

Abstract

Observations of the Magadi tilapia *Alcolapia grahami* in hot, highly alkaline Lake Magadi revealed that they air breathe not only during hypoxia, as described previously, but also during normoxia and hyperoxia. Air breathing under these latter conditions occurred within distinct groupings of fish (pods) and involved only a small proportion of the population. Air breathing properties (duration and frequency) were quantified from video footage. Air breathing within the population followed a diel pattern with the maximum extent of pod formation occurring in early afternoon. High levels of reactive oxygen species (ROS) in the water may be an irritant that encourages the air-breathing behaviour. The diel pattern of air breathing in the field and in experiments followed the diel pattern of ROS concentrations in the water which are amongst the highest reported in the literature (maximum daytime values of 2.53–8.10 $\mu\text{M H}_2\text{O}_2$). Interlamellar cell masses (ILCM) occurred between the gill lamellae of fish from the lagoon with highest ROS and highest oxygen levels, while fish from a normoxic lagoon with one third the ROS had little or no ILCM. This is the first record of air breathing in a facultative air-breathing fish in hyperoxic conditions and the first record of an ILCM in a cichlid species.