Société franco-japonaise d'Océanographie

Ifremer

La mer

15ème Colloque franco-japonais d'Océanographie

"Productivité marine : perturbations et résilience des socio-écosystèmes"

« Marine Productivity: perturbations and resilience of socio-ecosystems »

Boulogne-sur-mer
17-18 octobre 2013

15ème Colloque franco-japonais d'Océanographie

"Productivité marine : perturbations et résilience des socio-écosystèmes"

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Résumés des communications orales et des posters

Summaries of oral communications and posters

La préparation de ce 15ème Colloque franco-japonais d'Océanographie n'aurait pas pu être réalisée sans la collaboration constante et très amicale entre la Société franco-japonaise d'Océanographie du Japon (fondée en 1960) et la Société franco-japonaise d'Océanographie de France (fondée en 1983).

Les deux Sociétés permettent à leurs membres, qui sont le plus souvent des chercheurs français et japonais, de mieux se connaître, de coopérer et de devenir des amis. Leurs réseaux d'échanges informels n'ont pas de prix, car ils permettent de tisser, de façon très souple, des liens efficaces et rapides entre réseaux d'équipes et de laboratoires. Ils conduisent d'ailleurs souvent par la suite à des collaborations plus officielles.

De nombreux organismes publics et privés ont justement mesuré l'intérêt théorique et pratique de telles rencontres et les ont toujours soutenues.

Aussi est-il très agréable d'exprimer ici notre reconnaissance aux organismes et aux personnes qui ont apporté une aide - inestimable - et leur soutien à notre entreprise.

Tout d'abord à l'Ifremer, au siège parisien de cet important organisme de recherche marine, au Centre Manche-Mer du nord, dirigé par M. Dominique Godefroy, ainsi que toute son équipe, au Centre Atlantique de Nantes pour la réalisation du site par Mme Catherine Coriou, sans oublier le Centre de Brest pour la réalisation des très belles affiches par Mme Sylvie Gros.

Nous sommes très heureux aussi de remercier ici, très sincèrement, le Conseil Régional de Provence Alpes Côte d'Azur, la Municipalité de Marseille, la Fondation franco-japonaise Sasakawa, la Commune de Boulogne-sur-Mer, la Région Nord Pas de Calais, l'Université d'Aix-Marseille, la Communauté d'Agglomération du Boulonnais, la Communauté urbaine Marseille-Provence Métropole, la Chambre de Commerce et d'Industrie de Boulogne sur mer, en particulier, pour leurs importantes contributions matérielles, ainsi que le C.N.R.S., l'Institut Pythéas, l'Institut méditerranéen d'Océanologie, l'aquarium Nausicaa à Boulogne sur mer, l'Institut Océanographique de Paris.

Nous n'oublierons pas le travail acharné des Comités scientifiques et d'organisation ainsi que des bureaux exécutifs dans chacun des deux pays ainsi que le dévouement de l'équipe d'accueil: MM. Georges Stora, Gérald Grégori, Marc Tédetti, Mme Emi Gueydan.

Les sujets scientifiques traités à ce 15ème Colloque sont tous d'une grande actualité: aires marines protégées (liens avec IMPAC 3) ; macro déchets ; produits radioactifs dans les réseaux trophiques après Fukushima ; conséquences écologiques du tsunami du Tohoku sur les écosystèmes ; conséquences des dragages en mer ; produits polluants dans les réseaux trophiques ; indicateurs biologiques ; milieux tropicaux ; sato-umi et prud'homies ; services rendus aux communautés humaines.

Ils devraient intéresser les communautés scientifiques, les structures de gestion, les organes de décision, les administrations des deux pays, car ces derniers seront de façon concrète, nécessairement confrontés aux problèmes soulevés dans les domaines cités plus haut et qui sont abordés, puis résolus de façon différente dans chacun des deux pays.

En cela, nos colloques présentent un intérêt majeur, car au delà de leurs caractères scientifiques et techniques, ils permettent aussi des approches sociales et culturelles fructueuses sans équivalent et d'un très grand intérêt.

Hubert-Jean CECCALDI *Teruhisa KOMATSU*

Présidents des deux Sociétés franco-japonaises d'Océanographie.

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Historical Perspective and Context

The Boulogne and Marseille conferences are co-organized by the two French-Japanese Oceanography Societies. These academic societies were separately created first in Japan (1960) at Tokyo University of Fisheries (nowadays called TUMSAT –Tokyo University of Marine Sciences and Technology-) and later in France (1984) based at Paris Oceanographic Institute. They both aim at promoting scientific exchanges between the two countries and hold since 1983 regular conferences alternatively in Japan and France. The last two conferences took place in France, Marseille and Paris, in 2008 and then in Japan, Kobe and Tokyo, in 2010.

The 13th conference in Marseille was about global change with its proceedings edited by Springer under the title: « Global Change: Mankind-Marine Environment Interactions[1] ».

The 14th in Kobe was entitled: "Towards sustainable use and management of the Oceans", at the same time commemorating the 50th anniversary of the Japanese Society. A selection of the proceedings was published as a 50th anniversary special issue in the scientific Journal « La Mer[2] »

In continuity with these two last conferences, the 15th edition of the French-Japanese Oceanography Conference will take place in 2013 at Boulogne-sur-Mer and Marseille focusing on **"Marine Productivity : Perturbations and Resilience of Socio-Ecosystems".**

The topic of the conference was chosen in consideration of actual multi-scale research carried out in Japan and France on marine environments and will contribute to the 3rd Marine Protected Area World Congress (IMPAC3, 21-27 October 2013) taking place in Marseille and Ajaccio and to which it is associated as the second part of the conference after the first one in Boulogne-sur-Mer.

The choice of Boulogne-sur-Mer as the main venue of the conference is motivated by the activities and highly significant results gained by IFREMER, CNRS and university partners about impacts of anthropogenic activities on estuary and coastal ecosystems in a climate change context. Amongst the many multidisciplinary projects at stake, one may mention SCALE (about a future multi-institutional structure on Applied Sciences in Environment), the 'GIP Seine Aval' in the Seine estuary and the large-scale Channel project. This highly frequented and exploited large-scale marine ecosystem (the Channel) is also the place of active multi-disciplinary and multi-scale research between researchers and institutions like IFREMER, CNRS, universities and NAUSICAA (a large aquarium and communication center at the core of the World Ocean Network), making the site of Boulogne a very challenging one for holding the 15th French-Japanese Oceanography Conference.

[1] H.-J. Ceccaldi, I. Dekeyser, M. Giraut and G. Stora, 2011. Proceedings of the 13th French-Japanese Oceanography Symposium. Editor Springer, 447 pages.
[2] Volume 49, n° 3 and 4, December 2011.

The 15th French-Japanese Oceanography Symposium

« Marine productivity: perturbations and resilience of socio-ecosystems »

Boulogne-sur-mer

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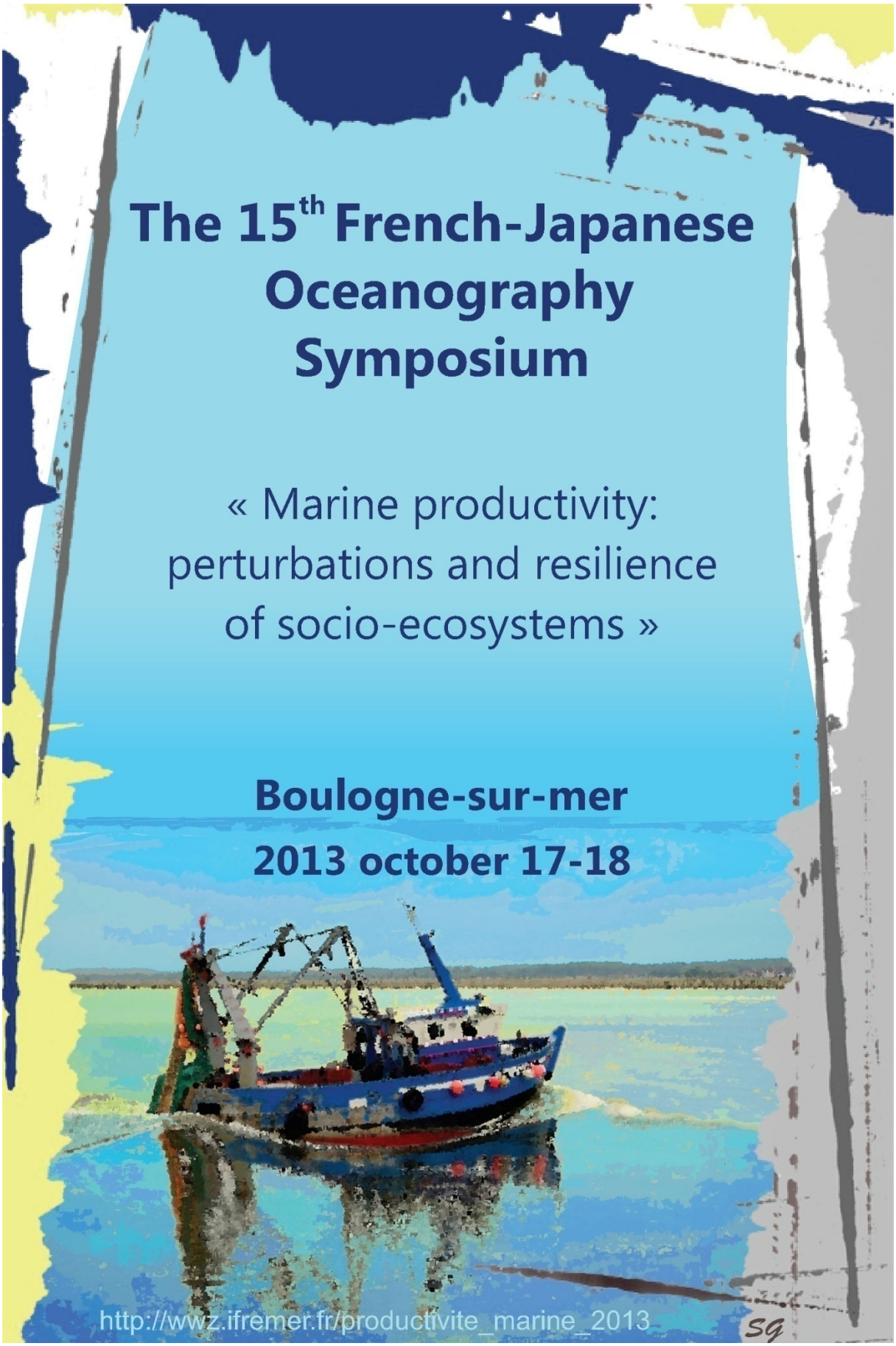

Session 1 : Process Studies

Abstract Com 1

Diffusion Processes of Radioactive Materials in Ecosystems of Coastal Areas off Fukushima

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Keywords; Fukushima Dai-ichi nuclear power plant･radioactive cesium･ecosystem･coastal area

A large quantity of radioactive material was emitted into the sea as a result of the Fukushima Dai-ichi nuclear power plant (1FNPP) accident due to the huge earthquake and tsunami of March 2011. Many marine organisms, seawater, and sediments with high radiation levels have been reported in the sea along the Fukushima Prefecture coast. Currently, fishing in Fukushima Prefecture is locally stopped independently. In this research, we studied the following problems: (1) Diffusion of radioactive materials via the food chain; (2) Diffusion via movements of various organisms.

Sampling of marine organisms has been carried out from Nov. 2011 to May 2013 by SCUBA diving, gill net, and seine fishing. Sampling locations areset at a rocky shore and a sandy beach in Yotukura (35km south from 1FNPP, depth:0.5-1m) and Nagasaki(50km south from 1FNPP, depth:5-6m). Sampled species were 8 seaweeds, 24 invertebrates, and 25 fish. Concentrations of radioactive cesium were measured using a germanium semiconductor detector. Furthermore, we have used an ultrasonic pinger, to investigate the behavioral range of *Sebastes cheni* in an area contaminated with a high concentration cesium.

