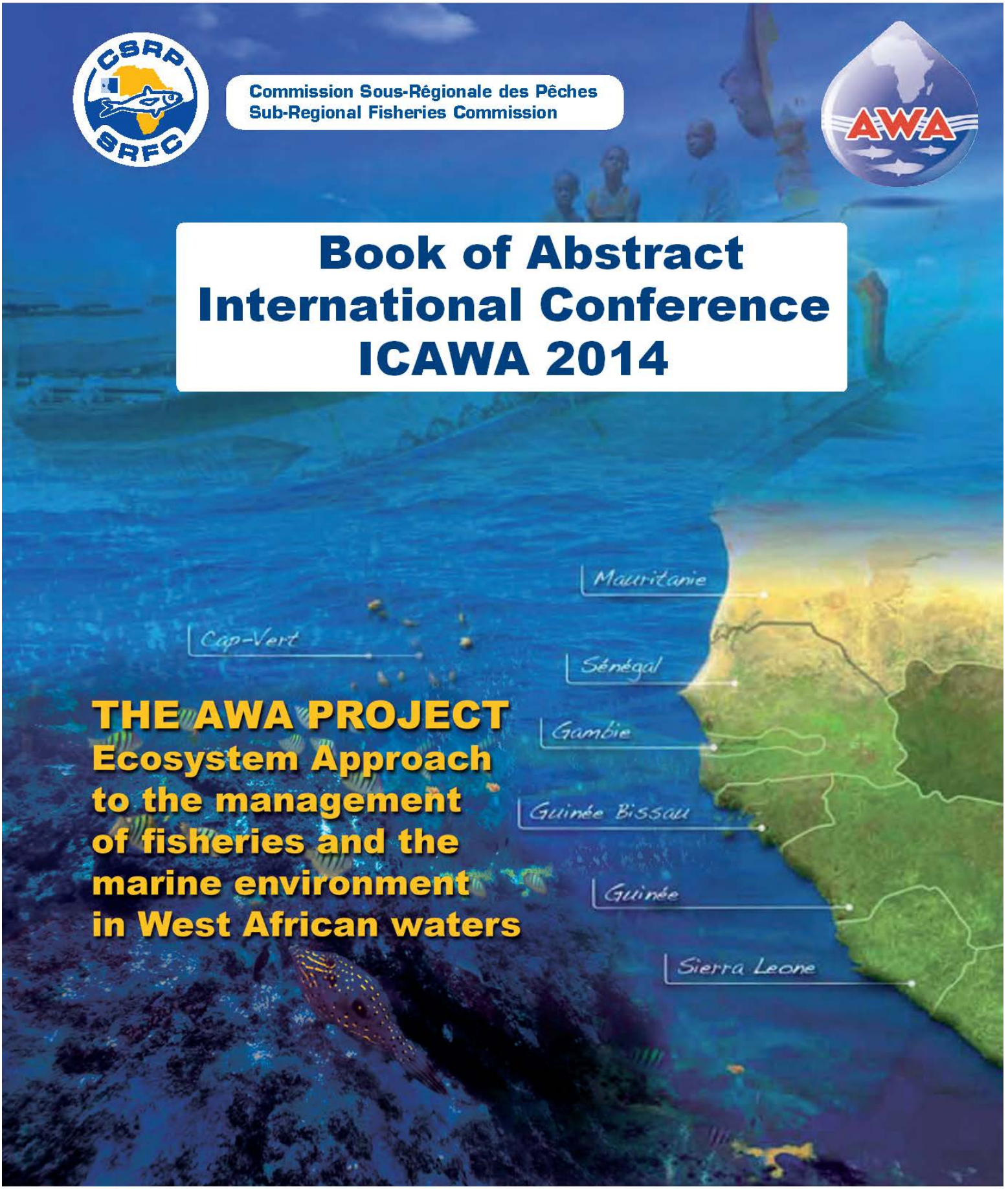
Commission Sous-Régionale des Pêches
Sub-Regional Fisheries Commission

Book of Abstract International Conference ICAWA 2014



THE AWA PROJECT
Ecosystem Approach to the management of fisheries and the marine environment in West African waters

Bundesministerium
für Bildung
und Forschung

IRD
Institut de recherche
pour le développement

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RÉPUBLIQUE FRANÇAISE
Ministère des Affaires étrangères et du Développement international
Ministère de l'Enseignement Supérieur et de la Recherche

Trilateral German-French-African research initiative

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"Ecosystem **A**pproach to the management of fisheries and the marine environment in **W**est **A**frican waters"

Build the foundation of a West African observatory

Create a sub-regional task force on the ecosystem approach to the management of fisheries and the marine environment in West African waters under the effect of climate change

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Preface

The three prefaces of the book is taken from the opening address of the conference interntionale ICAWA 2014.

Les trois prefaces de cet ouvrage sont extraites des discours d'ouverture de la conference interntionale ICAWA 2014.

Picture 1 : Picture of ICAWA participants (Morocco, Mauritania, Senegal, Capo Verde, The Gambia, Guinea, Ivory Coast, Benin, Ghana, Cameroun, South Africa, Namibia, France, Germany, Spain, Norway, Netherland, Belgium, Italia, Portugal, United Kingdom), Hotel le Nianbour, Dakar, Senegal (December, 2014).

H.E. Omar GUEYE,
Minister of Fisheries
and Marine Economy (Senegal)

Excellence Monsieur l'Ambassadeur d'Allemagne au Sénégal ; Excellence Monsieur le Représentant de l'Ambassadeur de France au Sénégal ; Monsieur le Représentant Résident de l'IRD au Sénégal ; Madame le Secrétaire Permanent par intérim de la Commission Sous-Régionale des Pêches ; Mesdames, Messieurs les Directeurs Généraux et Directeurs ; Mesdames, Messieurs les Représentants des institutions de recherche ; Mesdames, Messieurs les Partenaires techniques et financiers ; Honorables invités en vos rangs et qualités respectifs;

Mesdames et Messieurs

C'est pour moi un grand plaisir de présider en ma qualité de Ministre de la Pêche et de l'Economie maritime, cette importante conférence que le Gouvernement de la République du Sénégal a l'immense plaisir d'accueillir en terre sénégalaise de la Téranga.

Je voudrais au nom de Son Excellence, **Monsieur Macky SALL, Président de la République, de Monsieur le Premier Ministre Mahammad Boun Abdallah DIONNE**, de l'ensemble des membres du Gouvernement et à mon nom propre souhaiter la bienvenue à nos chers invités.

Ces mots de bienvenue s'adressent également aux Représentants des Partenaires techniques et financiers et aux nombreux Experts régionaux et internationaux qui nous ont honorés par leur participation à cette conférence scientifique internationale.

Je me réjouis particulièrement de la tenue de cette conférence dont j'apprécie à sa juste valeur la pertinence des objectifs visés et le rôle que nous pays et leurs partenaires devraient jouer pour contribuer à la mise en place des bases scientifiques nécessaires pour une gestion durable des pêches et de l'environnement marin en Afrique de l'Ouest.

Les États africains de la façade Atlantique doivent relever de nombreux défis, notamment la gestion des ressources halieutiques face à la raréfaction de celles-ci et à de rapides changements hydro-climatiques. Les conséquences de ces deux phénomènes sur les ressources halieutiques et l'environnement marins sont au cœur des débats entre les gestionnaires et les chercheurs de la sous-région.

A cet effet, je note avec satisfaction que ces préoccupations sont prises en considération par le projet tripartite « **Approche écosystémique de la gestion des pêches et de l'environnement marin dans les eaux ouest-africaines -AWA** » dont la présente conférence

permet le partage des premiers résultats et d'ouvrir d'intéressantes perspectives pour le Sénégal et toute la sous-région.

Pour ma part, il me plait de relever la participation effective à la Conférence d'Experts régionaux et internationaux compétents dans des domaines multidisciplinaires à travers la présence d'halieutes, d'écologistes, de bio-géochimistes, d'océanographes physiciens, de socio-économistes et de climatologues. Assurément, cette diversité des experts devrait nous permettre de poser les bases d'un observatoire pour la surveillance, la simulation et la prévision des paramètres clés qui influent sur la dynamique et l'organisation des écosystèmes, afin de mieux appréhender les effets sur les ressources marines et de leurs habitats dans notre région.

Je profite de l'opportunité qui m'est offerte aujourd'hui dans le cadre du projet « **Approche écosystémique de la gestion des pêches et de l'environnement marin dans les eaux ouest-africaines - AWA** », pour remercier chaleureusement l'ensemble des partenaires techniques et financiers pour leur soutien à l'organisation de cet important évènement. Je veux nommer la GIZ, le PPR-CUTE, le SCOR aux cotés du Ministère Français de l'Enseignement Supérieur, le Ministère Français des Affaires Etrangères et Européennes et le Ministère Allemand de l'Education et de la Recherche pour leur appui financier.

Permettez-moi enfin, de saisir cette occasion pour inviter tous les Partenaires à continuer à appuyer techniquement et financièrement les initiatives de recherche dans notre sous-région et d'accompagner la CSRP dans ses efforts de renforcement de capacités de nos Etats membres.

Je reste persuadé que les conclusions de cette Conférence, les échanges et les recommandations qui en découleront, seront des jalons importants dans l'atteinte des objectifs stratégiques de la CSRP.

Je ne saurai terminer mon propos sans souligner l'intérêt particulier que **Son Excellence, Monsieur Macky SALL, Président de la République** accordeau secteur de la pêche d'une manière générale, intérêt qui a valu d'être inscrit parmi les axes stratégique et prioritaire du plan Sénégal Emergent (PSE).

A ce titre, il me plait de vous transmettre le message de soutien de **Son Excellence, Monsieur Macky SALL, Président de la Républiqueet de l'ensemble du Gouvernement du Sénégal** qui demeurent très attentifs au renforcement des mécanismes qui permettront d'atteindre une bonne gouvernance de la gestion des pêches en Afrique de l'Ouest.

En Souhaitant un plein succès à vos travaux, je déclare ouverte la Conférence Internationale ICAWA 2014.

S.E. Omar GUEYE,
Minister of Fisheries
and Marine Economy

H.E. Bernhard KAMPMANN,
German Ambassador in Senegal

Estimated Minister Gueye, Estimated Madame Tagne, Ladies and Gentleman,

it is an honnour for me to address to you some words of welcome to this first International Conference on the Ecosystems Approach to the Management of Fisheries and the Marine Environment in West African Waters. The city of Dakar offers an ideal backdrop for a conference on the managment of fisheries and the marine environment. Situated on the most western tip of the African continent, the Atlantic is never further than a few kilometers away.The population of Dakar, just as those of the other member countries of the AWA project, has traditionally been relying on fisheries as an important source of income and continues to do so nowadays. Global changes in climate and economic activities disrupt the ecosystem and thus the dynamic of renewable marine resources such as fish stocks. Small scale fisheries are strongly impacted by such changes. The study of the management of fisheries and the marine environment in West African Waters is highly relevant not only for a country like Senegal, but for the region as a whole. While this may be the first AWA-conference, the excellent tripartite cooperation between Germany, France and the countries of Subsahara Africa (Capo Verde, Gambia, Guinea, Guinea-Bissau, Mauritania, and Senegal) already took off in January 2013.

The German and French partners involved in the project have long and comprehensive experience in scientific research concerning the tropical Atlantic Ocean. The regional character of the project and its focus on capacity building in the involved member countries are keys to its success.

Germany has been active in environmental research in West Africa for many years and proud that the German federal Ministry of Education and Research, together with its French counterpart is securing the financing of the project until 2017.German research vessels have regularly conducted research trips in West African Waters in the past. The research vessel Walther Herwig will probably undertake its next visit to Senegal and its neighbouring countries in the spring of 2015.

German marine research activities take place in other countries of the AWA-project too. During my recent official visit to Capo Verde I had the opportunity to visit the Instituto Nacional de Desenvolvimento das Pescas in Mindelo. The institute has been closely and successfully cooperating with the German GeoMar research center at the University of Kiel

since 2004. Currently 3 German scientists are working in Mindelo, undertaking oceanographic and atmospheric studies in the waters around Sao Vicente. I hope this first international conference in the framework of the AWA-project will also lay a foundation – a foundation for deepened cooperation between the involved research institutes and between the member countries in West Africa.

H.E. Bernhard KAMPMANN,
German Ambassador in Senegal

Picture 2 : ICAWA openningshowing the German Ambassador and First Secretary with the Senegalese Minister of Fisheries H. E. Omar Gueye.

I

Mr. Pierre-Yves BERTRAND
Conseiller régional développement durable
Represantant de l'Ambassadeur de France

Au nom de l'ambassadeur de France au Sénégal, je tiens à saluer et à remercier tous ceux qui ont rendu possible la tenue de ce séminaire : M. le ministre de la pêche et de l'économie maritime, SEM. Oumar Guèye ; M. le Secrétaire permanent de la CSRP ; Messieurs le ambassadeurs ; Mesdames et Messieurs

Le secteur de la pêche constitue, au Sénégal et dans la sous-région, un enjeu, tant au plan **économique** (par sa contribution au PIB et les recettes qu'il génère pour l'État), que **social** (par les emplois et revenus qu'il assure) et sur celui de la **sécurité alimentaire et nutritionnelle** (comme source de protéines animales). Ces enjeux, capitaux pour le pays, sont dépendants de la **ressource halieutique**, elle-même partie intégrante d'**écosystèmes fragiles**, souvent surexploités et de surcroît maintenant soumis à l'impact du changement climatique, dont les effets se font déjà sentir.

Je rappelle ces éléments, qui sont pour vous des évidences, pour mettre l'accent sur la **complexité** de la question. Déjà au niveau de son analyse scientifique, c'est ce défi de la complexité que le projet AWA ambitionne précisément de relever (ce n'est pas facile de faire travailler ensemble des géophysiciens, des biologistes, des écologues, que dire alors des sociologues et des économistes !).

Mais, pour valoriser ces diagnostics et ces modélisations scientifiques, il faut ensuite intégrer dans un dialogue constructif, d'une part les **acteurs** du secteur et leurs organisations professionnelles, puis les **décideurs**, ceux qui sont en charge définir des **politiques publiques** équilibrées et de trouver des compromis entre priorités nationales et protection des ressources, entre durabilité à long terme et exploitation à court terme (il s'agit parfois de *profit* à court terme mais souvent, tout simplement de *survie*).

Il est important que les chercheurs délivrent leur message aux décideurs. Les "résumés à l'intention des décideurs" du GIEC sont un modèle du genre.

Ce souci d'intégration des différents niveaux est, à l'évidence, constitutive de la démarche des autorités sénégalaises (les aires marines protégées communautaires en sont un bon exemple). Et au niveau sous-régional, la CSRP travaille à assurer la cohérence des politiques des États-membres par la coordination et le dialogue. J'en tirerai une conséquence : cela impose aux PTF de respecter cette cohérence, en s'appuyant sur les conventions internationales (comme la CNUDM).

Je souhaiterais rappeler enfin que la France est très sensibilisée à la question des politiques de pêche : outre sa participation à ce projet scientifique AWA, elle a financé un programme de soutien institutionnel à la CSRP ("*Projet d'appui à la CRSP pour le développement d'initiatives de cogestion et pour l'intégration des Aires marines protégées*", 5M€), qui s'est terminé en 2013. Elle appuie également le "*forum régional sur la cohérence des politiques dans les secteurs halieutiques en Afrique de l'Ouest*", qui aura lieu début 2015 à Dakar, organisé entre autres par le REPAO et l'OCDE.

Je ne doute pas que vos travaux vont être fructueux et passionnants.

Mr. Pierre-Yves BERTRAND
Conseiller régional développement durable
Represantant de l'Ambassadeur de France

Acknowledgment of ICAWA 2014 sponsors

On behalf of all the organisors and participants from Europe and Africa, we would like to thank the sponsors of 2014 edition of the ICAWA. Special thanks to:

- SRFC: Sub Regional Fisheries Commission;
- IRD : Institut de Recherche pour le Développement ;
- GIZ: Gesellschaft für Internationale Zusammenarbeit;
- PPR CUTE: inter-Regional Pluridiciplinary Program on Coastal and Upwelling Ecosystems;
- SCOR: Scientific Committee on Oceanic Research.

This first edition of ICAWA should set the stage for a regular event in West Africa allowing both researchers and students working on the West African ecosystem to come together and contribute towards improving coastal and fisheries management in a spirit of synergy involving all stakeholders.

High-level authorities were present, the conference brought together over 250 participants (including co-authors) representing 21 nationalities and almost one hundred institutions. The conference was organized in 6 sessions (physics-atmophere, fisheries ecology, biogeochimistery, socio-economy, environmental law and seabird/fisheries interactions as well as four "sides events" or working groups: IndiAWA, establishing a West African oceanographic fleet, MPAs (marine protected area), and monitoring and processes of coastal erosion and itsimpact on societies in West Africa.

Synopsis on the AWA tripartite project

The Consortium (English version)

The AWA consortium includes 10 countries (15 including associated partners) and more than 40 laboratories.

Joint proposals by the Federal Ministry of Education and Research (BMBF/Germany) and the IRD (France) under the patronage of the French Ministry for Higher Education and Research (MESR) and the French Ministry of Foreign and European Affairs (MAEE).

Locally implemented by the SRFC

A trilateral German-French-African Research initiative in Sub-Sahara Africa

To add a new dimension to the long history of cooperation in Science and Technology (S&T) between Europe and Africa, Germany and France have decided to join their efforts to strengthen S&T cooperation with Sub-Sahara Africa, building on mutual strengths and interests.

Goal

AWA project is a strategic partnership among Germany, France and West African countries that will be capable of developing a vision and the scientific basis for an ecosystem approach to the management of fisheries and the marine environment ('EAMME') in West Africa with a long-term endeavor focusing on small pelagic.

Combining process studies of ecosystem functioning, long-term biological and physical monitoring and modeling, the final goal is to develop indicator-based management and adaptive decision support tools for EAMME in the context of global change and regional cooperation, since the same stocks are shared by several member States of the Sub-regional Fisheries Commission (SRFC).

To achieve this goal, the laboratories involved will work in two main areas of research: the monitoring of oceanic biological resources and the functioning (ecological processes) and modeling of their environment. These are both research areas of outstanding importance in the broader scientific context of the analysis of global climate change, and of paramount relevance of their impacts on fisheries resources for West Africa. Both research activities will be done with a particular interest in capacity building of West Africa.

Project structure

WP 0: Project coordination and management

WP 1: Observations and modeling of ocean physics supporting the ecosystem approach to marine management

The lack of historical perspectives, continuous monitoring and regular forecasts of ocean physics and biochemistry parameters increase the vulnerability of the fragile economies of West African Countries. WP1 will concentrate on the observation and modeling of four key parameters that are at the heart of the assessment, understanding and anticipation of the

ocean response to ongoing future changes: upper ocean temperature, sea level, and oceanic current.

Tasks

Task 1.1. Assessing a highly variable oceanic environment.

Task 1.2. Modeling the variability of the physical environment.

Task 1.3. Observation and simulation synthesis: towards prescription and early warning tools.

WP 2: Variability of pelagic productivity in West-African waters

Pelagic productivity in the West African upwelling sustains one of the world's largest small pelagic fisheries. However, key ecosystems processes and stock dimensions are still not clearly understood. WP2 will link process data and operational observational data (e.g. satellite data, physical oceanography) in order to establish long-term modeling and forecasting capabilities of pelagic productivity and exchange processes in the West African upwelling and estuarine interface.

Tasks

Task 2.1. Indicators of productivity of oceanic small pelagic in nurseries, shelf and deep water/oceanic habitats.
Task 2.2. Pelagic key components at the interface between subtropical gyre and coastal upwelling.
Task 2.3. Exchange processes and pelagic productivity at the estuarine interface.

WP 3: Physical-biogeochemical coupling: processes and small pelagic fish control

Within the eastern boundary currents, pelagic fish are strongly dependent on their environment which defines their habitat, the availability of food and probably also drives their spawning, growth recruitment success, spatial distribution and health. WP3 will increase understanding of the physical/biochemical environment of small pelagic fish in West Africa in order to apprehend the bottom up processes that impact on their life cycle and also identify useful indices in a context of climate change.

Tasks

Task 3.1. Key biogeochemical processes: control of primary production and oxygen minimum zone.
Task 3.2. The spatio-temporal variability of small pelagic spawning.
Task 3.3. Recruitment of *Sardinella aurita.*
Task 3.4. Temporal evolution of fish habitat defined from coupled modeling approach.

WP 4: Economics integrated into the ecosystem approach to marine management

WP4 goal is to determine the optimal management of key fish species, taking into account economic (including profits by fleet) and ecological drivers and needs. A special focus will be

on the effects of environmental variability and climate change on economics performance and indicators (IndiAWA).

Tasks

Task 4.1. Optimal economic-ecological management of selected key-species under environmental uncertainty.

Task 4.2. Spatial economic-ecological approaches.

Task 4.3. Ecosystem, economic, and fish based indicators of global change in West Africa.

WP 5: Education, Training and Capacity-building

There is a strong demand for capacity building strategies as well as strategic partnerships between institutions and universities in the sub region of West Africa. WP5 will encourage the development of common data formats and sampling protocols, as well as communication to exchange data and information between project partners and other institutions. WP5 will also develop the advancement of local scientific expertise in marine environment management. In each WP, individual training opportunities are provided to PhD students and MSC candidates from African partners. In particular students require a high degree of mentoring and therefore require a strong component of capacity building. Action of common interest will be lead along the course of the project e.g. on MPA, doctoral school, oceanographic research fleet, coastal erosion.

Tasks

Task 5.1. To coordinate and reinforce existing training capacities in the oceanography field.

Task 5.2. Enforcement of local scientific expertise.

Le Consortium (French version/version en Français)

Le consortium AWA comprend 10 pays (15 en incluant les partenaires associés) et plus de 40 laboratoires.

Propositions conjointes du Ministère Fédéral Allemand de l'Éducation et de la Recherche (BMBF) et l'IRD (France), sous le patronage du Ministère Français de l'Enseignement Supérieur et de la Recherche (MESR) et le Ministère Français des Affaires Etrangères et Européennes (MAEE).

Localement mis en œuvre par la Commission Sous Régionale des pêches (Sénégal)

Une initiative de recherche tripartite Allemagne-France-Afrique sub-saharienne

Pour ajouter une nouvelle dimension à la longue histoire de la coopération en science et technologie (S&T) entre l'Europe et l'Afrique, l'Allemagne et la France ont décidé d'unir leurs efforts pour renforcer la coopération S&T avec l'Afrique subsaharienne, en s'appuyant sur les forces et les intérêts mutuels.

Objectifs

Le projet AWA est un partenariat stratégique entre l'Allemagne, la France et les Etats d'Afrique de l'Ouest qui a pour objectif de développer une vision et les bases scientifiques pour une approche écosystémique de la gestion des pêches et de l'environnement marin (‘de EAMME') en Afrique de l'Ouest en mettant particulièrement l’accent sur les petits pélagiques.

Combinant l'étude des processus qui régissent le fonctionnement des écosystèmes, le suivi biologique et des paramètres physico-chimiques à long terme et la modélisation. L'objectif final est de développer des outils d'aide à la décision pour l’EAMME basés sur des indicateurs adaptatifs de gestion dans le contexte du changement global et de la coopération régionale, puisque les mêmes stocks sont partagés par plusieurs Etats membres de la Commission Sous Régionale des Pêches (CSRP).

Pour atteindre cet objectif, les laboratoires impliqués travailleront dans deux principaux domaines de recherche : le suivi des ressources biologiques océaniques, et le fonctionnement et la modélisation (processus écologiques) de leur environnement. Ces deux domaines de recherche sont essentiels à appréhender dans le contexte scientifique plus large de l'analyse des changements climatiques, et de la pertinence de ces effets sur les pêcheries en Afrique de l'Ouest. La mise en œuvre du projet est réalisée avec un intérêt particulier sur le renforcement des capacités d’expertises des partenaires ouest-africains.

Project structure

WP 0: Coordination et gestion du projet

WP 1 : Observations et modélisation de la physique de l'océan pour soutenir l'approche de la gestion de l'écosystème marin

Le manque de prévisions régulières et de suivi des paramètres d’océanographie physique et biochimiqu econtribue fortement à la vulnérabilité des économies fragiles des pays ouest-

africains. WP1 se concentrera sur l'observation et la modélisation de quatre paramètres-clés qui sont au cœur de l'évaluation, la compréhension et l'anticipation de la réponse de l'océan face aux changements à venir et en cours : la température de surface des océans, le niveau de la mer, et la courantologie marine.

Tâches

Tâche 1.1. Suivi d'un environnement océanique très variable.

Tâche 1.2. Modélisation de la variabilité de l'environnement physique.

Tâche 1.3. Synthèse observation et simulation : vers la prescription et des outils d'alerte précoce.

WP 2 : Variabilité de la productivité pélagique dans les eaux ouest-africaines

La productivité de l'upwelling en Afrique de l'Ouest maintient l'une des plus grandes pêcheries de petits pélagiques au monde. Cependant, les processus-clés des écosystèmes et l'étendue de certains stocks ne sont pas encore bien compris. WP2 fera le lien entre les études de processus de ces écosystèmes et les données associées aux observations opérationnelles (par exemple, les données satellitaires, l'océanographie physique) afin de modéliser et de prédire dans le long terme les capacités de productivité pélagique et les processus d'échange entre les upwellings et les estuaires.

Tâches

Tâche 2.1. Indicateurs de la productivité des petits pélagiques océaniques dans les nurseries, le plateau continental et les eaux profondes / habitats océaniques.
Tâche 2.2. Composantes pélagiques clés à l'interface entre "gyre subtropical" et upwelling côtier.
Tâche 2.3. Processus d'échange et productivité pélagique à l'interface estuarienne.

WP 3 : Couplage physique-biogéochimique : processus et contrôle des petits poissons pélagiques

Entre les bordures Est des courants, les poissons pélagiques sont fortement dépendants de leur environnement qui définit leur habitat, la disponibilité de la nourriture et probablement leur ponte, le succès du recrutement de croissance, leur répartition spatiale et leur état de santé. Le WP3 va tenter d'améliorer les connaissances entre l'environnement physique/biochimique de petits pélagiques en Afrique de l'Ouest afin d'appréhender les processus-clefs qui ont une incidence sur leur cycle de vie et aussi de dégager des indices utiles dans un contexte du changement climatique.

Tâches

Tâche 3.1. Processus biogéochimiques clés: contrôle de la zone de minimum d'oxygène et de la production primaire.

Tâche 3.2. Variabilité spatio-temporelle de la ponte des petits pélagiques.

Tâche 3.3. Recrutement de *Sardinella aurita.*

Tâche 3.4. Évolution temporelle de l'habitat des poissons par une approche de modélisation couplée.

WP 4 : Economie intégré dans l'approche de la gestion de l'écosystème marin

Le WP4 a pour objectif de déterminer la gestion optimale des principales espèces de poissons, en tenant compte des aspects économiques (y compris les bénéfices de la flotte), des « drivers écologiques » et des besoins. Une attention particulière sera portée sur les effets de la variabilité de l'environnement et du changement climatique sur les performances économiques sur l'estimation des indicateurs écosystémique (IndiAWA).

Tâches

Tâche 4.1. Gestion économique-écologique optimale des espèces-clés retenues dans un contexte d'incertitude environnemental.

Tâche 4.2. Approche spatiale de l'économie/écologie.

Tâche 4.3. Indicateurs écosystémiques, économiques, et ichtyologique des changements globaux en Afrique de l'Ouest.

WP 5: Education, formation et renforcement des capacités

La demande pour le renforcement des capacités et des partenariats stratégiques entre les institutions et les universités de l'Afrique de l'Ouest est forte. Le WP5 encouragera le développement de formats harmonisés et de protocoles d'échantillonnage et facilitera les échanges des données et d'informations entre les partenaires du projet et d'autres institutions. Le WP5 facilitera également la promotion de l'expertise scientifique locale dans la gestion de l'environnement marin. Dans chaque WP, des possibilités de formation ciblée de partenaires africains sont prévues pour les doctorants et les étudiants. En particulier les étudiants nécessitent un degré élevé d'encadrement et donc une forte composante de renforcement des capacités. Des actions ciblées d'intérêt commun seront aussi menées au fil de l'eau, par exemple sur les AMP, l'école doctorale, la flotte océanographique scientifique, l'érosion côtière.

Tâches

Tâche 5.1. Coordonner et renforcer les capacités de formation existantes dans le domaine de l'océanographie.

Tâche 5.2. Renforcement de l'expertise scientifique locale.

SESSION report, recommandations
and
book of abstract

ICAWA Report Session 1 "Observation and modelling of ocean physics supporting the ecosystem approach to marine management".

Chairmen: Peter BRANDT (Geomar, Germany), Alban LAZAR (UPMC, France), Bamol Ali SOW (UASZ, Senegal)

Rapporteur: Ndague DIOGOUL (UCAD/ISE - IRD)

Summary Report

The session focused on near-coastal physical processes driving coastal upwelling variability on daily to interannual timescales as well as on the exchange processes between upwelling and Open Ocean. Adjacent to the coastal upwelling off North West (NW) Africa is the oxygen minimum zone (OMZ) of the eastern tropical North Atlantic (ETNA), whose variability and long-term changes affect the near-coastal ecosystem as well. The session was split into oral and poster presentations. The session started with an overview of observations used to study the ventilation of the OMZ and oxygen distribution focusing particularly on the ongoing deoxygenation of the ETNA OMZ over the last 40 years.Although the ETNA OMZ is relatively oxygen-rich, locally extreme low oxygen values (<2 µmol/kg) are observed in mesoscale eddies so-called dead zone eddies, which directly impact the ecosystemwithin this local environment. Following talks represent observational and modeling studies regarding different aspects of the coastal upwelling system of NW Africa showing the progress within AWA to a better understanding of the mean state and functioning of the coastal upwelling.

Within AWA different field campaigns were carried out including the UPSEN2/ECOAO field experiment performed in the Senegalese upwelling region with RV Antea. Together with different modeling studies based on ROMS and NEMO ocean models, different factors for upwelling variability were analyzed. For realistic simulations of upwelling processes the need for improved near-coastal winds and surface heat fluxes were highlighted. Besides the importance of upwelling for the coastal ecosystem, the sea surface temperature variability in this region was shown to affect rainfall in the Sahel region and around Dakar as well. On the other hand, a remote influence of the Pacific El Nino on interannual upwelling variability off NW Africa could be shown, which might lead to a predictability of the NW African upwelling system. Other aspects covered by the session included pollutant dispersion in near coastal regions, using the example of the "Baie de Hann", that represents a threat for the local ecosystem; or the salt budget in the eastern tropical Atlantic showing impact of salinity variability on mixed layer dynamics and potentially air-sea coupling.

RECOMMENDATIONS

After highlighting the importance of the establishment of a prediction system for upwelling variability, it was recommended to further develop the observing system required to validate and improve applied models.

Compared to other eastern boundary upwelling regions in the Pacific or South Atlantic, the ETNA upwelling system lacks important continuous observations like *e.g*. buoys and sub-surface moorings.

Besides physical parameters like velocity, temperature, and salinity, oxygen is a key parameter required to assess threats of the ecosystem due to possible hypoxia on the shelf off NWA.

For the development of the observing system a better understanding of the importance of different scales of variability and their effect on the ecosystem has to be studied.

Numerical simulations can help to define required measurement for the observation of the upwelling ecosystem and also needed for the optimal validation of the models.

The results from the performed and ongoing process studies have to be synthesized to develop a sustained observing system, incorporating repeated shipboard and glider observations and continuous observations with subsurface moorings and buoys, thereby fostering the cooperation between African and European institutes within AWA, and also enabling pooling of cruises within and between each WP 1, 2, 3 and 5.

During this session the price of the best oral comunication was delivered to Ibrahima CAMARA (UCAD, Senegal) and Florian SCHUTTE (Geomar, Germany) and the price of the best poster was delivered to the PhD candidate Siny NDOYE (UCAD, Senegal).

Picture 3 : The winner of the best presentation of ICAWA session 1.

Session 01

EU-PREFACE: improving prediction of Tropical Atlantic climate from a season to decades

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Abstract

Seasonal to decadal variations of the Tropical Atlantic have major impacts on West African marine ecosystems and climate. The Tropical Atlantic is also undergoing pronounced long-term changes. Climate models exhibit large-systematic errors and our ability to predict these changes is low. Furthermore, our understanding of the long-term changes is lacking. The EU-PREFACE project aims to address these issues, by a combined observational and modeling approach. Importantly, the project aims to improve understanding and skill to predict climatic impacts on marine-ecosystems and assess the socio-economic consequences on fisheries. In this presentation I will summarize (1) the modes of climate variability and observed long-term climate change, (2) seasonal-to-decadal prediction skill in the Tropical Atlantic and future change projections, and (3) model systematic error and how EU-PREFACE is working to reduce these and improve predictions.

Keywords: climate change, climate variability, long-term climate change, seasonal-to-decadal prediction, systematic errors.

