseudoleskeella*, Wilson and Norris (1989) reported *P. sibirica* (Arn.) P. Wilson & Norris (= *Leskeella ner-*

vosa var. *sibirica*) from Utah and distinguished it from *P. nervosa* using leaf and asexual reproductive characters. Using their key, I was able to clearly identify the park plants as *P. nervosa*, inasmuch as they possess asexual brood bodies and the leaves on the upright branches have a strong costa extending somewhat obscurely into the acumen. This is the first report of *Leskeella* (*Pseudoleskeella*) *nervosa* for Utah. As it is found in Arizona, California, and Idaho, its presence in Utah is not unexpected. I agree that *Leskeella* and *Pseudoleskeella* are very close (Wilson and Norris 1989); however, I prefer to maintain them as separate genera for now, based on the occurrence of asexual brood bodies in the former but not the latter.

Dryopteris filix-mas (L.) Schott

UTAH: Wayne Co., Capitol Reef National Park. In humid crevice in Navajo Sandstone, just south of Blowout Flats northeast of Golden Throne. With *Cymopterus beckii*, *Erigeron maguirei*, *Desmatodon obtusifolius*, *Pohlia nutans*, and *Amblystegium serpens* var. *juratzkanum*. Ele. 2000 m, 38°14'N, 111°11'W, T30S R7E Sec. 4. July 23, 1990. Spence & Mason 4137 (deposited in park herbarium).

New to Wayne County and Capitol Reef National Park, *Dryopteris filix-mas* has been collected in five other localities in Utah, once each in Garfield, Sanpete and Salt Lake counties, and twice in Washington County (Albee et al. 1988). The closest population is the one in Garfield County. The park plants were growing in a narrow, shaded crevice in Navajo Sandstone in an area of high topographic relief in the Waterpocket Fold of the park, just south of a pristine aeolian grassland/*Pinus ponderosa* woodland complex called Blowout Flats. Three rare species, *Erigeron maguirei* (listed endangered), *Gilia caespitosa* (category 1 species), and *Cymopterus beckii* (category 2 species), were also growing in the crevice. *Dryopteris* is a common circumboreal fern, abundant in the Pacific Northwest and the northern Rocky Mountains. Further south, it is found in scattered localities in the mountains south to New Mexico and Arizona (Cronquist et al. 1972). The habitat of the park population, at middle elevations in semiarid slickrock, is atypical compared with traditional northern habitats.

DISCUSSION

All species in this report are rare in Utah and Capitol Reef National Park. The mosses are sterile, while *Dryopteris* produces abundant sori. Unusual habitats, rarity, and disjunct distribution patterns suggest that all these species are relicts from a previous period when climates in the region were milder and wetter, probably the late Pleistocene or early Holocene (Betancourt 1984). All are associated with species, including *Pinus ponderosa*, *Symphoricarpos oreophilus*, *Petrophytum caespitosum*, *Arctostaphylos patula*, *Cymopterus beckii*, and *Gilia caespitosa*, which are at or below their typical lower elevational limits in south central Utah (Welsh et al. 1987). For example, small stands of *P. ponderosa* are found as low as 1800 m in the Fold, where they consist almost exclusively of large (>50 cm dbh) and presumably old trees with little or no recruitment occurring (Spence, unpublished data). The trees are isolated by low elevations (1500 m to the west and 1400 m to the east) and semiarid to arid shrublands from the extensive *P. ponderosa* forests on the Henry, Boulder and Thousand Lake mountains. Populations of these species may be stranded relicts from the late Pleistocene, surviving in the Waterpocket Fold only because of its large vertical relief (700 m) and varied topography and substrates. The fern and mosses can be considered rare components of these relict vegetation patches.

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