The radioactive cesium concentration of coastal marine organisms showed very high values right after the accident. The cesium concentration decreased with time. Now the concentrations of benthic and coastal fish are higher than pelagic species. The behavioral range of the coastal fish, *Sebastes cheni* polluted at comparably high levels was a very small area. It is considered the diffusion of radioactive cesium by the behavior of S*ebastes cheni* is small. Two years or more have passed since the accident. However, the surveillance of the radioactive cesium concentration of coastal benthos and coastal fish is progressively required to enable suitable management.

Abstract Com 2

Antibiotics and antibiotic-resistant fecal bacteria in water from the contamination source to the estuary: impact and /or resilience?

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Keywords: Antibiotic, Antibiotic -resistant bacteria, estuary, hydrosystem, sediment, water contamination.

The aim of this study based on a multidisciplinary research program (FLASH)[3] associating chemists, hydrologists, clinical and environmental microbiologists, was to monitor the impact of antibiotic prescription in human and veterinary practices, on water and sediments contamination by antibiotic and *Escherichia coli* (distribution of phylogenetic groups, antibiotic resistance, integrons) and *Enterococci* (diversity, antibiotic resistance and genes associated) along *(i)* a medical center – Waste Water Treatment Plant (WWTP) – river continuum and *(ii)* a rural continuum. For this purpose, a multi-residue chemical methodology was developed in order to detect low levels of 34 antibiotics. In the medical center, the main prescribed antibiotic (amoxicillin) was weakly found in effluents. Along the continuum, contamination of water by antibiotics decreased from 160µg.L^{-1} (cefotaxim) in hospital effluents to 1ng.L^{-1} (ofloxacin) in the river. These concentrations were too low to exert a selective pressure (mg.L^{-1}) on antibiotic-resistant bacteria. In same samples, occurrences of antibiotic-resistant E. coli and those harboring a class 1 integrons were significantly (p-value < 0.001) decreased along the continuum. Among *Enterococcus* populations, *E. faecium* was mainly isolated (from 89% to 98%). All *E. faecium* isolates from medical center effluents were multiply antibiotic-resistant, contained *erm*(B) and *mef*(A) genes, and belonged to the hospital adapted CC17. The relative proportion of CC17 decreased in favor of other subpopulations, less resistant to antibiotics. In the river, only persistent compounds were found (quinolones, macrolides, sulfonamides), but they did not correspond to the major resistances in *E. coli* and *Enterococcus* (penicillins, tetracyclines).

[3] FLASH (FLuxes of Antibiotic Antibiotic-resistant bacteria and the corresponding genes in Surface Hydrosystems) funded by CNRS EC2CO/ GIP Seine- Aval
Oberlé et al., Env. sci. Technol., 2012, 46 :1858-1868.
Leclercq et al., , Appl.Environ. Microbiol 2013, 79 :2428-2434
Berthe et al, Appl.Environ. Microbiol 2013, 79 : 4684-4693

Abstract Com 3

Fate and effects of long-term exposures to PCB and PBDE mixtures on fish physiology under experimental conditions and in the wild.

Authors : ML Bégout[(1)] , C Munschy[(2)] , X. Cousin[(1)] , F. Akcha[(2)], V. Buchet[(4)], M. Cannas[(3)] , T. Daouk[(1)] , M. Eichinger[(4)] , F. Hénaff[(2)] , N. Imbert[(3)] , C. Lefrançois[(3)] , S. Péan[(1)] , O. Lepape[(5)] , D Mazurais[(4)] , J. Morin[(6)] , S. Rochette[(5)] , C Tixier[(2)] , H. Thomas Guyon[(3)] , N. Wessel[(2)] , J. Zambonino[(4)] , V. Loizeau[(4)] .

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Aquatic ecosystems in general and littoral areas in particular are submitted to ever growing anthropic pressures. Coastal ecosystems have a high economical and ecological value as they host a large number of species for some parts of or all their life. Such species are thus exposed to anthropogenic aggression during early highly sensitive stages. This is the case of common sole which reaches coastal nurseries 1 month after hatching, settles and stays at least 1 to 2 year(s). Our work has demonstrated that juvenile sole caught in the Seine Estuary are indeed highly contaminated by polychlorinated biphenyls (PCBs) in particular, which could explained why observed sole density is lower than models' prediction. In previous projects, we have shown that sole or zebrafish fed diets spiked with selected persistent organic pollutants (POPs), i.e. PCBs or polybrominated diphenyl ethers (PBDEs), display several physiological disruptions and that these POPs are transferred to progeny. At this level it appears that the behaviours (locomotor activity, cryptic abilities…) as well as the immune and reproduction functions (endocrine disrupting, decrease of maturing follicles, reduction in the number of fertilized eggs …) are more particularly affected by contaminants. However, questions remain, in particular about the effects on reproduction, underlying mechanisms, consequences on progeny fitness and long-term consequences on populations. The main objectives of Fish'N'POPs (new ANR project) are to tackle this set of questions, to evaluate the consequences of a chronic exposure of fish to PCBs and PBDEs under experimental conditions and in the wild.

Abstract Com 4

Harmful shell borers, *Polydora* species (Polychaeta: Spionidae) from East Asia morphology, molecular sequence analysis, and shell infestation condition.

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Keywords: Polydora species, gene analysis, species identification, east Asian.

The harmful shell borers, *Polydora* species(Polychaeta: Spionidae), which transport worldwide accompanying commercially important mollusk shells are required to trace and monitor today. Accurate species identification is needed and not only morphological characteristics but the nuclear 18S rRNA gene sequences of shell boring *Polydora* in east Asian aquaculture, *Polydora brevipalpa*, *P. uncinata*, *P. aura*, *P.websteri*, *P. calcarea*, *P.haswelli*, and *P. onagawaensis* were determined for the first time from Japan, Korea, and north China. A wide range of morphological variation, particularly with regard to pigmentation, is observed among these species. Not only species differentiation but also intraspecific pigmentation variation was clarified in these morphologically complex species. Black pigmentation pattern on the palpsis suggested to be a key characteristic for species determination. *Polydora uncinata* and *P. aura* which possess special notochaetae in the posterior chaetigers were sister species, and the other species which do not possess any special posterior notochaetae made the other group in the phylogenetic tree. *Polydora websteri* and *P. haswelli,* and *P. onagawaensis* and *P. calcarea* were sister species, respectively. Both morphology and molecular analysis of the 18S rRNA gene are suggested to be useful and effective for *Polydora* species identification and phylogenetic discussion.

Abstract Com 5

On the effects of hydrocarbon contamination on zooplankton behaviour: a French-Japanese approach.

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Key words: Behaviour; Ecotoxicology; Hydrocarbons; PAHs; Mating; Fitness

Hydrocarbon contamination is a pernicious threat for marine ecosystems as non-lethal effects on the plankton propagate through the food chain and accumulate in the tissues of top predators, ultimately putting human health at risk. In this contribution, I will first illustrate how the swimming behaviour of French and Japanese calanoid copepods (i.e. *Eurytemora affinis*, *Temora longicornis*, *Acartia clausi*, *Acartia omori*, *Centropages hamatus* and *C. typicus*) can be used as a very sensitive quasi real-time screening tool to assess hydrocarbon contamination in marine waters, even at contamination levels well below lethal concentrations. A behavioural stress index based on the complexity of swimming behaviour and swimming sequences is suggested as a potential tool to critically assess behavioural responses to natural and anthropogenic forcing in the marine environment. Second, I investigate how hydrocarbon contamination may impact the copepod mating. The mating behaviour and the mating success of copepods rely on chemoreception to locate and track a sexual partner. However, the potential impact of the hydrocarbon contamination on these aspects of copepod reproduction has still barely been tested despite the widely acknowledged acute chemosensory abilities of copepods. I will show how hydrocarbon contamination affect copepod behaviour at both species-specific and sex-specific levels, and more specifically for most species decreases the ability of male copepods to detect and track a female, hence suggest an overall impact on population fitness and dynamics.

Abstract Com 6

Impact of repeating massive earthquakes on intertidal mollusks

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Keywords: bivalve, land subsidence, liquefaction, repeating earthquake, tsunami,

History repeats itself. Earthquakes are frequent in Japan. In these 3500 years, massive earthquake like the Pacific coast of Tohoku Earthquake in 2011 have occurred at least seven times. Major earthquakes with big tsunami have occurred in five-hundred-year cycles along the Pacific coast of northern part of Japan. The 3.11 tsunami caused a lot of damage to the Tohoku region including marine life.

During the earthquake of 3.11, wave-like movement observed on the surface of the tidal flats in Yatsu, Chiba Prefecture near Tokyo. Gulls and shore birds flied away from the tidal flats during shaking. Liquefaction occurred just after the earthquake before tsunami. We observed many fissures moving and a jet of water from liquefaction coming to the surface around the Yatsu tidal flats. Bivalves like *Mya arenaria oonogai* normally distributed in deep were dug out to surface with a jet of water in Gamo tidal flats in Miyagi Prefecture northern Japan. Some species of infaunal bivalves were also rushed by the tsunami in Matsukawa-ura Inlet, Fukushima Prefecture. In this way, not only the tsunami but also the liquefaction brought quick damage in the coastal marine life. The infaunal bivalves dug from the tidal ground were not killed instantly. Some adult specimens of *Macoma contaculata* and *Myarenaria oonogai* had been survived on the tidal surface in Matsukawa-ura Inlet, Fukushima by the end of June 2011.

The earthquake caused sudden land subsidence of about 1m in maximum around the Oshika Peninsula, Miyagi where intertidal zone became sub-tidal zone. Spat of Pacific oyster *Crassostrea gigas* and juvenile of barnacle were observed to attach to new hard substances in this region after summer. It may take at least several ten years to recover the co-seismic land subsidence. What creatures will advance to new environment and will disappear? We have to clarify not only short-term effect which may explain an initial recovery of intertidal and sub-tidal animals but also a long-term effect which may explain continuous changes in population with land subsidence.

Session 2 : Ecosystem Modelling

Abstract Com 7

Physical and biological perturbations linked to marine aggregate extraction in the eastern Channel

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Keywords: ecosystem perturbation, impact, marine aggregate extraction, Eastern Channel

The objectives of the programme SIEGMA (2003-2011) were to complete international knowledge on the impact of marine aggregate extraction in the macrotidal context of the eastern Channel and to test exploitation methods (fallow temporal zoning, levelling) able to minimize this impact and favour restoration on two sites in French waters.

The initial concentration of the turbid plume is influenced by extraction conditions, while its dispersion is linked to the nature of the dredged material and the intensity of tidal currents. Extraction is modifying the topography (furrows, depressions) and the nature of the seabed; a levelling test did not show any increase of its restoration rate. Impact on benthos was quantified after limited extraction periods (fallow tests) with different intensities; extensive exploitation with fallow areas reduces the impact thanks to an opportunistic recolonisation. Impact on demersal fish was direct (temporary disturbance, substrate modification) or indirect through the food web; the bigger impact observed is due to high extraction intensity with rarefaction of the benthic preys.

The type of substrate and associated fauna explained the nature of the fish communities. Finally, a food-web model was developed to study the ecological responses of fish species facing particular stress namely related to anthropogenic activities and to analyse the consequences of these activities on the marine ecosystem.

Abstract Com 8

Use of bio-fluorescent characteristics for ecosystem monitoring on hydrothermal deposits

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Keywords: deep-sea, hydrothermal deposit, monitoring, fluorescence, ultraviolet, laser

The anthropogenic pressures for the marine ecosystem so far is mostly limited to coastal zone. Landfill, urban effluent, overfishing, oil spill, etc. give most effect to the coastal area. The global climate change is expected to affect to entire earth ecosystem, but the biggest risk prediction is on the coastal ecosystem such as coral reefs and Arctic seashores.

