Gene regulatory networks, underlying the molecular regulation of eye development are conserved across many animal phyla. Genes from the Pax family of transcription factors are one of the most conserved members through the evolution, regulating the development of crucial parts of eye, including the photoreceptor cells. Pax transcription factors are considered to be regulators of opsins, molecules providing the conversion of the light stimulus into the electrochemical signalisation in the photoreceptors cells. In this thesis, pax6 and pax2/5/8 transcription factors are investigated as potential regulators of eye development in Platynereis dumerilii.

pax6 and pax2/5/8 transcription factors are tested as potential regulators of the r-opsin in Platynereis, based on the observed early expression onsets of these genes. Wild-type expression analysis of pax6 and pax2/5/8 using the whole mount RNA in-situ hybridization is provided, accompanied by the initial analysis of the Platynereis pax6 knockout line. pax6 heterozygote mutants are shown to be viable and able to reproduce, however, homozygote mutation of pax6 in Platynereis is lethal. Our data suggest that transcription factors pax2/5/8, otx and six3 are not regulated by the pax6 in Platynereis. Concerning the r-opsin present in the Platynereis eyes, pax6 is shown not to be the regulator of r-ops1 in the Platynereis adult eyes.

To investigate the potential role of pax2/5/8 transcription factor during the Platynereis eye development, CRISPR/Cas9 was successfully implemented and verified in Platynereis as a functional tool able to provide the pax2/5/8 knockout.