

EVOLUTION OF PHONOLOGICAL COMPLEXITY: LOSS OF SPECIES-SPECIFIC BIAS LEADS TO MORE GENERALIZED LEARNABILITY IN A SPECIES OF SONGBIRDS

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A species of songbirds, the Bengalese finch (*Lonchura striata* var. domestica) is a domesticated strain of the wild white-rumped munia. White-rumped munias were imported to Japan some 250 years ago and then domesticated as pet a bird. Munias have been bred for their intense parental behavior and white color morph during the course of domestication, but they were never bred for their songs. Nevertheless, domesticated Bengalese finches sing very different songs from those of Munias: Bengalese songs are sequentially and phonologically complex while Munia songs are simpler (Okanoya, 2004).

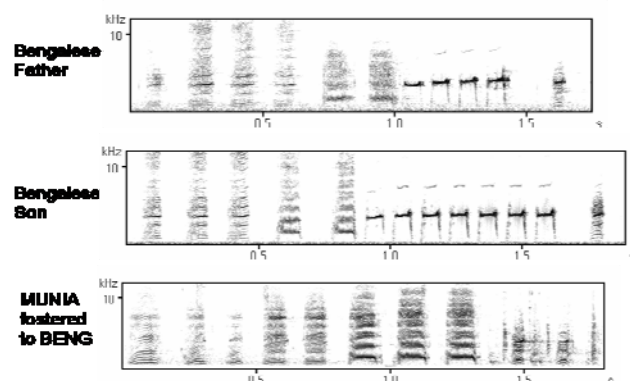


Fig. 1. A white-rumped munia cross-fostered to a Bengalese father (top) had a difficulty in learning a particular song note (bottom) while the Bengalese son learned father's song without difficulty (middle).

To elucidate the degree in which environmental and genetic factors contribute to these differences in song structure, we cross-fostered chicks of Munias and Bengalese. Detailed phonological analysis revealed that accuracy song-note learning is highest in Munias chicks reared by Munias, and lowest in Munia chicks cross-fostered to Bengalese. Bengalese chicks, on the other hand, showed intermediate degree of learning accuracy regardless whether they were reared by Munias or Bengalese. Results suggest that Munias are highly specialized in learning Munia song phonology, but less adopted in learning song phonology of the other strain, and Bengalese are less specialized in learning the own strain phonology but more generalized in learning the other strain phonology (Fig. 1).

Results can be interpreted as that there is an innate bias to learn species-specific phonology in Munias, and that such a bias is lost during domestication. White-rumped munias have several sympatric species such as spotted munias in their wild habitat. To avoid infertile hybridization, having a strong innate bias to attend to own-species phonology should be adaptive for Munias. Bengalese, on the other hand, are a domesticated strain and breeding is under the control of breeders. In such environment, species-specific bias is a neutral trait and might soon be degenerated. By the degeneration of species-specific bias, Bengalese perhaps obtained more general ability to learn from a wide-range of phonology.

Results also can be explained in the light of masking – unmasking and genetic redistribution, the idea proposed by Deacon (2003). Domestication functions as a masking factor and perceptual specialization for species-specific sound is masked. Under that environment, genetic specialization to attend species specific sound is re-distributed to more general ability to learn from a wider range of sounds in Bengalese finches

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References

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