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The way back journey: islands as sources of biodiversity

Until very recently, biogeographers and ecologists considered continents as the main source of biodiversity for islands. This notion of islands as the end of the colonization journey was held mainly for two reasons (Bellemain and Ricklefs 2008). First, species colonizing islands from the mainland may lose dispersal ability making the process of reverse colonization less likely. Second, continental populations evolve under intense interspecific competition and a high diversity of predators and pathogens, whereas island taxa usually evolve in a low-competition environment and in the absence of such natural enemies; this makes mainland habitats more difficult to invade by island populations. However, Bellemain and Ricklefs (2008) suggested that the way back journey to the continent should happen more often than previously thought, and this may be crucial for the maintenance of biodiversity on continents.

A recent study by Hutsemékers et al. (2011), based on population genetic analysis of the spore-producing moss *Platyhypnidium riparioides* from North Atlantic archipelagos, provided strong evidence that (i) this bryophyte had not lost dispersal ability in island populations; (ii) the migration rates from continent to islands and *vice versa* were statistically similar; and (iii) continental, instead of island populations, experienced a severe bottleneck during the last glacial maximum. According to their analyses, the sea is not a major barrier for migration by island mosses. They did find a geographical pattern in genetic diversity in *P. riparioides* within the archipelagos of the Azores, Canary Islands, and Madeira, but it was not different from the isolation by distance pattern found for the Iberian Peninsula and Morocco. Moreover, although present air currents have favored island colonization, the emergence of sea-mounts in the region may have acted as stepping stones between the archipelagos and the continent.

The major implications of their findings go beyond the biogeography of spore-producing plants. Although bryophytes can be regarded as

among the best candidates to show reverse colonization—due to their high dispersal ability and widespread distributions—these results altogether suggest that islands have the potential to act as refugia. Population size on islands can remain constant in periods of intense disturbance on the continent, and such refugial biodiversity can be the source for recolonization of mainland areas. This link was made by Hutsemékers et al. (2011) by showing that, opposed to what happened in the archipelagos, there was a decrease of suitable areas in the Iberian Peninsula during the last glacial maximum, and that island-continent air currents might have predominated during the arid phases of the last glaciation. The challenge now is to test for similar patterns for other groups—especially those with active dispersal such as birds, bats and insects—and other archipelagos with varying distances to the continent to test the generality of these findings. Testing the ‘way back journey’ and other emerging hypotheses in oceanic island biogeography has the potential not only to improve our understanding about the factors that affect diversity across insular communities, but also to help the development of a comprehensive new model of biogeography (Heaney 2007).

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