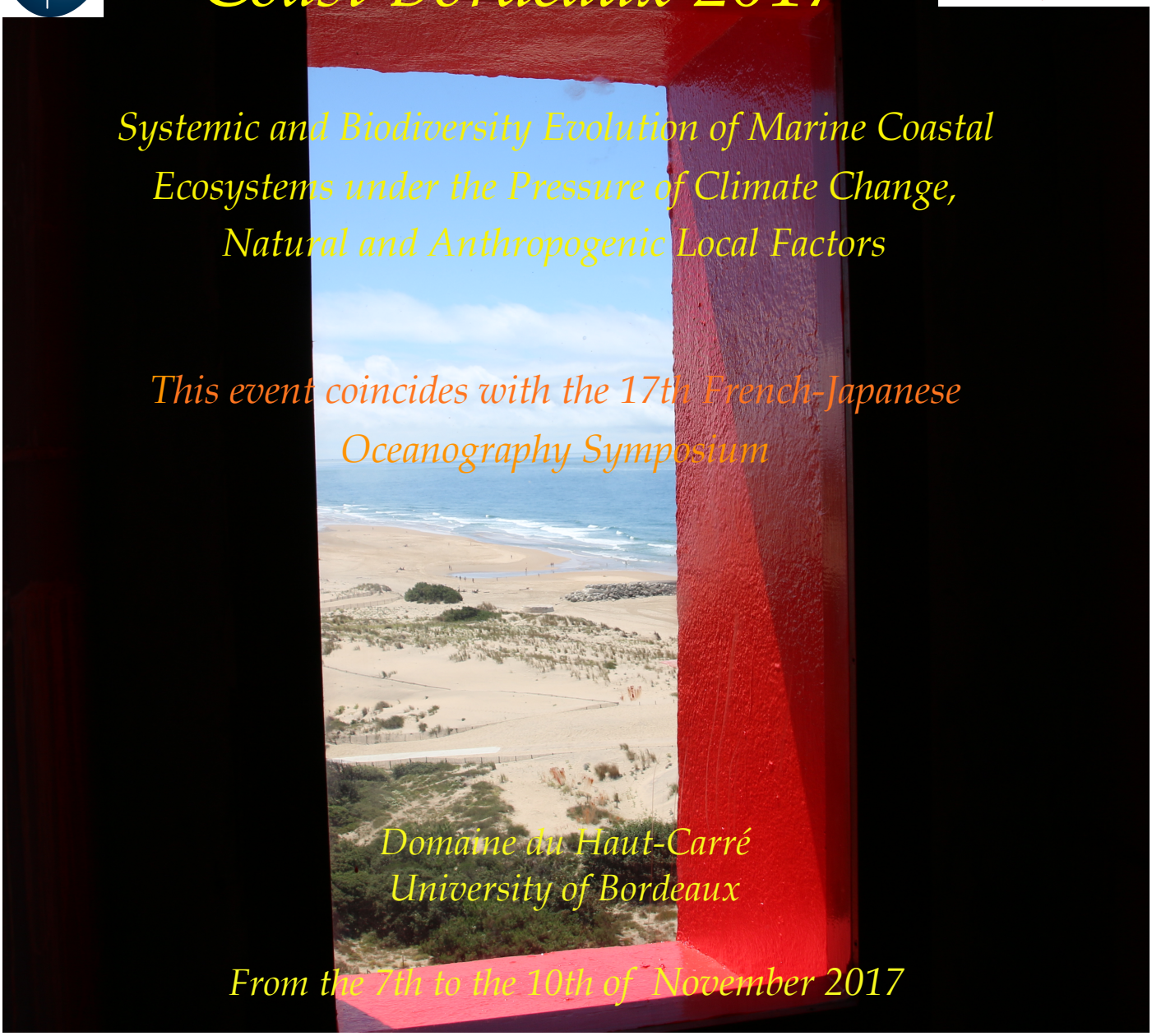
Coast Bordeaux 2017



Systemic and Biodiversity Evolution of Marine Coastal Ecosystems under the Pressure of Climate Change, Natural and Anthropogenic Local Factors

This event coincides with the 17th French-Japanese Oceanography Symposium

Domaine du Haut-Carré
University of Bordeaux

From the 7th to the 10th of November 2017

Compilation of Abstracts

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COAST Bordeaux 2017 and the 17th French-Japanese Oceanography Symposium

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COAST Bordeaux 2017 and the 17th French-Japanese Oceanography Symposium

Symposium

Auditorium AGORA

Session 1: Identification and analysis of environmental stressors.

Keynote Session 1- Climate science after COP21: a new responsability ?

Hervé Le Treut – Académie des Sciences

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Auditorium AGORA
Tuesday the 7th of November from 3 pm to 3:45 pm

Session 1: Identification and analysis of environmental stressors.

Session 1: Identification and analysis of environmental stressors.

Oral Communications Session 1

Auditorium AGORA

Tuesday the 7th of November from 4pm to 5:15 pm

Wednesday the 8th of November from 9 am to 11:15 am

Session 1: Identification and analysis of environmental stressors.

Session 1: Identification and analysis of environmental stressors.

The Japan Sea, a changing Pacific Asian marginal Sea

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***Keywords**: deep and bottom waters, warming trend, dissolved oxygen, interdecadal variation, global warming, Arctic oscillation*

Abstract:

The Japan Sea is a semi-enclosed marginal sea in the East Asia surrounded by the Japanese islands, Sakhalin, Russian coast, and Korean Peninsula. Similar to the Mediterranean in the Europe, the Japan Sea has a deep and bottom water formation mechanics in the sea, which indicates the existence of a thermohaline conveyer-belt system in the sea.

Remarkable trends of warming and of decreasing in dissolved oxygen concentration have been reported in the deep and bottom layers of the Japan Sea since the 1960s. The changes in water characteristics, which indicate structural change in the Japan Sea, can be considered as reflecting processes of water mass modification in the deep sea under the stagnation of deep and bottom water formation associated with global warming.

In addition to the linear trends, clear interdecadal variation with a period of about 20-year is recognizable in potential temperature and dissolved oxygen concentration in the abyssal Japan Sea. This bi-decadal variation is associated with the sea surface temperature in the East China Sea synchronized with the Arctic Oscillation. This is an example of the Pacific Asian Margial Seas system which is the linkage system among the Pacific Asian marginal seas including atmosphere over the seas.

Session 1: Identification and analysis of environmental stressors.

Dynamics of particulate organic matter composition in coastal systems: forcing to the spatio-temporal variability at multi-systems scale

Nicolas Savoye[1], Camilla Liénart[1], Valérie David[1], Pierre Ramond[1,2], Paco Rodriguez Tress[1], Vincent Hanquiez[3], Vincent Marieu[3], Fabien Aubert[4], Sébastien Aubin[5], Sabrina Bichon[1], Christophe Boinet[5], Line Bourasseau[1], Yann Bozec[6], Martine Bréret[4], Elsa Breton[7], Jocelyne Caparros[8], Thierry Cariou[9], Pascal Claquin[10], Pascal Conan[8], Anne-Marie Corre[11], Laurence Costes[1], Muriel Crouvoisier[7], Yolanda Del Amo[1], Hervé Derriennic[3], François Dindinaud[1], Robert Duran[12,13], Maïa Durozier[11], Jérémy Devesa[14], Sophie Ferreira[15], Eric Feunteun[16], Nicole Garcia[17], Sandrine Geslin[5], Emilie Grossteffan[14], Aurore Gueux[8], Julien Guillaudeau[5], Gaël Guillou[4], Orianne Joly[18], Nicolas Lachaussée[4], Michel Lafont[17], Véronique Lagadec[17], Jézabel Lamoureux[5], Béatrice Lauga[12,13], Benoît Lebreton[4], Eric Lecuyer[7], Jean-Paul Lehodey[18], Cédric Leroux[9], Stéphane L'Helguen[14], Eric Macé[6], Eric Maria[8], Laure Mousseau[11], Antoine Nowaczyk[1], Philippe Pineau[4], Franck Petit[11], Mireille Pujo-Pay[8], Patrick Raimbault[17], Peggy Rimmelin-Maury[14], Vanessa Rouaud[12,13], Pierre-Guy Sauriau[4], Emmanuelle Sultan[5], Nicolas Susperregui[12,19].

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Session 1: Identification and analysis of environmental stressors.

Keywords: *particulate organic matter, coastal systems, environmental forcing, meta-analysis, France*

Abstract:

Particulate organic matter (POM) is deeply involved in biogeochemical cycles and constitutes the base of food webs. In coastal systems, POM is a composite pool fuelled by autochthonous and allochthonous sources of pelagic, benthic and continental origin, and whose relative contributions highly vary over time and space. Twelve systems (three littoral systems, eight embayments and semi-enclosed systems, and one estuary) distributed along the three maritime façades of France were studied during one to eight years in order to quantify the relative contribution of organic matter sources to the surface-water POM and to assess the drivers of their spatial and temporal variability. At multi-system scale, two main gradients of POC composition have been identified: a 'Continent-Ocean' gradient associated to hydrodynamics, sedimentary hydrodynamics and depth of the water column, and a gradient of trophic status related to nutrient availability. At local scale, seasonality of POC composition appears to be station-specific but still related to part of the above-mentioned forcings. A typology of systems was established by coupling spatial and temporal variability of POC composition. Four groups were highlighted: 1) the estuarine stations where POC composition is dominated by terrestrial POM and driven by the hydrodynamics and sedimentary hydrodynamics, 2) the oligotroph systems, characterized by the contribution of diazotrophs due to low nutrient availability, and the marine meso/eutroph systems whose POC composition is 3) either deeply dominated by phytoplankton or 4) dominated by phytoplankton but where the contribution of continental and benthic POC is not negligible and is driven by the hydrodynamics, the sedimentary hydrodynamics and the height of the water column.

Session 1: Identification and analysis of environmental stressors.

Potential use of the SWOT satellite to characterize the hydrodynamics of the estuaries and coasts

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Keywords: *SWOT satellite, Hydrodynamic, Coasts, Estuaries*

Abstract:

The coastal and estuarine zones are very diverse and complex environments, where the spatial survey of hydrodynamics is difficult, because of sparse *in situ* measurements and the conventional altimeters have difficulties to observe the coastal physical processes at small scale.
The SWOT satellite (Surface Water and Ocean Topography; NASA and CNES mission, with CSA and UKSA contributions; launch in 2021) will offer new opportunities to survey the hydrodynamic because it will provide data on the water level with an high spatial resolution (oceans: 1 km, rivers: 100 m of width) and with a global cover.
The aim of this work is to study the ability of SWOT to reproduce the spatial and temporal variability of the hydrodynamic in the coastal and estuarine environments. We use two approaches in different environments (Seine, Gironde, Senegal and Connecticut estuaries, Mississippi delta, The Channel, Atlantic, Mediterranean and Gulf of Mexico coasts): Comparison of in situ and simulated SWOT data from statistical and signal processing methods; Combining of hydrodynamic modeling (T-UGO, DELFT-3D models) and SWOT simulator.
The results show: a best reproduction by SWOT in microtidal (wavelet coherence: 73-90) than macrotidal contexts (50-87), a decrease of the reproduction from upstream (87-90) to downstream estuary and coast (50-82),an aliasing problem in macrotidal context, the observation of some storms urges in microtidal context. The combining of modeling and SWOT simulator show a good restitution of the spatial variability of the water level along the estuary in 12 different hydrodynamic conditions (high/low tide, neap/spring tide, high-medium-low discharge).

Session 1: Identification and analysis of environmental stressors.

Formation process of Antarctic Bottom Water originating from a middle size polynya

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Keywords: *Antarctic Bottom Water, formation process, modification of water property*

Abstract:

Antarctic Bottom Water (AABW) is the densest water in the ocean and globally significant; its production at the Antarctic margin is a key component of the global overturning circulation. AABW originating from a middle size polynya called Vincennes Bay Polynya (VBP) was discovered recently. Although we found some evidences for AABW formation from the VBP, there are many unknown processes on its formation. Furthermore, recent Deep-float data showed no clear evidence of newly formed AABW off Shackleton Polynya where sea-ice production was more active than that of VBP.Thus, we carried out numerical experiments to explain detail process of the AABW formation off middle size polynya. From data analysis and model result, we finally conclude that not only sea-ice production but also oceanic condition off coastal polynya region is important on the process of AABW formation. In the presentation, we will mention about recent observation result to show modification of water property of AABW and accompanying sea surface rise.

Session 1: Identification and analysis of environmental stressors.

Tara Pacific Japan Leg: Tropicalization of Marine Ecosystems under Climate Change and Ocean Acidification

Sylvain Agostini[1], Yohei Nakamura[2], Maggy Nugues[3], Natacha Roux[4], Hironobu Fukam[5], Yuko Kitano[5], Shoji Yamamoto[6], David Lecchini[3]

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Keywords: *Tropicalization, Ocean Acidification, Coral-Algae Competition, Herbivorous Fish Community*

Abstract:

Initiated by *Agnes b* and Etienne Bourgois, Tara Expeditions gives scientists the opportunity to develop expeditions around the world to study the marine environment. Crisscrossing the Pacific aboard the schooner Tara, scientists coordinated by Serge Planes (CRIOBE, France) and Denis Allemand (CSM, Monaco) are trying to understand the evolution of coral reefs in the context of demographic and climate change In addition to this global survey, the Tara Pacific project includes targeted studies in diverse countries including Japan.
Tropical corals are so threatened by climate change that high latitude may be their last refuge. In Japan, tropicalization of temperate ecosystems is ongoing with a sharp decrease of macroalgae and recolonization by hermatypic corals. This rapid shift is possible because of the recent increased temperature and the high connectivity of with the southern tropical coral reefs through the northward current Kuroshio. However, two factors remain unclear: the effect of herbivorous fishes and of ocean acidification. During the Tara Pacific Japan leg, six locations along the Kuroshio where selected, ranging from reefs in the Ryukyus Archipelago to marginal coral communities in Kochi, Shikine Islands and Tokyo Bay. Two of these: Shikine Island and Iwotorishima also provided the opportunity to study the effect of ocean acidification. At each locations, coral diversity, coral algae interactions and, herbivorous fishes communities and grazing rates were quantified in two different sites: dominated by corals (healthy reefs or tropicalized areas) and low coral sites (non-tropicalized or degraded reefs).

Session 1: Identification and analysis of environmental stressors.

Environmental impact of saline pollution caused by desalination plant brine discharges in the Bay of Oran (western Algerian coast)

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Keywords: *Environmental impact, saline pollution, brine discharges, biomarkers, antioxidant defenses, molecular damage.*

Abstract:

Desalination of sea water is an increasingly common means by which nations satisfy demand for water. However, brine discharges from desalination plants cause serious environmental problems.
The aim of our study is to evaluate the impact of desalination plant brine discharges in the Algerian west coast, on a natural population of marine gastropod molluscs. The sampling of these sentinel organisms was carried out at four sites selected: site H considered as a "hotspot", located at desalination plant; two other sites E and W, at the east and the west of H respectively; and finally site R considered as a clean site. To evaluate the effect of these brine discharges, we measured biomarkers for defense and damage. A number of physicochemical characteristics of coastal waters were also measured.
Our results revealed that the activities of antioxidant defence enzymes reached the highest levels in gastropod molluscs collected from site H. The activation of antioxidant defense system in these organisms translated the alteration of their status health, reflecting a level of environmental disruption generated by the desalination plant brine discharges and the high salinity in this area. We also observed that the tissues of organisms collected from site H as well as the two other nearby sites, E and O, had undergone molecular damage. These results confirm the impact of desalination plant brine discharges on marine fauna, their risk in coastal and benthic habitats that encourage a more consistent approach to environmental management regarding the brine discharges in the environment.

Session 1: Identification and analysis of environmental stressors.

Effect of environmental stress on biochemical and physiological features in cultured fish

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Keywords: *Stressor, Heat shock, Antibiotics, Growth-related gene, Redox state, Oxidative stress, Fish, Coho salmon*

Abstract:

Fish are known to be often exposed to a wide variety of stressors, such as chemical contaminants, acute changes in temperature, and disease. Exposure of organisms to stressors may result in a series of biochemical and physiological changes. There are neuro endocrine and cellular stress responses following exposure to stressful situations. These stress responses in organisms affect their general health. Although maintaining homeostasis should be a key process for coping with stress, changes in physiological set points would be an important aspect of the adaptive response. In the course of studies on the health of cultured fish in response to a stress, we found that stress caused by handling or chemicals regulates the expression of important growth-related genes, such as growth hormone receptor (*ghr*) and insulin-like growth factor-1 (*igf1*) genes, in coho salmon (*Oncorhynchus kisutch*). In addition to these stress trials, we determined the redox state, such as levels of glutathione and lipid peroxide,and liver function in response to heat shock or high doses of a dietary antibiotic(oxytetracycline, OTC). The results concerning the changing patterns of stress-related biomarkers indicate that both heat shock and dietary OTC induce oxidative stress, which might enhance oxidation in the body. Accordingly, anti oxidative dietary supplements could suppress environmental stimuli-induced oxidative stress and improve the redox state in cultured fish. The possibilities of manipulating positive stress (desirable stimuli, such as mild physiological or thermal treatment, osmotic stress, etc.) and avoiding negative stress for fish will also be discussed.

Session 1: Identification and analysis of environmental stressors.

Decadal evolution of coastal system functioning: nutrients and chlorophyll biomass

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Keywords: *Coastal systems, nutrients, phytoplankton biomass, long-term trends, environmental forcing.*

Abstract:

Coastal systems play a key role in the transformation of biogenic elements and in marine productivity. The great diversity of these systems, as well as the spatial and temporal heterogeneity of the factors controlling the biogeochemical and biological processes governing those systems, contribute to their richness. Among these processes, phytoplankton primary production is directly impacted by nutrient inputs from watersheds. The nature and amount of these inputs directly affect the biological production rates and can account for ecological imbalances (nutritive, biomass and taxonomy). The aims of this study are 1) to characterize decadal changes in nutrient concentrations, 2) to identify the main drivers, and 3) to investigate consequences on chlorophyll biomass in order to better understand of evolution of coastal systems. This study focused on 3 contrasted systems of the Atlantic-English Channel façade over a 15-years period [2000-2015]. Results indicate system-specific evolutions. The littoral system of Roscoff is characterized by a decrease in benthic Si inputs that leads to a decrease in chlorophyll biomass. In the bay of Brest, the decrease in N, in line with similar decrease in river inputs, does not affect the chlorophyll biomass, suggesting that N is not the main limiting factor. At last, in Arcachon Bay, the increase of N concentrations, probably induced by the decline of eelgrass beds, leads to the increase in chlorophyll biomass. These results illustrate the diversity and complexity of the relationships between environmental drivers and abiotic and biotic compartments.

Session 1: Identification and analysis of environmental stressors.

The Bay of Seine: a resilient socio-eco-system under cumulative pressures

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Keywords: *Bay of Seine, cumulative pressures, resilience, climatic change, trophic models*

Abstract:

The Bay of Seine (English Channel) is a highly impacted ecosystem concerned by a lot of human activities and stakeholder interventions. It is subjected to heavy historic anthropogenic pressures and the emergence of new human activities: fishing, harbour extension, aggregate extraction, deposit of dredged sediment, offshore windfarm. By contrast, this area showed high level of protection of natural heritage mainly Natural Reserve and Natura 2000 sites. It is also sensitive to climate change. Nevertheless, in the Seine Estuary, there is an accumulation of European, National, Regional and Industrial research projects ensuring a high level of scientific knowledge in this area. The available data are analysed by food-web modellers, looking at functional and holistic properties derived from the Ecological Network Analysis indices. Trophic models describe the interaction between species at different trophic levels and are based on the quantification of flow of energy and matter in ecosystems. Two main characteristics emerged: contrast of zones with low and high abundances and biomasses of benthos, and presence of spot of abundances and biomasses which remained a high potential source of prey for high trophic levels. Moreover, benthic habitats show high resilience while pelagic, fish and bird compartments have been affected by clear global changes. The conclusions exhibit the need to integrate human pressures of the functioning of complex ecosystems and their integration into social-ecological system, with a special interest in interactions of scales, uncertainty estimation, possible use of scenarios and indirect interactions between decisions, through global changes.

Session 1: Identification and analysis of environmental stressors.

Posters Session 1

Poster flash presentations the 7th of November from 5:15 pm to 5:30 pm and the 8th of November from 10:00 am to 10:15 am in the AGORA

Special poster session in the cloister the 7th of November from 5:30 pm to 6:30 pm and during the coffee-breaks the 8th of November from 10:15 am to 10:45 am and from 3:45 pm to 4:15 pm.

Session 1: Identification and analysis of environmental stressors.

Session 1: Identification and analysis of environmental stressors.

A one dimensional diagenetic model for iron-sulfur interactions in coastal sediments

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Keywords: *early diagenesis, sediments, iron, sulfur*

Abstract:

Subjects to various terrestrial and marine forcing factors, coastal sediments play a key role in the global carbon cycle. The main biogeochemical pathways for organic matter mineralization are known (aerobic mineralization, denitrification, metal oxide and sulfate reduction, methanogenesis), but the quantification of their relative contribution to the carbon recycling and sediment-water interface (SWI) fluxes is still challenging. Recently, it has been highlighted that sulphate reduction and iron-sulfur (Fe-S) precipitation substantially contribute to SWI alkalinity fluxes, which could constitute a negative feedback to waters acidification.

A 1-D biogeochemistry-transport model was developed to characterize the diagenetic processes (mineralization, precipitations and reoxidation) occurring in coastal sediments. It introduces variable bioturbation, porosity and Fe-S coupling and can be used at steady-state or in transient conditions.

The model has been applied on a test case, the lobe complex of the Congo deep sea fan that shows similarities with coastal sediments: variable Fe-S coupling, high organic carbon inputs and large sedimentation rates. Using a modelling approach that uses sensitivity and Monte Carlo analysis, the model is fitted to a dataset acquired during the CONGOLOBE campaign (2011). This method leads to the determination of unmeasurable parameters (fluxes, organic matter characteristics, contribution of each diagenetic process…) and is able to reproduce contrasted biogeochemical situations with either porewater sulphide or iron domination, and thus provide a better understanding of the Fe-S coupling and its consequences on sediment-water exchanges. In the future, this model will be used to calculate biogeochemical fluxes at the SWI in coastal environments such as deltas or lagoons

Session 1: Identification and analysis of environmental stressors.

Use of metallothioneins as biomarkers for environmental quality assessment on Atlantic coast & Harbour sites (France)

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Keywords: *Metallotioneins, environmental quality, heavy metals, contamination*

Abstract:

Human activities development of the Atlantic coast (France) lead to chronic pollution of the environment by a mixture of organic type (pesticides, hydrocarbons, phytosanitary) and inorganic (metals) contaminants. These last years, an environmental regulation with Marine Strategy Framework Directive (MSFD, 2008/56/EC) and OSPAR commission for example, have been developed for the preservation of coastal environments, giving rise to studies of aquatic biomonitoring. The use of biomarkers allows observing the impact of pollutants on coastal species like the marine bivalve *Mimachlamys varia*. Various biomarkers considered as defenses biomarkers have been considered in this research to study oxidative stress by Superoxide Dismutase (SOD), detoxication of organic compounds by Glutathione-S Transferase (GST), lipidic peroxidation with Malondialdehyde (MDA), immune processes with Laccase and Metallothioneins (MTs) involved in uptake, storage, and excretion of metals. For this, bivalves were collected in March 2016 in thirteen sites contrasted by their level of pollution for a distance exceeding 500 Km in the French Atlantic coast (open area) & in harbour (semi-open area). Biomarkers assays were measured to compare responses in several tissues (gills, digestive glands, gonads) of organic and inorganic pollutants. Results have shown that the specific activities related pollutants were different depending on the sampling sites and organs. Detoxification (GST and MT) showed a greater signal in the digestive glands of bivalves compared with other organs. However, the SOD & Laccase showed a predominant signal in the gills. Correlations between biomarkers responses and inorganic contaminants were carried out to understand trace elements impact on short-term physiological effects.

Session 1: Identification and analysis of environmental stressors.

Does global warming favour the occurrence of recent blue mussel mortality events in France?

Analysis of local time series and assessment of biotic and abiotic environmental factors potentially controlling blue mussel outbreak in estuarine ecosystem of Pertuis Charentais (French Atlantic coast)

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***Keywords**: Hydro-climate, Estuary, Phytoplankton, Mussels, Mortality, Environment, Microbial community*

Abstract:

We report in this work data of two independent studies carried out in the Pertuis Charentais for which a link might exist? A 30-years local time series study of hydro-climatic variations in water temperature and salinity, which show a significant warming of the water masses in the Marennes Oleron bay (+ 1.5 °C) associated with a significant drop (> -15%) of freshwater intakes by nearby rivers. In this changing local climate context several major epizootics have appeared, severely affecting farmers and the production of Pacific oysters and mussels, from the first French shellfish-producing department (catching and growing). Following massive mortality event of blue mussels in 2014, a specific study (MORBLEU) is conducted, trying to identify the factors favoring the development of the phenomenon which, furthermore, involves pathogenic bacteria. First analyzes of environmental conditions suggest that there may be a link between: *i)* the local climate context, *ii)* a downward trend in phytoplankton diversity indices, *iii)* imbalances in the dynamics of bacterial community composition. These last two points are concomitant with the recent emergence of spring mortalities of mussels. The hypothesis of this link asks
the question of evolution in the interactions between the plankton communities of the water column, mussel *microbiota* and the emergence of pathogenic microbial flora in bivalve mollusks as underlying the recent shellfish mortality events. Such question requires performing functional ecology approach with long term monitoring at different scales, involving particularly NGS technology (metabarcoding) for environmental DNA research. Such a study is under way.

Session 1: Identification and analysis of environmental stressors.

A new method to estimate coastal chalk cliff erosion on Holocene times using watershed properties and shore platform morphology.

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***Keywords**: coastal erosion, cliffs, shore platform, suspended valleys*

Abstract:

Coastal chalk cliffs of Normandy are currently retreating with a mean erosion rate of about 0.15 m/y. Taking into account the past high stand stabilization of the mean sea-level at 6ky located 5m below the present-day one, a roughly 3km wide high-resolution land-sea Digital Elevation Model (DEM) has been produced on the coastal area including continental river outlets and marine shore platforms. We selected coastline suspended river outlets and a numerical analysis is used on each watershed to determine if they have reached an equilibrium state. A systematic analysis evidences a linear inverse relationship between the basin watershed area and the height of the suspended valley on the present-day coastline. We thus evidenced the relationship between basin area, base-level slope and river altitude on the present-day coastline.
In the chalk of the NW Paris basin, a watershed basin area lower than 6.4 10^7 m^2does not connect directly the present-day altitude of the shore platform and appears as a suspended valley outlet. We thus project their base level directly on the shore platform to estimate past erosion rates over 6 ky.
The detailed morphology of the shore platform, such as its seaward edge, is used to compare the location of the valleys base-level projections and paleo-coastline location. The seaward edge shore platform seems to correspond to the cliff face location at 6 ky. This leads to a static model of erosion, with a stable seaward edge built during the previous high stand level, from which the cliff retreated progressively since 6 ky.

Session 1: Identification and analysis of environmental stressors.

Nutrient and particulate materials flux from Seybouse and Mafragh estuaries (Algeria). The contribution of a flood event

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Keywords: *Nutrients, sediment, flux flood event, Mafragh estuary, Seybouse estuary, Mediterranean climate*

Abstract:

Mafragh and Seybouse Rivers with their large and highly dynamic estuarine parts (7-15 km) are two important catchments that supply Annaba Bay, NE Algeria. Dissolved nutrients (nitrogen, phosphorus and silicates) and particulate materials (suspended particulate matter, particulate organic carbon, chlorophyll *a*, and particulate biogenic silica) were monthly measured at the Seybouse and Mafragh estuaries' outlets during 2015. The flood event of 28 February-11 March 2015 has been extensively monitored for the same materials and sites. All the nutrients and particulate materials levels were always more elevated at Seybouse waters. Because of the high rivers discharge (100-925 $30 m^3 s^{-1}$), the marine tidal intrusion has been prevented for about 16 days and 12 days at Mafragh and Seybouse estuaries respectively, and the first marine tidal flood occurred when the rivers flow decreased to about $30 m^3 s^{-1}$. During 2016, together the two rivers introduced into Annaba Bay about $2\ 10^9$ m^3 of freshwater of which 70% was delivered during the flood event. Most of the annual dissolved nutrients and materials fluxes were due to the flood inputs (60-90%). The flood event was more pronounced at the Mafragh estuary's outlet and was responsible for more than 80% of the annual deliveries of sediment and nutrients.

Session 1: Identification and analysis of environmental stressors.

Oxygen consumption and carbon recycling in deltaic sediments: variability at different time scales in the Rhone River delta

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***Keywords**: delta, sediments, Rhône, Mediterranean Sea*

Abstract:

Estuaries and deltas are major locations in the global carbon cycle as they act simultaneously as incinerators of terrestrial carbon, therefore contributing to the CO_2 release to the atmosphere and as burial centres which preserve carbon in deep sediment layers. Temporal variability of the carbon cycle in estuaries and deltas is known to be very large as it combines hydrological variation from the river (floods and drought) and the hydrology of the coastal seas (storms, current surge). They are both influential on biogeochemistry and give rise to short timescale variability (hours to days) and long-term modulations (years to decades) which have been poorly documented. Using *in situ* oxygen microprofiling devices, we have collected a new dataset on organic matter recycling in the Rhone delta and shelf sediments (Northwestern Mediterranean Sea) which covers timescales from hours to a decade. The hourly variation is collected using a benthic station deployed at the bottom of the Mesurho station adapted to monitor short-term variations such as flood or storms. The seasonal to decadal timescale is constituted by a set of oxygen micro-profiles measured *in situ* on an array of stations in the Rhône prodelta and shelf.

The results show that the long term effect is dominated by river organic carbon discharge which modulates recycling in the river prodelta while resuspension during storms plays a key role over short time scales, with doubling of oxygen demand during reduced sediment exposure. A model coupling sediment resuspension and early diagenesis (HydroBioSed) is used to calculate the long term effect on sediment oxygen demand and link short term effect to monthly variations.

Session 1: Identification and analysis of environmental stressors.

