



Population genomics in the Hawaiian volcano shrimp: cryptic speciation and mitonuclear discordance



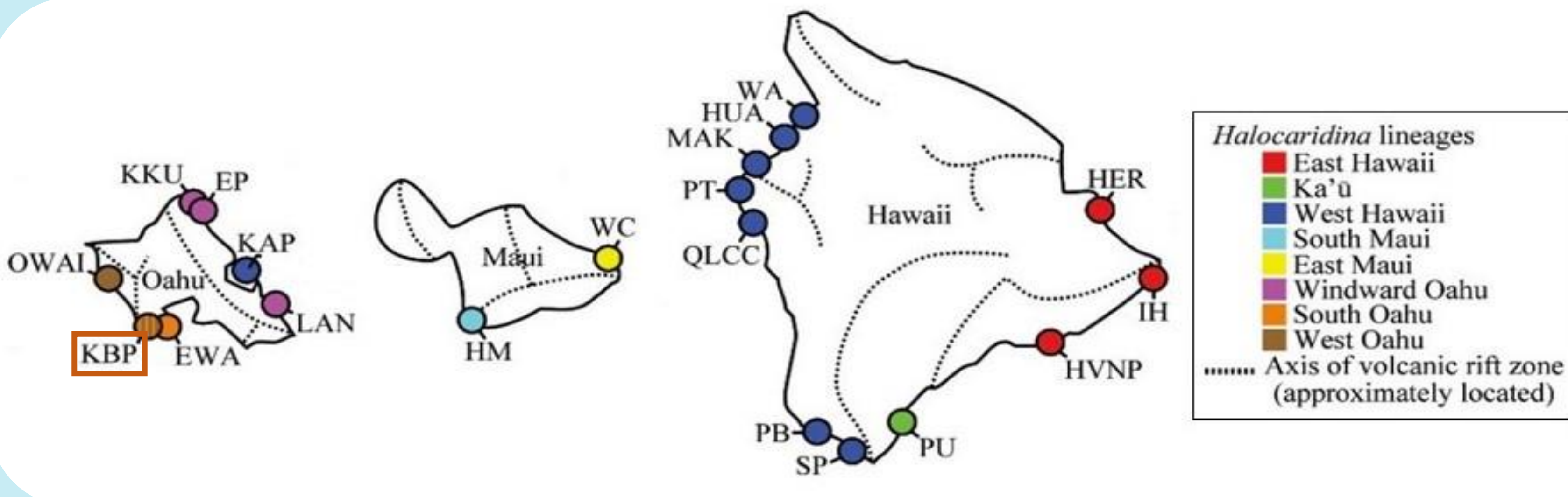
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Halocaridina rubra (*H. rubra*) is an atyid shrimp found exclusively in Hawaiian anchialine habitats¹, which are coastal pools with underground connections to both salt and freshwater aquifers, but no surface connection to the ocean. Early sequencing of mt-COX1 suggests that *H. rubra* is composed of at least eight divergent lineages across the Hawaiian islands². However, mitochondrial loci often have different histories than nuclear loci, and mitonuclear discordance is rampant in phylogenetics. **We aim to uncover signatures of mitonuclear coevolution and mitonuclear genetic incompatibilities leading to reproductive isolation.**