Since DSV Alvin discovered the first hydrothermal vent on the Galapagos Rift in 1977, many hydrothermal vents are reported at many deep-sea areas. The biological community around the hydrothermal vent is remarkable marine ecosystem, because it is independent from Sun light energy, and has peculiar ecological structure based on chemosynthetic bacterium.

Meanwhile, the anthropogenic pressures are spreading their impact to the deep-sea areas recent years. In the hydrothermal area, hydrothermal deposits are formed by sulfides and heavy-metal components settled out from hydrothermal plume, and it is expected to be a good field of the ore resources of gold, silver, copper, lead, zinc, and so on.

A new technology is necessary for the effective monitoring of the deep-sea hydrothermal ecosystem toward the environmental impact assessment of the drilling project. For this purpose, we develop a new deep-sea observation technique using bio-fluorescent characteristics. An ultraviolet (UV) LED illumination and a violet laser illumination are used for fluorescent video recording of a variety of deep-sea organisms. In this study, the observation results of bio-fluorescent patterns and colors of a variety of deep-sea organisms, and its usefulness for the monitoring are reported.

Abstract Com 9

Indicators for ecosystem based management: methods and applications

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Keywords: Fish and Shelfish stock management, pressure and ecological indicators, pelagic, demersal and deep-water systems.

Indicators are essential tools for policy making, public communication and the provision of scientific advice. In the fisheries realm indicators have been increasingly used to advise on fish and shellfish stock management, especially since the precautionary approach to fisheries management was developed. They are now becoming a cornerstone of the wider ecosystem approach to the management of all human activities. In this presentation we will provide an overview of the methods developed at Ifremer for selecting, validating and calculating indicators, combining suites of indicators and interpreting their changes in terms of ecosystem states and suitable management (response) actions. Establishing the causal link between single or multiple pressure indicators and state or impact indicators is at the heart of our approach. Indicators for socio-economic impacts of ecosystem state and management responses are also presented. We present examples for pressure indicators and ecological indicators derived from different types of information (scientific survey data, commercial fisheries data) for a range of ecosystems, covering pelagic, demersal and deep-water systems.

Abstract Com 10

Impacts of the huge tsunami on 11 March 2011 to a nearshore ecosystem in Sanriku Coast.

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Keywords: Tsunami, Sanriku Coast, nearshore ecosystem, seagrass and seaweed beds, aquaculture

A nearshore ecosystem is very important for humankind for its ecological services. It is mainly composed of sea grass and seaweed beds in Sanriku Coast consisting of *Rias*-type bays. Sea grass beds and seaweed beds are distributed on sandy or muddy bottom in the bay head and rock or rock plates from the mid-bay to the bay mouth, respectively. These habitats are essential for fish and mollusks as spawning, nursery and feeding grounds. On 11 March 2011, huge tsunami hit Sanriku coast after the big earthquakes. We conducted field surveys on states of a nearshore ecosystem three months after the tsunami because no boats were available till June 2011. *Laminaria* spp. completely covered rock beds and *Sargassum horneri* grew 7 m high from the bottom in June 2011. On the other hand, acoustic and visual surveys indicated sea grass beds were devastated by the tsunami. It is estimated that the tsunami waves concentrated to the bay head and removed sea grass with bottom sediments consisting of sand. However, seedlings were found in June 2011. They might germinate from seeds produced in previous years and buried in the sediments because flowering season of sea grass is from June to August there. Aquaculture such as shells, seaweeds and Coho salmon have been active in Sanriku Coast. The tsunami destroyed aquaculture facilities. Although we were afraid that escaped Coho salmon reproduced in a natural condition, they could not establish in Sanriku Coast. The ecosystem has already started succession to recover from the damaged conditions.

Abstract Com 11

Development of end-to-end models to describe the dynamics of exploited marine ecosystems in the Eastern Channel

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Keywords: end-to-end models, Eastern Channel marine ecosystem, fisheries, spatial management

We present here two end-to-end models, OSMOSE and ATLANTIS, which are being developed within the EU-funded VECTORS project, to evaluate the effects of spatial management and spatial interactions between human activities on the marine ecosystem of the Eastern Channel. Trophic interactions are central to both models but modelled differently. OSMOSE is a spatially-explicit (6' x 6' grid), individual-based model, including 14 species amounting 75% of the total estimated fish biomass and interacting through opportunistic size-based predation. Plankton and benthic preys are also included, in an aggregated fashion, via coupling to a bio-physical model and forcing spatial fields, respectively. The structure established for the ATLANTIS model in the Eastern Channel is composed of 38 spatial polygons referring to the Channel biological, physics and economic characteristics. 40 functional groups, from phytoplankton to mammals, interact through sized based predation and preys accessibility. The Eastern Channel ATLANTIS model also builds in spatial interactions between fishing fleets, aggregate extractions, maritime traffic, as well as prevailing area-based management. The underlying information feeding in both models mainly builds on information drawn from surveys, fishers' log-books and mappings processed within the EU-funded CHARM3 project.

Abstract Com 12

Rising to the challenge of reconstructing the coastal fisheries environment following the massive tsunami in Japan: the national 10-year "Tohoku Ecosystem-Associated Marine Sciences (TEAMS)" project

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Keywords: earthquake; tsunami; disaster; marine ecosystem; fishing environment; Sanriku coast.

On 11th March, 2011, the fifth most powerful earthquake in recorded history occurred off Japan in the northeastern (Tohoku) Pacific coastal area known as the Sanriku coast. It is now known as the Great East Japan Earthquake and was a magnitude 9.0 undersea megathrust type earthquake with its epicenter approx 70 km east of the Oshika Peninsula in Miyagi Prefecture. About 20,000 victims were confirmed dead or are still missing. Additionally, the tsunami-related nuclear accidents at the Fukushima Daiichi Nuclear Power Plant resulted in the release of large quantities of radioactive substances into the environment.

The impact of the earthquake and tsunami on the Sanriku area and the subsequent process of transition over the course of time are yet to be determined.

TEAMS is a national project to observe marine ecosystem change and was launched by the Japan Ministry of Education, Culture, Sports, Science and Technology. TEAMS is composed of research groups at three institutions. The representative institution, Tohoku University, is undertaking the project "Elucidation of the environmental change process in the fishing environment"; the Atmosphere and Ocean Research Institute (AORI) of the Univ. Tokyo is performing "Studies on the mechanisms of marine ecosystem change" and the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) is charged with "Elucidation of the mechanisms of ecosystem change on the seafloor around the coastal area".

TEAMS will construct a database for research information. The main objective of TEAMS is to facilitate reconstruction of the coastal environment and fisheries in the Tohoku area.

Session 3 : Integrated Management

Abstract Com 13

The continuum Estuary-Bay of Seine: the need to an ecosystem-based management.

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Keywords : Estuary and coastal zones, Bay of Seine, WFD, MSFD

Estuaries and coastal zones are conflicting processes reflecting their positions at the interface between terrestrial and marine environments. The estuary of the Seine is an example of a continuum between its upstream part (the watershed and its inputs in the hydrological system) and the downstream part (the Seine Bay and the eastern part of the English Channel). It is concerned by a lot of human activities and stakeholder interventions. As other European estuaries, the Seine estuary degradation started in the middle of 19th, but it remains an important area for biodiversity, fish and bird food web. The Seine estuary and the eastern part of the Bay of Seine are subjected to heavy historic anthropogenic pressures and new human activities, including harbour extension, aggregate extraction, harbour deposit of dredged sediment, offshore wind mill. Nowadays, harbour projects continue to maintain the existing ecological compartments of the Seine estuary and are still studied independently. Reforms of the Coastal Areas and Lakeshore Conservatory status, the creation of a 'National Marine Protected Areas Agency', the 'Water Framework Directive' and the 'Marine Strategy Framework Directive' should be insured a better integration of the natural patrimony protection in the Integrated Coastal Zone Management process. Nevertheless, there is a paradox between the declaration of the French State, which takes part through its Ministries, prefectures and decentralized services, to encourage a Global Management Plan of the Seine Estuary, and territorial approaches operated by the managers of the estuary such as the 'Grand Port Maritime' 'Réserve Naturelle de l'Estuaire de la Seine'. As an ecologist, my talk is to analyse the actual contrasted situation and to promote to take into account all the functionalities of such complex interface to share an ecosystem-based management process.

Abstract Com 14

Degradation of fishery work population in Japan and the possibility of its recovery in the ergonomic perspective.

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Key words: Japanese fishermen, work conditions, kaizen, ergonomic perspective

The number of fishermen halved to approximate 0.2 million persons during last three decades, and the proportion of older fishermen (65 years old or more) exceeds 30 percent in Japan. Though there are many theories concerning these problems, principal causes may be the decrease of fishery catches (probably caused by the decrease of natural resources), the stagnations of fish prices (probably relevant to the economic conditions and the miniaturizations of caught fish), and the unchanged and unmodified work conditions for many years. In other words, the Japanese fishery is losing its attraction as an occupation because its work is hard and risky despite of its poor profitability. The author focuses on the investigations and the KAIZEN (improvements of the work condition) of Japanese fishery from ergonomic perspective. A fisherman is able to do KAIZEN by itself and it may contribute to improve its fishery management. In this study, the author will introduce some information about the actual work circumstances of Japanese fishermen, and discusses the possible plans to improve their work conditions. The information will include some examples of actual circumstances of small trawl fishery, set net fishery and oyster farming in Japan, and an attempt to educate fishermen to do spontaneous KAIZEN activities.

Abstract Com 15

The Channel Arena: An integrated study for a better understanding and management of the English Channel Ecosystem.

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Keywords: English Channel; marine ecosystem; Ecosystem-based management; environmental and human impact; sustainable use of living resources

The English Channel constitutes a marine corridor between the Atlantic Ocean and the North Sea. Studies developed in a European framework, such as the CHARM project (Ifremer, CEFAS and Universities), have enabled a multi-disciplinary approach resulting in an Atlas describing the preferential habitat of several commercial fish species, integrating data over three decades with innovative spatial modeling techniques of the ecosystem.

This approach will lead towards an ecosystem-based management of living resources enabling to adapt human uses (including fisheries) to the biotic capacity of the marine environment and insure its sustainable use.

The main identified objectives are: *i)* to develop a multi-disciplinary understanding of the functioning of marine and coastal ecosystems submitted to strong human pressure; *ii)* to promote sustainable management by the development of decision-taking tools enabling to adapt human use intensity to the carrying capacity of ecosystems; *iii)* to provide indicators to characterize the ecosystem status, to measure the impact of human uses on these ecosystems and to evaluate the efficiency of management measures.

Abstract Com 16

Reviving the Seto Inland Sea, Japan: Applying the principles of Satoumi for marine ranching projects in Okayama.

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Keywords: marine ranching, Seto Inland Sea, Japan, Sato-umi concepts

This contribution introduces two Japanese marine ranching projects implemented in the western Seto Inland Sea off Okayama, Japan. These two marine ranches, costing a total of $USD 40 million, cover 300-500 hectares and are comprised of existing marine reefs (both artificial and natural) and sea grass beds,. In providing organized coastal environments with habitats optimal for nurturing the development of commercially exploited fish species, these artificially enhanced areas are intended to increase the levels of primary production and stock recruitment. Additionally, parts of these zones are protected as no-take zones or areas where bottom trawling is prohibited; measures were voluntarily implemented by local fishers organizations. From the perspective of marine ecosystem recovery, these sites have been created to ensure sustainable marine communities, nurturing not only commercially valuable stocks, but also the larger surrounding environment in this region. These efforts have been successful in contributing to the enhanced harvest of these stocks and brought stability of marine ecosystem in the areas. . Moreover, we hope to ultimately recreate a hydrological cycle that mirrors natural nutrient flow by connecting these networks to local freshwater systems. These modifications to the coastal ecosystem are based on the Japanese concept of *satoumi*—coastal, community-based resource management that combines both scientific knowledge and a traditional understanding of the local environment.

