

Localizing AANAT

Localization of *aanat* gene expression in the retina and pineal organ of Atlantic salmon

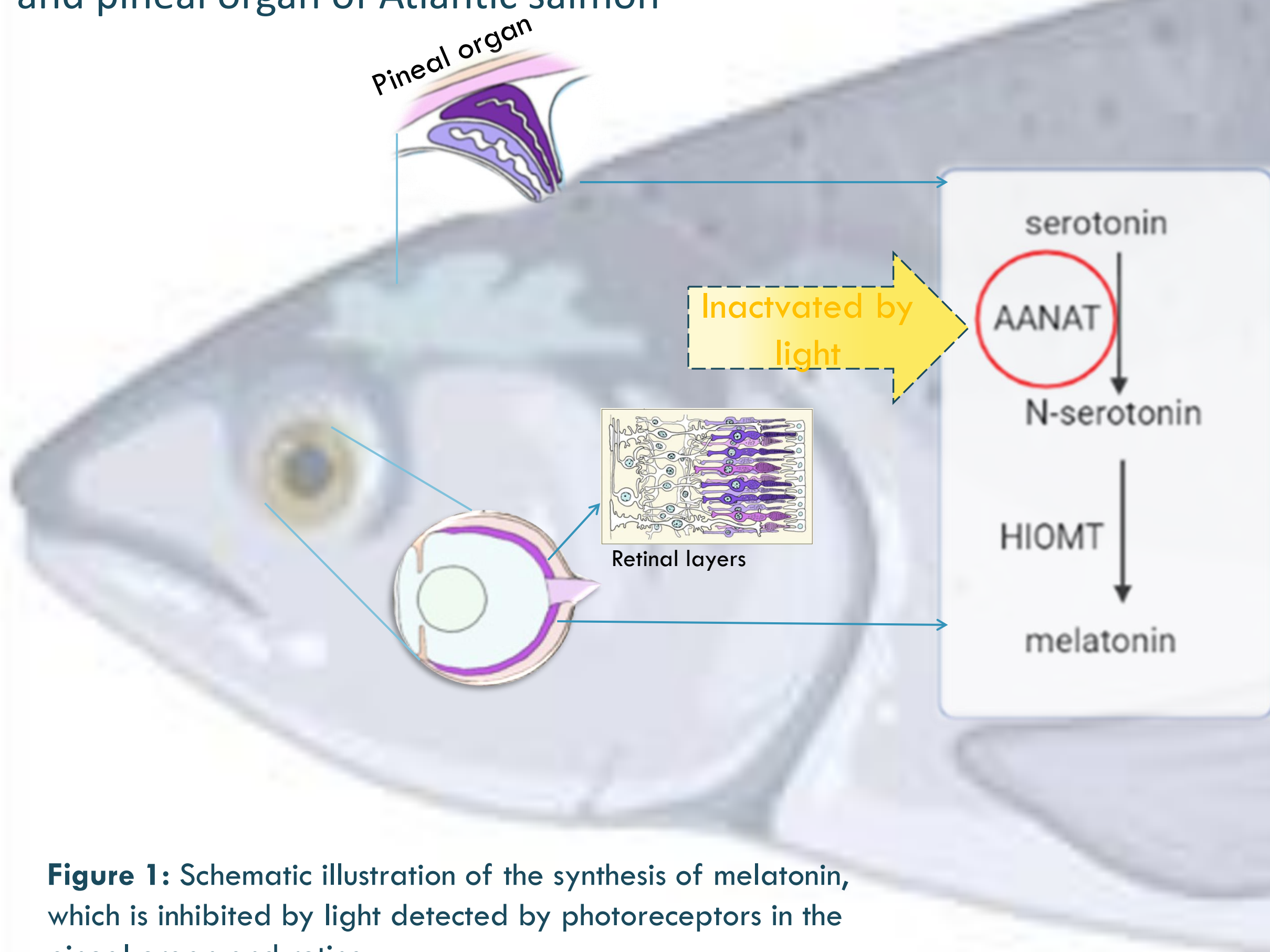


Figure 1: Schematic illustration of the synthesis of melatonin, which is inhibited by light detected by photoreceptors in the pineal organ and retina

