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Overview of seabird genetics

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OVERVIEW OF SEABIRD GENETICS

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Seabirds are a diverse group of organisms exhibiting a large amount of variation in life history traits and population dynamics. These species are found in a variety of habitats ranging from remote oceanic islands to coastal waters and can sometimes be found in inland areas. While, they are capable of dispersing vast distances, many species are highly philopatric. Recently, seabirds have become the focus for genetic studies to examine systematics, population structure and mating systems. Seabirds, especially those breeding on oceanic islands, are ideal study organisms because of their varying characteristics and the fact that they form discrete breeding populations.

Patterns of population structure in seabirds seem to be as varied as the birds themselves (Fig. 1). Physical barriers, such as land appear to be effective barriers to gene flow for most seabirds. Studies on globally distributed species in the Northern Hemisphere and tropics, suggest that gene flow is severely restricted between the Indo-Pacific and Atlantic Oceans. Genetic studies on sooty terns and three species of boobies have shown clear phylogenetic splits between the Indo-Pacific and Atlantic populations (AVISE et al. 2000; STEEVES et al. 2003). Within ocean basins and in the Southern Ocean, where there are no physical barriers, the pattern is more variable. For example, sub-antarctic species, such as shy albatross (*Thalassarche cauta*) in the Tasman Sea, exhibit high levels of population differentiation with each island forming a genetically distinct population (ABBOTT & DOUBLE 2003). In sharp contrast, the closely related grey-headed albatross (*T. chrysostoma*) is completely panmictic and the level of gene flow between geographically distant islands is high (BURG & CROXALL 2001). A similar pattern is found within the wandering albatross complex. The widely distributed *Diomedea exulans* shows low levels of population differentiation between breeding sites (<7000 km), compared to high levels of differentiation between *D. antipodensis* breeding on Antipodes and Adams Island (<750 km) (BURG & CROXALL 2004). In contrast, several northern species of seabirds show no genetic differentiation within the North Atlantic. The common murre (*Uria aalge*), black-legged kittiwake (*Rissa tridactyla*) and northern fulmar (*Fulmarus glacialis*) were all found to be panmictic across their range (Riffault pers. comm., McCoy pers. comm., BURG et al. 2003). Within ocean basins, there is evidence of isolation by distance (black-legged kittiwake and wandering albatross complex), long distance dispersal (great frigatebirds, *Fregata minor*; black-browed albatross, *T. melanophris*) and range expansion (northern fulmars, *Fulmarus glacialis*) (BURG et al. 2003; BURG & CROXALL 2001; DEARBORN et al. 2003; MOORE et al. 2001).

Clearly, genetic approaches add important insights into the biology of seabirds and combined with demographic and behavioural studies, they will continue to improve our understanding of population dynamics and life history traits of this vast group.

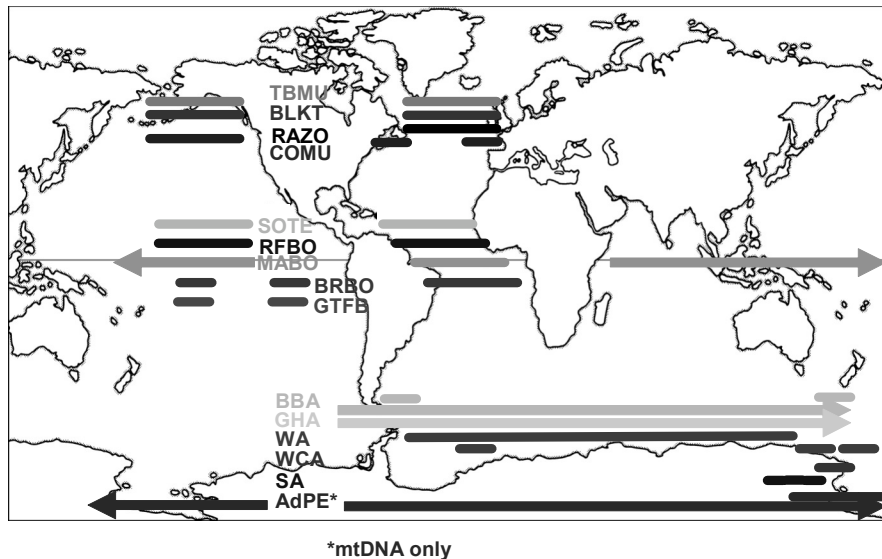


Fig. 1. Summary of global phylogenetic studies on seabirds (ABBOTT & DOUBLE 2003; BURG & CROXALL 2001; BURG & CROXALL 2004; DEARBORN et al. 2003; MOUM & ARNASON 2001; RITCHIE et al. 2004; STEEVES et al. 2003). Each continuous line represents genetically discrete populations. Species include thick-billed murre (*Uria lomvia*, TBMU), black-legged kittiwake (*Rissa tridactyla*, BLKT), razorbills (*Alca torda*, RAZO), common murre (*Uria aalge*, COMU), sooty tern (*Sterna fuscata*, SOTE), red-footed booby (*Sula sula*, RFBO), masked booby (*Sula dactylatra*, MABO), brown booby (*Sula leucogaster*, BRBO), great frigatebird (*Fregata minor*, GTFB), black-browed albatross (*Thalassarche melanophris* and *T. impavida*, BBA), grey-headed albatross (*Thalassarche chrysostoma*, GHA), wandering albatross (*Diomedea exulans*, *D. dabbenena*, *D. antipodensis*, WA), white-capped albatross (*Thalassarche steadi*, WCA), shy albatross (*Thalassarche cauta*, SA) and Adelie penguin (*Pygoscelis adelia*, AdPE*).

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