Abstract Com 17

From Global to Local: a comparative ocean and coastal Management approach in Western Europe, France, and East Asia, Japan

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Key words: Maritime policy, integrated coastal management, cultural identity, convergences

France and Japan are two very different countries from the geographical, environmental, socio-economical and cultural points of view:

France is part of Europe and member of the European Union, at the edge of the European continent, bordered by three ocean or semi-enclosed sea bodies, the Atlantic Ocean, the Channel/North Sea, and the Mediterranean Sea.

Japan is part of the "East Asian Community" and member of regional organisations like APEC, as an ocean and archipelagic state located into the Pacific Ocean and surrounded by the open sea and semi-enclosed sea bodies, namely the Okhotsk Sea, the Japan Sea, and the South-China Sea.

In Japan, the "Bill for the Basic Ocean Law" took effect in July 2007. The contents of this new Law "define the basic principles of Japan on the ocean, clarify responsibilities of the national government, local governments, business operators, and citizens, specify the basic items concerning measures on the ocean, and stipulate the establishment of the Headquarters for Comprehensive Ocean Policy for the purpose of promoting these measures in a comprehensive and systematic manner, aiming at realizing a new ocean-oriented nation.

In France, the current national move for the management of the coast and ocean is largely influenced by the new European Maritime Policy and its Marine Strategy Framework Directive. It was initiated within the framework of the "Grenelle Environment" and then "Grenelle of the Sea" national consultations pushing forward sustainable development measures related to the key maritime activities, governance arrangements, education and training, and knowledge in continuity between the water basin, the coast and the ocean in metropolitan France and its overseas territories.

In these respective national contexts, both countries have numerous ongoing local ICM initiatives taking place in specific regional and local context. The question is therefore how to progressively build up from national to local and vice-versa an adequate, viable and well supported governance and management process that can help each nation to consolidate their national framework hence promoting their ocean-state position in their respective maritime region and in the international arena.

Abstract Com 18

Today's aquaculture and capture fisheries in Japan

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Keywords: Aquaculture and Fisheries production, relationship between aquaculture and fisheries, Japan.

Global capture fisheries and aquaculture production reached 75.1 and 21.0 million tons (excluding aquatic plants), respectively in 2009 (FAO SOFIA 2010; excluding China). For the past five years, capture fisheries has been gradually decreasing, while on the other hand, aquaculture shows an increasing trend. From the point of view of human consumption, the demand for aquatic products has been increasing. However, per capita food fish supply remained at 13.7kg levels from 2006 to 2009. In Japan, during the past decade, marine capture fishery and aquaculture production has remained at four million tons and one million ton levels, respectively. In 2010, aquaculture production reached 220,000 tons, consisting mostly (about 90%) of *Pagrus major* and *Seriola quinqueradiata*. From early 1990s, marine fish products from aquaculture showed a gradual decline. One can realize clearly that on the reverse side of aquaculture production, there are huge amount of baitfish that are consumed. Currently, almost all marine fish resources have been fully exploited, while the ratio of non-food uses/human consumption has been decreasing. Focusing on aquaculture production, the baitfish problem under given socio-economic conditions constitute a limiting factor. There is a need to discuss and find appropriate measures concerning the issue of consumption exceeding production. Although there is currently a rising demand for aquatic products, increase in global capture fisheries remains sluggish. The purpose of this study is to evaluate fundamental aspects of the relationship between aquaculture and capture fishery product in Japan viewed against the background of global fisheries.

Abstract Com 19

A participatory integrated assessment of sea grass meadows ecosystem services in the Gulf of Morbihan.

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Keywords: Gulf of Morbihan, ecosystem services, ecosystemic approach.

Building ownership of conservation needs is crucial to the efficiency and success of conservation policy. This should target both users who generate direct or indirect pressures on species or habitats of interest, as well as the general public. Sea grass meadow is typically an habitat that provides numerous ecosystem services and that doesn't enjoy the image of an emblematic habitat. Therefore, engaging into sea grass meadows protection doesn't raise spontaneous support and attempts to limit pressures on them are not easily implemented. Although the science of sea grass meadows is extensive, the processes leading to their regression or expansion are not well understood. The role of environmental conditions and of anthropogenic pressures in explaining observed degradation and regression of sea grass meadows is much less understood than the various ecosystem services they provide. As a precautionary approach, uses that take place on sea grass meadows are banned without necessarily evidence of their real impact. As a result such regulation raises strong protest, or is simply ignored when enforcement capacity is low. The VALMER project (Interreg IVA, Channel area) develops a knowledge visualization platform with researchers and stakeholders so to describe the ecosystem services provided by sea grass meadows as well as the impact of pressures on these services as a tool to raise awareness among stakeholders and the public and to engage them in discussions to develop monitoring and conservation plans. This is applied to the management of sea grass meadows in the Gulf of Morbihan, a hotspot for biodiversity on the French coast and also a place where numerous uses take place on the near shore waters and on land. The methodology applied and first results are presented.

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Session 4: Status and Evolution of MPAs

Abstract Com 21

Regulation and management of marine protected areas in Japan

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Keywords: MPAs, regulation, scenery, environment, habitat, fishery

1- Background

In response to the global movement for establishing MPAs and MPA networks, such as the CBD COP Decisions, Japan defined the MPAs and decided to promote the establishment thereof.

2- Process of defining "Marine Protected Areas" in Japan

The Ministry of the Environment formulated its "Marine Biodiversity Conservation Strategy" in 2011, which specified the definition of MPAs in Japan, along with the existing systems that can be regardes as MPAs. Later, this definition was adopted on the cabinet level.

The purposes of the existing systems can be categorized into three groups: 1) protection of natural scenery, 2) protection of natural environment or habitats, 3) protection and cultivation of fishery resources. The regulations imposed in each area depends on the purpose, but they regulate either development activities, taking designated species (e.g., endangered species), or fishery activities.

One distinctive character of MPAs in Japan that regulate fishery activities is that the fishery is managed by the resource users themselves (Makino, 2011). Accordingly, local fishers are engaged not only in fishery operations, but also in resource management (e.g., resource assessment and setting Individual Catch Quota) and ecosystem conservation (e.g., maintaining seaweed beds and coral reefs).

3- Criticism and the possible way forward

There is a controversy as to whether some MPAs can really be regarded as MPAs. As stated in the "National Biodiversity Strategy of Japan 2012-2020," it is important to consider standards and methods for evaluating the effects of marine protected areas from the biodiversity standpoint.

Abstract Com 22

Limits of the concept of Marine Protected Area: Adaptation of the populations and their professions in the different types of MPAS.

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Keywords: MPA concept, interest, management tool.

Although the expression of Marine Protected Area (MPA) covers several different concepts, basically, it consists in an interdiction and/or strong restriction of human presence and activities in a natural marine environment. They concern mainly coastal areas, as they existed before their exploitation by men, and even before the existence of mankind.

One of the main aims is to preserve the natural processes of marine production, its local bodies of waters, the occupant ecosystems and to leave nature playing, within each framework, its own equilibriums between living constituents.

Another main aim is to insure eggs production as well as preserve life cycle of females to disseminate the produced larvae in the surrounding marine environments.

Human activities are affecting the normal ecological functions of coastal ecosystems, for instance by overfishing, tourism, coastal constructions, harbors, artificial reefs, etc., perturbating in various ways the created MPAs.

In order to lead to a resilience, and even to a return to the initial state, several ways have to control thoroughly this evolution, and to create new kind of activities in the fields of local marine production and productivity, artificial reefs and marine habitats, measurement of larval fluxes and propagation, control of biodiversity, coastal management, marine sports, education, sociological behaviors, alimentary habits, police constraints, new kind of rights and finally, ecological strategy of mankind, leading to huge consequences on the preservation of their cultural or historical marine resources, through international political decisions.

Other decisions have to be taken for the deep sea water volumes, for cold seas (Antarctica) for open-sea areas, sometimes already over-exploited or highly perturbated.

We have to reach the state of de-extinction of numerous marine species, as they have certainly the right to exist.

The final aim and the ultimate finality remains: exploitation of seas and oceans, even soft exploitation, or maintenance of biodiversity?

Abstract Com 23

A Consideration of MPA management from the perspective of Japan's experiences and lessons learned.

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Keywords: MPA, SATOUMI concept, Japan,

Nature conservation is not the only reason for marine protected areas (MPAs); they also function as a resource base for sustainable fisheries.

The 10th Conference of the Parties to the Convention on Biological Diversity adopted the "Aichi Target", which sets up a quantitative goal of designating 10 percent of the sea's surface as protected area. Though it is important for us to discuss percentages of area to be protected, our knowledge of related failures leads us to hope for deeper discussions of protected area content and case studies of actual management regimes.

Mere delineation of a marine protected area's extent is a completely inadequate way to protect its biological diversity.

To maintain an ecosystem's dynamic equilibrium in a particular area, it is essential to practically manage impacts from adjacent areas, water and material cycles, and biota. Principles of nature conservation must be inherent in management mechanisms for coastal zones. Most particularly, specific management techniques such as those included in legal systems governing development activities are needed for both fisheries and nature conservation.

Japan went through a variety of experiences and was taught many lessons about protecting seacoasts during its century-long history of modernization. The Japanese archipelago extends from the subarctic zone to the tropics, and its variegated climate formerly gave rise to a mosaic of traditional protection techniques. By introducing and integrating occidental ideas and techniques through a process of trial and error, and by making comparisons with case studies from other countries of the Asia/Pacific region, ways are now being discovered to create marine protected areas well-suited to each country and locale.

Especially, the basis and formation of the concept of 'SATOUMI' will be discussed. This may be a viable alternative to paper national parks.

Session 5 : Natural Perturbations and Impacts

Abstract Com 24

Oithona davisae, the most dominant copepod in Tokyo Bay, a highly eutrophicated embayment: Why are they so dominant?

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Keywords: copepod, *Oithona davisae*, jellyfish, *Aurelia aurita*, Tokyo Bay

Among various factors, anthropogenic loading and global warming are considered to be causing significant changes in the coastal marine environment. We need to holistically understand mechanisms in such changes to predict how the environment would be in the future. Prerequisite is detailed knowledge on biological processes as well as physical and chemical ones in response to the environmental changes. Here we show our recent study on *Oithona davisae*, a planktonic cyclopoid copepod species that is known to be extremely abundant and often dominates in coastal marine embayment. To understand why this animal is so successful, we have been looking into its vertical distributions corresponding to water-column stratification, and also its swimming ability to escape from predators. Here we show how *O. davisae* escapes from the moon jelly *Aurelia aurita*, which devours zooplankton and occurs in a huge number in embayments including Tokyo Bay. Direct observations revealed that *O. davisae* is agile enough to escape from the moon jelly's ephyra larvae that appear much more numerously than adult moon jelly. This agility reducing the predation mortality may be crucial for *O. davisae* to dominate in this bay and somewhere else that are full of predators. Movies showing such ability to escape from predators will be shown in our presentation, comparing with some other planktonic animals such as *Acartia* (larger copepod), barnacle cypris, decapod zoeas, etc., being less agile than *O. davisae*.

