

Innovative Genetic Approaches for Sustainable Aquaculture: Unveiling Sex-Specific Markers and Neo-Y Chromosome Evolution in Spotted Knifejaw (*Oplegnathus punctatus*)

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Introduction

Background:

Spotted Knifejaw (*Oplegnathus punctatus*) is a commercially valuable fish species with complex sex chromosome systems (X1X2Y).

Understanding its genetic and genomic architecture is crucial for sustainable aquaculture practices.

Objectives:

- To identify and validate sex-specific markers.
- To explore the evolution of neo-Y chromosomes.
- To analyze differential gene expression related to sex.

Results

Genomic Assemblies:

- High-quality assemblies of male and female genomes.
- Identification of neo-Y chromosome and sex chromosome structures.

Sex-Specific Markers:

- Discovery of male-specific genetic markers and differential expression patterns.

Neo-Y Chromosome Evolution:

- Characterization of neo-Y chromosome and identification of Y+X-genes.

Divergence Analysis:

- Estimated divergence times between X/Y chromosomes and comparison with other species.

Functional Insights:

- Identification and validation of sex-specific genes through RNA-Seq and PCR.

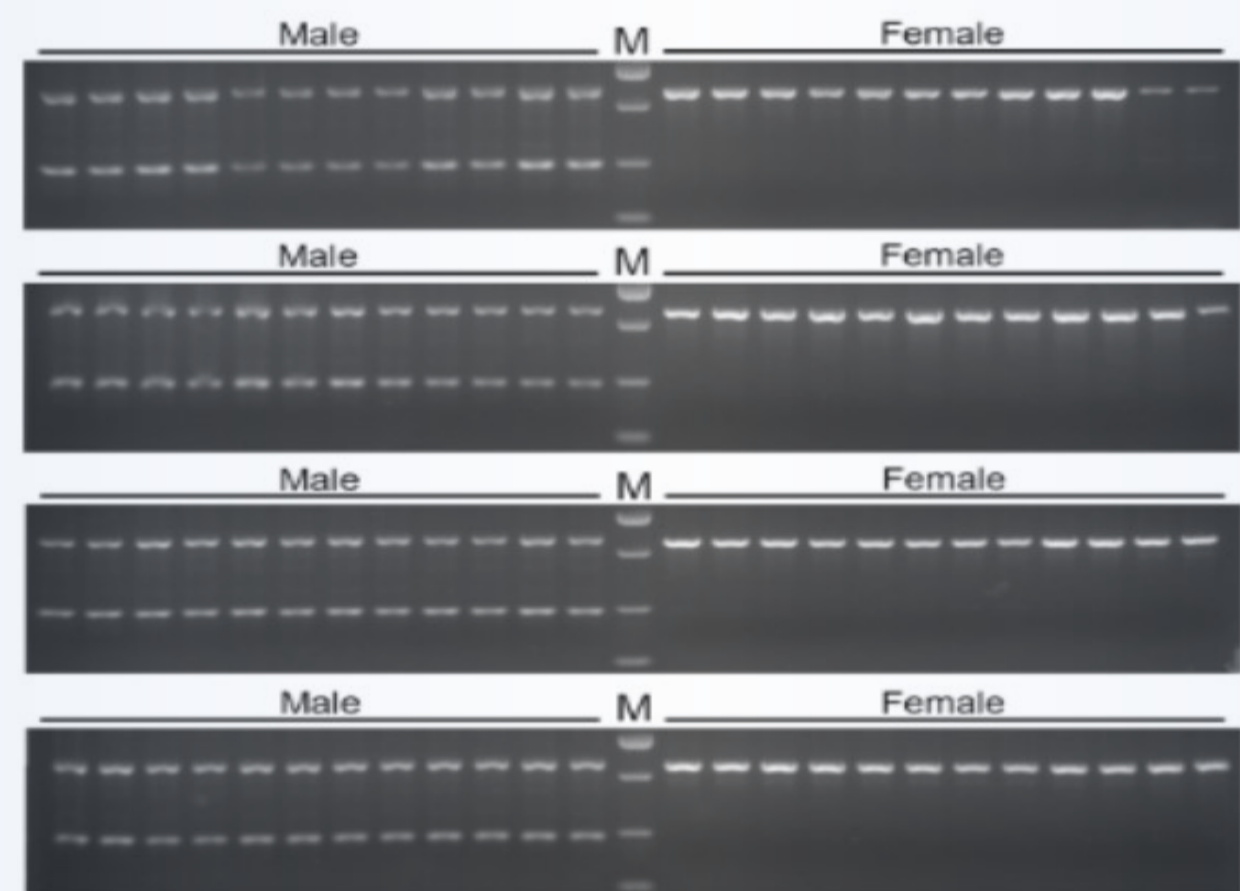


Fig. 1 Verification of the male-specific marker

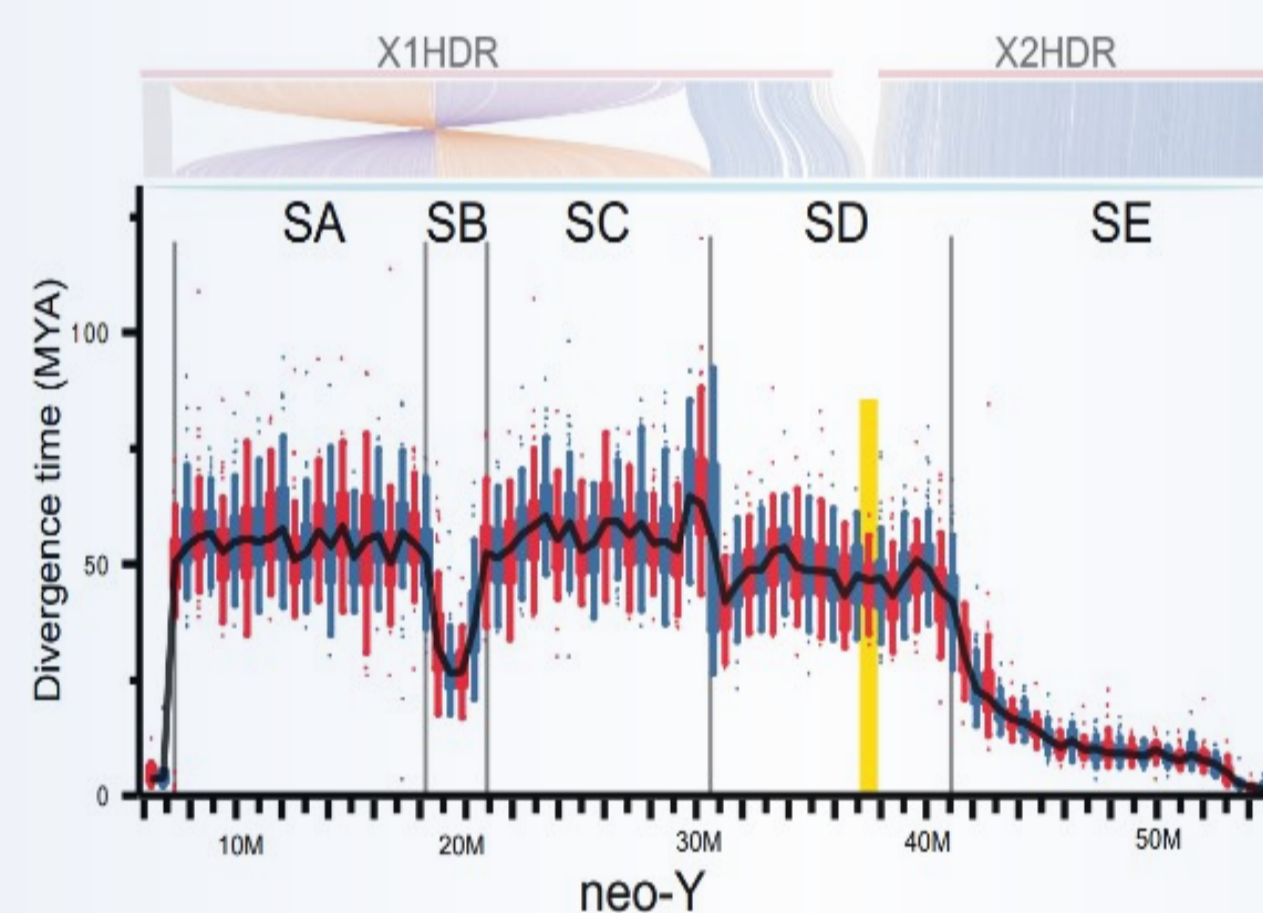


