

琉球大学学術リポジトリ

メダカ科魚類における性淘汰圧の緯度間変異

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Abstract

Title

Latitudinal Variation in Sexual Selection Pressure in Ricefishes of the Family Adrianichthyidae

Tropical animals are characterized by showy ornaments and conspicuous body colors as compared with temperate relatives. Some studies hypothesized that sexual selection pressures are stronger in the tropics than in the temperate zone. However, this is not a collective view. In this study, I demonstrate the latitudinal variation in sexual selection pressures, using ricefishes (Adrianichthyidae), which is having a wide geographic range throughout Southeast and East Asia, as a model system.

First, comparisons of the degree of sexual dimorphisms in body size, fin lengths, and body coloration among 32 adrianichthyid species revealed that lower-latitude species are sexually more dimorphic in all characters than higher-latitude species. PGLS analyses using a mitochondrial DNA phylogeny demonstrated that the negative correlations between latitude and the degree of sexual dimorphisms/dichromatism become non-significant when phylogeny is considered, but that the variance in the degree of sexual dimorphisms is explained not only by phylogeny but also almost equally by latitude. Ancestral state reconstruction indicated that sexual dimorphisms/dichromatism have evolved independently even within major clades. These findings indicating that tropical species are exposed to stronger sexual-selection pressures than temperate ones.

Second, I compared mating behaviors between a tropical (*Oryzias woworae*) and a temperate (*Oryzias sakaizumii*). Mating experiments revealed that males of *O. woworae* are more aggressive in male-male interaction and more active in courting females than *O. sakaizumii* males. In addition, *O. woworae* females tended to reject male courtships more frequently than *O. sakaizumii* females, indicating that *O. woworae* females are choosier in mating than *O. sakaizumii* females. These findings are concordant with the view that *O. woworae* is exposed to stronger sexual-selection pressures than *O. sakaizumii*.

Third, I compared seasonal patterns in the occurrence of mature individuals in the wild among three latitudinal species (*O. sakaizumii*, *O. latipes*, and *O. woworae*) to test if operational sex ratios (OSRs), which is a determinant of the strength of sexual selection pressures, are more male-biased at low latitudes. Field collections revealed that mature females and males appear throughout the year in the tropical species (*O. woworae*). However, OSRs were strongly male-biased throughout the year (male : female = ca. 1 : 3). This bias in OSRs in *O. woworae* was much stronger than the bias in the temperate (*O. sakaizumii*) and sub-tropical (*O. latipes*) congeners, in which both mature females and males occur in greater synchrony during a shorter period of the year, and therefore OSRs are less biased. Thus, OSRs were estimated to be more male-biased at lower latitudes, as expected, supporting that sexual selection pressures are stronger in tropical species than temperate species.

Thus, I demonstrated that latitudinal variation in OSRs, as a determinant of sexual selection pressures, leads to the evolution of latitudinal variation in sexual dimorphisms and mating behaviors. I conclude that this explains why tropical animals are characterized by showy ornaments and conspicuous body colors.