Benthic nitrogen and carbon recycling in two eutrophicated estuaries (Brittany, France)

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***Keywords**: Elorn and Aulne rivers, France, estuaries, eutrophication, benthic nitrogen and carbon recycling*

Abstract:

Estuaries are important nutrient filters along the land-ocean continuum. However, the role of benthic diagenesis is still poorly quantified. The aim of this work is to investigate carbon mineralization and the contribution of benthic denitrification in two macrotidal estuaries Elorn and Aulne (Brittany, France) at two seasons (winter and spring). The two eutrophicated estuaries exhibit very high nitrate concentrations in upstream waters (> 500 μM) with lower values downstream (< 10 μM). We combined the use of diagenetic modelling with field measurements of pore water nutrients and metals profiles (O_2, NO_3^-, NH_4^+, Fe^{2+}, Mn^{2+}), sediment carbon and experimental denitrification rates. The contribution of denitrification to the total mineralization was high in upstream sediments (15-35%) of both estuaries and decreased consistently downstream to 5-10%. The relative large contribution of denitrification to organic matter degradation is related to high bottom water nitrate concentrations in the upstream part of the estuaries. Overall the organic matter mineralization rates showed a general decrease with high values upstream and lower values in the saline part of the estuary. This is related to the trapping and recycling of allochtonous organic matter in estuarine sediment. The contribution of oxic mineralization was generally dominant in total mineralization in upstream sediments. The contribution of anoxic mineralization showed an increase with salinity in all estuaries and seasons.

Session 1: Identification and analysis of environmental stressors.

Comparison of water level changes in the Mekong River using GNSS Reflectometry, Satellite altimetry and tide gauges

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Keywords: *Mekong River, Satellite altimetry, GNSS reflectometry, changes in water level*

Abstract:

In the recent years, due to climate changes, extreme droughts and floods occur more frequently and severely in the Mekong delta (Vietnam). Information on water level and its changes are one of the main parameters in connection to climate change processes. This study presents the potential of GNSS Reflectometry (GNSS-R) for monitoring of tides and floods in river deltas. A geodetic GNSS station was installed at the Tran De port, Soc Trang province, Vietnam over 23-30 August 2016. The method used to retrieve water levels from GNSS-R data is based on the analysis of the Signal-to-Noise Ratio (SNR). We also have used different radar altimetry data from JASON-2, SARAL, JASON-3 and Sentinel-3A missions during the same period for measuring sea surface height (SSH) and in-situ tide gauge station as reference. The aim of this study is to evaluate the performances GNSS-R for monitoring river stages and the possibility to use this technique for calibration/validation of altimetry data. Early results show the good agreement between in-situ and GNSS-R based estimates with correlations are better than 0.86.

Session 1: Identification and analysis of environmental stressors.

Sedimentological characteristics of Mellah lagoon: effects of clogging of the communication channel with the sea

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Keywords: *granulometry, mud, sand, sedimentary organic matter, Mellah lagoon.*

Abstract:

The Mellah lagoon (865 ha) is the only lagoon in Algeria. The present study is an update of the sedimentological characteristics of the lagoon, three decades after the last channel development operation. In April 2016, 40 stations are sampled. A granulometry analysis of the surface sediment was realized after a separation between the fine and coarse fractions (limited to 63 μm). We are also interested to the distribution of mud and organic matter in the sediment.

The sedimentary analysis shows that in the Mellah as in the majority of the Mediterranean lagoons, the grain size decreases regularly from the shores to the center of the extent. This situation is due to the accumulation of fine particles in the center in relation with the hydrodynamism of lagoon. Indeed, the shores are formed of medium sand and as we move towards the upper depths, the mud fraction increases. Thus in this study we can identify five lithological zones ranging from pure sand in the shores to pure mud in the center, passing by slightly muddy sand, sandy mud and slightly sandy mud. The extreme values of the distribution of sedimentary organic matter fluctuate between 0.62% (in the banks) and 24.62% (in the center). Compared to previous studies, the rate of mud is increased significantly from the periphery to the middle of the lagoon. This situation is related to the reduction of hydrodynamic intensity due to the clogging of the channel, favoring the settling of fine particles especially in the deepest zone.

Session 1: Identification and analysis of environmental stressors.

Reconstruction of sea level changes in northern France for the past 300 years and their relationship with the evolution of the coastal zone

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***Keywords**: sea-level changes; tide gauges; data rescue; North Sea; English Channel*

Abstract:

Changes in sea-level at local or regional scale may differ significantly from changes in global ocean level due to a multiplicity of factors. Along the Hauts-de-France coast, the evolution of the sea-level is only known for the last few decades, whereas it is essential to know the long-term trend of local variations in sea-level if we want to be able to forecast the future evolution of sea-level in this area.
In order to reconstruct the evolution of sea-level during the last centuries, an analysis of the tidal data and archives of the ports of Dunkirk, Calais and Boulogne-Sur-Mer is needed. New observations of the sea level of decades and centuries ago need to be digitized to secure this historical heritage. In addition, maps of the Hauts-de-France coast with topographic and bathymetric data are available since 1800. After converting these charts in the present day geographical projection, a comparison of the evolution of the shoreline and of the morphology of the coastal zone with sea-level changes, will enable to evaluate the impacts of the observed morphological changes on local hydrodynamics.
The new data will provide perspective for assessing the risk of submersion and coastal erosion in this region for the future.

Session 1: Identification and analysis of environmental stressors.

Influence of variation of solar radiation on marine forest distribution

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Keywords: *solar radiation, seaweed forest, Gelidium elegans, community formation*

Abstract:

It is known that there is a large variation in the annual total solar radiation value around Japan, it influences the marine primary production. In order to clarify the influence of the variation of solar radiation on seaweed forests, we examined the method to estimate underwater irradiance from sky light irradiance on the coast of Miyakejima Island, Tokyo, in relation to the formation depth of red alga *Gelidium elegans* seaweed forest which is the main fisheries production on the island.

The underwater irradiance and sky irradiance were measured during 2014 to 2015 on Miyakejima Island. The long term variation of solar radiation was analyzed by meteorology data for 30 years.

There was a significant positive relationship between the diffuse attenuation coefficients K of seawater near the Miyakejima coast and wind speed ($p < 0.001$). The underwater irradiance estimated by the relationship of K and wind speed has a significant relationship ($p < 0.01$). The solar radiation at the sea surface of Miyakejima Island has increased with years. However, the wind speed on east and west direction of Miyakejima Island has increased with years, the K of east and west of the island has also increased. The shallowest depths near the intertidal of *G. elegans* forest has increased on the north, east, and south sea area, and the deepest depth of the forest on east also increased with years.

Session 1: Identification and analysis of environmental stressors.

Statistical analysis of high frequency pCO2 data acquired on the Astan buoy (southern Western English Channel, off Roscoff)

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Keywords: *High-frequency, CO2Air*

Abstract:

Since 2007, in the context of the SOMLIT network, we installed a CTD (SeaBird SBE19+) below the ASTAN buoy located in the Western English Channel (WEC) off Roscoff (48'46'40N 3°56'15W; depth 5m) between the SOMLIT-Estacade and SOMLIT-Astan sampling sites. These sensors provide high-frequency (HF) measurements (hourly) of Sea Surface Salinity (SSS), Sea Surface Temperature (SST), fluorescence and Dissolved Oxygen (DO) all year. Since 2014, we added a SAMI-CO_2 sensor, which measures the sea surface partial pressure of CO_2 (pCO_2) to investigate the dynamic of the pCO_2 and associate air-sea CO_2 exchange at the Astan site, and its evolution over time. This study station is characterized by strong tidal currents, which transports two masses with different properties: biologically productive near-shore costal water mass influenced by benthic fauna due to the shallow depth; and a less biologically active, well-mixed water mass from the WEC.
Here we present data from the year 2015 to assess the different temporal scales of variability of pCO_2 at hourly, daily and seasonal scale. In an environment strongly impacted by tides, we attempt to quantify the impact of various biogeochemical and physical forcing (temperature, wind, solar radiation, tidal level, diurnal biological cycle) on the pCO_2 dynamics. For this purpose, statistics tools such as multivariate analysis and wavelets are used to carry out analysis of high-frequency data. This quantification of short-scale variability of air-sea CO_2 flux in costal ecosystems is essential for climate models in the context of climate change and Ocean Acidification (OA).

Session 1: Identification and analysis of environmental stressors.

Analysis of the spatial and temporal variations of pCO2 by using the in-situ measurement data in the Seto Inland Sea and the Pacific Ocean of west part of Japan.

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***Keywords**: pCO2, the Seto Inland Sea, in-situ measurement*

Abstract:

The partial pressures of carbon dioxide in the sea water (pCO2) and in the air (pCO2), and the pertinent items were measured in the Seto Inland Sea and in the Pacific Ocean of the south side of Shikoku Island on the spring and summer during 1994-2010 on the vessel, Fukae Maru, of Kobe University. The spatial and temporal variations of pCO2 were analyzed using this historical data.

CO2 were measured by the automatic system every 15 minutes. pCO2 were measured by the equilibration chamber using the bubbling method and NDIR detector. And the concentrations were decided by the calibration line by the peak method. Sea water was pumped up from the 3m depth. And the air was sampled from 12 m high.

The increase tendency of pCO2 was found in general over time. pCO2 of Osaka Bay was always low compared with pCO2, and was absorbing CO2. All the area was absorbing CO2 in spring. However, the Seto Inland Sea except Osaka Bay was emitting CO2 in the summer. Since solubility will decrease when water temperature increases, pCO2 becomes high. It is considered that one of reasons is large scale estuary circulation is formed in the Seto Inland Sea. Sea water flow in to the Seto Inland Sea from the Pacific Ocean along the bottom layer, and up well in the Bisan-Seto, which is located in the middle part of the Seto Inland Sea. Because a seto is narrow, vertical mixing will develop.

Session 1: Identification and analysis of environmental stressors.

Statistical analysis of surface circulation in Sagami Bay using High Frequency（HF）Radar

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Keywords: *Sagami Bay, HF radar, surface circulation*

Abstract:

Surface circulation in Sagami Bay located to the south of Honsyu, Japan, was analyzed using High Frequency (HF) radar located at Izu-Oshima Island and at Arasaki (the Miura Peninsula).The surface current detected by HF radar drew similar currents measured by drifting buoy. Prominent current direction isanti-clockwise circulation in the western part, and cannot be defined in the eastern part of Sagami bay. EOF 1st mode shows currents influenced by the inflow of the Kuroshio water. Stronger currents inflowing via Ohshima eastern channel generates clockwise circulation. The EOF 2nd mode implies wind-driven current. Higher modes indicate dipole modes (north-south or east-west), and eddy-like mode.

Session 1: Identification and analysis of environmental stressors.

Elucidation of the migration mechanism of radio cesium from sediment to benthic microalgae

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***Keywords**: Radio cesium, benthic microalgae, seabed sediments, pore seawater, Fukushima*

Abstract:

Due to the Fukushima Dai-ichi Nuclear Power Plant accident in 2011, various radio nuclides were discharged into the ocean, leading to radioactive pollution of marine organisms and their surroundings. While radio cesium concentrations of the organisms have drastically decreased with time, seabed sediments and benthic microalgae still have relatively high radio cesium concentrations at present. To elucidate the radiocesium migration process from the substratum to benthic microalgae, we investigated the abundance ratio of sediments, pore water in sediments, bottom seawater and microalgae, as well as the seasonal variation of the microalgal species composition in Fukushima coastal waters.

We are carrying out the investigation at Onahama Bay and Matsukawaura Bay, Fukushima every 3 months from September, 2016. Bottom seawater and sediments were sampled with a Van Dorn water sampler and by scuba diving, respectively. Nets for the microalgae to adhere were set on the seabed. In the laboratory, pore seawater was separated from the sediment samples by filtration, and micro algal samples collected by brushing the nets. Radio cesium concentration of each sample was measured with a Ge semiconductor spectrometer.

Radio cesium concentrations of sediments, pore seawater and bottom seawater were higher at Matsukawaura Bay than Onahama Bay. The sediments had 3 orders of magnitude higher radiocesium concentrations than the pore seawater which was 5-8 times higher than the bottom seawater. The dominant species of the algae in winter were diatom *Parlibellus* sp. at Onahama Bay, and both diatom *Navicula gregaria* and *Berkeleya rutilans* at Matsukawaura Bay. We are currently incubating the dominant microalgae to examine the species differences of the uptake mechanism of radio cesium.

Session 1: Identification and analysis of environmental stressors.

Session 2: Impacts on socio-ecosystems and biological resources

Keynote Session 2 Interactions of microplastics throughout the marine ecosystem

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Auditorium AGORA
Wednesday the 8th of November from 11:15 am to 11:45 am

Keywords: *plastic pollution, ecotoxicology, impact on ecological processes*

Abstract:

Marine microscopic plastic debris, or microplastic, is a modern societal issue, illustrating the challenge of balancing the convenience of plastic in daily life with the prospect of causing ecological harm by careless disposal. This presentation will provide an overview of our group's recent work exploring the ecotoxicology of micro and nanoplastics. Microplastic is a complex, dynamic mixture of polymers and additives, to which organic material and contaminants can bind, leading to changes in bioavailability and toxicity. Our results will be used to illustrate how chronic exposure to microplastic is rarely lethal, but can adversely affect individual animals, inducing inflammation, reducing feeding and depleting energy stores, with knock-on effects for fecundity and growth. The extent to which ecological processes could be impacted especially in coastal locations will be discussed as will the ecological risks posed by microplastics in comparison to other anthropogenic pollutants and stressors.

Session 2: Impacts on socio-ecosystems and biological resources

Session 2: Impacts on socio-ecosystems and biological resources

Oral communications Session 2

Auditorium AGORA

Wednesday the 8th of November from 11:45 am to 3:45 pm

Session 2: Impacts on socio-ecosystems and biological resources

Session 2: Impacts on socio-ecosystems and biological resources

Large-, local-scale influences and impacts of extreme events on the characteristics of coastal waters of Western Europe (1998-2016)

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***Keywords**: Coastal systems, Climate variability, River inputs, Time-series, Weather regimes, high frequency in situ measurements.*

Abstract:

It is now well documented that coastal marine ecosystems are highly affected by the combined influence of natural climate variability and anthropogenic climate change. However, it is still a challenge to assess both the spatial and temporal scales at which forcings operate and therefore to anticipate the response of these coastal ecosystems under threat.

Investigating this issue, our recent studies have shown that the combination of large- and local-scale hydro-climatic influences have induced noticeable changes in physical and chemical characteristics of coastal waters in Western Europe. Here, using both high- and low frequency observations collected from 1998 onwards at the outlet of the Bay of Brest and off Roscoff, we depict and relate decadal changes in *(1)* sea surface temperature, *(2)* sea surface salinity, *(3)* nutrient concentrations, *(4)* river discharges and *(5)* regional and local precipitations. Our study reveals that decadal variability in coastal waters, during the winter period, is connected to the large-scale North Atlantic atmospheric circulation but is also partly explained by local river influences. The impact of recent years linked with extreme events from 2013 to 2016 on the processes involved to explain observed signals has also been investigated. The role of extreme events in the multiannual trends in coastal waters and the potential impact on phytoplankton blooms is explored as a straightforward consequence of the observed large-scale changes.

Session 2: Impacts on socio-ecosystems and biological resources

Presentation and test of a new metric to infer changes in benthic habitat ecological quality new metric

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Keywords: *benthic habitat, changes, new metric*

Abstract:

Most of the existing metrics currently used to infer the Ecological Quality Status of marine benthic habitats from benthic macrofauna composition are either based on *(1)* the sensitivity tolerance concept, or *(2)* assessment of the deviation from a reference status. In the first case, this raises the difficulty in establishing sound reference lists valid for a large set of disturbance sources, whereas the second approach requires a large number of reference stations and is for the moment generally not applied directly to the fauna matrix. Within the framework of the French ANR project BENTHOVAL, our research group has developed a new metric to overcome these difficulties. This metric is based on the decomposition of the Bray-Curtis dissimilarity between the loss and gain of species between a reference station in a good ecological status and the one to be assessed. It has been successfully tested for: *(i)* an original data set where maerl extraction is taking place and *(ii)* a composite data set including six Scandinavian sites submitted several disturbance sources. This second data set has already used to compare the results of three Scandinavian multi-metric biotic indices. Our results show that the new metric is able to efficiently detect disturbances in all cases and irrespective of disturbance sources. These results will be discussed and a procedure will be proposed to use the new metric to infer both the trajectories and the absolute values of habitat Ecological Quality Status.

Session 2: Impacts on socio-ecosystems and biological resources

Re-creating intertidal habitats for the ecology: the influence of site morphology and location on ecological development.

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***Keywords**: estuarine birds, intertidal habitats, ecological engineering, managed realignment.*

Abstract:

Managed realignment is the ecological engineering practice of re-creating habitat in intertidal areas by moving the flood defence inland, and breaching the existing sea defence allowing the flooding of former agricultural land. Managed realignments can be created with different objectives (e.g. flood relief, wetland habitat compensation). However, their location is often constrained by land availability rather than by ecological constraints (e.g. best environmental conditions favouring habitat formation and colonisation by wetland fauna and flora). Three of the Humber Estuary (UK) managed realignment sites were monitored over a 10-year period to examine the evolution of the water bird community in response to the physical and biological development of the site. All three sites varied in their locations along the estuary gradient (upper, mid and lower estuary), their design and subsequent morphology. The study examined the effects of physical parameters (e.g. size, width of breach, length of embankments, site geometry etc.) and biological parameters (e.g. macrofaunal abundance, bird density in adjacent intertidal areas) on water bird community. The influence of the morphology of such sites, their connectivity to established mudflat and intertidal sediment processes taking place are crucial to understand how managed realignment could be better positioned and designed to provide self-sustained habitats for birds. The outcome of the study provides design and management tools for planners and practitioners.

Session 2: Impacts on socio-ecosystems and biological resources

Community structure of macrozoobenthos and its spatio-temporal change ina shallow eutrophic lagoon after the 2011 tsunami impact

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Keywords: *tsunami, impact, macro zoobenthos, community structure, lagoon*

Abstract:

The Great East Japan Earthquake and tsunami struck the Pacific coast of Northeast Japan on 11 March 2011. In Gamo lagoon, which is the shallow eutrophic lagoon located at the Nanakita River mouth, Sendai Bay, a large-scale removal of sediment was observed and the benthic community suffered serious damage. Gamo Lagoon was of great importance to large numbers of invertebrates and fish for their habitats and provides resting and feeding areas to birds. From the view point of conservation of coastal environment, it is required to investigate the spatio-temporal variations in benthic community assemblage in Gamo Lagoon after the disturbance. Macro zoobenthos, which is strongly associated with the soft sediments, the density was very low just after the tsunami in May. Following that, annelids immediately increased in June and July but again decreased in August and September. From October 2011 to August 2012, amphipods appeared and increased. From September 2012, bivalves were observed and dominated for the first time since the disturbance. The benthic community structure of each high temperature season showed alternation in inner part of the lagoon which may be caused by hypoxia. Density continues in low level at river mouth after the intense deluge happened in September 2015. The topography continues changing and macro zoobenthos community is still fluctuating until now. Monitoring should be continued.

Session 2: Impacts on socio-ecosystems and biological resources

Complex response of aquaculture to Climate Change: the case study of oyster farming in Arcachon bay.

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Keywords: *Arcachon Bay, Crassostrea gigas, Climate Change*

Abstract:

The Pacific oyster, *Crassostrea gigas*, was intentionally introduced to Europe in the 1970s for oyster farming. Since this species reproduces naturally in Arcachon Bay in contrast with others northern systems, spat harvesting is widely practiced by oyster farmers. While the subtle rise in North Atlantic water temperatures since the mid-1990s allowed larval development and the proliferation of feral oysters in northern Europe, oyster populations have in contrast exhibited reproduction anomalies in this system. Several tools such as long-term series analysis, DEB models, *in situ* sampling of oyster condition in relation with their abiotic and trophic environment have showed that:

• The reproduction timing and effort of oysters are highly related to long-term mesoscale climate with an indirect and important role on food resources. The shift in phytoplankton that have occurred in 1995s had led to a higher contribution of species with a lower biochemical quality for oyster physiology causing a spawning delay and a decrease in the number of oyster larvae nowadays.

• The high year-to-year fluctuations in larval harvesting is the result of disconnected responses of several phases of the life cycle of oysters: both adult response to climate through food quality during the gametogenesis (spring) and planktonic larvae response to temperature during summer.

• The nowadays long-term decrease of larvae abundances and thus seed harvesting at the bay scale is also due to the lower contribution to global larval stock localized in the inner part of the bay for which higher difficulties may be related to anthropogenic pressures.

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Post-tsunami oyster feeding environment in Miyagi prefecture

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Keywords: *great earthquake, tsunami, aquaculture effects, Japan*

Abstract:

The great earthquake and resulting tsunami of 11 March 2011 seriously damaged aquaculture throughout the Tohoku coastal area. Post-tsunami oyster harvest levels (about 20,000 tons/year with shell) are higher than just after-tsunami level (5,000 tons/year).Oyster stocks within the Miyagi Prefecture have gradually recovered, although the levels are lower than pre-tsunami levels (40,000–60,000 t/year).

We investigate the dietary environment of oysters in Oginohama Bay, Miyagi, and determine the total amount of phytoplankton in the culture area to be higher than quantity of phytoplankton filtered daily by oysters. We conclude that the quantity of oysters being cultured post-tsunami is suitable. The number of companies producing oysters in 2008 and 2013 was 809 and 364, respectively. With the post-tsunami retirement of many employees, and reduction in number of companies, the total quantity of oysters in the aquaculture grounds has decreased. The aquaculture grounds are currently not overcrowded.

We develop a sequencing method using the PsbA gene, encoding the D1 protein of photosystem II, by Next Generation Sequencing (NGS). Using NGS, we identified roughly 450 species of phytoplankton in seawater, oyster stomach and gut contents. Future research will compare DNA sequences in stomach and gut contents and stable isotope ratios with various shellfish species to investigate the competition for prey of shellfish.

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A seagrass–oyster farmers interaction detected by eelgrass DNA analysis in Hinase area of the Seto Inland Sea, Japan

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***Keywords**: Zostera marina, seagrass restoration, microsatellite markers, oyster farming, indigenous and local knowledge*

Abstract:

Seagrass beds are one of the most important coastal habitats with high productivity and biodiversity and thus various ecosystem services. Therefore they often become the target of ecosystem restoration such as a marine protected area. This study demonstrated the contribution of oyster farmers' long-term activities to eelgrass bed restoration in the Hinase area, located at the central of the Seto Inland Sea, Japan, based on a DNA analysis for the eelgrass population-genetic structure using seven microsatellite markers.
Hinase area was famous for the fishing by coastal pound netting to catch fish and shrimp migrating to eelgrass beds, but gradually the fishing had been replaced by oyster farming with the massive loss of eelgrass. The fishers conducted eelgrass bed restoration using a seeding method for several decades even after the oyster farming became the majority, because they already knew eelgrass can maintain a better coastal environment for oyster farming as well as coastal productivity for fishing. The farmers collected eelgrass seeds from natural sites with better environmental conditions, and then sowed the seeds in the sites where eelgrass beds had disappeared.
We collected 30 eelgrass shoots as DNA samples from each of nine sites where the farmers collected seeds and where they sowed the seeds. Our DNA analysis revealed the farmers' seeding activity did not disturb the genetic structure by natural eelgrass dispersal but significantly facilitated the recovery of the eelgrass distribution, suggesting that the eelgrass-oyster farmer relationship in Hinase is a good practice as an ideal ecosystem restoration.

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Temporal recruitment windows of *Crassostrea gigas* in Mediterranean lagoon under oligotrophication.

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***Keywords**: Crassostrea gigas, Oyster Spat, Pediveliger, Metamorphosis, Recruitment, Oligotrophication, Larval* Ecology.

Abstract:

In the context of increasing demand for environmental recovery, aquatic systems may now face the challenge of evolving under oligotrophication. This is the case of Mediterranean lagoons, in particular the shellfish farmed Thau lagoon in France, where we studied recruitment of the Pacific oyster (*Crassostrea gigas*) for three years (2012, 2013 and 2014) from June to September.

Oyster spat and environmental parameters were monitored from six to eight sampling sites between 2012 and 2014 using a temporal and spatial strategy to study pre and post-settlement processes and to identify the best conditions for recruitment.

Beforehand, our study demonstrated that recruitment of this species is possible in the Thau lagoon. We identified favorable environmental windows for recruitment from August to mid-September characterized by high water temperature (>26.5 °C) and high nano phytoplankton and *Chaetoceros spp.* abundances (>4.3 10^6 cell. l^{-1} and 345.10^3 cell. l^{-1}, respectively). Here, we describe that these favorable conditions correspond to an ecosystem working as an autotrophic system, as opposed to a heterotrophic system that characterizes unfavorable conditions (between June and July). In heterotrophic conditions, high abundances of mixotrophic and heterotrophic organisms (ciliates and dinoflagellates) limited the metamorphosis of *C. gigas* larvae, leading to poor recruitment. This study provides new knowledge on the reproduction of the Pacific oyster in the Mediterranean Thau lagoon under warming and oligotrophication.

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Climate effects on historic bluefin tuna captures in the Gibraltar Strait and Western Mediterranean

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***Keywords**: Historical bluefin tuna captures, total solar irradiance, sea surface temperature, paleoclimate reconstructions, little Ice Age*

Abstract:

Historical capture records of bluefin tuna (*Thunnus thynnus*; BFT hereafter) from the Gibraltar Strait and Western Mediterranean show pronounced short- and long-term fluctuations.

Some of these fluctuations are believed to be associated with biological and ecological process, as well as distinct climate factors. For the period of study (1700–1936) of this work, we found a long-term increasing trend in the BFT captures and in the climate variables. After applying a statistical time series analysis of relevant climate variables and long-term tuna capture records, it is highlighted the role played by sea-surface temperature (SST) on bluefin population variations. The most relevant result of this study is the strong correlation found between the total solar irradiance (TSI) – an external component of the climate system – and bluefin captures. The solar irradiance could have affected storminess during the period under study, mainly during the time interval 1700–1810. We suggest physico-biological mechanisms that explain the BFT catch fluctuations in two consecutive time intervals. In the first period, from 1700 to 1810, this mechanism could be high storm and wind activity, which would have made the BFT fisheries activities more difficult by reducing their efficacy. In contrast, during the interval from 1810 to 1907, the effects of wind and storms could be on spawning behaviour and larval ecology, and hence on year class strength, rather than on fish or fisherman's behaviour.

These findings open up a range of new lines of enquiry that are relevant for both, fisheries and climate change research.

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The Effects of Climate Change on Fisheries and Aquaculture in Japan: A Review

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Keywords: *climate change, fisheries, aquaculture, Japan*

Abstract:

Japan extends north to south over 3000 km along the western edge of the Pacific Ocean in the temperate region. This geographical advantage brings rich fishery production to Japanese people, who can enjoy a variety of fishes each season. However, this enjoyable life might be in danger because of climate change.

Understanding the mechanism of the climate-change effects on this richness of fishery production is very challenging. Global warming not only simply causes a rise in seawater temperature, but also affects the marine ecosystem itself by changing current flows, vertical circulation, nutrient supply and so on. Spawning grounds, feeding grounds, fishing grounds, migration routes of fishes around Japan all might change.

Aquaculture activities are also affected by climate change. Fishes tend to be cultured near the upper level of the optimum water-temperature range to yield maximum production. Therefore, even a mall change in water temperature may cause the decrease in aquaculture production. The demand for fish with the high-water-temperature tolerance might increase in the future. Otherwise, better aquaculture cites may move northwards.

Commercially important fishes around Japan will be focused in this presentation. Their current conditions will be summarized and recent progress in global warming research on fisheries and aquaculture will be introduced.

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Posters Session 2

Poster flash presentations the 7th of November from 5:15 pm to 5:30 pm and the 8th of November from 10:00 am to 10:15 am in the AGORA

Special poster session in the cloister the 7th of November from 5:30 pm to 6:30 pm and during the coffee-breaks the 8th of November from 10:15 am to 10:45 am and from 3:45 pm to 4:15 pm.

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Session 2: Impacts on socio-ecosystems and biological resources

Understanding pelagic community's assembly from multidisciplinary oceanographic cruises

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Keywords: *community assemblage, predator-prey assembly, species interactions, oceanographic cruises, Bay of Biscay*

Abstract:

To better understand and predict how pelagic ecosystems will response to changing environmental conditions, it is required to improve our knowledge about interactions between different trophic levels. In that framework, multidisciplinary oceanographic cruises can be a powerful information source, as they allow us to work combining annual predator observations and pelagic prey data. The aim of this work is to analyze the pelagic community of the Bay of Biscay, using the probabilistic modelling approach developed by Veech to investigate statistically significant pair wise patterns in species co-occurrence. Based on data collected during the JUVENA oceanographic surveys, we obtained preliminary results for the predator community composed by 42 taxonomic groups of seabirds and marine mammals for the 2013-2016 period analysed at the daily scale. Our results showed that this predator community largely followed random patterns, although interestingly a significant part of interactions (36.1%) were not random. Most of them (89%) were positive (co-occurring significantly more frequently than expected) occurring especially among seabirds and among marine mammals separately. By contrast, negative associations (co-occurring significantly less frequently than expected) were quite far less (11%) occurring within the whole community of seabirds and marine mammals. Our next steps would be to define the community structure shaped by these interactions and to include pelagic prey data within the same analysis. Identifying the trophic relationships between these communities could help us apply the ecosystem based management approach.

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Marine debris characterisation and distribution in relation to regional oceanography in the Bay of Biscay

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Keywords: *marine debris, regional oceanography, oceanographic cruises, Bay of Biscay*

Abstract:

Each year approximately 10 million tonnes of marine litter gets to the world's seas and oceans. Although the majority of debris in the oceans is generated in land, their distribution in the oceans is complex and can be related to different physical, chemical and biological processes. Since the typical time scales of debris transformation are much longer than those of the oceanic transports, they can be considered like conservative particles whose motion is driven by currents. Within this context, we took advantage of the annual JUVENA oceanographic surveys to monitor the distribution and abundance of marine debris for the 2013-2016 period. In addition, horizontal fields of temperature, salinity, geostrophic velocities, vorticity and mean thermocline depth were obtained based on hydrographic casts. Trained observers collected information on 6 different types of marine debris: (unnatural) wood trash, fishing trash, oil slicks, plastic trash, small debris and large debris. We hypothesized that areas of high concentration of marine debris would be associated to areas of low geostrophic velocity and the presence of coherent mesoscale structures like frontal systems or eddies. The analysis of the hydrodynamic fields showed marked mesoscale activity and inter annual variability in the study area. Our preliminary results concerning the cross-analysis of marine debris and regional oceanography showed high spatial variability and different techniques are used to further explore the relationship between them. Our results could contribute to the Marine Strategy Framework Directive Marine since marine litter is one of the eleven descriptors established to assess the environmental status of the European Marine waters.

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Growth Performance of oyster *Ostrea edulis* and *Crassostrea gigas* cultured in the open ocean of the South-eastern Bay of Biscay.

