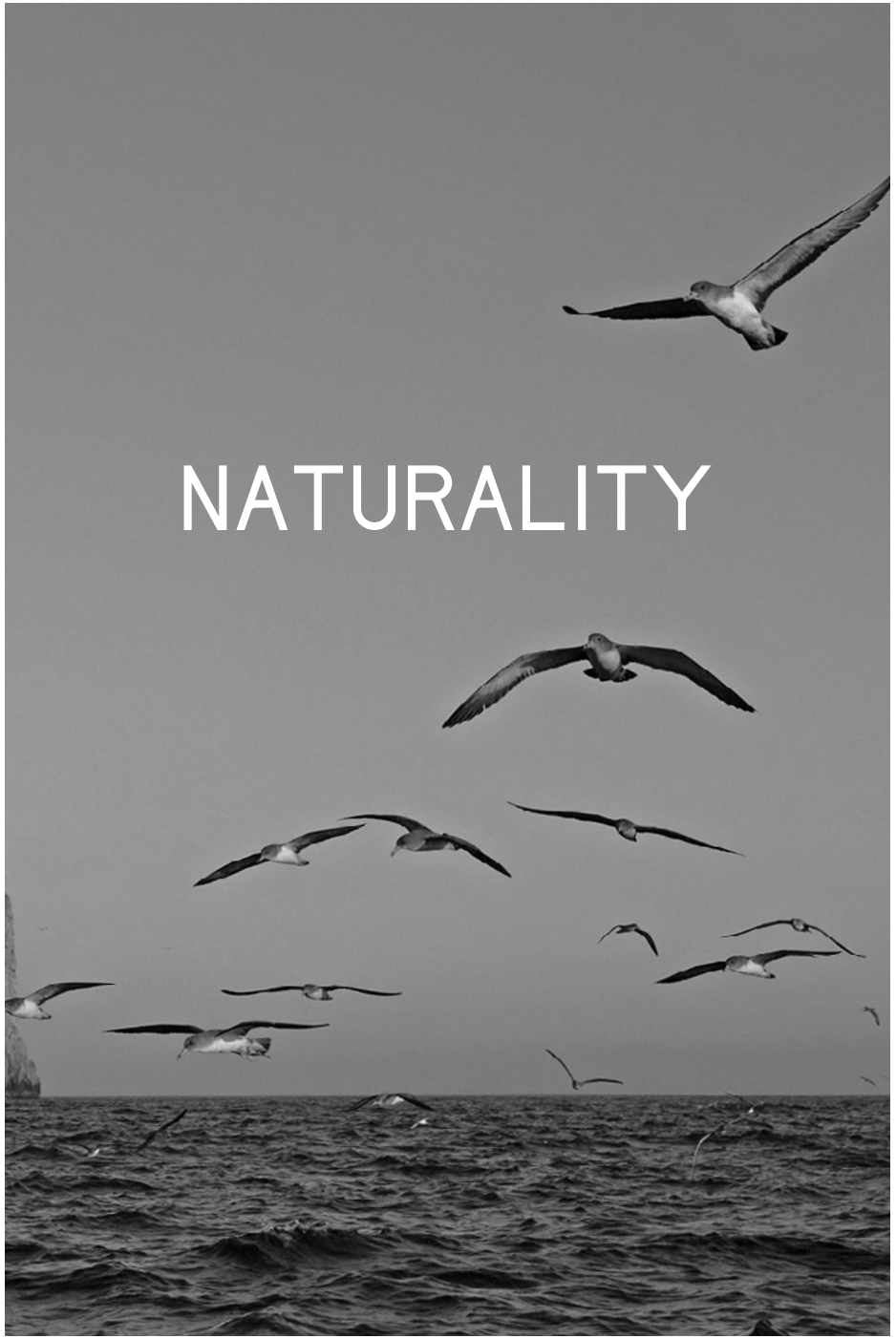

In the current context, the depleting of natural resource and the environmental and socioeconomic crises raise the necessary issue of sustainable ecological and economic management practices. Protected area administrators need to position themselves between two options: (1) the naturality approach that suggests you leave areas to evolve “naturally” (2) the active intervention approach which aims to control the evolutionary trajectories of environments and to manage them in order to maintain or enhance biodiversity by developing restoration and ecological engineering programs. Given the new challenges of rising sea levels, invasive species, over-developed coastal tourism, over-exploitation of resources and even the erosion of biodiversity, which management methods should the European and the Mediterranean Coastal Agencies choose? Which battles are lost in advance and which ones should we focus on? Should we continue to actively intervene and how? If so, what are the identified priorities for our natural coastal areas?