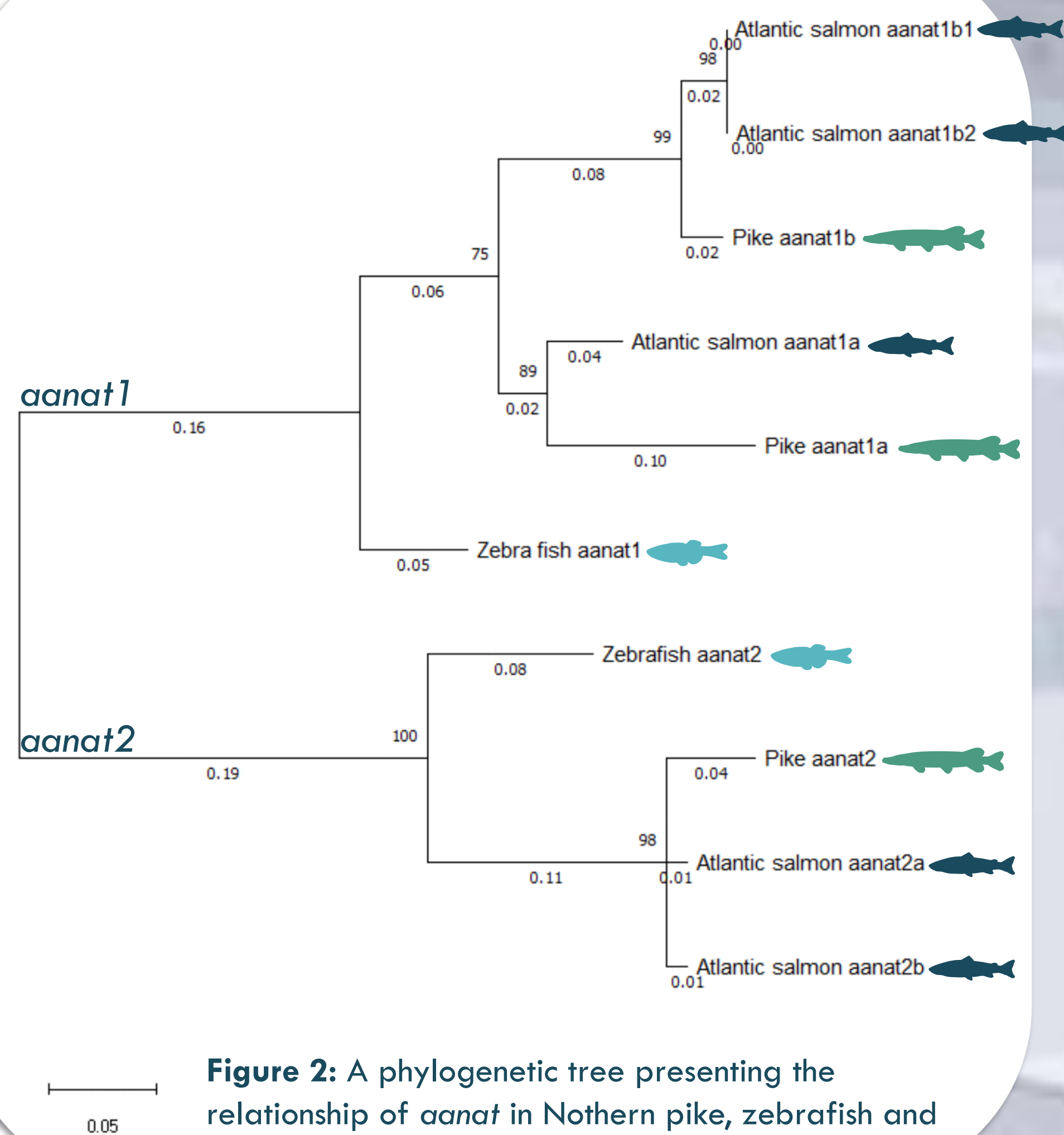


Figure 2: A phylogenetic tree presenting the relationship of *aanat* in Northern pike, zebrafish and Atlantic salmon

1 Background: AANAT is the rate-limiting enzyme in melatonin synthesis

Melatonin is a conserved hormone important in transduction of light and dark information, involved in regulation of biological rhythms¹. The melatonin level in the pineal organ of vertebrates have a diurnal rhythm depending on the activation of arylalkylamine N-acetyltransferase (AANAT).

AANAT is activated in the absence of light, resulting in melatonin synthesis at night. In Atlantic salmon (*Salmo salar*), light is detected by nonvisual photoreception in the retina, pineal organ and deep brain cells².

In teleosts there exist at least two *aanat* genes (*aanat1* and *aanat2*) and due to the fourth whole genome duplication in salmonides, the complexity of *aanat* genes in Atlantic salmon is even greater³.

The phylogenetic tree in figure 2 illustrates the *aanat* genes in Northern pike, Zebrafish and Atlantic salmon. Due to whole genome duplication gene loss, the number of *aanat* genes in teleosts varies⁴.