Abstract Com 25

Ecosystem services of mangrove forests with reference to the transportation of organic materials to coral reefs: A case study in Palau for the MPA management

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Keywords: *ecosystem service, mangrove, coral reef, interdisciplinary science*

Mangrove forests have several important ecosystem services including, 1)Storage of high quantities of organic materials and nutrients, 2) Source of organic materials supply to coral reefs, 3) Environmental purification functions by feedingbehavior of benthic animals, 4) Shelter for young coral reef fish, 5) Site for marine leisure activities, such as kayaking, 6) Provision of habitats to birds, insects and other animal species. 7) Field for food resources, 8) Field for environmental education including eco-tour, and so on. In order to clarify these services, a preliminary survey was conducted in Palau where mangroves are dominant along the coast, connecting to coral reefs. Accumulation of organic materials was conspicuous around the river mouth area, but it seemed that those would be dispersed in coral reef area. Research on biogeochemical cycle must contribute to clarify the importance of ecosystem services in mangrove forests as well as the information on sustainable use of mangrove and coral reef ecosystems for tourists. Ecosystem evaluation should also be done from the interdisciplinary aspects.

Abstract Com 26

Health and degradation of coral reefs: Time scale - Natural and anthropogenic perturbations at global, regional and local scales.

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Keywords : global and climate changes, coral reefs.

Coral reefs are in crisis. We wonder about their survival in the face of pressures and anthropogenic degradation as well as considering the predictions of climate change. In short, what will happen to coral reefs under the influence of global change?

Answering this question requires agreement on the time scale, on the distinction between natural and anthropogenic disturbances and on the spatial scales considered.

On the geological time scale, natural disturbances during the Quaternary did not affect the vitality of existing coral reefs. At this moment in the Holocene (or Anthropocene for some) we can rightly be worried about their future but it is only related to our human scale because the reef phenomenon survived after many other catastrophic events over 600 million years, and it is not finished...

Significant degradation due to human activities has occurred for less than a century as a result of human population growth, economic development and globalization. However we should note that it depends on oceanic regions and in some of them, the reefs are healthy and sometimes untouched by human influence.

Natural disturbances have adverse effects on the reefs of a magnitude much greater than those caused by man and can affect the reefs in the most vital parts of the ecosystem. But they are experienced by reefs that support them well. Nevertheless, the intensities and frequencies of these disturbances are worrying in the context of climate change.

In all these aspects/subjects we should avoid any generalization of local or regional observations and not transfer the findings to a global scale.

Abstract Com 27

Impacts of the 2011 mega-earthquake and tsunami on Ezo abalone *Haliotis discus hannai* at Iwaisaki, Miyagi, Japan.

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Keywords : Gastropoda, marine invertebrates, mortality, physical disturbance

On 11 March 2011, a massive tsunami generated by a mega-earthquake hit a wide area of Pacific coast of northeast Japan. We have analysed effects of the tsunami on Ezo abalone *Haliotis discus hannai* population at Iwaisaki in Miyagi. Ezo abalone is among the most economically valuable and important commercial fisheries resources in Japan, so rapid assessments are needed to evaluate effects of the disaster on the abalone population. Before the tsunami, algal forests dominated by the brown macroalga *Eisenia bicyclis* had developed in the survey area shallower than 8 m in depth, where large juvenile and adult abalone > 30 mm in shell length (SL) inhabited. Juvenile abalone < 30 mm SL inhabited the deeper area dominated by crustose coralline alga (CCA). After the tsunami, no apparent decrease was observed in the density of large juvenile and adult abalone inhabited in the algal forests. The impact of the tsunami was more profound in the CCA area than in the algal forests. Zero and one-year-old juveniles largely decreased to less than 5 % of the densities just before the tsunami. The distribution pattern of juveniles could be a cause of the marked decrease, because most of them inhabited the CCA area where the disturbance by the massive water movement was not reduced by the effects of the macroalgal forest. Since the age at first capture of abalone is at 4-5 years old, the future commercial catch may considerably decrease for at least 4-5 years after the tsunami.

Abstract Com 28

The influence of the March 11, 2011 tsunami on the environment and the phytoplankton community in Matsushima Bay.

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Keywords: Earthquake, Japan, Matsushima Bay, Miyagi Prefecture, plankton distribution,

We studied the effects of the March 11, 2011 Great East Japan earthquake and subsequent tsunami on a large Japanese aquaculture site in Matsushima Bay, Miyagi Prefecture. To identify the influence of the tsunami, we conducted documentary searches of sewerage and environmental observation at 18 sampling sites approximately every two months from April 2012 to 2014. We analyzed the horizontal distribution of phytoplankton quantities using High Performance Liquid Chromatography (HPLC) analysis of phytoplankton pigments. In three sampling sites, where we accessed data from previous studies, phytoplankton cells were counted by microscope. We then compared phytoplankton diversity before and after the tsunami using Non metric Multidimensional Scaling (NMDS) statistical analysis.

After the tsunami, total nitrogen and phosphate discharged from the nearby Senen sewage plant in Matsushima Bay increased from 51 to 101 t/month. Total phosphate increased from 5.7 to 11 t/month. The water depth changed from -3 m to +1 m as a result of dredging and depositing caused by the tsunami. The highest Chlorophyll *a* (Chl *a*) concentration (10.4 µg/L) after the tsunami was greater than that before the tsunami (8 µg/L). However, when measured in December 2012, Chl *a* concentrations ranged from 0.4 to 10.4 µg/L and they varied among the sampling sites. Therefore, it is not clear whether the high Chl*a* concentrations after the tsunami were caused by the tsunami itself. According to the NMDS analysis, phytoplankton diversity did not differ before and after the tsunami. As Matsushima Bay is enclosed by many small islands, the influence of the tsunami might be less severe than on surrounding coastal areas and phytoplankton diversity may have been more affected elsewhere.

Session 6 : Antropogenic Perturbations, Adaptations and Impacts

Abstract Com 29

Changes, adaptations and resilience: the case of French oyster farming.

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Keywords: oyster culture, changes, adaptation, resilience, environment, socio-economy

The French oyster farming sector since its inception in the nineteenth century has regularly had to evolve for adapting to new situations. So there has been significant change in the oyster practices, the economic operation of enterprises, the place of oyster farming in coastal areas, whereas the persistence of the oyster farming sector facing significant threats has periodically been questioned. Environmental changes have played an important role in this activity closely related to the environment: pollution from various sources, increasing episodes of contamination by phycotoxins, extreme weather events, and climate change. Recently, the high mortality syndrome questions the issue of the conditions for the sustainability of the activity. Taking into account the conflicting uses in the coastal zone and the importance of relationships with watersheds activities, the development policies must also analyze the adaptation capacity of oyster farming socio-ecosystems, in these environments highly dynamic, spatially and temporally. Can we talk about resilience about oyster culture and the associated coastal socio-ecosystems? Can we speak of a reference state, a concept discussed today in the policies of environmental protection? This communication attempts, using examples, to discuss the answers that can be given to these questions, for different aspects: ecological, technical, socio-economic.

Abstract Com 30

Oyster farming in Tohoku: post-tsunami restoration and technical adaptation of culture systems.

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Keywords: Oyster culture, Spats, *Crassostrea angulata*, *C. Gigas*, Tsunami, Restoration

In the year of 1960's, the oyster culture in France has been entirely destroyed because of the mass mortality in Portuguese oyster, *Crassostrea angulata.* But it could resumed by the help of spats exportation urgently from Japan. The quantity of spats of the Japanese oyster, *C. gigas* have been transferred to France by the Oyster farmers of Ishinomaki (Pacific cost of Tohoku, N-East of Japan), under the authority of Japan and France. From that time, the close relationship has been established between oyster cultivators in France and Sanriku.

On March 11th 2011, the Tsunami surged against the coast of Sanriku and ravaged the fisheries installations included the oyster culture.

Just after the disaster, with the solidarity, the French organizations raise the help to re-construction and activities of marine production in the coast of Sanriku.

By the finances delivered from several associations (SFJO[4] , ADA[5]) and private partners (such as Air Liquide) we could buy back the essential materials, microscopes and plankton nets for the Regional Technical Centres. And also by the fisheries committee and group (Comité Regional d'Oléron, Gambalo Japan de Brest), life jackets, buoys and ropes were delivered to the fisheries cooperations of Miyagi and Iwate prefectures. Thanks to the solidarity of French colleagues, the restoration of fisheries and aquaculture have started about four months after the Tsunami around the costs of Sanriku and the enduring way of development should be found.

About two years after the disaster, the restoration has accomplished in the scale of 75% of a draft plan (not a scale of before the disaster) on Oyster culture. At the moment, the infrastructure must be reformed urgently (facilities of fishing port, macro debris, water level of the shore and fishing ports, transportation, etc).

Last year, several groups of oyster farmers have visited in France and exchanged their technical informations. To the development of oyster culture in each countries, the exchange of new culture techniques and informations about the diseases are expected.

[4] SFJO[1] : Société franco-japonaise d'Océanographie,

[5] ADA[2] : Association pour le Développement de l'Aquaculture

Abstract Com 31

« Prud'homie de méditerranée »

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Keywords: Sea fisher organisation, Mediterranean fishery, management, Prud'homie

La prud'homie a traversé les siècles, nos archives l'attestent : lettres patentes du Roi René et des rois de France depuis le XVème siècle, décret de l'Assemblée Constituante qui, en 1792, reconnaît le bien-fondé des prud'homies de Marseille et de Cassis et autorise les autres ports à créer des prud'homies sur ce modèle, décret de 1859 qui nous régit encore.

Les Prud'homies exploitent diverses espèces au fur et à mesure de leur concentration saisonnière dans la bordure littorale, ou plus au large. C'est une activité de petits métiers à forte polyvalence.

Dans ce contexte et de manière locale, les prud'hommes exercent une gestion de proximité au sein de 33 prud'homies réparties de Port-Vendres à Menton, Corse incluse. A lui seul, le Comité local des pêches du Var recouvre 8 prud'homies et 6 sections de prud'homies, soit au total 200 pêcheurs répartis sur 432 km de côtes.

De tous temps, les prud'homies se sont mobilisées pour préserver la qualité et l'étendue de leurs zones de pêche. C'est cette gestion des territoires, héritée de longue date, qui confère à l'institution sa modernité. Et le fait qu'elle soit réalisée à de micro-échelles sur l'ensemble du littoral lui confère une efficacité certaine.

Actuellement et depuis quelques années l'avenir de notre profession et de notre institution est soumis à de rudes épreuves pour des raisons d'ordre économique et politique : industrialisation des pêches en Méditerranée, politique communautaire des pêches qui laisse peu de place aux gestions locales et de proximité, plan de réduction des effectifs,…

Plutôt que de nous desservir, la spécificité à l'échelle européenne de notre pêche et de son institution pourrait servir à d'autres communautés halieutiques et même constituer une sorte de « **laboratoire** » (cf. le groupe FEP varois).

Abstract Com 32

Marine Litter along European coasts: sources, distribution, impacts and European policy.

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Keywords: Marine litter, marine debris, Marine Strategy Framework Directive, monitoring.

One of the most evident changes in the last half-century is the ubiquity and abundance of litter in the marine environment. The EU Marine Strategy Framework Directive (MSFD, 2008/56/EC) established a framework within which EU Member States shall take action to achieve the good environmental status (GES) of their marine waters by 2020. Amongst the 11 MSFD qualitative descriptors, descriptor 10 (D 10) concerns marine litter. Here we report the general strategy in support to the implementation of MSFD for marine litter. It includes various aspects such as scientific background, monitoring strategies and protocols, definition of Good Environmental Status and targets, and support to management policies.

A Technical Study Group on Marine Litter (DG Environment /TSG ML) was created to provide scientific and technical background for the implementation of MSFD requirements and support to Member States with regard to (D 10). The work of the TSG ML focuses on the specification of monitoring methods through the development of monitoring protocols for litter in the different marine compartments, including micro plastics and litter in *biota*. Further consideration is also being given to the identification of sources of marine litter and a better understanding of the harm caused by marine litter.