Fig. 2 Divergence times along the neo-Y in a sliding window of 100 kb.

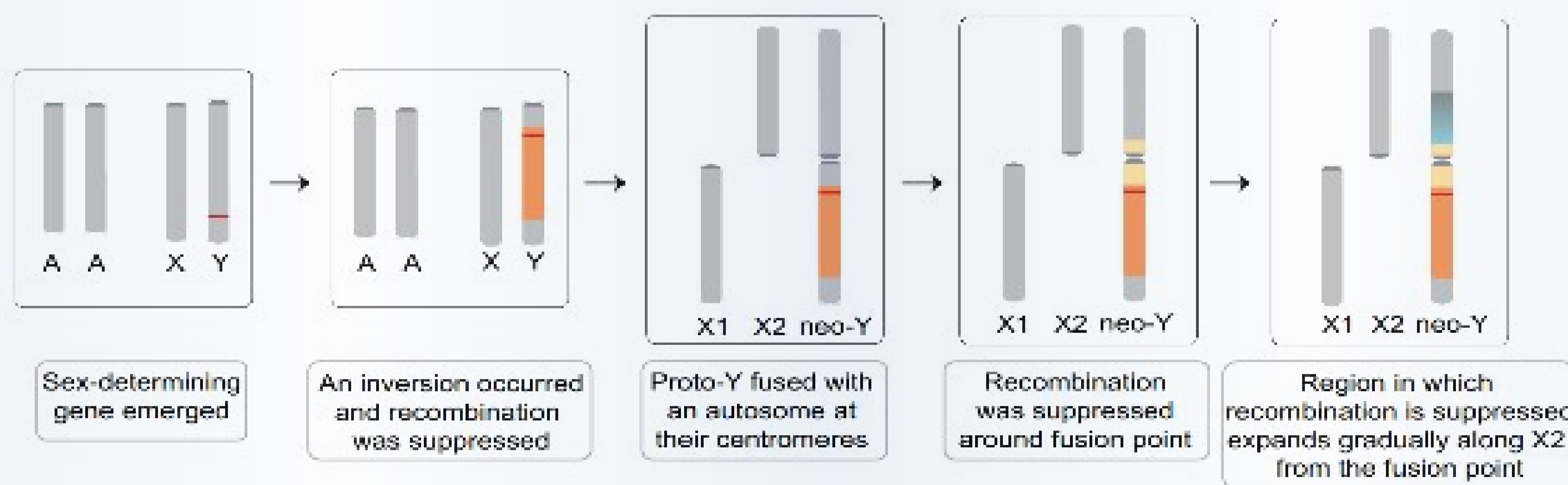


Fig. 3 Model for the evolution of the Y chromosome in spotted knifejaw.

Conclusion

The study provides valuable genomic and transcriptomic insights into the spotted knifejaw, emphasizing advancements in understanding sex chromosome evolution and differential gene expression.

• Implications for Aquaculture:

Findings support sustainable aquaculture practices through enhanced genetic knowledge and sex-specific marker development.

• Future Directions:

Further research on functional roles of identified genes and continued exploration of sex chromosome evolution.