Activity report

This is the report of the activities carried out during my 3-year PhD course (2021–2024).

Research activity

Here are the research activities not directly related to the main topic of the PhD thesis.

- Manual curation of long interspersed nuclear element (LINE) libraries of several bivalve species;
- comparative genomics analysis of Hox and ParaHox genes in branchiopod crustaceans;
- comparative genomics analysis of branchiopod crustaceans to investigate the molecular underpinnnings of morphological stasis and genome size variations;
- molecular phylogenetics and Bayesian dating of branchiopod crustaceans;
- preparation of mRNA sequences of genes involved in body segmentation in *Triops cancriformis* (Pancrustacea, Branchiopoda), to be used to generate probes for mRNA *in-situ* HCR on larvae (in collaboration with the Patel Lab; Marine Biology Lab, Woods Hole, MA, USA);
- collection, fixation, and storing of jouvenile stages of several stick insect (Insecta, Phasmida) species, to be used for mRNA *in-situ* HCR to investigate the temporal and spatial transcription of genes involved in wing morphogenesis (in collaboration with the Patel Lab; Marine Biology Lab, Woods Hole, MA, USA);
- preparation of a review on the evolutionary causes and consequences of trait loss reversals;
- preparation of mitotic chromosome plates in the red wood ant *Formica paralugubris* from cerebral ganglia of pre-pupae.

Visiting scholar

- Nuzhdin Lab (University of Southern California, Los Angeles, CA, UA; Aug 20th, 2023–Feb 20th, 2024), to accomplish the abroad period of my PhD;
- Juan Pasantes lab (University of Vigo, Vigo, Spain; Jan 12th–22nd, 2023), for a specific training on chromosome mitotic plate preparation in bivalve species.

Teaching activity

- Practical class CAFE: estimating gene family turnover across a phylogenetic tree (Apr 23, 2024) for first-year students of the course Molecular phylogenetics pursuing a Master degree in Bioinformatics at the University of Bologna (Italy);
- Practical invertebrate zoology class (Sep, 2022–Jan, 2023) for first-year students pursuing a Bachelor degree in Biological Sciences at the University of Bologna (Italy).

Co-supervised thesis

- *Evaluation of different calibration methods on Branchiopoda (Crustacea) phylogeny.* Niccolò Righetti. Master degree in Biodiversità ed evoluzione, University of Bologna, Bologna (Italy). Supervisor: Andrea Luchetti. Co-supervisor: Filippo Nicolini. AA 2022–2023;
- *Filogenesi molecolare di alcune famiglie dellordine Phasmatodea con enfasi sulla famiglia Heteropterygidae (Bacilloidea).* Giacomo Orsini. Bachelor degree in Scienze biologiche, University of Bologna, Bologna (Italy). Supervisor: Andrea Luchetti. Co-supervisor: Simona Corneti, Filippo Nicolini. AA 2021–2022;
- *Filogenesi molecolare di specie appartenenti alle famiglie Heteropterygidae e Anisacanthidae (Phasmatodea, Bacilloidea).* Alessandro Siragusa Camacho. Bachelor degree in Scienze biologiche, University of Bologna, Bologna (Italy). Supervisor: Andrea Luchetti. Co-supervisor: Simona Corneti, Filippo Nicolini. AA 2021/2022;
- *Filogenesi molecolare di specie della famiglia Pseudophasmatidae.* Giovanni Amedeo Paselli. Bachelor degree in Scienze biologiche, University of Bologna, Bologna (Italy). Supervisor: Barbara Mantovani. Co-supervisors: Simona Corneti, Filippo Nicolini. AA

2020–2021.

Courses and workshops

- *Establishing state-of-the-art mollusc genomics*. EMBO Workshop. Namur, Belgium. May 28th–31st, 2024;
- *Art (Science) Attack*. Physalia Courses. Online. May 20th–23rd, 2024;
- *Introduction to Python for biologists*. Physalia Courses. Online. Sep 2nd5–2nd8, 2023;
- *ITA*PHY phylogenetics workshop*. Trento, Italy. Jan 6th–9th, 2023;
- *Sex chromosome evolution*. Physalia Courses. Online. Jan 23rd–27th, 2023.