Abstract Com 33

Mapping the state of the marine ecosystem after the Great East Japan Earthquake 2011

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Keywords: Tsunami, marine debris, Geographical Information System (GIS), Species distribution modelling (SDMs), seafloor mapping

The Tohoku Ecosystem-Associated Marine Science (TEAMS) project started from 2011 with the aim of revealing the impacts of the 2011 tsunami and to assess the present state of the marine ecosystem in affected areas over time during the next decade. The Habitat and Ecosystem Mapping Team in TEAMS aims to integrate data from our project to visualize the state of the ecosystem using maps. Creation of these habitat maps are expected to contribute to our understanding of the effects of large tsunamis, present the status of marine biodiversity in the area, and lead to the identification of key areas for ensuring ecosystem resilience.

We collected various data such as bathymetry, geography, oceanography, benthos and tsunami-debris not only from our project but also from the archived data at our respective institutes and in public databases. We appended location information onto deep-sea images and identified the presence of species and debris at each survey point. We conducted data integration for GIS using geo-statistical models, analysis for species distribution modeling, and made a map of habitat suitability and environmental variables in the research area.

Our preliminary results suggest that the impact of the tsunami in deep-sea areas (ca. 200-500m) was not as severe as in coastal environments. Accumulations of tsunami debris were found mainly in submarine canyons. We also found some large debris using a side scan sonar at depths of 150 to 200 meters. The relationship between the state of the environment and the distribution of organisms (focusing on brittle stars) before and after the tsunami will be discussed in this presentation.

Abstract Com 34

A Subject of the Chlorine Management at a Thermal Power Plant on the Northwest Pacific Ocean in Japan.

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Keywords: biofouling, DPD, phytoplankton.

Power plants using seawater for cooling usually suffer from biofouling. Chlorine is often used to lessen biofouling damages. A monitoring survey of the concentration of chlorine residuals was conducted at the outlet of a large-scale thermal power plant where it has been required by the local government to keep the concentration of chlorine residuals under 0.05mg/L at the outlet. Monthly measurements of chlorine residuals were conducted. The development of red color of DPD reagents were observed even while the chlorination was stopped (it means a background level of chlorine residual). This may cause a difficulty in the effective management of chlorination. The relationship between chlorine residuals and phytoplankton concentrations was studied. In the laboratory, temperature effects on measurements of chlorine residuals (oxidants) were examined using three methods (iodometric titration, Orthotolidine and DPD method).

We found that the background level of chlorine residuals changed seasonally connecting with phytoplankton growth, but did not change depending on the water temperature. We assume that H_2O_2 produced by phytoplankton might be related to the background of chlorine residue.

Session 7 : Integration Management and mitigations tools

Abstract Com 35

Application of advanced technology to integrated coastal management －Assessment of fish habitat use by through bio-logging.

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Keywords: Integrated coastal management, behavioural and environmental recording system, fish behaviour, management measures.

For utilizing coastal areas in a sustainable manner, there is a need for a mechanism that harmonizes coastal uses with natural environment and manages them from an integrated point of view. Integrated coastal management is expected to properly perceive coastal areas as "natural systems"; to have municipalities play a proactive role with the participation of diverse interested parties; to provide integrated management plans for coastal areas; and to promote various businesses, measures and policies, uses, etc. in an integrated and planned manner. In such integrated coastal management, the perception of "natural systems" requires the understanding of coastal environments based on material cycles. Especially, it is indispensable to understand how living organisms are using coastal areas and such understanding is expected to be utilized for measures and policies. This study introduces case examples that target fish species of high-order consumers and deeply associated with human beings, and examine their habitat use status by using pioneer science and technology called bio-logging (bio-mounted behavioral and environmental recording system). The study targets represent 3 categories of species, including rare species, species important to fishery and species harmful to human beings. Based on the relationships of the target species with human beings obtained from the results, the study further discusses the scope of application of measures and policies necessary for promoting integrated coastal management.

Abstract Com 36

Recent topical studies about artificial fish reef utilizations in Japan

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Keywords: artificial fish reef, marine protected area, bio-diversity

The beginning of modern studies and developments of artificial fish reefs in Japan can date back to the 1960s, however, the structures and the ways of utilizations of artificial fish reefs are remarkably changed from around the beginning of 21st century. High-rise type artificial fish reefs were actively developed in the 1st decade of 21st century for example, and there are some case studies that artificial fish reefs were introduced into marine protected areas (MPAs). Though those MPAs are mainly aimed to recover natural fishery resources, they also consider that they can contribute to enhance the bio-diversity in some parts. In this presentation, the authors introduce a few topics about artificial fish reefs studies that the authors concerned. The topics include a case study to estimate the abundance of the fish aggregation around high-rise artificial fish reef by means of stationery observation systems, and two case studies to create MPAs by means of artificial fish reefs and to estimate their effectiveness. One of the latter is the creation of the marine ranch in Seto-inland sea area which has multi-purpose functions considering the life histories of various useful fish. The third example is the establishment of sanctuaries to protect snow crab by means of artificial nursery reefs in the Sea of Japan area, which is also thought to contribute for the enhancement of the bio-diversity.

Abstract Com 37

How to size “fair” compensatory mitigation for fisheries resources: HEA scoring method applied in off shore wind mill project

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Keywords: mitigation, scoring methods, ecosystemic services, off-shore wind mill, equivalency approach, stock enhancement, artificial reef, fisheries resources

In France four off-shore wind mill projects are planned before 2017. For the three Northeast projects fisheries fields are likely to be impacted, due to foot foundation. The environmental impact studies states that impacts to fishermen will be offset with subsides from wind mill taxes and with specific mitigation like artificial reef or stock enhancement for fisheries losses mainly for scallops, lobsters and demersal fishes as seabasses, flat-fishes and small pelagics. Losses should be offset, for scallops, by the release of juveniles and for lobsters and fishes with effective artificial reefs (as new functional habitats). We propose to scale the size of projects likely to mitigate these losses for fisheries, in the aim to reach an ecological equivalency between the losses and the gains. To do so, we use the "Habitat Equivalency Approach" software proposed by the EU commission and the French Ministry of Environment in the case of ex-post damage compensation (E.L.D[6] 2004/35/EC; CGDD, 2012), based on the assessment of ecosystemic services through indicator species. Preliminary results will be presented and a criticism of the approach will be exposed to define what could be the arguments to a “fair” mitigation for fisheries resource, as basis for future negotiation with fishermen.

[6] Environmental Liability Directive : *Directive* 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on *environmental liability*

Abstract Com 38

Sato-umi: a new approach of marine protected area cooperated with local people

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Keywords: Satoumi, Marine protected area, biodiversity, local fishermen, cooperation

1. Introduction

Protected area is generally considered as an area controlled to avoid human impact on nature for increase in high biodiversity. This concept excludes human kind from components of nature. However, a sustainable society including fisheries had been established in Edo period in Japan from 17 to 19 centuries. It is interesting to examine how local people had lived with the nature.

2. Sato-yama

Villagers near small mountains had utilized forests by planting woods for fire and managed them. Scientists point out that the forests have higher biodiversity than intact forests near villages. These forests are called “Sato-yama” consisting of words meaning village near the mountain (Sato) and the mountain (yama), respectively.

3. Sato-umi as a new type of MPA

Using word “umi” meaning the sea, Sato-umi is defined as “high productivity and biodiversity of a coastal sea as a result of, and in harmony with, human activity.” Sato-umi places increased emphasis on promoting positive interaction between humankind and the coastal sea. It may be realized through concerned, continuous environmental conservation programs. Sustainable economic return through ecosystem-based resource management and agricultural practices are other aspects of sato-umi. Finally, sato-umi places a high premium on an education that connects young people with the natural world and provides them opportunity to learn through hands-on experiences how their sincere concern for the natural world relates to the well-being of their community, family, and themselves. We introduce examples of sato-umi in this communication and propose sato-umi as a new type of marine protected area due to their higher biodiversity.

Posters

Boulogne sur Mer

Marseille

Abstract

A scientific cluster: SIEGMA (Monitoring of impacts of marine aggregate extraction): a tool for regional governance in the Eastern Channel.

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Key words: aggregate extraction, scientific cluster, governance, Eastern Channel.

To answer to the questioning of impacts of aggregate extraction on the ecosystem and to reduce forseeable user's conflicts (mainly fishers), a scientific cluster SIEGMA (Monitoring of impacts of marine aggregate extraction) has been created in 2003 in the Eastern Channel.

The cluster includes delegates of all main actors of the marine sector, with a Management Committee (users – extraction industry and fishers-, delegates of public state and regional bodies), which propose working guidances to the Scientific Committee (delegates from regional scientific bodies) who is in charge of actions, under the supervision of a coordinator. The multidisciplinary topics involved firstly on the *Dieppe* site, then on the *Baie de Seine* site, had for main objectives: i) to improve international knowledge on the impact of extraction and on ground restoration; ii) to collect original data on the fishery compartment; all of them in connection with ICES WGEXT recommendations.

The results of the cluster are given back each year during the General Meeting to an audience broadened to all marine regional stakeholders, as a contribution to a good governance in the aggregate extraction activity at the Eastern Channel scale.

Abstract

Toward a dynamical approach for systematic conservation planning of Eastern English Channel fisheries

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Keywords: MPAs, systematic conservation planning, fleet dynamics, model coupling, Eastern English Channel.

The Eastern English Channel is an important ecological area submitted to growing human pressure, mainly exerted by bordering countries, France and United Kingdom. Spatialised regulations are plebiscited to regulate these perturbations, and within this context, France and United Kingdom are under the obligation to create a consistent Marine Protected Area (MPA) network.

In the past decade, systematic conservation planning tools have been increasingly and successfully used to reach spatialised conservation plans which meet objective targets (*e.g.* a given protected percentage of each species abundance or habitat surface) while minimising enforcement and socio-economic costs. However, systematic conservation planning applied to fisheries does not take into account neither (*i*) changes in fleet dynamics induced by new conservation constraints and their associated feed-backs on conservation costs, nor (*ii*) their influence on fish population dynamics and distributions, which may in turn alter the achievement of conservation targets. Such a static approach may therefore lead to short- or medium-term misestimates in forecasted costs and target achievements.

This poster present preliminary outcomes and perspectives of a first attempt to couple a conservation planning tool (Marxan with Zones) with a mixed-fisheries dynamics simulation model (ISIS-Fish) to circumvent such limitations. The study notably aims at answering the following issues:

1. What would be the dynamics of the main fleets and fish populations under different conservation scenarios? And how would they influence targets achievement?
2. Is the proposed MPA network suitable to ensure the viability of fleets and of the fish populations they harvest?
3. What would be the influence of the sequence of enforcement measures and how could it be optimized?

Abstract

Modelling the relative impacts of traditional harvesting and habitat degradation on the population dynamics of Dugongs (*Dugong dugon*) in the Moreton Bay (Australia)

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Key words: Dugong dugon, seagrass, coastal management, indigenous traditional harvesting, netlogo modelling

The sustainability of Indigenous traditional harvesting of dugongs is a key issue in coastal Northern Australia, and the impacts of such harvests on dugong conservation and management has not been placed into the context of other potentially cumulative impacts such as the loss of their seagrass habitats due to development and/or climate change threats (e.g. increased freshwater and turbidity events, trawling). Here we are using the individual-based modelling platform "netlogo" to develop a tool incorporating the seagrass component into a spatialised dugong population/harvesting dynamics model, which will help explore hypotheses and scenarios to better inform coastal management. This model is first implemented in the Moreton Bay, a shallow embayment in the south-east Queensland, supporting extensive seagrass meadows and the largest population of dugong in close proximity to a major and rapidly expanding city, Brisbane. This population is geographically isolated from the closest population, situated in Hervey Bay, 200 km to the north.

