

## PROTECTED AREAS AND ENDEMIC SPECIES

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**Keywords:** endemic species, protected areas, nature reserves, ecological islands, Mediterranean Islands, micromammals of the Mediterranean Islands

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### 1. Introduction

The extinction of plant and animal species has become an issue in the news, and the media have gradually become interested in the fate of the most endangered taxa. International organizations, such as the International Union for Conservation of Nature (IUCN), the World Wildlife Fund (WWF), and others, are making tremendous efforts to safeguard hundreds of species. Their actions have already made it possible to put several dozen out of danger, but the future of the majority remains uncertain. The panda, *Ailuropoda melanoleuca*, for example, which is the emblem of the WWF and symbol of the protection of nature, could disappear in the wild before the middle of the twenty-first century despite all the protection efforts. In this case, we are dealing with an animal that is endemic to a restricted Chinese territory, but many other native plant and animal species are also doomed to early extinction in several areas of the world.

Among the endangered plants, for example, some have almost died out. This is the case with the dodo tree—or the New Caledonian palm—whose heart was so appreciated by the convicts. There was only one adult tree left when a horticultural scheme was started to save the species. For the rarest plant species, botanists have established conservatories, of which there are a few dozen throughout the world. In them, seeds are stocked and adult plants are regularly grown in order to produce new seeds to be shared with other conservatories or even replanted in the natural environment. Unfortunately, when a species is approaching its final demise, biologists are completely without recourse. Today, nature reserves are being set up worldwide and play a fundamental role in the management and conservation of the planet's natural resources.

### 2. Endemic Species and Ecological Islands

A living organism is described as “endemic” if it is both native and restricted to a particular geographical region. Some plants and animals are in fact confined in their distribution to the areas in which they evolved and, consequently, are said to be endemic to that region. Confinement may be due to physical barriers to dispersion, as in the case of many island faunas and flora; alternatively, they may have only recently evolved and have not yet had time to spread from their centers of origin. Because each species of organism evolves in one particular, restricted area, its distribution will be limited by the barriers that surround its area of origin. Each such area will, therefore, contain endemic organisms: those that are found there and nowhere else.

In general, there are two major factors influencing the degree of endemism in an area: isolation and stability. Thus isolated islands and mountains are often rich in endemics. Long-term climatic stability is rather rare, but there is evidence that some parts of the planet have been more stable than others. Island environments exhibit a greater degree of fragility than do continents, because of the restricted variety of ecological niches and the small number of individuals living in a reduced space. Similarly, species restricted to unduly narrow or fragile environments—such as springs, dunes, tops of mountains, and valleys—run the risk of disappearing with the first change of their habitat.

An island is certainly an intrinsically appealing study object. Simpler than a continent or an ocean, it is a visibly discrete object that can be labeled with a name and its resident populations identified thereby. In the science of biogeography, the island is the first unit that the mind can pick out and begin to comprehend. By studying clusters of islands, biologists view a simpler microcosm of the seemingly infinite complexity of continental and oceanic biogeography. Islands offer an additional advantage in being more numerous than continents and oceans. By their very multiplicity, and variation in shape, size, degree of isolation, and ecology, islands provide the necessary replications in natural “experiments” by which evolutionary hypotheses can be tested.

Island ecosystems are most vulnerable to different kind of biotic invasion; they host a high proportion of endemic species, which are particularly vulnerable to the introduction of exotic species. Approximately 90% of bird extinctions since 1600 have happened on islands, and in 30% of cases the introduction of alien species was the cause. The fate of most populations is eventual extinction, but island species appear to be particularly susceptible. For example, of the 94 species of birds that are known to have become extinct since 1600, only 9 lived on continents; the rest were endemic to islands. To see the enormity of this, we must remember that island species make up only 10% of the world’s avifauna. Island populations will always be more vulnerable than those on continents because of their smaller size and restricted range.

For this reason, they have been particularly hard hit by the activities of humans: hunting, destruction of habitat, and the introduction of predators, diseases, and alien competitors. In New Zealand, for example, the role of large grazers was filled not by ruminant mammals but by large flightless birds, the moas. There were approximately 20 species of these giant birds, some of which may still have been alive in remote areas until about two centuries ago. The tallest moas grew to a little over three meters in height, and their masses could exceed 250 kg. By the time Captain Cook arrived in New Zealand in the late 1700s, the Polynesian Maoris had hunted to extinction most of these

magnificent giants. Today none remain. Similarly, in Fiji islands the introduction of the mongoose has eliminated the barred-wing rail, *Nesoclopeus poecilopterus*, from Viti Levu within 100 years. The remains of New Zealand moas are found either in marshy deposits, in caves, or in the kitchen middens of Maoris, and in all the countries where flightless birds, including the dodo (*Raphus cucullatus* (L., 1758)) and the solitaire (*Pezophaps solitaria* Gmelin, 1789) have been found, it was chiefly humans who directly or indirectly exterminated those that are no longer represented.

The impact of humans, however, is not the only factor at work. It fails to explain why, for example, in Fiji the parrot-finch (*Erythrura cyanovirens*) is common and widespread while its relative *E. kleinschmidti* is on the brink of extinction, even though its montane forest habitat is practically undisturbed. Nor does it explain why the long-legged warbler (*Trichocichla rufa*) is a common bird of the rain forest. Clearly, extinction of island species is not a simple matter; some species are more likely candidates for doom than are others, from whatever direction it comes.

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### **Biographical Sketch**

**Marco Masseti** works as researcher and teacher at the Dipartimento di Biologia Animale e Genetica, Laboratori di Antropologia, of the University of Florence (Italy). His studies are mainly focused on the reconstruction of the former ecosystems and the relations between humans and the other animals in the Mediterranean region and in the Near East, since prehistorical times, with particular reference to mammals.