I/ INTRODUCTION: COASTAL ECOSYSTEMS UNDER PRESSURE, AT THE FRONTLINES OF GLOBAL CHANGE

The coastline is an environment that moves naturally, subjected to the considerable forces of the sea, the wind and coastal rivers. Over the centuries, man has tried to control these natural evolutions to better enhance and secure its activities. More recently we have become aware of the ecological value of coastal and marine natural heritage and have outlined protected areas - or areas to be protected – with the aim of maintaining or restoring the identified heritage elements. Therefore, the coastline of the early twenty-first century is virtually immobilised in these vocations, the only changes that can occur are those further reducing the portion of nature remaining (urbanization, artificial development) or those caused by major natural disasters.

The global tendency for high coastal population, amplified by urbanisation and coastal tropism, threatens natural shorelines that become more artificial and lose their dynamic buffering role between land and sea. Terrestrial biodiversity is increasingly fragmented, compartmentalised in isolated and confined spaces. It is estimated that around 5 to 10 km of coastline are affected daily by anthropogenic development (Beoutis, John, and Colas 2004).

Coastlines are also particularly fragile geographic interfaces. Coastal and marine natural heritage consists of ecosystems, exploited or not, as well as terrestrial and marine landscapes. The wide variety of coastal lines offers a great diversity of natural habitats sheltering many various species, a real ecological mosaic essential to the balance and integrity of the areas (Henocque and Bersani 2008). Wetlands and small islands (between 15,000 and 20,000 islands and small islands in the Mediterranean) are meeting places between land and sea, they are very vulnerable areas where many endangered species are dependent and take refuge (Mabille and Piante 2008).

The latest IPCC predictions, regarding future sea level rising, have increased compared to previous estimates, which will have serious consequences for many coastal areas, particularly low-lying areas, wetlands and sand formations (IPCC, 2014. 5th report).

Coastlines are on the frontlines of the announced global changes, and therefore are very concerned by the deliberation on the rigidity or mobility of areas, heritage and activities.

II/ EUROPE AND THE MEDITERRANEAN AT THE HEART OF COASTAL AREA PROTECTION POLICIES

On the 3rd of May 2011 the European Commission adopted a new strategy to decrease biodiversity loss and improve the conditions of species, habitats and ecosystems in the EU as well as ecosystem services provided. Six goals (1. the full implementation of EU legislation on nature protection, 2. better protection and better restoration of ecosystems and ecosystem services, and increased use of green infrastructure 3. greater sustainability of agriculture and forestry, 4. better management of EU fish stocks and more sustainable fishing 5. tighter controls on invasive alien species and 6. the EU's increased contribution in efforts to decrease biodiversity loss globally) cover the main environmental issues and lay the foundations for policies on which EU measures will be based for the next decade (European Commission 2011). Through the «Habitats» and «Birds» directives as well as the water and marine area framework directives, the European Union sets strict targets for maintaining the quality of natural areas. Furthermore, since 2009, the implementation of the «European Parliament resolution on European Wilderness» emphasizes the necessity to integrate as best as possible the highly natural area concept especially in the N2000 network. Out of 27 000 Natura 2000 sites in Europe, 384 are included in the wilderness list (highly natural areas) (Génot 2014).

The Mediterranean has had a cooperation framework agreement for the protection of regional seas, since 1976 under the Barcelona Convention and the Action Plan for the Mediterranean with a protocol concerning Special Protected Areas and Biodiversity. In 2003, a strategic action program for the conservation of biological diversity (SAP-BIO) has strengthened the implementation of the protocol. While the SPA / DB protocol aims to preserve species and the most remarkable areas, at sea and in coastal areas, the ICZM Protocol, which was implemented in 2011, aims to preserve all the elements of coastal areas (ecosystems, natural resources, landscapes...) by assisting with their development and the sustainable use of their resources.

III/ MANAGING COASTAL ECOSYSTEMS

The relationship that man has had with coastal areas has fluctuated over the centuries. Since ancient times man has tried to control these natural environments to make them productive (first for salt then agricultural reclamation), but up until the eighteenth century, coasts were considered dangerous and not often inhabited by man. In the nineteenth century, reclamation continued and was accompanied by dig developments such as dune stabilisation, pine tree planting, hydraulic sanitation... The seaside tourism boom increased coastline development and construction, with a densification during the twentieth century (lots, buildings, «defence against the sea» developments...), in parallel industrial and port complexes were emerging, transforming the shores into coveted space resources as with agriculture. It was only in the 1970s that the human exploitation of nature was criticized and the notions of environmental fragility, endangered species and ecological capital were raised. Nowadays, the exploitation of natural areas for economic development is limited by regulations and nature protection in western countries is a publicised cause, politically adopted and used for the benefit of sustainability (Meur-Férec 2007).

