

A Quantitative Survey Technic for the Assessment of Waterfront Patrimonial and Indicator Marine Species. Application around Marine Protected Areas of French Mediterranean Sea and Miyajima National Park (Seto Inland Sea Japan)

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Marine biodiversity of protected areas must be particularly surveyed to evaluate the health of the ecosystems and to prevent human impacts. On the waterfront and the intertidal zone, highly adapted species of fauna and flora can grow, most of them living only in this biotope. They are very resistant to temperature and salinity variations but are exposed to drifting pollutants such as hydrocarbons or tensioactive detergents.

In most studies, these species are only qualitatively checked (list of species) or the abundance of selected populations are evaluated on transects established perpendicular to the coast. We propose a survey technique giving an accurate global quantitative approach linked to a Geographic Information System (GIS).

Along the coast of Seto Inland Sea, the tide amplitude is mainly between 3 to 5 m in high, while in the Mediterranean sea, it is less than 0.5 m. On the narrow intertidal zone, we selected 5 to 15 species which are easy to visually assess *in situ*. We choose some species for their patrimonial value, others for their perennial presence or for their indicator value (as the green nitrophilic algae of the order of Ulvales). Most of these species are present with few individuals, or grow in the shadow of rocks so that they cannot be monitored by aerial photographs. Abundance of each species is checked on unit "cells" of 20 meters of coast length whose width is depending on the tide amplitude and the slope of the waterfront. Other environmental data are collected (artificial or natural rocks, sandy bottom, trace of hydrocarbons ...)

In the Mediterranean sea, 3 people can easily check 50 unit "cells" in two hours, walking on the sea shore or swimming when cliffs are on the waterfront. On the rocky shore of Seto Inland Sea, 5 to 10 people (graduate students with 2 seniors) must walk in parallel along the 20 m coast length, one hour before and one hour after the lowest tide.

For species less than 100 individuals in front of 20 m of shore, the number of individuals per unit "cell" is monitored. For the species established as belts parallel to the coastline, the linear of the belt found in front of each 20 m unit "cell" is noted.

Each unit "cell" has a number and is positioned on a plastified aerial photo taken *in situ*. After the field work, all data are compiled in an Excel spreadsheet with the numbers of the unit "cells" as lines and the selected species as columns. This table is linked with the corresponding unit "cells" drawn on a map with a specific software (Map Graftix). This allows to quickly obtain maps of each species with reference to their abundance and geographical position.

Natural or anthropic variations can be easily monitored with diachronic surveys. Otherwise these maps have a high sensitive and valorisation value for the management of Marine Parks and other patrimonial coasts, especially for the quantitative evaluation and the precise localisation of potentially endangered species.

In the French Mediterranean sea, in the last decade, 126 km of the waterfront biodiversity is described with this technique {38,9 km of coast line of the natural marine park of Scandola (Corsica), 65,8 km of the Marine park of Lavezzi (Corsica) with for example 5401 endangered limpets *Patella ferruginea* checked and mapped, 21,4 km of the Marine National Park of Port-Cros}. In 2000 a first application of this technique was successfully used around the National Park of Miyajima.