Session 01

On the role of circulation and mixing in the ventilation of the oxygen minimum zone of the eastern tropical North Atlantic

Peter BRANDT [1,*], Hermann W. BANGE[1], Donata BANYTE[1], Marcus DENGLER[1], Sven-Helge DIDWISCHUS[1], Tim FISCHER[1], Richard J. GREATBATCH[1], Johannes HAHN[1], Torsten KANZOW[1], Johannes KARSTENSEN[1], Arne KÖRTZINGER[1], Gerd KRAHMANN[1], Sunke SCHMIDTKO[1], Lothar STRAMMA[1], TosteTANHUA[1] and Martin VISBECK[1]

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Abstract

Ocean observations are analyzed to study 1) the structure of the oxygen minimum zone (OMZ) of the eastern tropical North Atlantic (ETNA), 2) the processes that contribute to the oxygen budget, and 3) long-term changes in the oxygen distribution. The ETNA OMZ, located between the well-ventilated subtropical gyre and the equatorial oxygen maximum, is composed of a deep OMZ at about 400 m depth with its core region centred at about 20° W, 10° N and a shallow OMZ at about 100 m depth with lowest oxygen concentrations in proximity to the coastal upwelling region off Mauritania and Senegal. The oxygen budget of the deep OMZ is given by oxygen consumption mainly balanced by the oxygen supply due to meridional eddy fluxes (about 60 %) and vertical mixing (about 20 %, locally up to 30 %). Advection by zonal jets is crucial for the establishment of the equatorial oxygen maximum. In the latitude range of the deep OMZ, it dominates the oxygen supply in the upper 300 to 400 m and generates the intermediate oxygen maximum between deep and shallow OMZs. The deoxygenation of the ETNA OMZ during recent decades suggests a substantial imbalance in the oxygen budget: about 10 % of the oxygen consumption during that period was not balanced by ventilation. Long-term oxygen observations show variability on interannual, decadal and multidecadal time scales that can partly be attributed to circulation changes. As the shape of the OMZ is set by ocean circulation, the widespread misrepresentation of the intermediate circulation in ocean circulation models substantially contributes to their oxygen bias, which might have significant impacts on predictions of future oxygen levels.

Keywords: OMZ; North Atlantic; deoxygenation; ventilation; subtropical gyre.

Session 01

Characterization of "dead-zone eddies" in the tropical North Atlantic Ocean

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Abstract

Open-ocean low–oxygen dead-zones in the Northeast Atlantic are recently discovered ocean features that can develop within cyclonic and anticyclonic-modewater eddies. Through a combination of eddy dynamics and biogeochemical cycling within the eddies, hypoxic/close to anoxic environments are created. So far the description of such eddies was limited by the availability of only few opportunistic observations; high- resolution observations of physical and biogechemical parameters able to analyse in detail the eddy structure are so far not available.In an attempt to survey anomalous eddies by means of research vessels and gliders an eddy identification, tracking and characterizing scheme based on remote sensing and Argo float measurements was developed and applied to the region between the Cape Verde Islands and the coast of Mauritania and Senegal. In December 2013 a potential "dead-zone eddy" was identified and in March/April 2014 a multi-platform survey of that eddy was performed, which comprised the usage of three gliders (measuring temperature, salinity, oxygen, Chl-a, turbidity, nutrients) and two ships (preforming CTD and ADCP measurements). The formation, propagation, mean vertical/spatial structure and its temporal evolution of the eddy event 2013 are presented.To set the single eddy event into a greater context an assessment of potential dead-zone eddies is performed, due to the combination of all historical available glider, shipboard, Argo float and sea level anomaly data. Low oxygen concentrations have been observed in cyclones and in anticyclonic-modewater eddy with oxygen levels reaching suboxic/close to anoxic concentrations in the latter ones. Both types of eddies have cores filled with South Atlantic Central Water that is anomalously low in salinity compared to the ambient water and typically found in the coastal upwelling region. Inspecting the available oxygen dataset from CTD, mooring and Argo float measurements indicate that eddies with low oxygen concentrations at shallow depth can be found in an extended latitude range from about 20°N to 5°N.

Keywords: oxygen, CTD, mooring, Argo float.

Session 01

Long-term Variability of NorthWest African coastal upwelling

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Abstract

The NorthWest African sea surface temperature variability can be due to changes in the coastal upwelling system, which in turn can be due to alterations in local winds, global winds induced by teleconnections and propagation of waves from wind burst in remote regions. The two last processes could be due in turn to changes in the sea surface temperature in extended regions remote from the upwelling region, as changes in Pacific SSTs associated with ENSO, or in the Equatorial Atlantic SSTs. This work demonstrates that the whole signal cannot be explained by local wind/Ekman pumping and large scale winds induced by teleconnections play an important role. Using observational data of SSTs and winds from atmospheric reanalysis, and applying different statistical technics, as correlation analysis, filtering and discriminant analysis, the different influences and its stationarity along the observational period are tested pointing to the non stationarity of El Niño influence in FMA and to other possible predictors influencing in the region.

Keywords: Africa, Equatorial Atlantic, upwelling, ENSO, SST.

Session 01

The southern Senegal upwelling center: state and functioning during the UPSEN2/ECOAO field experiments (Feb.-Mar. 2013)

Xavier CAPET[1,*], Philippe ESTRADE[2], Eric MACHU[3], Siny NDOYE[2], Jacques GRELET[4], Alban LAZAR[1], Louis MARIE[3], Denis DAUSSE[1] and Patrice BREHMER[5]

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Abstract

Upwelling off southern Senegal and Gambia takes place over a wide shelf with a large area where depth is shallower than 20 m. This results in typical upwelling patterns that are distinct from those of other better known systems, including Oregon and Peru where shelves are comparatively narrower. 4 weeks intensive measurement period sheds light on the synoptic and superinertial variability of this upwelling sector. The influence of mesoscale activity extends across the shelf break into the shelf where it impacts the mid-shelf upwelling. Internal tide and solitary waves of large amplitude are ubiquitous over the shelf. Our observations suggest that they play a fundamental role in the overall system functioning, including biogeochemical.

Keywords: upwelling patterns, mesoscale, mid-shelf upwelling, Internal tide, solitary waves ECOAO.

Session 01

Upwelling dynamics and cold-water filaments off the Senegal and Mauritania coasts

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Abstract

Lagrangian observations (surface drifters), satellite data (images of sea surface temperature) and ocean surface wind products are used to describe the upwellingdynamics off northwest Africa during 2009-2013, with particular focus to the region between Cap Blanc (Mauritania) and Cap Vert (Senegal). The upwellingseason generally starts in late November and persists until early July north of 19°N, whereas it starts in late December and prevails until May in the south; inJune the upwelling events south of Cap Blanc disappear and the residual cold water gradually mixes with the warm surface tropical Atlantic water. The most intense upwelling episodes, identified by a minimum in the Sea Surface Temperature values (lower than 20°C), are recorded between February and May with a mean duration of 5-10 days and coincide with maximum intensities ofupwelling favourable winds (Trade winds). Cold and nutrient-rich coastal nearsurface waters are upwelled and transported offshore (westward) by means of energetic filaments rooted at specific locations along the coasts of Mauritania and Senegal. Four recurrent upwelling filaments (temperatures lower than 20°C), with an offshore extension between 200 km and 400 km, are observed and characterised. These filaments persist for a few weeks, and they subsequently mix with the surrounding waters. The intensity of vertical velocities in the Ekman layer follow the evolution of the main upwelling events,showing large positive values distributed along the entire Senegal and Mauritania coasts in January-May; largest values correspond to the location of the main cold water filaments. Drifter observations confirm the prevalent westward flow in the regions of the upwelling filaments with mean speed of 15- 20 cm/s. The area off Cap-Vert is strongly influenced by the inter-annual variability of the upwelling seasons and by relaxation/intensification of Trade winds.

Keywords :Northwest Africa coasts; upwelling events; Sea Surface Temperature maps; drifter data; cold water filaments.

Session 01

Influence des températures de surface de la mer dans le Golfe de Guinée et le Pacifique tropical sur la pluviométrie au Sahel, particulièrement à Dakar

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Résumé

L'influence des anomalies de température de surface de la mer (TSM) dans le Golfe de Guinée (GG) et le Pacifique Tropical sur la pluviométrie au Sénégal, Dakar, est étudiée en utilisant la méthode de l'analyse composite sur la période 1901-2013 (113 ans). Les résultats obtenus montrent que les précipitations au Sahel et particulièrement à Dakar dépendent de la TSM de ces bassins océaniques.Cette relation entre ces deux variables se traduit par un mode dipolaire d'anomalies de pluie en Afrique de l'ouest avec le maximum de pluie au Sahel (Dakar) associé au refroidissement des TSM ; le contraire est observé pour le réchauffement des TSM dans ces régions océaniques. Cependant, l'évolution temporelle à basse fréquence de la corrélation glissante sur des fenêtres de vingt ans (20 ans) montre que cette relation est non stationnaire. Cette étude montre que les plus fortes corrélations sont enregistrées au cours de la période humide, -0.7 (GG) et -0.6 (Pacifique) et qu'elles sont négatives sur toute cette période. En effet, pour le GG, on note une augmentation progressive de celles-ci au cours de la période sèche et atteignent des valeurs positives. Alors que celles obtenues avec le pacifique restent négatives mais elles sont plus fortes à Dakar qu'au Sahel sur toute notre période (1901-2013).

Mots clefs : TSM, Anomalie, Golfe de Guinée (GG), Pacifique Tropical.

Session 01

Pollutant dispersion in the Baie de Hann: a ROMS modeling study for the Mbao outfall

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Abstract

Dispersion of sewage waters in the Hann Bight: a numerical approach. The Senegalese water department (ONAS) is in charge of designing and implementing a plan to clean up the Dakar metropole and its surrounding waters. It involves the collection, treatment and release of industrial and domestic waters of the capital of Senegal. The technical solutions that have been retained resemble those in use in developed countries: a cost-effective approach consists in combining imperfect clean-up of waters and its subsequent dispersion in the coastal ocean to limit residual pollutant concentrations.In 2013-2014 the Laboratoire de Physique de l'Atmosphère et de l'Océan (LPAO-SF at Dakar University) conducted a study to test the viability of placing an outfall 2km offshore of Mbao in the Baie de Hann. Although located relatively close to shore our numerical simulations indicate that the projected level of water treatment and release at the outfall will significantly improve the bacterial quality of waters in the bay.

Session 01

SST patterns and dynamics of the Southern Senegal-Gambia upwelling center

Siny NDOYE[1,*], Xavier CAPET[2], Philippe ESTRADE[1], Bamol SOW[3], Dominique DAGORNE[4], Alban LAZAR[5], Amadou T. GAYE[1] and Patrice BREHMER[6]

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Abstract

The southern end of the Canary current system comprises an original upwelling center that has so far received limited attention, the Southern Senegal-Gambia Upwelling Center (SSUC). We investigate its dynamical functioning by taking advantage of favorable conditions in terms of limited cloud coverage. Analyses and careful examinations of over 1500 satellite images of sea surface temperature scenes contextualized with respect to wind conditions confirm the regularity and stability of the SSUC dynamical functioning (as manifested by the recurrence and persistence of particular SST patterns) but also reveal subtle aspects of its upwelling structure: shelf break cooling of surface waters consistent with internal tide breaking/mixing ; complex interplay between local upwelling and the Mauritanian current off the Cape Verde headland ; complexity of the inner-shelf/mid shelf frontal transition. The amplitude of the diurnal cycle suggests that large uncertainties exist in the SSUC heat budget. Study limitations underscore the need for continuous in situ measurement in the SSUC, particularly of winds.

Keywords: SST; Southern Senegal, Gambia, Upwelling, CCLME.

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Session 01

Seasonal salt budget in the Eastern Tropical Atlantic

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Abstract

A regional numerical simulation is used to investigate the different processes that control the seasonal cycle of the mixed-layer salinity in the Eastern North Tropical Atlantic (ETAn 10:17°N/20:5°W). The simulated tendency agrees well with the observed one qualitatively. The mixed layer salinity increases from November to April and decreases the rest of the year. The freshening during boreal summer-fall is due to a net freshwater input from the atmosphere. But it is strongly attenuated by oceanic processes, in particular the vertical diffusion at the base of the mixed layer. The vertical diffusion salt along the year with a maximum in October when the vertical salinity gradient is maximum indicating that the later drives the diffusion. We discuss the impact of theseprocesses in terms of seasonal cycle of the mixed layer density and with respect to the mechanisms driving the mixed layer salinity evolution in other parts of the tropical Atlantic.

Session 01

The Senegalese upwelling: mean state and mesoscale activity

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Abstract

The Senegalese and Mauritanian coasts are characterized by upwelling boundary currents and undercurrents generated by alongshore parallel winds. A modeling approach is used to build a numerical solution from a regional model (ROMS). These simulations are compared with satellite abamolnd in-situ measurements. At regional scale, the ROMS simulations reproduce the main characteristics of the regional circulation from Morocco at the northern part to Guinea South of our region of interest and around Cape Verde. This circulation is characterized at the surface by the North Equatorial Current (NEC), the North Equatorial Counter Current (NECC), the Guinea dome and the cyclonic gyre of Senegalese and Mauritanian coasts. Under the surface layer, the circulation shown by the model emphasizes the South and North Atlantic Central Waters (SACW and NACW) converging along the Cape Verde Frontal Zone. Along the Senegalese coasts, the upwelling is mainly seasonal and occurs in winter and spring with spatial disparities. In the northern part of the coast called "Grande Côte", located between Dakar and Saint-Louis city, we have a usual upwelling with the SST minimum found near the coastline whereas in the southern part the lowest SST are found at the middle of the continental shelf, between warmer waters on its western and eastern sides. This upwelling is mainly controlled at seasonal scale by the wind field which produces Ekman transport. This situation gives a pressure gradient along the direction where the waters are transported creating the geostrophic southward coastal jet along the Senegalese coast. In addition to this system of currents associated to upwelling process, turbulence generated by an important mesoscale activity in the area, is also described.

Keywords: Mesoscale, upwelling boundary currents, undercurrents, turbulence, West Africa.

ICAWA Report Session 2 "Variability of pelagic productivity in West-African waters", joint with **Side Event 3** communications on "Marine protected Area"

Chairmen: Heino Fock (TI Germany), Carlos Santos Ferreiro (INDP, Capo Verde), Werner Ekau (ZMT) & Patrice Brehmer (IRD, France)

Rapporteur: Ndague Diogoul (ISE/IRD, Senegal)

Session on "Variability of pelagic productivity in West African waters" started with some general consideration and observations on the reproduction of pelagic fish variability under various conditions. Studies of reproductive biology of Ethmalosa fimbriata in Senegalese waters particularly in Sine-Saloum estuary showed that there is a higher reproductive potential in the estuarine population than in the coastal population. Indeed, fecundity increases with the rate of salinity. In the Senegalese coast characterized by upwelling phenomena, anchovies, horse mackerel and Sardinella species prevail. It was shown, that larvae maintain their position in the upwelling zone by different vertical migration strategies. A mathematical model of a fisheriesoperating on several sites with variable prices showed how bio-economic models can be applied to analyse major issues in fisheries management. The model takes into account the temporal development of the resource, respective fish and boat movements between different sites, and varying fishing effort and fish prices that varyin relation to supply and demand. Observation studies included the study of the effect of oceanographical conditions on Sardinella aurita and Sardinella maderensis. High inter-annual variability was observed from 2002 to 2006) with Sardinella aurita tending to increase, while Sardinella maderensis was decreasing. Thus, variability in Sardinella spp. is linked to upwelling conditions.Studies of composition variations of bottom species targeted by the artisanal fishing season on Coast of Senegal (2004 to 2013) showed: a response of the ecosystem to fishing pressure by a reduction species numbers in the captures of bottom species; and changes in the bottom species targeted by the artisanal fisheries due to scarcity of the resources and a new adaptation to the consumption of other bottom species targeted by the small scale fisheries.Two methods of pelagic fishegg identification and evaluation were presented. Besides genetic studiesto identify, characterize and follow the evolution of the pelagic fish stock, the seconde one to identify species applied MALDI-TOF mass spectrometry on fish eggs.The importance of the mesopelagic zone in West Africa was presented by the Mauritanian colleague. Exploitation of mesopelagic could be in the future an alternative for industries of fish oil and flour in a context where the small pelagic undergo many pressures. Such exploitation requires more consideration on the impact on the marine food web.

RECOMMENDATIONS

- Installing a program of genetic evaluation of Sardinella stocks in West Africa since this method is considered to be effective.
- To continue research and to make effort of sampling and analysis of surface water, particularly on small pelagic egg spatial distribution.
- To apply the Multi- site fishery models to other fisheries in West Africa.
- To develop a program of research on mesopelagic fish.

During this session the price of the best oral comunication was delivered to Ahmed JEHID (IMROP, Mauritania) and the price of the best poster was delivered to the PhD candidate Maik TIEDEMANN (TI, Germany). During the joint session on Marine protected Area the price of the best oral comunication was delivered to Adam CESAY (ZMT, Gambia), the price of the best poster was delivered to Awa WATT (IUPA-IRD, Mauritania).

Picture 4 : Dr Mahfoudh Ould Taleb IMROP deputy director (Mauritania) during an ICAWA session.

Picture 5 : Dr Heino Fock (TI, Germany)) AWA WP2 principal investigator, reporting the summer school on Marine protected Area the week before the conference.

Session 02

Climate change impacts on small pelagic stocksand food security of North West Africa

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Abstract

The coastal region of Northwest Africa (from Morocco to Senegal) constitutes an important geographical entity with a population of about 50 million inhabitants. The Exclusive Economic Zone (EEZ) of the region covers about 2,475,000 km² and is characterized by a well-defined upwelling rich in nutrients, which sustains one of the highest productive ecosystemin the world. Small pelagic stocks constitute the bulk (tonnage) of all fish landings and are the most significant marine resources. Small pelagic species, composed mainly of *Sardinella aurita and Sardinella maderensis*, are the main source of animal protein for the majority of the population. The fish consumption of about 25 kg/year/inhabitant surpasses the world average of 12 kg/year/inhabitant and that of the rest of Africa, at 8.2 kg/year/inhabitant. However, small pelagic stocks have already experienced signs of decline and spatial shifts of their distribution and abundance driven mainly by overfishing and climate change. Recent stock assessments of small pelagics in Northwest Africa reported that these stocks were severely overfished ($F_{current}>F_{msy}$) and that overfishing is still occurring today ($B_{current}<B_{msy}$). Since fishing and climate change are strongly interrelated pressures on fish production, they must be addressed jointly in fisheries management, as they alter reproductive output, growth, and survival of fish stocks. In addition, fisheries management reference points (F_{msy}, B_{msy}) must be adjusted to take into account the climate-induced changes in fish productivity. Given the complexity, regional variability, and responses to climate change of small pelagic stocks, coupled with fast growing coastal populations, it is difficult to provide detailed management and adaptation strategies for fisheries management. However, it is possible to suggest attributes of management that include flexibility, adaptability to new information about the status of the stocks (i.e., continuous stock assessments to address consequences of management in relation to targets), and transparency in the use of information and in governance. These concepts have not historically been part of fisheries management in Northwest Africa, however the utilization of these concepts in a multidisciplinary approach founded onscientific information and local knowledge has been demonstrated

to be successful in other regions.

We developed a new Biomass Dynamic Model (BDM) for small pelagics, which accounts for climate change and stock rebuilding potential. The model integrates temperature, upwelling index, chlorophyll a, and the NA Multi-decadal Oscillation Index to estimate environmentally driven Maximum Sustainable Yield (MSY) and its associated management reference points (Fmsy, Bmsy), and to project the stock into the future under different climate and fishing scenarios. The preliminary results showed that temperature improved the fit of the assessment model but increased the uncertainty around the fisheries management reference points (F_{msy}, B_{msy}) estimates. Future projections suggest that rebuilding the stock to historical levels is unlikely, but the probability of meeting rebuilding targets varies depending on climate prediction scenarios. We will demonstrate that the integration of fishing and the environmental factors with these models has the potential to provide managers with more realistic expectations of future stock size and its contribution to food security in the region. However, they must be completed and reviewed as frequently as possible (annually) in order to support flexible and adaptive management systems. We showed that model results have been useful in guiding the ongoingco-management plan development under a changing climate for small pelagicslead by the Department of Marine Fisheries with the assistance of the USAID/COMFISH project in Senegal.

Communication cancelled.

Session 02

Upwelling at the Senegalese coast: A suitable spawning area of small pelagic fish species

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Abstract

The Canary Current Ecosystem (CUE) is known to be one of the most productive marine regions of the world ocean heavily exploited by regional and international fisheries. Small pelagic fish species migrate long distances to find suitable spawning areas along the CUE. A suitable spawning area has been suggested south of Senegalese Cap Vert peninsula (15°N). Here, hydrographic and ichthyoplankton sampling were performed during the upwelling season in April 2013. Larval fish distribution patterns show that the inshore area (between the upwelling core and the coast) is characterized by an enhanced spawning activity. The further offshore the lower the larval fish abundances and the higher the difference in larval assemblages. The inshore assemblages are dominated by small pelagic species like sardinella and anchovies, further offshore horse mackerels and foureyed sole occur in high densities, while in oceanic regions low larval densities and higher proportions of mesopelagic species occur. In accordance to sustainability and ecosystem protection there is a need in investigating recruitment processes representing an important basis for regions which are under high exploitation. Variability in recruitment of populations is often less the spawning stock all the more the variability of ecosystem drivers in early stages of fishes.

Keywords: ichthyoplankton, spawning, recruitment, small pelagic, sardinella, CCLME; Senegal

Session 02

Observations on the reproductive biology of *Ethmalosa fimbriata* (Bowdich, 1825) in Senegalese waters

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Abstract

Ethmalosa fimbriata, or Bonga Shad, is a pelagic clupeid fish species of tropical marine origin. It is distributed from Mauritania to Angola, and its migration behaviour leads to high abundances in estuaries, deltas, and lagoons. The species has a high commercial importance in West African waters, with an annual catch exceeding 16,000 t in 2011 in Senegal. Due to its life cycle, the Bonga Shad experiences a variety of environmental conditions, in particular wide ranges of temperature and salinity. Therefore aneuryhaline physiology allows the species to cope with salinities ranging between 0 to at least 97. The Sine-Saloum, an inverse hypersaline estuary, permits an examination of the Bonga Shad local spawning behaviour and reproductive effort in the context of a spatial and temporal steep salinity gradient. Accordingly, sampling of *E. fimbriata* was conducted from February to October 2014 at three sampling sites: upstream the river Saloum (Foundiougne), at the river's mouth (Djifer), and at the Senegalese coast (Joal). Results revealed not only differences in spawning times, but also spatial and temporal variations in fish condition and spawning fractions. The species' batch fecundity was investigated by applying the hydrated oocyte method. Absolute, as well as relative batch fecundities varied among sampling sites and months. The results further suggest that fecundity is positively related to salinity in Bonga Shad. The obtained data are important for a better understanding and evaluation of the species' reproductive potential.

Keywords: *Ethmalosa fimbriata*, Bonga Shad, aneuryhaline, spawning behavior, reproductive effort, Saloum.

Session 02

Multi-site fishery models with price variation depending on demand and supply

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Abstract

We present multi-site stock-fishing effort models. Different sites can correspond to fishing areas, fish aggregating devices (FAD) or still marine protected areas (MPA). We study effects of price variation, due to demand and supply, on the global dynamics of the fishery. In a first case, we consider a linear decreasing demand function of price. We show that in the linear case, we can have multi-stability, i.e. existence of two strictly positive and stable equilibria associated with different markets and prices. In a second case, we consider a non-linear demand function of price. A non-linear demand function allows us to maintain a small demand even when the resource price is high. We show that, in the non-linear case, a stable equilibrium can be found for which the resource goes extinct at a constant fishing effort with booming price. To end, we apply our model to the case of a commercial species, the “thiof” in Senegal, for which it is observed that the catch is drastically decreasing with a booming market price. We show that the obtained results using our model are in qualitative agreement with observed data.

Session 02

Variability of round sardinella (*Sardinella aurita*) and flat sardinella (*Sardinella maderensis*) landings in Senegalese waters: insight from the effects of oceanographic conditions

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Abstract

We report the use of generalized linear models (GLM) and generalized additive models (GAM) to evaluate whether the variability of round and flat sardinella abundance is related to physical conditions coastal pelagic habitat. Landing data from 1999 to 2010, considered as abundance index, remotely sensed thermal data and coastal upwelling index (IUC) calculated from SST, sea level anomalies (SLA), wind stress and chlorophyll concentration (Chl-a) were used to construct the GLM and GAMS. Senegalese coast was divided in two zones: southern zone and northern area which get similitude and differences in their physical functioning. These data were averaged from the coast to the 200 m isobaths in each zone. Seasonal decomposition method was used to divide the time series in seasonal component and trend component. Results show that both biological and environmental data strongly vary from one season to another and year to year as well. The models show that variability of round sardinella and flat sardinella are tidily related to upwelling intensity. However, GAM better evaluate the association between sardinella and upwelling intensity than GLM. Our hypothesis is that the interaction between pelagic habitat and the sardinella biology is complex due to the non-linear population dynamics response.

Keywords: Senegal, sardinella, generalized linear model, generalized additive model, IUC, SST.

Session 02

The potential of genetic tools to understand marine population processes and aid fisheries challenges in West Africa

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Abstract

Species identification and stock delimitation represent central challenges in Fisheries Sciences that can be addressed by using molecular genetic approaches. To illustrate the contribution of molecular tools to answer questions related to exploited marine species, we present an overview of the research activities developed in our research group. We use a combination of mitochondrial and nuclear sequences together with microsatellite data to assess spatial genetic variation and identify the effects of evolutionary, demographic and ecological processes. The case studies presented include a barcoding approach (species identification) based on 363 mtDNA sequences belonging to 23 recognised species of Indo-Pacific rabbitfishes (*Siganus spp*.) that revealed cases of misidentifications, cryptic diversity or hybridisation. The combination of microsatellites and Bayesian clustering methods are used for delimiting genetics stocks (*e.g*. the Cape hake *Merluccius paradoxus*). When population subdivisions are observed, it is possible to assess the level of connectivity and potential directional gene flow among geographical regions (*e.g*. kobOtolithesruber). In the tassergal *Pomatomus saltatrix*, we found evidence of environmental effects on genetic variation by identifying limited connectivity and signature of natural selection among contrasted habitats along the east Atlantic coasts. We also identified the effect of sea surface temperature on the success of recruitment in an endemic species around South Africa (Hottentot seabream *Pachymetopon blochii*). These different approaches can be applied to species distributed along the west coasts of Africa to increase knowledge for the economically important exploited species and help develop management tools.

Keywords: Species identification, stock delimitation, Fisheries Sciences, molecular genetic microsatellite, evolutionary, Africa.

Session 02

Observed changes in the composition of targeted demersal species by artisanal fisheries in the Petite Côte of Senegal from 2004 to 2013

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Abstract

Changes in the demersal species composition of artisanal fisheries at the Petite Côte of Senegal are analyzed over the period of 2004-2013 from calculating some ecological and fishery indicators to understand recent trends of the species composition of catches.The results show that from 2004 to 2011, catches were dominated by *Cymbium spp* and *Murex spp* representing respectively 23.5% and 16.5% of the catch in 2004 against 5.9% and 5.4% in 2013. In contrast, from 2012 to 2013 catches were dominated by the species *Arius gambiensis* and *Cynoglossus canariensis* representing respectively 7.4% of the catch in 2004 and 3.8% of the catch in 2006 against 16.3% and 15.0% in 2013. Species richness (number of taxa / fishing gear category) has gradually declined from 2004 to 2013, from more 150 to 50 taxa for the net frame gear, from 125 to 50 taxa for the diverse lines and from 90 to 15 taxa for the 'non-motorized simple line'. The abundance-biomass curve presents a state of 'no stress' in 2004 for exploited species (abundance curve below that of biomass) against a situation of 'high stress' in 2013 (abundance curve above that of biomass) especially for the categories' net frame gear 'and' diverse lines.The observed changes may be explained in part by the heavy fishing pressure on resource, which consequently leads to the reorientation of fishing for other species such as *Murex spp* and *Cymbium spp* because of the opportunities offered by consumer demand and other parts from the exploration of other richest fishing areas outside the Senegalese EEZ with large catches of the species *Arius gambiensis* and *Cynoglossus canariensis*.The efficiency and robustness of the indicators used in the detection of recent trends on the composition of catches under the effect of fishing from artisanal fisheries data in this study is of great interest to the extent that these types of data are more accessible and less expensive than scientific fishery data acquisition.

Session 02

Distribution of pelagic fish eggs off the Senegalese Coast during an intense upwelling event in March 2014

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Abstract

The upwelling ecosystem off the coast of Senegal is highly productive and usually dominated in biomass by *Sardinellaaurita*. During the AWA cruise in March of 2014 (F/RV Thalassa off Mauritania, Senegal, and the Gambia) continuous egg samples were collected onboard with a CUFES (Continuous Underwater Fish Eggs Sampler). Laboratory analysis of theses samples show that very few eggs collected had a size corresponding to *S. aurita* eggs. Instead, a large part of the eggs collected could be identified as *Engraulis encrasicolus*, *Sardina pilchardus*, or *Diplodus bellottii.* As of now, no data is available on spawning behavior and locations of these species in Senegalese waters. Additionally, the coastline (20 m isobath) South-East of Dakar was repeatedly sampled. The obtained results not only indicate a southward migration of *S. pilchardus* down to at least 14°30' N, when compared to data from the early 1980s, but also pose as a proof for continuous spawning activity of *S. pilchardus* and *E. encrasicolus* in the area South-East of Dakar.We suggest that the very intense upwelling event that occurred during the cruise was responsible for the spawning event of *S. pilchardus,* and *E. encrasicolus* and also for the absence of *S. aurita* eggs. Finally, it is highlighted that, especially for *D. Bellotii*, the highest egg densities were found very near the planed Dakar city wastewater emissary off Mbao (South coast of Senegal).

Keywords: Continuous Underwater Fish Eggs Sampler, CUFES, clupeidae, Senegal.

Session 02

Design of a fish-specific cytochrome b marker and its utility as DNA barcoding in commercial marine fish from Senegal

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Abstract

DNA barcoding is a procedure based on short diagnostic sequences of DNA used for rapid species identification, delimitation and discovery. Over the last decade, the COI mitochondrial marker has received much attention and is often used routinely on teleosts. However, the cytochrome b(cyt b) gene is still largely used for species identification in fish. The objectives of the study were: 1) to provide cyt b primers specific toteleosts and 2) to evaluate the utility of this marker in DNA barcoding of a few commercially important fish species from Senegal which have been caught during ECOAO scientific survey carried out off the south coast of Senegal. We generated sequences for a total of 8 species *(Caranx rhonchus, Engraulis encrasicolus, Pagellus bellottii, Pomadasys jubelini, Pomatomus saltatrix, Sardina pilchardus, Sphyraena guachancho and Trachurus trachurus*) and compared this to data available on Genbank. This study is the first to generate sequence data for *P. jubelini* and *S. guachanco*. In most cases, the results show an assignment to the correct species (e.g. *E. encrasicolus, P. bellottii, P. saltatrix, S. pilchardus*) but in one case, it identified a potential misidentification i.e. *Trachurus trachurus* specimens cluster with *T. trecae.* The comparison with other species within targeted genus shows some cases of ambiguities (*Pomadasys jubelini* vs. *P. perotaei*), suggesting the need for taxonomic assessment. Finally, we detected some cases of deep divergences along the West coast of Africa e.g. Caranx rhonchus, P. saltatrix. This first survey applied to Senegal commercial fish shows that the cyt b marker can be used for species identification and illustrates the utility of DNA barcoding in biodiversity assessment as well as for traceability of fishing product exported outside Senegal.

Keywords: DNA barcoding, species identification, mitochondrial marker, cytochrome b, Genbank, taxonomic assessment, traceability.

Session 02

On the application of mass spectrograph to discriminate fish eggs species

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Abstract

Fish eggs sampling in the ocean is one of the main observation used to understand fish population spatial dynamics; in particular this is a major observation used for small pelagic fish stock assessment methods i.e. Fish egg production method. During the AWA cruise carried out on the fisheries research vessel FRV Thalassa in March 2014, a large number of pelagic fish egg samples were collected off the southern Senegalese coast using the CUFES system (Continuous Underway Fish Egg Sampler). In the lack of local taxonomy expertise, an alternative method, cheaper than genetic tests (DNA barcoding or metagenomic), is considered necessary to identify fish eggs species. In this study we propose a methodology to identify fish egg species using a Matrix-Assisted Laser Desorption/Ionization - Time of Flight (MALDI-TOF) mass spectrometry. Briefly, a single fish egg removed from gonads was triturated in 10 µl of 10% formic acid using a manual homogenizer with disposable inoculation loops, one microliter of the homogenate was spotted in duplicate onto a steel target plate. Additionally, 1 µl of CHCA matrix (alpha-cyano-4-hydroxy-cinnamic acid) was added directly to the spots and air-dried at room temperature. Protein profiles were obtained using a MALDI-TOF Vitek Mass Spectrometry (VITEK® MS RUO, bioMérieux, Marcy l'Etoile, France) at The Principal Hospital of Dakar. Resulting profiles were analyzed using Saramis premium software, version 4.0.0.14. We performed several tests on three different common Senegalese fish species from two family clupeids (*Sardinella aurita, Sardinella maderensis*) and sparidae (*Pagellus bellottii*) with eggs collected from fresh mature individuals collected in the main landing place of Dakar. The fish gonad state has been established in laboratory with sizing. The goal in this test was to prove whether the single fish egg could produce a MALDI-TOF spectre, and to test the applicability of the method to eggs fixed in alcohol and buffered formaldehyde solutions. We present preliminary results and discuss the feasibility and locks of this method. As perspective such methodology could also be applied to work on the egg condition factor, level of ecotoxicity as well as probably on the life trait of fish species in the time interval of the fish gonad maturation.