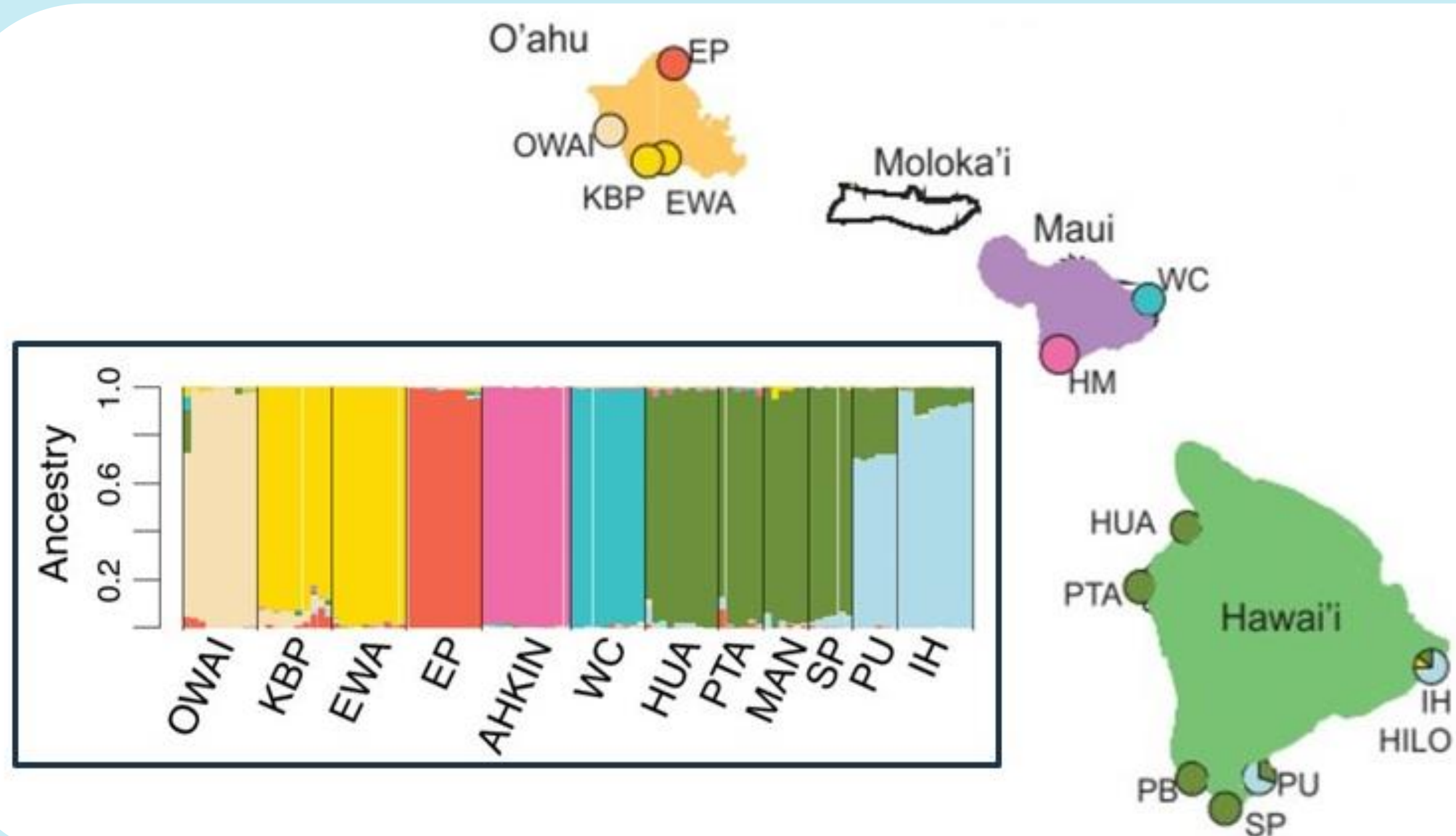


Initial sequencing of mt-COX1 identifies at least eight divergent *H. rubra* lineages



