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SUB-LETHAL EFFECTS OF EXPOSURE TO ATRAZINE IN GILL CELLS OF SEA LAMPREY DOWNSTREAM MIGRANTS

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ABSTRACT

In Portugal, atrazine (ATZ) was one of the most widely used herbicides in agriculture, and despite prohibited since 2007, it still continued to be detected in the surface and ground waters. Recent research demonstrated that the conditions experienced by anadromous fishes, while in freshwater, may be critical to their subsequent fitness and survival in the sea. Several studies established a decline in wild populations, most probably caused by a reduction in recruitment related with pollution. In the case of sea lamprey (*Petromyzon marinus*) trophic migration to the ocean, expose fish to several stress factors, including chemical stress. Thus, it is crucial to assess the effects of sub-lethal exposure to ATZ and predict potential consequences to juveniles of sea lamprey. Fish were exposed to 50 µg L⁻¹ and 100 µg L⁻¹ of ATZ for 30 days and subject also to a gradual increase in salinity up to 35. We analyzed gill histopathological biomarkers, characterized the lipid profile of

the basolateral membrane (BLM) of gill cells, and determined NKA activity, to assess effects of sub-lethal exposure to atrazine.

Upon exposure to ATZ, there was a fatty acid saturation of the BLM of gill cells and this correlated significantly ($r=0.966$) with the NKA activity in the presence of the highest concentration of herbicide. Fish exposed to $50 \mu\text{g L}^{-1}$ ATZ and salinity 35 showed at lamella epithelium level moderate distal hyperplasia, rare fusion and low level of lifting. At $100 \mu\text{g L}^{-1}$ and salinity 35 presented thicker filaments with irregular structure, mild distal hyperplasia, and also architectural and structural alterations of the epithelium, mild rupture of pillar cells and mild increased in chloride cells number inside the clusters. These concentrations of ATZ lead to low number of gills lesions which doesn't compromise the gill physiology and sea lamprey survival.