Keywords: CUFES**,** MALDI-TOF, fish egg, AWA, small pelagic.

Session 02

Espèces mésopélagiques : opportunité pour l'industrie la farine de poissons ?

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Résumé

Les mésopélagiques sont constituées en majorité de la famille des Myctophidés (226 espèces) de petite taille vivant entre 200 à 1000 m de profondeur pendant le jour et remontent la nuit en surface (nourriture). Malgré leur très diversité et abondance, ces espèces demeurent l'une des composantes les moins étudiées de l'écosystème en pleine mer, avec notamment de grandes lacunes dans les connaissances de leur biologie et leur comportement. Avec une biomasse mondiale estimée à un 1000 millions de tonnes (Lam & Pauly 2005), ce groupe de poissons est le plus abondant. Ces auteurs évaluent la biomasse à 80 millions dans la zone de l'Atlantique centre-est (34) qui concerne la Mauritanie.

Mots clefs : industrie minotière, Afrique de l'Ouest, Upwelling, Mauritanie.

Session 02

Study of the emergence of hairtail fishery in Mauritania

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Résumé

Unexpected catch (3,000 tons in 2011) of hairtail fish were carried out by artisanal fisheries in Nouakchott. This fish not targeted by this fishery until very recently is exported toward China. Since 2011, a specific fishery targets this species using longline fishing technics. Even large catches of hairtail were carried out by the industrial fishery between 1990 and 1997, and incidental catches were made by Ukrainian and Russian vessels fishing horse mackerel or opportunistic ships. This species of high trophic level (4.5) deserves special attention especially after the drastic fall incatches since 1999 and theunexpected catch report for the first time by the artisanal fishery since 2011. Comparative analysis with catches of anchovy show that the period of collapse of hairtail is the emergence period of anchovy which was 986 tons in 1996 to 162,000 tons in 2003. The validity of catches of anchovy has been questioned by several authors. Specific assessments for this species should be conducted at the sub-regional acoustic surveys and mobilization ofcommercial catch datais needed to assess the exploitable potential and find an explanation for the fallin landing. This study attempts to reconstruct the history of this fishery and show some perspectives.

Key words: longline, artisanal fishery, industrial fishery, Upwelling, Mauritnia.

Session 02

Ichthyoplankton Biodiversity and Exchange Processes in an Inverse Estuary, the Sine-Saloum Delta (Senegal)

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Abstract

There is a widely-held paradigm that tropical estuaries are critical for sustaining production in coastal fisheries through their role as essential nursery areas for important exploited species (Manson *et al*., 2005). Since early life stages are a particularly vulnerable phase, it is hypothesized that in order to maximize survival, marine fish larvae are transported and juveniles migrate into estuaries to make use of the high food abundance, refuge against predators, and shelter from physical disturbances (Blaber&Blaber, 1980). Located in Senegal, the Sine Saloum Delta is a mangrove estuarine system impacted by climate change and bad management practices. The combined effects of reduced freshwater inputs, intense evaporation and a low gradient in the lower estuary, have resulted in a high overall salinity and an inversion of the salinity gradient. This results in a so-called inverse estuary (Pritchard, 1967) with salinity usually greater than that of seawater in the upper part of the system. Giving the hypersalinity and the mangrove degradation that is taking place, the potential roles of the Sine Saloum as a nursery area for fish larvae are far to be clear and a sound understanding of nursery habitats within the system will help to set more effective targets for conservation and management of critical coastal ecosystems. As part of the trilateral (Germany-France-West African Coastal States) cooperation project AWA, the potential of the Sine Saloum system as a recruitment and nursery area for locally exploited coastal fishes is being investigated by looking at the relationships between the environmental conditions, fish larvae distribution, larval transport, and food sources fuelling mangrove larval fishes.

Keywords: fish larvae, larvae distribution Parc national du delta du Saloum, réserve de biosphère, Senegal.

Session 02

Implementation of artificial habitats: inside or outside the marine protected areas? Insights from a mathematical approach

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Abstract

At the world scale, many exploited species are currently threatened or undermined by human activities, particularly fishing. Given this situation, establishing Artificial Habitats (AHs) and Marine Protected Areas (MPAs) is seen as a way of both conserving biodiversity and managing fishing activities. AHs have two main effects: (1) they attract fish from the surrounding areas and concentrate them in the AH, and (2) they increase the capacity of the environment, as a result of the installation of new individuals or, in some cases, of new species. MPAs decrease fish accessibility by constraining the spatial distribution of the fishing effort. We have developed a system of ordinary differential equations (ODEs) that can be used to describe the evolution of fish density, fishing effort, and landings depending on whether AHs are deployed in a MPA or in a fishing area. The analytical study of the ODE system is simplified by means of assuming that processes occur on different time scales. Fish reproduction and landings were assumed to occur at a "slow" time scale, whereas fish displacement was assumed to occur at a "fast" time scale. For both scenarios of AHs implementation (in an MPA or in a fishing area), we show the existence of different equilibria according to hypotheses based on a purely attractive or purely productive effect of the AH. In all cases, the deployment of AHs in the fishing area leads to an equilibrium with lower fish biomass and lower fish landings than when AHs are deployed within the MPA. This suggests that AHs should not be fished in order to maximise long term fish productivity and fish landings in the surrounding areas. In addition, we attempt to establish a correspondence between our theoretical results and the management plan for artisanal fisheries on the Senegalese coast, which includes the implementation of both AHs and MPAs. This suggests that there is not enough coordination between the non-

governmental organizations deploying the AHs and the institutions managing MPAs. Indeed, AHs are usually either immersed in an MPA or subject to local fishing ban, but in fact regulation is inadequate. In this context, the deployment of AHs as part of fisheries management would be premature and could have potentially adverse effects on the resource.

Keywords: MPA; management; articicial reef; ODE, Senegal.

Session 02

Mangrove Degradation and Estuarine Fisheries: Case Study of Tanbi Wetland Complex, The Gambia

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Abstract

The growing concern over the impacts of unsustainable land use needs validation. As such, scientists have begun to advocate for conservation of estuarine ecosystems as they contain invaluable flora (mangroves) that recycle and maintain the nutrient mass balance and fauna (fisheries) that provide food and support a vibrant socioeconomic sector for coastal communities. In an undisturbed estuarine system, mangroves trap and filter upland runoff and waterborne sediments, thereby improving water quality and providing ambient nursery grounds for diadromous fishes, as well as provided a safe refuge from predation. This allows for greater survival of different fish species.To assess the impacts of climate change on such ecosystems, a study was conducted to assess fish diversity (as influenced by seasonal changes in water quality and land use) on Tanbia Wetland Complex (TWC). Sampling period was chosen to feature best (September – December) and worst (April – June) environmental scenarios i.e. peak discharge and peak dry season. To allow for mass catch of different species, a seine net was used to conduct three throws per land use per season. Fish caught at each land use (i.e. Agriculture, Tourism, Settlement, Oyster processing and "untouched" zones) were sorted, identified and weighted. For correlation, physico-chemical parameters of the water were also analyzed in situ using a YSI Pro-plus water meter.Preliminary findings of this research indicate a decline in fish species as human activities increase, with the highest at the oyster processing zone while the lowest was recorded at the agricultural zone. Fish biomass per unit area also followed a similar trend. Water quality studies also indicated a significant change in physico-chemical parameters e.g. salinity increased from an average of 27ppt during the peak discharge period to 38ppt during the dry season indicating hyper-salinity. This increase was inversely proportional to the amount of dissolved oxygen at all the sites studied. The combined effect of this on water temperatures might be lethal to most fish species.This research goes to show that the impacts of socioeconomic activities would not exceed the carrying capacity of the TWC without the impacts of climate change (as manifested in seasonal variability). Land uses such as oyster processing are very sustainable and least deleterious if the current practice is maintained. The decline in fish landings at the TWC may partly be attributed to species

migration (which is a natural response to environmental change) rather than over-exploitation as most people believe. This leaves the apparent need for capacity building for and awareness creation in the communities most dependent on coastal resources.

Keywords: Tanbi Wetland, water quality, fisheries, land use, hyper-salinity, mangrove.

Session 02

Regular scientific monitoring system for all marine protected areas: challenge of the department of marine protected areas (DAMCP)

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Abstract

Today, it is widely recognized that marine protected areas (MPAs) have positive impact on fisheries management and biodiversity conservation. However, in Senegal, it is very difficult to evaluate the impacts that have MPAs on conservation and on fisheries management because of the weakness of systems to monitor impacts. Only the Bamboung MPA has been subject of regular scientific monitoring since its creation (2004) by scientists from the French Research Institute for Development (IRD). This lack of scientific information (data) about the effective impact of MPAs on biodiversity conservation and fisheries management leads people to doubt about the relevance of these MPAs in Senegal.Since its creation in 2012, DAMCP aware that management of marine and coastal biodiversity inevitably involve regular scientific monitoring, begins to lay the groundwork for the establishment of an observation system for MPAs. This observation system will serve as a research center with laboratories and offices. The building to house this observatory is under construction in Somone. A small research vessel equipped with a CTD multi sensors (Temperature, conductivity, pH, Chlorophyll, dissolved oxygen, turbidity and redox) are already acquired. Diving equipment, bathy sounders, small canoes are available in each site. A scientific monitoring program has been set for all MPAs. The seasonal reference status of all MPAs are carrying out. So far, the ichtyofaunique composition in Joal MPA is known. The processisunderway in other sites.

Session 02

Aires marines protégées, défis scientifiques et enjeux sociétaux

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Résumé

Les aires marines protégées (AMP), catégorie particulière d'espaces naturels protégés constituent un facteur clé de la résilience des systèmes vivants pour faire face aux variations de l'environnement, et à l'accroissement des contraintes naturelles et anthropiques. Elles sont au cœur des démarches d'exploration transectorielle qui vise à associer différents secteurs d'activités dans un but de conservation de la biodiversité. Aux premières expériences de mise en place d'AMP succède désormais un véritable engouement pour les AMP. L'importance de multiplier les AMP fait l'objet d'un consensus international tant dans le cadre du droit international de la conservation de la nature que dans les décisions politiques récentes relatives aux changements climatiques. Cependant, de nombreuses incertitudes demeurent. Cette communication présentera les défis scientifiques en lien avec cette multiplication sans précédent des AMP et mettra également en valeur les enjeux de gouvernance qui y sont associés. L'étude des dérives potentielles liées à la multiplication du nombre d'AMP permet effectivement des réflexions tant sur la définition même des AMP que sur la différenciation des jeux d'acteurs qui découle de la mise en place de ces AMP.Cette communication a été réalisé dans un démarche interdisciplinaire par des chercheurs en biologie et en droit de l'environnement. Ces travaux de recherche ont été réalisés dans le cadre du programme AMPHORE financé par l'Agence Nationale de la Recherche française, qui associaient des chercheurs issus des principaux organismes de recherches français et des instituts de recherche ouest-africain.

Session 02/Side Event 03

Efficacité d'une Aire Marine Protégée comme outil de restauration des ressources marines : l'expérience ouest-africaine

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Abstract

This thesis focuses on the study of the effectiveness of Marine Protected Areas (MPAs) as a tool for restoration of marine resources and management of fish stocks in tropical West Africa. The study involves three MPAs. The first one is the Bamboung community MPA, a marine reserve located in estuarine areas (with marine influence), closed to fishing since 2004. The second is the Community MPA of Urok Islands established in 2005 and located in the biosphere Reserve of Bijagos archipelago in the coastal part of Guinea-Bissau. It is divided into three areas and fishing is allowed there with a fishing pressure becoming stronger from the central zone to peripheral zone. The third MPA is the National Park of Banc d'Arguin (PNBA) located along the coast of Mauritania. It was created in 1976 and fishing activities are practiced restricted way. Many AMP were evaluated worldwide and the results are in the main part positive. In tropical environments, inter and intra annual variability of environmental parameters affecting the spatiotemporal organization of fish assemblage. Therefore, the establishment of MPAs in a tropical zone has raised questions about their effectiveness in relation to the influence of environmental parameters. The main purpose of this study is to show the attractive effects of MPAs and analyze spillover effects, which can improve the efficiency of fishing activities yield near MPAs boundaries. According to the AMP, spatial or temporal approach will be used to answer questions. Comparison analysis will be used.Comparative analysis of environmental parameters showed strong seasonal variability. The results will help to understand very well the role of protected areas in tropical West African marine area.

Keywords: Marine Protected Area, Restaurant Management, bio-ecological indicators, fish assemblage, tropical environments, West Africa.

Session 02

History of an emblematic MPA in West Africa: The Bamboung experience

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Abstract

The poster will encapsulate Oceanium's 2014 campaign at Bamboung's Marine Protected Area and will deal with the challenges inherent to governance, conservation, valorization, sustainability, and local development in MPAs

Keywords: Oceanium, MPA, governance, conservation, West Africa, Bamboung.

Session 02

Integrating local knowledge on the implantation of artificial reefs in a Marine Protected Area: the case of a small scale fisheries village, South Senegal

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Abstract

In West Africa, the implantation of artificial reefs and marine protected area are set in a context of gradual decrease in fish landing, fishermen poverty and an increased population pressure, triggered sometimes misleading action from public, governmental, and non governmental actors. From 2004 to 2005, a project of artificial reef implantation have been initiated a small Senegalese's community of Yenne, with the aims to encourage co-management. However at the end of the project, the monitoring of artificial reefs was interrupted and the local fishing effort onthese artificial habitats suddenly significantly increases. This result, complete previous studie swhich had also concluded that artificial reefs may have a negativeimpacton the fish resourcesin the case of lack of management *e.g.* leading to an 'intensive fishing on artificial reefs'.To assessthe validity of ouranalysis we use the local knowledge of the artisanal fishermen. A survey was carried out inJune-July 2014. Thesurvey covereda sample ofa representative panel of fishermen from the fishing villages of Yenne who operate on and co-manage the artificial reefs and the marine protected area. The results of thissurvey showed thatthe majority of the fishermendescribesome key features of the artificial reef effect on fish population dynamics. Fishermen, called 'experimented' who get a complex perception of the ecosystem also agreed the needto prohibit fishing on artificial reefs.Alternatively fishermen 'naïve' getting less empirical knowledge, than the 'experimented' group, do not understand the interest of fishing regulation over the artificial reef. We present preliminary results of our filed study, as well as the exhibition to provide (1) a feedback to the villages surveyed which comfort the first conclusion obtains from our mathematical

approach and (2) enhance public awareness on the co-management of fisheries resources, particularly in the case of artificial reef management inside a marine protected area.

Keywords: Artificial reef, MPA, Co-management, Artisanal fisheries, local knowledge, West Africa.

ICAWA Report Session 3 « Physical-biogeochemical coupling: processes and control of small pelagic fish ».

Chaimen: Eric MACHU (IRD, France), Vamara KONÉ (CRO, Ivory Coast) and Hamet DIADHOU (CRODT, Senegal)

Rapporteur: Eric MACHU (IRD UMR LPO, France)

Summary Report

During the ICAWA meeting, 5 oral and 3 poster communications were presented. One of the oral presentation presented a publication by Mbaye et al. recently accepted in Fisheries Oceanography to fill some scientific objectives of Task 3.2.

B.C. Mbaye received the best presentation award for his oral and R. Shelley for her poster.

Short-time perspectives

Deployment of an oxygen sensor on board the MELAX buoy deployed off Mbour south of Senegal by 35m depth.

Training capacity

B.C. Mbaye : last months of PhD, defense the 4th of March 2015.

H. Senghor : Started a PhD in February 2014, funding IRD.

R. Shelley : post-doc within the project, funding Labex Mer.

During this session the price of the best oral comunication was delivered to Baye Cheikh MBAYE (UCAD, Senegal) and the price of the best poster was delivered to the PhD candidate Rachel SHELLEY (IUEM, France).

Picture 6 : Rachel Schely (cluster of excellence Labex Mer) receving the price of the best presentation ICAWA session 3

Session 02-03

An individual based biophysical model to study *Sardinella aurita* population's spatial dynamic off North-West Africa

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Abstract

Sardinella aurita, or round sardinella, has been the main small pelagic fish species harvested off Senegal and Mauritania coasts over the last 4 decades and plays a central role for sub-regional food security and economic incomes. Landings of this species have strongly declined recently. Intense exploitation and climate change are acting together but population's dynamics are too poorly understood to disentangle the different drivers. Here we developed a bio-physical, full life cycle individual based model for *S. aurita* population off North-West Africa over the period 1980-2009. The hydrodynamic and biogeochemical environment were simulated by the coupled regional models "ROMS-PISCES" in a configuration covering the area 5°-40°N and 5°-30°W, with a ~8km resolution. Fish schools of S. aurita were represented by active lagrangian markers affected with ad hoc larval, juvenile and adult fish swimming behaviour. Individual's physiology was described following the local temperature and food availability by a Dynamic Energy Budget model ("DEB"). The horizontal fish movement depends on food research, temperature preference and spawning migration, whereas vertical distribution was set for each stage according to scientific knowledge. We show that the predicted seasonal migrations patterns obtained match quite well with the seasonal fluctuations of CPUE, and that some major inter)annual trends are also reproduced by the model. An analysis of the mechanisms behind the inter-annual biomass variability in the model leads to a new hypothesis. The upwelling intensity over the Sahara bank spawning grounds would play a major role on the population biomass level at the regional scale. Other potential uses of the model for data analysis are discussed.

Keywords: clupeidae**,** DEB, ROMS-PISCES, Fish school, swimming behavior, spawning migration.

Session 03

Spatial characterization of biogeochemical fluxes in the North West African upwelling

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Abstract

Using state-of-the art dynamical and biogeochemical models, we aimed at documenting the regionalization and seasonal variability of the ocean biogeochemistry in the North West African upwelling system. An interannual simulation covering the 1980-2009 period have been performed and has been shown to represent reasonably well the dynamical, biogeochemical features and variability of the North West African upwelling. In our simulation, the sensitivity of nearshore surface (0-100m) phytoplankton biomass (and/or Chl concentration) to upwelling intensity has been shown to display a meridional structure. Following this regionalization, we present here the main processes explaining the phytoplankton biomass patterns, its offshore extension and the related seasonality. Our study is crucial to a better understanding of the phytoplankton variability and its potential impact on higher trophic levels and therefore halieuticressources.

Keywords: dynamical model, biogeochemical model, interannual, seasonality, phytoplankton variability.

Session 03

Modelling *Sardinella aurita* spawning habitat and larvae dynamic in the Senegalese-Mauritanian upwelling

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Abstract

The stock of *Sardinella aurita* off North West Africa experience variability at different temporal scales. Here we study the interannual variability of this stock which is defined by annual evaluation surveys conducted between 1996 and 2006 by the R/V Fritdjof Nansen. On one side, we used a coupled physical-biogeochemical model (ROMS-PISCES) to investigate the spawning habitat of Sardinellaaurita along the NorthWest African Coast. The potential habitat volume (PHV) used to assess sardinella habitat is defined as a function of depth, temperature and salinity which uses the ranges 0-60m, 22-26°C and 35.5-36psu respectively. The coupled experiment run is then used to represent the environment of fish individuals modeled through a Lagrangian approach (Ichtyop) which permit to evaluate retention and larvae survival within the spawning areas.Two main features emerge from evaluation surveys: 1- a reduction by around 2 of the biomass between 1996-1999 and 2000-2006 and 2- years 1998 and 1999 are characterized by exceptional recruitments.In this study, we used PHV, plankton biomass, retention success and larvae survival to investigate these patterns. PHV remains higher during the period 1996-1999 when acoustic biomass is important than the following years, the signal being stronger in the northern regions. This period of favorable spawning also corresponds to a period of low larvae mortality. It is hypothesized that the combination of high values of PHV and low larvae mortality is responsible for the important *sardinella* stock estimated for the years 1996-1999. In this presentation, we will also attempt to explain the high recruitment success observed for years 1998 and 1999.

Session 03

Marine primary productivity and associated ecosystem indices in the Canary upwellling system

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Abstract

The Canary current upwelling system is one of the most productive marine coastal marine regions of the world, and sustains among the largest coastal fisheries.The importance of its tridimensional structure, and the way primary production is used in the system determines the functioning of the whole food web. In the Senegalese upwelling, and specially in its coastal part, where light and nutrients rapidly decrease because of the biological activity itself, a precise knowledge of the vertical structure of the phytoplankton biomass is required, whatever the way the production is estimated.The computation of the primary production can be done either by direct in-situ measurements or through an indirect estimation of the phytoplankton biomass and the knowledge of the photosynthetic light efficiency of the organisms.We present two different methods to estimate the primary production in coastal upwelling ecosystems: first by the measurement of the ocean color from space combined with in-situ measurements of vertical profiles of biomass, second by the use of biochemical models of productivity coupled with ocean circulation models. Despite the fact that this later models need to estimate the average quantity of nutrients reaching the euphotic layer in order to estimate a biomass of planctonikalgaes, both use bio-optical models of photosynthetic efficiency. We show here the advantages of both approaches and the derivation of practical integrated indices of biomass and primary production.

Session 03

Towards quantifying the aerosol flux of trace and major elements: a case study of the West African Eastern Boundary Upwelling System

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Abstract

Aerosol deposition plays a key role in global climate, both directly (via changes to the radiative budget) and indirectly (as a source of essential elements for primary production). It has been proposed that the Eastern Boundary Upwelling System (EBUS) of the Canaries current large marine ecosystem is more efficient than its counterpart in the Pacific (Humboldt and California currents) due to the greater availability of iron (Fe) in the Atlantic EBUS. Due to its proximity to the Sahara/Sahel region the North Atlantic Ocean receives ~ 200Tg/year of dust (a significant source of Fe), much of it deposited under the 'Saharan plume' (~10-25°N). However, there are uncertainties associated with the strengths and mechanisms of future dust supply, and this parameter remains one of the least-well quantified aspects of the global climate system. Our project aims to address this problem by providing field data for constraining aerosol terms in ecological and biogeochemical models. In order to estimate atmospheric inputs off the coast of West Africa, trace element concentrations were determined from aerosol samples from AWA (RV Thalassa), UPSEN-2 and ECOAO (RV Antea) cruises. Elemental ratios and enrichment factors are presented that demonstrate the desert origin of the samples, but also highlight that the aerosols are not pure end-member soils as enrichment of pollution-derived elements points to anthropogenic impacts.

Keywords: Aerosol; Iron, EBU; ECOAO, Upsen2, Senegal.

Session 03

Assessing the impact on microphytoplankton of an artificial upwelling

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Abstract

The artificial upwelling created by the release of deep water flowing out of an Ocean Thermal Energy Conversion (OTEC) plant into the sub-surface layer (whose temperature and biogeochemical composition are quite different) could locally induce alterations in ecosystem structure and functioning. The anticipated effects on the microphytoplankton were studied on a scheduled pilot site off Martinique (Caribbean Sea), within the framework of the IMPALA project.The biogeochemical processes that participate in the artificial upwelling linked to use of an OTEC plant in an oligotrophic environment were addressed by simulation of the discharge using in situ microcosm experiments immersed for 6 days on a 250 m mooring. Mixing of deep water with sub-surface waters was achieved at different depths (maximum of chlorophyll and bottom of the nutricline) and mixing rates (0%, 2% and 10% of bottom water). Analyses of pigments (HPLC), picophytoplankton abundance (flow cytometry), and nutrients were performed in the microcosms and the surrounding waters to assess the natural variability of the phytoplankton assemblage and the potential shifts induced by deep water supply.Similar evolution over time of the phytoplankton communities was observed in the natural environment and in the microcosm without deep-water input, suggesting that microcosms can be used to assess the impact of bottom water discharge at sub-surface. The enrichment of sub-surface waters by 10% of deep seawater induced a significant shift in the phytoplankton assemblage towards the development of diatoms. This could have biogeochemical and ecological consequences since diatoms are major drivers of the biological carbon pump in the ocean.

Session 03

Development of new proxies to assess the 20th century variability of the North West Africa upwelling

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Abstract

Alkenone unsaturation index ($U^{K'}_{37}$) recorded an unprecedented cooling in several coastal upwellings among which the one of Cape Ghir off the coast of Morocco (McGregor *et al*., 2007), presumably as a result of increase land-ocean thermal contrast and wind intensification. It may continue to intensify as global warming and atmospheric CO_2 levels increase. The recent variability of the Senegal-Mauritanian upwelling (NW Africa) will be studied because of the likelihood of dramatic ecosystem and socioeconomic impacts. New proxies (Sr/Ca, Li/Mg, B/Ca, and ^{11}B ratios) will be calibrated for reconstructing past century surface waters pH (acidification) and sea surface temperature (SST) off Senegal, two key oceanic variables in the context of the today's climate change. We will investigate the incorporation of these elemental ratios and boron isotopes in the calcite of major phytoplankton producers, the coccolithophorids. These biominerals, so far relatively unexplored, will be studied using cultures of coccolithophorids performed with turbidostats, to explore the mechanisms leading to the incorporation of these elements in the calcite during the biocalcification. Coccoliths buried in surface sediments of the continental margin of Senegal will be also analyzed for cross-comparison with results obtained from cultures over a similar range of SSTs and pH to evaluate the ability of these proxies to record SST and surface-pH. This work will likely open new perspectives for the reconstruction of changes of the Senegal-Mauritanian upwelling over the past centuries due to global warming and CO_2 emissions.

Keywords: Alkenone, coccolithophorids, pH, Senegal-Mauritanian upwelling.

Session 03

Quantification of the spatial and temporal variability of atmospheric deposition of desert aerosols on Atlantic Tropical East

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Abstract

The dust affects the climate through their effect on the Earth's radiative budget, the hydrological cycle, populations' health and the marine ecosystem. Therefore, it is important to understand their characteristics and their spatial and temporal variability. In this thesis, we have investigated the spatial and temporal variability of desertic aerosols over NorthWest Africa (continent and ocean). We are interested in the seasonal variability of their distribution. In this work, we used optical depth and Angström's exponent from Seaviewing Wide Fieldofview Sensor (SeaWiFS), single scattering albedo from Ozone Monitoring Instrument (OMI) and aerosol from CloudAerosolLidar with Orthogonal Polarisation (CALIOP) in order to characterize the mineral component of aerosol and their transport over the Atlantic Ocean. We also used observations from AErosol Robotic NETwork (AERONET) to validate a modeling experiment run with the General Circulation Model of LMD (LMDZ). Over the continent, the lower atmospheric mixed layer is characterized by the presence of mineral dust throughout the year but with different vertical distribution according to the season. In summer, the convective system distributes aerosols over a much thicker boundary layer than in winter. The transition from the continent to the ocean shows different dynamics between winter and summer. In summer, dusts contained in the continental boundary layer are uplifted while moving offshore over the Ocean. The contrary occurs in winter when aerosols show a subsidence towards the surface of the Ocean. This seasonality of the vertical distribution of aerosols is in agreement with the dust depositions observed in Canary and Cabo Verde islands.

Session 03

Oxygen variability on the Senegalese continental shelf

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Abstract

South Atlantic Central Waters in the eastern subtropical Atlantic Ocean are characterized by an oxygen minimum zone which borders the shelf holding the upwelling activity. Hence waters depleted in oxygen are advected over the shelf where they undergo changes related to both physical and biological processes. Since 2012, four oceanographic cruises have been carried out in Senegalese waters during the upwelling season. We will present the variability observed across the shelf which also show the occurrence of hypoxic and even anoxic events associated to denitrification process which impact pelagic habitats and nitrous oxide production.

Keywords : Anoxic event,biogeochemistery, Senegal.

Session 03

L'Homme et la Mer

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Résumé

Jeune femme d'origine Belge, née au Maroc, elle passe son enfance dans plusieurs pays d'Afrique noire. C'est donc très naturellement que Yasmine Sweetlove a été inspirée par les scènes de vie qui ont jalonnées son enfance. Ayant toujours vécue aux abords de l'Océan, elle veut nous faire partagée le quotidien de ces hommes courageux, qui par traditions et coutumes, s'élancent à l'assaut des vagues dans leurs pirogues multicolores, bardées de grigris protecteur. La série de photo qu'elle nous présente pour cette exposition, est le résultat de sa rencontre avec les différentes ethnies de « pêcheurs du Sénégal » (titre de son premier livre) qui vivent le long des côtes du pays. Du Nord au Sud, sur terre et sur l'eau, elle témoigne de ce lien fort qui unit l'homme et la mer sur le continent Africain. Derrière la vision parfois idylliques de certaines photos, elle nous permet aussi de nous interroger sur notre propre devenir dans un monde ou les ressources naturelle s 'épuisent, et ou le dur et dangereux labeur journalier des pêcheurs traditionnels Sénégalais, se résume de plus en plus souvent : à des filets vides. C'est d'ailleurs avec les mêmes pirogues, la même audace et pour certains beaucoup de désespoir, que nombre de ces pêcheurs, au péril de leur vie, tourne la proue de leurs embarcations….vers l'Europe. » Suite à l'exposition de l'homme et la mer lors du Festival de Guilvinec puis au Festival de Photoreporter à Saint Brieux, j'ai été encouragée à reprendre mon objectif pour continuer mon travail photographique et faire la suite des « pêcheurs du Sénégal » en remontant géographiquement vers le Maroc et la Mauritanie. Avec toutefois les mêmes questions de l'homme face aux ressources actuelles de la mer.

Mots clefs : photographie, pêcheur, sensibilisation grand public.

ICAWA Report Session 4 «Economics integrated into the ecosystem approach to marine management and economic benchmarking »

Chairmen: Didier JOUFFRE (IRD, Senegal), Ibrahima DIALLO (CNBH, Guinea) and Hamady Diop (CSRP, Mauritania). **Excusé:** Joern SCHMIDT (CAU, Germany)

Rapporteur: Didier JOUFFRE (IRD UMR ECOSYM, LABEP-AO, Senegal)

Summary Report

Session 4 was an inter-disciplinary panel of contributions, covering a very broad range of thematic and methods (see list of contributions).

Studies from Bivigou *et al.*and from Camara *et al.*proposed examples of ecosystem analysis based on ecosystem indicators in Senegal and Guinea respectively. This was followed by Jouffre *et al.* on the indiAWA initiative, an international research network on ecosystem indicators for the management of the fisheries and the marine environment in West Africa waters. The presentations generated interesting debates on indicators interpretation (like for example Mean Size of fish). As a component of AWA (WP4) and with an objective of improving the West-Africa regional expertise on marine indicators, the IndiAWA network is also an open consortium (including AWA and extra-AWA members), currently developing close links with other international programs working on similar topic (EAF and marine ecosystem indicators). The study by Ba *et al.* presented a review of the state of the art on bio-ecological knowledge on *Ethmalosa fimbriata* in North West Africa. This study, and the debatethat followed, addressed the issue of the stock migration from Senegal to Mauritania and to Guinea (depending on the season). Demarq *et al.*, in their contribution on integrated environmental indices for ecosystem management in West Africa, addressed a large panel of issues linked to environmental indicators. This large amount of indices that can be generated and their diversity (environmental indices) highlighted the necessity to adapt the procedure of computing the indicators to the local situation and to the specific problematic of the study. The contribution by Chaboud *et al.* on "Bio-economics of small pelagic fishery, a modeling introduction" presented the basis for a future modeling approach that can be developed in the region on pelagic fisheries. Hypothesis and data to fit the model were discussed. It is to be noticed that the proposed model is very analytic on both the resource and economic dynamics and that this is a regionalized model. Finally, the contribution by Diop addressed the "Exploitation of small pelagics in West Africa: challenges for regional collaboration ». This contribution highlighted the challenges of regional collaboration, the role of SRFC in this context and the weakness of its mandate with regard to management of shared stocks.

During this session the price of the best oral communication was delivered to Marie Louise BIVIGOU (UCAD, Benin).