Therefore, to preserve ecosystems (in the functional sense), habitats and species, several approaches are used, independently or concurrently:

- Diminishing urbanization and coastal development (Article 8 of the ICZM Protocol for the Mediterranean): limiting continuous linear development by establishing green belts and favouring transverse road access to the sea, redirecting part of the coastal tourist flow to inland areas, regulating tourism development, with economic tools for the sector's contribution to environmental maintenance, defining total capacity, trying to find synergies with traditional activities (agriculture, fishing, construction…) with the implementation of the «sea» component of the Territorial Coherence schemes (Thibault, Laria, and Coudert 2005), not degrading, particularly with moorings, to protect underwater habitats (2014 Boissery); diminishing the impact of construction: reducing water and energy consumption, using renewable energy, reducing and recycling waste, treating waste water.

- Preserving remarkable coastal sites (parks, reserves, classified landscapes...), preserving the integrity of certain areas (100 meter strips, 50 geometrical steps, wetlands, sensitive areas, beaches and dunes…), and endangered species (IUCN list, European Directives, national red lists, national decrees…)

- Reconnecting the areas through ecological corridors: taking into consideration the flow of genes, of energy and materials, connecting well preserved but isolated ecosystems in landscape matrices not conducive to exchange (Gauthier-Clerc, Mesléard and Blondel 2014). Local policies should be coordinated with all regional policies through international strategies by networking all key-players and their administrators (Mabille and Piante 2008) (N2000 network, green and blue infrastructure, MedPAN network of marine protected areas…)

- Restoring / rehabilitating / optimizing coastal environments using ecological engineering: «Ecological restoration tends to help a degraded, damaged or destroyed ecosystem come back to its previous state» (Gauthier-Clerc, Mesléard and Blondel 2014)

- Limiting human intervention by trusting natural processes and new equilibriums in place: let natural environments evolve freely (Madelin, Peter, and Daniel Vallauri 2012).

1) FROM NATURE GARDENING…

Ecological restoration is a response to the deterioration of wildlife, flora and habitats or ecological functionality. In regards to marine environment, ecological restoration does not take into account water quality, but this of course is a prerequisite for effective restoration, as is the fact that whatever is responsible for the degradation should be previously controlled or eliminated when possible. "An environment that is not damaged does not need to be restored." Therefore, ecological restoration is a measure that aims to improve the ecological state or restore ecological functioning (return of indicator species…) (Boissery 2014), it is not always necessarily required.

	Non-degradation	Restoration
Technical Feasibility	Easy	Difficult
Available tools	Regulation, incentive	Innovative technical solution
Cost	Cheap	Expensive
Results	Short term	Mid to long term

Comparison between non-degradation and restoration (according to Boissery 2014)

"In terms of cost: an operation involving the re-organisation of usage can be carried out in a few months with a €150k budget, an ecological restoration operation such as the Prado reefs required more than 10 years of work before the immersion of the first reefs and just under €10 million. In regards to sanitation-related expenses in the urban areas of Marseille, this represented less than 1% of the expenditure dedicated to the fight against pollution in the area. The destruction of a harbour with several hundred moorings cost a few million. By comparison equipping a port with artificial habitats to regain some of its ecological "nursery" functionality is estimated at less than €100 k. Non-degradation remains the best solution, whether in terms of efficiency, cost or timeline"(Boissery 2014).

Apart from the usually high cost of ecological restoration of functionalities or features, certain measures may be considered heavy and impactful on the natural environment in response to various issues:

• Protection of native or endemic species: the fight against invasive species, particularly on islands, by manual and mechanical control (pulling out, capturing), chemical control (herbicides, poisoning), biological (introduction of predators or specific pathogens), ecological (environment restoration and modifying natural or anthropogenic disruptions), reproductive (immuno-contraception) / translocation or reintroduction of native species / implementation of artificial reefs, artificial nests...
EXAMPLE : Eradication of the carpobrotus plant on the island of Bagaux = 100,000 euros for one hectare located on cliffs / Eradication of rodents: spreading of chemical bait by helicopter assisted by GPS mapping / Island Conservation: organisation dedicated to fighting invasive species, particularly rats, on islands to prevent the extinction of species (measures carried out in the Pacific, the Caribbean, California, Mexico and South America).