The aim of this project is to clone the Atlantic salmon *aanat* genes that will be used in expression analyses by *in situ* hybridization.

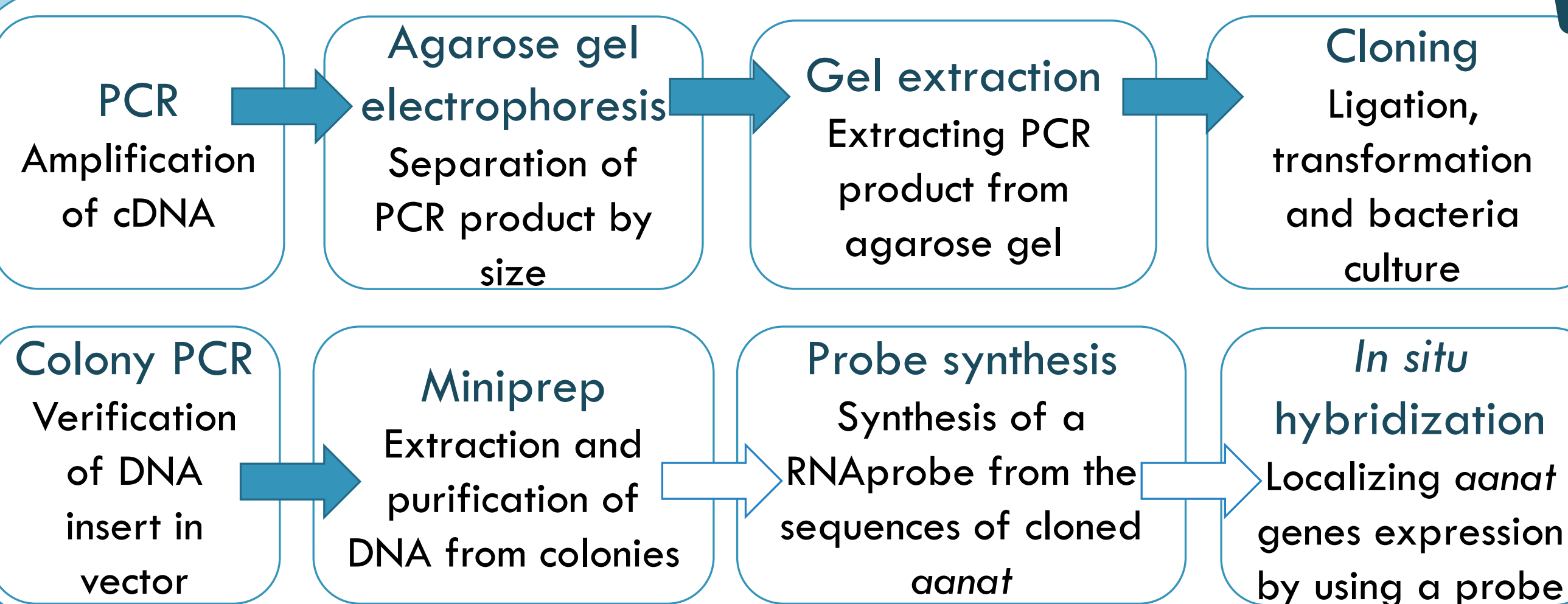
3 Results and discussion: Detection of *aanat* allowing *in situ* hybridization

There are five *aanat* genes in Atlantic salmon, where three of them were successfully cloned (*aanat2b*, *aanat1a* and *aanat1b1*). This allows probe synthesis and *in situ* hybridization to localize the expression of *aanat1a* and *aanat1b* and *aanat2*.

Possible reasons for not detecting all genes:

- Sequence similarity of *aanat* genes may have resulted in no discrimination of some paralogs
- Different level of expression of the genes causing only some of the genes to be detected.

2 Methods: Cloning of *aanat* genes for localization of expression



References:

- 1.Saha, S., K.M. Singh, and B.B.P. Gupta, *Melatonin synthesis and clock gene regulation in the pineal organ of teleost fish compared to mammals: Similarities and differences*. *Gen Comp Endocrinol*, 2019. **279**: p. 27-34.
- 2.Pérez, J.H., et al., *A Comparative Perspective on Extra-retinal Photoreception*. *Trends in Endocrinology & Metabolism*, 2019. **30(1)**: p. 39-53.
- 3.Lien, S., et al., *The Atlantic salmon genome provides insights into rediploidization*. *Nature*, 2016. **533(7602)**: p. 200-5.
- 4.Li, J., et al., *Molecular Evolution of Arylalkylamine N-Acetyltransferase in Fish: A Genomic Survey*. *International journal of molecular sciences*, 2015. **17(1)**: p. 51.