Picture 7 : Working group in one of the Sub commision room during ICAWA

Session 04

Evaluation de l'état d'exploitation des ressources halieutiques de la ZEE sénégalaise

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Résumé

Au Sénégal, le secteur de la pêche traverse une crise sans précédente au cours de ces dernières années, ce qui conduit les autorités du pays à revoir leurs méthodes de gestion. Ainsi, le gouvernement s'est engagé à développer l'Approche Ecosystémique des Pêches afin de limiter les impacts négatifs de l'exploitation sur l'écosystème. Un préalable à cela est de se doter des moyens de suivi et de compréhension de cet écosystème. Dans ce contexte, la présente étude a pour objectif de chercher à mieux comprendre le fonctionnement et la dynamique de l'écosystème marin du plateau sénégalais à partir d'analyse d'indicateurs écologiques, de biodiversité et conservation.Les résultats obtenus montrent que l'indice moyen de vulnérabilité intrinsèque et le niveau trophique des débarquements diminuent de façon significative sur la période 1981-2010. De plus, la biomasse des espèces a fortement diminué au cours de la période 1981-2014. L'indice marin trophique, la proportion des poissons prédateurs et les captures ont par contre connu une hausse. La durée de vie moyenne des espèces varient d'une année à une autre, sans tendance claire. Les principaux stocks démersaux côtiers sont presque tous dans une situation de surexploitation continue.Les résultats obtenus ont mis en évidence une forte intensité des activités de pêche avec comme conséquence la déplétion de certains stocks dès les années 1980. Toutefois, malgré la pression croissante de la pêche, l'écosystème semble récemment se caractériser par un état certes appauvri mais relativement stable. Cette stabilité explique les tendances plus ou moins plates des indicateurs écologiques au cours des deux dernières décennies. Outre la dimension halieutique, la stabilité de l'écosystème mérite d'être mise en rapport avec d'autres facteurs relatifs à l'environnement, par exemple l'upwelling côtier.

Mots clefs : Approche écosystémique ; indicateurs écologiques ; indicateurs de biodiversité et conservation ; pression de pêche ; Sénégal.

Session 04

Review the state of the art on bio-ecological knowledge of *Ethmalosa fimbriata* in North West Africa

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Abstract

Ethmalosa fimbriata is a clupeid, this exploited fish species is particularly abundant in West Africa. Based on fish landing (in 2005) the specie is reported by FAO from Senegal to Cameroon, more recently they are also reported in Mauritania, but they are really abundant in Guinea. Mainly targeted by small scale fisheries, exploitation of this species contributes greatly to job creation and food security in the sub-region. However, a lack of information on the bio-ecological characteristics of the species (FAO 2012) hinders the effective management of these stocks and any attempt of efficient modeling exercice. On the other hand, the very coastal character of the species makes impossible to estimate its abundance through the acoustic surveys in the area. In this study, we review the state of the art on bio-ecological knowledge of *Ethmalosa fimbriata* in North West Africa. It is emerged from this study all the features that are related to reproduction, growth, distribution and migration of Bonga in West Africa. This will allow us to know more about the species and get an overview on study opportunities in the future. We plan to use the preliminary results of this study as input in biological module of a bioeconomic model planned for the Senegambia area.

Keywords : Small pelagic, clupeid, management, modeling.

Session 04

Biodiversity dynamics of demersal fish assemblages of the Guinean continental shelf in an increasing fisheries exploitation context

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Abstract

The purpose of present study is to assess the impact of fishery exploitation on biodiversity dynamics of demersal fish assemblages in Guinean continental shelf. A statistical treatment combining factor analysis and biodiversity indices calculation is performed on data series of demersal trawls scientific surveys between 1985 and 2012 in order to characterize the multi-species composition and diversity characteristics of fish assemblage and its evolution over the studied period. The results show that the fishing intensification, quantified and documented here by national data on effort and landings, seems to have significant effects on some characteristics of the fish assemblages in the area. Since 1985, we can indeed notice a decline in the average density, the average trophic level, the Simpson equitability index and the richness of the fish assemblages as well as some turnover of the dominant species. Smaller species with lower commercial value and rapid growth are replacing gradually former dominant species of high commercial value, characterized by high body mass and slow growth. The study tends to prove that the concerned fish assemblages may not represent a fully resilient system regarding its biodiversity.

Keywords: Biodiversity, ecosystem indicators, fishing impact, Guinea, historical data, marine ecology, trawling surveys, West-Africa.

Session 04

Integrated environmental indices for ecosystem management in West Africa

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Abstract

The definition of environmental indices and their regular availability in time is of key importance in the management of marine areas, specially for coastal systems, generally under high anthropic pressure. Such indices, from the physics to the biology, are presented for the West African Upwelling system, in order to monitor the state of the environment, as well as to define possible “reference points” for management purposes as well as for the estimation of political measures.For the Canary current upwelling system, we present several integrated indices that describe some physical and productivity aspects of the system, as well as their ability to be supplied on a regular basis.Such indices also need to be simple, reliable, reproductive and based on homogeneous data sets for the longest possible periods. Comparative ecosystem studies also needs by nature comparable indices, and a compromise has sometimes to be found between usability and ecological pertinence.

Session 04

Ecosystem Indicators for the management of fisheries and the marine environment in West Africa waters: the indiAWA experience

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Abstract

This communication presents the current state of indiAWA work and experience. IndiAWA is an extending network of scientists working on West African marine ecosystem or fisheries, initiated from the Working package 4 of the AWA project. The long term objective of the IndiAWA consortium is to develop an Ecosystem Indicators Based approach for the management of fisheries and the marine environment in West Africa waters. One of the first goals for this group will be to put on (or contribute to) the theoretical and practical basis for evaluating the status of West Africa exploited marine ecosystems. In order to reach this goal indiAWA plans to develop and to test multi-institutional sets of indicators including climate, biodiversity dimension and human dimension, taking into account the local situation of data availability and information systems. IndiAWA will relies on regional expertise, developed in the AWA project, but will also benefit from the IndiSeas experience (www.indiseas.org), a project working since several years on a similar thematic at the worldwide scale. Close collaborations are indeed in progress between the two groups which are sharing some common experts and ecosystem case studies.

Keywords: Marine ecosystem, indicators, fisheries, West-Africa, scientists network.

Session 04

Mutations socio-economiques de la peche a la ligne : cas des communautes de pecheurs de la commune de Saint-Louis

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Abstract

The fishing targeting demersal species called noble is highly developed in St. Louis. Much of the fishing communities of the Langue de Barbarie of Saint Louis living through this type of fishing. The need to increase their activities in order to improve their living conditions is increasingly felt. Both economic and social changes hinder the development of this activity.These changes have been caused by the scarcity of fish resources which drive for many consequences that affect their lifestyle. But to deal with socio-economic changes, communities of anglers have adopted strategies. However, it remains important to think of a better organization of fishing. This requires participation of all stakeholders with the implementation of the regulations for a better joint management of fisheries resources.

Keywords: Mutation, angling, migration, strategies.

Session 04

On conservation and exploitation of fisheries and marine resources

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Abstract

In recent years, theoretical debate has focused on the common-pool resources concept within environments. These typically include: common fishing waters, grazing areas and forests which have often been either overlooked or not given adequate attention in the formulation of economic policies and in the context of international cooperation. Sustainable fisheries and marine resources management should achieve both resource conservation and Socio-economic gains simultaneously. Consistent with a multidisciplinary approach, this paper reviews three relevant theories: the Neoliberal view, people- centred development view and the global environmental management view. The paper emphasizes the importance of local social institutions in managing fisheries and marine resources. I argue that, as opposed to the centralized-control model, the local community-management model of natural resources is the most effective approach. It enhances equitable access to resources, sustains human development through essential ecosystem services, maintains ecosystem integrity and reduces the potential for over exploitation. Implications for the community-based sustainable management of fisheries and marine resources are discussed.

Session 04

Bioeconomics of small pelagic fishery, an introduction

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Abstract

A bioeconomic model of small coastal pelagic fishes in Senegal is in development. This model is produced to analyze the responses of the fishery *i.e*. mainly small scale units but other fishing units types mays be include if necessary, to economic (price, costs), biologic (growth, mortality, recruitment) and management (taxes/subsidies, licenses, spatial regulation) parameters. It focuses on the main small pelagic species caught in Senegal (S. aurita, *Sardinella maderensis* and *Ethmalosa fimbritata*). The model is based on 1) an analytical spatial population dynamics model, 2) a spatial fleet dynamics model. Main model's outputs are catch, revenue, private profit and economic rent, and also the spatial distribution of fishing units of the small scale fihseries.

A first version of the model will be presented. To go further, the model has now to be calibrated with updated economic and biological data. These data needs and also the consequences for new data collection will be discussed.

Keyword: bioeconomic model, price, costs, growth, mortality, recruitment, management.

Session 04

A common Policy for Fisheries Reforms in the SRFC's Space: the Case of Small Pelagic of North West Africa

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Abstract

Stocks of small pelagic fish from West Africa are not limited to the territorial waters of one country, but extend into the territorial waters of two or more neighboring coastal countries (shared stocks). In addition, some stocks migrate along the coast: they may be found in the coastal waters of a country for part of the year, and those of neighboring countries for the rest of the year. The transboundary nature of these resources and natural variability to which they are subjected require specific management and regional cooperation for consideration of the resource in its borders. Information on the size of stocks of small pelagics and their level of operation and the exchange of this information between states that share these stocks are a prerequisite for a coordinated and harmonized fisheries management in the region. The objective is to present the steps and the process followed by the SRFC in developing a regional common policy for small pelagics and the promotion of the development of plans for joint management of fisheries, particularly for fisheries of common interest.

ICAWA Report and recommandations Session 5 : « Droit de l'environnement marin »

Chairmen : Pr Ibrahima LY (UCAD) et M^{me} Dienaba Beye Traoré (CSRP/SRFC)
(Excusé : M^{me} Marie Bonnin, IRD)

L'ordre du jour de la session 5 s'est déroulé conformément au programme de la conférence.

La présentation de l'ouvrage sur le Droit de l'environnement marin et côtier mauritanien par le Professeur Ahmed Ould Zein a debouché sur deux recommandations : (1) Vulgariser l'ouvrage précité auprès des universités, des décideurs, des parlementaires … en général auprès de tous les usagers de la Mer ; (2) la gestion de l'environnement marin doit être suffisamment prise en compte dans les politiques et stratégies des parties prenantes.

La Présentation du cadre juridique et institutionnel de la protection des Requins dans l'espace de la CSRP par Monsieur Souleye NDAW, Doctorant au « Laboratoire Droit de l'Environnement et de la Santé de l'UCAD » a permis de présenter les législations et réglementations qui régissent la conservation et la gestion des populations de Requins. Il a rappelé les efforts de la CSRP qui a mis en place un Programme d'Action Régional Requins (PAR-R) qui a été traduit en Programme d'Action National (PAN). Cependant, il a constaté des disparités dans le contenu et la mise en œuvre des législations et réglementations nationales. Il a été recommandé deux points précis : (1) la collaboration inter-agence au niveau national, régional et international pour prendre en compte la dimension spéciale de cette espèce que sont les Requins ; (2) l'harmonisation de la réglementation en vigueur en matière de conservation et de gestion durable des Requins dans les Etats membres de la CSRP.

La présentation sur la demande d'avis consultatif au Tribunal International du Droit de la Mer (TIDM) par Madame Dienaba Beye TRAORE, chef de Département Harmonisation des politiques et législations des pêches à la CSRP, a été très appécié. Après avoir présenté l'ampleur et la subtilité des infractions qui sont commises en matière de pêche dans l'espace de la CSRP, elle a justifié les raisons qui ont amené les Etats membres de la CSRP à saisir le TIDM, pour solliciter des avis consultatifs sur quatre(4) questions juridiques qui portent respectivement sur les droits et obligations de l'Etat du pavillon, de l'Etat du Port et de l'Etat côtier et des Organisations Internationales (OI) signataires d'accords de Pêche en cas de Pêche INN, mais également sur la responsabilité de l'Etat côtier pour la gestion des stocks partagés ou d'intérêt commun. Madame TRAORE a également résumé la procédure de saisine du TIDM qui consiste à présenter des exposés écrit et oral devant le TIDM. Les Avis du TIDM sont attendus pour Avril 2015 ; elle recommande (1) d'appuyer la CSRP et ses Etats membres pour une prise en compte du fléau de la pêche INN dans l'ensemble des Traités et Accords internationaux quitte à les réviser, actualiser ou adopter de nouveaux instruments contraignants ; (2) d'appuyer la CSRP et ses Etats membres dans sa démarche tendant à amener l'Etat du Pavillon et l'Etat du Port à admettre leurs responsabilités en cas de pêche INN et à agir en conséquence.

La présentation « Un premier pas vers la représentation de la nature devant le juge sénégalais » par le Professeur Ibrahima LY, Directeur du Laboratoire Droit de l'Environnement et de la Santé de l'UCAD, a cloturé les exposés de cette session sur le droit

de l'environnement. Après avoir rappelé les faits notamment un chalutier étranger qui a échoué au large du Parc National des îles de la Madeleine, situé sur la zone côtière sénégalaise, le Professeur LY a précisé la procédure de saisine du Tribunal Hors classe de Dakar par l'Etat et ses démembrements (HASSAMAR, DPN, Marine Marchande, Agent Judiciaire de l'Etat). En échouant à l'intérieur des eaux sénégalaises, le navire a causé des dommages à l'environnement en violation des règles de navigation, et de la pêche en deversant des substances illicites. Pour la première fois, le juge sénégalais reconnait en 1ère instance l'existence d'un dommage à l'environnement marin et côtier en infligeant des sanctions civiles et pénales. En effet, l'équipage a été condamné à 6 mois d'emprisonnement avec sursis et à 100 millions de FCFA de dommages et intérêts. Les recommandations suivantes ont été faites par le Professeur : (1) c'est un premier pas vers la reconnaissance des dommages à l'environnement par le juge sénégalais. Cette jurisprudence devrait être vulgarisée dans l'espace de la CSRP ; (2) il faudrait renforcer les capacités des magistrats en Droit de l'environnement y compris en Droit des Pêches.

Une recommandation générale unamine est egalement ressortie de cette session. La dimension juridique n'a pas été suffisamment évoquée comme composante déterminante dans l'approche écosystémique de la gestion de l'environnement et des pêcheries.

Deux participants ont été primés pour leur presentation à la fin de cette session : il s'agit de Dieyaba Beye TRAORE et de Souleye NDAO.

Picture 8 : Working group in one of the Sub commision room during ICAWA.

Session 05

Droit de l'environnement marin et côtier mauritanien

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Abstract

Alors que l'environnement marin est de plus en plus menacé, les règles relatives à la conservation des espaces côtiers s'étoffent. Au delà de l'exploitation halieutique, les différentes formes de pressions liées au développement urbain et aux activités économiques s'intensifient. Toutes ces activités font l'objet de réglementations qui s'entremêlent les unes aux autres ne facilitant pas leur accessibilité et leur lisibilité. La Mauritanie est au coeur de ces problematiques. L'environnement marin et coitier y est à la fois protégé par de multiple textes novateurs et en meme temps les impacts des activités anthropiques qui s'y exercent sont de plus en plus menançants.cet ouvrage permet à tous ceux qui sont interessés par l'exploitation, l'utilisation ou la protection du milieu main et côtier de la Mauritanie de disposer du droit applicable sur ce territoire. afin de faciliter l'appréhension de ces normes, les auteurs ont utilisé des cartes pour spatialiser et illustrer, de manière novatrice, les réglementations relatives à l'espace marin et côtier.l'ouvrage présente l'ensemble du cadre juridique mauritanien applicable à l'environnement marin et côtier : les frontières de cet espace naturel, les acteurs de la protection de ce milieu par les différentes branches du droit telles que la protection de la nature, le droit des pollutions, les droits relatifs à la pêche, à l'exploitation des hydrocarbures ou encore du tourisme.la description et l'analyse de ces règles permettront de poser les bases de la construction d'un droit de l'environnement marin et côtier en Mauritanie.

Session 05

Le cadre juridique et institutionnel de la protection des Requins dans l'espace de la Commission Sous Régionale des Peches (CSRP)

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Abstract

Perçue jadis comme une activité peu importante, la pêcherie des Requins a connu au fil du temps une exploitation intensive dans l'espace CSRP.L'émergence et le développement de cette filière d'exploitation des Requins se sont opérés avec le concours de facteurs multiples qui ont engendré des changements significatifs dans l'organisation et la gestion des pêcheries de Requins. La valeur commerciale intéressante dont bénéficie l'aileron sur le marché asiatique a été à la base d'une ruée excessive vers les Requins. Ce marché qui, présente sans aucun doute le plus grand danger pour la survie de ces espèces, a conduit beaucoup de pêcheurs artisans à se spécialiser dans l'exploitation des Requins. Cette spécialisation qui est à l'origine de l'augmentation considérable de l'effort de pêche des Requins, ne s'était pas accompagnée d'une règlementation spécifique en dépit de la ratification ou de l'adhésion des Etats membres de la Commission Sous Régionale des Pêches (CSRP) à de nombreuses conventions internationales et régionales de protection des ressources biologiques marines. Mais, force est de constater que depuis l'adoption des Plans d'Action Nationaux Requins (PAN-Requins) au niveau des Etats membres, approuvés par arrêtés ministériels des Ministres en charge des Pêches maritimes et qui s'inscrivent dans le cadre du PAI- requins de la FAO et du Plan Sous Régional d'Action pour la Conservation et la Gestion Durable des Requins, qui a été adopté en septembre 2001 par la conférence des Ministres des Etats membres, il y a une prise en compte effective de la règlementation des pêcheries de Requins dans la quasi-totalité des législations en vigueur et des projets de loi en circuit d'adoption. Le rôle régulateur des Requins dans l'écosystème marin et leur vulnérabilité à la surpêche en raison de leurs traits d'histoire de vie, doivent conduire les Etats membres de la CSRP, à réguler l'effort de pêche et à veiller au respect scrupuleux de la règlementation des pêcheries de ces espèces « clefs de voûte » dont la disparition peut être préjudiciable non seulement au milieu marin mais aussi à l'humanité tout entière comme l'a du reste rappelé Robert Calcagno Directeur Général de l'Institut Océanographique de Monaco : « l'avenir de l'humanité dépend de la bonne santé de nos océans et celle–ci est étroitement liée à la survie des Requins ». Mettre un point final au déclin des populations de Requins est une tâche difficile mais pas impossible.

Session 05

Processus de saisine du Tribunal international du droit de la mer (TIDM) par la Commission sous régionale des Pêches (CSRP) visant à conseiller les États membres sur les meilleurs moyens institutionnels et juridiques d'éradication de la pêche INN dans l'espace de la CSRP

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Résumé

Après l'entrée en vigueur en septembre 2012 de la Convention relative à la Détermination des Conditions Minimales d'Accès et d'Exploitation des Ressources Halieutiques à l'intérieur des zones maritimes sous juridiction desÉtats membres de la CSRP *ou* Convention CMA, la 14e Session Extraordinaire de la Conférence des Ministres de la CSRP (Dakar, 27-28 mars 2013) a adopté une Résolution autorisant le Secrétaire Permanent de la CSRP à saisir le Tribunal international dudroit de la mer (TIDM) pour avis consultatif conformément à l'Article 33 de la Convention CMA. La demande d'avis consultatif permettra à la CSRP d'avoir une meilleure compréhension des droits et obligations de ses Etats membres par rapport aux instruments juridiques de lutte contre la pêche illicite, non déclarée et non réglementée (INN), notamment (i) la Convention des Nations Unies sur le droit de la mer (CNUDM), (ii) l'Accord sur les stocks de poissons chevauchants et les stocks de poissons grands migrateurs, (iii) l'Accord visant à favoriser le respect par les navires de pêche en haute mer des mesures internationales de conservation et de gestion (Accord de conformité), (iv) le Plan d'action international de 2001 visant à prévenir, à contrecarrer et à éliminer la pêche INN et (v) l'Accord de 2009 relatif aux mesures du ressort de l'État du port visant à prévenir, contrecarrer et éliminer la pêche INN.L'examen de ces droits et obligations prendra également en compte les instruments juridiques régionaux applicables dans l'espace de la CSRP. Quatre questions juridiques déterminées ont été posées au TIDM : (1) Quelles sont les obligations de l'État du pavillon en cas de pêche illicite, non déclarée, non réglementée (INN) exercée à l'intérieur de la Zone Économique Exclusive des États tiers ? (2) Dans quelle mesure l'État du pavillon peut-il être tenu responsable de la pêche INN pratiquée par les navires battant son pavillon ? (3) Lorsqu'une licence de pêche est accordée à un navire dans le cadre d'un accord international avec l'État du pavillon ou avec une structure internationale, cet État ou cette organisation peut-il être tenu responsable des violations de la législation en matière de pêche de l'État côtier par ce navire ? (4) Quelles sont les droits et obligations de l'État côtier pour assurer la gestion durable des stocks partagés ou d'intérêt commun, en particulier ceux des thonidés et des petits pélagiques ? Des Exposés écrits ont été soumis au TIDM et l'Exposé oral a été présenté en septembre 2014 à Hambourg (siège du TIDM). Le Rendu de l'avis du Tribunal est attendu le 02 avril 2015.

Session 05

Dommages à l'environnement, une première reconnaissance par le juge sénégalais

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Résumé

A l'instar de la plupart des espaces côtiers, le domaine public maritime (DPM) Sénégalais fait face à plusieurs enjeux économiques, environnementaux, sociaux et humains. Les atteintes à l'environnement marin et côtier s'inscrivent dans un cadre juridique et institutionnel jusque-là insuffisant du fait tant de l'imprécision de certains textes juridiques que de leur très relative effectivité. Toutefois, le juge sénégalais par un premier arrêt percutant vient contrecarrer cette affirmation et s'instaure comme un nouvel acteur du droit de l'environnement pour faire face à la vulnérabilité du DPM.Cette communication aura pour objet de présenter cet arrêt très récent du tribunal dakarois alors que l'épave du navire est encore visible dans le Parc national des iles de la Madeleine.Cette affaire met en perspective différents points de droit relatifs à l'environnement marin qui seront présentés. L'élément le plus important de ce premier jugement est certainement la reconnaissance par le juge du fait de pollution et surtout la reconnaissance d'un préjudice écologique. Ce jugement constitue une avancée jurisprudentielle qui doit être analysée et surtout présentée en ce qu'elle constitue un nouveau moyen de garantir la vulnérabilité des espaces côtiers.

ICAWA Report Session 6 «Ecosystemic Seabird / Fishery interactions»

Chairmen: Jacob González-Solís (University of Barcelona, Spain) and Ross Wanless (University of Cap Town, South Africa)

Rapporteur: Justine Dossa (Alcyon project Manager, BirdLife International)

Summary Report

The session organized on issues of seabirds in West Africa by the Alcyon project (now run by BirdLife International) in collaboration with Barcelona University and the AWA project, brought together around 15 participants, including a dozen international experts and seabird specialists. They not only shared their research on seabirds, but also discussed the different issues specific to West Africa. It was the first time in West Africa that international ornithologists had got together on issues of seabirds and was also an opportunity to share the experience of other projects; in particular in South Africa, and to discuss how West Africa in its context could contribute to their protection.

Quite a number of important ideas and recommendations arose from the different discussions held following various presentations which are worth mentioning here.

The participants recommended:

- that the Alcyon project should consider the studies done on seabird species sensitive to variations in fish availability, with a view to making this kind of information available in the CCLME sub-region.
- that the state of some birds that over-winter in West Africa and those whose flyways are located off West Africa remain relatively unknown and is an extremely important issue to understand. In particular, the issue of Northern Gannets and what is happening to them off the West African coast.
- In addition, collaboration could be developed with IRD, to study the correlation between the distribution of small pelagic species and the use of these areas by different bird species in the sub-region.
- To consider and carefully examine the issue of interaction between fishermen and seabirds in the sub-region (by-catch and also targeted capture) and put in place appropriate measures.
- To seek synergies between the programme Biodiversity, Gas and Petrol and the Alcyon project in order to assess the impact of offshore oil exploitation on seabirds; in particular, north of Mauritania which is an area of risk for seabirds.

To finish, the participants emphasized the need to address, the need to collaborate on research and data collection of seabirds in the sub-region, with a view to rectifying the situation of low observer coverage on board. Sometimes, the problem of by-catch is with the cables that drag the nets and not the net itself (as is the case in South Africa). That is why the first stage is about making information available through data collection. It would be useful to concentrate effort on one or two species at high-risk and in an area where the stakes are high. For this, it should start with short surveys in collaboration with fishermen and observers onboard.

To conclude, it is clear that the challenges concerning seabirds in the West African sub-region cannot be underestimated with large gaps concerning the information available. Information and data is vital to moving forward and setting up measures to improve, and to push lobbying. The Alcyon project - already established in the sub-region - is a great opportunity for this. It is hoped that as part of this project, several complementary activities will be developed to put in place information to be used for decision-making; not only for birds, but also for other species whose by-catch is considerable.

During this session the price of the best oral communication was delivered to Kees CAMPHYUSEN (Netherland).

Session 06

Ecosystem approaches to low trophic level fisheries: impacts on seabirds

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Abstract

Upwelling ecosystems such as the Canary Current are characterised by high productivity, high biomass, but relatively low biodiversity. The low biodiversity is particularly noticeable at the lowtrophic level (LTL); the primary consumer space is dominated overwhelmingly by very high abundance of very few species, with a high diversity of secondary and higher trophic level consumer species reliant on a that small complement of primary consumers(known as a wasp-waist system). Fisheries that target secondary consumers are, logically, dependent of healthy stocks of low trophic level species. When fisheries begin to target these LTL stocks, the risk of unbalancing the ecosystem becomes significant. West Africa's fisheries are increasingly dominated by high volume, low value, LTL landings. The Benguela ecosystem is very closely analogous to the Canary Current system in many respects, both biologically, physically, and in fisheries, and is useful to use as a model for what vulnerabilities the Canary Current system might face. I use the African Penguin *Spheniscus demersus*, which is a highly specialised predator that relies almost exclusively on LTL fish stocks for food. It is therefore a very useful indicator of general LTL fish availability. Overfishing of LTL fish stocks – sardine and anchovy, in the northern Benguela system in the 1960s and 70s caused the collapse of those stocks, which have not recovered to date. The African Penguin populations in those areas collapsed in tandem with the landings – providing a very neat example of how seabirds can provide very reliable cues for fisheries management, particularly in the absence of large-scale, high intensity stock surveys. I propose that West African seabirds, in particular the Northern Gannet *Morus bassanna*, could serve as a cheap, simple and reliable tool to help monitor the Canary Current ecosystem health, and possibly to serve as an early warning system for potential overfishing.

Session 06

The importance of seabird population connectivity across the Canary Current: the case of the Calonectris shearwaters

José Manuel REYES-GONZÁLEZ[1], Teresa MILITÃO[1], Raül RAMOS[1], Laura ZANGO[1], Pedro RODRIGUES[1], Daniel ORO[2] and Jacob GONZÁLEZ-SOLÍS[1,*]

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Abstract

The importance of the Canary Current Large Marine Ecosystem (CCLME) for seabirds has long been recognised, particularly for wintering seabirds, mainly based on ship surveys. However, nowadays tracking studies can give us a much detailed picture about the seasonal and spatial use of this region for several seabird species with known breeding colonies of origin. Understanding population connectivity between breeding and wintering grounds is essential for the conservation of the marine ecosystem, since gaps of knowledge for some relevant seabird grounds may lead to wrong management actions on particular species or populations. Calonectris shearwaters are one of the most important seabird groups in the CCLME in terms of numbers, but also because these are the only pelagic seabirds exploiting the CCLME all year-round. To assess the summer and winter connectivity of these species in relation to the CCLME use, we analyzed a multi-years tracking database of GLS and GPS positions for the three recently split Calonectris species: Cory's, Scopoli's and Cape Verde shearwaters, breeding in north and central Macaronesia, Mediterranean and Cape Verde Islands, respectively. We found a clear spatial and seasonal segregation among species. During the breeding and post-breeding seasons, Banc d'Arguin was the southern and northern limit distribution for Cory's and Cape Verde shearwaters, respectively. In winter, Cape Verde shearwaters left the area and were replaced by Scopoli's shearwaters from the Mediterranean, whereas Cory's shearwaters essentially remained exploiting the same region but in much lower numbers, since most birds winter in the Southern Hemisphere. Our results highlight the need to understand seasonality and connectivity between species and populations of seabirds across the CCLME to properly define MPAs.

Session 06

Longline fisheries in the North East Atlantic, a threat for seabirds?

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Abstract

Longline fishing is one of the major threats for seabirds worldwide and therefore determining when and where interaction between seabirds and longliners occurs is crucial for a proper management of fisheries. In the North East Atlantic, longliners are suspected to have negative impacts on shearwater populations but evidences are still scarce. The Atlantic marine areas of the Macaronesian region (aprox. 34 FAO area) are important grounds for longline fisheries from several European countries, but also for many wintering seabirds and for large shearwaters breeding across all Macaronesian archipelagos and some western Mediterranean Islands. In spite of the by-catch risk, on board observers programs in the region have been scarce and consequently seabird by-catch rarely reported. Here we report on-board observer data from 338 fishing lines (346,008 hooks) set by Spanish longliners targeting swordfish. In addition, we analyzed the spatial overlap between this fishery and GPS tracks of Calonectris shearwaters breeding on Berlengas, Madeira, Canaries, Chafarinas and Terreros. Despite a substantial spatial overlap between foraging grounds of Cory's shearwaters and longliner activities we registered a single capture of Cory's shearwater. However, a poor seasonal match between breeding movements of shearwaters and the on-board observer program, undertaken mainly in winter, may potentially obscure higher by-catch rates of longliners during spring and summer. In contrast, we recorded the capture of 32 Northern gannets Morusbassanus typically migrating through and wintering on the area. Overall, low seabird by-catch rates observed in this fishery and the absence of reported catches in other monitored fisheries operating in the same region suggest a relatively low interaction between NE Atlantic fisheries and seabirds. However, further on board observations are needed throughout sensitive periods, such as spring and summer seasons as well as during the prenuptial and postnuptial migration periods of shearwaters.

Session 06

Colony breeding terns and gulls as indicators of fish availability

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Abstract

From 1998 onwards seabird breeding and feeding was monitored in colonies between Guinea and Mauritania. The most detailed data and longest time-series were obtained from Royal Terns *Thalassa maximus*, Caspians Terns Sterna caspia and Slender-billed Gulls Larusgenei breeding in the Saloum Delta National Park (PNDS) in Senegal. In all countries agents from National Park Services were trained in basic monitoring techniques.Parameters studied included number of breeding pairs, clutch and egg size and chick condition. Food was studied by analysis of fish otoliths in faeces and regurgitated pellets and feeding ranges were established by the use of solar-powered data loggers (UvA-BiTS).Royal Terns had the largest feeding range, extending to the shelf break. Diet was rather divers, including deep sea species likely obtained while feeding on bycatch from trawlers. A significant correlation was obtained between the number of breeding pairs and the percentage of Carangidae (predominantly Trachurus sp.) in the diet. Chick condition decreased between 1998 and 2005 and was negatively correlated with SST.Caspian Terns had coastal feeding ranges mainly in waters less than 20 m of depth. Number of breeding pairs correlated best with the proportion of Mugilidae in diet. Diets of three individual birds were distinctly different as were their feeding ranges. Only in 1995 (high) and 2011 (low) chick condition significantly deviated from the long-year range. No correlation with SST was found.Slender-billed Gulls had the most coastal feeding range, generally in waters less than 10 m of depth and often including inland creeks. Number of breeding pairs correlated best with proportion of juvenile Clupeidae in diet.In recent years accelerated coastal erosion forced colonies to move to less surveyed sites (Senegal, Mauritania) or to abandon sites (The Gambia). To compare the total breeding populations from Guinea to Mauritania with those in 2005, a census covering all colonies is planned for 2015.

Session 06

The charismatic megafauna in the upwelling zone off Mauritania: a conservation concern

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Abstract

The Mauritanian fishery institute IMROP (Nouadhibou), in collaboration with European scientists, investigates the biodiversity within the upwelling zone off Mauritania, partly within the framework of ProgrammeBiodiversité, Gaz, Pétrole (BGP), an initiative of the Mauritanian Ministry of Environment to reduce environmental risks of emerging offshore oil industries. One objective is to map distribution and abundance of 'charismatic megafauna' (cetaceans, seabirds, turtles) in surface waters around the shelfedge. It is our aim to characterise prime (offshore) habitats, to study ecological interactions between species, and to identify interactions with fisheries. To document the dramatic temporal changes in species composition in the area, we aim to survey in all seasons at least twice.

