COAST Bordeaux 2017

An objective: knowing to manage

Two events to answer

An international symposium on "**systemic and biodiversity evolution of marine coastal environments under the pressure of climate change, natural and anthropogenic local factors**".

A forum about "**Vulnerability to climate change, natural hazards and anthropogenic pressures**", underpinned, but not exclusively, by the strong cooperation between the French and Japanese scientific and professional communities[1] led by, among others, the French-Japanese Oceanography Societies.

1. The International Symposium

If the coastal and estuarine environments constitute the ecosystems targeted by this event, we do not forget that these highly productive systems interconnected are constrained by more oceanic (sea basin) and more continental environments (watershed).

These ecosystems at the interface of terrestrial and marine areas are among the most productive in the world. The natural productivity of estuarine waters and reef environments is equivalent to human activities such as intensive farming[2].
However, since the beginning of the industrial era, these ecosystems have been subjected to strong anthropogenic pressures directly or indirectly affecting the quality and diversity of these environments (littoralization, pollution of continental, estuarine and coastal waters, alteration of the coastline, exploitation of marine resources, intensification of maritime transport). This cumulative anthropogenic pressure intensified from the second half of the 20th century, when there was a marked acceleration in the warming (climate change) of the continents, particularly at high latitudes.
This rapid climate change also leads to modifications in the ocean-atmosphere exchanges, which are at the heart of the climatic mechanisms that, at the regional level, can alter the water cycle[3], increase the temperature of continental and estuarine waters and the sea levels. That leads to rapid functional disruption of estuarine and coastal ecosystems.
Coastal ecosystems are highly vulnerable to alteration of their physical, chemical and biological characteristics (marine intrusion, acidification of marine environments, changes in biocenoses, evolution and artificialization of the coastline[4], etc.).

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[1] Cooperation that goes beyond scientific relationships since in 1960, it was from Japanese spat that French oyster farming was revived and in 2011 after the tsunami destroyed many aquaculture facilities in Sendai Province, Japanese shellfish farmers were able to recover their production capacity more quickly thanks to the material sent by French shellfish farmers.

[2] Biodiversity less !

[3] For example, in New Aquitania, current changes result in an overall decrease in precipitation and a modified rainfall regime with a strengthening of low flow periods in duration and intensity.

[4] The construction of protective walls to protect against the very strong waves generated by tsunamis and especially those generated by the 2011 wave, are causing changes in the coastal benthic ecosystems directly

In contact with heavily populated areas, these environments are often the receptacle of a lot of chemical and biological pollution sources that significantly diminish their resilience. In this context of accelerated evolution and degradation of these areas important for food security of many populations around the world[5], it is necessary to better identify the factors of pressure and understand, at different scales of observation, their effects and impacts on the biodiversity and on the socio-ecosystems, in order to determine the degree of vulnerability of these coastal ecosystems and the risks they face. A transdisciplinary and integrated approach is required to prevent risks and implement, where it is possible, a strategy for restoring these environments and for adapting the local human populations. Within this framework, operational coastal oceanography occupies an important place.

Some of the European Framework Directives such as the WFD (Water Framework Directive), the MSFD (Marine Strategy Framework Directive) and the recent FDMSP (Framework Directive for Maritime Spatial Planning) allow, for the two firsts, to evaluate the good status of continental, estuarine and coastal waters and to measure the impacts of anthropogenic pressures[6] in order to feed the Integrated Coastal Management (ICM) approach[7]. The third directive focuses on the coexistence policies of coastal marine uses up to the limit of the Exclusive Economic Zone (EEZ), thus justifying the term integrated coastal management (ICM) and ecosystem approach.

These three framework directives will be addressed in the topics of the symposium and the forum, including ecological footprint minimising of the various activities on a fragile environment with high biodiversity[8]. The erosion of marine and coastal biodiversity is an important indicator of the degradation level of these ecosystems and constitutes a major concern of the scientific community in that it is difficult to predict the tipping points, i.e. situations of irreversible changes in ecosystems that will impact quantitatively and qualitatively the status of biodiversity and ecosystem services[9].

