Ecological factors associated with speciation in New Zealand triplefin fishes (Family Tripterygiidae)

by

Maren Wellenreuther

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Abstract

Theoretical research has demonstrated that ecological interactions in sympatry or parapatry can generate disruptive selection that in concert with assortative mating can lead to speciation. However, empirical examples are few and restricted to terrestrial and lacustrine systems. New Zealand triplefin fishes (Family Tripterygiidae) are an ideal model system to study speciation in the sea, as they conform to the criteria of an adaptive radiation, being philopatric, speciose and abundant, and having largely sympatric distributions. This thesis investigates two key aspects of the New Zealand triplefin radiation: 1) which ecological traits are under selection?; and 2) which traits are potentially available for the development of assortative mating?

Habitat use was identified as a possible key trait for selection and investigated in detail in this thesis. Habitat use of the majority of New Zealand triplefin species was censused quantitatively throughout most of their latitudinal range and analysed using novel statistical methods. Analyses showed that habitat use was highly divergent between species and thus diversification in habitat may have been a major component in the evolution of this clade. The phylogenetic analysis of habitat characters confirmed that there has been rapid evolution in habitat use among species. Habitat selection at settlement was highly species-specific, indicating that interspecific differences in adult habitat use may be the outcome of active habitat choice established at settlement. These species-specific habitat associations showed no evidence for geographic variation in habitat use. Laboratory trials and field observations of the sister-species pair *Ruanoho decemdigitatus* and *R. whero* showed that competition was linked with body size, with *R. decemdigitatus* being the larger and consequently dominant species. The second part of this thesis investigated which traits may have contributed to prezygotic isolation, and thus to assortative mating. Little evidence was found for divergence in breeding season or male colour patterns. However, divergence in habitat affected breeding habitat choice, as triplefins court and mate in the same territory as that occupied year round. This suggests that assortative mating in New Zealand triplefin species could be the by-product of adaptation to habitat resources. Body size affected mate choice and time at first maturity in the *Ruanoho* sister-species pair, suggesting that size is important in the maintenance of reproductive isolation in these species. Differences in body size may have also lead to assortative mating in other New Zealand triplefin sister-species pairs, as all sister-species pairs differ in maximum body size. The findings of this thesis invoke a strong role for ecologically-based selection in speciation, and support the hypothesis that adaptation to habitat has been a major factor in speciation in this system.

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