Session 06

A model for preventing seabird bycatch in West African fisheries

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Abstract

Seabird bycatch is a common feature in many fisheries, with most gear types presenting some risk to seabirds at some point. The scale of seabird bycatch, and the conservation consequences that it creates, vary between regions and gear types. However, there are some commonalities which suggest that in West Africa, which is an exceptionally productive marine ecosystem of global importance for tens of thousands of breeding, wintering and passage migrant seabirds, significant bycatch of seabirds is a real possibility. In particular, demersal trawl and demersallongliners are particularly risky for seabird assemblages such as occur in West Africa, which include medium-sized procellariiform and sulid seabirds. Although bycatch risks and options to avoid it are well understood, there is typically a gap between knowledge of why and how to avoid bycatch, and practices onboard fishing vessels. It is highly likely that Northern Gannets Morusbassanna and several shearwater species (including the breeding endemic Cape Verde Shearwater Calonectrisedwardsii) are at significant risk from bycatch in the industrialised fisheries in the region, an hypothesis supported by at-sea observations of aggregations of these species in association with fishing vessels. Currently there are no formal requirements for vessels to use any measures to reduce or avoid interactions with seabirds. BirdLife International created a programme to address albatross (and related species) bycatch in the southern Hemisphere, precisely because solutions to high bycatch rates existed but were not being implemented. The model has delivered some unusually good results – including the near-elimination of seabird bycatch in South Africa's demersal trawl and longline fisheries. Success was predicated on several factors, including significant, long-term investment (some programmes have been operational for >10 years), employing local staff and ensuring that local.

Session 06

Significant reductions in mortality of threatened seabirds in a South African trawl fishery

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Abstract

Globally, many thousands of seabirds are killed accidentally in demersal trawl fisheries; through cable strikes and net entanglements. However, multi-year datasets for estimating seabird-trawl interactions robustly are scarce. In 2004/05, an estimated 9300 birds were killed, of which ~7200 were albatrosses. We compare these figures to data from 2006-10, when vessels used a single measure (bird scaring lines) to reduce seabird mortality. From 64 trips and 690 hours of observation, 41 seabirds were confirmed killed due to cable strikes, of which 22% were albatrosses. Fatal cable interactions occurred overwhelmingly when vessels discarded offal, with the highest rates (birds killed per hour of observation, birds/hr) in winter and during setting. Comparing rates shows that bird scaring lines alone resulted in 73-95% lower mortality in the winter during discard (all seabirds: 0.56 birds/hr before, 0.15 birds/hr after, $P<0.001$; albatrosses: 0.44 birds/hr before, 0.02 birds/hr after, $P<0.001$). Assuming compliance with regulations, estimated total mortality (mean and 95% CIs) in 2010 was 990 (556-1633) seabirds, including 83 (38-166) albatrosses, a reduction in mean albatross deaths of >95%, reflecting both bird scaring line effectiveness (accounting for >90%) and a reduction in annual fishing effort by 50% from 2004-05 to 2010. Bird scaring lines cost <US$200 each in South Africa, a trivial expense per vessel for a measure that reduces fatal interactions with threatened seabirds so effectively. These results provide a strong case for the mandatory adoption of bird scaring lines in trawl fisheries with high densities of scavenging seabirds. Recent observations, however, show an alarming increase in net captures of Cape Gannets (*Moruscapensis*). At least 90 birds were captured in four events, of which 58 (65%) died. This represents more deaths from 4 operations than were recorded in the previous 6 years, for all species combined. Of regional significance, Northern Gannet (*Morusbassanus*) and Masked Booby (*Sula dactylatra*) are probably similarly susceptible to net entanglements. Bycatch rates from warp interactions and net entanglements in West Africa should be investigated as a priority.

Session 06

Seasonal abundance of audouin's gulls, Cape Verde shearwaters and red-billed tropicbirds in Senegal

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Abstract

The coast of Senegal is an important area for many wintering and migrating seabird species, including the Audouin's gull (*Larusaudouinii*) and the Cape Verde shearwater (*Calonectris edwardsii*) both listed as Near Threatened by the IUCN. However, numbers and phenology of seabirds passing or wintering on the Senegalese coast are poorly known.In this study, we aim to determine the seasonal abundance of Audouin's gulls, Cape Verde shearwaters and red-billed tropicbird (*Phaetonaethereus*) on the coast of Senegal throughout the year.From December 2013 to November 2014, we visited Palmarin once a month for reading rings counting and aging Audouin's gulls.In addition, from May 2013 to August 2014, we counted Cape Verde Shearwarters from a vantage point from Ngor every week from 9h to 12h. Finally from June 2014 to November 2014, we visited the Iles de la Madeleine every 15 days to monitor the breeding sites of red-billed tropicbirds.Audouin's gull numbers increased from July to December decreased from February to April and were lowest in May and June. In the later period, all birds were immatures, suggesting these birds may be all year round in Senegal. Cape Verde Shearwaters occurred from March to June, indicating this species feed or neritic waters off Senegal for recovering from their migration journey and building reserves before laying.Red-billed tropicbirds occurred all year round and breed from June to November and number of breeders peaked in October. Our results show Senegalese waters are crucial feeding grounds for the three species at different periods of the year and there-fore their distribution at sea should be considered for designing marine IBAs and future MPA.

Session 06

Fouling and mortality of seabirds from heavily greased trawl warps

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Abstract

Preventing accidental mortality during fishing is essential to improve the conservation status for many seabird populations globally. In 2009, during a routine voyage to quantify interactions between seabirds and trawl warps, we recorded a previously undescribed and potentially significant threat to seabirds: newly greased warps. Vessels that had recently been fitted with a new set of trawl warps were covered in thick, bitumenised, protective grease. Seabirds that came into contact with greasy warps became fouled. In severe cases seabirds became stuck on the warps and were drowned by the submerging cables. Bird-scaring lines also became fouled, reducing their efficacy in preventing seabird mortalities and increasing the risk of grease transfer to seabirds. Fouled birds are at risk when ingesting toxic petrochemical grease while preening, and from hypothermia due to loss of insulation and waterproofing; we speculate that many of the affected birds will have succumbed. We investigated the effects of greased warps on the mortality rate of seabirds from observations on 25 treatment (grease) and 18 control (no grease) days aboard South African demersal trawlers. The most commonly affected species was the Pintado Petrel *Daptioncapense*. All birds that had medium or heavy warp collisions were assumed to have fouled feathers. A total of 27 birds drowned in 100.9 hours of observations, with 74% of mortalities occurring on greased warps. Mortality rates on greased warps were 2.25 times higher than comparable rates on un-greased warps (0.36 birds/hour vs. 0.16 birds/hour). Seabirds are particularly at risk in regions where high fishing effort levels coincide with high abundance of scavenging seabirds. In South Africa the resolution to this problem was relatively simple; BirdLife South Africa's Albatross Task Force, fishing industry representatives and government collaborated to formulate regulations that prohibited the use of bitumenised, heavily greased warps in 2012, and suppliers of new warps were advised to amend their manufacturing process. Since 2013 no heavily greased warps have been observed in the fishery.Fisheries in other regions should investigate seabird-warp interactions, and particularly the nature of greased new warps and the impacts these have on seabirds.

ICAWA Report Side Event 1 "1st International Workshop "Ecosystem Indicators" for the Management of Fisheries and the Marine Environment in West African Waters (IndiAWA)"

Chairmen: Didier JOUFFRE (IRD, Senegal) and Ibrahima DIALLO (CNSHB, Guinea)

Rapporteur: Didier JOUFFRE (IRD/ECOSYM/LABEP-AO, Senegal)

Summary Report

A session involving some of the key-participants of indiAWA workshop, preceeded the workshop and it took place in Room 3 on 10th December between 9H00 and 11H00. In spite of this agenda modification, the indiAWA workshop (Appendix 1) addressed all its agenda items. Some of them have been developed or brought into focus during the present meeting and others were evoked, as points to develop during future meetings or along the year through mails discussions (see below).

- Day 1: 10th December 2014

D. Jouffre presented the objectives of the workshop and this provided the opportunity to precise some points of the agenda and to adopt them. This was followed by a roundtable introduction of the participants (see the list of participants in Appendix 2). After this introduction the work began with video projections and discussions on the first issue concerning ecosystem descriptions (of national case studies).

M. L. Camara (CNSHB) made a presentation of the Guinean ecosystem. The following questions and/or discussion were on specific issues and points concerning Guinea and particularly on some ecosystem indicators that were presented. General issue of the approach were also debated, like how to define the boundary of the ecosystem in the national case studies to be developed during indiAWA, how to define the communities of fauna assemblages on which the indicators have to be calculated, etc..

The second ecosystem presentation was made by V. Okpeitcha (CROHB) on the Benin marine ecosystem. Discussion followed on the notion of emblematic species and key species (which one and why this status), concerning Benin but also on the general case. The question of which data are available in Benin was also evoked and M. Okpeitcha answered with a brief description of scientific surveys data and fisheries statistics data for Benin.

J. Tape (CRO) made then a presentation on his national case study description titled "Some Elements on the Ivory Coast ecosystem". In the discussion H. Demarcq (IRD, Sète) noticed that some data or information used in the presentation were outdated and he suggested to complement the bibliographic review for this country. Some precisions and complementary information were also brought by M. Tape about the national fishery monitoring and scientific survey data in this country.

Similar ecosystem presentations and discussions were also made concerning:

- The Bissau Guinea Ecosystem description by J. Intchama (CIPA)
- The Gambia Ecosystem description by E. Mbye (DOF)
- The Cabo Verde Ecosystem description by C. Santos (INDP)
- The Senegal Ecosystem description by M-L. Bivigou (student in stage with M. Thiaw, at CRODT)

These presentations contributed to the achievement of some of the goals set in the workshop agenda.

Concerning the description of the available data for each ecosystem, this point was largely treated along most of the several discussions following the previous presentations on ecosystem descriptions. So just complementary information were then requested during a round table among participants which took place on this topic. During this round table, V. Okpeitcha and J. Tape proposed to prepare a specific presentation on the data, for Benin and Ivory Coast respectively, and to present it during the second day of the workshop (see below).

- Day 2: 11th December 2014

A large and multi-thematic session started which covered several points of the initial agenda. This session was about the different type of indicators to be agreed upon in indiAWA: biodiversity and ecological indicators, environmental indicators and human dimension (socioeconomic) indicators.

The issue concerning the Environmental indicators was introduced by a presentation made by H. Demarcq. He showed the great diversity of products (and indicators) that can be extracted from satellite data. He highlighted also the necessity to adapt each environmental indicator to specific problem that need to be addressed for each area and case study.

The issue concerning the focus on ecological and biodiversity indicator (*i.e*. some example of biodiversity indicators, which indicators for our approach? indicators used in indiAWA and IndiSeas + potential additional indicators for indiAWA) was then introduced by D. Jouffre and illustrated with the support of the on-line presentation and exploration of the IndiSeas website (www.indiseas.org).

The exploration of Indiseas website offered also the opportunity to debate of the indicator approach planned for indiAWA. The main points can be summarized as follow:

- As for the description of the ecosystems, D. Jouffre recommended to develop the first set of IndiAWA indicators (common with indiseas) based on the basic information on the calculation of some indicators as presented on the IndiSeas website. I. Diallo and D. Jouffre will organize the work to be done during this year and assist the focal points of the different countries in the calculation of the indicators at the national case study level.
- It was decided that the sharing of data within IndiAWA will be made via Dropbox. Each country will manage its national data and only results of indicator calculations will be shared.
- H. Demarcq accepted to be in charge of the development of the environmental indicators. He will be responsible for defining them in collaboration with the national focal points. The presentation of results on the calculation of these environmental indicators will be done in graphs and numbers. In addition to biomass indicators calculated in IndiSeas, primary production may also be calculated in IndiAWA.
- W. Mullié (VEDA/FIBA) suggested that it would be also interesting to calculate biochemical indicators and indicators of abundance via birds. He also committed to providing to IndiAWA, the biochemical indicators already calculated to allow the team to have an idea of their trends.

Concerning human dimension and economic indicators, M. Chaboud was identified as one of the key specialist in our group for this topic. He listed some examples which could be calculated as part of IndiAWA. This concerns, among others, human resources involved in fishing, contribution of fisheries to food consumption that could also be a pressure indicator, contribution to exports in concrete regulatory measure efforts of small-scale fisheries, management (existence of AMP, see area relative to the plate) etc. The interest of starting now a website for indiAWA emerged also from the discussion. It was decided that this website will be set up at first to help and structure the activities inside indiAWA and then to be a communication media of the indiAWA results for the public. This site will thus be at first a working site only (internal initial phase, reserved to indiAWA members) but envisaged as the first step in a process towards a more ambitious, more complete and more "professional" public website in the future. H. Demarcq proposed to be the webmaster of this site during the initial phase.

Then V.r Okpeitcha and J. Tape made their presentations on data availability, for Benin and Ivory Coast respectively (see day 1). The last and conclusive session (multi-thematic and open) was the occasion to evoke most of the others points or issue of the planned agenda that time did not allow to fully debate. These issues will concern the future of indiAWA activities.

That is:

- Specific and or transversal questions like: Alternative indicators for data poor situations, Local knowledge (how to use and integrate it in the indicator approach).

- Towards an integrated ecosystem diagnosis (dashboard of indicators, reference levels, modeling approaches, links between EAF indicators and stock assessment methods, relation to maintain and develop with indiseas consortium).

- The thought process to be conducted on Scientific publication planning (proposal/identification of topics and leaders), and more broadly on the strategy for valorization of the future AWA results.

- For the planning of AWA future activities (between now and the next indiAWA Meeting) this will be organized by the co-PI Ibrahima Diallo and Didier Jouffre, and defined by mail exchange with the local focal points and with the assistance of Khady Diop (IRD UMR MARBEC, Labep-AO Dakar).

- Concerning the link between indiAWA-WP4 and others AWA's WP: It has been identified that it would be interesting to investigate the possibility of integrating new indicators in IndiAWA based on data and results from other AWA's WP. To achieve this goal, there is a need to establish closer collaboration between indiAWA and others AWA'S WP on this topic (additional indiAWA's indicators derived from other AWA-WP).

As there were no additional question or information to share the workshop was then closed at this point.

ICAWA Report Side Event 2 "West African scientific fleet, toward a sub-regional coordinating commission "

Chairmen: Dr. Mahfoudh ould TALEB SIDI (deputy director IMROP, Mauritania) and Dr. Yves GOURIOU (Head of IRD-US Imago, UMS Flotte, France

Summary Report

La nécessité de suivre l'état très instable des espèces marines exploitées notamment les petits pélagiques et leur importance économique et sociale dans la région nord ouest africaine crée une forte demande sur l'évaluation des ces stocks. Cette variabilité est liée fortement aux variations des conditions environnementales (Upwelling, courant, sédimentologie..). Les captures commerciales sur lesquelles se fondent les approches d'évaluations classiques peuvent présenter plusieurs limites qui militent en faveur d'autres approches indépendantes de la pêche. Les campagnes scientifiques fournissent de telles informations qui demandent cependant des moyens et des compétences qui ne sont pas facilement mobilisables au niveau de la région.

Depuis plus de 30 ans, plusieurs pays de la région (Maroc, Mauritanie et Sénégal, Guinée notamment) conduisent des campagnes scientifiques qui ont couvert à des degrés divers l'aire d'extension des stocks concernés du nord ouest africain.

A la fin des années 90 et au début des années 2000, ces quatre pays ont bénéficié d'un programme d'aide japonais qui a permis la mise à leur disposition des navires de recherches avec les équipements et appareils adéquats pour l'évaluation des stocks demersaux et pélagiques et le suivi de la dynamique environnementale et de la biodiversité (Cétacés, oiseaux et tortues marins….)

Plusieurs campagnes internationales se sont déroulées aussi les ZEE des pays concernés (65 campagnes pour le cas de la Mauritanie entre 2000 et 2014). Elles ont couvert différents domaines océanographiques (physico-chimiques, hydrologiques..) et biologiques.

Dans la zone allant du Maroc à la Côte d'Ivoire en passant par les iles Cap Vert les évaluations des stocks halieutiques constitue un objectif prioritaire. Au Maroc et en Mauritanie, la mise en œuvre de ces outils de prospection scientifique occupe une place maitresse dans les stratégies nationales de développement du secteur de la pêche. Leur apport est jugé déterminant pour la politique de gestion et d'aménagement des ressources halieutiques (quota pour le poulpe et les petits pélagiques, période d'arrêt et de reprise de pêche…).

Ces campagnes constituent une lourde charge financière représentée par le fonctionnement et l'entretien de ces navires qui pèsent de façon excessive sur le budget de ces institutions de recherche et réduit les moyens financiers déjà notoirement insuffisants.

Dans certains pays, la dotation publique ne va guère au delà du versement des salaires et de la couverture des frais incompressibles. Ce manque de moyens financiers affecte les observations sur le terrain et limite considérablement la coopération régionale.

Le spectre des recherches pluridisciplinaires susceptibles de contribuer au développement et la protection de l'environnement est très large. De toute évidence, les données collectées en mer sont limitées dans le temps et l'espace (particulièrement pour les premiers stades de développement, la biodiversité, la bathymétrie et la sédimentologie) du fait que les moyens

logistiques mis en œuvre ne permettent pas d'échantillonner la région nord ouest africaine de façon continue et exhaustive en raison de l'immensité des zones à explorer et de la mobilité des ressources halieutiques qui ne connaissent pas de frontière.

Pur les pays qui ne disposent pas de navire de recherche (Gambie, Guinée Bissau et Côte d'Ivoire) la conduite de campagnes scientifiques se fait par le recours à des navires étrangers de la région ou d'ailleurs. Ces affrètements coûtent généralement chers. Mais le manque de campagne ou leur irrégularité reste le problème le plus difficile et mettrai très mal à l'aise la recherche dans ses pays.

Les résultats de ces campagnes sont considérés comme indispensables par les pouvoirs publics comme des sources précieuses d'aide à la décision. Il s'agit donc de maintenir sinon améliorer le rythme de conduite des campagnes scientifiques pour garantir une meilleure connaissance de l'état des ressources halieutiques du pays et de leur environnement.

La mise en place d'un comité chargé de la coopération scientifique dans le domaine de la recherche océanographique et halieutique et également dans le domaine de la biodiversité est jugée importante pour créer un cadre de concertation et de collaboration.

Ce comité regroupera les différentes institutions concernées de la région (INRH, IMROP, CRODT, INDP, CIPA, CNSHB, CRO) en plus du Fisheries Département de la Gambie. L'adhésion des partenaires techniques et financiers (IRD, JICA, FAO, UEMOA, PRCM) et institutionnels (COMHAFAT, CSRP) est fortement souhaitée. Le mandant de comité doit couvrir toutes les problématiques prioritaires. Les campagnes océanographiques constituent la priorité numéro 1.

Ce comité doit reposer sur quelques principes de base, qui en conditionnent l'efficacité :

- éviter de créer un structure lourde et budgétivore (15 membres au plus) avec les représentants des projets qui travaillent dans la région (AWA, CCLME….);
- se doter d'une large autonomie (les institutions impliquées doivent prendre en charge les frais de participation de leur scientifique impliqué). L'institution qui accueille les réunions doit supporter les frais du secrétariat et des pauses café
- proposer des campagnes internationales pour couvrir une fois par an, l'ensemble de la zone depuis le nord du Maroc jusqu'au sud de la Côte d'Ivoire (Fridjoft Nansen, Coopération française, Coopération Russe, UEMOA, JICA, COMHAFAT…) et apporter ainsi une économie d'échelle mais aussi disposer de données comparables car collectées suivant le même protocole et à des périodes proches.
- chercher des solutions consensuelles aux problèmes posés pour la région et répondre aux besoins spécifiques de chacun des pays lorsqu'un exprime le besoin (organisation de campagne conjointe, prêt de matériel et d'appareillage scientifique ; mobilisation de compétence…).
- définir un mode de financement pour les campagnes notamment en recherchant des cofinancements (publics ou privés).

Ce comité présente donc l'avantage de répondre au double souci de rationalisation etmutualisation des équipements, des campagnes scientifiques et des activités de recherche et de renforcement à coût réduit et de façon durable les capacités nationales.Des impératifs qui conditionnent la réalisation du Plan de recherche respectif de chacune des institutions impliquées.

Comment s'y prendre ?

- La création du comité de coordination chargé de la coopération scientifique de la recherche océanographique et halieutique
- **Rédaction du mandat** avec comme priorité les campagnes scientifiques
    - Rédaction d'un draft de statut et d'un règlement intérieur
    - Ancrage institutionnel (CSRP, COMHAFAT) pour rendre visible le travail accompli pour les scientifiques et le grand public.

- **Faire un état des lieux**
    - inventaire des navires scientifiques et de leur équipement fonctionnel
    - disponible)
    - inventaire des équipements des laboratoires
    - répertoire des scientifiques ayant des profils indispensables à la conduite et à l'analyse des données collectées lors des campagnes
    - inventaire des campagnes nationales, régionales et internationales
    - protocole de l'acquisition des données
    - les partenariats existants, leurs avantages et limites respectifs nationaux (public et privé), étrangers (ex. Europe, Russie) ; inventaire par pays des possibilités d'affrètement ponctuelle extérieure :
    - Détail des difficultés auxquelles font face les navires de recherche. (d1) logistique, d3) humaine, d4) financière

- **Aspects juridiques** liés aux autorisations de travail des campagnes internationales dans les ZEE des pays de la région (harmonisations..).

Tous ces éléments seront documentés et discutés à traversdes échanges mail.

La date limite de la fourniture de ces données est fixée au 30 mars pour une réunion prévue vers le 30 juin 2015.

Un comité provisoire avec à sa tête Mahfoud Taleb de l'IMROP (Mauritanie) a été constitué.

Les membres de ce comité sont :

- Aka Marcel Kouassi (CRO, Abidjan)
- Bamy Idrissa LAMINE (CNSHB, Conakry)
- Yves Gouriou (IRD, Brest)
- WahbiFatima(INRH, CASABLANCA)
- Massal Fall (CRODT, Dakar)
- Carlos Santos (INDP, Sao Vicinté, CaboVerdo)
- Gambie (FisheriesDepartment, Banjul)
- Guinée Bissau (CIPA, Bissau

Participants

IMROP (MAURITANIE), CRODT (SENEGAL), CNSHB (GUINEE), Cap Vert (INDP), CRO (République de COTE D'IVOIRE), IRD (France), invitation Sub Regional Fisheries Commission (CSRP/SRFC).

ICAWA Report Side Event 3 "MarineProtected Area (MPA) in West Africa "

Afternoon 09th to 10th December: Room 2

Chairmen: Dominique DUVAL DIOP (RAMPAO) and Modou THIAW (ISRA/CRODT).

Summary Report

Depuis le Sommet de Johannesburg en 2002, la Convention sur la Diversité Biologique définit pour ses Etats signataires des objectifs de création de réseaux d'aires marines protégées – AMP, pour la conservation de la biodiversité et la reconstitution des stocks halieutiques. En Afrique de l'Ouest, le Réseau Régional d'Aires Marines Protégées (RAMPAO) a été crée en 2007 pour contribuer au renouvellement des ressources halieutiques, à la réhabilitation et à la restauration des habitats critiques et à la conservation de la biodiversité.

Une analyse des lacunes écologiques a été menée entre 2009 et 2012, afin d'identifier les acquis et les faiblesses du réseau et de définir les actions prioritaires pour l'atteinte de ses objectifs. Parmi les faiblesses identifiées sont le manque de connaissances sur les services tangibles et concrets fournis par les AMP pour la production halieutique et le manque de diagnostic des pressions liées aux activités de pêches dans les AMP qui permettront aux acteurs de développer des réponses appropriées. Par ailleurs, les représentants des pêcheurs ne sont pas suffisamment intégrés dans les systèmes de gouvernance et de gestion des AMP ouest africaines qui ont une dynamique de pêche, ce qui se traduit par une faible compréhension des retombées socio-économiques de l'AMP par les usagers et riverains, et génère parfois des conflits.

Ces défis ainsi que des recommandations endossées par les membres du réseau en assemblée générale en Novembre 2011 à Dakar, ont conduit la constitution d'une task-force opérationnelle AMP-Pêche du RAMPAO et de la CSRP. Elle bénéficie de l'appui technique de l'UICN. Cette task force AMP-Pêche a pour vocation de conseiller et d'appuyer le réseau, en vue du renforcement de sa contribution à la gestion durable des ressources halieutiques et d'atteindre ainsi tous ses objectifs. Cette recommandation a également été formulée lors de l'atelier de restitution de l'*Etat de l'art sur le rôle des AMP pour la gestion des pêches*, organisé par la CSRP en décembre 2011 à Dakar, et a fait l'objet d'un « side event » organisé conjointement par la FIBA et la CSRP en septembre 2012 à Jeju en Corée du Sud au cours du congrès mondial de la nature. La recommandation a également été approuvée lors du Forum marin et côtier organisé par le PRCM à Banjul en février 2012.

Objectif global

Le but de la rencontre organisée dans le cadre du Side Event 3 de la réunion internationale du projet AWA était de constituer de façon formelle la task-force AMP-Pêche où les experts AMP-Pêche auront à développer un plan de travail conjoint sur la pêche et les aires marines protégées et le processus de mise en place de la task-force. Cette task force met à la disposition des acteurs des AMP des expertises et outils pour améliorer les connaissances et le dialogue, en vue de renforcer le rôle des AMP dans la gestion des pêches.

Objectifs spécifiques

- Rassembler un pool d'experts de terrain opérationnels, mobilisables, ayant les capacités d'appuyer concrètement des gestionnaires d'AMP pour identifier des solutions face aux problématiques précises et prioritaires sur la thématique des liens entre la pêche et les aires marines protégées (e.g. les domaines de la gouvernance, la surveillance, la règlementation de la pêche et de l'environnement et les AMP, le zonage, les rapports sociaux et la gestion des conflits, la variabilité des ressources et des usages, etc.) ;
- Proposer un plan d'action et de travail qui répond aux besoins et qui programme les activités, des formations et des échanges d'expériences à différentes échelles (CSRP et RAMPAO, niveau pays, niveau local), bénéficiant d'une série d'outils (modifiés pour les rendre accessibles aux acteurs et gestionnaires des AMP) pouvant être utilisés par le pool d'experts pour répondre à ceux-ci ;
- Finaliser la fiche descriptive de la task-force comprenant les modalités de mobilisation des experts, les services qu'ils peuvent fournir aux gestionnaires d'AMP ainsi que leur profil ;
- Préparer une mission de terrain pilote pour tester le mécanisme de mobilisation d'experts AMP-Pêche pour apporter des outils/solutions à des problématiques identifiées au préalable par un gestionnaire d'AMP.

Résultats attendus

- La task force est formellement constituée et dispose d'un plan de travail pour son opérationnalisation
- La communication entre les experts des AMP et de la pêche est renforcée
- Le mécanisme de travail des experts sur un problème spécifique est testé sur le terrain afin d'apporter des leçons apprises

Membres de la Task Force AMP-Pêche

Les membres de la Task-Force regroupent:

- des experts en gestion et aménagement des pêches des pays
- des experts issus des centres de recherches halieutiques des pays
- des experts des structures de gestion des aires marines protégées
- tout expert et/ou scientifique intéressé et/ou coopté en cas de besoin

Résultats du Side Event

Le Side-event AMP-Pêche représente la phase de concrétisation d'un processus de réflexion engagé dans le cadre des synergies entre la CSRP et le RAMPAO pour remettre la question de la durabilité de la pêche au cœur des fonctions des AMP de l'Afrique de l'ouest. Il s'est organisé en deux étapes complémentaires, avec deux jours de réunion à Dakar et 4 jours de mission de terrain à l'AMP de Joal-Fadiouth. Toutes les activités menées ont permis l'atteinte des résultats attendus précisés ci-dessus.

Durant les deux jours de travail, regroupant une quinzaine d'experts sociologues, économistes, biologistes, conservateurs et gestionnaires, la Task-force AMP-Pêche du RAMPAO a été constitué et son environnement institutionnel balisé. Aussi le cadrage de a task force a été élaboré. Sa ligne d'action de cet outil d'intervention mise en place au profit des AMP et de la gestion durable des pêches, suivra l'objectif commun identifié de manière participative, à savoir «**apporter un appui technique aux AMP pour la gestion durable du secteur des pêches »**. Aussi, ses principales problématiques relatives aux liens entre la pêche et les AMP, ainsi que les modalités de son intervention ont été définies et un plan d'action pour 2015 a été validé.

La Task-Force ainsi constituée a organisé de suite sa première mission de terrain au profit de l'AMP de Joal-Fadiouth qui avait exprimé au RAMPAO une demande spécifique. La TF a passé alors 3 jours en accompagnement des gestionnaires et des conservateurs de cette AMP, des acteurs de la pêches (y compris ceux ayant subis en plein fouet les contraintes de la mise en place de l'AMP). Au sujet de cet AMP, elle a fournit un appui (animation, facilitation et expertise) pour traiter la demande qui touchait les questions diverses des états de références et systèmes de suivi écologique, l'aménagement des pêcheries de crevettes dans la zone de l'AMP et certains signes de changements de l'écosystème observés depuis la création de l'AMP. Cet appui a ainsi laissé un plan pour améliorer le suivi de l'AMP en référence aux objectifs et attentes des pêcheurs, un processus à construire un plan de gestion avec les pêcheurs de crevettes au Kili et un protocole relatif aux gastéropodes, y compris celui qui serait devenus plus fréquent (*Stramonita haemastoma)*.

Au-delà des résultats en terme d'appuis de l'AMP ciblée, l'expérience de travail sur le terrain d'une équipe d'experts de la Task-Force, du reste très fructueuse et riche, a permis de tirer les leçons de nature à améliorer les prochaines missions de la TF.

Picture 9 : (above) the working group in progress (below) just after this side event the participant was in filed to apply their methodology on the Joal marine proteteed area.

ICAWA Report Side Event 4 "Coastal erosion; monitoring, processes and impact on societies in West Africa"

Chairmen: Moussa SALL (CSE, MOLOA), and Rafael ALMAR (IRD).

Rapporteur: Moussa SALL (CSE, MOLOA)

Summary rapport:

En Afrique de l'Ouest, les zones côtières concentrent 80% de l'activité économique régionale (UEMOA) ; ce qui fait que l'érosion côtière à laquelle sont vulnérables la plupart des pays de cette région, est devenu un enjeu régional majeur. Situées à l'interface entre l'océan et le continent, les côtes sont vulnérables aux risques environnementaux et sont actuellement confrontées à une intensification de divers risques associés à l'augmentation de la pression humaine dans un contexte de changement climatique à l'échelle mondiale. Les pays d'Afrique de l'Ouest font actuellement face à une pression démographique sans cesse croissante et l'exploitation incontrôlée des ressources, liée à un développement économique rapide. La vulnérabilité des zones côtières face aux phénomènes naturels (c'est-à-dire les événements extrêmes des tempêtes tropicales, l'érosion, les inondations), conjuguée à la pression démographique, accroît le risque pour les activités humaines et représente une contrainte au développement de la côte (transport maritime, le tourisme, le développement urbain).

L'une des principales contraintes à la connaissance de la dynamique côtière est le déficit d'intégration d'observations appropriées (multi-échelles, structurées dans un réseau, sur une longue durée) et d'outils numériques (régionales pour les zones côtières, hydro-morphologiques pour la dynamique littorale). Il y a un important besoin d'une meilleure compréhension et d'une estimation de la dynamique actuelle et de l'évolution future (ALOC-GG rapport de 2011, l'impact du réchauffement climatique, Stive, 2004).

L'objectif de cette session est de montrer l'état des connaissances actuelles dans la compréhension des processus responsables de la grande variabilité observée (y compris pour l'érosion côtière) et d'en quantifier les impacts; ceci en examinant les projets en cours, les actions entreprises à ce jour, la surveillance et les outils de modélisation utilisées. Cette session examine aussi des solutions pour anticiper l'évolution côtière et améliorer les techniques et les politiques de gestion des zones côtières pour une stratégie intégrée de l'atténuation des risques.

During this session the price of the best oral comunication was delivered to Benet Atsu FOLI (MESA, Ghana) and the price of the best poster was delivered to the PhD candidate Abdoulaye NDOUR (UCAD, Senegal).

Side Event 04

COASTVAR 2015-2018: Caractérisation de la variabilité littorale en Afrique de l'Ouest par une étude multi-échelle et multi-méthode

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Abstract

Les littoraux sont devenus des zones d'importance majeure dans l'accompagnement du développement socio-économique des pays d'Afrique de l'Ouest. Ces littoraux, dont la dynamique est peu connue, sont de plus en plus vulnérables de par leur caractère d'interface entre une pression anthropique croissante et une exposition naturelle aux aléas environnementaux. Le projet de recherche international COASTVAR vise à améliorer notre connaissance de cette dynamique littorale en identifiant et décrivant les causes, les mécanismes à l'origine de la forte érosion observée (>10 m/an à certains endroits) afin d'anticiper les changements à venir pour les populations exposées. Des moyens d'observations innovants seront déployés (réseau d'observation vidéo permanent -MOLOA, campagnes de mesures intensives, drones,...etc.) ainsi que l'application de modèles numériques de vagues, courants et d'évolution de plage (Xbeach, ROMS-WW3/WKB).