2. The Forum

Structured around four main issues.

How can today's socio-ecosystems be resilient to adapt tomorrow not only to coastline changes, but also to natural disasters increasing frequency and strength on the coast?

Coastal areas are, in general, heavily exploited ecosystems. They account for about 2% of the Earth's land surface but are home for 10% of the world's population. 13% of the world's urban population, 65% of cities with more than 5 million inhabitants, a large part of island states and densely populated deltas are in low-land areas[10]. Hence a very strong vulnerability to natural hazards: tsunamis, floods,

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downstream of these protective structures. (Proceedings of the 15th French-Japanese Oceanography Symposium- Springer 2015).

[5] According to FAO, in 2006, 43.5 million people practiced fishing and aquaculture activities, of which 34.8 million in the small-scale fishing activity.

[6] It should be noted that since 1960 worldwide, coastal dead zones have practically doubled each decade and are now reported in more than 400 ecosystems reaching a total area of about 250,000 km² (Volume 50 of the Convention on Biological Diversity).

[7] Term adopted at the French national consultations on the 'Grenelle de la mer' (2009).

[8] Within the meaning of the Convention on Biological Diversity: abundance and distribution of genotypes, species, communities, ecosystems, biomes and their interactions.

[9] The increase of temperature and its effects on the coral reefs may be at the origin of a tipping point causing an irreversible degradation of these ecosystems with induction of a very great loss of biodiversity.

[10] Data for 2000, from Mc Granahan G., Balk D., Anderson B. (Environment and Urbanization, 19, 2007) quoted by Duarte Santos (in Coastal Risks and Adaptation of Companies, 2014 ISTE Editions).

marine intrusions, cyclones as evidenced by relatively recent events: Indian Ocean tsunami in 2004, Katrina cyclone in 2005, Xynthia storm in 2010, Tohoku tsunami in 2011, typhoon Haiyan in 2013 which caused considerable material damage and thousands of human losses, with large-scale environmental, social and economic repercussions.
The effects and impacts of these exceptional and violent *phenomena* can be amplified by the increase in mean global sea level and in overall average intensity of tropical cyclones[11]. Protections against giant waves or large-scale marine intrusion have shown their limitations and generated significant changes in coastal ecosystems.

How to implement an integrated management approach for these interface and land-sea transition areas in order to minimize synergy of impacts from different uses and better adapt to the factors of change?

The synergetic effects of surface water warming, hydrological regimes and terrestrial pollution[12] can lead to severe anoxic crises (particularly in estuarine silt plugs rich in organic matter), an increase in the occurrence frequency epizooty very detrimental to the economy of traditional fishing and aquaculture activities such as shellfish aquaculture, a change in the distribution of marine species by modifications in the dispersal of their prey or the distribution of their colonization areas. The deterioration of coastal waters (and sheltered areas) can reduce the productivity of species that constitute one of the main economic resources for the artisanal fishing activity (e.g. flatfish or many estuarine species or even pelagic marine species[13]). Acidification of marine waters have a direct impact on the development of shellfish species or crustaceans and more broadly on the specific composition of trophic chains, which could be another major cause of biodiversity shift, for example in terms of specific composition of larvae of commercial interest.

Tourism activity can be affected by the foreseeable increase in the appearance of toxic or non-toxic algal blooms in confined waters, in sheltered bay heads, lagoons or estuaries, with significant consequences for the sanitary quality of bathing waters or shellfish production.

How to ensure uses co-existence and preserve the resilience of traditional activities such as fishing and shellfish farming facing new activities in a context of global change. To this end, how to promote a process of dialogue between stakeholders (including decision-makers) in the frame of an integrated ecosystem based management approach including Maritime Spatial Planning (MSP)?

