

Permanent lake stratification caused by a small tributary - the unusual case of Lej da San Murezzan

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ABSTRACT

Meromixis in temperate freshwater lakes is in most cases caused by (1) a morphometric predisposition combined with a high productivity that leads to anoxic conditions in the hypolimnion, (2) saline subsurface inflows, or (3) turbidity currents. Here we report an unusual case where meromixis is caused by the surface inflow of a small tributary. Lej da San Murezzan has been known for several decades to be salinity-stratified during winter, contrary to its neighbouring lakes Lej da Silvaplauna and Lej da Segl. To determine the cause of this stratification, vertical profiles of conductivity were measured on ten occasions between 27 September 2006 and 23 March 2007. An evaluation of these profiles showed that the salinity stratification was continuously built up by a salt source of approximately 5 t d⁻¹. Ovel dal Mulin, a small tributary that contributes only about 1% to the total water inflows of the lake, was identified as the source of this salt. To our knowledge this is the first reported case of a lake where such a small unpolluted surface inflow leads to almost permanent salinity stratification. The salinity stratification has important consequences: it causes the lake to be meromictic with only occasional complete mixing instead of dimictic as the neighbouring lakes and thus supports the build-up of an anoxic bottom layer. Furthermore, it allows restratifying the cold water discharge from a recently installed heat pump within the hypolimnion without the risk of disturbing the ice formation at the lake surface by a rising plume.

Key words: meromixis, Lej da San Murezzan, salt balance, lake stratification
