ABSTRACT

Light pollution is often mentioned as an energetic loss but its effect on natural ecosystems is seldom studied. In Krkonoše National Park and other locations in the Czech Republic, artificial illumination of ski slopes is widely used to enable night skiing. In this study, we quantified the area around illuminated ski slopes where the light intensity at night was $\geq$ 0.1 lx because previous studies showed that this light intensity could have biological effects. For these estimations, 62 transects were laid perpendicular to the illuminated ski slope (12 slopes in total were studied), and illumination was measured with a Extech EA 30 luxmeter at 0 m and 1.5 m above the ground. Transects were located in four basic types of habitat: open plain with snow covering the vegetation; closed spruce forest in which the trees on the margin have branches that reach the ground; open spruce forest in which the trees have branches only in the top part of the trunk, permitting light to penetrate beneath the canopy; and young dense spruce forest. The data were expressed as log of illumination vs. log of distance from the slope. Most measurements were taken on cloudy nights but some were taken on clear nights. Comparison of the same transect measured on clear and cloudy nights showed that clouds significantly increased light penetration into the surrounding landscape, most likely due to light reflection from low clouds or fog. The light penetration was affected by the direction of light and by the habitats in the surrounding landscape. At 1.5 m above ground in the open plain, a light intensity of $\geq$ 0.1 lx occurred reached 527±257 m in the direction of light and 68±17 m in the closed spruce forest in direction away from the light in the spruce forest. When these data are applied to the 1-km-long Hromovka downhill ski slope, an estimated 0.3-0.5 km^2 of the surrounding landscape experiences $\geq$ 0.1 lx. When the data are applied to the 30 km of illuminated downhill slopes in Krkonoše National Park, an estimated 13-15 km^2 (about 4% of the park) is affected by light pollution.