

Field examinations on the growth rate of epilithic lichens in the city of Salzburg

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Lichens are characterized by very slow growth, which is either expressed as linear measure or as increase in area or weight relative to the initial value (HONEGGER 1993). The lichen's growth form influences considerably the growth rate. Crustose lichens grow at the lowest rate, viz. 0.5 - 2 mm yr⁻¹, followed by foliose lichens with 0.5 - 4 mm yr⁻¹, and fruticose lichens with 1.5 - 10 mm yr⁻¹ (HALE 1973, GANONG 2001). The growth rates of the epilithic lichens *Caloplaca variabilis* (PERS.) MÜLL. ARG., *Protoparmeliopsis muralis* SCHREBER, *Xanthoria elegans* (LINK) TH. FR. and *Physcia caesia* (HOFFM.) FÜRNR., growing on the roof terrace of the Faculty of Natural Sciences of the University of Salzburg, were assessed from April to November 2006. Photographs were taken of 18 lichen samples with a digital camera in monthly intervals. These images were analysed with ArcGIS 9.2 (ESRI, USA). By means of digitalisation, the thallus surface area of the lichens was calculated. Deduced from the monthly change in area, the lichens' growth rates were determined.

The crustose lichen *C. variabilis* showed very low growth rates of 0 - 0.01 cm² month⁻¹. This agrees with the characteristic tight adherence of crustose lichens to their substrate. It enables them to withstand unfavourable climatic conditions, however at the expense of slow growth. The placodioid species *P. muralis*, whose marginal lobes were adhered quite closely to the substrate, had growth rates of c. 0.4 cm² month⁻¹. The foliose lichens *Ph. caesia* and *X. elegans* yielded quite varying results. While some samples had growth rates of c. 0.1 - 0.15 cm² month⁻¹, others even had negative rates, ranging from -0.05 to -0.87 cm² month⁻¹. The negative rates stemmed from a decrease in thallus surface area, as observed especially in July. Due to high temperatures the lichen thalli dried out. Subsequent heavy rainstorms caused several thallus parts to break off, mostly at the margins. As the thallus of foliose lichens is not attached so closely to the substrate, it is more easily removed. In contrast, the placodioid species *P. muralis* and the crustose lichen *C. variabilis* performed constant growth with no thallus parts breaking off because of their close adherence to the substrate.

The typical growth pattern of the fastest growing species, *Protoparmeliopsis muralis*, is given in the figure below for the sample *P. muralis* no. 1. The lichen grew at a rate of 0.16 - 0.27 cm² month⁻¹ from April to June 2006. On 17 July, a negative rate of -0.05 cm² month⁻¹ was calculated. On that day, relatively high temperatures of c. 24 - 25 °C caused the lichen thallus to dry out and to contract. Hence, the lichen's size was smaller than the month before (20 June 2006), although no thallus parts broke off. Until the end of the monitoring period on 29 Nov 2006, the lichen's growth rate ranged between 0.11 and 0.27 cm² month⁻¹.

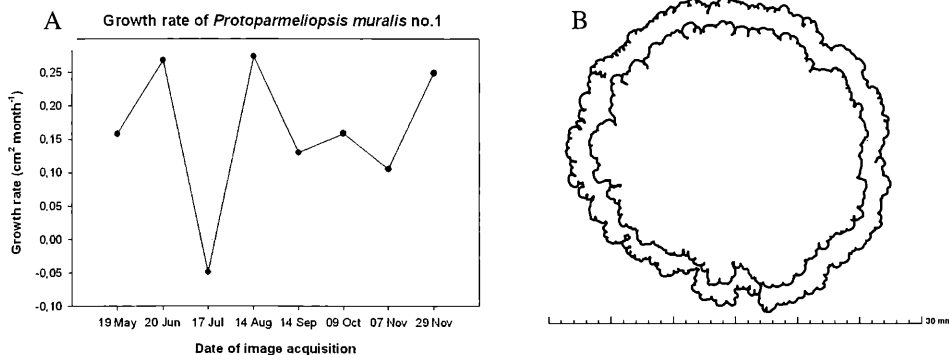


Fig. (A) Growth rates of *Protoparmeliopsis muralis* no. 1 from May to Nov 2006. The curve was drawn **using the statistic programme** SigmaPlot 9.01 (Jandel Scientific, USA). (B) Contours of the sample of *Protoparmeliopsis muralis* no. 1. The thallus surface area increased from 3.44 cm² on 14 Apr 2006 (inner contour) to 4.73 cm² on 29 Nov 2006 (outer contour). The thallus surface area was calculated and drawn with ArcGIS 9.2 (ESRI, USA).

Literature:

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