琉球大学学術リポジトリ

ウォレスの古代湖での同所的種分化

メタデータ	言語: English 出版者: 琉球大学 公開日: 2021-10-04 キーワード (Ja): キーワード (En): 作成者: Nobu, Sutra メールアドレス: 所属:
URL	http://hdl.handle.net/20.500.12000/49806

Form 3

Abstract

Title : Sympatric speciation in a Wallacean ancient lake

Sympatric speciation, the process through which new species evolve from a single ancestral species in the absence of geographical barriers, has been a central subject in evolutionary biology since Darwin's "principle of divergence". Sympatric speciation is considered to be difficult, because automatic magic traits, i.e., the coupling between ecological traits that allow resource partitioning and reproductive traits that allow assortative mating, are necessary for it to complete. Indeed, only a few empirical case studies demonstrating this mode of speciation are known. Some consider that this is due not to its rarity, but because of the difficulty of empirically demonstrating this mode of speciation. In this study, I examined a possible case of sympatric speciation in three ricefish species of the genus *Oryzias*, *O. nigrimas*, *O. nebulosus* and *O. orthognathus*, which are endemic to Lake Poso, an ancient tectonic lake in central Sulawesi.

First, I tested if the three *Oryzias* species satisfy all criteria necessary to demonstrate sympatric speciation. Phylogenetic analyses using RAD-seq-derived single nucleotide polymorphisms (SNPs) revealed that the three *Oryzias* species are monophyletic. I also found that the three species are morphologically distinguishable and clearly separated by population-structure analyses based on the SNPs, suggesting that they are reproductively isolated from each other. A mitochondrial DNA chronogram suggested that their speciation events occurred after formation of the tectonic lake, and existence of a historical allopatric phase was not supported by coalescent-based demographic inference. These results all concur with criteria for sympatric speciation.

Second, I examined resource partitioning and assortative mating in the three species. Stable isotope analyses revealed that the three species use different food resources, which reflect differences in their feeding morphologies (gill rakers and digestive tracts) and feeding sites. Field and laboratory observations showed that *O. nebulosus* and *O. orthognathus* share a mating habitat of cobbles, where they scatter fertilized eggs, whereas this site is never used by *O. nigrimas*, indicating that assortative mating is partly achieved by spatial isolation. The small, less-adhesive eggs of *O. nebulosus* and *O. orthognathus* probably reflect their adaptation to spawning on cobble beaches. Laboratory mating experiments showed strong prezygotic isolation between *O. nebulosus* and *O. orthognathus*, which is achieved by strong species recognition presumably by both sexes based on species-specific mating dances and nuptial coloration. Thus, the assortative mating of *O. nebulosus* and *O. orthognathus* was probably not coupled to resource partitioning.

In summary, it is highly probable that the three *Oryzias* species in Lake Poso have diverged in sympatry, but that, contrary to theories, the sympatric divergences have been completed without automatic magic traits. This is especially true for the divergence between *O. nebulosus* and *O. orthognathus*. The ricefishes in this Wallacean lake provide a promising new model system for the study of sympatric speciation.

Name SUTRA NOBU