

Interspecific introgression and widespread intraspecific gene flow in a clade of tropical and subtropical seabirds

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Abstract

The mechanisms that restrict gene flow between populations and facilitate population differentiation and speciation vary across the tree of life. In systems where physical barriers to gene flow are dynamic over time and space, such as many marine species, introgression may be a major factor in the speciation process. In sympatric species of seabirds with no land barriers between them, hybridization has been frequently observed but few studies have investigated patterns of introgression. We used whole-genome sequence data to test for interspecific introgression between five pairs of tropical and subtropical seabirds and to test for gene flow within species across major land masses and ocean basins. We found evidence for introgression between blue-footed (*Sula nebouxii*) and Peruvian boobies (*S. variegata*); masked (*S. dactylatra*) and Nazca boobies (*S. granti*); and blue-footed and Nazca boobies. We found no evidence of introgression between blue-footed and brown boobies (*S. leucogaster*) and masked and brown boobies despite observed hybridization between these species. We also found evidence for gene flow across several major land masses in three pantropical species: red-footed (*S. sula*), brown, and masked boobies. Finally, we report evidence for ancient introgression between brown boobies and the ancestor of blue-footed, Peruvian, masked, and Nazca boobies. Our work indicates (1) that interspecific introgression has shaped contemporary booby diversity in the eastern Pacific, and (2) that contemporary physical barriers to gene flow between booby colonies are not impenetrable. Our findings contribute novel insights to the growing body of evidence that suggests introgression is a widespread evolutionary process.

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