GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN IN PUBLICA COMMODA SEIT 1737

MAX-PLANCK-INSTITUT FÜR MULTIDISZIPLINÄRE NATURWISSENSCHAFTEN

Evolutionary Genomics: Consequences of Biodiverse Reproductive Systems (EvoReSt)

EvoReSt

A4

Causes and consequences of asexuality in planarians

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State of the art

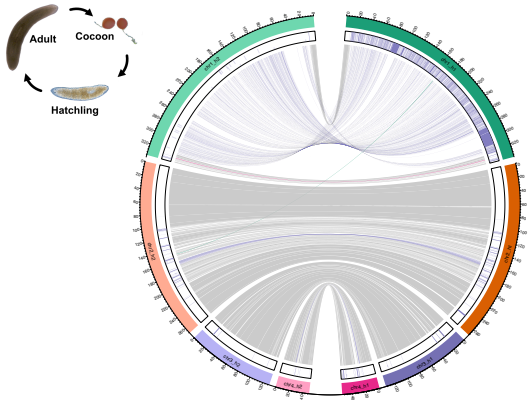
- As a group, planarians display a fascinating continuum of reproductive strategies, including asexual fission/regeneration, parthenogenesis, hermaphroditic sexual reproduction and possibly even species with separate sexes[1].
- Of the planarian model species *S. mediterranea*, laboratory strains exist that are either obligate asexual or sexual hermaphrodites.
- We have generated chromosome-scale and haplotype-phased genome assemblies of the sexual[2,3] and asexual (unpublished) strains.

Objectives

Taking advantage of the molecular tractability of a model species with sexual and asexual strains and the high-quality genome assemblies, we will:

- Study the genomic causes of asexuality, by identifying the salient mutations and studying their mechanistic consequences on RS formation.
- Study the genomic consequences of asexuality via comparative genomics.

PhD 1 – Genomic causes of asexuality



ATACseq/RNAseq time courses of RS-development

- "Diagnosing" the developmental process at which RS-Development is interrupted in the asexual strain.

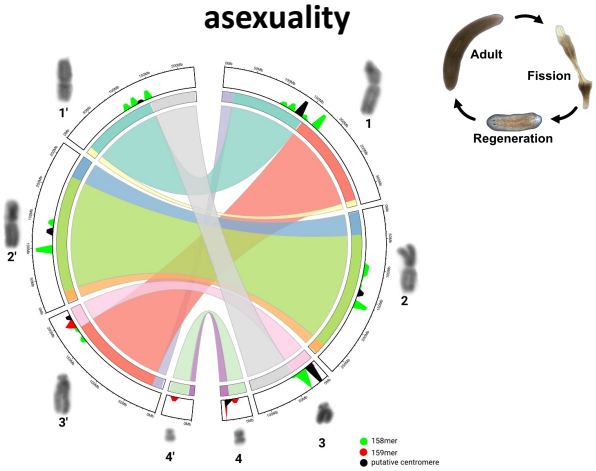
Data mining

- Computational gene network reconstruction .
- Mutation identification in network components via com-Parative genomics.

RNAi-screening for functional verification

- Confirm the functional significance of the network com-Ponents affected by the mutations.
- General verification of the regulatory network that orchestrates germ line development from pluripotent neoblasts.

PhD 2 – Genomic consequences of asexuality



S. Mediterranea sex/asex genome comparisons

- dN/dS ratios
- Transposon accumulation and activity
- Gene loss/gene gain
- DS break repair scars
- Prevalence, frequency and identity of loci with sub-allelic SNP.

General principles

- Analysis extension to a panel of sex/asex genomes with different divergence times
- Population genomics of "wild" asexual populations.

References

1. Vila-Farre M, Rink JC. 2018. The ecology of fresh water planarians. Book chapter in „Planarian Regerneration". Editor: Rink JC; Springer 2018.
2. Grohme M., Schloissnig S, …., Rink JC. 2018. The genome of Schmidtea mediterranea and the evolution of core mechanisms. Nature 554(7690): 56-61
3. Ivankovic M, Brand JN, … Rink JC. 2023. A comparative analysis of planarian genomes reveals regulatory conservation in the face of rapid structural divergence. BioRxiv 2023

RTG 2984/1