Abstract

A spatially-explicit MSE framework for the assessment of management measures from the new Common Fisheries Policy: an application to the Eastern Channel mixed fisheries

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Keywords: Management strategy evaluation, bio-economic model, mixed fisheries, harvest control rules, spatial management, Eastern Channel.

The Common Fisheries Policy is currently in a major reform process which led to proposals for new management measures. These new measures aim at overcoming the shortcomings of the previous management regime especially regarding the issues related to mixed fisheries, spatial dynamics, discarding behaviour and data-limited species. Among others, Harvest Control Rules (HCR) have been proposed to adapt catch quotas (TAC) to the value taken by a range of indicators traditionally used in EU fisheries management plans, but also alternative status/pressure indicators that do not require analytical stock assessments.

Creative tools are central to the Management Strategy Evaluation (MSE) process. These include new spatially-explicit HCRs and bio-economic models, which can account for fish population dynamics and fishing reaction to a variety of management scenarios.

In the Eastern Channel, a diversity of fleets target a large variety of species with various gear and according to spatio-seasonal patterns of exploitation which depend both from fish population dynamics and constraints applied on fishermen (management, costs…). The development of new HCRs is complicated by the mixed nature of the fisheries with risks of increasing discards and effort report from one species to another. To allow the evaluation of new HCRs on fish communities and fleets accounting for these risks, we present a MSE framework, developed using the ISIS-Fish software. The framework embodies a spatialized operational model which simulates the dynamics of the mixed fisheries in the Eastern Channel including the spatial dynamics of the main species targeted (sole, plaice, cod, scallops, whiting…), driven by habitat models and the dynamics of the fleets dictated by a fishing behaviour model.

Abstract

The protection and management of offshore sea-hill fishing ground: the Hachirigase hill case study

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Keywords: seamount, resource management, responsible fisheries, sea hill, fishing grounds, Japan

The importance of seamounts outside the continental shelf as hot spots for a wide range of species (from primary producers such as phytoplankton to top predators like tuna) is currently being discussed globally. Especially it has been pointed out the necessity of managing the resources available in these areas. But because hills situated on the continental shelves are smaller than seamounts, the importance of managing them as a resource has yet to be fully recognized.

The depletion of fishery resources all over the world and the fast increase of the price of crude oil used by vessels could result in a high pressure on fishing grounds that are close to fishery harbors, like these offshore hills. The devastation of these fishing grounds may not be able to be prevented only through managing the resources of the nearby areas, so, under the circumstances where the "responsible fisheries" and resource management are demanded for each country, we will present our vision of the desirable methods for protection and management of these fishing grounds in harmony with the environment.

Abstract

Measurements of bedload transport in the English Channel using DySPI system.

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Keywords: Bedload transport, In-situ measurements, English Channel

In the macrotidal inner shelf English Channel, sandy-gravel sediments is a well developed sediment habitats due to tidal currents and wave influence. The mobility of this heterogeneous sediment is hard to be demonstrated and to be understand.

Two oceanographic campaigns named « Sedhete » (2007) and « Mesflux » (2011) were led to deploy the DySPI (Dynamic Sediment Profile Imaging), an instrument dedicated to the estimation of bedload fluxes. Once placed on the bottom, its pendulum enters into the sediment on 8 to 15 cm depth after the triggering of a motorized arm. Composed of a camera oriented towards the seabed, it provides videos which field of view is separated in two parts. The first half points perpendicularly to the seabed and the second half is intercepted by an inverted periscope, giving a top and a profile view of the sediment layer.

By using VirtualDub, the interesting parts of videos are converted into sequences of two seconds representing 50 images of 1080*700 pixels resolution. With the ImageJ software, the first image is considered as a reference to which is subtracted each one of the following pictures of the sequence. Thereby, we can obtain an image of the total area in motion (in pixels²) between our reference image and the subsequent ones.

The analysis of DySPI videos provides the following results and work perspectives:

1) An estimation of total sediment fluxes along a tidal cycle to compare to commonly used formulas.
2) An evaluation of fractional sediment fluxes on a study site presenting for example an armoring layer. A low transport stage allows a higher precision in fractional calculations.
3) A visualization of the in-situ sediment mobility and the evolution of the seabed granulometry and morphology along a tidal cycle.

Abstract

Morphosedimentary mobility in sandy habitats on inner macrotidal continental shelf (Eastern English Channel)

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Keywords: Bedform, sediment dynamics, Bedload transport, benthic fauna

The seabed of inner macrotidal continental shelves regularly corresponds to a mobile sandy cover moulded by tidal currents and waves in these relatively shallow regions. In outer estuaries and areas of currents convergence, fine-to coarse-sand sediments cover is driving throughout a grain-size gradient associated to various submarine bedforms (ripples, dunes, sandbank). These mobile sedimentary features potentially increase navigation hazards as well as risk of damage to offshore human structures (submarine cables, offshore wind turbines, …). Moreover, this sedimentary pattern induces a zonation of the benthic fauna due to: (i) the physical characteristics of the environment (depth, grain-size, roughness,...), and also (ii) the bedform mobility (sediment reworking, grain-size variability at the dune scale, …).

This study deals with the dynamics of bedforms covering the sedimentary wedge of Picardy (off the Normandy coast, Eastern English Channel). The seabed in the subtidal zone is covered by a multitude of large to very large dunes (2-10m high and wavelengths between 250 and 1800m). Based on repeated bathymetric surveys, dune migration rates have been estimated around 0.8 to 5 ± 0.25 $m.yr^{-1}$ and up to 6.6 ± 0.7 $m.yr^{-1}$ (respectively from multi-decennial and decennial observation periods). Dune movements are directed toward the North-East, which is consistent with the direction of tidal residual currents. Dune dynamics has been also measured during tidal periods. The influence of waves on sediment fluxes has been quantified by calculating bedload fluxes under different combined-flow conditions (currents only, currents and waves). Results have been used to interpret the dune internal architecture as a resultant of the time-integration of sediment transport processes. It has been noted that bedform dynamics is strongly influenced by storm events with multi-decadal return periods.

Thus, it is necessary to accurately assess the natural sediment dynamics, and especially the dune dynamics, in order to contribute to an accurate knowledge of these sandy environments, and consequently to better manage them. In this context, the sand mobility could be considered as well as a possible and natural way of sediment restoration (i.e. gravel extraction).

Abstract

Offshore/coastline sedimentary transfers in a macrotidal area (Eastern English Channel). Case of the Baie de Somme.

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Keywords : sediment flux, intertidal sandy zone, estuarine infilling, macrotidal, Eastern Channel

Like many estuaries in the Eastern English Channel, the Baie de Somme is currently infilling (natural and anthropogenic phenomena), mainly by marine sands. Sedimentary transfers between the open sea and the bay are poorly understood and badly quantified, while they are determinant to understand the morpho-sedimentary evolution of the bay in order to be able to predict its future evolution.

Sedimentary transfers between the subtidal sandy-gravelly wedge of Picardy, characterized by large sandbanks and dunes, and the Baie de Somme are studied in the framework of a PhD thesis (supported by DGA and Région Haute Normandie) which aims at defining and quantifiying: *(i)* available sedimentary stocks, *(ii)* the pathways and modalities for the transfer of sediment, *(iii)* the fluxes, sedimentary processes and forcing involved. A particular attention will be given to the small dunes that cover the seabed of the shallow waters and intertidal zones.

The approach is based on *in situ* measurements conducted at the scale of the Baie de Somme and on small sites (fluxes quantification). Different tools will be used to investigate both sub- and intertidal zones of the Baie de Somme and to characterize the morphology, sediments and the sedimentary fluxes: topographic LiDAR data (founded by Region Picardie-FEDER and INSU-CNRS, acquired by the operational team CLAREC), terrestrial laser scanner, bathymetry and acoustic imagery, VHR seismics, sediment sampling, currents measurements, altimetry.

Results have been obtained on: *(i)* the sedimentary evolution of the bay over the last 30 years (updating of the sedimentary cover), *(ii)* the morphodynamic evolution of the bay over the last 2 years, and *(iii)* the quantities of sediment transported during spring tidal cycles.

Abstract

Contamination of seabed sediments and organisms by radioactive cesium in the coastal area of southern Fukushima.

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Key words: Fukushima Dai-ichi nuclear power plant accident, radioactive cesium, seabed sediments particle size

Introduction Tohoku Earthquake and a large Tsunami occurred on the east coast of Japan March 2011 which cause the Fukushima Dai-ichi nuclear power plant (1FNPP) meltdown and release a huge amount of radioactive substances (including ^{134}Cs and ^{137}Cs) were released into the surrounding sea area. Then high concentrations of radioactive substances were detected in seawater, sediments and some organisms in coastal waters of Fukushima. Now, the fishing in Fukushima Prefecture is forbidden. To examine how these polluted marine organisms should be managed, we investigated the change of radioactive cesium concentration in seabed sediments and marine organisms.

Method Sampling of marine organisms and seabed sediments has been carried out from May 2012 to May 2013 by SCUBA diving. Sampling locations were set at a rocky shore and a sandy beach in Yotsukura (35km south from 1FNPP, depth:0.5-1m) and Nagasaki (50km south from 1F, depth:5-6m). Sample species were 8 seaweeds and sea urchin. Seabed sediments were divided in 4 size classes (~125,125~250,250~500,500~2000μm) by sieve. These samples were measured concentrations of radioactive cesium by germanium semiconductor detector (GEM20-70).

Result Concentration of ^{137}Cs was highest at Nagasaki at rocky shore area. However, there is no clearly decrease trend the ^{137}Cs concentration of the sediments.^{137}Csconcentration of sediments was highest in 250-500μm particle size class in rocky shore at Nagasaki. The ^{137}Cs concentration of seaweeds and sea urchin decreased with time. More than two years have passed since the accident; however surveillance of coastal benthic organisms is still required.

Abstract

Coral observation by the boat-based fluorescence imaging lidar

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Keywords: coral, monitoring, fluorescence, lidar

Reef-building corals are threatened by global climate change and other risks. It becomes of increasing importance for monitoring regional coral distribution.

A glass-bottom-boat based coral observation system has been developed using lidar (light detection and ranging) techniques for large area coral monitoring. The lidar system consisting of an ultraviolet (UV) pulsed laser with a wavelength of 355 nm and a gated ICCD camera has been designed and tested.

Most reef-building corals have fluorescent proteins that emit blue-green fluorescence on UV excitation. Seabed images are recorded by emitting UV pulsed laser and receiving fluorescence by the gated ICCD camera synchronized with the laser. Because the exposure time is very short, the sunlight background effect for the lidar image is suppressed, and this makes it possible to detect weak UV excited fluorescence even in the daytime. Coral viability check can be achieved by verifying the coral image pattern and fluorescence intensity.

Coral observations were conducted using a glass-bottom-boat at Taketomi Island, Okinawa, Japan. The information of live coral distribution along the boat track was obtained successfully around Taketomi island, in depth from 2 to 12 m.

Abstract

Development of an analysis system for matter contributing to turbidity using a three wavelength in situ beam transmissometer

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Keywords: turbidity, beam attenuation coefficient, dissolved organic matter, particulate organic matter

Introduction

In coastal areas, it is known that turbid water influences the feeding behavior of marine resources. The turbidity of seawater (beam attenuation coefficient, m^{-1}: $\mathrm{C}'\mathrm{in\ situ}(\lambda)$) is attributed to three groups of matter: dissolved organic matter (DOM), particulate organic matter (POM) and particulate inorganic matter (PIM), and turbidity is expressed asthe sum of the turbidity with each matter: $\mathrm{C}'\mathrm{in\ situ}(\lambda) = \mathrm{C}_{\mathrm{DOM}}(\lambda) + \mathrm{C}_{\mathrm{POM}}(\lambda) + \mathrm{C}_{\mathrm{PIM}}(\lambda)$.A system we developed a system to calculate these turbidities respectively from in situ turbidities measured at three wavelengths, which used the coefficients of DOM and POM at wavelengths of 370, 488 and 660nm.For precision improvement of the system, we examined the effect of changes in ratio of kinds of POM (phytoplankton). And then the wavelength for measurement of the turbidity was changed 488nm to 470nm.