• Protecting habitats/ landscapes: maintaining open areas (cutting, mowing, controlled burning, grazing...), reforestation, stabilisation, restoration and maintenance of ponds and water
EXAMPLE : Regionalised agro-environmental measures: contracts with farmers to keep landscapes open

• Making natural environments accessible to all, making the public aware of its fragility: improving natural sites (tables, rubbish bins, parking, paths, signage, gateways, viewing platforms...).

IS ACTIVE MANAGEMENT COMING TO AN END OR IS IT THE ONLY REMAINING EFFICIENT PROTECTION ?

Nevertheless, nature conservation measures carried out efficiently often fall under the field of ecological engineering and active restoration, due to the fact that natural habitats have suffered heavy damage and that the vitality of remarkable natural heritage depends on it. Nature protection methods, on legal, institutional and scientific levels, are essentially turned towards the conservation of these remarkable biodiversity elements (or, one might say, noticed elements). These measures, carried out in emergency situations, have helped preserve spaces and endangered species, even in small areas, and have helped mobilise resources for monitoring. Nowadays, nature conservation policies are being reviewed: are we not sometimes carrying out costly and unrealistic excessive treatment? Shouldn't biodiversity «get out of its reserve» and spread through the entire territory? Aren't «wild», «virgin», and «highly natural» areas a more global solution for biodiversity protection?

2) ... TOWARDS THE NATURALITY CONCEPT (GAUTHIER-CLERC, MESLÉARD, AND BLONDEL 2014)

"Naturality defines a natural or spontaneous state. The term is opposed to something that is grown, to dynamic processes not affected by man, in any environment regardless of its initial state. Two innovative aspects have emerged from the naturality concept: the acceptance of new trajectories led by nature alone, without man's involvement other than observation, and the desire to protect nature in the future, as much as that of the present and the past. Applying the naturality concept can lead to not valuing rare species more than common species and native species more than exotic species that have become part of human heritage «(Gauthier-Clerc, Mesléard and Blondel 2014).

Therefore the naturality concept can be applied to conservation biology:

- Non-intervention (vast network of ecosystems evolving freely): many natural or semi-natural areas can be left to evolve freely, rocks, cliffs, scree, streams, lakes, ponds, lawns, meadows, cultures, tall-grasses, fruit trees, heathland, scrubland, garrigues... because leaving nature to evolve freely costs nothing for the community and can provide a lot through observation and continuous monitoring of the nature of tomorrow. Some of these areas are more dynamic than others, particularly on the coast: the concepts of ecological succession and instability must be integrated into these approaches.

- Restoration by removing artificial developments that disrupt naturality: leaving an ecosystem to recover on its own on an ecological level. Restorations in favour of naturality should have a double objective: to significantly increase the naturality level of the initial ecosystem and letting nature follow its course after the restoration.

EXAMPLE

Reintroducing large predators; removing dams; closing and destroying certain roads in order to preserve the tranquillity of certain natural areas; removing electrical or telephone networks; deconstructing buildings to eliminate traces of human occupation; suppression of domestic grazing in protected areas such as central areas of national parks to promote wild ungulates...

- In a world marked by global changes (climate, society, economy, energy, and/or usage), could ecosystems currently considered as «damaged» enhance their heritage, functional or natural value in the future through their spontaneous evolution or modifications in future preservation criteria?

EXAMPLE

The Wild Europe initiative created in 2005 to promotes a common strategy for the protection and restoration of wilderness areas (highly natural areas) and large wild natural habitats through various European nature protection organisations such as

PAN Parks, EUROPARC , WWF, Birdlife International, IUCN, UNESCO, the Institute for European Environmental Policy (IEEP), the European Centre for Nature Conservation (ECNC) and Rewilding Europe - a project that involved members of the European Commission and the Council of Europe (Madelin and Vallauri 2012). Wild Europe is studying the possibility of setting up 5% of land dedicated to wilderness by 2034. This goal is supported by the International Convention for Biological Diversity (Global Biodiversity Out–look 2010) which identified the amount of potential marginal land in the whole of Europe that could be returned to the wild around 200 000 km2 (Aykroyd 2014).

On the coast, the logic is reversed nowadays: with climate change and the gradual rising of sea levels, coastal risk management can't depend entirely on the rigid defence of coastlines. It must return some areas to natural phenomena, use natural environments as buffers and whenever possible move whatever is at stake away from vulnerable sectors.
Letting coastlines evolve freely within a coastal strip of sufficient width improves sediment, absorbs the sea's energy when it rises, and thereby reduces risks further up. Natural coastal areas offer effective, sustainable and efficient solutions to ensure coastal areas adapt to climate change. Coastal forests such as mangroves also contribute to reducing the effects of climate change by capturing carbon and reducing ocean acidification.