Side Event 04

Monitoring of Ocean Conditions: an Approach to nsuring safety at sea for artisanal fishers in Western Africa

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Abstract

In western Africa, the fisheries industry is dominated by artisanal fishers who rely on unsophisticated fishing crafts and poor navigational tools during fishing. Activities of the fishermen are often threatened by severe waves and winds due to unavailability of monitoring and early warning information on ocean conditions. Timely information on ocean state including sea surface height (SSH), waves, currents and winds are essential for ensuring safety at sea, especially for artisanal fishers in the region.This study employed satellite observation to monitor sea surface wave heights (improved Jason-2 altimetry products for coastal zones and continental waters) and winds (ASCAT daily averaged gridded products) in the western Africa region of the Tropical Atlantic and to verify the satellite data with in-situ data obtained from wave rider buoy deployed in a section of the study area. This forms part of the Monitoring for Environment and Security in Africa (MESA) project. Satellite data for the study was from 2011 and two distinct regimes of wave heights and winds were identified in the entire study area, which were designated as sub-region-A and sub-region-B. Average wind speed in the entire study area was 8 m/s while wind speeds recorded in north western end (sub-region-A) and south-eastern end (sub-region-B) ranged between 2.72-11.52 m/s and 2.29-8.09 m/s respectively. Significant wave heights ranged between 1.04-3.29 m and 0.78-2.80 m for the two sub-regions respectively. A time-series plot of wave heights for two selected sub-locations indicated unique seasonal variability for the two sub-regions, suggesting that the study location have two distinct wave regimes and surface wind influence. This information is important to guide fisher folks in planning their fishing expeditions for enhanced safety at sea and also to guide physical oceanographers in deploying oceanographic equipment for the study of various phenomena in the area of the Guinea Current System. A comparison of satellite wave data to in-situ waverider buoy data showed good correspondence with each other. However, satellite data did not show very high wave heights as recorded by the waverider buoy. This suggests the development of further algorithms for estimating of significant wave heights from satellite for the study location.

Keywords: ASCAT, Eastern Tropical Atlantic, MESA, sea surface winds, significant wave heights, western Africa

Side Event 04

Analyse diachronique de l'évolution du trait de côte entre Grand-Popo et Hillacondji de 1984 à 2011

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Résumé

Ce travail a été réalisé dans le cadre d'une thèse de doctorat sur la dynamique du littoral béninois et des activités de suivi de l'érosion côtière initiées par le Centre de recherches Halieutiques et Océanologiques du Bénin. Il a pour objectif de savoir comment s'est comportée la ligne de rivage dans ce secteur de côte dans un passé récent. Le matériel iconographique utilisé pour ce travail est essentiellement constitué d'images satellitaires Landsat. Elles ont servi pour l'analyse des évolutions de la morphologie des plages et celles de la ligne de rivage entre Hillacondji et Grand-Popo. Les images exploitées proviennent des catalogues d'images d'archives issues des instruments TM (Thematic Mapper) et ETM+ (EnhancedThematic Mapper Plus) et correspondent aux satellites Landsat 4, 5 et 7. Elles ont été téléchargées gratuitement via le site http://glovis.usgs.gov/. Après une observation visuelle des scènes téléchargées, quatre (04) ont été retenues pour cette étude. Elles datent de 1984, 1991, 2000 et 2011. Toutes les scènes sont directement orthorectifiées et projetées dans le système de projection UTM/WGS84.Les résultats obtenus nous amènent à distinguer deux segments de côte: Gbèkon-Ayiguénou : le secteur a évolué de 1984 à 2000 dans un contexte d'équilibre dynamique. Depuis 2000, le secteur connaît une progradation notable, avec une vitesse moyenne d'avancée de +0.42 m/an. Ayiguénou-Hillacondji : La dynamique de ce secteur de côte montre que l'érosion a été généralisée, de 1984 à 2000. Depuis 2000, le secteur montre des phénomènes d'érosion qui s'étendent jusqu'à la côte d'Agoué (zone source) au-delà de laquelle on observe une stabilité/progradation du rivage (zone de transition et d'accumulation). La vitesse d'évolution du trait de côte calculée dans ce segment de côte entre 1984 et 2011 montre deux sous-segments : un sous-segment de côte entre Ayiguénou et Agoué avec une vitesse moyenne de recul moins importante de -1,20 m/an et l'autre sous-segment de côte entre Agoué et Hillacondji avec une vitesse moyenne de recul plus importante de -3,03 m/an.Avec l'évolution du phénomène de

l'érosion côtière dans ce secteur de côte, si rien n'est fait, au cours des vingt cinq prochaines années, les segments de côte Hillacondji-Agoué et Agoué-Ayiguénou subiront respectivement un recul de l'ordre de cent cinquante (150) mètres et soixante (60) mètres. Une estimation des largeurs et surfaces des bandes de terre érodée et une évaluation financière des pertes de terre aux horizons 25 ans ont été faites.

Mots clefs : Analyse diachronique, évolution du trait de côte, côte de Grand-Popo à Hillacondji, érosion côtière, équilibre dynamique, perte de terre.

Side Event 04

Climate Change: nature, effects and impacts on coastal erosion and human activities in West Africa

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Abstract

Because of he global forcing climate a lot of energy will come from the sea.Generally we have two ways to dissipate this energy arriving on the shoreline (i) dispersed along the coast if it has sufficient inertia (eg: rocky coast high, the mass amortized the extra energy) (ii) or if the material is not sufficient to absorb the shock, the coastline moves (eg a coastal forest could be destroyed). The second situation is happening in West African coasts very vulnerable because of its main aspects: low and sandy coasts, coastal mangrove, few coral formations. These modification of ecosystems can reduce the coastal areas, namely in areas where populations are growing. And impacts on the physical environment, fisheries resources, local communities and their activities are mainly observed.

Side Event 04

Vulnérabilité climatique à Saint-Louis (Sénégal). Défis et enjeux écologiques de l'adaptation

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Résumé

Saint-Louis du Sénégal est une vieille cité de la façade atlantique de l'Afrique de l'ouest. Créée en 1659 sur l'île de Ndar, la ville s'est étendue progressivement sur son environnement immédiat en annexant le cordon littoral de la Langue de Barbarie et l'île de Sor. Cette extension s'est faite à l'assaut des écosystèmes et des zones particulièrement basses vers la mer pour la langue de Barbarie et dans les zones humides dans l'île de Sor.Cette dynamique urbaine vers la mer a fini par rendre récurrente l'érosion côtière au niveau des quartiers de la Langue de Barbarie au point que Saint-Louis est classée aujourd'hui parmi les villes les plus vulnérables aux changements climatiques du fait de l'impact de la dynamique marine combinée à celui des inondations.L'exposition de la ville est le fruit d'une trajectoire urbaine diffuse marquée par une installation non planifiée sur des terrains non aménagés ou non aedificandi par des populations au revenu modeste cherchant à satisfaire un besoin en logement.Les écosystèmes ont joué un rôle ambigu au sujet de l'exposition des populations aux risques. Jouant potentiellement un rôle de régulateur, d'approvisionnement en ressources avec des valeurs culturelles et de support pour la biodiversité à travers les services écosystémiques, ils sont de véritable piège hostile à l'occupation humaine.L'analyse effectuée dans le cadre de cette communication montre une trajectoire urbaine non inclusive par rapport aux préoccupations écologiques et non réglementaire par rapport aux normes du littoral. La dynamique des écosystèmes qui en résulte entretient la vulnérabilité actuelle de cette cité d'eau face à l'érosion côtière. Or ces milieux présentent des potentiels non négligeables à valoriser dans l'adaptation aux changements climatiques.Dans le cadre de la vision d'une ville résiliente aux changements climatiques bâti autour du slogan « Construire avec l'eau et gérer le site», l'intégration des écosystèmes apparait comme le défi ultime de la planification urbaine dans le cadre de la gestion des risques et les services écosystémiques comme l'enjeu majeur face aux défis des changements climatiques pour la ville tricentenaire.

Mots clefs : Vieille cité de la façade atlantique de l'Afrique de l'ouest, dynamique urbaine vers la mer, Erosion côtière, préoccupations écologiques, Résilience, Intégration des écosystèmes, planification urbaine.

Side Event 04

Kite Aerial Photography system: a low cost and high resolution solution for beach monitoring (2D map and 3D topography)

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Abstract

Coastal West African countries are subjected to frequent events of erosion and flooding, with all the consequences there to loss of socio- economic infrastructures, impact on habitats (marine and coastal wildlife), farmlands etc. Thus, efficient and low cost tools allowing standardized measurements and easy to deploy are required. In this work we present first trial of high-resolution mapping using a kite lead along the coast of West Africa and then in France. Kite is used as an instrumented platform to lift a consumer-grade digital camera over the terrain to be studied. Horizontal displacement and overlapping images allow 2D mosaic and 3D reconstitution of the terrain. Mosaic and 3D model can be georeferenced with control points visible on pictures and positioned by different systems (GPS, DGPS, Theodolyte…). Spatial analyses in GIS software can be perform for geomorphology studies *e.g*. coastline, terrain profile, surface or volume calculation. Such methodology allows standardized and repeated high resolution topographic measurements. The system allows to monitor hundreds meters to a kilometrer of coast with monthly or yearly period. It also allows fast deployment before and after an extreme event (e.g. storm, flooding events etc). Due to these properties, this low cost and easy to implement system is interesting for punctual coast studies at different time scale. We present the technical specificity of the material, the advantages to deploy it in the field, as the drawback.

Keywords: Kite, high-resolution mapping, topographic measurements, West Africa.

Side Event 04

Télédétection et écosystèmes marins et côtiers : Applications des images ERS-2 à l'étude du trait de côte et à la mise à jour des cartes marines de la Langue de Barbarie dans la région de Saint-Louis (Sénégal)

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Résumé

La Langue de Barbarie est une flèche littorale dans la région de Saint-Louis. Ce cordon littoral très instable est fragilisé par les facteurs dynamiques (marins, éoliens et fluviaux) et les actions anthropiques (extractions de sables de plage, aménagements côtiers, abattages de filaos, etc.). Son relief très bas (-de 2 m en dessous du niveau marin), l'état de son sol et l'occupation anarchique de ses terres font qu'elle est souvent victime d'inondations récurrentes, de coupures périodiques et de recul de son rivage. A Saint-Louis, les évolutions côtières dues à la dynamique sédimentaire sont très rapides (évolution du trait de côte, évolution de bancs de sable). Parallèlement, la fréquence de réactualisation des cartes marines (la plus récente datant de 1989) est très faible et leur mise en œuvre souvent très lente.Le but de cette étude est de caractériser l'évolution de l'environnement de la flèche avec comme objectifs : 1) étude multidate de l'évolution du trait de côte et de la mobilité des bancs de sables qui perturbent la navigation et 2) la proposition de spatiocartes pour la mise à jour des cartes marines de petits fonds aux environs du canal de délestage, de l'ancienne embouchure et de l'estuaire du fleuve Sénégal.Matériels et méthodes : L'étude de l'évolution du littoral du cordon sableux a été entamée à partir d'images satellitaires (2003 à 2010) Radar ERS-2 de SAR de type PRI, Mode Descendant par contre la réalisation de spatiocartes a été mené à partir de la fusion des informations ponctuelles et linéaires des anciennes cartes de la zone et les informations récentes issues des images ERS-2.La série multidate radar a subi des traitements géométriques (géopositionnement) et radiométriques (filtrage multidate) grâce à RViewer (logiciel de correction automatique sans points d'appui des images radar, Radarsat et Envisat développé par Hervé Trébossen).Résultats et discussions : L'évolution de la ligne de rivage entre 2003 et 2010 montre : i) à Saint-Louis des érosions compensées par des accumulations (la zone d'érosion maximale se déplace µd'une extrémité à l'autre du rivage; tantôt elle est à Guet-Ndar en 2003-2006, tantôt à Goxxu-Mbacc en 2006-2008); ii) à

l'ancienne embouchure, une évolution marquée par une accrétion de 1.2 à 6.92 m.an-1 sur le bord Nord et Sud iii) au canal de délestage, un taux d'érosion variant entre 8.29 et 33.67 m.an-1 contre 24.87 à 61.16 m.an-1 à l'île Babagueye. Au Nord et au Sud de cette île, l'accumulation varie entre 5,94m et 26,28 m.an-1 pour la même période 2003-2010.Les spatiocartes ont l'avantage de présenter sur le même document des informations qualitatives récentes (issues des scènes ERS-2 de 2003 à 2010) et des données quantitatives plus anciennes (réseaux hydrographique et routier, limites de végétation et administrative, courbes bathymétriques issus des cartes topographiques et bathymétriques). Ces types de cartes auront aussi l'avantage d'être produit relativement rapidement surtout quand on possède une base de données géographique très riche. Ainsi, elles constitueront un outil efficace qui pourra être mis à la disposition de ceux qui utilisent les milieux marins et côtiers (navigateurs, pêcheurs, etc.).

Mots clefs : Télédétection, ligne de rivage, spatiocartes radar, Langue de Barbarie.

Side Event 04

L'évolution du trait de côte de Rufisque (Petite Côte, Sénégal) de 1954 à 2006

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Résumé

L'érosion côtière constitue une sérieuse menace pour la stabilité du littoral de Rufisque. Pour y remédier, des ouvrages de protection y ont été construits dès les années 1980. Toutefois ces ouvrages ont conduit à la dégradation de l'environnement de certaines plages et parfois même à leur disparition. L'étude de l'évolution par régression linéaire de la ligne de rivage cartographiée à partir des photographies aériennes de 1954, 1980, et 1997 et de l'image Spot 5 2006, montre que tout le littoral de Rufisque, à quelques exceptions près, est en érosion avec des taux de -0,4 à -1,5 m/an. Cette évolution a connu cependant une variation spatio-temporelle très importante, surtout après le durcissement de la quasi-totalité des plages par des murs de protection. Ainsi, l'étude de l'évolution à long terme de la ligne de rivage a permis de juger de l'impact de ces ouvrages. En effet, au-delà de l'atténuation du recul du trait de côte juste après la période qui a suivi leur construction et la protection des riverains contre les fortes houles de l'hivernage, les murs de protection ont intensifié les taux de recul de la ligne de rivage, surtout à leur extrémité sud, suite aux phénomènes de contournement des ouvrages par la houle.

Mots clefs : télédétection, étude diachronique, ouvrages de protection, érosion côtière, ligne de rivage, Sénégal.

Side Event 04

Transferts sédimentaires littoraux : analyse des conditions hydrodynamiques et sédimentaires littorales sur la plage réflective à terrasse de Grand Popo (Bénin, Golfe de Guinée)

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Abstract

La bande côtière du Golfe de Guinée est actuellement soumise à une pression sociétale croissante (développement économique et urbain) et à une forte vulnérabilité naturelle aux aléas climatiques. Les houles longues énergétiques générées en Atlantique Sud sont le moteur d'une des plus importantes dérives littorales au monde, d'Ouest en Est. La construction de digues portuaires le long de ce littoral, au Ghana, Togo et Bénin perturbe l'équilibre naturel du système et provoque des érosions extrêmes de l'ordre de 10 m/an. Une étude est actuellement menée sur la côte béninoise afin de comprendre la dynamique du système littoral, de prévoir et d'anticiper les risques pour les populations et les infrastructures. Dans le cadre de cette étude, une campagne de mesures intensives a été menée à Grand Popo du 10 au 19 mars 2014. Un grand nombre de paramètres à la fois hydrodynamiques (vagues, courants, marée, "swash" ou jet de rive), sédimentaires (turbidité, distribution granulométrique, porosité) et morphologiques (bathymétrie, évolution topographique) ont été mesurés. En particulier, un ADCP WHS 1200 kHz (Acoustic Doppler Current Profiler) et une sonde multiparamètre (YSI)

muni d'un capteur de turbidité ont été déployés au-delà de la zone de déferlement, à 12 m de fond. L'objectif de cette mesure est de connaître le forçage hydrodynamique en entrée du domaine littoral ainsi que les flux sédimentaires. Durant la campagne, les conditions de houles et de marée ont été très variées, offrant une grande diversité de forçage du système littoral. Une analyse a été menée sur l'influence des conditions hydrodynamiques rencontrées (houles longues lointaines, courtes générées dans le Golfe de Guinée, différentes incidences de la houle, marée de vives et mortes eaux, vent) sur les flux sédimentaires afin d'appréhender l'origine de la morphodynamique observée. Les données de houle et de courant obtenues par ADCP ont été comparées à la rétrodiffusion acoustique du courantomètre en termes de turbidité, en corrélant les données acquises via le turbidimètre co-localisé avec l'ADCP. Les paramètres influençant la remise en suspension des sédiments ont été identifiés. Ces flux sédimentaires ont finalement été reliés aux phases d'érosion/accrétion observées en bas/haut de plage.

Side Event 04

Impacts of natural factors on the morpho-dynamic Beach of Kribi

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Abstract

The coastal strip of the urban area of Kribi is deeply marked by coastal erosion. The causes are many: tourism (seaside constructions), sand extraction activities (sand pits on the beach) and natural factors (waves, tides ...). The decline of the coastline is very pronounced.The work aims to establish a morpho-dynamic profile of the beach of Kribi to instant scales (second hour) and event (week season) to assess the impact of different possible causes. For this, topographic surveys were conducted using a theodolite and GPS manual during the rainy season (July, August and September) and the dry season (5 days, November). The swell and tide data obtained daily basis, have assessed the tidal parameters, flood, etc. Data processing was performed with the MATLAB software. The correlation between the different settings and readings was evaluated there. The main result shows that the beach is dissipative with a predominant effect of the tide.

Other Acitivities : Book launch and associate

- « Droit de l'environnement marin et côtier en Mauritanie ».
  Auteurs : Marie Bonnin, Ould Zein Ahmed, Queffelec Betty.

- « Les aires marines protégées : Défis scientifiques et enjeux sociétaux en Afrique du Nord-Ouest ».
  Auteurs: Marie Bonnin, Raymond Lae, M Behnassi (eds).

- "Manual for Monitoring breeding colonies of terns and gulls along the West African coast".
  Auteurs: Jan Veen et Wim Mullié.

- « Pêcheurs du Senegal ».
  Auteur: Yasmine Sweetlove.

Droit de l'environnement marin et côtier en Mauritanie

Auteurs : Marie Bonnin, Ould Zein Ahmed, Queffelec Betty.

Cartes : Le Tixerant Matthieu.

Résumé : Alors que l'environnement marin est de plus en plus menacé, les règles relatives à la conservation des espaces côtiers s'étoffent. Au-delà de l'exploitation halieutique, les différentes formes de pressions liées au développe- ment urbain et aux activités économiques s'intensifient. Toutes ces activités font l'objet de règlementations qui s'entremêlent les unes aux autres ne facilitant pas leur accessibilité et leur lisibilité. La Mauritanie est au cœur de ces problématiques. L'environnement marin et côtier y est à la fois protégé par de multiples textes novateurs et en même temps les impacts des activités anthropiques qui s'y exercent sont de plus en plus menaçants. Cet ouvrage permet à tous ceux qui sont intéressés par l'exploitation, l'utilisation ou la protection du milieu marin et côtier de Mauritanie de disposer du droit applicable sur ce territoire. Afin de faciliter l'appréhension de ces normes, les auteurs ont utilisé des cartes pour spatialiser et illustrer, de manière novatrice, les règlemen- tations relatives à l'espace marin et côtier. L'ouvrage présente l'ensemble du cadre juridique mauritanien applicable à l'environnement marin et côtier : les frontières de cet espace naturel, les acteurs de la protection, ainsi que la protection de ce milieu par les différentes branches du droit telles que la protection de la nature, le droit des pollutions, les droits relatifs à la pêche, à l'exploitation des hydrocarbures ou encore du tourisme. La description et l'analyse de ces règles juridiques permettront de poser les bases de la construction d'un droit de l'environnement marin et côtier en Mauritanie.

Table des matières

Cet ouvrage est co-édité par les éditions de l'Institut de Recherche pour le Développement (IRD), la Commission Sous-Régionale des Pêches (CSRP) et le Partenariat régional pour la conservation de la zone côtière et marine en Afrique de l'Ouest (PRCM).

Il est téléchargable sur le site de ces institutions.

Commission Sous-Régionale des Pêches
Sub-Regional Fisheries Commission

IRD
Institut de recherche pour le développement

PRCM

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Editon : CSRP, IRD, PRCM décembre 2014.

Les aires marines protégées : Défis scientifiques et enjeux sociétaux en Afrique du Nord-Ouest

Auteurs: M. Bonnin, R. Lae, M. Behnassi (liste complete voire ci-dessous).

Résumé : Les écosystèmes côtiers sont particulièrement impactés par le changement climatique et les activités anthropiques d'autant qu'ils concentrent actuellement 70 % de la population mondiale. Il devient donc urgent de protéger des habitats essentiels pour la conservation des espèces. On attend énormément des aires marines protégées qui suscitent beaucoup d'espoirs notamment parce qu'elles constituent un facteur clé de la résilience des systèmes vivants. Un véritable consensus international s'est d'ailleurs imposé quant à l'importance de les multiplier. Cependant, de nombreuses incertitudes demeurent quant à leur efficacité. Les défis scientifiques relatifs à la mise en oeuvre des aires marines protégées restent de taille, comme les enjeux sociétaux qui découlent de la multiplication de ces aires. Dans l'état actuel des connaissances, l'apport positif des AMP n'est pas clairement démontré et de nombreuses expérimentation et observations doivent encore être menées. Quelle est leur efficacité ? A quelle échelle doit-elle être analysée ? Quelles formes de mise en réseau doivent être favorisées ? Quels sont leurs effets à court et moyen terme ?
Cet ouvrage apporte un éclairage interdisciplinaire sur les enjeux liés au développement sans précédent des aires marines protégées, les chercheurs étant actuellement partagés entre le soutien au développement des AMP et l'importance de souligner les controverses dont elles font l'objet. Plusieurs études de terrains centrées sur l'Afrique du Nord-Ouest en Algérie, au Maroc, et au Sénégal permettent d'illustrer à la fois les ambitions de ce mode de conservation des zones marines et côtières et les réserves quant à son efficacité.

1ère partie : soutiens et controverses face au développement des aires marines protégées

- De la conservation à la concertation : Intérêts des AMP dans les secteurs côtiers et estuariens
- Place des écosystèmes de mangrove au sein des AMP entre mythe, réalité et nécessité
- Les AMP face au changement climatique : de la résilience écosystèmique à la résilience des territoires
- AMP et résistance aux risques, une fonction rénovée pour de nouvelles politiques publiques?

2ème partie : le développement des AMP dans l'écosystème nord-ouest africain, un succès pour l'instant mitigé

- De la conservation a la concertation. Quelles AMP pour quelle gouvernance territoriale au Sénégal ?
- Les AMP : bénéfices attendus et bénéfices réels pour la restauration et la gestion des ressources marines en Afrique de l'ouest
- Changements climatiques, pêche migrante et AMP en Afrique de l'ouest
- La conservation des écosystèmes et la gestion de la pêche au moyen d'AMP : l'exemple du Sénégal
- Conserver la ressource halieutique ou les privilèges ? De l'aménagement d'une AMP en Algérie (parc national d'El Kala).
- AMP : nouvel outil de gouvernance côtière dans le contexte des changements climatiques ? Le cas du Maroc

Conclusion : des AMP pour la résilience des écosystèmesEditon : Eyrolles/Géodif, IRD Diffusion

Reference

Picture Gildas Roudaut (IRD) taken the after ECOAO survey (AWA, 2013) in Senegal.

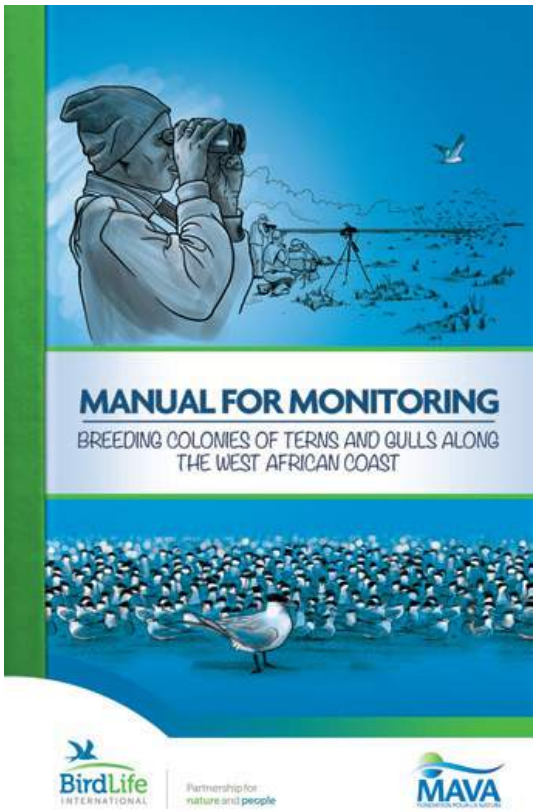
Manual for Monitoring breeding colonies of terns and gulls along the West African coast

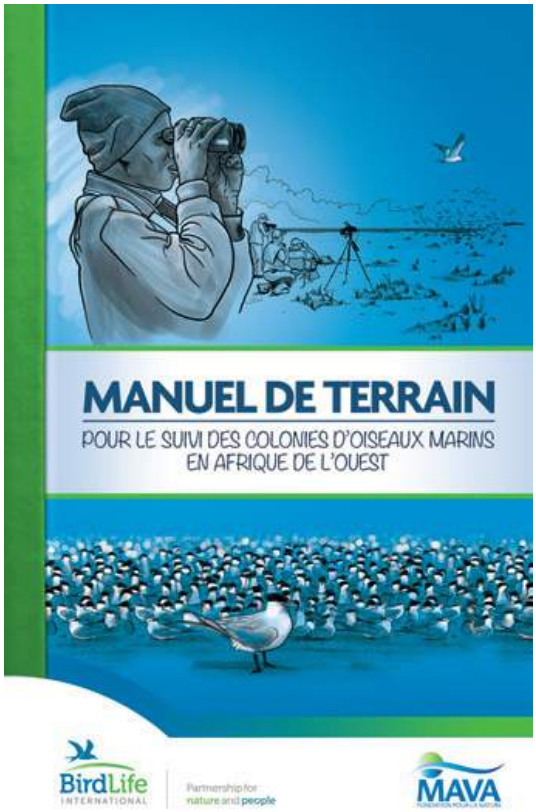
Auteur : Jan Veen et Wim Mullié.

Résumé /Abstract : Il s'agit d'un manuel de terrain principalement fait pour aider les agents techniques des aires protégées qui sont impliqués dans les activités de monitoring et de recherche dans les colonies d'oiseaux marins, à acquérir les compétences sur la façon de collecter des informations d'une manière standardisée, qui peuvent ensuite être utilisées pour analyser l'état des colonies pour par la suite identifier les Zones Importantes pour la Conservation des Oiseaux et de la biodiversité (ZICO) et mettre en place les mesures appropriées.

This field manual is mainly aimed at helping technical staff in Protected Areas; involved in monitoring and research on colonial breeding bird to acquire skills in how to collect information in a standardized way. This can then be used to analyze the state of colonies in the West African sub-region, and to identify Important Birds and Biodiversity Ares (IBAs) in order to implement appropriate measures.

Editon : Birdlife / MAVA



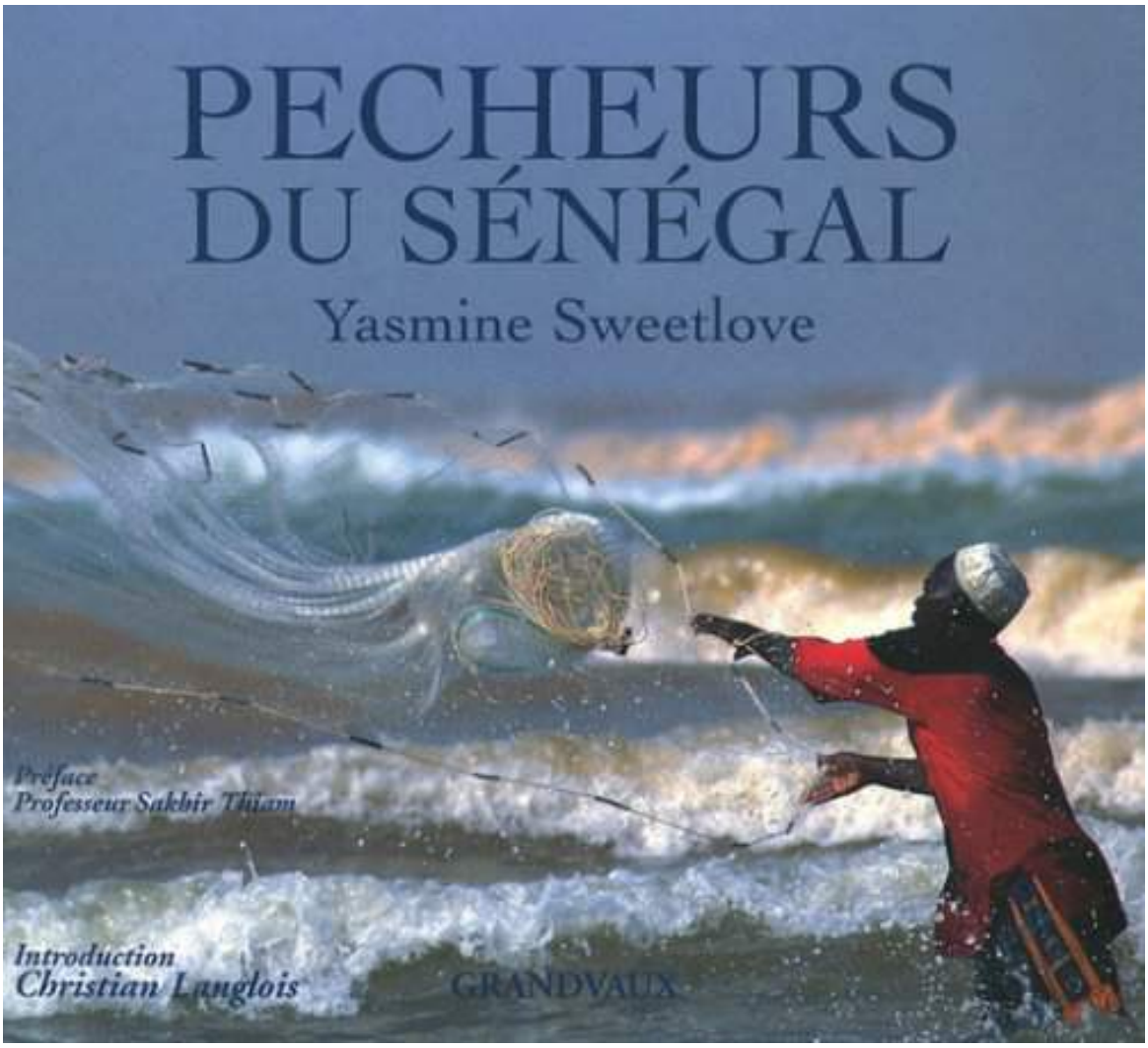


Pêcheurs du Senegal

Auteur : Yasmine Sweetlove

Résumé : Il était une fois une terre battue par les vents : de grandes plages, une île à l'ouest de l'ouest de la terre d'Afrique. Quelques pêcheurs lébous y vivaient dans de petites maisons en bois, au rythme des sorties en mer quotidiennes sur leurs pirogues dans les alizés. Et puis tout a changé, le poisson se fait rare, les jeunes rêvent d'un eldorado au-delà de l'horizon...Pour mieux comprendre, et peut-être se trouver, Yasmine Sweetlove est partie à la rencontre du monde de ces pêcheurs qui, de Saint-Louis du Sénégal à la Casamance, jettent inlassablement leurs filets à la quête d'une pêche de moins en moins miraculeuse. Elle regarde l'intimité de la vie avec la fraîcheur de sa jeunesse, c'est pour cela que son regard nous touche.