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Keywords: *Offshore aquaculture, Oyster culture, long-line, Crassostrea gigas, Ostrea edulis.*

Abstract:

Oyster culture industry is nowadays restricted to sheltered areas, and its expansion is constrained by conflicts with other uses, thence, offshore aquaculture is a promising opportunity to expand the bivalve culture operations, minimizing environmental impacts and conflicts with other uses.

Despite the growing interest on offshore aquaculture, information about the feasibility of oysters in open ocean conditions is limited. Therefore, the aim of this study is to assess the growth performance of the European flat oyster (*Ostrea edulis*) and the Pacific oyster (*Crassostrea gigas*) cultured in the offshore environment of the south-eastern Bay of Biscay.

Oysters were cultured in submerged long-line systems through suspended lanterns at an experimental offshore site during 19 months. Together with physical/chemical parameters (including Chlorophyll, temperature POC and TPM) oysters were collected and shell length and fresh weight were monthly determined.

Despite the low chlorophyll concentrations (mean = 0.56 μg/l) measured, both oyster species showed a good growth performance, comparable to rates observed in both nearshore and offshore farms. *Ostrea edulis* grew from 28 mm to 76 mm in length and from 1.6 g to 53.7 g in fresh weight. On the other hand, *Crassostrea gigas* presented faster growth rates ranging from 26 mm to 114 mm in length and from 1.6 g to 112.1 g in fresh weight. These results indicate that offshore oyster production is biologically and technically feasible in the South-eastern Bay of Biscay and may be an alternative to reduce environmental impacts.

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Long-term changes in the structure of the fine sand macrobenthic community of the Bay of Seine: a comparison between species and functional diversity

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Keywords: *Biological traits analysis, benthos, long-term changes, spatio-temporal data, English Channel*

Abstract:

While coastal ecosystems experience increasing pressures due to human activities and climate change, measurement of functional diversity based on the biological traits analysis of species (BTA) is increasingly used as a tool to assess ecosystem functioning and its responses to disturbance. In the eastern Bay of Seine which is a representative area of these changes and exposed to numerous anthropogenic disturbances (e.g. coastal construction, regular dredging, pollution, introduction of *Ensis directus* and shrimp fisheries), an original long-term monitoring program of the benthic macrofauna community has been developed providing spatio-temporal data on the benthic community variability. It is based on the sampling of 60 common stations during 7 sampling cruises over 28 years (i.e. 1988, 1991, 1996, 2001, 2006, 2011, 2016). From this dataset, this study aims to investigate the link between species and functional diversity at different scales (α-diversity, β-diversity and γ-diversity), as well as to assess how changes in the community structure and species composition may have altered the ecosystem functioning in the Bay of Seine. A 'traits-by-species' matrix including seven biological traits (i.e. body size, life span, feeding mode, development mode, mobility type, sediment reworking type and tolerance to disturbance) chosen according to their relevancy for three major ecosystem functions (i.e. secondary production, nutrient cycling, resilience) was built. To cover the different facets of α-diversity (i.e. richness, evenness and heterogeneity), a selection of species and functional diversity indices were calculated at each station. Functional diversity indices were calculated by weighting traits according to species abundances or biomass. For each campaign, the links between these different metrics were determined from a Principal Component Analysis. The β-diversity on a regional scale was analysed by applying clustering and non-parametric multidimensional scaling on both species and traits composition matrices. The results showed that population fluctuations of a few very abundant species led to the major variations observed in the structure of the macrobenthic community in both taxonomic and functional aspects when based on abundance data. A certain redundancy was found among species and functional diversity indices in terms of richness, evenness and heterogeneity.
Likewise, at regional scale, similar patterns were reported on the spatial structure of the community along an inshore-offshore gradient described from species or traits composition in parallel to an inshore-offshore gradient in food supply, hydrodynamics, sediment grain

size and salinity. The interests and limits on BTA to assess changes in benthic communities in response to environmental changes will be discussed.

Session 2: Impacts on socio-ecosystems and biological resources

Temporal dynamics of submerged macrophytes in response to re-oligotrophication of Mediterranean coastal lagoons: return to the baseline?

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Keywords: *Coastal lagoons, submerged macrophytes, recovery, successional trajectories*

Abstract:

Since the last forty years French Mediterranean lagoons suffered from eutrophication, leading to significant changes in their ecosystem structure, functioning and services. The main effect of nutrient enrichment to primary producers includes a shift from aquatic angiosperms and perennial macroalgae to opportunistic macroalgae and phytoplankton communities. Management actions have been implemented in order to reduce nutrient inputs into coastal lagoons with the aim to achieve their "good" ecological status as requested by the Water framework Directive. For the last ten years, a decline in nutrient loads has been recorded in several lagoons, leading to a re-oligotrophication of the water column. However, the recovery trajectory of macrophytes in response to the nutrient decline is still poorly understood. Is it reversible? Does the trajectory follow the same pathway during eutrophication and re-oligotrophication? To study the trajectory of macrophytes communities during the ecological restoration of lagoons, we analyzed a long-term data set (1998-2015) concerning 21 polyhaline and euhaline lagoons in different trophic status. In fact, some oligotrophic lagoons were non-degraded (used as target baselines) and other ranged from mesotrophic to hypertrophic status. At the time scale of the study, we only observed the first steps of lagoons recovery; thus, we are not able to retrace a complete story of the macrophyte succession for a single lagoon. The k-table analysis (STATICO) allowed us to take into account all the lagoons to study the temporal changes of macrophyte communities and to propose a pattern of macrophytes succession during the re-oligotrophication of Mediterranean coastal lagoons.

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Rocky intertidal communities' response to sewage discharges and associated micropollutants in the southeastern Bay of Biscay

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Keywords: *South-eastern Bay of Biscay, wastewater treatment plant discharges, intertidal platforms, macroalgae and macrofauna communities, micropollutants*

Abstract:

Current works within the EU Water Framework Directive about the good ecological status of water bodies show deficiencies on how biological indicators respond to each pressure in particular coastal wastewater treatment plant discharges and untreated urban rejects. To understand and assess the ecological condition of the whole Bay of Biscay, it is essential to implement a monitoring program including geographical specificities of the south-eastern Bay of Biscay. Then, the project aims to study the impact of "urban effluents" pressure on rocky benthic communities (macroalgae and macrofauna) along the rocky Basque coast and finally to identify relevant indicators for this geographical area. In addition, this work will allow to support several Marine Strategy Framework Directive descriptors as the "Biodiversity", "Non-indigenous species", "Eutrophication", "Sea-floor integrity" and "Contaminants".

Four intertidal locations along the Basque coast were studied from March to June 2017: two "impacted" by wastewater treatment plants (Hendaye in France and Ondarroa in Spain) and two "controls" (Socoa in France and Lekeitio in Spain). At each location, three sites were chosen to evaluate the composition and the relative abundance of macroalgae and macrofauna on rocky platforms according to a distance gradient, using 0.1 m² quadrats. In parallel, *in situ* measurements were taken directly into wastewater discharges with a multi parameters probe. Water samples and the main abundant organisms (*Patella ulyssiponensis* and *P. vulgata*, *Enteromorpha spp.* and *Gelidium corneum* …) were also collected for chemical analysis. Priority and emerging pollutants were determined such as metals, organometals, PAHs, PCBs, synthetic musks, alkylphenols.

Session 2: Impacts on socio-ecosystems and biological resources

From biological impacts on natural resources to fisheries impacts in the context of climate change - a case study within the Nouvelle- Aquitaine region

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***Keywords**: Exploited species, regional study, environmental changes, climate, fishing enterprises, adaptation*

Abstract:

Status of populations exploited by fishery activities depends on the exploitation choices with regards to the capacity of renewal of the stocks. It also relies on the environmental characteristics that impact the different life stages of the species and ultimately the successful completion of their biological cycles. These environmental characteristics are dependent in part on anthropogenic activities (quality and quantity of available water, crossing obstacles, other disturbances) and may be subject to the effects of climate change.
For important fisheries species in the Nouvelle-Aquitaine region, impacts related to changes in the environment are already observed or expected. Even if distinction and quantification of the different factors contributions (climate change, degradation of habitat quality...) are difficult behind the observed trends, some changes can be directly attributed to climate change. Examples presented are extracted from a synthesis of knowledge on thirteen species (red algae, European anchovy, European eel, European sea bass, European monkfish, gilthead sea bream, allis shad, shade fish, North Atlantic mackerel, European hake, manila clam, Atlantic salmon and common sole).
Beyond these impacts on targeted species, the presentation will then assess the current impacts on the fisheries in terms of, for instance, location of fishing areas and redeployment on other species. The discussion will focus on adaptations of regional fishing enterprises and related issues. The definition of borders and access rights is of particular matter for fisheries resources and climate change poses a new challenge and new conceptions, in particular institutional, due to the mobility of the species and the induced changes.

Session 2: Impacts on socio-ecosystems and biological resources

Impact of storms and floods episodes on primary production in an exploited coastal zone (Thau lagoon, south of France): coupled hydrodynamic-biogeochemistry modelling approach.

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***Keywords**: Thau Lagoon, France, primary production, impact of storms and floods*

Abstract:

The authors collaborate within the SO RECThau (Service of Observation and Research in coastal Environment of Thau) of the OSU OREME. They find themselves here on a project of hydro-biogeochemical numerical modelling complementary of their activities of observations. Illustrated on the period of the RESTHAU campaign (November 2008), the aim is to evaluate the impact of storms and floods episodes on primary production.

The coupled model Symphonie-ECO3M was implemented on a fairly original computing grid encompassing the Thau lagoon, the canals, the foreshore and open sea to the offshore zone. The hydrodynamic model is coupled to the ECO3M model based on mechanistic formulations of biological processes. The model uses 35 state variables and reproduces a complex planktonic ecosystem with several primary producers and several consumers. The biochemical cycles of the biogenic elements (C, N, P, Si) are managed by the model.

Owing to field data, the November 2008 storm period was investigated. The first results show no increase in primary production during and after the storm in spite of an enrichment of the lagoon in nutrients which seems to indicate a limitation by light or temperature. The role of predation by oysters (more than 10 000 tonnes in the lagoon) is also investigated by comparing the modified model integrating this compartment with mesocosms results.

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Distribution and Biodiversity of the Annelidian macrofauna in the eastern coast of Algeria

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***Keywords**: Biodiversity, benthic macrofauna, annelids polychaete, esat Algerian coastline.*

Abstract:

Among marine invertebrates, the most abundant taxon in benthic communities in terms of digital richness and biodiversity is the Annelids Polychaete. They constitute 35-50% of macrobenthic species.
The aim of this work is to compare the abundance and distribution of the different species of marine invertebrates in general and the Nereidae (Annelids, Polychaete) particularly, because this family is one of the most diverse at three sites of the East Algerian coastline: EL-Kala, Annaba and Skikda, taking into account the various physicochemical parameters during the year 2016.
After the establishment of an inventory according to the Fauvel classification criteria and a morphometric analysis of all the individuals, this study allowed the identification of several species of polychaete annelids.
The results have led to the identification of several species of polychaete such as *Nereis falsa*, *Platynereis dumerilii*, *Perinereis marionii*, *Lepidonotus clava*, *Perinereis macropus*, *Perinereis marionii*, *Nereis succinea*, *Perinereis floridana*, *Nereis virens* ...), crustaceans, molluscs, Nematodes, gastropods... at the three study sites. Also, several species of algae have been identified.
The variations in the distribution of species at different sites are related to the external factors (temperature, salinity, dissolved O2 ...), the reproduction period and the direct impact of pollution on the abundance of these marine worms and biodiversity of benthic species in the East Algerian coastline. However, the diversity index recorded in El Kala is the highest compared to other sites studied with a dominance of annelids followed by molluscs.

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Qualification of the European conger *Conger conger* (Linnaeus, 1758) as a bioindicator of coastal organic and metallic chemical contaminations

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Keywords: *Conger eel, chemical contaminants, bioindicator, bioaccumulation, biomagnifications, stable isotope ratios*

Abstract:

The European conger was chosen to evaluate the contamination of the food chain by local pollution sources in the industrialized Gulf of Fos (France), resulting from sociological and biological considerations implying local marine users and scientists. *Conger conger* presented socio-economic advantages (limited commercial value, recreational interest) and suitable behavioral and reproduction characteristics reflecting local contaminations and limiting intra-specific variability.
They were analyzed individually for organic and metallic contaminants and stable isotope ratios δ15N and δ13C were determined to identify potential factors explaining bioaccumulation processes.
The δ13C values allowed to define distinct zones in the Gulf of Fos, while δ15N confirmed that the European conger was a high level predator, and that younger individuals (< 100 cm) feed on lower trophic levels than older ones.
Contaminants concentrations were high but did not reach extreme values. Highest As and Hg levels (22 – 251 and 0.5 – 5.3 mg.kg-1dw, respectively), and tribromophenol (nd – 10.4 µg.kg-1ww) pointed out corresponding industrial discharges, showing the potential of the European conger as a bioindicator at a small spatial scale. The homogeneous distribution of PCB levels (7.2 – 28.7 µg.kg-1ww) likely reflected the influence of the Rhône river inputs, while PAH (3.6 – 9.5 µg.kg-1ww) related to conger age suggested biomagnification. A decline of the exposure to pesticides heptachlor and aldrin was also demonstrated.
Investigating contaminant levels in *C. conger* along with physiological parameters and isotopic ratios revealed great interpretation capabilities at local scale. Moreover, very homogeneous profiles were observed in larger individuals contrary to smaller ones, attributed to different feeding habits. Thus, restricting to larger individuals should reduce intra-specific variability even more, increasing the pertinent use of *C. conger* as bioindicator.
Despite a high media coverage and association recommendations to avoid fishing where Hg values exceeded EU regulations, the results were well accepted locally by the population and stakeholders.

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Monogeneans of the kind *Dactylogyrus* parasitizing *Barbus callensis* caught in the dam Hammam Debagh

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Keywords: *Barbus callensis, ectoparasites, Monogeneans, Dam Hammam Debagh, parasitism.*

Abstract:

The examination of the gills of 35 individuals of host species *Barbus callensis*, teleost of Cyprinidae family caught in the dam Hammam Debagh, allowed us to harvest 391ectoparasitesMonogeneans of the genus *Dactylogyrus*.
The morphometric study by discriminant statistical analysis (PCA and DFA) and the observation of anatomical criteria of Monogeneans collected, revealed the presence of three species: *Dactylogyrus minutus*, *Dactylogyrus prostate* and one individual of the species *Dactylogyrus heteromorphus*.
The results of the distribution of parasitic indices at studied host species, show that infection rates and parasite loads differ between the two species of monogeneans. We note, moreover, that it is the species *Dactylogyrus prostate*, records the highest parasite loads.
Moreover, it is clear from the study of multivariate analysis that the size of the host and the different arcs within each gill, affect parasitism in the two species parasite. However, the variation of these parasites by sex and both sides (left and right) is not specific for each species of *Dactylogyrus*.

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Is the Target Reference Point (F0.1) vulnerable to changes of natural mortality (M)? Case of the Round sardinella (*Sardinella aurita* Valenciennes, 1847) from the Central Algerian Coast

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***Keywords**: Sardinella aurita, central Algerian coast, F0.1, overfishing, overfished*

Abstract:

To highlight a possible impact of changes in natural mortality (M) on the yield level of *S. aurita*, it was deemed beneficial to use the equations of natural mortality (M). Taking into account the recommendations of Froese and Proelss, results generate two opposite scenarios. First, namely a state of not overfishing and not overfished with M = 0.79 yr^{-1} [B = 14.09 g.; BMSY = 9.73 g; F = 0.63 yr^{-1}; 1.1 × FMSY = 1.05 yr^{-1}] and secondly an overfishing and overfished condition for M = 0.39 yr^{-1} [B = 19.181 g.; BMSY = 34.72 g.; F = 1.03 yr^{-1}; 1.1 × FMSY = 0.53 yr^{-1}].

Objectively, we will retain between these two opposite results the second case justified by the geographical origin of biological material used for the development of the empirical equation of (M). Indeed, the authors compiled data from 56 stocks of Mediterranean teleosts while Pauly's model, based on 175 stocks, from polar to tropical areas, include only five Mediterranean data sets.

Finally, we recommend to adjust the catch effort factor FC = 1 to F0.1 = 0.24 for M = 0.39 yr^{-1}.This precautionary approach would have as consequences the revaluation of the exploitable biomass from 16,534 to 46,860 tons. So, the application of this measure would allow long-term renewal of the stock of *S. aurita* in the central region of Algeria.

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Assessment of metal contamination in the marine sediments in the Gulf of Annaba (North-East of Algeria- Southwestern Mediterranean)

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Keywords: *Depth; trace metals; Marine sediments; Gulf of Annaba.*

Abstract:

The present work consists of assessing the degree of contamination on the west coast of Annaba Gulf (Algeria), in order to analyze two physicochemical parameters of the waters (pH and S ‰) that containing certain metallic elements in the sediments. The ecosystem is subject to many complex discharges of various origins. This situation is further complicated at the level of the bay, which makes the easy evacuation of the pollutant load that is caused by the anthropogenic activity, difficult. Thus, a summer sampling campaign was conducted in June 2012. The surface sediment samples from six selected stations were plunged into an increasing bathymetric gradient (-5m and -10m). The contamination index (CI) was used for the assessment of the metal contamination of sediments and the concentrations of the metals (Cu, Fe, Mn, Pb, Ni and Zn) were determined by an atomic absorption spectrophotometer with flame. The results of the measured MTE and CI of the surface sediments of the study area bring clearly to light heterogeneity in their divisions. The hydrodynamics of this region favoured the accumulation of Fe, Pb and Cu particularly within the port. At the depth of -10m, the concentration of the majority of the studied metals decreases.

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Heavy metal contamination in the sediments cores from Oualidia lagoon

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Keywords: *Sediment, Heavy metal, Oualidia Lagoon, INAA, ICP-MS, environmental indices.*

Abstract:

Marine sediments are the ultimate depository of many pollutants such as heavy metals from natural and anthropogenic sources. In fact, a quantitative analysis of sediments can reflect upon the current state of pollution in a marine system. The target of the present study is to evaluate the concentration of heavy metals in sediments cores retrieved from Oualidia lagoon on the Moroccan Atlantic Coast, and to assess the levels of contamination in the study area by using environmental indices.
Furthermore, the sediments cores were analyzed for Al, Mn, and Fe, a determination by Instrumental neutron activation analysis (INAA) and for Cd, As, Cr, Zn, Co, V and Pb by ICP-MS. The results of the study showed that As, Cr, and Cd presented elevated concentrations compared to the other heavy metals measured in the sediments cores. The calculated indices (EF, Igeo and Cf) revealed that the studied sediment is unpolluted to weakly enriched with Fe, Mn, V, Co, Zn, Pb and Hg, while Cr, As and Cd, whose levels were higher than those measured in similar ecosystems lead to indices typical of a moderately to highly polluted and severe enrichment.

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Feeding habits of the comber *Serranus cabrilla* (Linnaeus, 1758) (Teleostei, Serranidae) from the gulf of Annaba (Eastern coast of Algeria)

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(presented by K. Willia)

Keywords: *Diet, Serranus cabrilla, trophic level, Algeria, Mediterranean.*

Abstract:

This study was carried out to describe the feeding habits of the comber *Serranus cabrilla* from the Gulf of Annaba (eastern coast of Algeria). During an annual cycle (October 2015 to September 2016), we examined a total of 831 individuals (11.3 < TL < 23.2 cm; 19.96 < WT < 157.7 g). Different qualitative and quantitative aspects of the diet have been discussed: digestive vacuity (%VI), index of relative importance (%IRI) and trophic level (TROPH). The average annual digestive vacuity is 18.05% (150 empty digestive tracts). It varied over the year, with a maximum during spring and summer (reproduction period). The qualitative analysis reveals a total number of 1959 preys for a total weight equal to 131.66 g, which correspond to an average number (Nm) and weight (Wm) of about 2.88 and 0.19 g respectively. This species preferentially feeds on benthic and epibenthic prey, in particular Pancrustacea (% IRI = 48.71) and teleost (% IRI = 29.25).Remaining prey is considered secondary (Nematoda) or accessory (Bryozoa, Tunicata, Macrophyta, and other items). The statistical comparison using the Spearman rank coefficient (*rho*) shows no significant differences in diet according to fishing seasons. The comber *S. cabrilla* is a carnivorous predator (TROPH = 3.9; Se = 0.63; OI = 0.79) with a preference for decapod crustaceans and teleost.

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Improving our knowledge on the state of skate species

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Keywords: *Skate, fisheries, distribution, abundance, habitat, management*

Abstract:

Dramatic declines in skate species have been observed over the past century. Such declines are largely as a result of fisheries interactions and habitat degradation, accentuated by their large size, slow growth and late maturity. Five skate species *are* observed within French Atlantic waters *Raja undulata* (undulate ray), *Raja microocellata* (painted ray), *Raja brachyura* (blonde ray), *Raja clavata* (thornback ray) and *Raja montagui* (spotted ray). However, due to international concern for the status of *R. undulata, it* was categorized as 'Endangered' (2009) under the IUCN red list. Although a controversial measure among fishers due to high catch rates, little is known about the ecology and population of these species.

Long-term scientific and fisheries data on skate catch rates around French waters have been analysed to better understand the distribution and abundance of these species. The latter has enabled better understanding of fisheries interactions to be explored. To strengthen this analysis telemetry, isotope and microchemistry studies are also being undertaken to learn more about the movement of these species and identify essential habitats.

Currently, management measures for skates are generic and a burden on the fishing industry. By improving our understanding on the current state of skate stocks, their ecology and movement, targeted management measures could be adopted. Targeted management measures would not only safe guard these species but also reduce impact to the fishing industry. Results from this study will also be useful to assess skate environmental status under the Marine Strategy Framework Directive.

Record and relative growth of subtropical exotic crab *Percnon gibbesi* (Crustacea, Decapoda, Plagusiidae) on eastern Algerian coasts

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Keywords: *Percnon gibbesi - Brachyura – Morphometry – Algeria - Mediterranean.*

Abstract:

This study describes for the first time the presence of the subtropical grapid crab *Percnon gibbesi* (H. Milne Edwards, 1853) on eastern Algerian coasts. Relative growth was studied on 104 individuals (10.2 <Lc <41 mm) sampled from Cap de Garde (West of the Gulf of Annaba). The crabs were sampled in free diving (< 2 m), between October 2015 and March 2016. The morphology was characterized using 16 metric parameters and one meristic parameter (number of spines on the anterior margin of the five pairs of periopods). The different measured parts of the body were expressed as a function of the length and width of the carapace. Measurements on the left and right chela were based on the length and width of the left and right hands. Possible variations of these dimensions were sought using the method of the least rectangles (reduced major axis). The mean numbers, modes and extreme values of each meristic parameter were also statistically compared between the two sides of the crabs.

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Biodiversity of the sponges (Porifera: Demospongiae) from the gulf of Annaba (Eastern coast of Algeria)

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Keywords: *Sponge, biodiversity, Annaba gulf course, Mediterranean*

Abstract:

Porifera, commonly called sponges, are primitive metazoans. There are about 5000 species of porphyry throughout the world and they constitute the dominant phylum of benthos encountered on hard substrate. Sponges have many of the characteristics of a good indicator of pollution. They are sessile filterers with a relatively long life expectancy and therefore form stable communities, thus making it possible to monitor a given ecosystem in the long term. The literature on biology, ecology and in particular the systematics of sponges in the Algerian coasts is scanty and fragmentary. In order to contribute to the inventory of the latter (Demospongiae, Porifera), a first Level of the Annaba gulf course in the extreme east of Algeria, we undertook a series of sampling at the Cape of Guard to the port of Annaba at a depth of between 1 and 35 meters. The study of the systematics of the collected sponge samples allowed to identify 6 species belonging to 3 different orders: *Chondrosia reniformis, Chondrilla nucula, Petrosia clavata, Ircinia fasciculta and Sarcotragus spinosulus* which appeared the most Term of spatial distribution, over the entire sampling area.

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Low impedance mollusk meat for fish electro cardiogram under natural conditions without handling

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Keywords: *electrocardiogram, impedance, bio-electrode*

Abstract:

Heart rate (HR) is useful to indicate not only the metabolic rate but also autonomic nervous activities. To date, fish electrocardiograms (ECG) have been recorded using micro data logger, even in unrestrained conditions. However, most fish dislike the necessary process of suturing metal electrodes to the fish body, which involves human handling. Metal electrodes are usually used because of their extremely low electric resistance. On the other hand, impedance of biological tissues is widely known to be depressed according to the frequency of alternating current. Measuring the impedance of moray eels in different parts of the body, such as the abdomen, skin, and oesophagus, revealed the lowest impedance in the oesophagus. In addition, cut squid meat impedance was lower than that of the moray eel oesophagus. A bio-electrode made from cut squid meat was connected to a micro data logger by a thin electric lead wire set inside a PVC cylinder and put on the shallow sea bottom. An underwater video camera monitored fish behaviour. A few days later, the cylinder was retrieved with the data logger and underwater video camera. The accumulated electric potentials in the data logger revealed a clear natural moray eel's ECG of only a few tens of seconds recorded with no human handling. Its average heart rate was approximately 30 beats per minute, which was lower than the heart rate measured attaching a metal electrode on the body surface in experimental tank.

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Resting cysts distribution and genetic characterization of the harmful dinoflagellate *Cochlodinium polykrikoides* Margalef (Gymnodiniales,Dinophyceae) in recent sediments from Lampung Bay (Sumatra, Indonesia)

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Keywords: *Harmful algal blooms, dinoflagellate cysts, Cochlodinium polykrikoides, Indonesia.*

Abstract:

The emerging of Harmful Algal Blooms (HABs) caused by *Cochlodinium polykrikoides*has repeatedly occurred in Lampung Bay (Sumatra, Indonesia),a strategic location for aquaculture and fishing activities,since 2012. Theincreasing occurrence of this dinoflagellate, which considered as toxic invasive species according to DAISIE (Delivering Alien Invasive Species Inventories for Europe),is a significant and expanding threat to health and the fisheries and shellfish industries. The toxic events caused by these species have ledto mass-mortalities of fishes and consequently significant economic lossesin Lampung Bay. However,its vegetative cellsarescarcely observed in water column monitoring. Thus, investigations were conducted to study the cysts beds distribution of this harmful species in Lampungbayand determine the sub-clade of the *C. polykrikoides* isolatedin regard to understand its expansion. Field surveysindicated that the highest densities of *C. polykrikoides*cysts were recorded in the inner part of the bay,in front ofBandar Lampung and Hurun Bay which are anthropogenizedarea where blooms occurredperiodically. Sediment fractionsof those locations are silt and clay which isprobably related to sediment inputs from anthropogenic activities, such as sediment dumping, marine and coastal aquaculture. Interestingly, molecular identification and phylogenetic analysis from cysts and vegetative cells showed that there were two sub-clades in this area. In addition, the anthropogenic activities, such as international harbour, fisheries, and aquaculture, located in Lampung Bay might play a role in *Cochlodinium polykrikoides* expansion.

Session 2: Impacts on socio-ecosystems and biological resources

Climate-induced changes in coastal copepod community of the southeast of the Bay of Biscay

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***Keywords**: coastal ecosystems, climate variability, copepods, long-term changes*

Abstract:

It is now well documented that coastal ecosystems, among the most ecologically and economically important ecosystems on the planet, are highly threatened by the combined influence of global warming and direct anthropogenic forcing. Over the last two decades, concomitant changes in local environment, regional climate, and large-scale hydro-climatic conditions have been thus observed in Western Europe. Such abiotic changes have resulted in a suite of processes that affected biological compartments, ranging from phytoplankton to top predators, and altering ecosystem functions and services. While of paramount importance, the relative contributions of large- and local-scale processes to this variability remains still poorly quantified. In littoral ecosystems, copepods, the most prominent *taxa* in zooplankton assemblage, are ubiquitous. As such, they play key roles in the functioning of marine systems and in biogeochemical cycles. Because of their non-linear responses even to very subtle environmental changes, evidences suggest that copepod species are relevant candidates for tracking modifications in coastal systems. Here, using data from zooplankton surveys from 2001 to 2014, we characterised the relationships between climate forcing at different spatial scales and interannual changes in copepods community of the North-East Atlantic coastal waters, in Arcachon Bay. By quantifying cross-scale interactions between climate variability, environmental conditions, and biological changes at a decadal scale, our results reveal that global and local hydro-climatic processes did not directly influence copepods, but impacted the physical and chemical properties of coastal waters which in turn conditioned species diversity and abundances.

Session 2: Impacts on socio-ecosystems and biological resources

Local-scale changes in copepod biodiversity unravel global diversity trends in coastal systems

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***Keywords**: coastal/littoral systems, biodiversity, copepods, diversity indices, long-term changes*

Abstract:

While global change has induced a loss in diversity at large scale, trends in diversity are more intricate at local scale. The need to better assess such complex patterns has thus led scientists and policymakers to encourage long-term monitoring of biodiversity. In consequence, data are accumulating and the challenge is now to summarise the vast amount of information. To do so, diversity indices are traditionally calculated, but their responses may vary depending on the ecosystem, the biological compartment and the spatio-temporal scale considered. Comparative studies, in which several indices are estimated, should therefore be urged to adequately capture the complexity of any marine and coastal ecosystem. Here, using data from the Service d'Observation en Milieu LITtoral (SOMLIT) from 1998 onwards, we examined year-to-year changes in copepod communities in two nearby coastal regions of Western Europe (*i.e.* the Arcachon Bay and the Gironde estuary). We then investigated diversity trends by testing the ability of 13 commonly used diversity metrics to reproduce ecosystem variability. For both sites, a synchronous change in copepod communities was detected *circa* 2005 using not only observation data but diversity indices as well. We also revealed that opposite trends in diversity might emerge between two nearby sites. Our study provides evidence that more local studies need to be initiated for a better characterisation of diversity trajectories at very fine scales at which ecologists often work, and stress the importance of considering a large panel of indicators in diversity studies to better characterise the state of littoral pelagic ecosystems.

