Abstract:

This thesis reviews the mechanisms of osmotic adaptation observed in various species throughout the teleost lineage, highlighting various convergent trends and strategies among them. The primary focus is on the gills, as they represent a key osmoregulatory organ and as such are a frequent subject of study, thus providing sufficient data for comparisons to be made between different species. Specialized epithelial cells referred to as ionocytes are responsible for maintaining osmotic balance and are located in osmotically active tissues. These cells express an array of different ion transporters and channels whose combined function facilitates ion mobility across the membrane. The specific combination and localization of different ion transporters determines the ion-excretory or ion-absorptive character of a given cell. Among different teleost species, common tendencies exist in relation to the expression of these ion transporters and their various isoforms in a salinity dependant manner and are highlighted throughout this thesis. However, the existence of different isoforms generates a certain degree of variability among species, along with differences in transcriptional and post-transcriptional regulatory mechanisms. Despite these deviations, a common trend in ion transporter expression is apparent. Apart from gene expression, other mechanisms and processes contributing to osmotic adaptation are explored as well, such as gene duplication in relation to different ion transporter isoforms, epigenetic mechanisms seeming to act in a complementary manner to genetic mechanisms, or the effect of gene flow in relation to habitat transitions. Overall, it is apparent that a change in water salinity represents a challenge for osmoregulatory mechanisms and requires a complex and coordinated physiological response.