# DO WE PROTECT BIOLOGICAL ORIGINALITY IN PROTECTED AREAS? THE CASE OF THE BONIFACIO STRAIT MARINE RESERVE

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**Abstract**

Nowadays the question is no longer whether protected areas are able to maintain species richness but whether protected areas are able to protect other overlooked facets of biodiversity against erosion. Our study aims at evaluating the ability of protected areas to maintain viable populations of the most "original"species on a biological point of view. This question was investigated using a long-term monitoring programme in the Bonifacio Strait Marine Reserve. As a result, our study provides a clear example of how protection against human impact in coastal areas benefits preferentially to the most original fish species in terms of ecomorphological characters.

*Keywords : Biodiversity, Trawl Surveys, Strait Of Bonifacio, Marine Parks, Coastal Management.*

In a natural world increasingly transformed by human activities, it is now widely accepted that biodiversity is being lost rapidly in both terrestrial and marine ecosystems. For aquatic ecosystems, the most important factors are certainly climatic change, biotic exchange and overfishing; the latter being the most direct human disturbance to all coastal ecosystems [1]. If the causes of biodiversity loss seem established, the consequences of such dramatic declines or alterations have spurred considerable research and tremendous debate. Indeed biodiversity should be preserved not only for aesthetic reasons and for its direct usefulness, but also for its indirect benefits. For instance, it has been experimentally demonstrated locally that species richness *per se* positively influences ecosystem functioning and some fundamental ecosystem properties such as productivity, resistance to invasion, stability and resilience (e.g. [2]). Given the uncertainty of the future, preserving local biodiversity would maximize the probability of a viable response at the community level and would increase the variability of possible alternative types of ecological organization to disturbance and changing environmental conditions [3]. Thus, as alterations of biodiversity may disrupt ecological functions performed by species assemblages, it is urgent to carefully examine the implications of biodiversity loss not only in terms of pure conservation purposes but also in terms of sustainability of ecosystem services upon which human welfare depends.

Protected areas are indisputably the primary tool for *in situ* biodiversity conservation across the world [4] with more than 100,000 sites covering nearly 11.7 per cent of the land surface of the planet and about one per cent of the marine environment. However protected areas have been set up for reasons which are more based on species and habitat considerations rather than on knowledge and understanding of ecological systems. For instance biodiversity is almost exclusively assimilated to species richness in protected areas (the number of species coexisting on a site) while the definition of biodiversity includes various facets of the diversity of life. It is thus ironic that the main measure of biodiversity ignores what makes species different in an assemblage: their relative abundances and their biological attributes. In addition the two diversity facets of biodiversity, which are closely related to the differences among species, are known to influence ecosystem functioning. Evenness, which measures the relative distribution of abundance among species, is positively related to the resistance against invasion [5]. Functional diversity, which measures the value and range of the functional traits of the organisms, is now widely recognized as a main driver of ecosystem processes in aquatic environments [6]. Thus the question is no longer whether protected areas are able to maintain species richness but whether protected areas are able to protect other overlooked facets of biodiversity against erosion.

When considering the differences among species to assess the biodiversity of an assemblage we can assume that the species that contributes the more to the biological diversity of this assemblage is the one with the more original biology, i.e. the one with the highest average rarity of its features or characters [7]. Consequently the loss of such original species is more likely to provoke the loss of some unique biological features which can be life-history traits, morphological structures or behaviours. This is particularly true for some species-poor families on Earth (rhinos and kiwis) because extinction of species belonging to these families would inevitably lead to the loss of their unique biological characters [8]. Moreover, the degree of originality of species within an assemblage determines the strength and the shape of the relationship between taxonomic and functional diversity [9]. Extinction of species which are functionally equivalent to some others in the assemblage has less impact on functional diversity than the extinction of original species. Thus measuring the biological originality of a species gives insight into its conservation importance in the light of the conservation of ecosystem functioning. Then, a crucial question arises: do protected areas contribute to protect biological originality? In other words our article aims at evaluating the ability of protected areas to maintain viable populations of the most "original"species on a biological point of view. This question was investigated using a long-term monitoring programme in the Bonifacio Strait Marine Reserve. As a result, our study provides a clear example of how protection against human impact in coastal areas benefits preferentially to the most original fish species in terms of ecomorphological characters.

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