Blue energy development in France or more widely in Europe, within the framework of the energy transition policy, is a new space consuming activity that creates new ecosystem services.
These new sources of renewable marine energies will represent, in 2030, an installed capacity of between 15 and 20 GW depending on the scenarios defined[14].
Furthermore, the implementation of marine protected areas is part of the French "National Strategy for Sea and Oceans" with an ambitious objective to have 20% of marine protected areas in waters

[11] If the models predict a significant decrease in the number of tropical cyclones at mid-latitudes, they project an increase in their overall average intensity.
[12] 80% of marine pollution is of terrestrial origin, particularly from agricultural activities or urban activities, the discharges of which are still insufficiently treated or controlled in certain regions and countries.
[13] Approximately 75% of the fish species eaten in Europe depend for a part of their life cycles on coastal and estuarine ecosystems.
[14] After Paillard et al, 2014 – Editions ISTE – Valorisation et économie des ressources maritimes.

under French jurisdiction[15] (metropolitan France and Overseas). This is reflected in the creation of marine parks such as those in New Aquitania, the “Bassin d'Arcachon” or the “Gironde-Mer des Pertuis”, thus contributing to the implementation of the Marine Strategy Framework Directive (MSFD).

How can traditional community management methods be used to co-build an integrated marine and coastal management approach as part of an integrated maritime strategy?

Japan, one of the leading seafood producers, surrounded by particularly productive marine areas[16] despite a highly urbanized coastline, has nevertheless managed to safeguard an important part of its coastal maritime economy and thus constitutes a privileged interlocutor within the framework of this forum.

Japan has demonstrated a strong capacity to adapt the fisheries and aquaculture sector to factors of particularly abrupt changes, such as those caused by the catastrophic tsunami of March 2011. Indeed, the drop in its production from 2010 to 2011 was only 7% against the 33% expected (FAO 2014).
The implementation of integrated approaches and large-scale habitat restoration programs[17], integrating all stakeholders, is a long-standing concept for this country, based on local development. This is evidenced by the concept of "Sato-Umi" (sea and man in harmony), itself derived from the much older "Sato-Yama" (mountain and man in harmony).
More broadly, these two concepts evoke a very strong link between nature and culture, on which the sustainable exploitation of an environment on which the sustainable exploitation of an environment that is the fundamental base of food supply but also cultural heritage. This link between nature and culture is reflected in the very high valuation of seafood products which is also the case in France and Europe[18].

The involvement of communities of fishers in Japan in the environment restoration or sea restocking (fish and shellfish restocking, artificial reefs, replenishment of sea grass fields, etc.) constitute a participative approach that is also found in France and Europe particularly in the context of the observation of highly migratory fish (salmon, tuna, sharks, etc.), or in the development of more selective gear or production techniques combining fishing and aquaculture (catch-based aquaculture and tuna fattening for example), or joint surveys of fish population with scientists (case of the Bay of Biscay anchovy, Atlantic salmon on the Adour basin, European eel on the Loire basin, ...). So many points of convergence between these French and Japanese communities[19] that deserve to be shared during this forum which is particularly interested in the link between nature and culture.

[15] In 2012, the network of MPAs covered 1.52% of the waters under French jurisdiction and 11.68% of the metropolitan waters. (See Performance Agreement of the AMP Agency 2012-2014).
[16] Despite a substantial decline in the number of fishermen, nearly 90,000 out of 260,000 at the end of the 20th century, Japan remains a major seafood producer: 4.9 million tons of seafood in 2012 (Yamane T ., Proceedings SFJO-Springer -2015).
[17] Seto Sea Inland example.
[18] Trademarks "merlu de ligne" or "bar de ligne", labeling "wild salmon", trademarks "Pavillon France", "Wild fish of the Loire basin", “oyster vintages”.
[19] Henocque Y., Proceeding SFJO – Springer 2015.