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Distribution and biological data of *Chirocephalus salinus* (Crustacea, Anostraca) in Northeastern Algeria

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Keywords: *Chirocephalus salinus, Crustacea, ecology, pools, Algeria.*

Abstract:

Temporary pools are important habitats for food webs and are threatened by climate change and disappearance. *Chirocephalus salinus* is a small anostracan (Crustacea) which lives in various types of temporary water bodies. Geographical distribution and biological data of 20 populations from the Eastern littoral region are provided. Physico-chemical parameters (water temperature, salinity, dissolved oxygen, pH, conductivity, TDS) were measured during sampling. *C. salinus* is widespread; it colonizes various types of water bodies and lives in variable abiotic conditions, and salinity up to 4 ppm. Average sizes of males and females ranged from 8.91 mm (males) in Les Salines pool to a maximum of 19.5 mm in El Frine pool where it co-occurs with *Tanymastix stagnalis* (Anostraca).The sex ratio was generally in favor of males (0.61 and 5). Fecundity was extremely variable, between a minimum of 34.22 ± 1.92 cysts/brood (Malahmar) and a maximum of 211 ± 8.48 cysts/brood (El Frine). The mean diameter of the cysts was comprised between 287.79 ± 14.26 µm (Malahmar) and 412.5 ± 22.71 µm (Ain Magroun).

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Structure and diversity of macrobenthic communities in a paralic ecosystem (Bay Dakhla in southern Morocco)

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***Keywords**: macrobenthos, Dakhla Bay, density indices*

Abstract:

The identification of the different functional traits of macrobenthos in the benthic processes of Dakhla Bay was studied to estimate the effects of the decrease in density and loss of exploitable coastal resource species on the functioning of the benthic ecosystem. Two samplings were carried out in the spring of 2013 and winter 2014. The taxonomic treatments of the shells present in the site are identified to 49 species distributed on 52 stations. Variables that have a significant impact on macro zoobenthos such as water depth, substrate composition, macrophyte presence, and chlorophyll "a" concentrations were analyzed identifying non-homogeneous macrobenthic activity at the bay of Dakhla. Also, density indices, richness and diversity are low due to hydrodynamism, which promotes sedimentary instability in potential areas of Dakhla Bay.

Session 2: Impacts on socio-ecosystems and biological resources

Biodiversity and benthic ecosystems of the CCLME Region (south of Morocco).

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***Keywords**: CCLME/ benthos / ecosystem / faunistic*

Abstract:

Within the framework of the CCLME project "The Large Marine Ecosystem of the Canary Current", three ecosystem campaigns were carried out in 2011 and 2012 at the level of the plateau and the continental slope at the head of the zone, between Cape Juby (28 ° N) and Cap Blanc (21 ° N), where the phenomenon of upwelling is constant. 206 stations at depths from 20 m to 600 m were sampled using a dredger on the research vessel Dr. Fridtjof Nansen. During our study, we focused our attention on benthic invertebrate-based indicators that reflect all the pressures of climate change.
6,000 specimens were preserved for latest taxonomic study and a high specific richness is observed off the coast of Moroccan Sahara. Epibenthic communities of CCLME are clearly dominated by Decapods epibenthos of CCLME.

Session 2: Impacts on socio-ecosystems and biological resources

Analysis of phytoplankton assemblages by next-generation sequencing (NGS)

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Keywords: *phytoplankton diversity, metagenomic analyses, Ofunato, Yamada and Onagawa bays, Japan*

Abstract:

Recently, metagenomic analyses have been conducted using NGS technology. Bacterial metagenomic analyses are often based on the 16SrRNA gene, while the18SrRNA sequenceis frequently used to identify eukaryotes. The enormous amount of sequence data obtained by NGS is generally processed using pipelines such as Quantitative Insights Into Microbial Ecology (QIIME), with the aid of databases including SILVA and Greengenes. Analysis of non-ribosomal genes by NGS is more difficult, and therefore less common, because it requires the design of specific primers and databases. However, such an approach is necessary to examine phytoplankton assemblages.We developed a NGS method targeting chloroplast gene *psbA* to carry out metagenomic analysis of phytoplankton.

Seawater samples were collected from Ofunato and Yamada bays, while sediment core samples were collected from Onagawa Bay. Following DNA extraction, PCR assays were performed using *psbA* primers specifically designed for NGS. The resulting PCR products were analyzed using the Illumina Miseq and Roche 454 sequencing systems. Sequence data was processed using the QIIME pipeline, and analyzed against a specific database containing sequences obtained from GenBank and prepared using Tax-collector software. We detected more than 280 phytoplankton species from the seawater samples. Diatoms and green algae accounted for approximately 50% and30% of the sequences, respectively, with *Cyclotella meneghiniana* and *Micromonas pusilla* being the predominate species in the respective categories. In the sediment core samples, diatom *Skeletonema costatum* was the predominant species. Therefore, using the approach developed in this study, we successfully examined phytoplankton assemblages in seawater and sediment samples.

Session 2: Impacts on socio-ecosystems and biological resources

Understanding the migration of planktons by a direct measurement of their swimming speeds?

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Keywords: *Climate change, plankton, swimming speed, calibration of model*

Abstract:

Plankton migrations are essential for nutrient acquisitions and as survival strategy against predators. Mathematical models are mainly used constant to reflect plankton migration. However, swimming speed depends on numerous factors including the physiology of each cell. By using classical approaches, following specific plankton in a sample is difficult during long time due to the high speed of some motile cells. Moreover some technical limitations such as the displacement of the cell along the z-axis as well as the rotation of the organism can biases the measurement of the swimming speed. Within this context we developed a method based on a new image processing system in order to measure the speed and direction of cells in real-time (Fig. 1). This tracking system is capable to recognize the morphology of the particles in each image captured with a high speed camera. To maintain a plankton in a focus plane, measurements were performed using a rectangular microfluidic channel with a depth fitted to the plankton's size. 2 μm beads were also used to measure the flow velocity in the channel. Results obtained highlight a high variability of swimming speed among the species and the lack of link between size and swimming speed. Results also reveal that planktons quickly modify the swimming direction when the flow direction changes. They preferentially swim at counter current. This behaviour is emphasized by local increase or decrease of flow speeds suggesting an escape behaviour of the phytoplankton. This new microfluidic method can provide a precise measurement of the velocity of a plankton cell depending on the environmental conditions.

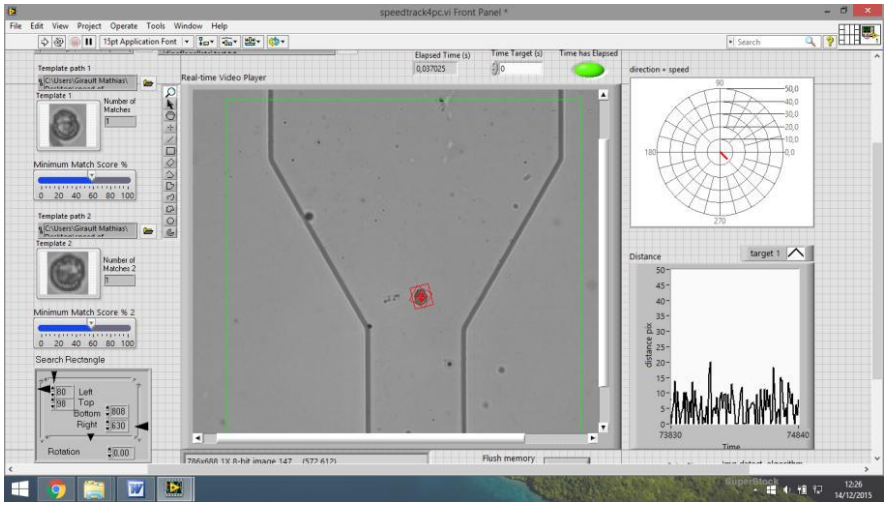

Fig. 1: Graphical user interface of the image processing algorithm. Swimming speed and direction were measured in real-time, the red square show the plankton recognized by the image processing algorithm. Circle and bar graph show the direction and the speed of plankton, respectively.

First record of the alien zooplanktonic copepods *Pseudodiaptomus australiens* and *Pseusodiaptomus arabicus* in the Mediterranean Sea (Annaba Bay, Algeria)

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Keywords: *Zooplankton; alien species; copepods; pseudodiaptomus; Annaba Bay, Mediterranean Sea*

Abstract:

Zooplankton samples were collected in Annaba Bay from January 2009-March 2011 at three coastal sites differently affected by estuarine plumes and external currents. Aim of this survey was to analyze zooplankton composition, abundance and biomass and compare the results with previous studies to reveal possible populations and environmental changes. Copepods constituted the main fraction of zooplankton community, and *Oithona similis* and *Paracalanus indicus* successively dominated during autumn-winter and spring-summer. The singularity of the zooplankton from Annaba Bay is the prevalence of *Paracalanus indicus* throughout the entire bay and and the decrease od *Oi-thona nana* abundance with the large development of *Oithona similis*. Among the identified copepod species, the alien species *Pseudodiaptomus australiensis* and *Pseudodiaptomus arabicus* are reported for the first time in the Mediterranean Sea. The occurrence of young stages of *Pseudodiaptomus australiensis* suggests that this species survives and reproduces in Annaba Bay, but so far without developing an abundant population.

Session 2: Impacts on socio-ecosystems and biological resources

Study of ichtyofaune of lacustry ecosystems in Algeria

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Keywords: *fish diversity, Lake Ecosystem, fish potential, Algeria*

Abstract:

The aim of this work is to study and inventory the fishes of the Algerian inland waters, and thus to provide a list of the autochthonous and introduced species, comparing our results obtained on the ground by qualitative fishing, with the data collected by Bibliographic research and previous work in order to update it. The ichthyofauna of Algeria comprises 67 species divided into 23 families, including 33 native species, 31 Introduced, and 3 endemic species, with carp dominance, followed by barbels. Several species have been extirpated or threatened with extirpation due to a number of factors, such as pollution, eutrophication, overfishing, drought, and the degradation of water bodies.

In a second stage, the fish potential of the lake ecosystems of Algeria was evaluated, 80% of which have good fish potential, 15% are bad, while 5% are dry. Several companions of restocking of the waters by fishes were carried out in Algeria, the concerned species are Carps, Tilapia, Pike perch and Black bass.

Session 2: Impacts on socio-ecosystems and biological resources

Effect of polycyclic aromatic hydrocarbon on stress-related biomarker expression in coho salmon

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Keywords: *Polycyclic aromatic hydrocarbon, anthracene, redox state, Heat shock protein, Liver function, Oxidative stress, Fish, Coho salmon*

Abstract:

It is known that urban effluents, petroleum residues from industrial and oil spills represent the major sources of polycyclic aromatic hydrocarbons (PAHs) in estuaries and marine coastal areas. PAHs are composed of multiple benzene rings. Though light PAHs could also be toxic to fish, little is known about their effect on health of fish. This study examined stress-related biomarker expression in response to a dietary PAH, anthracene (ANT), in coho salmon (*Oncorhynchus kisutch*). Fish received ANT orally (8 mg/BW 100 g/day) for two weeks.The percentage of liver to body weight (hepatosomatic index) and aspartate amino transferase and alanine amino transferase activities in plasma showed no significant differences between the control group and ANT-treated group. Plasma protein levels in ANT-fed fish were also higher than those in control fish. Accordingly, the effect of dietary ANT on liver function might be small. Expression levels of heat shock protein 70 in liver and muscle of the group fed a diet containing ANT were observed to be significantly higher than those of the control group. The glutathione levels in the gill and plasma of ANT-fed fish were higher than those in control fish. Hence, ANT-induced stress could increase the metabolic mobilization of glutathione due to consumption from scavenging oxidants generated by stress. These results suggest that ANT might induce oxidative stress, which results in damage to tissues and ruin of health of fish.

Session 2: Impacts on socio-ecosystems and biological resources

Session 3: Vulnerability of coastal ecosystems and risk assessment

Keynote Session 3: Development in satellite mapping of intertidal zone and coastal seas

Rodney Forster

Auditorium AGORA
Wednesday the 8th of November from 4:15 pm to 4:45 pm

Session 3: Vulnerability of coastal ecosystems and risk assessment

Session 3: Vulnerability of coastal ecosystems and risk assessment

Oral communications Session 3

Auditorium AGORA
From Wednesday the 8th of November at 4:30 pm to Thursday the 9th of November at 11:15 am

Session 3: Vulnerability of coastal ecosystems and risk assessment

Session 3: Vulnerability of coastal ecosystems and risk assessment

The lower estuary of the Senegal River: from hydro-climatic risks management to impoverishment of local communities

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Keywords: *Senegal River estuary, hydro-climatic risks, local communities, environment, vulnerability*

Abstract:

The Senegal River estuary is a highly vulnerable ecosystem where live disadvantaged and poor economic communities. To overcome impacts of the Sahelian drought of 1970 and the reduction of freshwater inflows, large dams have been established on the Senegal River. However, in the lower estuary and the natural region of Gandiolais, the management of these dams causes serious environmental problems such as freshwater scarcity and recurrent flooding of the city of St. Louis. The opening of a breach on the "Langue de Barbarie" in October 2003 was justified by the impending floods in St. Louis. This breach became the new mouth of the Senegal River. With an initial aperture of 04 m, the gap reaches nowadays a width of +7 km. More than the rapid expansion, it is the environmental and socio-economic impacts that are of concern today, putting this eco-socio-system at a critical stage of its evolution. The accumulation of vulnerability factors such as hypersalinization water and agricultural lands, rapid morphological changes of the "Langue de Barbarie" spit sand caused by severe erosion at the coast, constitutes today a major challenge for local communities. Despite adaptation efforts of communities through the development of activities such as salt extraction or transfer of market gardening activities to less-favoured areas, the situation is highly alarming, given the impoverishment of local communities. The evolution scenarios defined are very alarmist. What would be the future of these communities dealing with international interests from OMVS projects and national politics like PSE?

Session 3: Vulnerability of coastal ecosystems and risk assessment

On the local El Niño observed in Peru after the monster El Niño in 2017

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***Keywords**: El Niño, La Niña, ENSO, Peru*

Abstract:

The El Niño occurred in 2014 and grew big in 2015. This event brought many heavy disasters to not only Peru but the world from 2014 to 2016. So, it was called the monster El Niño. After this El Niño was finished, many scientists thought La Niña came soon. But, the average water temperature kept normal in the offshore Niño3 region. Moreover, the warm sea water came again along Peruvian coast in 2017 as if the El Niño occurred. This warm sea water brought the same or stronger rain and the terrible disaster to Peruvian coast compared to the time when the global El Niño occurred. So, we call this event "the local El Niño" as the global El Niño indicates the ENSO.

The water temperatures at 8 to 9 sites along the Peruvian coast have been monitored since 2005. The risings of about 10 degree C in water temperature at northern sites were observed from January in 2017 although this event was not appeared in the offshore area (e.g. Niño3region). In response to this event, the strong rain fell in Trujillo in the early February as if the ENSO occurred. This event was the local El Niño different from the ENSO.

In this presentation, the movement of the warm sea water, i.e. the local El Niño, observed in 2017 along Peruvian coast will be shown using the data of our monitoring sites.

Session 3: Vulnerability of coastal ecosystems and risk assessment

Systemic Coastal Vulnerability of the Western Algerian Coast

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Keywords: *Coastal hazard, Coastal vulnerability index (CVI), Geographic information System (GIS), Integrated management of coastal zone (IMCZ), Shoreline change.*

Abstract:

Most of the world's coasts are exposed to a wide variety of hazards; in many Mediterranean coasts the situation has become really alarming where erosion is unprecedented, threatening socioeconomics properties and natural potentials.
Researches on the Algerian littoral remain few and seem fragmented between the various disciplinary fields. However, the preparation of appropriate coastal zone management plans and the implementation of regulations require a multidisciplinary studies which combine the physical and socio-economic factors of coastal vulnerability,
This study attempted to develop a Systemic Coastal Vulnerability Index (SCVI) in order to understand the vulnerability of coastal zones under the combined action of natural and social dynamics, this index is based on multidisciplinary approaches taking into account the different spatiotemporal scales, with the aim of providing support for management, simplifying and presenting the information in a more easily understandable form, and defining coherent and sustainable strategies for an integrated management of the coastal zone,
The western Algerian littoral was chosen as a case of study in order to assess coastal vulnerability by calculating a SCVI
The resulting calculations and vulnerability map depict the fluctuation of systemic vulnerability intensities; about 13% of the western coast of Algeria is identified to have high systemic vulnerability. The study emphasizes that the inclusion of socio-economic parameters influences the overall assessment of vulnerability. According to that, using the SCVI seems to better represent the complexity of the coastal system and provides information aiming to increase awareness amongst decision-makers to deal with disasters mitigation and coastal zone management.

Session 3: Vulnerability of coastal ecosystems and risk assessment

Development of innovative tools to support the ecosystem-based spatial planning to aquaculture: the northern Spain example

Ibon Galparsoro, Arantza Murillas, Joxe Mikel Garmendia, Leire Arantzamendi, Luis Lagos, Kemal Pınarbaşı, Javier Franco and Ángel Borja

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***Keywords**: Maritime Spatial Planning, Ecosystem Approach to Aquaculture, Ecosystem-based management*

Abstract:

Open sea aquaculture offers a new perspective for the marine blue economy and food security. It is considered as being a mean of maintaining the marine food provision ecosystem service and promoting the diversification of the coastal areas economic activities. Nevertheless, the open sea aquaculture has not been historically developed due to a set of different factors, including environmental and technological limitations. Northern Spain is a good example of this situation.

A set of different tools were implemented in the ongoing process of the identification and assessment of development opportunities of open sea aquaculture in the Cantabrian sea. First step in this process was the performance of a multicriteria analysis for suitable site identification by using a GIS platform. Then, the conflict between aquaculture activity and fisheries was assessed and finally, the specifically developed AquaSpace tool was implemented to assess the cost and benefit of different aquaculture options. Here, costs relate to a risk based evaluation of combined environmental effects of the planned activity and the additional pressure contributions of a new aquaculture activity to the overall human pressures in a management area; while benefits relate to socio-economic assessments of the added value of an activity, food security or expected revenues.

Main aspects that open sea aquaculture is facing are related to constraints imposed by environmental conditions (waves exposure and production capacity) and the conflicts with other users. The tools implemented have demonstrated their utility when tackling such issues but also has shown weaknesses and new functionalities needs.

Session 3: Vulnerability of coastal ecosystems and risk assessment

Coupling Earth Observation and oyster physiological modelling to quantify the influence of environmental changes on shellfish farming ecosystems

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Keywords: *Remote sensing, Ocean color, Aquaculture, Crassostrea gigas, Mudflats*

Abstract:

While the influence of sea surface temperature (SST), chlorophyll (*chl*) concentration and suspended particulate matter (SPM) concentration on the physiological responses of suspension-feeders has mostly been assessed through laboratory experiments, it has rarely been studied at the scale of shellfish-farming ecosystems. As Earth Observation (EO) satellites have the ability to observe the world ocean at global scale as well as to zoom in specific coastal areas, the combination of high resolution satellite observations with bivalves ecophysiological model now makes it possible to spatially explore the response of cultivated suspension feeders to environmental conditions in every region of the planet, at a spatial scale compatible with the size of shellfish-farming sites.
Using a variety of satellites/sensors (SeaWiFS, MODIS, MERIS, and Sentinel2), we demonstrate how the coupling of oyster physiological modelling and ocean colour remote sensing can be used to quantify the influence of SST, *chl*, and SPM on oyster-farming ecosystems at time scales varying from the semidiurnal tidal cycle to decades, and spatially at the scale of an oyster farm to the whole European coastal ocean. Examples will be provided where the coupling of EO and oyster physiological modelling has been used to address critical environmental challenges (European invasion of the Pacific oyster in a climate-changing world) as well as more applied issues in coastal zone management (spatial planning for offshore shellfish farming).

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Risk Based Consenting of Offshore Renewable Energy Projects (RICORE)

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Keywords: *offshore renewables, consenting, environmental impact, risk based approach, monitoring*

Abstract:

Consenting and Environmental Impact Assessment (EIA) procedures are two of the major non-technical barriers to the further expansion of offshore renewable energy (ORE).

RiCORE (Risk-based Consenting of Offshore Renewable Energy) is a HORIZON 2020 funded project which aims to promote the successful development of ORE in the European Union by developing an environmental risk-based approach to the consenting of ORE projects, where the level of survey requirement is based on the environmental sensitivity of the site, the risk profile of the technology and the scale of the proposed project.

The project aims to provide guidance on how to potentially improve consenting processes to ensure cost-efficient delivery of the necessary surveys, clear and transparent reasoning for work undertaken, improving knowledge sharing and reducing the non-technical barriers to the development of the ORE sector.

The output from RiCORE includes deliverables over six Work Packages including four expert workshops conducted with relevant stakeholders (regulators, industry and EIA practitioners). The first workshop considered the practices, methodologies and implementation of pre-consent surveys, post-consent and post-deployment monitoring. The second workshop examined the legal framework in place in the partner Member States (MS) to ensure that the framework developed will be applicable for roll out across these MS and further afield. Two further workshops have involved target stakeholders to develop and refine recommendations and discuss their effective implementation.

This presentation will highlight the main findings and draft recommendations from the RiCORE project to date. For further information and associated deliverable reports visit http://ricore-project.eu

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Alkaline phosphatase activity under climate change: a single cell measurement approach using micro fluidic technology

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Keywords: Climate change, nutrient limitation, alkaline phosphatase, phytoplankton

Abstract:

Climate change leads to the increase of Ocean stratification at the World wide scale. This stratification impacts the nutrient uptake by primary producers. In order to survive to nutrient depletion, phytoplankton can activate a set of enzymes, such as alkaline phosphatase. Although accurate measurements of alkaline phosphatase can be performed on bulk or on sample populations of phytoplankton, no existing method provides in real-time and at single cell level the measurement of the physiological adaptation of the plankton. Within this context, we take advantage offered by the micro fluidic to compartmentalize a culture sample into small droplet (1nL) containing single phytoplanktons. These stable droplets are trapped in a micro fluidic chip in order to perform alkaline phosphatase assay. Kinetics of alkaline phosphatase activity of plankton of interest are measured at single cell level using an enzyme labelled fluorescence method (ELF97). To test the new micro fluidic method, the kinetic of alkaline phosphatase was measured using a culture of *Tetraselmis* sp. (Stein 1878). The results obtained indicate that labelling kinetics can be measured at a single planktonic cell level. A high variability in alkaline phosphatase kinetics was observed for *Tetraselmis* sp. cultivated under the same environmental condition (Fig. 1). These results highlight the key role of cell physiology to efficiently access phosphorus compounds. This new micro fluidic method can provide a precise measurement of the variation of phosphorus stress for each cell depending on the environmental conditions.

Variability of alkaline phosphatase kinetic in a sample (subtrat 1.5%v/v) Time (min) 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 Fluorescence (RFU) 0 5000 10000 15000 20000 25000 30000 35000 40000 45000 50000 55000 60000 Cell 1 Cell 2 Cell 3 Cell 4 Cell 5 Cell 6 Cell 7 Cell 8

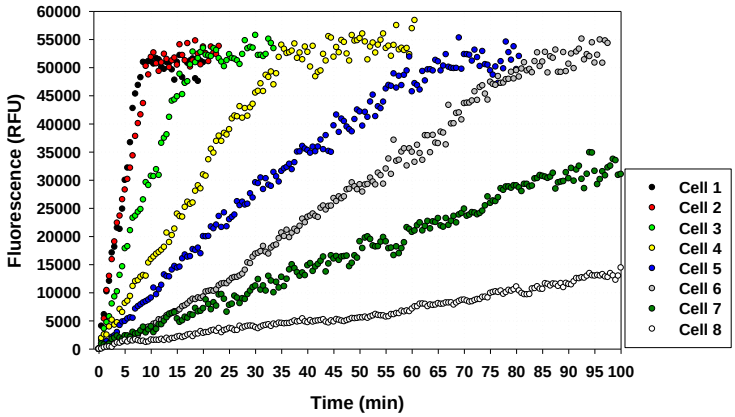

Figure 1: Example of kinetics of alkaline phosphatase measured at a single cell level. Concentration of ELF substrate is 1.5% v/v.

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Temporal fluctuations of plankton communities and *Sardina pilchardus* (Walbaum, 1792) landings in a North Atlantic Marine Protected Area.

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***Keywords**: plankton communities, temporal fluctuations, sardine landings, North Atlantic Marine Protected Area*

Abstract:

Planktonic ecosystems and associated services are facing rising challenges because of climate change and anthropogenic pressures. In this context, concern for monitoring and managing the marine environment and diversity has strengthened. Monitoring marine ecosystems through time series is thus mandatory to describe ecosystem status and infer food web dynamics, from primary producers to the top predators. The Iroise Sea MPA initiated such a time series in 2010 with seasonal sampling of physical variables, nutrients concentrations, phytoplankton diversity (determined under microscope after in situ collection) and zooplankton community composition and size (using the Zooscan) along two coast-open sea transects. Time series of *Sardina pilchardus* landings from SIH data (Ifremer) were used as a proxy of in situ abundance. Time series of sea surface temperature and chlorophyll-a concentration were obtained from satellite data.
For the first time in the Iroise MPA, the seasonal and interannual variability of plankton community and sardine landings are analysed together. Spring is characterized by higher phytoplankton biomass, mostly due to large colonial diatoms. As the season proceeds, the contribution of diatoms weakens and nanoflagellates dominate community composition. The zooplankton is largely dominated by small Copepoda in terms of abundance and biovolume. Seasonal cycle of zooplankton community composition is observed. Interestingly, copepod average size also shows a seasonal cycle with a larger contribution of small copepods in autumn. Consistent with other fisheries regions, sardine landings increase with the contribution of smaller Copepoda. The interannual variability in temperature, phytoplankton, zooplankton and sardine landings is also discussed.

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Organic matter modelling in the estuarine sediments (Aulne and Elorn, France)

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Keywords: *Organic matter, estuarine sediments, mathematical modelling, water-sediment interface, Phosphorus*

Abstract:

The Aulne and Elorn estuaries are influenced by deposition of organic matter and nutrients due to anthropogenic pressure and intense agricultural activity. Thus, a part of this organic matter is buried across the water-sediment interface, where the most important processes that control the CO2 take place.
The objectives of this work are to improve the knowledge of organic matter mineralization at this area and develop a mathematical model representing its transformation.
The model describes the organic matter degradation in estuarine sediments by transport processes, such bioturbation and advection for the solid substances and as molecular diffusion and bioirrigation for the dissolved ones. Whereas reactive processes are the oxic mineralization, denitrification, anoxic mineralization and also the reoxidation of reduced substances.
On the other hand, a particular interest was given to the phosphorus dynamics in estuarine sediments because it could be buried within organic matter, detrital and authigenic phosphate minerals. Adding those minerals phases (Fe bound to P and Ca bound to P) to the model as state variables allows to describe the fate of the phosphorus in those sediments.
The results showed that simulated profiles of PO42-, FeP and CaP were well adjusted to phosphorus data in the inner of Elorn and Aulne estuaries, whereas organic phosphorus was not. Obtaining this estimate was done by varying the rate of FeP adsorption/desorption and the rate of CaP production/dissolution. Therefore, the ratio Phosphorus:Carbon could modify the organic phosphorus profile, and impacts on the PO42- evolution.

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Developing proper indicators of tourism sustainability to protect Mediterranean coastal ecosystems.

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Keywords: *tourism sustainability; human pressure indicators; Mediterranean coastal ecosystems.*

Abstract:

Sea-side recreation is a major driver for the local and regional economy of many Mediterranean touristic areas. On the other hand, coastal touristic activities impinge substantially on the ecological integrity of coastal and marine ecosystems, often depleting their functionality and capability of delivering many other fundamental ecosystem services. Adequate strategies shall be then put in place to estimate and monitor the impact of coastal tourism on the natural environment and to evaluate which enabling factors (e.g. measures of threat mitigation) can counteract it. To date, the European Tourism Indicator System (ETIS) includes 43 core indicators addressing the key issues for tourism sustainability. Still, this system needs to be implemented with supplementary indicators to better characterize the threats and enabling factors related to each type of tourism. Moreover, indicators should be tested by means of appropriate data, possibly transferable at various scales, in order to prove their applicability.
In the framework of the European INTERREG MED project Co-Evolve (Promoting the co-evolution of human activities and natural systems for the development of sustainable coastal and maritime tourism), a sustainability indicators toolkit was created to help addressing the major threats and enabling factors connected to Mediterranean coastal tourism. Here, we propose a specific set of indicators measuring touristic pressure on the coastal ecosystems and discuss their applicability scale and time wise. Moreover, we present some Mediterranean case studies where appropriate indicators for coastal tourism sustainability were selected, populated and mapped.

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Posters Session 3

Poster flash presentations the 9th of November from 10:00 am to 10:15 am and from 3:45 pm to 4:15 pm in the AGORA

Special poster session in the cloister the 9th of November from 4:30 pm to 5:30 pm and during the coffee-breaks the 9th of November from 10:15 am to 10:45 am and from 4:15 pm to 4:30 pm.

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X-TRACK regional altimeter products for coastal applications

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Keywords: *Altimetry; Sea surface height; Coastal observations.*

Abstract:

Climate change is likely to worsen many problems that coastal environments already face: shoreline erosion, coastal flooding, stress and damage of the coastal biodiversity. Sea level variation is one of the major threat for coastal zones. Improving its observation is essential to better understand and predict the behavior of the coastal ocean. Altimetry provides unique long term observational dataset to characterize how sea level variability evolves from the open ocean to the coastal ocean.

In order to optimize the completeness and the accuracy of the sea surface height information derived from satellite altimetry in coastal ocean areas, X-TRACK has been developed by CTOH (Center of Topography of the Ocean and Hydrosphere, INSU and IRD National Service for satellite altimetry) and LEGOS (Laboratoire d'Etudes en Géophysique et Hydrologie Spatiale). It is tailored for extending the use of altimetry data to coastal ocean applications and provides freely available along-track Sea Level Anomaly time series as well as along-track empirical tidal constants that cover today all the coastal oceans. We present here the new developments made in version 2016 ofX-TRACK, the resulting improvement in terms of near-coastal sea level data availability and accuracy and some coastal applications.

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Monitoring of Rhone River inputs under the influence of extreme events at the MesuRho multi-parameter moored observatory

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***Keywords**: Rhone River Input, High frequency in-situ measurement*

Abstract:

The Rhone River is the largest source of fresh water discharge to the Mediterranean Sea. As it is also an important source of particles, it constitutes a key forcing for the ecosystems of the Gulf of Lions in the north-western Mediterranean. In order to assess the input and fate of suspended material at the Rhone River mouth and the influence of extreme events, a multidisciplinary oceanographic moored observatory has been installed in 2009 for high frequency measurements. The platform is part of the COAST-HF network (IR-ILICO) and data are collected and sent in near real time to the Coriolis data centre. Our work is supported by the MERMEX-MERITE, ANR-MATUGLI, EC2CO-CHIFRE and OSR projects.

The long time series recorded at the MesuRho platform show the impact of extreme events on the local hydrodynamics and thus on the input fluxes. Whereas the plume thickness rarely exceeds 0.5-1m depth at the Rhone River mouth, strong floods can induce a salinity decrease down to more than 3m depth at the MesuRho station, associated with a possible increase in turbidity. At the bottom, turbidity increase was recorded under south-east swells associated with sediment resuspension events.