However, the obstacles to the implementation of the naturality concept should not be overlooked:
- To be functional it requires large entire surfaces, which are is increasingly difficult to find on the coasts;
- Non-intervention is often associated with a negative image of abandonment, fallow or even hostile nature; there may be strong social reluctance to its implementation;
- Leaving natural environments to evolve freely can lead to adverse changes for some habitats or species legally protected and expose the administrators to be held accountable.

NATURALITY, AN ETHICAL, ECOLOGICAL OR ECONOMIC CHOICE ?

«*On an economic level, leaving nature to evolve freely costs nothing other than some investment for continuous monitoring and observation. On an ecological level, the areas dedicated to naturality shelter species linked to the slow maturing stages of ecosystems and can be used as monitoring areas to study the effects of global changes. On an ethical level, naturality is at the heart of emotional, spiritual and educational values, they are places that lead to contemplation and inspiration. However, all human activities should not be condoned under the pretext that «nature always resume its rights'*» (Gauthier-Clerc, Mesléard and Blondel 2014).

THOUGHTS

The trend towards greater naturality seems intellectually and economically necessary, but it will have to be gradual. Changing our natural coastal environment management practices requires more than technical ad justments: it is the whole cultural, administrative and scientific backgrounds that also need to incorporate these new approaches. Without necessarily abruptly changing methods, it could be useful to study and experiment how to use the functional resilience of nature, while continuing to intervene more actively to restore certain ecosystems considered «cultural», of high ecological heritage value.

Here are some tips that can help European and Mediterranean Coastal Agencies on the subject:

- The intrinsic mobility of coastal ecosystems, which will accelerate with rising sea levels, is a reason to promote management methods favouring naturality. In which way ? In what areas and under what conditions ?

- In low-lying coastal areas, naturality goes hand in hand with submersibility, on sandy erodible coasts. How to interact with natural hazard management ?

- Native Species vs invasive species: must we still fight ? Which battles are already lost and which ones should we focus on ?

- What are the legal, scientific and social limits to the implementation of the naturality concept for natural coastal area management ? Mobility, when it exists, is nowadays most often endured. How to overcome the hurdles when a natural solution seems reasonable ?

- Do the administrators have prerequisite knowledge to assess the long term impacts of their actions on biodiversity or ecological functions ? How to properly assess the success of ecological restoration operations when they concern ecosystems whose composition, richness, structure and dynamics are the result of thousands of years of interaction between living things, their environments and human activities ?

BIBLIOGRAPHY

Aykroyd, Toby. 2014. « Wild Europe : une initiative en faveur de la wilderness », Naturalité, la lettre de forêts sauvage, , no 14: 3-4.

Beoutis, Adeline, Patricia Jean, et Sébastien Colas. 2004. « Démographie et économie du littoral. » Les dossiers de l'Observatoire du littoral. INSEE, SOeS Observatoire du littoral, IFEN, Ministère de l'Ecologie de l'Energie, du Développement durable et de l'aménagement du territoire.

Boissery, Pierre. 2014. « Restauration du milieu marin méditerranéen, état des travaux en cours et perspectives. » Rapport Agence de l'eau Rhône Méditerranée Corse.

Comission européenne. 2011. « La stratégie de l'UE en matière de biodiversité à l'horizon 2020. »

Gauthier-Clerc, Michel, François Mesléard, et Jacques Blondel. 2014. Sciences de la conservation. De Boeck.

Génot, Jean-Claude. 2014. « Natura 2000 et la wilderness », Naturalité, la lettre de forêts sauvage, , no 14: 5.

GIEC, 2014. 5ème rapport.

Henocque, Raphael, et Catherine Bersani. 2008. « Acteurs, réseaux et gouvernance. » In , 7. Nice.

Mabille, Sébastien, et Catherine Piante. 2008. « Espace littoral, aires protégées et continuité écologique dans la GIZC. » In , 6. Nice.

Madelin, Pierre, et Daniel Vallauri. 2012. « Une définition provisoire des espaces de nature sauvage en Europe. » Wild Europe.

Meur-Férec, Catherine. 2007. « Entre surfréquentation et sanctuarisation des espaces littoraux de nature. » Cairn.info, 41-50.

Thibault, Henri-Luc, Silvia Laria, et Elisabeth Coudert. 2005. « Protéger et valoriser le littoral méditerranéeen, bien commun menacé. » Les notes du Plan Bleu - Environnement et développement en Méditerranée 6. Plan Bleu, PNUE, PAM.