# ISLANDS

## COMMUNITY ASSEMBLY ON REMOTE ISLANDS: DOES THE EQUILIBRIUM THEORY APPLY?

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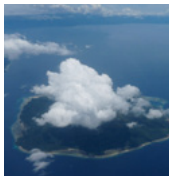
The theory of island biogeography has long served as a cornestone for biodiversity sciences, and its impact goes far beyond biogeography only (theoretical ecology, conservation biology, ...). This theory aims at explaining species diversity within islands and was the first to emphasize the importance of historical and regional perspectives to explain the dynamics of ecological communities. Postulating that the number of species on an island depends on a dynamic equilibrium between colonisation and extinction, the theory predicts that large islands (or those close to continents) have more species than small islands (or remote islands). Although these predictions have often been verified, area and degree of isolation are not the only factors that influence island biodiversity. Phylogenetic studies from the last 20 years have shown that evolutionary divergence and species formation (or speciation*) may play a role analogous to the colonisation process in adding species to communities on remote islands, and that evolution on islands can also influence extinction dynamics. Geological studies also demonstrate that geographic and ecological contexts are highly dynamic over time and that they can greatly influence the likelihood of colonisation as well as opportunities for speciation for most animals and plants.

The main objective of the ISLANDS project is to evaluate the importance of historical factors *sensu lato,* including the evolutionary dynamics of colonist lineages, in the buildup of island ecological communities, by focusing on a wide array of organisms and archipelagoes. The project will also aim at formulating a new general theory of island biogeography that will be closer to empirical observations and will allow a better appreciation of the heritage value of biodiversity in insular environments (« true » islands, mountains, lakes, ...).



## CESAB'S ADVANCES

- The ISLANDS project provides a unique opportunity for a panel of international experts on island biodiversity and paleoecology, geodynamics and theoretical community ecology to assemble and synthesize existing data and contribute to developing a new general theory of island biogeography.
- The ISLANDS database will be the first one to compile published data on a wide array of organisms and remote archipelagoes for which complete or almost complete time-calibrated phylogenetic hypotheses are available.
- The ISLANDS project will offer a web portal to visualise geomorphometric data; this portal will allow many users to explore and generate maps (species distribution, bathymetry, paleogeography, biodiversity and endemism indicators,...) available in a universal format (Digital-Earth type).

## STEPS

- To build a database that will synthesize exisiting data on distribution, evolutionary history, and the biology and ecology of a wide array of organisms living in remote archipelagoes.
- To explore new theoretical fields and develop modelling tools to analyse the factors that explain current diversities and distributions within and among islands.
- To integrate the data in a robust comparative framework to test the relevance of new models that take into account geographic and ecological factors as well as historical processes to explain the community buildup on islands.

## Focus

### *Speciation and biodiversity

The formation of new species, once islands have been colonised, can happen in two different ways. An island population may diverge and become reproductively isolated from the mainland source population (anagenesis); or two island sister-populations may diverge and become reproductively isolated from each other within an island or archipelago (cladogenesis). These two processes do not have the same impact on biodiversity. Anagenesis results in the replacement of a colonist species by an endemic one with no effect on local species diversity; but it increases global biodiversity. In contrast, cladogenesis simultaneously increases both local species diversity and global biodiversity.



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The FRB was launched in 2008 at the initiative of the ministry of research and the ministry for the environment of France, and was founded by 8 public research institutions (BRGM, CIRAD, CNRS, IFREMER, INRA, IRD, IRSTEA, MNHN). The FRB is a science-society platform and it supports and promotes scientific projects and expertise on biodiversity.

The CESAB is a centre for the synthesis and analysis of biodiversity created and developed by the FRB to foster knowledge on biodiversity through data and theoretical synthesis activities. CESAB provides researchers with the means to conduct these activities in a dedicated place over sustained periods of time.