Editon : Grandvaux



ICAWA 2014: list of Institutional partners that attended the meeting

African Confederation of Artisanal Fisheries Professional (CAOPA), Senegal
American International University West African (AIUWA), the Gambia
Association OCEANIUM, Senegal
Bird Life (BLSA), South Africa
Centre de recherche halieutique (CRH), France
Centre de Recherches Océanographiques de Dakar-Thiaroye (CRODT), Senegal
Centre de Recherches Océanologiques d'Abidjan (CRO), Côte d'Ivoire
Centre de Suivi Ecologique Africain (CSE), Senegal
Centre National des Sciences Halieutiques de Boussoura Conakry (CNSHB), Guinea
Collecte Localisation Satellite (CLS), France
Collectif National des Pêcheurs Artisanaux du Sénégal (CNPS), Senegal
Department of Agriculture, Forestry and Fisheries (DAFF), South Africa
Direction de la Protection du Littoral et des Côte (DPLC), Benin
Direction de la Protection et de la Surveillance des Pêches (DPSP), Senegal
Direction des Aires Marines Communautaires protégées (DAMCP), Senegal
Direction des Parcs Nationaux (DPN), Senegal
Direction des Pêches Maritimes (DPM), Senegal
Doñana Biological Station (EBD-CSIC), Spain
Ecole Supérieur de Polytechnique (ESP), Senegal
Environments and Paléoenvironnements Oceanic and continental (EPOC), France
European Centre for Research and Education in Environmental Geosciences (CEREGE)
Fisheries Department (FD), The Gambia
Fondation Internationale du Banc d'Arguin (MAVA), Senegal
French National Centre for Scientific Research (CNRS), France
Gesellschaft für Internationale Zusammenarbeit (GIZ), Senegal
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Institut de Recerca de la Biodiversitat and Departement Biologia Animal (IRBABA), Spain
Institut de Recherche pour le Développement (IRD), France
Institut de Recherches Halieutiques et Océanologiques du Bénin (IRHOB), Benin
Institut des Sciences Halieutiques de Douala (ISH), Cameroun
Institut Fondamental d'Afrique noire (IFAN), Senegal
Institut National de Recherche Halieutique (INRH), Maroc
Institut Sénégalais de Recherches Agricoles (ISRA), Senegal

Institut Universitaire De Pêche et d'Aquaculture (IUPA), Senegal

Institut Universitaire Européen de la Mer (IUEM), France

Institute of Marine Research (IMR), Norwey

Instituto Nacional do Desenvolvimento das Pescas (INDP), Cabo Verde

Instrumentation, moyens analytiques, observatoires en géophysique et océanographie, (US-IMAGO), France

International Chair In Mathematical Physics And Applications (CIPMA- Chaire UNESCO), Benin

Inter-Regional Pluridiciplinary Program on Coastal and Upwelling Ecosystems (PPR CUTE), France

Laboratoire d'océanographie et des sciences de l'environnement et du climat (LOSEC), Sénégal

Laboratoire de Biologie et d'Ecologie des Poissons en Afrique de l'Ouest (LABEP-AO), Senegal

Laboratoire de Géologie, Mines et Environnement, Faculté des Sciences et Techniques (FAST), Bénin

Laboratoire de Météorologie Dynamique (LMD), France

Laboratoire de Physique de l'Atmosphère et de l'Océan Siméon Fongang (LPAO-SF), Senegal

Laboratoire de Physique des Océans (LPO), France

Laboratoire des sciences de l'environnement marin (LEMAR), France

Laboratoire d'Etudes en Géophysique et Océanographie Spatiales (LEGOS), France

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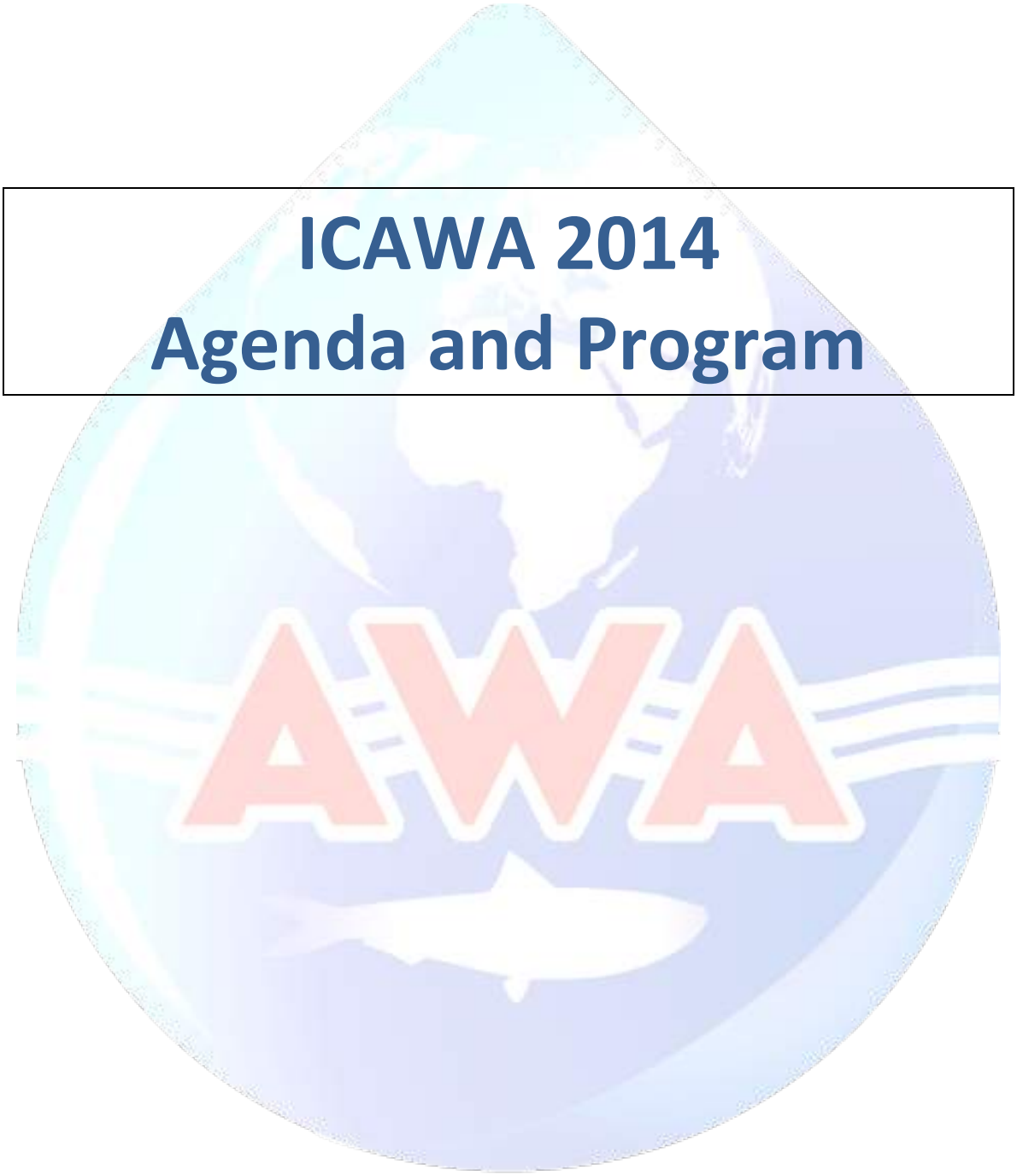
ICAWA 2014
Agenda and Program



Agenda and Program

The AWA project is funded by:

Bundesministerium für Bildung und Forschung

BMBF: Federal Ministry of Education and Research (Germany)

IRD Institut de recherche pour le développement

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RÉPUBLIQUE FRANÇAISE
Ministère des Affaires étrangères et du Développement international
Ministère de l'Enseignement Supérieur et de la Recherche

IRD: Institut de Recherche pour le Développement

MESR: French Ministry of Higher Education and Research (France)
MAEE: French Ministry of Foreign and European Affairs (France)

The ICAWA Conference sponsors are:

SRFC: Sub Regional Fisheries Commission

GIZ: Gesellschaft für Internationale Zusammenarbeit

PPR CUTE: inter-Regional Pluridiciplinary Program on Coastal and Upwelling Ecosystems

IRD : Institut de Recherche pour le Développement

SCOR: Scientific Committee on Oceanic Research

Context

The Sub-Regional Fisheries Commission (SRFC) is an intergovernmental organization for fisheries cooperation, created by a Convention on March 29th, 1985. Its overall objective, in the long term, is the harmonization of fisheries policy of member states in terms of conservation and sustainable exploitation of their fisheries resources and fostering of fisheries cooperation for the benefits of their respective populations. It grouped together seven member states namely: Cape Verde, The Gambia, Guinea, Guinea Bissau, Mauritania, Senegal and Sierra Leone.

Within the framework of AWA, financed by IRD (France) and BMBF (Germany), the SRFC is to support the member states and associated West African partners with concrete actions and enhanced advisory capacities on the new fisheries management approaches.

It must be noted that coastal states of the sub-region face host of problems, notably, overexploitation of fisheries resources together with rapid hydro-climatic changes. The consequences of the two phenomena on the fisheries resources are at the heart of debates among managers to which researchers of the sub-region take part. The multidisciplinary approach adopted in AWA allows the interaction of ecologists, bio-geochemists, physical oceanographers, socio-economists and climatologists. The long-term objective of this conference is to promote the development of a platform to monitor, simulate and predict key parameters of the ecosystem of North West Africa.

Scope of the Conference

The primary objective of the conference is to assist member states of the SRFC and its African and European partners to put in place sustainable fisheries and marine environment management systems based on biological, ecological, laws, economic and social state of the art knowledge. Consequently, the conference will contribute to: (i) enhancing fisheries management mechanisms in West Africa with special focus on the member states of the SRFC; (ii) Improving knowledge on the effects of climate change on living marine resources relative to the functioning of their habitats and (iii) enhancing and training students including researchers of institutions and universities of West Africa in view of propagating AWA in the region.

Program Overview

ICAWA Session / Event	9th Morning	9th Afternoon	10th Morning	10th Afternoon	11th Morning	11th Afternoon
Conference Opening Conference Closing	Plenary Room					Plenary Room
Session 1. Observation and modelling of ocean physics supporting the ecosystem approach to marine management					Plenary Room	Plenary Room
Session 2. Variability of pelagic productivity in West-African waters			Plenary Room	Plenary Room		Plenary Room
Session 3. Physical-biogeochemical coupling: processes and control of small pelagic fish					Room 2	Plenary Room
Session 4. Economics integrated into the ecosystem approach to marine management and economic benchmarking		Plenary Room				Plenary Room
Session 5. Environmental marine law				Room2		Plenary Room
Session 6. Ecosystemic Seabird / Fishery interactions		Room 3				
Side event 1. WG IndiAWA. "Ecosystem Indicators for the Management of Fisheries and the Marine Environment in West Africa "			Room 3	Room 3	Room 3	Room 3 / Plenary
Side event 2. "West African scientific fleet, toward a sub-regional coordinating commission"				Room 4	Room 4	Room 4 / Plenary
Side event 3. "Marine Protected Area (MPA) in West Africa"		Room 2	Room 2	Plenary Room joint Session 2		
Side event 4. "Coastal erosion; monitoring, processes and impact on societies in West Africa"	Room 2	IRD Room by bus	IRD Room by bus			Plenary Room

Poster presentation by the author at each coffee break.

Social event:
Start from the hotel conference the 10th at 17h40: Visit small scale fishing harbor, Mosque of Divinity, lighthouse of Mammelles and the Statute of the African Renaissance. Registration is required and the event is free of charge.

Event related to AWA before during and after the ICAWA conference

[Session 1 & Side Event 3]

AWA Summer School on MPA (Marine Protected Area): Marine Protected Areas Management Challenges; 4th to the 8th December, Hotel 'Le Lodge', Dakar, Senegal

(Contact: Ana REI, Heino FOCK, Patrice BREHMER and Werner EKAU)

[Session 1, Session 2 & Session 3]

Journée Porte Ouverte Laboratoire Mixte International ECLAIRS (UCAD/IRD)« Sécheresses, inondations, érosion côtière, pollution et sécurité alimentaire :Quelles réponses et défis pour les scientifiques ? », Ecole Supérieure Polytechnique, 13th December

(Contact: Amadou GAYE or Alban LAZAR, Eric MACHU)

[Session 6]

Workshop CVSH « Atelier d'élaboration du plan d'action sur la conservation des puffins du Cap vert » ; date: 1 to 5 Decembre 2014 Mindelo, Capo Verde

(Contact: Justine DOSSA)

Field missions

[Side Event 3]

MPA meeting the 11 to 13 December, in Joal, Senegal

(Contact: Dominique Duval Diop).

[Side Event 4]

Coastal erosion in Mbour and Saint-Louis set of Video device system, 7-9/12/2014

(Contact: Rafael ALMAR (PI ANR Coastvar) or Moussa SALL (coordinator MOLOA))

[Session 2, Side Event 4]

Centre de Mise en œuvre de la thématique marine de la CEDEAO sera au Sénégal du 8 au 12 pour le lancement du réseau national de la thématique marine MESA

(Contact : Dr Mamadou NIANE, MESA-ECOWAS)

Tuesday 9th December: Official Opening, Plenary room

08h30-09h30: Registration of all participants

- 09h30-09h35: Marieme Talla DIAGNE, Permanent secretary of the Sub-Regional Fisheries Commission
- 09h35-09h40: S.E. BernhardKAMPMANN, German Ambassador
- 09h40-09h45: S.E. Jean Félix PAGANON, French Ambassador
- 09h45-09h50: S.E. Dominique DELLICOUR, European Union Head of delegation
- 09h50-10h00: S.E. Takashi KITAHARA, Japanese Ambassador
- 10h00-10h05: Dr Yves DUVAL, IRD Represantative for Senegal, Mauritania, Capo Verde, Gambia, Guinea Bissau
- 10h05-10h10: Opening by the S.E. Omar GUEYE, Minister of Fisheries and Marine Economy

10h10-10h20: Coffee break

- 10h20-10h30: Hamady DIOP& Patrice BREHMER

« AWA a tripartite project; general project overview ».

10h30-11h50 Keynote Speech

- 10h30-10h50:

Keynote Speech Guest Prof. Noel KEENLYSIDE (University of Bergen, Geophysical Institute, Norway)

Prof. Noel KEENLYSIDE

«EU-PREFACE: improving prediction of Tropical Atlantic climate from a season to decades».

- 10h50-11h10:

Keynote Speech Guest Prof. Jacob GONZÁLEZ-SOLÍS (University of Barcelona, Departament de Biologia Animal, Spain)

Prof. Jacob GONZÁLEZ-SOLÍS

«New aproaches to the study of seabird-fishery interactions».

- 11h10-11h30:

Keynote Speech Timothée BROCHIER (IRD)

Timothée BROCHIER, Pierre-Amaël AUGER, Laure PECQUERIE, Eric MACHU, Baye Cheikh MBAYE, Modou THIAW, Patrice BREHMER.

«An individual based biophysical model to study *Sardinella aurita* population's spatial dynamic off North-West Africa».

11h50-12h20: presentation of some South AWA laboratories

MODERATORS: Hamady DIOP, and Patrice BREHMER

- 11h50-11h55:

IMROP Institut Mauritanien de Recherches Océanographiques et des Pêches, Mauritania; Mahfoud TALEB (Deputy director)

- 11h55-12h00:

CRODT Centre de Recherches Océanographiques de Dakar-Thiaroye, Senegal; Massal FALL (Director)

- 12h00-12h05:

INDP Instituto Nacional do Desenvolvimento das Pescas, Capo Verde; Carlos F SANTOSMELICIOS (on behalf of Oscar MELICIOS President)

- 12h05-12h10:

FD Fisheries Department, the Gambia; Famara Darboe SAMBOU (Director)

- 12h10-12h15:

CNSHB Centre National des Sciences Halieutiques de Boussoura Conakry, Guinea ; Idissa Lamine BAMY (Director)

- 12h15-12h20:

CRO Centre de Recherches Océanologiques d'Abidjan, Ivory Coast; Aka Marcel KOUASSI (Deputy director)

- 12h20-12h25:

Labep-AO Laboratoire de Biologie et d'Ecologie des Poissons en Afrique de l'Ouest, IFAN-UCAD, Senegal; Prof. Papa NDIAYE (Director)

- 12h25-12h30:

UCAD/ESP/LPAOSF Laboratoire de Physique de l'Atmophere et de l'Océan, and UASZ/LOSECLaboratoire d'Océanographie, des Sciences de l'Environnement et du Climat Senegal, and LMI Eclaire, Bamol Ali SOW (on behalf of Prof. Amadou GAYE Director).

12h30-14h00: Lunch Break

Session 1 « Observation and modelling of ocean physics supporting the ecosystem approach to marine management ». Morning Thursday 11th December: Plenary room

***CHAIRMEN*: Peter BRANDT (GEOMAR, Germany), Alban LAZAR (UPMC, France) and Bamol Ali SOW (UASZ, Senegal).**

Oral communications

- 09h00-09h20:

Keynote Speech

Peter BRANDT, Hermann W. BANGE, Donata BANYTE, Marcus DENGLER, Sven-Helge DIDWISCHUS, Tim FISCHER, Richard J.GREATBATCH, JohannesHAHN, TorstenKANZOW, Johannes KARSTENSEN, Arne KÖRTZINGER, Gerd KRAHMANN, SunkeSCHMIDTKO, LotharSTRAMMA, TosteTANHUA and Martin VISBECK.

« On the role of circulation and mixing in the ventilation of the oxygen minimum zone of the eastern tropical North Atlantic ».

- 09h20-09h40:

Florian SCHUETTE,Peter BRANDT, Johannes KARSTENSEN, Gerd KRAHMANN, Björn FIEDLER, Arne KÖRTZINGER.

« Characterization of «dead-zone eddies» in the tropical North Atlantic Ocean ».

- 09h40-10h00:

Malick WADE.

« Long-term Variability of North West African coastal upwelling ».

- 10h00-10h20:

Xavier CAPET, Philippe ESTRADE, Eric MACHU, Siny NDOYE, Jacques GRELET, Alban LAZAR, Louis MARIE, Denis DAUSSE, Patrice BREHMER.

« The southern Senegal upwelling center: state and functioning during the UPSEN2/ECOAO field experiments (Feb.-Mar. 2013) ».

Poster teaser

- 10h20-10h25:

Saliou FAYE, Milena MENNA, Pierre MariePOULAIN, Luca CENTURIONI, AlbanLAZAR, Amadou GAYE, Bamol SOW, Dominique DAGORNE.

« Upwelling dynamics and cold-water filaments off the Senegal and Mauritania coasts».

Poster teaser

- 10h25-10h30:

Dahirou WANE, Malick WADE, Amadou Thierno GAYE.

« Influence of the sea surface temperature on the variability of pluviometry in Sahel, particularly in Dakar ».

- 10h30-10h35:

Philippe ESTRADE, Xavier CAPET, Siny NDOYE, Amadou T. GAYE.

« Pollutant dispersion in the Baie de Hann: a ROMS modeling study for the Mbao outfall ».

- 10h35-10h40:

Siny NDOYE, Xavier CAPET, Philippe ESTRADE, Dominique DAGORNE, Bamol SOW, Alban LAZAR, Amadou GAYE, and Patrice BREHMER.

« Sea Surface temperature 'SST' patterns and dynamics of the Southern Senegal-Gambia upwelling center ».

Oral communications

- 11h00-11h20:

Ibrahima CAMARA,Juliette MIGNOT, Alban LAZAR, Nicolas KOLODZIEJCZYK, and Amadou T. GAYE.

« Seasonal salt budget in the Eastern Tropical Atlantic».

- 11h20-11h40:

Bamol Ali SOW, Xavier CAPET, and Siny NDOYE.

« The Senegalese upwelling: regional circulation and mesoscale activity».

- 11h40-12h00:

Round table

« Observation and modelling of ocean physics supporting the ecosystem approach to marine management ».

Session 2 «Variability of pelagic productivity in West-African waters ».Joint with Side Event 3 communication on Marine protected Area. All day Wednesday 10th December, Plenary room

***CHAIRMEN*: Heino FOCK (TI, Germany), Carlos Ferreira SANTOS (INDP, Cabo Verde) and Patrice BREHMER (IRD, Senegal)**

Oral communications

- 08h30-08h50:

Lazar NAJIH, Vaque NDIAYE, and Modou THIAW.

« Climate change impacts on small pelagic stocks and food security of Northwest Africa ».

- 08h50-09h10:

Maik TIEDEMANN, Heino FOCK, and Patrice BREHMER.

« Upwelling at the Senegalese coast: A suitable spawning area of small pelagic fish species ».

- 09h10-09h30:

Julian DÖRING, Ousseynou SAMBA, and Werner EKAU.

« Observations on the reproductive biology of *Ethmalosa fimbriata* (Bowdich, 1825) in Senegalese waters ».

- 09h30-09h50:

Ruth LEENEY, Nigel DOWNING, Peggy PONCELET.

« The conservation status of sawfishes in The Gambia, Guinea-Bissau and Liberia ».

- 09h50-10h10:

Pierre AUGER, Sidy LY, Fulgence MANSAL, Tri Nguyen HUU.

« Multi-site fishery models with price variation depending on demand and supply ».

- 10h10-10h30:

Ousmane DIANKHA, Patrice BREHMER, Modou THIAW, Bamol SOW, Amadou Thierno GAYE.

« Variability of round sardinella (*Sardinella aurita*) and flat sardinella (*Sardinella maderensis*) landings in Senegalese waters: insight from the effects of oceanographic conditions ».

10h30-10h50: Coffee break

- 10h50-11h10:

Thierry Bernard HOAREAU, Kerry REID, Ilkser KIPER, Carel Jakobus OOSTHUIZEN, Arrie KLOPPER, Paulette BLOOMER.

« The potential of genetic tools to understand marine population processes and aid fisheries challenges in West Africa ».

Poster teaser

- 11h10-11h15:

Ismaïla NDOUR, Massal FALL, Ndiaga THIAM, Hamet Diaw DIADHIOU.

« Observed changes in the composition of targeted demersal species by artisanal fisheries in the Petite Côte of Senegal from 2004 to 2013 ».

- 11h15-11h20 :

Julian DÖRING, Timothée BROCHIER, Xavier CAPET, Oumar MANE, Werner EKAU, et Patrice BREHMER.

« Distribution of pelagic fish eggs off the Senegalese Coast during an intense upwelling event in March 2014 ».

- 11h20-11h25:

Masethabela MAPHATSOE, Kerry REID, Patrice BREHMER, Mor SYLLA, Ibrahima CISSE, et Thierry Bernard HOAREAU.

« Design of a fish-specific cytochrome b marker and its utility as DNA barcoding in commercial marine fish from Senegal ».

- 11h25-11h30:

Timothée BROCHIER, Mediannikov OLEG, Aubadie MAXENCE, Mor SYLLA, Oumar NDIAYE, Patrice BREHMER.

« On the application of mass spectrograph to discriminate fish eggs species ».

- 11h35-11h40:

Ruth LEENEY, Mariama DIA.

« Food, pharmacy, friend? By catch, direct take and consumption of dolphins in three West African countries ».

- 11h40-11h45:

Ahmed Jeyid MOHAMED AHMED.

« Mesopelagic species opportunity for fish meal».

- 11^h45-11h50:

Hans SLOTERDIJK, Werner EKAU, Patrice BREHMER and Oumar SADIO

« Ichthyoplankton Biodiversity and Exchange Processes in an Inverse Estuary, the Sine-Saloum Delta (Senegal) ».

Oral communications

- 11^h50-12^h10:

Limam ABDALLAHI, Ahmed Babou DEDAH and Yeslem VALY.

« Study of the emergence of hairtail fishery ».

- 12^h10-12^h30:

Hans SLOTERDIJK and Werner EKAU

« Ichthyoplankton Biodiversity and Exchange Processes in an Inverse Estuary, the Sine-Saloum Delta (Senegal) ».

12^h25-14^h05: Lunch Break

Session 2 (Part 2) Joint Sessions with Side Event 3 «Marine Protected Area (MPA) in West Africa ». Wednesday 10th December, Plenary room

***CHAIRMEN*: Dominique DUVAL-DIOP (Rampao), and Modou THIAW (ISRA/CRODT).**

Oral communications

- 14h00-14h20:

Timothee BROCHIER, Pierre AUGER, Ndiaga THIAM, Momar SOW, Sidiya DIOUF, Hans SLOTERDIJK, et Patrice BREHMER.

« Implementation of artificial habitats: inside or outside the marine protected areas?Insights from a mathematical approach ».

- 14h20-14h40:

Adam CEESAY and Mathias WOLFF.

« Mangrove Degradation and Estuarine Fisheries: Case Study of Tanbi Wetland Complex, the Gambia ».

- 14h40-15h00:

Ousmane DIANKHA and Momar SOW.

« Regular scientific monitoring system for all marine protected areas: challenge of the department of marine protected areas (DAMCP) ».

- 15h00-15h20:

Luis Tito DEMORAIS, MarieBONNIN, RaymondLAË, MohamedBEHNASSI.

« Aires marines protégées, défis scientifiques et enjeux sociétaux ».

Poster teaser

- 15h20-15h25:

Oumar SADIO, Jean-Marc ECOUTIN, Luis Tito DEMORAIS, Monique SIMIER, Jean RAFFRAY et Raymond LAË.

« Efficacité d'une Aire Marine Protégée comme outil de restauration des ressources marines : l'expérience ouest-africaine ».

- 15h25-15h30:

Jean-Christophe HENRY, Seynabou DIOP, Jeanne DIOUF and Yannick GOUNONGBE.

« History of an emblematic MPA in West Africa: The Bamboung experience ».

- 15h30-15h35:

Awa WATT, Timothée BROCHIER, Mamadou DIOP, Ndiaga THIAM, Adama MBAYE, Pierre AUGER, Sidya DIOUF, Momar SOW, Patrice BREHMER.

« Integrating local knowledge on the implantation of artificial reefs in a Marine Protected Area: the case of a small scale fisheries village, South Senegal ».

15h35-16h00: Coffee break

- 16h00-17h30: Round table « Marine Protected Area (MPA) in West Africa».

Session 3 « Physical-biogeochemical coupling: processes and control of small pelagic fish ». Morning Thursday 11th December, Room 2

***CHAIRMEN*: Eric MACHU (IRD, France), Vamara KONÉ (CRO, Ivory Coast) and Hamet DIADHOU (CRODT, Senegal)**

Oral communications

- 09h00-09h20:

Pierre Amael AUGER, Thomas GORGUES, Eric MACHU, Olivier AUMONT, & PatriceBREHMER.

« Spatial characterization of biogeochemical fluxes in the North West African upwelling».

- 09h20-09h40:

Baye Cheikh .MBAYE, Eric MACHU, VincentECHEVIN, & TimotheeBROCHIER.

« Modelling *Sardinella aurita* spawning habitat and larvae dynamic in the Senegalese-Mauritanian upwelling».

- 09h40-10h00:

Hervé DEMARCQ, EricMACHU, & IbrahimaDIACK.

« Marine primary productivity and associated ecosystem indices in the Canary upwellling system ».

Poster teaser

- 10h00-10h05:

RachelSHELLEY, GeraldineSARTHOU, Eric MACHU, GeorgeTYMEN, ChristopheMESSAGER, ThomasGORGUES, Hamet Diaw DIADHIOU& PatriceBREHMER.

« Towards quantifying the aerosol flux of trace and major elements: a case study of the West African Eastern Boundary Upwelling System ».

- 10h05-10h10:

MarieBOYE, Melanie GIRAUD, Véronique GARÇON, & DenisDELABROISE.

« Assessing the impact on microphytoplankton of an artificial upwelling ».

- 10h10-10h15:

MarieBOYE, NinaDELEBECQUE, Marie AlexandrineSICRE, Hamet DiawDIADHIOU, Sabine SCHMIDT, Ada NDIAYE, & PatriceBREHMER.

« Development of new proxies to assess the 20th century variability of the North West Africa upwelling ».

10h15-10h30: Coffee break

Poster teaser

- 10h30-10h50:

Habib SENGHOR, EricMACHU, Amadou ThiernoGAYE, FabriceHOURDIN, & MactarGUEYE.

« Quantification of the spatial and temporal variability of atmospheric deposition of desert aerosols on Atlantic Tropical East ».

- 10h50-11h10:

EricMACHU, XavierCAPET, PhillipeESTRADE, AlbanLAZAR, Bamol AliSOW, FrancisBAURAND,& PatriceBREHMER.

« Oxygen variability on the Senegalese continental shelf ».

- 11h10-12h00:

Round table « Physical-biogeochemical coupling: processes and control of small pelagic fish ».

- 12h00-12h20:

Yasmine SWEETLOVE.

« Pêcheurs du Sénégal (édition 2007), vers l'édition d'un nouvel ouvrage « Pêcheurs du Maroc de Mauritanie (Photographer, General Public) ».

12h20-14h00: Lunch Break

Session 4 « Economics integrated into the ecosystem approach to marine management and economic benchmarking ». Afternoon Tuesday 09th December, Plenary room

***CHAIRMEN*: Ibrahima DIALLO (CNSHB, Guinea), Didier JOUFFRE (IRD, Senegal) and Hamady DIOP (CSRP, Mauritania)**

Oral communications

- 14h00-14h20:

Marie Louise BIVIGOU, Modou THIAW, Didier JOUFFRE.

« Assessing the exploitation status of marine resources and the Senegalese EEZ ecosystem using the Ecosystem Indicators analysis ».

- 14h20-14h40:

Aliou BA, Hamady DIOP, Joern SCHMIDT, Djiga THIAO, Christian CHABOUD, Phillipe CURY, Patrice BREHMER.

« Review the state of the art on bio-ecological knowledge of Ethmalosa fimbriata in North West Africa ».

- 14h40-15h00:

Mohamed LamineCAMARA, BastienMERIGOT, FabienLEPRIEUR, Marc AntoineTOMASINI, IbrahimaDIALLO, MariamaDIALLO and DidierJOUFFRE.

« Biodiversity dynamics of demersal fish assemblages of the Guinean continental shelf in an increasing fisheries exploitation context ».

- 15h00-15h20:

Hérvé DEMARCQ, Didier JOUFFRE, Saliou FAYE, Aissa BENAZZOUZ.

« Integrated environmental indices for ecosystem management in West Africa ».

- 15h20-15h40:

Didier JOUFFRE, Mohamed Lamine CAMARA, Modou THIAW, and Ibrahima DIALLO.

« Ecosystem Indicators for the management of fisheries and the marine environment in West Africa waters: the indiAWA experience ».

15h40-16h00: Coffee break

Poster teaser

- 16h00-16h05:

Hayssatou Niang MBAYE, Malick DIOUF and Aminata NDIAYE.

« Socio-economic change of angling: case of fishing communities of the district of Saint Louis ».

Oral communications

- 16h05-16h25:

Lamin SIDIBEH

« On conservation and exploitation of Fisheries and marine resources ».

- 16h25-16h45:

Christian CHABOU, Aliou BA, Patrice BREHMER.

« Bioeconomics of small pelagic fishery, a modeling introduction».

- 16h45-17h05:

Hamady DIOP.

« Exploitation of small pelagics in West Africa: challenges for regional collaboration».

- 17h05-18h00:

Set of the Working group IndiAWA days (see below, ICAWA Side Event 1, page 22).

Session5 .«Environmental marine law ». Afternoon Wednesday 10th December, Room 2

***CHAIRMEN*: Pr. Ibrahima LY (UCAD, Senegal), Dienaba Beye TRAORÉ (SRFC-CSRP) and Dr. Marie BONNIN (IRD, France)**

Cette session sur le droit de l'environnement marin s'intéressera aux problématiques juridiques en lien avec les thématiques du programme AWA. Les présentations porteront à la fois sur des analyses de l'évolution du droit et sur les modalités de son application aux différentes échelles (locales, nationales, internationales). Les contributeurs sont invités à présenter des communications soit en lien avec le droit applicable à l'exploitation des ressources halieutiques dans la sous-région, soit sur le traitement juridique des éléments pouvant limiter les capacités de pêche des pays de la sous-région, comme par exemple le traitement judiciaire des atteintes à l'environnement marin.

Oral communications

- 09h30-09h50:

Marie BONNIN, Betty QUEFFELEC, Ahmed OULD ZEIN et Mathieu LE TIXERANT.

« Droit de l'environnement marin et côtier mauritanien ».

- 09h50-10h10:

Souleye NDAO , Ibrahima LY, Mika DIOP.

« Le cadre juridique et institutionnel de la protection des Requins dans l'espace CSRP ».

- 10h10-10h30:

Diénaba BEYE TRAORE.

« Processus de saisine du Tribunal international du droit de la mer (TIDM) par la Commission sous régional des Pêches (CSRP) visant à conseiller les États membres sur les meilleurs moyens institutionnels et juridiques d'éradication de la pêche INN dans l'espace de la CSRP ».

10h30-10h50: Coffee break

Oral communications

- 10h30-10h50:

MarieBONNIN, MohamedDIEDHIOU, et Ibrahima LY.

« Dommages à l'environnement, une première reconnaissance par le juge sénégalais ».

- 10h50-12h00:

Round table « Environmental marine law / Droit de l'environnement marin ».

Session 6 « Ecosystemic Seabird / Fishery interactions ». Afternoon Tuesday 9th December, Room 3

***CHAIRMEN*: Jacob GONZÁLEZ-SOLÍS (University of Barcelona, Spain) and Ross WANLESS (University of Cap Town, South Africa)**

The Canary Current is one of the most important upwelling systems in the world, holding both large populations of seabirds but also a large fleet of artisanal and industrial fisheries operating under variable but generally weak regulation and control. Many of the major gear types (demersal trawl and longline) are known to be extremely problematic for similar seabird assemblages elsewhere. The area is the major feeding ground for Macaronesian shearwaters in summer, but it is particularly important as a stopover and wintering area for many European seabirds, pointing out the need to establish transnational policies and international agreements to guarantee the conservation of seabirds over the entire annual cycle. Despite the importance of this huge area, little is known about the distribution and abundance of seabirds and their overlap with fisheries, seabird bycatch, explotation of fisheries by seabirds or competition between seabirds and fisheries for the same resources. This session will update the current information on these topics, consider major gaps of knowledge and provide a platform for collaborative, coordinated research into seabird-fishery interactions in the Canary Current.

Keynote Speech

- 14h00-14h20:

Ross WANLESS.

« Ecosystem approaches to low trophic level fisheries: impacts on seabirds ».