Awards and scholarships

- Travel grant to attend the Evoluzione2024 congress in Naples (Italy). Stazione Zoologica Anton Dohrn. Sep 8th–11th, 2024;
- Travel grant to attend the EMBO workshop *Establishing state-of-the-art mollusc genomics* in Namur (Belgium). EMBO. May 28th–31st, 2024;
- Laura Bassi scholarship for editorial assistance to postgraduates and junior academics. Editing Press. Apr 13th, 2023.

Presentations at congresses

Oral presentations

- Nicolini F, Iannello M, Piccinini G, Ghiselli F, Luchetti A, Milani L. (2024). Advancing the study of bivalve sex determination in the light of comparative genomics. Establishing state-of-the-art mollusc genomics (EMBO workshop). Namur (Belgium). May 27-30, 2024;
- Nicolini F, Ghiselli F, Milani L, Luchetti A. (2023). Contrasting patterns of amino acid evolution and shared ancestry between putative sex-determining genes in bivalve molluscs. EVOLMAR 2023. Online. Nov 14-17, 2023;

- Nicolini F, Ghiselli F, Milani L, Luchetti A. (2023). Sex-determination related genes in bivalves: novel acquisitions and high rates of sequence evolution. Evolution 2023 (Ernst Mayr Award symposium). Online. Jun 2-3, 2023.

Poster presentations

- Nicolini F, Iannello M, Piccinini G, ghiselli F, Nuzhdin S, Luchetti A, Milani L. (2024). How to detect sex-determinig genes through molecular evolution: bivalves a a case study. Evoluzione 2024. Naples, Italy. Sep 8–11, 2024;
- Nicolini F, Ghiselli F, Milani L, Luchetti A. (2022). Clues of accelerated molecular evolution in gene families associated wit sex determination in bivalves. SMBE 2023. Ferrara, Italy. Jul 24–27, 2023;
- Nicolini F, Ghiselli F, Milani L, Luchetti A. (2022). Clues of accelerated molecular evolution in gene families associated wit sex determination in bivalves. SIBE/ISEB 2022. Ancona, Italy. Sep 4–7, 2022;
- Nicolini F, Martelossi J, Forni G, Mantovani B, Luchetti A. (2021) First insights and comparative genomics of Hox and ParaHox genes in tadpole shrimps. EuroEvoDevo 2022. Naples, Italy. May 31–Jun 3, 2022.

Invited talks

- *From comparative genomics to fluorescence imaging: a multi-disciplinary approach to study bivalve sex determination.* Auer Lab. University of Fribourg, Fribourg. Jul 26, 2024.

Outreach activity

- Editor and web writer for BioPills – the Italian community of life sciences (biopills.net/). Jul 2017–ongoing;
- Presenter at the European Researchers Night 2024, University of Bologna, Bologna (Italy). Sep 27, 2024;
- Presenter at the BiGeA Day 2023, University of Bologna, Bologna (Italy). May 27, 2023;

- Opening Days, University of Bologna, Bologna (Italy). Nov 18, 2022.

Scientific publications

** equal contribution*

- Righetti N*, Nicolini F*, Forni G, & Luchetti A. (2024). Towards a time-tree solution for Branchiopoda diversification: a jackknife assessment of fossil age priors. *Submitted for peer-review*
- Nicolini F, Ghiselli F, Luchetti A, & Milani L. (2023). Bivalves as emerging model systems to study the mechanisms and evolution of sex determination: a genomic point of view. *Genome Biology and Evolution*, *15*(10), evad181. doi: 10.1093/gbe/evad181
- Martelossi J, Nicolini F, Subacchi S, Pasquale D, Ghiselli F, & Luchetti A. (2023). Multiple and diversified transposon lineages contribute to early and recent bivalve genome evolution. *BMC Biology*, *21*(1), 1–23. doi: 10.1186/s12915-023-01632-z
- Nicolini F, Martelossi J, Forni G, Savojardo C, Mantovani B, & Luchetti A. (2023). Comparative genomics of Hox and ParaHox genes among major lineages of Branchiopoda with emphasis on tadpole shrimps. *Frontiers in Ecology and Evolution*, *11*, 23. doi: 10.3389/fevo.2023.1046960
- Forni G, Cussigh A, Brock PD, Jones BR, Nicolini F, Martelossi J, Luchetti A, & Mantovani B. (2023). Taxonomic revision of the Australian stick insect genus *Candovia* (Phasmida: Necrosciinae): insight from molecular systematics and species-delimitation approaches. *Zoological Journal of the Linnean Society*, *197*(1), 189–210. doi: 10.1093/zoolinnean/zlac074