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Might planktonic food webs be used to define ecosystem Health indicators for marine and coastal systems?

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Keywords: *planktonic food webs, ecosystem health indicators, marine and coastal systems*

Abstract:

Marine and coastal ecosystems offer several services such as food production or climate regulation while human activities have caused several alterations on their structure, their functioning and their resilience. The Ecosystem Health is defined as its ability to maintain its activity, its structure and its function over time in the face of external tresses. Previous works have nevertheless highlighted the lack of operational tools to follow and define the "good ecological status" of coastal and marine ecosystems (directive 2008/56/CE DCSMM).
Some services provided by such ecosystems are entirely or partly based on the characteristics of the Planktonic Trophic Networks. Previous works actually assume that a typology of planktonic food web exists and might be theoretically caused by several environmental conditions and characterized by certain properties in term of activities (production, export, trophic efficiency), organization and stability, that is to say the main components of ecosystem „health".
This works proposes to characterize a typology of planktonic food webs based on more than one hundred stations corresponding to highly contrasted marine and coastal systems distributed along an oligo- to hyper eutrophic gradient with LIM- MCMC models. The use of Ecological Network Analysis indices to assess the organization and the stability characteristics of each model details how this typology may be useful to describe ecosystem health through the link highlighted between each type of planktonic food pathway, the organization/ resilience of the system and several environmental pressures.

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Long-term monitoring of coastal ecosystems: the SOMLIT Network

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Keywords: *observing system, coastal ecosystem, multi-decadal evolution, climate forcing, anthropogenic forcings.*

Abstract:

The water column of coastal systems shares interfaces with adjacent compartments (land-ocean, water-atmosphere and water-sediment) and consequently is on the influence of highly dynamic physical (*e.g.* hydrodynamics and sedimentary hydrodynamics, mixing), (biogeo)chemical (*e.g.* nutrient uptake and remineralisation) and biological (*e.g.* primary or secondary production) processes, which highly impact their physical, (biogeo)chemical and biological characteristics. These processes exhibit high seasonal and latitudinal variability in

these systems and are subject to long-term changes of climate and anthropogenic origins. Both short-term and long-term variability are reflected by the above-mentioned characteristics.
In order to understand the seasonal variability, the long-term changes and their environmental drivers within the coastal systems, long-term time series of sub-monthly resolution are needed. The French Coastal Monitoring Network SOMLIT (Service d'Observation en Milieu LITtoral; INSU/CNRS; http://somlit.epoc.u-bordeaux1.fr/fr/) performs such a time series within nine ecosystems since the late 90's and more recently within three additional ones. These ecosystems are distributed over the whole littoral of the continental France. Surface water is sampled every two weeks for 16 parameters (temperature, salinity and pH, concentration of dissolved oxygen, nutrients, SPM, chlorophyll *a* and particulate organic carbon and nitrogen (POC and PN, respectively), and more recently stable isotopes of POC and PN and pico- and nano-plankton). The objectives, the scientific strategy and the overall functioning of the Somlit Network will be presented. Then, snapshot overviews of some main findings as the pronounced sensitivity of the coastal systems to climate variability, and the dynamics, composition and environmental drivers of the particulate organic matter will be reported.

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Vulnerability of coastal “ecosociosystems “in Senegal (West Africa)

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Keywords: *Senegal, West Africa, vulnerability, coastal ecosociosystems*

Abstract:

The Senegalese coast is experiencing a degradation of coastal resources and a growing loss of its coastal areas such as beaches, mudflats, mangroves, etc. These dynamics result from the combined effects of natural and anthropogenic factors. The problems are complex and numerous: coastal erosion, marine submersion, salinization of coastal agricultural land, surface and coastal aquifers, strong anthropization of coastal watersheds, and sand beach extraction to fuel the expanding real estate construction along the Senegalese coast. Thriving at the edge of tides, Mangrove forests are among the most diverse and productive ecosystems, providing shelter and food for many species.

This environmental fragility is as much dangerous because it contributes to amplify the risks induced by a changing climate which first effects are already observable. It thus considerably affects the human populations concentrated over the last decades on the most threatened region by the environmental and climatic risks.

In the West African region, and particularly in Senegal, it is observed a high level of urbanization along the coastline. The major regions of the country (Dakar, Thiès, Fatick, Saint-Louis, Ziguinchor) lies along the coast. More than 75% of the Senegalese population lives within 60 km of the shoreline and 70% of the fruits and vegetables we consume come from coastal agriculture.

The intensified and diversified activities turned the maritime borders into main economic and social development centres. In Senegal, the major socio-economic activities (ports, fisheries, aquaculture, tourism, industry, agriculture ...) are concentrated in the coasts. These coastal economic activities remain the main source of income of coastal communities and play a fundamental role in the socio-economy.

In a context of climate change (population growth and increasing vital needs, global warming and rising sea levels), extremes such as storms, surges, marine submersions are increasing and are the major constraints to a sustainable socio- economic development. Therefore, the notion of territorial management has been rehabilitated as the best approach to sustainable development in order to help and facilitate sustainable management of coastal zones and understand the complex socio-ecological systems.

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Investigating the efficiency of satellite altimetry to reproduce water levels variability in various coastal features

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Keywords: *Coastal altimetry, SWOT, estuarine processes*

Abstract:

Coastal systems are highly dynamic environments affected by large variations in water levels. The complex variability of coastal hydrodynamic is due to the interaction between different physical processes like tides, waves, storm surges, sea level rise, and stream flows. Despite the limitations of satellite altimetry near the coasts due to land contamination in the footprint, recent improvements in processing techniques extended the capabilities of altimeters in coastal areas. Furthermore, a new high resolution wide-swath altimetry mission (Surface Water and Ocean Topography - SWOT) envisaged for 2021 will enable better coastal observations. This study investigates the efficiency of different satellite altimetry missions (e.g., ENVISAT, SARAL, Jason-2, etc.) to reproduce the coastal hydrodynamic variability (water levels) in different tidal contexts (i.e., micro-, meso, and macro-tidal; Gironde, Seine, Mississippi, Saint Lawrence, and Guayas)). A focus is made on the impact of satellite orbit (i.e., revisit time) on reproducing this temporal variability. Water levels variations obtained by conventional altimeters are then compared to SWOT simulated data (based on the mission orbit specifications and in-situ observations) in order to estimate the potential of SWOT to reproduce water levels variability in coastal areas. Results show a better restitution of the temporal variability in micro-tidal environments with higher consistency in upstream regions of estuaries where tidal effects are weaker.

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Monitoring sea level and topography of bays using satellite radar altimetry: the example of the Arcachon's Bay in the Bay of Biscay

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Keywords: *Coastal altimetry, sea surface height, topography, SARAL, ENVISAT, CryoSat-2, Arcachon*

Abstract:

Satellite radar altimetry was developed to measure ocean surface topography along the nadir track of the satellite. Near the coasts, data acquisition and processing suffers from several flaws. Major efforts are currently undertaken to extend the capabilities of satellite altimetry as close as possible to the coast. We present an investigation on the potential of radar altimetry to monitor sea level and along-track topography (at low-tide) of coastal bays. The case study site is the Bay of Arcachon located on the southwest coast of France which was flown over by the RA-2 radar altimetry mission onboard ENVISAT over the 2003-2012 period, and has been under the Altika radar altimetry mission onboard SARAL track since February 2013. The results obtained using ENVISAT and SARAL are validated against ancillary data (i.e. tide gauges records, LIDAR Topography) to estimate the accuracy of the measurements and to show its evolution between the Ku (frequency of 13.5 GHz used by ENVISAT RA-2) and the Ka (frequency of 35.5 GHz used by SARAL Altika) bands. The use of the Ka band (SARAL) shows a remarkable improvement in the measurements accuracy of Sea Surface Height (SSH) rendering the satellite altimetry able to retrieve SSH within a few cm near the coasts. Besides, along-track profiles show consistent variations with the bay topography (at low tide) for SARAL and, to a lesser extent, for ENVISAT. An evaluation was undertaken as well for observations made by the Ku-band satellite mission CryoSat-2 (launched in April 2010) dedicated mainly to polar observations.

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Observation of the coastal environment using coastal AUVs: results from the upAUV project

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Keywords: *AUV, coastal Mediterranean processes*

Abstract:

Autonomous Underwater Vehicles (AUVs), with their high resolution sampling rate, allow the study of (sub) meso-scale oceanographic processes. The aim of the FixO3-upAUV project was twofold: 1) to set the optimal configuration of a coastal AUV for current measurement; 2) to assess our ability to study coastal processes using data from the AUV, a fixed platform and models.
An Iver2 AUV, equipped with two 1MHz DVL-ADCP sensors and a multi parameter probe, was deployed during 8 surveys in spring 2016 in the Expandable Seafloor Observatory (OBSEA) area, off the coast of Vilanova i la Geltrú, Spain (20m depth). Vehicle navigation and ADCP cell variables were tuned during the first three surveys to propose an optimal AUV configuration for water current measurement. The five other surveys were devoted to sample coastal physical processes.
Short term upwellings were previously found in the area, uncorrelated with wind forcing. OBSEA observatory and current data were processed concomitantly with the AUV data and MENOR ocean model forecasts to get the spatial pattern of the circulation during the cruises. Focusing on cooling events at OBSEA, we show that they are associated with complex circulation patterns.

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EarthLab Aquitaine: Coastal and Nearshore Satellite Remote Sensing Services

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Keywords: *Coastal monitoring, satellite derived products, optical sensors, Copernicus, Sentinel*

Abstract:

An unparalleled, high quality and free satellite data stream is now available for analysis of the territory dynamics and more particularly for the coastal fringe, located at the forefront of climate change issues. Frequent, recurrent and up-to-date data with high spatial resolution makes it possible to answer many planning issues and to address decision-maker needs, especially focusing on coastal zone management. Facing the climate change and adaptation strategies that must be developed and implemented by land-use and public decision-makers, this environmental data disrupts current practices and methodologies, which, are often limited by cost benefit analysis. A costs reduction is therefore crucial in a constrained institutional agencies budget context and the satellite derived solutions proposed more frequent and updated diagnostics are a promising alternative for a coastal dynamics better understanding and better management practices.

These satellite derived information's address specific temporal dynamics of biodiversity and medium to long-term coastal processes that play a key role in protecting the coast from oceanic forcing. The acquisition frequency allows, at reasonable cost, providing updated assessment feeding decision-making tools, trending so to reach the end user's needs, both at local and regional scales.

Through its EarthLab initiative, with an efficient regional partnership approach, Telespazio has developed highly useful and operational services using drone and satellite data. By offering high value-added information at local or national scale, those services can solve a wide range of issues concerning coastline management, agriculture, forestry and land use among others.

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COAST-HF - A fixed-platform network along French coasts

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Keywords: *coastal in situ observation, high-frequency, long-term observation, coastal ecosystem*

Abstract:

COAST-HF (Coastal OceAn observing SysTem – High Frequency) is an observation network of the physical and biogeochemical high frequency dynamics of the coastal ocean. COASTHF aims understanding and analysing the evolution of the coastal ecosystem at different temporal scales from extreme or intermittent high frequency (hour, day) events to multi-year trends.

Since several years (from 2000 for the longest time series in Bay of Brest), the network extends along the Atlantic and Mediterranean French coasts through 13 fixed platforms instrumented for the *in situ* high-frequency (≤ 1h) observations. Several French research institutes (IFREMER, CNRS, Marine Universities) are operating these systems. This organization in a unique network for these coastal observing systems aims operating an optimal system to pool efforts and initiatives (e.g. human resources for data management), to converge on best practices, and to support common measurement standards. On this basis, scientific key questions can be addressed as the eutrophication processes and effects on dissolved oxygen or the influence of main river plumes on sediment dynamics.

This coastal observing network is part of a national Research Infrastructure (ILICO) dedicated to the nearshore and the coast. COAST-HF is also contributing to the Marine Strategy Framework Directive.

Time series obtained from these multi-parameter moorings will be presented highlighting specific events that have been observed based on this network.

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MOOSE-Network: a coastal/offshore observatory in the north-western Mediterranean Sea

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Keywords: *Moose Networks, coastal and offshore observatory, Mediterranean sea*

Abstract:

Slow and irreversible changes are occurring in Mediterranean waters – including the warming of deep waters, an increase in anthropogenic carbon dioxide and acidification. Such factors are inducing changes in both deep waters and marine habitats as a whole. More specifically, the northwestern Mediterranean area is mosaic of hugely diverse geographical, physical and ecological domains of highly important biological activity. With all these issues in mind, the NW Mediterranean can be seen as a localized means by which to observe the marine environment's response to both climate change and anthropogenic factors. In this context, an interactive and integrated observatory network of the NW Mediterranean Sea (MOOSE) has been set up to detect and identify long-term environmental anomalies.

MOOSE, built as a multi-scale observation network, is based on a multisite system of continental-shelf and deep-sea fixed stations as well as Lagrangian and mobile platforms to observe the spatio-temporal variability of interaction processes between the coastal-open ocean and the ocean-atmosphere components. It includes high frequency monitoring in order to precisely document the broad spectrum of temporal and spatial scales involved and to link it to the main circulation features. The system will be able to detect and monitor seasonal or inter-annual variability, as well as the impact of extreme events that control fluxes and budgets in the marine environment.

This collaborative approach has led to MOOSE's greatest success to date: the creation of a real multidisciplinary network of many associated French laboratories along the northwestern Mediterranean coast and the technical oceanographic Centre of INSU-CNRS, all of which are working towards the same long-term objective.

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New high spatial and temporal ocean colour satellite products and applications in European coastal waters

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Keywords: *ocean colour, satellite products, high spatial and temporal resolutions*

Abstract:

New satellite products are generated for coastal waters as part of the FP7-HIGHROC ongoing research project based on high and medium spatial resolution (Sentinel2-MSI, Landsat8-OLI) and high temporal resolution (MSG-SEVIRI) satellite data. Ocean colour algorithms have been developed at regional scales then validated based on match-ups between satellite data and autonomous field measurements. These algorithms have been routinely applied in various test sites in European coastal waters to monitor water turbidity (T), concentrations of suspended particulate matter (SPM) and chlorophyll-a (*Chla*) at high spatial (up to 10 m) and high temporal (every hour) resolutions.

The first step in the validation process was to assess the uncertainties associated to the atmospheric corrections applied to satellite data, based on numerous quality match-ups between satellite data and field radiometric measurements. Match-ups between satellite data and autonomous field measurements of water turbidity and *Chla* fluorescence are then used to quantify the uncertainties associated to the final satellite products (SPM and *Chla* concentrations).

High spatial resolution satellite products open new perspectives in terms of scientific studies, such as the monitoring of suspended sediment transport in rivers, river mouths, estuaries and bays. They also provide useful information to non-scientists involved in aquaculture (e.g., oyster farming) and dredging activities. High temporal resolution satellite products now allow studying the daily dynamics of suspended particles in river plumes and the perspective influences of tidal currents, wind stress and regional circulation.

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Surface water volume changes in delta areas using multi-mission remote sensing: examples of the Mackenzie and the Mekong

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Keywords: *Remote sensing, flooding, surface water volume, surface water extent, altimetry, multispectral imagery*

Abstract:

Remote sensing has shown his strong potential to detect and to monitor water surfaces using multispectral imagery, and to measure water levels using radar altimetry. Here, we present an original and innovative method, based on the use of multi-mission data to quantify surface water volumes and to analyze their temporal and spatial variations. Until the launch of the SWOT (Surface Water and Ocean Topography) mission, predicted in 2021, this approach is the only one to our knowledge allowing to monitor the variations of surface water volumes using observation data. The method was developed and applied on two contrasted delta areas: the Mackenzie (North West of Canada) and the Mekong (South East of Asia) delta. The hydrological cycle of these two systems are mainly influenced by important recurrent floods located in the downstream part, generating dramatic environmental and economic impacts. To understand the dynamics of surface waters, a long time series (ranging from 2000 to 2015) of satellite products is analysed. Surface water extents are estimated using MODIS products at 500 m and water levels are calculated using data acquired from ERS-2, ENVISAT and SARAL missions. We demonstrated that surface water extents peak at 9,600 km² and 35,000 km² and total surface water volumes reach a maximum of 8.5 km^3 and 20 km^3 in the Mackenzie and Mekong delta, respectively. The good agreement between river discharges and surface water volumes permits to validate and highlight the potential of our method to study the surface water dynamics in key hydrological systems.

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From sediment chemical status to risk evaluation in the context of the European Water Framework Directive using different Lines of Evidences (LoEs): biology, chemistry and ecotoxicology

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Keywords: *WFD, risk assessment, chemical status, investigative monitoring*

Abstract:

In the framework of the Basque Water Quality Monitoring Network (WQMN), physico-chemical and biological elements are analyzed in coastal and estuarine waters. Data, obtained since 2002, are used in the ecological and chemical status assessment, according to the European Water Framework Directive (WFD*; 2000/60/EC*).

The objective of this contribution is to assess the risk associated to contaminants present in sediments from WQMN, with benthic community being classified as Good or High status, but with high levels of contaminants. This assessment was carried out by integrating different LoEs (biology, chemistry and ecotoxicology) according to the Weight of Evidence approach, following the WFD.

A total of 53 sediment samples were obtained from 12 estuaries of the Basque Country, between 2004 and 2013. Several priority substances (metals and organic compounds) were analysed. The toxicity of sediment samples was established using a battery of bioassays. The multivariate AMBI (M-AMBI) was used for evaluating the benthic community status (BS).

The results show that most of the sediment samples (98% of the total) did not achieve good chemical status and near 53% of those samples showed toxicity evidence. However, more than 70% of the samples not achieving good chemical status were classified as “high” or “good” BS.

This apparent contradiction between chemical and benthic community status highlights that, for regulatory purposes, decisions should be made based not only on the results of the contamination but also taking into account potential toxicity which provide more comprehensive conclusions.

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Monitoring of plastic litter ingested by seabirds in the Southeastern Bay of Biscay: EU management implications

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Keywords: *plastics, seabirds, Bay of Biscay, Marine Strategy Framework Directive*

Abstract:

The use of seabirds as monitors of the marine environment has been widely addressed. In the European Atlantic Area the Northern Fulmar (*Fulmarus glacialis*) has been the main focus for monitoring the ingestion of plastic litter; this has been incorporated into European environmental policies such as the Marine Strategy Framework Directive (MSFD). However, this species is not widely distributed in the Southern European Atlantic area and therefore it cannot be used as bio indicator. Hence, there is a need to assess alternative seabird species as bio monitors of plastic litter in the abovementioned region.

Here, we focused on the plastic ingestion by the Common Guillemot (*Uria aalge*) and the Northern Gannet (*Morus bassanus*) in the South-eastern Bay of Biscay. Dead birds were obtained from beach surveys and recovery centres in Cantabria, Bizkaia and Gipuzkoa provinces (N Spain). Birds were dissected and stomach contents were analyzed in search of plastic litter. Regarding the Common Guillemot, plastic fragments were found in 5 out of 50 (10% of the individuals). The range of plastic size was 1,8-45 mm, hence classifying from microplastics to macroplastics. The types of plastic items were fragments (5 items), foam (1 item) and fibre (1 item). The results corresponding to the Northern Gannets are being processed and will be presented.

The potential use of these two species as bio indicators to monitor plastic pollution and its contribution to the implementation of the Marine Strategy Framework Directive in the Southern European Atlantic area will be discussed.

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Environmental quality of coastal waters (North-east of Algeria): Determination of heavy metals and biomarkers in *Phorcus turbinatus* (Mollusca gastropoda)

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Keywords: *Phorcus turbinatus, metallic pollution, biomarkers, eastern Algerian coastline.*

Abstract:

As part of a program to monitor the quality of Algerian coastal waters, glutathione-S-transferase (GST) and acetyl cholinesterase (AChE), respectively biomarkers of oxidative stress and neurotoxicity, are measured in *Phorcus turbinatus* (Mollusca, Gastropoda), a bioindicating species of pollution. Moreover, six metal elements (Cd, Cr, Cu, Pb, Zn and Ni) are metered into the flesh of *P. turbinatus*.

During 2011, a monthly sampling of *P. turbinatus* colonizing the hard substrate of the mid-coastal stage is carried out at three monitoring stations (Collo Bay, Gulf of Skikda and Gulf of Annaba) subjected to various sources of pollution in addition we added a fourth reference station (Chétaïbi Bay). GST is measured in the mantle and AChE at the head of this gastropod. The concentrations of the six trace metals are determined in the flesh of *P. turbinatus* by atomic absorption spectrophotometer.

The ANOVA analysis reveals time and station effects. Indeed, a significant induction of GST was observed, accompanied by a highly significant decrease in AChE activity in individuals harvested in Collo Bay, Gulf of Skikda and Gulf of Annaba, compared to those of Chetaibi.

The lowest metal concentrations are recorded in the control station in summer. The highest concentrations of Pb and Zn are observed in Collo Bay in autumn and summer respectively. It is clear that Zn and Cu are predominant in the organism of *P. turbinatus*. Positive correlations are detected between trace metals and the enzymatic activities of AChE and GST.

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Sponges in environmental biomonitoring

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Keywords: *sponges, pollution, bio monitoring, metals*

Abstract:

In the context of estimating the ecological status of an ecosystem, bio monitoring programs are being developed to assess the quantities and distributions of selected contaminants in species for their bio-ecological characteristics. Sponges collect a very large part of the qualities required for a pollution bio indicator. The results show that some species of sponges are able to carry out an important bio concentration of metals but responses are very variable according to the species analyzed. *Sarcotragus spinosulus* was identified as to be the best species suited for the requirements of a sentinel species in the Gulf of Annaba. Although metal concentrations in the species are low and are not dangerous to the environment, they can result in significant biological disturbances to wildlife. However, it is estimated that sponges can be used to assess the contamination of an area, compare sites and the seasonal fluctuation of these pollutants at risk and to monitor the health of an ecosystem.

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Biodiversity of the sponges (Porifera: Demospongiae) from the gulf of Annaba (Eastern coast of Algeria)

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Keywords: *Sponge, biodiversity, Annaba gulf course, Mediterranean*

Abstract:

Porifera, commonly called sponges, are primitive metazoans. There are about 5000 species of porphyry throughout the world and they constitute the dominant phylum of benthos encountered on hard substrate. Sponges have many of the characteristics of a good indicator of pollution. They are sessile filterers with a relatively long life expectancy and therefore form stable communities, thus making it possible to monitor a given ecosystem in the long term.

The literature on biology, ecology and in particular the systematics of sponges in the Algerian coasts is scanty and fragmentary. In order to contribute to the inventory of the latter (Demospongiae, Porifera), a first Level of the Annaba gulf course in the extreme east of Algeria, we undertook a series of sampling at the Cape of Guard to the port of Annaba at a depth of between 1 and 35 meters. The study of the systematics of the collected sponge samples allowed to identify 6 species belonging to 3 different orders: *Chondrosia reniformis*, *Chondrilla nucula*, *Petrosia clavata*, *Ircinia fasciculate* and *Sarcotragus spinosulus* which appeared the most Term of spatial distribution, over the entire sampling area.

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Distribution of nutrient in waters of the lagoon Mellah (North-East of Algeria)

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Keywords: *nutrients, oligotrophy, Mellah lagoon, Northeast Algeria.*

Abstract:

The Mellah lagoon is located in the northeast of Algeria and totals 865 hectares, with a maximum depth of 5 m. It communicates with the sea by a long and narrow channel. The present work studies the distribution of nutrients: nitrogen (NH_4^+, NO_2^-, NO_3^-) and phosphorus (PO_4^{3-}) in the lagoon. During 2016, a sampling every 15 days is realized in three stations.

Unlike most Mediterranean lagoons, Mellah appears less rich in nutrients. Therefore, the eutrophication problem doesn't arise for this ecosystem. It is true that for the phosphorus, the values are almost always less than 0.50 µmole.l^{-1} throughout the productive season, enriched by marine intrusions. The lagoon becomes relatively rich (0.50 - 3.91 µmoles.l^{-1}) when the flow period lengthens as a result of continental water intakes. Similarly, nitrogen (NH_4^+) concentrations are low (1.46 - 6.84 µmoles.l^{-1}). In winter and spring, the lagoon exports ammoniacal nitrogen and appears to import oxidized nitrogen in summer and autumn, when marine waters intensifying. Although, the concentrations remain far below the values of the majority of the Mediterranean lagoons.
Thus the Mellah lagoon appears poorly enriched in nutrient and the problem of eutrophication doesn't arise. Though the majority of Mediterranean lagoons suffer of eutrophication problems, the Mellah lagoon tends into oligotrophy in view of the depletion of phosphorus and ammonium in summer and autumn. Moreover the lagoon by belonging to a natural reserve is spared from the pollution inducing an additive nutritional. This is a remarkable singularity of the Mellah among the other Mediterranean lagoons.

Assessment of trace element contamination and bioaccumulation in mussels (Pernaperna) ,fish (Mugil cephalus) and sediment in the gulf of Annaba (Algeria): Risk assessment for the consumers.

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Keywords: *Heavy metals, Perna perna, Mugil cephalus, gulf of Annaba, Algeria.*

Abstract:

The objective of this work was the diagnosis of the health status of the gulf of Annaba, located in the extreme eastern section of the Algerian coast. Using multi-compartment approach (sediment and *biota*). To achieve this objective, the selected biological models were the mussel (*Pernaperna*) and the fish (*Mugil cephalus*). Both species are widespread in the Mediterranean Sea. The concentrations of five heavy metals zinc, copper, lead , cadmium and mercury were determined in the brown mussels , in the liver and muscles of the fish (*Mugil cephalus*), and in sediment from four locations in the gulf of Annaba. The main results of the chemical analyses show a general contamination levels are dependent on the studied species and stations. Comparing our values with literature data, showed that the levels of contamination of the gulf are similar or slightly superior to the contamination level of equivalent ecosystems in other parts of the world. Besides, the estimation of sediment toxicity, using sediment guideline values, as well as bioassays, showed that stations of the gulf S 1 and S3 were associated with increased hazard to aquatic organisms. Obtained data suggest that integrative approach, combining chemical and ecotoxicological measurements, may represent a good way to assess the quality of the environment, particularly, in the context of bio monitoring programs. The estimated values of all metals in the edible part of *Pernaperna* and in the liver and muscles of *Mugil cephalus* in this study were below the established values. Therefore, it can be concluded that zinc, copper, lead, cadmium, and mercury in mussel and in fish pose no health risk for consumers.

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Are satellite measurements of oceanic SST reliable proxies of lagoon temperature in the South Pacific?

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***Keywords**: Observation network, modelling, coastal temperature, tropical ecosystems, vulnerability, climate change*

Abstract:

Monitoring climate-change-related risks for coastal management requires an accurate real-time characterisation of coastal temperatures and an understanding of the processes driving them. However, in situ measurements of temperature are usually scarce, cover limited time frames, and are hardly available in real-time at reduced cost. In coral reef environments, oceanic Sea Surface Temperature (SST) measured by satellite has therefore been frequently used as a proxy of lagoon temperatures experienced by coral reef organisms (TL) to define alert-thresholds, especially during coral bleaching events. Satellite products are freely available since the 70s without interruptions and in near-real time even for the most remote coral reefs, which increases the reactivity of stakeholders when a thermic crisis arises. However, the link between SST and TL is poorly characterized, and may significantly differ when the renewal between coastal and oceanic waters is weak. We analysed the differences between SST and TL from 2012 to 2016 in three atolls and one island in the Central South Pacific Ocean, and modelled them as a function of the drivers of lagoon water renewal and mixing, namely waves, tide, wind, and season. Simple linear correlations between SST and TL ranged between 0.44 and 0.97 depending on lagoons, localities of sensors, and type of SST data, and underestimated the thermal stress suffered by coral reefs. By contrast, the multivariate models reduced significantly the bias. A correction taking into account the drivers of lagoon water renewal and mixing is therefore necessary when using SST to define organisms' thermal stress thresholds.

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Shoreline extraction and monitoring using WorldView-2 images along the coast near the Fukushima-Daiichi Nuclear Power Plant after the Tohoku tsunami

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Keywords: *Remote sensing, shoreline, foam, classification, WorldView-2, multispectral, high resolution satellite images*

Abstract:

On 11th March 2011, Japan has experienced one of the most significant natural disaster of its history. A tsunami, with an average height of 15 m and a maximum height up to 38 m, has ravaged Japanese coastline and caused an unprecedented nuclear disaster. The AMORAD project, led by the IRSN in France, is intended to measure damages caused by the tsunami and subsequent radioactive releases to terrestrial and marine ecosystem. This study focuses on the shoreline extraction and evolution after the tsunami near the FNDPP. The methods developed are automatic and take into account the presence of foam which usually leads to an invalid shoreline detection. We use multispectral (8 bands) optical images provided by WorldView-2 sensor with high spatial resolution (2 m). The developed algorithms are based on the multispectral classification using different distances as Euclidian Distance (ED), Spectral Angle Mapper (SAM) or Maximum Likelihood Estimation (MLE). Pixels are classified into three classes: sand, foam and water. The merge of water and foam classes allows to separate water and land. Pixels located at the border of the 2 classes are vectorized in order to extract the shoreline. Results of each method are compared to validation data. MLE is the automatic method delivering the best results. Considering a coastline portion of 26 km long, the surface of shoreline retreats (erosion) is estimated to reach 361 448 m² and shoreline advances (accretion) 112 928 m², namely an average retreat of 13.9 m and an average advance of 4.34 m.

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Ecological data on the endangered crustacean *Tanymastix stagnalis* (Linnaeus, 1758) in El-Frine pool (Northeastern Algeria)

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Keywords: *Tanymastix stagnalis, ecology, statute, Algeria.*

Abstract:

Tanymastix stagnalis (Linnaeus, 1758) is a small anostracan (Crustacea) of freshwater temporary pools. Its distribution is restricted to two pools in Algeria (El-Frine in El-Tarf province and Réghaïa in Algiers province). The population of El-Frine, a pool near Oubeira Lake, is considered in this study, where some ecological and biological aspects have been studied in order to provide a statute of protection to this rare species.
T. stagnalis developed in 2015 between December and February, where water temperature varied between 17.14 and 21.84 °C. Adult's mean size was of 12.08 ± 1.18 mm and 9.79 ± 0.85 mm for males and females respectively in January and 10.36 ± 1.54 mm and 9.42 ± 0.68 in February (n=100). Sex-ratio was in favour of females (0.86 in January and 0.20 February) of which 50 % became mature at 7.5 mm. Fecundity was relatively low, with 12.82 ± 10.88 cysts/brood (n=84) in January and 15.96 ± 9.55 cysts/brood (n=50) in February. *T. stagnalis* co-occurs with other large branchiopods which are widespread in the region, like *Chirocephalus salinus* and *Lepidurus apus*, and the decapod *Atyaephyra desmaresti*. Adding to low fecundity, short development period and low food availability, the occurrence of *T. stagnalis* is threatened by the inundation of Oubeira Lake which is rich in fish predators like eels, grey mullets and others. This species deserves the statute of endangered species and site protection.