Theory and methods

$\mathrm{C}_{\mathrm{DOM}}(470), \mathrm{C}_{\mathrm{POM}}(470), \mathrm{C}_{\mathrm{PIM}}(470)$, and coefficients were determined as follows;
$\mathrm{C}_{\mathrm{DOM}}(470) = [P \times \mathrm{C}'in\ situ(370) - \mathrm{C}'in\ situ(470) + (1-P) \times \mathrm{C}'in\ situ(660)] \times [(K_{\mathrm{DOM}} - L_{\mathrm{DOM}}) \times P - (1 - L_{\mathrm{DOM}})]^{-1}$,
$\mathrm{C}_{\mathrm{POM}}(470) = [D \times \mathrm{C}'in\ situ(370) - \mathrm{C}'in\ situ(470) + (1-D) \times \mathrm{C}'in\ situ(660)] \times [(M_{\mathrm{POM}} - N_{\mathrm{POM}}) \times D - (1 - N_{\mathrm{POM}})]^{-1}$,
$\mathrm{C}_{\mathrm{PIM}}(488) = \mathrm{C}'in\ situ(488) - [\mathrm{C}_{\mathrm{DOM}}(488) + \mathrm{C}_{\mathrm{POM}}(488)]$
$K_{\mathrm{DOM}} = \mathrm{a}_{\mathrm{DOM}}(470)/\mathrm{a}_{\mathrm{DOM}}(370)$,$L_{\mathrm{DOM}} = \mathrm{a}_{\mathrm{DOM}}(660)/\mathrm{a}_{\mathrm{DOM}}(370)$,$D = (1 - L_{\mathrm{DOM}}) \times (K_{\mathrm{DOM}} - L_{\mathrm{DOM}})^{-1}$,
$M_{\mathrm{POM}} = \mathrm{a}_{\mathrm{DOM}}(470)/\mathrm{a}_{\mathrm{DOM}}(370)$,$N_{\mathrm{POM}} = \mathrm{a}_{\mathrm{DOM}}(660)/\mathrm{a}_{\mathrm{DOM}}(370)$, and $P = (1 - N_{\mathrm{POM}}) \times (M_{\mathrm{POM}} - N_{\mathrm{POM}})^{-1}$.
Measurements of turbidities were made in the laboratory and in the fieldusing C-Star transmissometer (WET Labs, measured wavelengths: 370nm, 470nm and 660nm). In the laboratory, we used phytoplankton as POM, which were *Skeletonema costatum*, *Chaetoceros gracilis* and *Tetraselmis tetrathele*. The field observations were carried out in May and Oct. 2010 in Tokyo Bay.

Results

1. The coefficients $(P, M_{\mathrm{POM}}, N_{\mathrm{POM}})$were found to be (0.44, 1.50, 0.60) for *Skeletonema costatum*, (0.66, 1.09, 0.81) for *Chaetoceros gracilis* and (0.49, 1.20, 0.81) for *Tetraselmis tetrathele*.
2. The correlations of $\mathrm{C}_{\mathrm{P}}\ in\ situ\ (470)$ and $\mathrm{C}_{\mathrm{P}}(470)$are shown as follows:
   $\mathrm{C}_{\mathrm{P}}\ in\ situ\ (470) = 0.76\ \mathrm{C}_{\mathrm{P}}(470) (\mathrm{R}^2 = 0.87)$ for *Skeletonema costatum*,
   $\mathrm{C}_{\mathrm{P}}\ in\ situ\ (470) = 0.80\ \mathrm{C}_{\mathrm{P}}(470) (\mathrm{R}^2 = 0.90)$ for *Chaetoceros gracilis* and
   $\mathrm{C}_{\mathrm{P}}\ in\ situ\ (470) = 0.77\ \mathrm{C}_{\mathrm{P}}(470) (\mathrm{R}^2 = 0.88)$ for *Tetraselmis tetrathele.*

Abstract

Three-dimensional monitoring of Pacific blue fin tuna cultured in an off-shore net cage using a digital stereo camera system.

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Keywords: three-dimensional monitoring, Pacific bluefin tuna, stereo-camera, aquaculture, direct linear transformation (DLT) method

A digital stereo-video camera system was used for three-dimensional monitoring of cultured Pacific blue fin tuna, *Thunnus orientalis*, swimming freely in a off shore net cage. We estimated the fork length and length frequency distribution of fish individuals using the direct linear transformation (DLT) method. Information obtained from stereo images is useful for managing the growth of tuna during cultivation. So that, we tried to develop a simple method for fish size monitoring that can be operated by the staff of aquaculture industries. In this study, we used a stereo-video camera system to evaluate the precision and validity of the fish size estimates determined from repeated measurements. Of the total assessed individuals swimming within a distance of <5.5 m from the camera system, the estimates for over 95% were found to be valid, with an error ratio (standard error/mean) of <5%. Therefore, we believe that our proposed simple method for monitoring free-swimming fish in an off shore net cage could be very useful for aquaculture management.

Abstract

Satellite tagging of blue sharks (*Prionace glauca*) in the Gulf of Lions: depth behaviour, temperature experience and movements: Preliminary results.

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Keywords : Biology Prionace glauca, management of shark populations, Mediterranean Sea

The lack of reliable fishery-dependent data and fundamental understanding of the biology of most shark species causes concern for the Sustainable management of shark populations in the Mediterranean Sea. The study aims at investigating on habitat occupancy, residency times and migratory pathways as well as providing behavioural data on temperature experience and swimming depth of the blue shark (*Prionace glauca*). This study strives to identify habitats and regions that are essential for the survival of sharks, while also determining when and where sharks are most vulnerable and will assist in the conservation of the species. The use of different types of satellite tags is proposed to investigate the ecology of the large pelagic sharks. The preliminary results of the first "Smart tags" deployed on eight individuals are presented.

Abstract

Effect of moderate or severe acute stressor on expressions of growth-related genes in cultured fish

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Keywords: acute stressor; growth hormone; growth hormone receptor; insulin-like growth factor-I; gene expression; cultured fish; coho salmon.

Growth in fish is regulated by the growth hormone (GH)-growth hormone receptor (GHR)-insulin-like growth factor-I (IGF-I) axis. However, the effect of acute stressor on GH-IGF-I axis in fish is not well understood. The present study determined the changes in mRNA expression of growth-related genes *gh*, *ghr*, and *igf1* in juvenile coho salmon (*Oncorhynchus kisutch*, an important fish species for aquaculture), in response to moderate or severe acute stress. Moderate stress consisted of simulated handling stress, which was known to be one of typical aquaculture-related stress, in the form of 2 min of chasing followed by using a dip net to gently lift the fish out of water for 0.5 min. Severe stress consisted of exposure to heat shock (adequate rearing temperature +11°C for 2 h).

In response to moderate stress, *ghr* mRNA levels in pituitary, liver, and muscle decreased gradually; pituitary *gh* mRNA levels did not change; and hepatic *igf1* mRNA transiently increased. In response to severe stress, *ghr* mRNA levels in pituitary, liver, and muscle increased; pituitary *gh* mRNA expression increased 2.5 h post stress; and hepatic *igf1* mRNA levels gradually decreased. These results show that expression of *gh*, *ghr*, and *igf1* genes is differently affected according to the type and strength of stress. Prudent control of conditions that can lead to stress should significantly improve both health and production in cultured fish.

Abstract

Embryological development of *Pinna nobilis* Linnaeus 1758 in controlled conditions.

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Keywords : Pinna nobilis, hatchery, improvment of artificial production.

In this work the first data on the hatchery of the endemic Mediterranean bivalve *Pinna nobilis* Linnaeus, 1758 are exposed. We have carried out numerous essays to develop the best hatchery protocol for this endangered bivalve. In order to obtain healthy gametes, 22 adult pen shells were collected during summer months (July to September) in 2012 and spawning induced by thermal shock. A reduction of 10 ºC in water temperature was sufficient to easily induce spawning in all specimens >44.5 cm and collected in July and August. Those individuals collected in September did not spawn. The egg mass was non-buoyant and larvae started swimming only one day after fertilization, which indicates that females maintain eggs in the body cavity until they are fecundated and larvae start swimming. On average, 725,000 larvae/l were obtained from an adult c. 60 cm length and some specimens were able to spawn repeatedly during several days. Some individuals changed from producing sperm to eggs in a few days. Interestingly, two specimens did spawn simultaneously eggs and sperm, inducing self fertilization. Viable larvae were susceptible to diseases from bacteria that spread and deteriorated the culture after a few days. We were able to maintain the larvae alive for 25 days, but the vellum was destroyed, likely by bacteria, and the offspring stopped swimming and feeding, then dyed. New experiments involve adult gonad maturation in captivity and improving the survival of larvae to arrive to settlement. The selectivity of substrates for settlement from a set of natural and artificial structures will also be tested.

Abstract

Environmental impacts of fish farming in floating cages in coastal seawaters and coral reef lagoons.

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Key words: fish farming, environmental impacts

Today, the fish farming in open sea and coastal bays as well in coral reef lagoons, that blows up since the 1990-years, represents a true alternative to the fish catching in temperate seawaters (Atlantic and Mediterranean coasts, North and South America, Japan) and in the tropical ones (Aqaba gulf, Persian gulf, Mayotte I., Reunion I., Mauritius I., Asian Mediterranean countries, Philippines, Pacific Is.). However, when the farmed fishes are carnivorous that sets another problem. These predators eat large quantities of foods (under granulate balls) made with « foraging » small pelagic fishes that are trawled mainly in the cold waters around the Antarctic seas or in upwelling areas (Chili or Namibia coasts). That moves away the problem of the sea resources over fishing.

As all the types of intensive farming, the fish farms could generate sources of pollution or disturbance of the environmental conditions.

So the positive and negative impacts of fish farming in the Mediterranean Sea (an old tropical sea, 18 My ago) and in tropical seas of the western Indian Ocean area analysed there.

When the farmer well manages his exploitation (floating cages, nets and farm area surroundings), which place was chosen very carefully taking in account to the oceanographic parameters (winds, sea streams, bottom features and eventually coastal pollution inputs) and when the fishes are fed with foods of high quality (even with the "bio" label) having regards to the fish densities in the net cages according to the ages and sizes of them, it is observed that a fish farm becomes equivalent to a "Marine Protected Area". That with no charges to the taxpayers!

Abstract

Ecosystem-versus species-based approach of the human impact on the Mediterranean seagrass *Posidonia oceanica*

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Abstract

Le Pôle Mer Méditerranée

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La Grande Vague", estampe de Hokusai,
est l'un des plus célèbres tableaux du monde.

Il est un symbole du Japon, à plus d'un titre :
- il personnifie les tsunamis, que les côtes japonaises reçoivent
depuis le nuit des temps, car c'est sous l'archipel que se déplace
la plaque tectonique Pacifique, la plus rapide de la planète ;
- le mont Fuji est présent, comme sur de très nombreuses estampes japonaises :
il est l'un des ressorts de l'unité nationale ;
- les pêcheurs montrent leur dur et dangereux labeur.

La place de ce tableau à la fin de ce fascicule se justifie pleinement,
car un nombre important de communications et de posters présentés
au cours de ce colloque se rapportent aux conséquences
du récent tsunami qui a affecté la région du Tohoku.

La photographie de vagues sur les côtes françaises,
dues au talent artistique de Madame PROUZET
montre un environnement marin très agité, mais moins menaçant.