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SNOW ALGAE IN NORTHERN NEW ENGLAND

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Algae from the genus *Chloromonas* are known to live in snow in alpine and arctic terrain (Kol, 1968). These cryophilic organisms can be seen as green patches near the surface of snow, typically under the limiting sunlight of a coniferous canopy. Forest litter from spruce and fir may provide nutrients essential for algal growth (Hoham, 1976). Its proliferation is generally sporadic in what often appears to be uniform snowbank habitat. Reports of snow algae in the northeastern United States have all been from the Adirondack Mountains of New York state (Hoham et al., 1989). In May 1992, green snow algae were collected from several peaks in northern New England; this is the first report of snow algae from New England.

Warm spring days and snow meltwater trigger germination and migration of algal cells towards the snowbank surface. In the early morning and evening hours, light conditions are best suited to observe the algae (Hoham, 1975). In May 1992, green and orange snow algal populations were found on Mt. Mansfield and Jay Peak in Vermont, Mt. Washington in New Hampshire, and Mt. Katahdin in Maine. Collections were separately contained in Whirl-pak™ bags packed in snow and transported to the laboratory in a cooler. Parameters such as snowbank depth, elevation and solar exposure were recorded. Light microscopy showed these cells to be *Chloromonas brevispina* Fritsch, or a mix of *C. brevispina* and spindle-shaped cells formally known as *Scotiella cryophila* (Fritsch). The latter are now believed to be asexual spores in the life cycle of a *Chloromonas* that may belong to the species complex of *Chloromonas polyptera* Fritsch (Hoham, 1983, 1992).

In March 1992, algal cells collected from snow on Mt. Greylock, Massachusetts were clearly not members of cryophilic snow algae. However, a complex community of microorganisms including cyanobacteria, fungi, rotifers, ciliates and other protists have been noted on Mt. Greylock. From Mt. Washington, ciliates engorged with green snow algal cells were an interesting component of the snowbank ecosystem.

Fungi belonging to the genera *Chionaster* and *Selenotila* were present in certain snow samples. Cohabitation of snow by cryophilic algae and the fungus *Phacidium* may occur via adherence

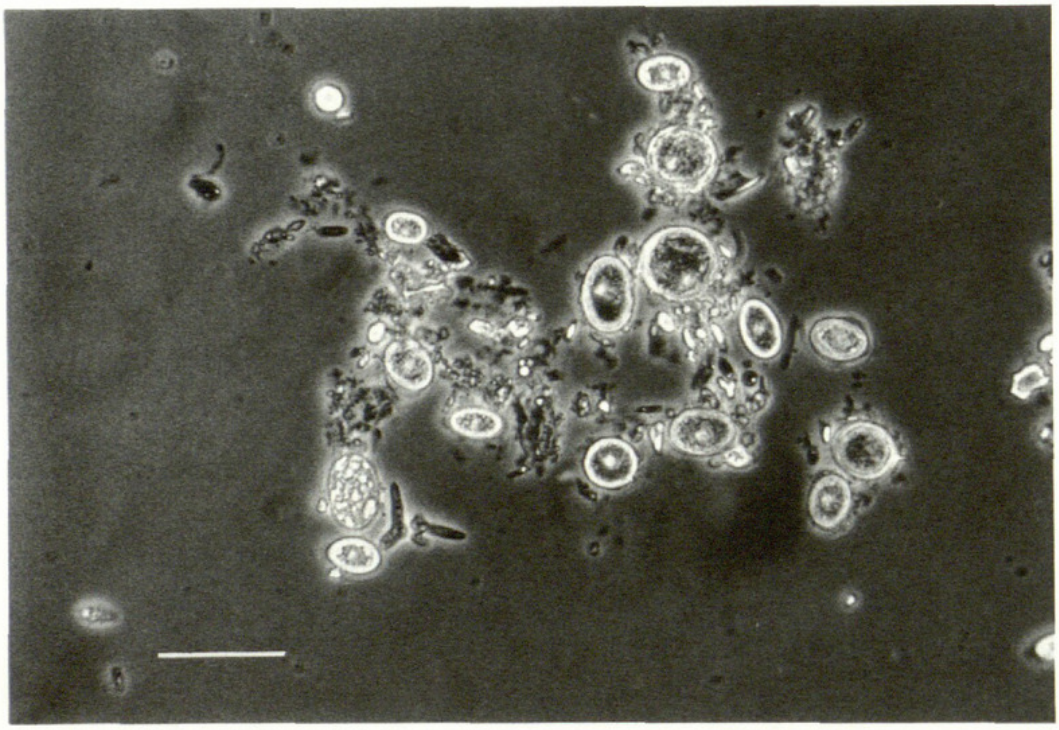

Figure 1. Phase-contrast photomicrograph of orange snow algae, unidentified species, av. 15 × 25 μm (scale bar = 40 μm). Collected from snow (Killington, VT, May 1992).

of algal cells to the web-like filaments of the fungus (Hoham et al., 1989). Snow collected in the Sierra Nevada and Cascade Ranges of California demonstrated this close spatial association (Duval, unpubl.); however, no such relationship was noted in New England snow.

Algal cells with orange carotenoids were found on man-made snow at four New England ski slopes. Secondary pigments serve to protect individual cells from visible and ultra-violet light (Hardy and Curl, 1972). Orange algal populations were found in faint suncups (small depressions in the snow) at the edge of ski trails in relatively open to partially shaded exposures. This organism is probably a new species not reported previously from snow (Figure 1).

Absorption spectra of solvent-extracted pigments from the orange New England snow algae were analyzed. Preliminary analysis of the pigments contained in the cells show absorption only at the wavelengths of 440, 460, and 640 nm; those absorption peaks are typical of *Chloromonas* cells collected in the western United States by the author. Red-pigmented cells of the genus *Chlamydomonas* from western snow have an entirely different spectral

profile. Peak light absorption near the 470 nm wavelength region indicates that carotenoids and xanthophylls are most predominant in the red cells. Thus absorption properties of these orange algal cells from New England appear similar to typical *Chloromonas* (green) rather than *Chlamydomonas* (red) snow algae. Spectrophotometric analysis suggested an ability of certain cryophilic algae to modify their photosynthetic pigments in response to solar exposure (Iturriaga and Sullivan, 1989). However, other studies suggest that nitrogen depletion in snow causes a shift towards secondary carotenoids that protect cells from ultraviolet irradiation (Czygan, 1970; Bidigare et al., 1992).

All snow algal samples are presently being examined and cultured in the laboratory of R. Hoham at Colgate University. This note is a partial report on the distribution of snow algae in New England.

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