Session 3: Vulnerability of coastal ecosystems and risk assessment

Monitoring Coastal Areas with the Coastal Thematic Exploitation Platform

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Keywords: *CTEP, data exploitation platform, monitoring, observation, coastal areas*

Abstract:

The Coastal Thematic Exploitation Platform (CTEP) is an on-line data exploitation platform focused on the monitoring and observation of coastal areas.
This platform provides access to an archive of relevant datasets (remote sensing, model and in-situ data). Users can explore this archive through interactive tools and non-interactive (batch) processes running on a computation cluster. Executables or scripts can be uploaded from a web interface with a few simple manipulations. This allows a fast transition from prototyping to massive computation.
We will present first experiences from the use of the CTEP on pilot projects. These projects cover research and development activities (algorithm development, optimization, validation and sensitivity analysis) but also precursor operational services.
A first pilot project concerns monitoring of coastal water level and storm-surge events. More precisely, some tools allowing comparisons between satellite altimetry and tidal gauges measurements have been deployed on the TEP. These tools can serve for validation and improvement of processing of satellite altimetry data in coastal areas, with a view to future development of satellite-based monitoring services.
Another field of exploration is the development of atmospheric correction for optical images in coastal areas. The CTEP allows users to compare the performance of atmospheric correction algorithms on Sentinel-2 images, with possible adjustment of processing parameters.
Once a processing chain has been developed and validated, the CTEP can be used as a back-end to support operational services. This concept has been experimented with the SAFI project (Supporting our Aquaculture and Fisheries Industry, H2020 project). This project has developed a prototype operational service with a dedicated web portal for aquaculture and fish farming applications. The web portal is connected to the CTEP in order to take advantage of the available data archive and processing resources of the platform. Software maintenance is simplified by the CTEP integration tools.

Record and relative growth of subtropical exotic crab *Percnon gibbesi* (Crustacea, Decapoda, Plagusiidae) on eastern Algerian coasts

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Keywords: *Percnon gibbesi, Brachyura, morphometry, Algeria, Mediterranean sea*

Abstract:

This study describes for the first time the presence of the subtropical gravid crab *Percnon gibbesi* (H. Milne Edwards, 1853) on eastern Algerian coasts. Relative growth was studied on 104 individuals (10.2 <Lc <41 mm) sampled from Cap de Garde (West of the Gulf of Annaba). The crabs were sampled in free diving (< 2 m), between October 2015 and March 2016. The morphology was characterized using 16 metric parameters and one meristic parameter (number of spines on the anterior margin of the five pairs of periopods). The different measured parts of the body were expressed as a function of the length and width of the carapace. Measurements on the left and right chela were based on the length and width of the left and right hands. Possible variations of these dimensions were sought using the method of the least rectangles (reduced major axis). The mean numbers, modes and extreme values of each meristic parameter were also statistically compared between the two sides of the crabs.

Session 3: Vulnerability of coastal ecosystems and risk assessment

Session 4: Integrated approaches and communities restoration processes.

Keynote Session 4 - Impact of global warming on coastal habitats in Northeast Asia: a case of *Sargassum horneri*

Auditorium AGORA

Thursday the 9th of November from 11:15 am to 11:45 am

Teruhisa Komatsu[1], Shizuha Mizuno[1], Attachai Kantachumpoo[1], Min Xu[2], Shuji Sasa[1], Michio Kawaiya[3]

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Keywords: *Global warming, impact, Northeast Asia, Sargassum horneri*

Abstract:

Macrophytes are ecosystem engineers that produce important coastal habitats and provide us ecosystem services. In Northeast Pacific coast, *Sargassum* species grow on rocky beds and form underwater forests. Commercially important species such as flying fish and rock fish use them as spawning grounds and/or nursery grounds. A luxuriant growth season of *Sargassum* species is generally in spring to early summer. They are detached from rocky beds and float to offshore waters around the luxuriant growth season. Floating *Sargassum* rafts are also important spawning substrates and refugees of juveniles for commercially important species such as Japanese saury and yellowtail. Among *Sargassum* species, *Sargassum horneri* is the most important species that contribute to fisheries. Geographical distributions of macrophytes are limited by the maximum and minimum water temperatures. Thus, we estimate a geographical distribution of *S. horneri* from surface water temperatures that were estimated according to some global warming scenarios. Impacts of future geographical distribution of *S. horneri* on fisheries are discussed.

Session 4: Integrated approaches and communities restoration processes.

Session 4: Integrated approaches and communities restoration processes.

Oral communications Session 4

Auditorium AGORA
The 9th of November from 11:45 am to 3:45 pm

Session 4: Integrated approaches and communities restoration processes.

Session 4: Integrated approaches and communities restoration processes.

Underwater trails as an integrated management tool for MPAs

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Keywords: *underwater trail, Marine Protected area, Taza National Park, ICZM, Scenarii*

Abstract:

In the literature, the underwater trail is considered one of the effective tools contributing to education and public awareness of the environment, concretizing the notion of Sustainable Development.
Connecting the public with the sea is a key to foster a better understanding of the importance of preserving marine resources. People, from children to decision makers and local operators, tend to better respect what they know and understand.
In addition to this, the underwater trail is defined as a territorial tool for the integrated coastal zone management.
The project to create an MPA in the Taza National Park in Jijel has allowed the relaunching and creation of new underwater activities, including underwater trails, in a dynamic of consultation and integration.
In a context where the ICZM approach and MPAs are still unknown to the public and to state and / or private institutions, awareness and promotion actions are more than necessary to ensure their acceptability and thus ensure their implementation.
In light of these findings, the present research aims to study the potential of these trails in the management and promotion of the future MPA in an ICZM framework in Algeria through an analytical study of the process of their implementation, Scenarios to identify the best management modalities.

Session 4: Integrated approaches and communities restoration processes.

Restoration effects on socio-ecosystems: perception of beach users on ecosystem services provision

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Keywords: *bathing waters, beach water quality, cultural ecosystem services, social perceptions*

Abstract:

Nerbioi estuary (North Spain) moved from being one of the most impacted estuaries in Europe, in the 20th Century, to a nearly recovered system, mainly due to the Water Treatment Plant (WTP) that started in 1990. The three beaches located within the estuary, after suffering from severe water pollution for decades, nowadays comply with the European Bathing Water Legislation. However, little is known about how water improvement influences the provision of cultural ecosystem services (CES), such as bathing waters. This study focuses in understanding beach user´s perceptions and attitudes in response to bathing water improvements. Between July and August 2016, a total of 426 questionnaires were distributed among people at the beaches. Questionnaires comprised questions on user´s perceptions about beach conditions and user´s behavioural variation in response to ecological changes. The results were compared with environmental time-series data (water transparency and microbiological pollution). Most respondents perceived an improvement in water quality (70.2%) and linked it to the estuarine sanitation; of those, 88% found water quality improvement to be a critical factor for deciding to visit these beaches. Furthermore, 90% of regular users answered that they would not come back if water conditions would deteriorate. Significant differences existed between beaches, with the most inner beach presenting worse environmental conditions than the other two beaches; these matched the perceptions of users. These findings highlight the importance of environmental restoration for the recovery of impacted socio-ecosystems and the maintenance of ecosystem service benefits.

Session 4: Integrated approaches and communities restoration processes.

Decision support tools in marine spatial planning: Present applications, gaps and future perspectives

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Keywords: *Marine spatial planning, management plan, maritime activities, spatial use conflict, spatially explicit tools, scenarios*

Abstract:

Evidence-based decision making is an essential process for sustainable, effective, and efficient marine spatial planning (MSP). In that sense, decision support tools (DSTs) could be considered to be the primary assistant of planners. Although there are many DSTs listed in tool databases, most of them are conceptual and not used in real MSP implementation. The main objective of this review is to: *(i)* characterize and analyse the present use of the DSTs in existing MSP implementation processes around the world, *(ii)* identify weaknesses and gaps of existing tools, and *(iii)* propose new functionalities both to improve their feasibility and to promote their application. In total, 34 DSTs have been identified in 28 different MSP initiatives with different levels of complexity, applicability and usage purposes. Main characteristics of the tools were transferred into a DST matrix. It was observed that limited functionality, tool stability, consideration of economic and social decision problems, ease of use, and tool costs could be considered as the main gaps of existing DSTs. Future developments are needed and should be in the direction of the specific need of marine planners and stakeholders. Results revealed that DST developments should consider both spatial and temporal dynamics of the ocean, and new tools should provide multi-functionality and integrity; meanwhile they should be easy to use and freely available. Hence, this research summarised current use, gaps, and expected development trends of DSTs and it concludes that there is still a big potential of DST developments to assist operational MSP processes.

Session 4: Integrated approaches and communities restoration processes.

Governance strategies for ecosystem services protection: the value of marine protected areas

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Keywords: *MPA, contingent valuation, marine ecosystem services, ALDFG*

Abstract:

The global decline of marine ecosystems may be partially ascribed to poor governance and to the lack of sustainable use and marine biodiversity conservation. Recurring governance failures have triggered a demand for change in the way coastal and marine resources are managed. Institutional and governance innovation is required for ecosystem conservation, and that such innovation can best be achieved by engaging in the process the local population. Thus, analysing marine biodiversity and its services is fundamental for designing efficient ecosystem services governance. This research first identifies the main ecosystem services (ES) produced by a coralligenous habitat locally named "Tegnùe" and located in front of the Lagoon of Venice (North Adriatic Sea) and then investigates public opinions and attitudes towards governance instruments and policies for the management and conservation of this ecosystem through a questionnaire administered to a sample of 4000 Italian citizens. This marine ecosystem is nowadays experiencing a loss of biodiversity because of human activities such as the loss of fishing equipment, the so-called ALDFG (Abandoned, Lost or Discarded Fishing Gears), or illicit waste disposal. The ALDFG causes considerable damage to the natural environment, including the destruction of nursery areas and the accidental entanglement of marine protected species. The questionnaire also investigates people's preferences and opinions towards the creation of marine protected areas (MPA) as an effectiveness instrument for conservation and management of ecosystems services. Results show that people are willing to pay an entry fee associated to management and protection of the MPA.

Session 4: Integrated approaches and communities restoration processes.

40 years of decline and 10 years of management, are European eels recovering? The broken thermometer paradox

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Keywords: *European eel, Anguilla Anguilla, historical trends, fisheries, management plan*

Abstract:

Because the landings of glass eels decline of recruits of European eels (*Anguilla anguilla*) have declined down to 1% of the historical levels recorded in the 1970s, EU implemented a drastic management plan in 2007 (EU 1100/2007) to reduce man induced mortality to enable 40% of the pristine stocks of silver eels to escape in good conditions to contribute to the spawning stock. Each member states have now implemented domestic eel-management plans, mainly based on reducing fishing effort but also on restocking and to a lesser extent on habitat restoration. According to ICES WG on eels, recruitment of glass eels has significantly increased since 2011 and is thought to be a direct consequence of the restriction on silver eel fisheries increasing the number of spawners that safely escape to sea. However, in the mean time, oceanic regime shifts have occurred and for the first time since the late 70's the North Atlantic Oscillation index has returned to negative values. So the question is to unravel the respective effects of ocean and climate changes and human pressures. Before 2010, more than 1300 fishermen targeted glass-eels in French estuaries, presently less than 750 remain. The implementation of the management plans and trade restrictions caused by the CITES glass eel ban, involved a steep drop of market prices. Fishermen have changed their historical practices to adjust to these changes. The interpretation of the glass eel landing data, used to calculate recruitment indices, is tricky because the significance of the professional catches is doubtful.

Session 4: Integrated approaches and communities restoration processes.

Green Shores: Coastal habitat restoration for natural flood and erosion control in the Tay – Eden Estuaries & the Dornoch Firth (Specially Protected Areas & Special Areas of Conservation)

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Keywords: *Fringe saltmarsh, habitat restoration, coastal resilience, sustainable practices, stakeholder participation, community groups.*

Abstract:

A stakeholder project between research, business and community is underway using the latest habitat creation methods to restore fringe saltmarsh habitat to three estuaries of high economic and ecological importance in Scotland: the Tay and Eden Estuaries & the Dornoch Firth (Specially Protected Areas & Special Areas of Conservation). The 'Green Shores' project has developed a coastal plant hub at the world-famous St Andrews Links in order to propagate a range of native saltmarsh plant species that are being transplanted in field trials behind bio-mats and bio-rolls deployed as wave-protection devices. The stakeholders include the University of St Andrews, the St Andrews Links Trust, the Ministry of Defence, Fife Council, the Royal Dornoch Golf Club, Leader (Fife) and Scottish Natural Heritage. The project is engaging a range of groups, such as public volunteers, wildfowlers, conservationists, greenkeepers, military personnel, students and school children, to help with the practical work of growing and transplanting selected saltmarsh species, whilst also raising awareness of these often undervalued and overlooked soft coastal habitats. Climate change adaptation, biodiversity conservation and natural flood management are closely linked to the economic growth and quality of life in coastal communities. A concerted effort by, and the involvement of, coastal users groups is crucial therefore to help develop sustainable restoration practices in order to adapt to, and mitigate for, projected coastal and climate change.

Session 4: Integrated approaches and communities restoration processes.

What motivates people to conserve marine ecosystem services: a case study in Japan

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Keywords: *marine ecosystem services, motivation, willingness to pay*

Abstract:

What motivates people to conserve marine ecosystem services? This has been a long research theme of environmental psychology, but no single answer has been identified. This study explores causal factors that motivate people to conserve marine ecosystem services through an interdisciplinary approach, i.e. combining environmental economics and social psychology. In this study, the relationships between people's willingness to pay (WTP) for marine ecosystem services and their character were explored based on the responses from 946 residents in Japan to a questionnaire. The analysis reveals that the groups of respondents with a higher WTP to conserve marine ecosystem services have higher public spirit and stronger connections with other people. On the other hand, the groups of free riders who have no WTP to conserve marine ecosystem services have lower public spirit and weaker connections with others, both humans and non-humans. The percentage of free riders was 19%, whereas that of positive payers was 11%. The positive payers also have high consciousness for the environment and love seafood. The analysis implicate that groups of respondents who have a higher WTP for marine conservation could have high internality, which means that they have high degree of belief that they can control their lives against external forces beyond their control. Based on these findings, the authors would recommend that politicians and social leaders understand and stress the importance of making connections with others and nurturing public spirit if they want to enhance people's contributions to conserving marine ecosystem services in the long term.

Session 4: Integrated approaches and communities restoration processes.

Global change and the management of Mediterranean coastal habitats: a plea for a socio-ecosystem-based approach

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Keywords: *Global change, coastal habitats, Mediterranean Sea, socio-ecosystem based approach*

Abstract:

Global change is often considered erroneously as a nomenclatural synonym of global warming. In fact, it refers to the changes in the Earth's physical and biological structure (natural and/or anthropogenic) and their interactions. Global change encompasses biological invasions, modifications in biological diversity (species, ecosystems, etc.) and changes in ecosystem functioning, changes in biogeochemical cycles, pollution, changes in land use and land cover, in addition to changes in climate and the distribution pattern of climatic zones, most of these parameters being in interaction.

Biodiversity is often defined erroneously as the number of species. The higher the number of species, the better the status or the health of a habitat is considered to be. Disturbances are erroneously thought to reduce the number of species, while in reality they often increase it. In fact, biodiversity is a multidimensional concept, with at least five scales (evolutionary, functional, organisational, spatial and heterogeneity) and more than a hundred metrics. These metrics can give apparently contrasting responses.

Managers, stakeholders and environmentalists worldwide often prioritize the 'species approach'. The protection of an iconic and endearing species, especially when it looks lovable, is obviously easier than that of tiny zooplankton species, or of parasites, although the latter may play a far more important role than the former in the functioning of healthy ecosystems. Within the European Union (EU), in the framework of the Habitat Directive (1992) and of the Natura 2000 network of nature protection areas, the species approach has been widely privileged compared to the ecosystem approach, despite the name of the Directive ('Habitat Directive').Beyond this Directive, the 'species by species' approach can be found at all levels of the environmental management process. The management is focused on particular species: emblematic species, ecosystem engineers, threatened species (species really threatened or perceived as threatened, because of their coefficient of sympathy), etc. However, 'species by species' management is unrealistic, particularly when the emblematic species are either predators or prey. Obviously, the number of predators and prey cannot increase in parallel as the result of protection measures, and the resulting decline of prey is problematic for many managers.

Session 4: Integrated approaches and communities restoration processes.

The problem is that the management of natural habitats is often driven by environmentalist lobbies on the basis of taxonomy: marine mammals, marine or terrestrial turtles, birds, iconic fish such as the grouper *Epinephelus marginatus*, flowering plants, etc. As every taxonomic lobby is obsessed by its particular concerns, the management of natural habitats often consists in a stack of taxon-focused protection measures and takes no account of possible contradictions between them. For example, the bat lobby only seeks to increase the number of bats, possibly by creating artificial habitats, regardless of the presence of endangered species among their prey, or of the competition with other *taxa* feeding upon the same prey. The management of natural habitats is also driven by disciplinary lobbies: biology, benthos, pelagos, contaminants, currents, etc. The role of economic lobbies should also be considered.

Ecosystems are units of biological and spatial organization that include all the organisms, their interactions, the functional compartments they belong to, along with the components of the abiotic environment within their boundaries. Man obviously belongs to ecosystems; however, certain sociologists, ecologists and environmentalists refuse to take Man into account. The concept of the socio-ecosystem is therefore useful insofar as it emphasizes the fact that man is part of ecosystems. Man is often rightly viewed as a disturbance by ecologists and environmentalists. However, at least in some cases, socio-ecosystems could be closer to 'natural' ecosystems than ecosystems excluding humans, such as No-Take Zones (NTZs) of Marine Protected Areas (MPAs). An example, involving the Mediterranean monk seal *Monachus monachus* and artisanal fishery, will be described.

Here, the authors make use of a number of case studies in an attempt to demonstrate the interest of a comprehensive, socio-ecosystem-based approach, in the field of environmental management, the sustainability of fisheries and contaminant flow. These case studies encompass salt marshes, coastal benthic ecosystems (such as *Posidonia oceanica* seagrass meadows, rocky reefs and coralligenous ecosystems), and coastal pelagic ecosystems (such as the Gulf of Lions). They also highlight the importance of tackling the coupling between benthic and pelagic ecosystems and between terrestrial and marine ecosystems. Such a socio-ecosystem-based approach obviously requires not only inter-disciplinary research, but also going beyond disciplinary frontiers to achieve a truly trans-disciplinary approach.

Session 4: Integrated approaches and communities restoration processes.

From coast to deep-sea, the winding road of a nested governance and management approach

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Keywords: *Coast, Deep-sea, community-based management, UNCLOS, nested governance*

Abstract:

Coastal management is nothing new. Since humans came downstream to reach and settle on the coast, what is called 'traditional' or community-based management, or 'sato-umi', have always been taking place, adapting to society and nature changes. It is only later, when ships were capable enough to cross the seas and oceans, that the first rules over the ocean were adopted to nowadays take the shape of the UN Convention on the law of the sea (UNCLOS). There is then an historical and geographical wide gap between what is happening locally on the coast and what is negotiated regionally and globally about seas and oceans. How to progressively and incrementally fill this gap using the existing complex multilayered network of rules, institutions, actors and dynamics at work from the coast to the deep ocean?

Session 4: Integrated approaches and communities restoration processes.

Posters Session 4

Poster flash presentations the 9th of November from 10:00 am to 10:15 am and from 3:45 pm to 4:15 pm in the AGORA

Special poster session in the cloister the 9th of November from 4:30 pm to 5:30 pm and during the coffee-breaks the 9th of November from 10:15 am to 10:45 am and from 4:15 pm to 4:30 pm.

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Management of Moroccan fisheries

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Keywords: *Management, fisheries, Ecopath model Morocco*

Abstract:

A preliminary Ecopath model was fitted to study the trophic interaction of the marine protected area (MPA) is the region of Safi-Essaouira (Atlantic, Morocco) using the available data on most of the ecosystem compartments. These areas of high abundance of fish are not yet studying nor identifying the key species that controls these ecosystems and ensures its evolution. Given this situation, the present study aims at feeding knowledge on the functioning of one of the marine ecosystems in Morocco and which, in order to be able to predict the behavior of its constituents in the face of different types of disturbances. Our Ecopath model includes 27 functional groups of which 18 are fishes, grouped by size and commercial importance. The model gives two types of results, statistics and network analysis. A relatively high ecothrophic efficacy (more than 0.5) with transfer efficiency near to 10% indicates a fair degree of stability. Also the PP/R ratio obtained in this study is slightly higher than 1, suggesting a system that may still be maturing. Analysis of mixed trophic impacts shows a significant top-down control of the food web in this system.

Session 4: Integrated approaches and communities restoration processes.

Fisheries Biology about blue shark in Sagami Bay

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Keywords: *Vertical long line, Blue shark, Sagami Bay*

Abstract:

Sagami Bay is located at the southern coast of Japan. It is one of the deepest bays in Japan, and its maximum depth is over 1500 m. The south side of Sagami Bay is connected to the Pacific Ocean. The Kuroshio as the western boundary current of the Pacific Ocean, and its branch intrude to the surface layer of Sagami Bay through the east/west channel of Oshima, and the first branch of Oyashio sometimes flow into the middle layer. These currents affect ecosystems and fisheries in Sagami Bay.

We carried out 2 types of long line operation, one is vertical long line operation which is excellent in estimating the vertical catch depth, and the other is horizontal long line operation which is expand fishing gear widely in the horizontal direction. We carried out a long line operation at Sagami Bay and caught Blue shark (*Prionace glauca*) and Shortfin mako shark (*Isurus oxyrinchus*). These sharks are recognized as pelagic sharks and as highly migratory species, fishing survey in coastal areas like Sagami Bay is rare case.

We could not catch sharks in the deep. There were many catches of male juvenile Blue shark before sexual maturity, and there were also pregnant Blue sharks among the females. It is suggested the possibility that Blue sharks give birth in Sagami Bay. To understand initial ecology of Blue shark, we will search new born Blue sharks in Sagami Bay.

Session 4: Integrated approaches and communities restoration processes.

Restoration trends of the Thau lagoon's water ecological status and phytoplankton communities in response to changes in anthropogenic nutrient inputs

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Keywords: *eutrophication, oligotrophication, primary production, coastal lagoon, restoration, ecological status, socio-ecosystem.*

Abstract:

Thau lagoon (south of France) is one of the largest Mediterranean coastal lagoons. It supports many ecosystem services such as shellfish farming, artisanal fishing and more recently tourism and hydrotherapy. Since the 1960s, the increase of anthropogenic inputs, linked to the exponential growth of human population has resulted in the microbiological contamination of shellfish farming and the eutrophication of Thau lagoon, with significant ecological and socio-economic impacts. Since the 2000s, the considerable efforts made to water depuration systems on the watershed have gradually led to a good environmental status of the lagoon according to the Water Framework Directive (WFD). Simultaneously with the restoration of the lagoon ecosystem, fishermen and shellfish farmers experienced changes in their professional activities related to recent residential and touristic attractiveness of the area. Facing difficulties in their economic sector, they also report loss in habitat and trophic capacity of the ecosystem. To address these issues and respond to social demands on Thau ecosystem, the need is raised to identify ecological status evolution adopting an interdisciplinary approach. Data on phytoplankton communities and water nutrients are available since 1987 on several stations of Thau lagoon. These data were analysed with multivariate technics and linear models in order: *i)* to highlight the changes in the water physico-chemistry, and in the biomass, abundance and diversity of phytoplankton communities of Thau lagoon, in response to the reduction of nutrient inputs since the late 20th; and *ii)* to identify potential trends within the trajectory of restoration of Thau lagoon.

Session 4: Integrated approaches and communities restoration processes.

The classification of the marine area of the National Park of Gouraya (Algeria-SW Mediterranean): Assessment and lessons learned

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Keywords: *Integrated coastal management, governance, marine protected areas, national coastal parks, participation, stakeholders*

Abstract:

Classified as the smallest urban coastal park in term of surface in Algeria, the National Park of Gouraya (NPG) consists of three outstanding ecosystems: terrestrial, marine and lacustrine and has national and regional importance owing to its exceptional biodiversity, aesthetic and historical richness. The Park is entirely located in the heart of the city of Bejaïa (Eastern Algeria) which has witnessed a significant growth over last decades causing strong damages to the ecosystems.

After the study conducted in 2003 on the marine area of the Park and which highlighted the presence of several species with a Mediterranean status and the presence of remarkable landscapes of international importance; the park managers proposed its classification as a marine protected area (MPA). This process has not yet been successful and the marine area is still not classified. The conflicts of interests and the lack of awareness of the multiple stakeholders and users of the marine area on the protection and the preservation of this area are among other, factors that may impede the classification process and the effective management of the future MPA.

This paper addresses the issue of stakeholder involvement in the governance of coastal protected areas with high ecological value, highly coveted and exposed to the constraints related to the multiplicity of actors. One major conclusion was that the current method of stakeholder involvement has not been successful as expected since the marine area is still not protected and natural heritage is in a constant deterioration.

Session 4: Integrated approaches and communities restoration processes.

Socio-economic assessment of the impact of environmental and anthropogenic shocks on coastal communities: the case of marine artisanal fishermen in Côte d'Ivoire.

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***Keywords**: Coastal regions, small scale fisheries, global change, vulnerability, resilience.*

Abstract:

In Côte d'Ivoire, marine small scale fisheries account for more than 50 % of national fish production. It is practiced mainly by migrant fishermen from Ghana who depends solely on fishing activity for their livelihoods. For more than a decade, these fishing communities are suffering from *(i)* global change, resulting in various phenomena such as coastal erosion, flooding, rising seawater temperature, and *(ii)* anthropogenic impacts such as the increase of pollutant discharges into sea and the intensification of illegal, unreported and unregulated fishing activities. These phenomena are factors of both territorial and individual vulnerability. In this context, it is necessary to identify adaptation strategies and governance mechanisms to reinforce their resilience.

This paper presents a method for analyzing and prioritizing the impacts on coastal areas and fishing communities based on their perceptions recorded in two recent vulnerability survey. The first is a socioeconomic survey of fishing households (sample of 588 households distributed in the 105 artisanal fishing villages of Côte d'Ivoire) conducted with the support of West African Economic and Monetary Union in 2014. The second, more thorough, is a comprehensive stakeholder-wide survey conducted in 2017. It concerned 180 head of household, sector management organizations, local elected officials and all others actors of artisanal fishery's sector in 11 fishing villages representative of all Côte d'Ivoire's coastal regions.

Session 4: Integrated approaches and communities restoration processes.

Coastal erosion and adaptation strategy on the Senegal small coast
Erosion côtière et stratégie d'adaptation sur la petite côte (Sénégal)

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***Mots clés** : Erosion côtière, adaptation, zone côtière, Sénégal*

Résumé :

L'élévation du niveau des océans constitue un des impacts physiques du changement climatique qui affectera les côtes par submersion et érosion. Le Sénégal comme la totalité des pays de la sous région est affectée par l'érosion côtière et le recul du trait de côte. Cette communication s'intègre dans cadre de travaux thèse sur la vulnérabilité des territoires aux effets du changement climatique. La méthodologie combine la revue documentaire, les travaux de terrain, les observations sur l'évolution du trait de côte sur la base d'une numérisation avec des images landsat multi-dates de 1972 à 2010.

L'étude de l'évolution historique du trait de côte fait apparaître un recul moyen de 0,86m avec cependant des situations locales très variables se présentant de façon modérée à très inquiétante. L'évolution du trait de côte est marquée par une alternance de phases d'érosion et d'accumulation.

La vulnérabilité de petite côte se justifie se justifie par ses caractéristiques morpho – structurales, topographique et enjeux économiques. En plus des effets du changement climatique, les mauvaises pratiques (urbanisation, extraction de sable…), les faiblesses dans la gouvernance contribuent dans l'occurrence ou l'accélération des perturbations.

Cette situation fragilise les ménages et les secteurs économiques clés du tourisme, de la pêche et de la transformation occupée par les femmes.

Différentes stratégies individuelles et collectives peu efficaces sont développées par les acteurs (individus, ménages, Etat, collectivités locales, Hôteliers), en attente de solutions de grande envergure.

Session 4: Integrated approaches and communities restoration processes.

Interactions between human and natural capital: An application to recreational activities on the Basque Coast.

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Keywords: *Natural Capital, Impacts, Recreational activities, Basque Coast*

Abstract:

Coastal areas support human well-being and livelihood by providing 'ecosystem services', including provisioning goods, regulation services and recreational opportunities. The interactions between Human and Natural Capital are complex, since human activities highly rely on the quality of resources but can also have an impact on them. Therefore, understanding the interactions between human and natural systems is needed to maintain the benefits flow in coastal areas.

Whit this aim, focus on Marine Recreational Activities (MRA) on the Basque Coast we first propose a conceptual framework for classifying the MRA based on dependency and impacts on marine resources. Secondly, a participatory mapping process based on the distribution of a questionnaire among locals and visitors, provided information on MRA they practice, location, frequency, dependence on natural resources and perception of impact. Additionally, MRA socio-economic data was collected to estimate the activity intensity in coastal areas. Heatmaps to identify hotspots for activities and their potential impacts were created with all gathered information.

In total, 12 categories of MRA were identified in the Basque Coast, and classified in three activity types: Activities that impact the same resource they rely on, Activities that impact a resource they do not rely on and Activities which impact is negligible. Heat maps of MRAs intensity show their heterogeneous distribution along the Basque Coast, highlighting areas with high natural value and of potential impacts.

Outputs of this study allows us to identify potential Natural Capital for each recreational activity, assess the size, intensity and detect potential impacts areas along the Basque Coast. Provided information helps to guide further research and management efforts.

Session 4: Integrated approaches and communities restoration processes.

EMODnet Human Activities portal: geo-referenced information on human activities

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***Keywords**: human activities, European waters, pressures, EMODnet*

Abstract:

Most human activities exert pressures and produce impacts on coastal and marine environments. That's why, the study and management of seas heavily relies on the availability of information on these activities. In fact, several organisations (e.g.: ICES, OSPAR, HELCOM, MEDPOL Convention) have made notable efforts to collect large-scale datasets. However, differences in the accessibility and the quality of these datasets make it extremely difficult to conduct large-scale assessments of the pressures related to these activities.