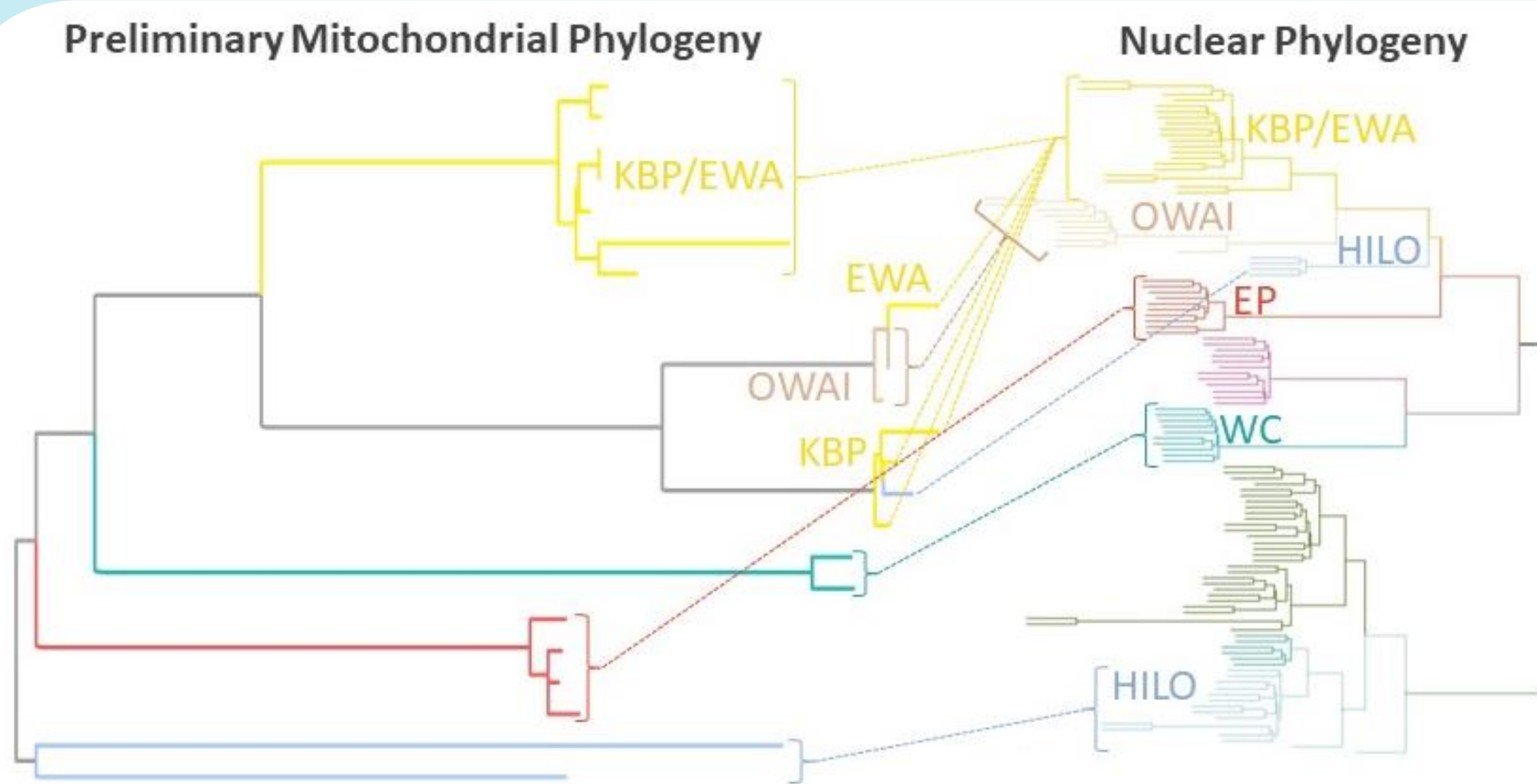
- In 2005, Santos et al. sequenced mt-COX1 in a collection of *H. rubra* samples from anchialine pools across the Hawaiian islands²
- The KBP population on Oahu (boxed in orange) shows mitotypes from the neighboring EWA and OWAI populations, with OWAI being the predominant mitotype^{2,3}

2b-RAD sequencing of the nuclear genome identifies admixture and possible mitonuclear discordance

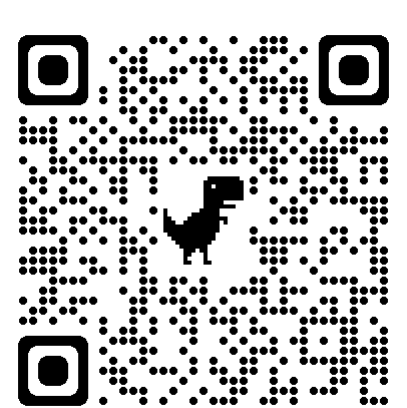


- 2b-RAD nuclear genome sequencing yields similar groupings of lineages and identifies instances of nuclear admixture
- The KBP population shares majority nuclear ancestry with the EWA population. This contrasts with the mt-COX1 sequencing done in 2005 showing that the KBP population predominantly carries mitotypes from the OWAI population²
- These data suggest that there may be mitonuclear discordance at play

Generating complete mitogenomes for *H. rubra* populations



- We are testing a new low coverage whole genome sequencing library prep which is simple and low cost (\$3-4 per sample)
- Constructed a preliminary mitochondrial phylogeny derived from parallel mitogenomic sequencing of a subset of 23 samples that underwent 2b-RAD sequencing
- Mitochondrial and nuclear phylogenies were discordant, suggesting that mitochondrial introgression may be rampant in anchialine species



Next Steps:

We plan to perform extensive genomic and mitogenomic sequencing on modern and historically collected samples from *H. rubra* across the range. These data will allow us to:

- 1) conduct holistic population genomics studies of *H. rubra* to identify instances of mitonuclear coevolution and mitonuclear discordance leading to reproductive isolation
- 2) evaluate the impacts of volcanism-induced thermal habitat changes on evolution and plasticity in *H. rubra*

Our findings have conservation implications for the management of this species and Hawaiian anchialine habitats, which are of cultural importance.

References

1. Holithus LB (1963) *Zoologische Mededelingen (Leiden)*
2. Santos et al. (2006) *Molecular Ecology*
3. Craft et al. (2008) *Limnology Oceanography*

Acknowledgements

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