In this context, the Human Activities portal[1] of the European Marine Observation and Data Network (EMODnet), an initiative from the European Commission, aims to facilitate access to existing marine data on different human activities carried out in EU waters. Since this information is collated from a variety of sources, it needs to be harmonised and made interoperable. In that sense, the Human Activities portal provides available and harmonized data for all European seas, and includes geo-referenced information and additional attributes, when such information is provided. All this information is of public access and free of any restrictions to ensure their use from a multitude of stakeholders (policy makers, researchers, students, spatial planners, etc.). Therefore, the EMODnet Human Activities portal aims to contribute to the improvement of marine human activities information quality and availability, and to extend its spatial coverage. All this information can indeed be relevant for several purposes such as management of sectorial activities, marine spatial planning, socio-economic and environmental risk assessment, legislation implementation and compliance (especially the European Marine Strategy Framework Directive).

Session 4: Integrated approaches and communities restoration processes.

An example of end-to-end model coupling for marine ecosystem services using ARtificial Intelligence for Ecosystem Services.

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Keywords: *Marine ecosystem services, ARIES, socio-economic, collaborative modelling, end-to end management solutions*

Abstract:

ARIES (ARtificial Intelligence for Ecosystem Services) is a networked software technology that redefines ecosystem service assessment and valuation for decision-making. The ARIES approach to mapping natural capital, natural processes, human beneficiaries, and service flows to society is a powerful way to visualize, value, and manage the ecosystems on which the human economy and well-being depend. Through artificial intelligence and innovative semantic modeling, ARIES assembles spatial data and expert-contributed model components (deterministic or probabilistic) to quantify and map ecosystem services, at the appropriate spatial scales and specifically for each ecological and socio-economic context. This presentation highlights how the semantic, collaborative and adaptive modelling of ARIES has been applied to couple physical, economic and social models in marine environments with an example on marine aquaculture. Only through an interdisciplinary and integrated open-access effort will we be able to get end-to-end ecosystem services models and deliver better ecosystem-based management solution schemes.

Session 4: Integrated approaches and communities restoration processes.

A novel sustainable material against coastal erosion: a calcareous agglomerate obtained by cathodic protection in seawater

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Keywords: *coastal erosion, calcareous agglomerate, cathodic protection*

Abstract:

Coastal erosion is a phenomenon of increasing importance due to the factors like rising sea levels. Different techniques are applied for protection of coastlines against erosion, meanwhile the research continues for improving the existing methods or coming out with modern ones.
A novel promising process licensed by Géocorail SAS is presented in this work. Being inspired by cathodic protection techniques, this process takes advantage of formation of calcareous deposit as a result of cathodic potential applied on the metallic substrates in seawater. Calcareous deposit can act as a binder between a metallic mesh and the natural elements present on the site (such as sediments, sand, shells, etc.) and therefore these "artificial reef" reinforce the coastline (dykes, beaches) against erosion.
Different parameters were studied on the mentioned process in the ANR Ecocorail project. In this article, we focus on Géocorail® samples taken from a deposit formed in the 1990s during a first experiment in Belle-Ile-en-Mer. The composition of the samples was studied on a macroscopic scale, by size analysis, on a more local scale, by mineralogical analyzes. An investigation of the microstructure of the material was conducted by mercury intrusion and water imbibition. Finally, the mechanical performances were evaluated by means of compression tests on specimens of different dimensions. Our results show that the formed material is close to a sedimentary rock or even a soil treated with hydraulic binder. A comparison with one year old Géocorail®, obtained from pilot project will be proposed and also compare to laboratory samples.

Session 4: Integrated approaches and communities restoration processes.

The calcareous deposit formed under cathodic polarization on steel as a metals remediation device of seawater

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Keywords: *calcareous deposit, seawater, contamination, nickel, electro remediation*

Abstract:

The contamination of coastal waters by trace metals is an important worldwide concern. Although metals are natural part of the environment, their release to coastal waters may significantly affect the productivity and diversity of lagoon ecosystems.
This is particularly true in New Caledonia, where soils are highly enriched in nickel and other metals and subjected to intense mining extraction and strong erosion due to tropical rainfall. In this context, a novel use of the calcareous deposit made of CaCO3 and Mg(OH)2 and formed under cathodic protection of a metallic structure is proposed as a remediation device of metallic contaminants in seawater.
The goals of these experiments are to understand the way and the quantity of metallic contaminants (Ni, Cr, Pb, …), present under their ionic form in seawater that are able to integer the calcareous deposit. Considering the intense nickel mining activities in New Caledonia, nickel is firstly studied. Experiments were performed in artificial seawater and containing different amount of ionic nickel (from 7.10-6 mol/L to 4.10-4 mol/L). A large volume (2 L) was used, avoiding variations of species concentrations during the formation of deposits. The working electrode was commercial galvanised steel wire and a current density of -300 µA/cm² was applied.
Different analyses, SEM, µ-Raman spectroscopy (surface and cross section) and X-Ray diffraction show the presence of nickel incorporate in the calcareous deposit in the form of Ni(OH)2. Quantitative analyses have demonstrated that 25% of the Ni-total was trapped inside the deposit after only 7 days.

Session 4: Integrated approaches and communities restoration processes.

How to characterize SCUBA diving sites for regional and local-scale management needs?

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***Keywords**: scuba diving, characterized method, environmental and human criteria, management*

Abstract:

The French Mediterranean coast is a hot spot for SCUBA diving (estimation: 70-75 000 of individual divers). About 550 dive centres are located on the coastal administrative departments, and receives a quarter of metropolitan French dive centres (French Underwater Federation, *pers. comm.*). Diving sites are mainly located along rocky shores on natural habitats. 80% of the 500 sites listed are located on a marine protected area. In order to implement the European Marine Strategy Framework Directive, a method to categorize diving sites is proposed to regional-scale management. Several criteria have been selected to be systematically assessed to the site: *(1)* conservation status of natural habitats (European Habitats Directive assessment), *(2)* habitat sensitivity to human pressures, *(3)* frequentation by divers, *(4)* pressure related to other activities, *(5)* seascape value, *(6)* management level (presence of environmental manager with effective action plan), and *(7)* level of ecological and uses knowledge. Crossing the first 5 criteria enables the definition of the environmental issue level. By subtracting the sixth criteria at environmental issue level, a categorizing index with 8 categories is gotten. The accuracy of the obtained value is qualified by the seventh criteria. The developed method provides 2 spatial-scale results: *(i)* a large-scale categorization of diving sites useful for the implementation of public policies, *(ii)* a local-scale for MPA managers providing information about the actions to be taken.

Session 4: Integrated approaches and communities restoration processes.

Ruppia spiralis in a Mediterranean lagoon habitat (Hyères salt marshes, France): an ecosystem-based approach for management

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***Keywords**: Mediterranean lagoon, Ruppia spiralis, Socio-ecosystem*

Abstract:

Hyères salt marshes (Provence, France) area Mediterranean lagoon deeply altered since antiquity; it is an example of socio-ecosystem characterized by industrial activities since 1848 for salt production and artisanal fishing (Pesquiers salt marshes). The industrial exploitation ended in 1995 and Hyères salt marshes became property of the French Littoral Conservatory in 2004 and managed by Toulon Provence Méditerranée local collectivity. Access to the sites was then restricted in order to preserve the historical heritage of the site and the biodiversity of avifauna. In this brackish habitat, *Ruppia spiralis*, a cosmopolitan aquatic annual magnoliophyte species, plays an important structural and functional role including an essential habitat for juvenile fishes. Many factors like water level, salinity and temperature fluctuations, desiccation and light-availability have led to the development of a well-established population of *Ruppia spiralis* in Hyères salt marshes. However, the hydraulic management plan, based on the ancient salt production network, does not take into account the lagoon ecosystem functions such as fish nursery. The aim of this paper is to improve knowledge on the lagoon habitats of Hyères salt marshes through the mapping of *R. Spiralis* meadows and the study of its vitality. This study is the first step of an ecosystem-based approach. *R. spiralis*, as primary producer, belongs to one of the functional compartments of the euryhaline and eurythermale Mediterranean lagoon ecosystem. Understanding the functioning of Hyères salt marshes lagoon ecosystem will improve its management in a concerted way according to the current priorities defined by the MSFD.

Session 4: Integrated approaches and communities restoration processes.

Fish assemblages of the Prado bay reefs: high volumes and complexity are keys of efficiency

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Keywords: *artificial reefs, fish, specific richness, biomass*

Abstract:

A 7 years fish survey has been conducted on the artificial reefs (AR) of the Prado bay (27 300 m3, 25-30 m depth, Marseille, France) in order to assess the colonization dynamic of the 6 different types of reefs. The evolution of the population parameters has been analyzed to compare the fish assemblages per reefs types, reefs groups, and location within the ARs concession. During the first years after the implementation of the ARs, the specific richness has rapidly increased. The biomass of targeted species has been multiplied by 4 in 7 years. The ones that have a reduced home range (sedentary benthic species) have been highly privileged by the implementation of the reefs. Other fishlike *Mullus surmuletus*, which have a high horizontal mobility but that found a suitable habitat as blocks of rocks had a biomass multiplied by 100. The biomass increasing is mainly due to the individual size increasing and a reserve effect (fish is banned). The increasing of the carnivorous species assesses that the assemblages are more stable and mature. Mobile demersal species are also using the Prado reefs more seasonally and their population does not increase in time. High volumes and more complex reefs got higher specific richness and mean biomass than the smaller reefs. They present similar dynamics and trophic composition oftheir fish population. The type of reef has more influence on the assemblages' characteristics than the location within 'villages' or 'functional connections'. The population is quite homogenous at the scale of the ARs concession. The quantitative results collected could be useful to identify the most efficient solutions to support Mediterranean coastal fish resources.

Session 4: Integrated approaches and communities restoration processes.

Educating for an integrated management of coastal zone: an example of a course initiating to an applied multidisciplinary approach

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Keywords: *Coastal zone, global management, education, multidisciplinarity.*

Abstract:

The growing utilisation of coastal zones has become for our societies a priority problem, which requires a multidisciplinary approach. A related question is : *How can we educate for a global management of these zones?*, and there is a temptation to answer that a quasi-encyclopedic knowledge is needed.

The French curriculum for "agronomist engineers", through multidisciplinary education prepares to a wide range of jobs related to agro-food sector, environment and life sciences. We include coastal zones in that wide scope for several reasons: water quality, as marine waters are the final receptacle of continental watersheds; food production, as coastal zones are place for marine aquaculture and fisheries; management of natural sites, both on marine and land sides; public policies, including ICZM.

We created in 1997 a course about coastal zone as part of second year of curriculum (Master course, 1st year), to initiate future agronomist engineers to a multidisciplinary approach applied to integrated management of coastal zone. The shortness of the course (150 h) obliges to select clearly education skills: we give a large role to application, through a case study with field work (5 weeks among 6), each year in a new zone; the course uses knowledge and methods taught in common core, completed by specialized lectures (24h). The students, by groups of 4, investigate subjects chosen as the main questions for coastal zone management in the studied region. Interestingly, the selected subjects along the 19 editions show evolutions linked with those of the key questions on French coastal zones.

Session 4: Integrated approaches and communities restoration processes.

Applied Sciences on Fisheries Management and Ecology in the Mediterranean Sea: concrete actions on marine ecological engineering by STELLA MARE Platform

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Keywords: *Stella Mare Platform, Fisheries management, ecology, Mediterranean sea*

Abstract:

The decrease of marine biodiversity is dramatic in the world but particularly in the Mediterranean Sea, according to the assessments of the Census of Marine Life (Coll and al., 2010, PlosOne). In this global context of recurrent fish stocks over-exploited, biodiversity loss and global deterioration of sea environment, the University of Corsica (France, Corsica Island) implemented since 2011 a fishery platform STELLAMARE (Sustainable TEchnologies for LittoraL Aquaculture and MArine REsearch) specialized in marine and coastal ecological engineering. This structure with the support of fishing professionals and specific European funding, allows to initiate in France direct actions in favour of responsible fishing, sustainable aquaculture and restoration of damaged ecosystems. This innovative concept involves a network of researches working in different areas such as ecology, biology, fisheries, aquaculture, hydrodynamic modelling, in an objective of sustainable economic development while preserving the most of fishery resources and marine biodiversity. Advances on these concrete actions will be presented and discussed in the meeting through different examples of applications on: *(i)* Ecological restoration on overexploited stocks (Sea urchin *Paracentrotus lividus*, Mediterranean red lobster *Palinurus elephas*, European oyster *Ostrea edulis*), *(ii)* Reduction of the marine biodiversity loss (using Mediterranean fish post-larval stages, creation of artificial nurseries and habitats), *(iii)* Environmental management models for PMAs (post-larval dispersion models), *(iv)* Diversification of the targeted species for fishing (European lobster *Homarus gammarus*) and aquaculture (Mediterranean Fish *Dentex dentex*, European oyster *Ostrea edulis)* and *(v)* poly aquaculture.

Session 4: Integrated approaches and communities restoration processes.

Jakarta Bay Reclamation and its impact on coral reefs resiliency

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Keywords: *Coral reefs, Jakarta bay, reclamation, seawall, socio-ecological resilience.*

Abstract :

Jakarta Bay, a semi enclosed sea in the north of Jakarta which has many fertile coral reefs is now facing threats from many activities especially the development / reclamation of 17 isles along the coast. Regarding this factansocio-ecological study concerning implication of level construction and reclamation against coral reefs in Jakarta Bay was carried out. This study focus on C-D and G sites, the new reclaimedisles. The results showed that the quality of waters conditions werenot significantly decreased, presumably because parts of the pollutants and nutrients have been trapped / deposited in the canals between reclaimed. Howeverthere were a significant death (20%) of coral reefs recorded after the reclamation started. This condition was quickly exploited by turf algae and dominated about 80-90% .The impacts had been also shown by a dominancy of coral reefs eaters, planktivor and omnivore fishes. As for thecoral, therecruitment is rare only 1-2 coral juvenile found in each transect. The social condition however is slightly better, probably because many poor local fishers and mariculturist are now find new jobs as isle cleaner and tour guide / boat driver This of course impact on the livelihood of the coastal community. In sum ecological resilience of the Jakarta slightly increased one year after reclamation started, while the social resilience was decreasing.

Forum

Salle des Actes

Opening Speech: Future ways of cooperations between the two Sociétés franco-japonaises d'Océanographie

Salle des Actes
Tuesday the 7th of November from 4:15 pm to 4:45 pm

Hubert-Jean Ceccaldi

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Keywords: *Cooperation, France, Japan, Oceanography, SFJO*

Abstract:

The economic models structuring the world in which we live are not any more adapted to the contemporary situations: they set to the humanity immense challenges.
It is essential to have a better knowledge of the marine ecosystems, by using new technologies of measures *in situ*, estimated partially by oceanographic satellites by new means of techniques and integrated into a global multi-data computer system, leading to a true management of natural resources.
The problems with which we are confronted today are multiple:
- Renovation of the modes of exploitation of the coastal natural marine resources
- Importance of the fish farming in the supply of marine products
- Concrete evaluation of the consequences of the global warming and the rise of the sea level
- Better knowledge of the pelagic ecosystems and the deep oceans ecosystems
- Reasonable artificialization of sea shore marine environments by ecological engineering
- Obligation by law to create marine habitats for marine species in any construction in the sea
- Return to a good quality of sea water in particular towards wastes and plastics
- Use of the marine energies well integrated in the marine environments and their ecosystems
- General application of the Japanese concepts of sato-umi to fishery cooperatives and fishers villages
- Implementation of teachings and developing really multidisciplinary researches
- Essential necessity of regulating the huge actual increase of the world population
- Study of the links of traditions and religions in the exploitation of the marine resources
- Renewal of the maritime law, based on new relationships between Nature and Society

Our final and common goal is to integrate strongly in a very deep way the human activities into the functioning of the ecosystems in which the man lives.
We are very confident in the quality of the long-standing scientific and friendly exchanges with our Japanese colleagues, academics, public and private researchers and their French counterparts.

Session F1: Socio-ecosystem resilience to global change

Session F1

Salle des Actes
From Tuesday the 7th of November at 4:45 pm to Wednesday the 8th of November at 9:45 am

Session F1: Socio-ecosystem resilience to global change

Session F1: Socio-ecosystem resilience to global change

The effects of land subsidence and uplift on intertidal mollusks following the 2011 Great East Japan Earthquake.

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Keywords: *mollusk, earthquake, tsunami, liquefaction, subsidence, uplift, disturbance, tidal flat*

Abstract:

The Great East Japan Earthquake that occurred on the 11th March 2011 caused a great deal of damage to the organisms that inhabit the coast of the Tohoku district of Japan. In this paper, we mainly focus on the earthquake's impact on bivalves that inhabit the sandy intertidal zone, with specific emphasis on the long-term effects of land subsidence and uplift. As previous studies have not discussed the details of the separate physical events of this type of natural disaster, this study divided it into four main events; the initial earthquake including liquefaction, subsequent tsunamis and following land subsidence and uplift. During the liquefaction period, bivalves were brought to the surface with jets of water and were then swept away by the tsunamis. The tsunamis have also contributed to dispersion of benthic organisms. For example, the redistribution of oysters across the mud bottom increased their range. In addition to these events, land subsidence resulted in marked changes to the vertical position of the intertidal zone. These large changes in the physical environment cannot recover in the short term and the re-adjustment of tidal communities is expected to take several decades. However, land subsidence has also formed new intertidal zones, which will ultimately promote the colonization of various organisms. These disturbances to the ecosystem have destabilized these bivalve species resulting in fluctuations in abundance and community structure for at least six years following the earthquake. Finally, continual monitoring studies are needed to understand the ecological impacts resulting from the earthquake.

Session F1: Socio-ecosystem resilience to global change

MAREA: a cross-border research project to improve coastal risks management in the Basque Country

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Keywords: *coastal risks, erosion, submersion, prevision, extreme wave, hydrodynamic model, alert tool, decision-making.*

Abstract:

Basque coast has a geomorphological and hydrodynamic coherence that generates identical processes of submersion and erosion on both sides of the border (Spain and France). After the disasters caused by the storms of 2013 and 2014, Basque authorities need to improve local knowledge about coastal risks (erosion and submersion) in order to optimize citizen's and infrastructures protection when a storm is coming.

Today, several official tools to predict coastal risks exist. However, they deliver alerts on a large-scale of Bay of Biscay, which is not precise enough to define safety campaigns. Therefore, the members of the Scientist Interest Group (GIS) Littoral Basque, including local authorities and scientific structures from the bask coast, have created the cross-border research project MAREA (POCTEFA – FEDER) in order to develop locals and operative alert tools capable of predicting erosion and submersion processes on local beaches scales in seven littoral cities, from Bermeo (Spain) to Anglet (France).

Partners of MAREA are working to develop monitoring systems, being able to measuring in real time the extreme hydrodynamics conditions, from the high-sea to the shore break zone at high frequency. They will analyze these innovating data to implement them in very high-resolution coupled wave-hydrodynamic models, which will predict the impacts of a storm on Basque coast beaches and cliffs, and help decision-making.

Furthermore, the partners of MAREA realize geophysics campaigns in order to analyze the dynamics of the sedimentary stocks (before, during and after a storm), to define recommendations about coastal and sedimentary management.

Session F1: Socio-ecosystem resilience to global change

Characterisation and impacts of the 2013-2014 winter storm events on the Aquitaine coast (SW France).

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Keywords: *Winter storm, characterization, impact, Aquitaine coast, France*

Abstract:

With more than 20 storm events in 4 monthsalong the Aquitaine coast, the 2013-2014 winter is considered as the most energetic within the last 50 years, considering wave parameters.

Important erosion coastline erosion occurred in consequence along the 270km monitored by the Aquitaine Coast Observatory using LiDAR and DGPS surveys.Contrasting with the mean erosion rate of 1-3m/y along the sandy coast, mean peaks of retreat were 10-20m during this winter, reaching more than 40m in several places.

Since 2015, normal atmospheric and oceanic conditions allow natural sediment accretion on most of the Aquitaine beaches and fore-dunes.

Four years after, the feedback experience of this winter allows us to improve our scientific expertise in destination to coastal managers, such as: the storm event characterization process (ie: multi-parameters and statistical approaches combining wind, wave, water level…), storm impact quantification on sandy beaches and rocky cliffs; evaluation of coastal resilience (ie: fore-dune reconstruction), quantification of uncertainties, etc.

Session F1: Socio-ecosystem resilience to global change

The quality of coastal waters in Nouvelle-Aquitaine

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CESER Nouvelle Aquitaine

Keywords: *Coastal waters, quality, Nouvelle-Aquitaine, France*

Abstract:

CESER, one of the assemblies of regional economic, social, and environmental councils of France, turned whistle-blower as it gave a thorough overview of the state of Nouvelle-Aquitaine's coastal waters. With hopes for a positive future, CESER proposed an action plan in light of the challenges highlighted. Although human health has not been harmed in the short term, CESER raised concerns regarding the medium- and long-term effects of micropollutants, agrochemical products, and hormones, and the cocktail effect they create. There are also more pressing concerns regarding the health of ecosystems and environmentally-based economic activities (shellfish farming, fishing, tourism, etc.).
It is the responsibility of the State, coastal communities, and inland coastal communities to get a handle on water quality, especially by planning water sanitation, preserving wetlands, and managing soil sealing. CESER has proposed 5 measures:

- **Monitor the health of coastal ecosystems**

Establish procedures for measuring, monitoring, and evaluating the functionality of coastal ecosystems, paying special attention to the biological quality of coastal waters.

- **Advance knowledge on micropollutants and their impact on ecosystems**

Support Research and Development focused on advancing knowledge on pollutants and emerging substances (hormones, nanoparticles, medicinal products, endocrine disruptors, etc.), as well as their combined effects (cocktail effect).

- **Consult with various end-users to ensure that fresh water is provided and establish local action plans**

Set up an integrated water resources management system by involving professionals in both the shellfish and fishing sectors in water management authorities.
Follow and reinforce the agricultural sector's efforts to change its practices in order to preserve the quantity and quality of water resources.

- **Anticipate nuisances and contaminations**

Implement preventative policies and measures(limit the negative effects of dredging and excavation operations) and back innovations in the water treatment and water recycling sectors.

- **Increase knowledge of and information on the coastline**

Build a sharedculture around the coastal and marine environment (information, education, etc.) and promote access to and use of existing data on coastal water quality and biodiversity.Marine naturalparks (*ParcsNaturelsMarins*) should play an important role in this.

Session F1: Socio-ecosystem resilience to global change

Session F2: Integrated management approach and adaptation to the factors of change

Session F2

Salle des Actes
Wednesday the 8th of November from 9:45 am to 3:45 pm

Session F2: Integrated management approach and adaptation to the factors of change

Session F2: Integrated management approach and adaptation to the factors of change

Marine Pelagic Mucilage on the French Basque Coast area: causes, consequences and trends.

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Keywords: *French Basque Coast area, marine pelagic mucilage, fisheries*

Abstract:

Fishermen of the French Basque coast observed for many years the presence of a viscous substance locally called "Liga", occasionally clogging their fishing nets, mainly in late winter / early spring and late summer / early fall. Since the mid-2000s, the phenomenon has become more pronounced and persistent throughout the year.

Between 2010 and 2013, a study combining professional fishermen of the Basque coast made it possible to identify the periods and zones of appearance, to make a first description of the phenomenon and to carry out the bibliographic research necessary to construct scientific hypotheses of a research program. Since April 2013, a program of research has been carried out in order to identify the mechanisms triggering the formation and evolution of this phenomenon.

Unbalanced nutrients inputs characterized by high *N/P* ratios cause a *P* limitation primary production. Mucilage events are associated with an increase in phytoplankton biomass and abundances and especially with the micro phytoplankton size-class, dominated by diatoms. The dominant species are *Leptocylindrus danicus*, *Chaetoceros sp.*, *Pseudo-nitzschia sp*. and *Cylindrotheca closterium* which are known to be involved in Extracellular Polysaccharidic Susbtances (EPS) secretion under nutrient stress conditions.

The decline in fishing yields, the deterioration of fishers' working conditions and certain skin problems and a decrease in phytoplankton diversity are the main consequences observed locally.

Finally, the construction of a hydroclimatic index and the analysis of its historical evolution may partly explain the acceleration of the phenomenon in recent years.

Session F2: Integrated management approach and adaptation to the factors of change

Comparative study of the work environments of fishermen between France and Japan: comparisons of statistics and some fishing boat images

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Keywords: *work environment, fishermen*

Abstract:

The decrease and aging of fishermen are serious problems in Japan, and the similar problems will possibly occur in France. Comparison of the status of the fishermen in each country will contribute to promote mutual understanding of both countries and to find some hints or solutions to recover or prevent from the problems. In this study, we compare the statistics data concerning the trends of fishermen population and aging. Some specific images of fishing boats in both countries are also compared to facilitate the understandings of the working situations of fishermen.
(This study is implementing as a part of the projects in French-Japanese Ocean Development Sub-Committee, Ministry of Education, Culture, Sports, Science and Technology, Japan)

Session F2: Integrated management approach and adaptation to the factors of change

Integrated Ecosystem management for exploited coastal ecosystem dynamics under oligotrophication

Masakazu Hori, Franck Lagarde, Mitsutaku Makino, Valérie Derolez, Juri Hori, Marion Richard, Masaaki Sato, Sandrine Vaz,

Abstract:

"Global environmental change and recent coastal managements have gradually and successfully decreased nutrient contents of coastal waters in some regions. However, some stakeholders suggest that the improvement in water quality is now causing another issue in coastal ecosystem services called oligotrophication. Oligotrophication has especially reduced pelagic productivity in coastal ecosystems, sometimes resulting in the decrease of fishery catch because coastal fisheries had been adapted to the previous eutrophic environment from 1970 s to 2000 s. For example in Seto Inland Sea, Japan, most of the recent fishery-target species are pelagic fishes and their predators derived from pelagic production. Bivalve rafted-culture, typical in offshore areas, has been prospering with eutrophication. In France, oligotrophication has been recently apparent and caused various concerns about oyster culture productivity. In this context of change, improved knowledge in regard to oyster growth, somatic condition index and recruitment process is urgently required to support sustainable farming. In contrast, oligotrophication with higher water transparency may enable the recovery of benthic primary productivity including seagrass vegetation, which is a quite important for climate change mitigation and adaptation such as carbon storage and protection from sea-level rise and storm surges. The recovery of these ecosystem services has been also welcomed by other stakeholders concerned with environmental issues. There is therefore a need to balance sustainable coastal fishery and environmental conservation to maximize the human-well-being in coastal areas. Our collaboration aims to test the influence of nutrients loading decreases on ecosystem functions, ecosystem services (fishery, shellfish culture, seagrass) and Human well-being in the Thau lagoon and in Seto Inland Sea. This collaboration will be carried out by Japan and French researchers using an inter-disciplinary approach among ecological, psychological and social dimensions."

Session F2: Integrated management approach and adaptation to the factors of change

The innovation and adaptation of culture technique on the recent oyster-culture in Japan

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Keywords: *Aquaculture, adaptation, tsunami, Japan*

Abstract:

The oyster production in Japan has been reducing due to the shortage of seed oyster and reduction of culturing facility after the Tsunami disaster in 2011. Contrary, Japanese consumer tends to look for occidental style raw oyster served in half shell besides traditional cooked oyster. This trend triggered demands for high quality oyster and local characteristic rich oyster. While the shucked oyster distribution for the mass retailer is decreasing, proportion of the shelled oyster shipping is increasing expecting its high price without shucking labor.

In the recent years, efforts to establish local brand of oysters based on diverse characteristic have been started at each local oyster producing area under intense collaboration among oyster growers, fisheries cooperatives and local government.

Here, we introduce the latest innovative oyster culture technique and the case of efforts targeting to diverse trends of consumers.

The main innovation points in Japan oyster culture concern:

i. Single seed oyster : shape of the shell,
ii. Intertidal zone culture : hard shell, resistance in the air, quality of taste
iii. Virgin oyster : taste
iv. Culture in Claire: quality of taste like Marennes (Hiroshima Pre.)
v. Total managements of culture areas : Sato-Umi(Okayama Pref.) and forest management (Miyagi Pref.)
vi. Abyssal sea water treatment and culture : pathological control
vii. Collaboration of hanging technique with Etang de Thau (Kyoto Pref.)
viii. Species
    a. Iwagaki: *Crassostrea nippona*
    b. Historical species, Shikame or Kumamoto: *Crassostrea shikamea* Suminoe: *Crassostrea ariakensis*
ix. Regional Brand oysters
x. Marketing management Association)

Session F2: Integrated management approach and adaptation to the factors of change

Restoration support for the Tsunami-hit oyster farming at the Karakuwa district, Miyagi Japan, contributing to rational fishing ground management

Masanori Hatakeyama

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Keywords: *oyster farming, restoration, tsunami, Karakuwa district, Miyagi, Japan*

Abstract:
The Great East Japan Earthquake and consequent tsunami in March 11th, 2011destroyed the Northern Pacific Coastal fisheries. It caused 10,455 dead, 1,297 missing and a total of over 9 trillion-yen damage in Miyagi Prefecture (68 billions €). In the Miyagi Fisheries Cooperative Association (MFCA), there were 392 dead members, 5,341 housing damage, 35 billion-yen of total damage. In Karakuwa District, 640 fishing vessels have been washed away among a total of 960.

Although the oyster farmers in the evacuation facility have been left in their devastated condition, we tried to persuade them to start quick restoration for early recovery of oyster farming. Because of this earlier decision, Karakuwa district was chosen to be the first area to benefit from the support offered by the MFCA oyster farmers in Hiroshima Prefecture, the largest oyster producing competitor.Since their support was not only about farming equipment but also about site operation, they efficiently contributed in setting up new facilities and preparing the foundations for restarting oyster farming in the district.

As the fishing ground disappeared with the tsunami, weonly restarted 30 % of the former raft systemavoiding the too crowded condition of 2,000 rafts before the tsunami. The remaining 70% of wooden raft was devoted to long line-system. Although these improvements have been achieved by collective work from all the members of the MFCA Karakuwa branch,it is the latter which allocated the farming areas depending on individual competence, household economy and physical labor.It was then agreed to adopt the following objectivesfor the next 20 years:

1. All members should establish the Karakuwa brand products from new fishing ground.
2. Utilization of the delimitated fishing ground should be maximized rationally.
3. Every sale of the products should be undertaken through MFCA.
4. Hanging culture rope length, number on each raft, and spacing should be standardized.
5. In regard to these objectives, fishing ground allocation could be confiscated if the 3rd year is considered to be insufficient.

Although it was a big difficult to procure the farming equipment,a lot of support coming from domestic volunteers, France and other countries, strongly encouragedthe production which recovered to the previous level. Human exchanges through such restoration support

changed our mind with the feeling that fishing activities were really considered by so many people who came to help us. We will deepen our further engagementin fisheries development through an attitude of‘learning by doing’.

Session F2: Integrated management approach and adaptation to the factors of change

Reviving the Seto Inland Sea, Japan: coastal environment restoration and ICM (Integrated Coastal Management) implementation in Bizen City

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Keywords: *Coastal environment restoration, integrated coastal management, Okayama Prefecture, Japan*

Abstract:

Hinase Town of Bizen City is located in the southeastern part of Okayama Prefecture, Japan. Hinase's coastal areas provide highly productive fishing and farming area for small-scale fisheries such as trawl, set net, drift net, and oyster farming. The Hinase Town Fisheries Co-operative has led the activities of "Satoumi" creation, and attracting wide attention of interested people. Their activities can be divided into three categories: 1) restoration of eelgrass bed, 2) marine ranching and establishment of rules to regulate the use of coastal waters and 3) environmental education for elementary and junior-high school students by focusing on eelgrass bed restoration and oyster farming. These continual actives that spent more than 30 years have revived almost extinct eelgrass beds to 250 ha rich habitat in 2015. The national convention on the eelgrass beds restoration (Eelgrass Summit 2016) was held in Hinase Town in June, 2016, and approximately 2000 people gathered from the whole country. With the success of that Summit, a council for Bizen City's ICM promotion has been established in February, 2017. The Hinase Town Fisheries Cooperative played a key role on the establishment. Various stakeholders such as farm co-op, forestry owners' association, commercial and industrial organization, association of tourism, ceramic artists of the traditional Bizen ceramic ware, cooks, culture facilities, researchers and educational sectors were connected and started active conversation on "satoumi-satoyama" branding toward a bright future of the Bizen city as a whole.

Session F2: Integrated management approach and adaptation to the factors of change

Session F3: How to preserve the resilience of traditional activities in a context of global change-

Session F3

Salle des Actes

From Wednesday the 8th of November at 4:15 pm to Thursday the 9th of November at 11:45 am.

Session F3: How to preserve the resilience of traditional activities in a context of global change-

Session F3: How to preserve the resilience of traditional activities in a context of global change-

Regional scheme for the development of marine aquaculture (SRDAM) and access to new farming sites on French Mediterranean coast

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Keywords: *SRDAM, new farming sites, Mediterranean Sea*

Abstract:

In France, the absence of further development of marine fish farming over the last 20 years has been attributed to regulatory constraints, and to the difficult access to new farming sites, due to high competition between different uses in the coastal zone and the shortcomings of governance in these areas. The Regional schemes for the development of marine aquaculture (SRDAM[1]) have been introduced by the French Law on modernisation of agriculture and fisheries (LMAP[2], 27th July 2010). The goals of SRDAM are to make an inventory of existing aquaculture sites and to identify potential sites suitable for aquaculture, and to conciliate the development of marine aquaculture with other coastal activities. As a tool for spatial planning, that is expected to allow access to new fish farming sites.

Our study focus the three SRDAM on French Mediterranean coast, in order to investigate to which extent the SRDAMs offer opportunities for a new development of marine fish farming. Based on desk work and on inquiries with professional representatives, administration and experts, it aims to characterize these opportunities, as for available space, possible production increase, concerned companies, and to analyze the constraints to an extension of marine fish farming allowed by these new tools. The role of SRDAM in the on-going process for coastal zone spatial planning, in French and EU policies, is also considered.

This study is part of the European research program SUCCESS.

[1] *Schéma régionaux de développement de l'aquaculture marine*

[2] *Loi de modernisation de l'agriculture et de la pêche.*

Session F3: How to preserve the resilience of traditional activities in a context of global change-

Japanese-types of MPAs and self-organized MPAs by local communities in Japan

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Keywords: *MPAs, Basic Plan on Ocean Policy, Basic Act on Ocean Policy, Marine Biodiversity Conservation Strategy of Japan*

Abstract:

In terms of measures with regard to the Oceans of Japan including conservation of marine biodiversity, Basic Plan on Ocean Policy based upon Basic Act on Ocean Policy was formulated in 2008 being updated at intervals of five years. Including this plan, Marine Biodiversity Conservation Strategy of Japan (2011), which was formulated in response to Convention on Biological Diversity, promotes establishment of Marine Protected Areas (MPAs). These MPAs aim at not only the conservation of marine biodiversity but also ensuring the sustainable use of marine ecosystem services.

The MPAs are often called “Japanese-types” due to the unique concept incorporating the method of fishery resource managements by bottom-up approaches that has been traditionally implemented in many coastal areas in Japan. One of them is an area of "a common fishery right" under Fishery Act that partly entrusts a management of fishery resources in its own area to a local fishermen’s cooperative.This Japanese-type of MPAs through the autonomous management by fishermen seem to realize an adaptive management of fishery resources with a flexible manner. In addition to the purpose of conservation marine biodiversity,advanced areas such as Tsushima Island, Sekisei Lagoon, Shiretoko Peninsula etc. have been preparing to establish self-organized MPAs by local communities considering issues in marine environments based on such traditional management methods and scientific knowledges through cooperation among local fishermen, local governments, local citizens and scientists.This communication will introduce Japanese-types of MPAs and some examples of self-organized MPAs in Japan.

Session F3: How to preserve the resilience of traditional activities in a context of global change-

Valuation of ecosystem services and identification of conservation and fisheries management activities protecting those services in Sekisei Lagoon, southwest Japan

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Keywords: *Ecosystem service, Economic valuation, Coral reef fish, Marine protected area*

Abstract:

Valuation of ecosystem services can indicate the importance of sustaining and enhancing the ecosystems. The Sekisei Lagoon is one of the largest coral reefs in Japan and provides various ecosystem services. This study calculated the spatial distribution of values of provisioning (food and aquarium fish provision) and cultural services(opportunity for recreational diving) and that of quantity of regulating service (seaweed regulation by herbivory) in Sekisei Lagoon based on the distribution patterns of coral reef fishes (Chaetodontidae, Pomacanthidae, Pomacentridae, Scaridae, and Siganidae) there. In addition, we estimated the spatially protected proportions by current conservation and fisheries management activities of each service. The total values of aquarium fish provision and opportunity for recreational diving in Sekisei Lagoon are ¥ 14.5 billion (US$ 130 million) and ¥ 35.5 billion (US$ 317 million), respectively, while that of food provision is only¥ 1.35 billion (US$ 12 million). Both provisioning services show higher values in the southern part, while cultural service for recreational diving shows higher values in the middle-western part. The quantity of regulating service is higher in the western part. Regulation of fisheries gears by Okinawa prefecture is protecting almost all the spatial proportions of three ecosystem services (92–100%), while national marine parks protecting higher proportions only of provisioning and cultural services (80–86%). Extermination of crown of thorns starfish by NPO and marine reserve of fish spawning area managed by local fisherman union are protecting lower proportions of each service (4–36%). (242 words)
(1 US$ = ¥ 111.83 on May 25, 2017).

Session F3: How to preserve the resilience of traditional activities in a context of global change-

French marine nature parks: an innovative tool for integrated management of maritime space

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Keywords: *Marine nature parks, integrated management of maritime space*

Abstract:

Marine nature parks are amongst the 15 French MPA categories listed by the law of April 14, 2006. Their aims are to contribute to the protection and knowledge of the marine environment, but also the sustainable development of maritime activities. Objectives of a marine nature park are defined in a management plan adopted for a period of 15 years, whose development requires a broad consultation of the local stakeholders in a co-construction dynamic. These objectives concern a wide range of subjects related to natural and cultural resources, as well as spatio-temporal coexistence between activities or contribution to the maritime economy.

Based on its recently approved management plan, the Marine nature park of Bassin d'Arcachon will present the various objectives set for the cohabitation between activities within its perimeter, whether professional or recreational, traditional or more recent. The different levers that can be activated to achieve these objectives will be addressed, partly relying on examples from other marine nature parks. Finally, the governance of the marine nature park will also be outlined. Represented by the management board, the local governance is characterized by its atypical composition which mobilizes and empowers stakeholders from local, state department, professional, user, associative and scientific sectors around the implementation of the management plan. Thus, this implementation rests on the convergence of efforts of public and private actors to achieve long-term objectives co-constructed and shared by the territory.

Session F3: How to preserve the resilience of traditional activities in a context of global change-

Development of Coastal Management Method to Realize the Sustainable Coastal Sea

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Keywords: *Japan, development of Coastal management, Seto Inland Sea, Sanriku Coastal Sea, Japan Sea's coastal Sea*

Abstract:

The Ministry of Environment, Japan has begun the new research project "Development of Coastal Management Method to Realize the Sustainable Coastal Sea" (2014-2018, PI: T.Yanagi) in 2014. This project aims to propose the suitable ICM (Integrated Coastal Management) for realizing the sustainable coastal community. Three research fields (Seto Inland Sea as semi-enclosed coastal sea, Sanriku coastal seas for open character coastal sea and Japan Sea's coastal sea where the international management is necessary) are selected to clarify their natural characteristics from the viewpoint of physical, chemical and biological oceanography. Social and human scientists are also included to this trans-disciplinary project in order to clarify the economic and cultural aspects of the sustainable coastal community. We will develop the integrated numerical model which is useful for the policy decision in the coastal areas.

Session F3: How to preserve the resilience of traditional activities in a context of global change-

Modern Satoumi approach to an open *rias*-type bay, Shizugawa Bay, Sanriku Coast, Japan after the hit by the huge tsunami in 2011 for realizing sustainable environment and prosperous aquaculture

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Keywords: *Satoumi approach, Shizugawa Bay, Sanriku, Japan*

Abstract:

Rias-type bays are one of the most common coasts in Japan where aquacultures have been active due to sheltered geological shape with a deep bottom. The huge tsunami hit Sanriku Coast consisting of open rias-type bays near the epicentre facing Pacific Ocean on 11 March 2011. For recovering Sanriku Coast, it is important to include sustainability in its program. Satoumi is defined as the human use and management of coastal seas for high productivity while maintaining high biodiversity and sound marine environments, which have been achieved with traditional use of the coastal waters by local people in Edo period. Therefore, we proposed modern Satoumi approach to an open rias-type bay, Shizugawa Bay, in southern Sanriku Coast. We conducted scientific researches on mapping of coastal habitats and aquaculture facilities, hydrography, and material flows of nutrients, a minor element (Fe) and organic matters in the bay including those from the rivers and from the offshore waters. At the same time, Committee for Shizugawa Bay Management of Fishermen's Cooperative of Miyagi Prefecture decided to decrease in aquaculture facilities for sustainable development of aquaculture. Oyster culture obtained Aquaculture Stewardship Council's certificate in 2015. Based on these data, a physical-biological coupling model was used for calculating the number of aquaculture facilities that are suitable not only for yields but also for environments. These researches were established on strong collaborations among a fishermen's' cooperative, local governments and scientists. Results of this practice may help to realize sustainable coastal use of a rias-type bay.

Session F3: How to preserve the resilience of traditional activities in a context of global change-

Une marée noire en Méditerranée: Risques, réponses, impacts.

Bernard Tramier

Membre de l'Académie des Technologies- Président d'Honneur du Comité Stratégique du CEDRE

***Keywords**: mer Méditerranée, marée noire, effets, impacts, remédiation*

Abstract:
La Méditerranée est une mer chaude, fermée mais alimentée par quelques grands fleuves. Il y a peu d'exploitations offshores mais elle concentre 30% du trafic mondial d'hydrocarbures. Peu d'accidents ont été recensés : le plus important remonte à 1991 en Italie avec l'accident du pétrolier Haven (144 000 tonnes déversées), le précédent datait de 1976 en Grèce avec un déversement de 102 000 tonnes.
En revanche la Méditerranée souffre de nombreuses pollutions chroniques, mais grâce aux efforts technologiques (ballasts séparés par exemple) et juridiques (poursuites et peines plus lourdes), ces rejets sont en régression. Individuellement ce sont de faibles quantités, mais globalement cela devenait important.
Une fois répandu en mer un pétrole a tendance à s'étaler, à s'évaporer (plus de 40% en moins de 48 heures), à s'émulsionner, à se dégrader. Dans de rares cas il peut s'enflammer. Les moyens d'intervention sont les mêmes quel que soit le lieu de déversement :

- En mer on privilégie les barrages flottants, les récupérateurs, les produits dispersants.
- Sur les côtes, on a recours aux produits absorbants, à des agents de biodégradation et à des lavages sous pression selon la nature des côtes.

Il est a priori difficile de dire quelles seraient les conséquences d'un déversement important en Méditerranée car il y a peu de retours d'expériences, on ne s'en plaindra pas. Par rapport aux océans la Méditerranée présente des avantages et des inconvénients. Avec un taux d'oxygène plus bas, la biodégradation naturelle sera plus lente, mais avec une température plus élevée, le taux d'évaporation sera plus élevé. En outre comme les marées sont faibles en Méditerranée, l'impact côtier devrait être moindre, car on estime que, hors avifaune, 90% des impacts se situent dans la zone intertidale.
La Méditerranée dispose, du moins en France, de moyens d'intervention importants en cas d'accident. Ceux du plan Polmar mer sont situés à Toulon, pour le plan Polmar terre les moyens sont dans les divers départements et chaque commune littorale doit avoir un minimum d'équipements gérés par la Protection civile. De plus Total dispose de son principal stock d'intervention à Rognac et il pourrait évidemment être mobilisé. Enfin il existe aussi des stocks privés importants chez des fournisseurs à La Ciotat et à Cannes. Sur le plan international, il existe une coopération dans le cadre du Plan RAMOGE qui associe la France, Monaco et l'Italie, ainsi qu'un centre de formation et de coordination à Malte : le REMPEC. Mais il est certain qu'à ce jour pour la Méditerranée les moyens d'intervention se situent principalement dans la partie Ouest et surtout en France.

Session F3: How to preserve the resilience of traditional activities in a context of global change-

Fishing on foot on the west coast of Cotentin: a fishery issue
La pêche à pied sur la côte ouest du Cotentin : un enjeu halieutique

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Keywords: *pêche à pied, côte ouest Cotentin, France, enjeu halieutique*

Abstract :

La pêche à pied est une activité récréative traditionnelle sur les larges estrans découverts lors des grandes marées de la côte ouest du Cotentin (bassin occidental de la Manche). Une très grande diversité d'engins de pêches est utilisée pour pêcherles bivalves tels que la praire *Venus verrucosa* (Linnaeus, 1758), la palourde européenne *Ruditapes decussatus* (Linnaeus, 1758) et la palourde japonaise introduite *Ruditapes philippinarum* (Adams & Reeve, 1850). La praire, vivant sur les bas niveaux de l'estran (infralittoral), est pêchable uniquement lors de très grands coefficients alors que les palourdes vivant au niveau du médiolittoral sont accessibles toute l'année. Les effets à court-terme de l'utilisation de la fourche à cailloux sur la praire et du râteau sur les palourdes ont été étudiés pour évaluer l'impact de ces engins sur la macrofaune de ces milieux sablo-graveleux. Les impacts sont plus importants avec l'utilisation de la fourche que du râteau, les habitats infralittoraux apparaissant plus sensibles que les habitats médiolittoraux. Une cartographie de la distribution des palourdes (densités maximales de 20 ind.m^{-2} dans les zones les plus riches) a été réalisée sur un secteur de la côte ouest du Cotentin en 2015.Cette étude a mis en évidence la présence de quatre principaux noyaux d'abondance d'une superficie d'environ 10 km², soit 10% de l'estran. Egalement en 2015, un comptage des pêcheurs récréatifs a été réalisé dans le cadre du projet LIFE+ Pêche à pied avec une estimation comprise entre 1200 et 1400 pêcheurs par jour durant les 50 j de marée possédant un coefficient > 95. Une estimation des prélèvements par les pêcheurs à pied professionnels a permis de montrer que les prises (8 tonnes) sur ce secteur sont faibles par rapport aux prises par la pêche récréative (121 tonnes). Enfin le stock des palourdes (> 40 mm ; taille autorisée pour la pêche) a été estimé en 2015 à 382 tonnes (poids frais avec coquille) ; chaque année environ 1/3 du stock est prélevé pour une valeur marchande de 4 millions d'euros. L'avenir de cette pêche passe par un contrôle renforcé des pêcheurs récréatifs (respect de la taille des palourdes et du nombre autorisé de 100 individus par jour et par pêcheur), par des interdictions d'engins destructeurs de macrofaune au profit d'outils de pêche moins pénalisant. Enfin un essai de zone de repos biologique (retrait total de la pression par pêche) se met en place. Il sera l'occasion d'un travail multi-partenarial autour de la gestion de ce stock. Cette démarche sera riche d'enseignements en termes scientifiques (ressource et habitat, quantification de l'effet réserve) et de gestion (mise en place et réouverture de la zone de repos après reconstitution du stock.).

Session F4: Traditional management methods and professional know-how allowing to implement an heritage approach associating nature and culture

Session F4: Traditional management methods and professional know-how allowing to implement an heritage approach associating nature and culture

Session F4

Salle des Actes

Thursday the 9th of November from 11:45 am to 6:00 pm

Session F4: Traditional management methods and professional know-how allowing to implement an heritage approach associating nature and culture

Session F4: Traditional management methods and professional know-how allowing to implement an heritage approach associating nature and culture

The Eel restocking in France: an emergency measure to save the European Eel.
Le repeuplement en France, une mesure d'urgence pour sauver l'anguille européenne

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Keywords: *anguille européenne, Anguilla anguilla, repeuplement, restoration, France*

Abstract:

L'anguille européenne est une espèce migratrice très dépendante de la continuité de son écosystème. En déclin depuis plusieurs années, elle est menacée par de multiples facteurs de mortalité notamment la dégradation de son habitat: fragmentation des rivières (barrages, ouvrages hydroélectriques,…), pollutions de l'eau (polluants chimiques, perturbateurs endocriniens,…). De plus d'autres facteurs contribuent à fragiliser le stock d'anguille comme le braconnage, l'introduction du silure (espèce prédatrice envahissante) ainsi que la pêche professionnelle et amateur.

C'est pourquoi afin de la protéger, l'anguille européenne bénéficie d'un plan de gestion au niveau européen. En outre la restauration des habitats et de la continuité écologique, une mesure d'urgence est mise en place dans les différents Etats membres: le repeuplement.

Le repeuplement est un transfert de civelles (jeunes anguilles) des zones estuariennes vers des sites d'accueil, les habitats les plus favorables. Ce transfert fruit d'une étroite coopération entre pêcheurs, mareyeurs, scientifiques et services de l'Etat évite les mortalités liées à la migration. Le but est de contribuer à augmenter le nombre de géniteurs sains qui regagnent la mer.

En France, cette pratique est menée dans des conditions strictes et rigoureuses et accompagnée de suivis scientifiques sur plusieurs années. C'est pourquoi forte de son expérience, la pêche professionnelle française initie la création d'une association, le 17 juin 2010 afin d'assurer la coordination du programme de repeuplement national: ARA France.

Session F4: Traditional management methods and professional know-how allowing to implement an heritage approach associating nature and culture

The leptocephalus larvae/marine snow food-web theory: pros, cons and uncertainties after 20 years of investigations in the Indo-Pacific.
La leptocéphale et la neige marine comme ressource trophique : avantages, inconvénients et incertitudes après 20 ans d'investigations dans l'Indo-Pacifique.

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Keywords: *Leptocephali, eel, indo-Pacific, biology, marine snow, trophic web*

Abstract:

Since the epic Danish around-the-world oceanographic cruise to collect *leptocephali* in 1938-1939 led by Johannes Schmidt, the intertropical oceans have been known to host a high diversity and abundance of larval stages of anguilliform and elopomorph teleosts: the leptocephalus larvae. They all share striking morphological features: large eyes, a transparent laterally flattened-body with only a thin muscle-layer. Some species reach lengths of >30cm and ages of several months to > 1year. Leptocephali are part of the micronekton that is mainly found in the ocean epipelagic layers. Despite these common features, little is known about their diet. Direct observations of thousands of specimens show that the majority of their guts are seemingly empty, but instead contain an apparent paste that could be consumed organic matter. Currently the leading hypothesis is that marine snow provides most of this organic matter paste. Marine Snow is formed by the agglomeration of a wide range of biologically produced and discarded materials that slowly sink while being processed and recycled to nutrients by a complex ecosystem of microorganisms and direct consumers. We examine thehistorical and unpublished findings of an unprecedented research effort resulting from 4 research cruises conducted in the Southwest Indian Ocean in 2006 and 2010 and the South Pacific Ocean in 2013 and 2016 that used $\delta^{15}N$ and $\delta^{13}C$ isotopic ratios and fatty acid signatures in leptocephali and particulate organic matter (POM). We compared those biochemical tracers obtained from hundreds of leptocephali from 7 families to planktonic and micronektonic organisms and POM that contains marine snow. These results clearly show that all leptocephali seem to have a similar feeding ecology, which is at lower trophic levels than all micro-zooplankton, suggesting that they are part of thedetrital food web. However, the findings using $\delta^{15}N$ and $\delta^{13}C$ratios and fatty acid profiles that some taxa of leptocephali occupy different ranges of trophic positions in the lower food web, suggests there are mechanisms limiting competition for the same food sources or feeding depths. This identifies new research objectives to understand the role of soluble organic matter (i.e. TEPs) contained in the marine snow.

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Present situation from eel aquaculture to processing eel in Japan

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***Keywords**: Eel aquaculture, eel processing, Japan*

Abstract:

In Japan, Japanese eel, *Anguilla japonica* is used for aquaculture.Glass eel coming from offshore waters to a river mouth are caught in an estuary by a hand net and used as seedlings for feeding aquaculture in fresh ponds. Catch of glass eel was rapidly decreased from around 200 tons in 1950s to 25 tons in 1980s and is now around 15 tons. In November 2016, quantity of glass eel used for aquaculture was 19.6 tons in total with imported seedlings.Price of glass eel was 1,090,000 yen/kg (8000 euro/kg) in 2016 and 1,820,000 yen/kg (13500 euro/kg) in 2015. Although aquaculture eel production was about 40,000 tons at the peak year of 1989, it is recently around 20,000 tons. Principal countries of eel aquaculture, which are China and Taiwan produced 130,000 tons of eel in total in 2000 with use of glass eel of imported European eel, *Anguilla anguilla*. However, European eel was listed in Appendix II of CITES in 2007. Its trade has been banned since 2009. Japan consumes about 50,000 tons of eel in a year consisting of domestic production of 19,000 tons and import of 31,000 tons from China and Taiwan.

Businesses of Omori Tansui Co. consist of an eel aquaculture, a live eel transport and distribution, processing an eel bamboo grill and an eel restaurant management ranging from eel aquaculture to eating eel. This presentation introduces anoutline of the businesses, a manufacturing process of bamboo grilled eel with movie and products of the company. Please visit the following web site for understanding of our company: http://www.omori-tansui.co.jp/movie/

Session F4: Traditional management methods and professional know-how allowing to implement an heritage approach associating nature and culture

The red Tuna fishery in the French Mediterranean Sea : Trend and perspectives
La pêcherie du thon rouge en méditerranée française, évolution et perspectives

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***Keywords**: Thon rouge, pêcherie, Méditerranée, évolution, perspectives*

Abstract:

La pêche du thon rouge en méditerranée est une activité ancestrale, remontant à plusieurs milliers *d'années avant JC. Sur les côtes de méditerranée française, la pêche du thon rouge est largement* documentée. Capturé traditionnellement à l'aide de petites sennes tournantes, de filets ou à l'hameçon, la pêche du thon rouge a subi de nombreuses évolutions, conséquence de nombreux enjeux environnementaux, réglementaires et sociétaux. Au travers d'une présentation de l'évolution des techniques de pêches, des règlementations et des marchés, nous analyserons les atouts et les faiblesses de cette pêcherie qui concerne l'une des espèces marines les plus médiatisée au monde. Nous expliquerons comment en moins de 10 ans, cette espèce « porte drapeau »des organisations non gouvernementales est passée du statut d'espèce en voie d'extinction vers une « success story » dans le domaine de la gestion raisonnée des ressources marines. Enfin, nous aborderons l'avenir de cette pêcherie au travers d'initiatives innovantes menées par des professionnels pour répondre aux enjeux de sélectivité, de conservation et de promotion durable.

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How to reduce the impacts of the French Mediterranean longline fisheries on the megafauna: Preliminary results of the SELPAL/RéPAST projects

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Keywords: *longline, bycatch, megafauna, Mediterranean*

Abstract:

During the last decade, particular attention has been paid worldwide to the problem of by catch and discards in fisheries. Collaborative research between fishermen and scientists is important to fisheries management. Partnerships with commercial long line fishermen were developed to enable them to participate in two research projects in order to integrate their information, experience and expertise. These programmes, financed by the fishing industry and regional councils were designed to describe the activity of the fisheries, to assess the scale of fishery effects on the various *taxa*, to study the ecology and explore spatial population genetic structure in the western part of the Mediterranean Sea of the blue shark (*Prionace glauca*) and sting rays (*Pteroplatytrygon violacea*) and finally to propose mitigation measures to reduce impacts on elasmobranches, sea birds and sea turtles. Communication, education, post-implementation monitoring and long-standing collaboration are the key factors to success. This presentation shows the progress realized to date

Session F4: Traditional management methods and professional know-how allowing to implement an heritage approach associating nature and culture

Heterogeneous supports for valorization of fishery products: a comparative approach between the regional self-label GOLION and the international label MSC (Marine Stewardship Council).

Bertrand Cazalet

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Keywords: *Sustainability, management, small-scale fisheries, valorisation, labelling, comparative approach, local, international.*

Abstract:

Among the numerous mechanisms for the valorisation of fish products, the use of labels has developed significantly in recent years. The origin, content and scope of these labels, however, remain very variable and do not allow a homogeneous and coherent definition of these economic tools. To illustrate this diversity, the comparative analysis of two labels will highlight the differences between these two approaches, both conceptually, in implementation processes and in the expectations of their initiators and stakeholders. GOLION is an auto-label created by professional small-scale fishermen with the support of the Carasso Foundation. It has been growing since its launch in 2015 and its specifications aim primarily at preserving the optimal quality of products and highlighting the polyvalence of catches in the small-scale segment. GOLION has led to a significant improvement in economic performance for its members, a better understanding of the market in terms of technical and environmental constraints and their uncertainties in fishing operations. For its part, the MSC is an international, independent label, created in the 2000s and obeying an environmental reference system based on the sustainability of fishing practices, whatever the mode of exploitation used. The recognition process is relatively long, based on the evaluation of complementary criteria (indicators of stock status, environmental impact and management system), expensive and rather adapted to monospecific and industrial fisheries. The award of the label meets strict, uniform criteria and has post-certification consequences for the economic operators concerned.

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Kesennuma Bay in Japan: Nature and Culture
La Baie de Kesennuma (Japon): le milieu, la culture

Hiroyasu Yamauchi

Member of the steering committee of Slow Food Kesennuma, curator of the Kesennuma Museum

***Keywords**: Baie de Kesennuma, Japon, lien entre culture et nature.*

Abstract:

Rooted in this environment in the far distant past, the life of the inhabitants was organized around the sea. With the modernity, the anthropocentric development of this littoral zone radically modified the relation between people and sea.
What does "Living with the Sea" mean? I will address the question in terms of the answers to the problems that the tsunami left behind.

Enracinée dans ce milieu depuis un lointain passé, la vie des habitants s'est organisée autour de la mer. Avec la modernité, le développement anthropocentrique de cette zone littorale a radicalement modifié la relation des gens avec la mer.
Que signifie «Vivre avec la mer» ? J'aborderai la question au vu des réponses aux problèmes que le tsunami a laissés.

「気仙沼の風土と文化」

気仙沼の民ははるか昔から風土に根差し、海を中心とした暮らしを営んできた。
しかし近代以降、気仙沼地域では人間中心主義的な湾岸の開発が続き、民と海の関係は大きく変化した。
「海とともに生きるとは？」2011年の津波によって遺（のこ）された課題、その解決の方向性を論じる。

Session F4: Traditional management methods and professional know-how allowing to implement an heritage approach associating nature and culture

Baie de Kesennuma / Bassin d'Arcachon : Déterminations et perspectives similaires, cultures différentes

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Keywords : *Baie de Kesenuma, Japon, Bassin d'Arcachon, France, cultures.*

Abstract:

Ce qui frappe de part et d'autre c'est une aspiration commune : celle d'aller de l'avant, de (re)construire et d'évoluer dans le respect d'un environnement naturel et culturel. Ce qui fonde la *rencontre* d'acteurs des deux régions, c'est de découvrir l'approche culturelle à la résolution de chaque problème.

Session F4: Traditional management methods and professional know-how allowing to implement an heritage approach associating nature and culture

Support for the sustainable development of fisheries and aquaculture in New-Aquitania
Soutien au développement durable de la pêche et de l'aquaculture en Nouvelle-Aquitaine

Benoit Biteau

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Keywords: *Nouvelle-Aquitaine, FEAMP, Pêche, aquaculture, impact environnemental*

Abstract :

La Nouvelle-Aquitaine avec ses 720 km de littoral est une région tournée vers la mer. Les activités « pêche et aquaculture, ancrées dans le territoire, font partie du patrimoine maritime existant.Le poids économique de ces filières place la région à l'échelle nationale et européenne.
La Région est leader enostréiculture avec une reconnaissance mondialede ces bassins de productions.
La pisciculture continentale permet de mettre sur le marché plus d'¼ de la production nationale, avec un savoir-faire reconnu sur des productions de niche comme le caviar.
La pêche maritime en Nouvelle-Aquitaine est connue pour ses produits de qualité et sa diversité.
A travers sa politique, la Région soutient le développement économique durable de ces activités sur son territoire. Ce soutien se fait, entre autres via l'outil financier européen : le FEAMP. Son enveloppe FEAMP est de 26,6 M€ sur 2014-2020, soit la seconde enveloppe régionale. Cette enveloppe permetd'appuyer la politique régionale en soutenant les projets de création et de développement des entreprises, de modernisation des navires, et des ports de pêche, d'innovationet de R&D dans les domaines de la transformation halio-alimentaire, de l'algoculture ou encore dans la valorisation des co-produits…
Sur le volet environnemental, il s'agit pour la Région de soutenir les investissements visant l'efficacité énergétique et la diminution de l'impact environnemental.
Enfin, le développement de l'emploi et le renforcement de la cohésion territoriale sont également une mission délicate qui devra intégrer l'ensemble des acteurs du nouveau territoire.

COAST Bordeaux 2017 and the 17th French-Japanese Oceanography Symposium

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