Oral communications

- 14h20-14h40:

José Manuel REYES-GONZÁLEZ, Teresa MILITÃO, Raül RAMOS, Laura ZANGO, Pedro RODRIGUES, Daniel ORO, Jacob GONZÁLEZ-SOLÍS.

« The importance of seabird population connectivity across the Canary Current: the case of the *Calonectris shearwaters* ».

- 14h40-15h00:

Salvador GARCIA, Jose Manuel REYES-GONZÁLEZ, David MACIAS, Vitor PAIVA, Raül RAMOS, Joan NAVARRO, Roberto SARRALDE, Sámar SABER, Manuela G. FORERO, Jacob GONZÁLEZ-SOLÍS.

« Longline fisheries in the NE Atlantic, a threat for seabirds? ».

- 15h00-15h20:

Jan VEEN and Wim C. MULLIÉ.

« Colony breeding terns and gulls as indicators of fish availability ».

- 15h20-15h40:

Kees CAMPHUYSEN, Sandra KLOFF, Frederic MARRET, Mohamed AHMED& Mahfoudh Ould TALEB SIDI.

« The charismatic megafauna in the upwelling zone off Mauritania: a conservation concern ».

15h40-16h00: Coffee break

Oral communications

- 16h00-16h20:

Julien SEMELIN and Ross WANLESS.

« A model for preventing seabird bycatch in West African fisheries».

- 16h20-16h40:

Bronwyn MAREE, RossWANLESS, Ben J. SULLIVAN and OliYATES.

« Significant reductions in mortality of threatened seabirds in a South African trawl fishery».

- 16h40-17h00:

Ngoné DIOP, Paul ROBINSON, Cheikh Tidiane BA, Jacob GONZALEZ-SOLIS.

« Seasonal abundance of Audouin's Gulls, Cape Verde shearwaters and Red billed topicbirds in Senegal ».

- 17h00-17h20:

Chrissie MADDEN, Lisa MANSFIELD, Bronwyn MAREE, and Ross WANLESS.

« Fouling and mortality of seabirds from heavily greased trawl warps».

- 17h20-18h00:

Round table

« Ecosystemic Seabird / Fishery interactions ».

Side event 1.« 1st International Workshop "Ecosystem Indicators for the Management of Fisheries and the Marine Environment in West African Waters (IndiAWA) ». All day 10th to 11th December, Room 3

***CHAIRMEN*: Didier JOUFFRE (IRD, Senegal) and Ibrahima DIALLO (CNSHB, Guinea).**

Daily schedule

- Morning : 08h30-12h30 / Coffee break 10h15-10h30

- Afternoon : 14h00-17h30 / Coffee break 15h30-15h45

Wednesday 10th December

Morning: Workshop opening

***Session 1:* Ecosystems description (national case studies)**

Presentation of the case studies (by country): Guinea, Senegal, Mauritania (countries involved in Indiseas, IndiAWA) followed by Capo-Verde, Gambia, Bissau-Guinea, Benin, Ivory Coast (new countries, indiAWA).

Focus by country on bibliographic data compilation; Identification of the « pertinent » grey literature by country (documentation about local ecosystem knowledge, description of information systems and available data, etc.).

Focus on the human resource at the national level, local expert that can join the IndiAWA network.

Regional level focus (same topics at a regional level, SRFC and/or CCLME and/or West-Africa levels).

Afternoon

***Session 2:* Description of the available data**

Presentations by country: Guinea, Senegal, Mauritania (countries involved in Indiseas, IndiAWA) followed by Capo-Verde, Gambia, Bissau-Guinea, Benin, Ivory Coast (new countries, indiAWA).

Description followed by concrete observations and checking of these national database (or some extract of these national database brought by their national owners; manipulation by national AWA correspondants on their own computers).

***Session 3:* Ecological and biodiversity indicators**

Theoretical reminders on biodiversity indicators (by D. Jouffre); indicators used in indiAWA and Indiseas + potential additional indicators for indiAWA .

Thursday 11th December

Morning

Session 3: **Ecological and biodiversity indicators (end)**

Round table or presentation by country on the results already obtained regarding ecological indicators, work in progress on these ecological indicators (mainly for countries already connected with indiseas).

Examples of calculations of these indicators

Brain storming and sharing of experience on the main issues concerning this topic (i.e. the estimation of biodiversity indicators from concrete national data).

Session 4: **Indicator of the human dimension (economic and other ones)**

Reflection on the indicators of the human dimension to be implemented in IndiAWA (indicators indiAWA and Indiseas) + other potential indicators (additional indiAWA), brain storming to be led in connection with the other AWA tasks and WPs.

Brain storming and analysis by Country concerning the national possibilities to perform such indicators: Guinea, Senegal, Mauritania (country Indiseas, IndiAWA) followed by Cape Verde, Gambia, Bissau- Guinea, Benin, Ivory Coast (new countries indiAWA).

Session 5: **Environmental indicators(with Hervé Demarcq, IRD)**

Environmental Indicators used in Indiseas.

Identification of potential new indicators within the framework of IndiAWA / identification of the database usable / available.

Brain storming and analysis concerning the possibilities to perform such indicators: (indicators at a national scale) + Regional Focus.

Reflection to be led in connection with the other AWA tasks and WPs.

Afternoon

***Session 5*: Environmental indicators (end)**

***Session 6*: Specific and or transversal questions and Issues**

Statistical issues.

Alternative indicators for data poor situations.

Local knowledge: how to use and integrate it in the indicator approach

Towards an integrated ecosystem diagnosis (for the future of IndiAWA), toward a regional methodology, dashboard of indicators, reference levels, modelling approaches, links between EAF indicators and stock assessment methods, etc..

***Session 7*: Publication**

Scientific publication planning: Proposal/identification of topics and leaders.

***Session 8*: Information**

Information on projects and events in connection with indiAWA (Indiseas, COI UNESCO UN project, etc.), exchange between the participants on the other WP of AWA and/or other information to share.

***Session 9*: Schedule**

Planning of the next steps for indiAWA (year 2015).

***Session 10*: Conclusion**

Final discussions and conclusion.

Workshop closure.

Side event 2.« West African scientific fleet, toward a sub-regional coordinating commission ». Afternoon 9th to 11th December, Room 4

***CHAIRMEN*: Dr.Mahfoudh ould TALEB SIDI (deputy director IMROP, Mauritania) and Dr. Yves GOURIOU (Head of IRD-US Imago, UMS Flotte, France).**

International workshop «West African scientific fleet, toward a sub-regional coordinating commission »: Establishment of a coordination unit « Scientific western African fleet ».

Participation: restricted see organizing committee

Toward «West African fleet commission **»** starting at the sub regional level. The West African research vessels are used for scientific research and sometimes punctual observations or infrastructure deployment. They are deployed in all fields of fisheries sciences and oceanography (themes: earth sciences and environmental sciences) and seldom for marine geosciences, biogeochemistry, seismic and marine chemistry, or EEZ delimitation etc. In West Africa there is a clear need of monitoring, expertise or public service missions on behalf of the state, political or economical originations and NGO. It will be good to emphasize that African research vessel could also act with the socio-economic entity in a partnerships between research and industry e.g. in the field of marine energy, mineral resources, and should interact more in the training of students and the universities. How to get a coordination unit of the research vessel survey programming, how to try to share common methodologies and equipments at sub regional level.Make a point on the mean at sea available.

Objectives

- Inventory of the mean at sea in West Africa;
- Inventory of the available mobile equipments on board survey vessel; how to share it;
- How to solve common problem during survey at sea and survey preparation.
- What could be the format of a “West African fleet joint unit”;
- Harmonization of methodologies of investigation at sea (data collection, software and analysis);
- Interest of common training for vessel crew;
- Redaction of a report for the West African decision maker, findings agencies and governments of Mauritania, Senegal, Guinea, Capo Verde.

Participants

IMROP (MAURITANIE), CRODT (SENEGAL), CNSHB (GUINEE), Cap Vert (INDP), CRO (République de COTE D'IVOIRE), IRD (France), invitation for UEMOA and Sub Regional Fisheries Commission (CSRP/SRFC).

Coffee break at 15h40-16h00; the 10th 10h30-10h50; 15h35-16h00; the 11th15h40-16h00: Coffee break

All day 12h30-14h00: Lunch Break

Side event 3. « Marine Protected Area (MPA) in West Africa ». Afternoon 09th to 10th December, Room 2

***CHAIRMEN*: Dominique DUVAL-DIOP (RAMPAO), and Modou THIAW (ISRA/CRODT).**

The scientific communications and posters related to this MPA side event are presented in the plenary session 2.

Meeting to officially launch the West African Regional MPA-Fisheries Taskforce

December 9 and 10, 2014

To meet the various challenges related to the sustainable management of natural resources, including fisheries, in the West African eco-region, the Regional Network of Marine Protected Areas in West Africa (RAMPAO) is organizing a side event to establish an operational task force on MPAs (marine protected areas) and Fishing in partnership with the Sub-regional fisheries commission (SRFC). This initiative benefits from the technical and financial support of the IUCN. The objective of theMPA-Fishing Task Force is to advise and support the RAMPAO network, in order to strengthen the contribution of its member MPAs to the sustainable management of fishery resources in the region. The will formally establish the MPA-Fisheries Task Force where MPA and fisheries experts will develop a joint work plan on fisheries and marine protected areas and formalize the process of mobilizing experts of the task force to support these areas. This group provides the expertise and tools to MPA actorsto improve knowledge and dialogue and to strengthen the role of MPAs in fisheries management. The side event will be held on December9 and 10, 2014 and will be followed by a pilot field mission in an MPA located in Senegal to test the MPA-fishing expert mobilization mechanism by applied it to solve a problem identified in advance by the MPA management team.

Expected results

- The task force is officially established and has an operational work plan.
- The communication between MPA and fisheries experts is strengthened.
- The mechanism to mobilize experts around an MPA-Fisheries problem is tested in the field in to order share lessons learned.

AGENDA

Tuesday December 9th 2014

14h00-14h30:

Opening of the session, presentation of the program and introduction of the participants

14h30-15h00:

Presentation of the State of the Art on the use of MPAs as fisheries management tools

15h00-15h30:

Presentation of the framework of the Taskforce

15h30-16h00:

Identification and discussion of the objectives of the Taskforce

16h00-16h20: Coffee break

16h20-17h40:

Discussion of the TORs of the Task force and the problems it can address; identification of the focus areas, creation of the taskforce (membership criteria, core group, etc.)

17h40-18h00:

Closing discussion

Wednesday, December 10, 2014

09h00-09h30:

General presentation of the available tools

09h30-10h00:

Identifying the keys elements of the toolbox of the Taskforce experts (monitoring, assessment, participative methods)

10h00-10h30:

Presentation of the application monitoring and assessment tools (based on successful experiences)

10h30-10h50: Coffee break

10h50-11h30:

Choice of relevant tools for the field mission

11h30-12h30:

Proposal of Taskforce Action plan

12h-30-14h00: Lunch Break

(Room 2 change to Plenary room)

14h00-15h-35:

Presentation of scientific communication (oral and poster).The scientific communications and posters related to this MPA side event are presented as joint session with session 2 in plenary session (see upper, Session 2, page 11).

15h35-16h00: Coffee break

16h00-17h-30:

Planning of the field trip to the Joal-Fadiouth MPA.

Side event 4.« Coastal erosion; monitoring, processes and impact on societies in West Africa». Morning 9th December, Room 2

***CHAIRMEN*: Moussa SALL (CSE, MOLOA), and Rafael ALMAR (IRD).**

Coastal zones are essential for social and economical developments. In West Africa, coastal zones represent 80% of the regional economic activity (UEMOA). The entire coast experiences a large erosion rate that reaches 10 m year^{-1} at Cotonou (Benin). Because most countries in West Africa are facing the same vulnerability to erosion, it has become a major regional issue. Located at the interface between ocean and continent, the coasts are vulnerable to environmental hazard and are currently facing an intensification of risk associated with increasing human pressure and the context of global climate change. West Africa countries are currently facing a rapidly growing demographic pressure and uncontrolled exploitation of resources associated with rapid economic development. The natural environmental vulnerability of the coastal zones (*i.e*. extreme events of tropical storms, erosion, flooding) conjugated with demographic pressure increases hazard for human activities and represents a limitation for coastal development (maritime transport, tourism, urban development).

One of the principal limitations to our knowledge of coastal dynamics is a lack of appropriate integrated observations (multi-scale, structured in a network, maintained over long term) and numerical tools (regional to coastal areas, hydro-morphological nearshore dynamics). There is a strong need for a greater understanding and estimation of present dynamics and future evolution (ALOC-GG 2011 report; global warming impact; Stive, 2004).

This session aims at providing our current knowledge on the understanding of the processes responsible for the observed large coastal variability and erosion, quantifying their impact; by reviewing current projects, actions undertaken so far, monitoring and modeling tools employed. This session also reviews solutions in anticipating coastal evolution and improve coastal zone management techniques and politics toward an integrated strategy for risk mitigation.

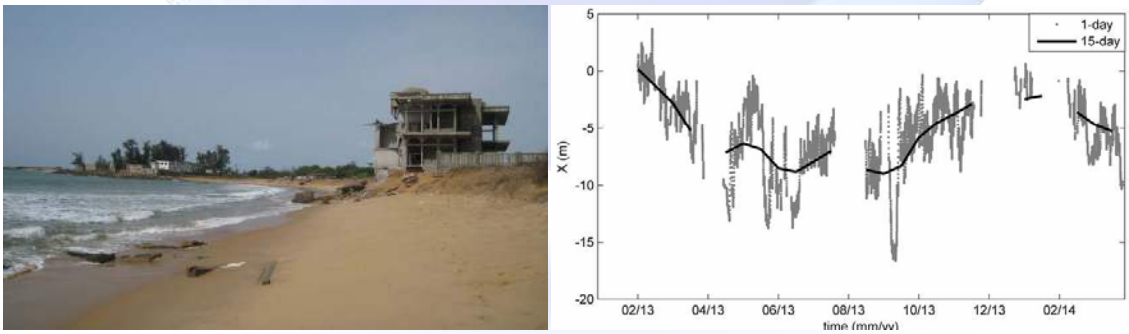

Figure: (Left) Evidence of coastal erosion, East Cotonou, Bénin (2012), (Right): Shoreline evolution at Grand Popo, Bénin (Feb. 2013- Feb. 2014).

Oral communications

- 09h30-09h40:

Rafael ALMAR, Thierry GARLAN, Philippe GRANDJEAN, Pascal ALLEMAND, France FLOCH, Patrice BREHMER, Bruno CASTELLE, Nadia SENECHAL, Guillaume DETANDT, Raoul LAIBI, Georges DEGBE, Zacharie SOHOU, Norbert HOUNKONNOU, Wahab LARYEA, Donatus ANGNUURENG, Kwasi Appeaning ADDO, Jean-Pierre LEFEBVRE, Edward ANTHONY, Chris BLENKINSOPP, Moussa SALL, Alioune TOURE, Rosh RANASINGHE, Dano ROELVINK, MARCHESIELLO Patrick, Rachid BENSHILA, Elodie KESTENARE, Christophe DELACOURT, Anne DESCHAMPS, Gregoire ABESSOLO, Timothy SCOTT, Labaly TOURE, Gildas ROUDAUT, Yves DUPENHOAT

« COASTVAR 2015-2018: Caractérisation de la variabilité littorale en Afrique de l''Ouest par une étude multi-échelle et multi-méthode ».

- 09h40-10h00:

Bennet Foli Atsu.

« Monitoring of Ocean conditions: an approach to ensuring safety at sea for artisanal fisher in western Africa».

10h00-10h15: Coffee break

- 10h15-10h35:

Cossi GeorgesDEGBE, Raoul LAIBI, Zacharie. SOHOU, LucienMarc OYEDE, Moussa Bio DJARA.

« Analyse diachronique de l'évolution du trait de côte entre Grand-Popo et Hillacondji de 1984 à 2011 ».

- 10h35-10h45:

Prof. Aminata NDIAYE.

« Climate Change: nature, effects and impacts on coastal erosion and human activities in West Africa».

- 11h45-11h05:

Fatimatou SALL, Adrien COLY.

« Vulnérabilité climatique à Saint-Louis (Sénégal). Défis et enjeux écologiques de l'adaptation».

11h05-11h00: Poster teaser

- 11h05-11h10:

GildasROUDAUT, RaphaelALMAR, AnneDESCHAMPS, Christelle. DELORD, Yannick PERROT, Christophe DELACOURT, Jérôme AMMANN, Nicolas Le DANTEC, Fabrice ROUBAUD, Moussa SALL, Patrice BREHMER.

« Kite Aerial Photography system: a low cost and high resolution solution for beach monitoring (2D map and 3D topography) ».

- 11^h10-11^h15 :

Kader BA, Soulèye WADE, Isabelle NIANG, Jean-Paul RUDANT.

« Télédétection et écosystèmes marins et côtiers : Applications des images ERS-2 à l'étude du trait de côte et à la mise à jour des cartes marines de la Langue de Barbarie dans la région de Saint-Louis (Sénégal) ».

- 11^h15-11^h20:

Abdoulaye NDOUR, Isabelle NIANG, and Soulèye WADE.

« L'évolution du trait de côte de Rufisque (Petite Côte, Sénégal) de 1954 à 2006 »

- 11^h20-11^h25:

France Floc'h, Kodjo Aziayibor, Rafael Almar, Yves Du Penhoat ,Jean-Pierre Lefebvre, Matthieu Dorel, Cossi George Degbe, Zacharie Sohou, Christian Adje, Norbert Hounkonnou, Toussaint Okey, Raoul Laibi, Gregoire Abessolo, Phillipe Grandjean, Timothy Scott, Bruno Castelle, Nadia Senechal, Guillaume Detandt, Wahab Laryea, Donatus Angnuureng, Edward Anthony.

« Transferts sédimentaires littoraux : analyse des conditions hydrodynamiques et sédimentaires littorales sur la plage réflective à terrasse de Grand Popo (Bénin, Golfe de Guinée) »

Oral communications

- 11^h25-11^h45:

Gregoire Abessolo ONDOA, Arnaud KOUEKAM.

« Impacts of natural factors on the morpho-dynamic Beach of Kribi ».

- 11^h45-12^h30:

Round table

« Coastal erosion; monitoring, processes and impact on societies in West Africa». (to be continued in the afternoon and the next day 10^{th}).

Thursday 11th December, Afternoon: Official conference closing, Plenary room

Chairman reports per session and side events

- 14^h00-14^h20:

Peter BRANDT (GEOMAR, Germany), Alban LAZAR (UPMC, France) and Bamol Ali SOW (UASZ, Senegal).

Session 1. **« Observation and modelling of ocean physics supporting the ecosystem approach to marine management ».**

- 14^h20-14^h40:

Heino FOCK (TI, Germany), Carlos F. SANTOS (INDP, Cabo Verde) and Patrice BREHMER (IRD, Senegal)

Session 2.**« Variability of pelagic productivity in West-African waters ».**

- 14^h40-15^h00:

Eric MACHU (IRD, France), Vamara KONÉ (CRO, Ivory Coast) and Hamet DIADHOU (CRODT, Senegal)

Session 3.**« Physical-biogeochemical coupling: processes and control of small pelagic fish ».**

- 15^h00-15^h20:

Ibrahima DIALLO (CNSHB, Guinea), Didier JOUFFRE (IRD, Senegal) and Hamady DIOP (CSRP, Mauritania)

Session 4.**« Economics integrated into the ecosystem approach to marine management and economic benchmarking ».**

- 15^h20-15^h40:

Ibrahima LY (UCAD, Senegal) and Diénaba BEYE TRAORE (CSRP, Mauritania)

Session 5.**« Environmental marine law ».**

15h40-16h00: Coffee break

- 16^h00-16^h20:

Jacob GONZÁLEZ-SOLÍS (University of Barcelona, Spain) and Ross WANLESS (University of Cap Town, South Africa)

Session 6. **« Ecosystemic Seabird / Fishery interactions ».**

- 16h20-16h40:

Didier JOUFFRE (IRD, Senegal) and Ibrahima DIALLO (CNSHB, Guinea).

***Side event 1.*WG IndiAWA. « Ecosystem Indicators for the Management of Fisheries and the Marine Environment in West Africa ».**

- 16h40-17h00:

Dr. Mahfoudh ould TALEB SIDI (deputy director IMROP, Mauritania) and Dr. Yves GOURIOU (Head of IRD-US Imago, France).

***Side event 2.*« West African scientific fleet, toward a sub-regional coordinating commission ».**

- 17h20-17h40:

Patrice Brehmer on behalf of Dominique DUVAL-DIOP (Rampao), and Modou THIAW (ISRA/CRODT).

***Side event 3.*« Marine Protected Area (MPA) in West Africa ».**

- 17h40-18h00:

Moussa SALL (CSE, MOLOA), and Rafael ALMAR (IRD).

***Side event 4.*« Coastal erosion; monitoring, processes and impact on societies in West Africa ».**

18h00 : Conference closing

Patrice Brehmer (IRD, Senegal)

Diop son (Senegalese fisherman) representing Adboulaye Diop (CNPS, Senegal)

Alassane Samba (re-ISRA/CRODT)

Hamady Diop representing the permanent secretary of the sub regional fisheries commission.

Local technical organizing Committee

- Patrice BREHMER, ISRA-IRD
- Hamady DIOP, SRFC
- Marie Madeleine GOMEZ, SRFC
- Amadou TOURE, SRFC
- Toussainte BOISSY, SRFC
- Oumar SADIO, IRD
- Viviane KOUTOB, IRD
- Ndague DIOGOUL, IRD

Press / communication

- Mame Fatou TOURE, SRFC

Finance

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- Xavier CAPET, UPMC-France
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- Ibrahima DIALLO, CNSHB-Guinea
- Hamady DIOP, SRFC
- Yves du PENHOAT, IRD-Benin
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- Heino FOCK, TI-Germany
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- AlbanLAZAR, UPMC-France
- Eric MACHU, IRD-France
- Jorn SCHMIDT, CAU-Germany
- Aboubacar SIDIBE, Guinea
- Bamol Aly SOW, UASZ-Senegal
- Mahfoudh TALEB SIDI, IMROP-Mauritania

Press briefing

To register as a media representative contact Mame Fatou TOURE: mamefatou.toure@spcsrp.org

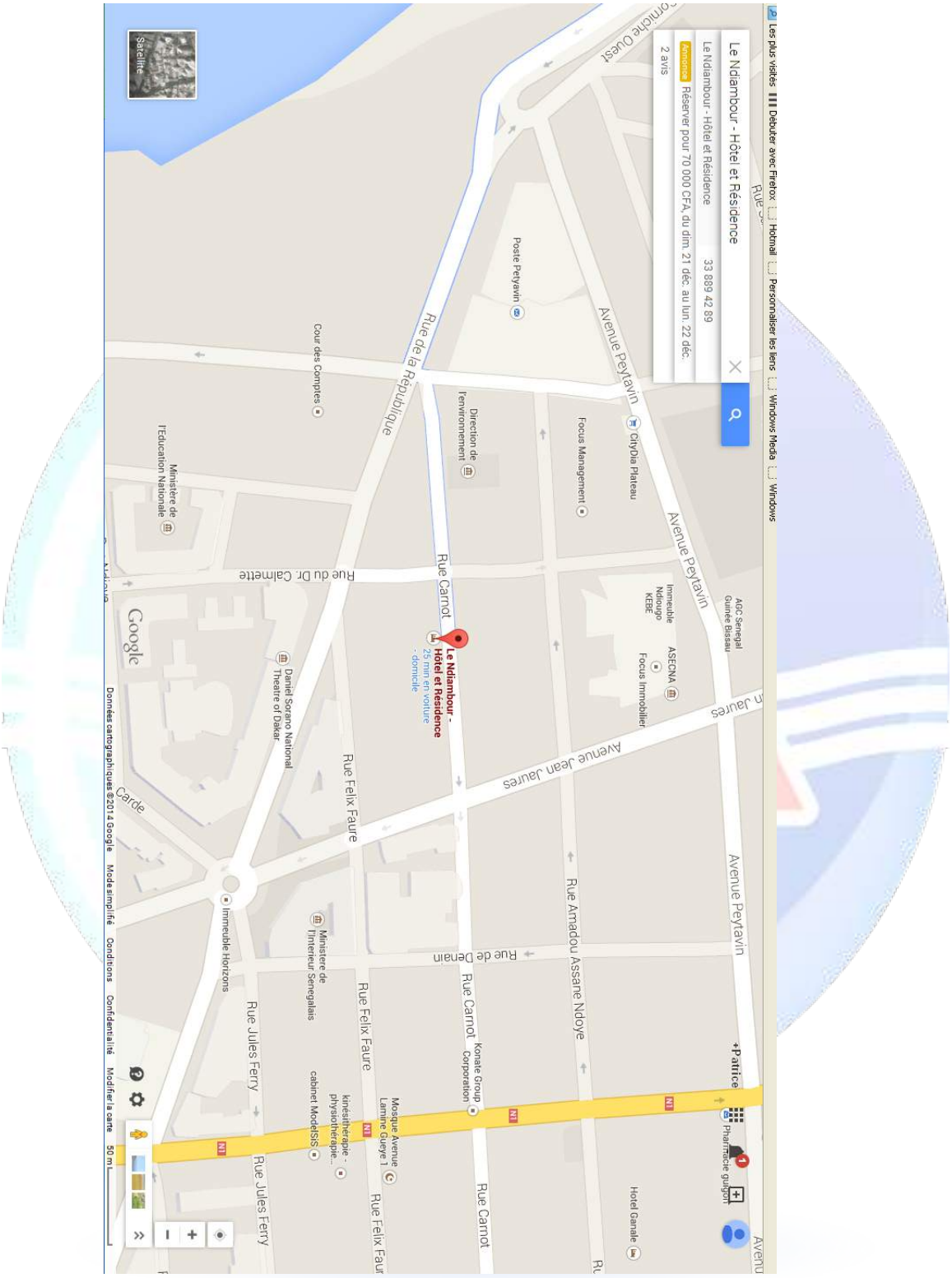
Accommodation

Conference Hotel (Hôtel Le NDIAMBOUR): *Hôtel Le NDIAMBOUR,* Dakar Plateau, 121 Rue Carnot, Dakar, Senegal. www.lendiambour.com

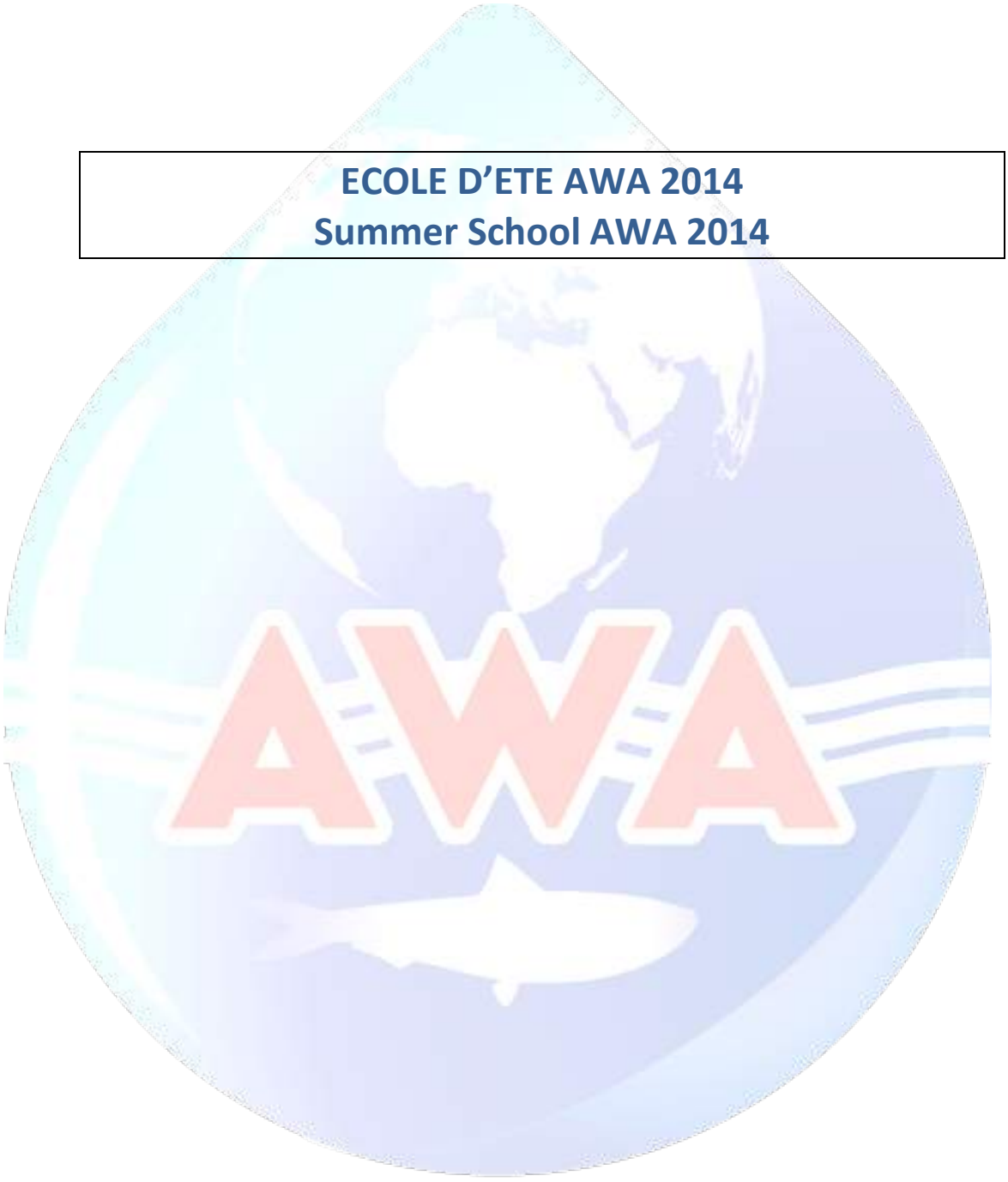
Conference contact

Marie Madeleine GOMEZ. E-mail : mariemadeleine.gomez@spcsrp.org

Map Conference hotel



ECOLE D'ETE AWA 2014
Summer School AWA 2014



INTRODUCTION

AWA is a cooperative integrated research project including collaboration between Germany, France and West African countries. The project has three major lines of action:

(i) Improvement of fisheries management
(ii) Understanding the effects of global change and particularly climate change on marine living resources
(iii) Training of West African scientists to continue AWA work in their institutions.

All West African scientific communities are asking for better training and educational oceanography programmes. This event contributes to the capacity-building strategies as devised in the project, as well as for strategic partnerships between institutions and universities in the sub-region of West Africa.

The main objectives of this Summer School are:

- Understand the nature of MPAs, their history and origins, their global patterns and issues
- Recognise and appreciate the importance of socio-political issues relevant to management and conservation goals
- To gain familiarity with current theory of, and controversies associated with, management of marine wildlife
- Understand the historical perspective of processes threatening marine wildlife
- Comprehend the application of relevant field techniques
- Develop competency in marine reserve design
- Analyse the types and scales of threatening processes and how their effects are measured

ABSTRACTS
AWA Summer School MPA 2014

Governance of MPAs – from understanding to action: The IUCN guidelines on protected area governance and their relevance for marine and coastal environments

Barbara LASSEN

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Germany
Contact: barbara.lassen@gmail.com

The session will consist of inputs and short interactive group exercises.
It will aim to introduce basic concepts of PA governance, specific challenges in MPAs, the IUCN guidelines, and the steps to conduct PA governance assessments.
Participants will explore the concepts by applying them to their own examples and discuss how PA governance assessments can be conducted in marine and coastal environments.

Inputs:

- PA governance: basic concepts (definition, actors, levels, diversity, quality)
- Differences between governance in terrestrial and marine PAs
- Governance diversity: the four IUCN categories of PA governance and the IUCN matrix
- Governance Quality
- Brief overview of the steps for PA governance assessments

Group exercises and discussions:

- Identifying and sharing governance challenges in MPA examples familiar to the participants
- Situating the examples in the IUCN Matrix and the Governance Continuum
- How appropriate are the steps of the IUCN PA governance assessments in the marine environment? Would they need to be adapted and how?

La situation de la pêche sénégalaise et perspectives

Papa NDIAYE

Institut Fondamental d'Afrique Noire (IFAN) / Université Cheikh Anta Diop (UCAD)
Contact: papandiaye50@yahoo.fr

Introductory Talk

Management of aquatic ecosystems: MPAs based approach

Justin KANTOUSSAN

UFR des Sciences Agronomiques de l'Aquaculture et des Technologies Alimentaires (UFR S2ATA / UGB) University Gaston Berger, Saint-Louis, Senegal
Contact:kantoussanj@yahoo.fr

The aquatic ecosystems throughout the world are now subject to natural (climate variability) and artificial (e.g. fishing pressure, pollution, etc.) constraints that affect their functioning, and act as forces that structure the ecosystem communities. Face to the great degradation and the complexity of the aquatic areas, the ecosystem approach management is preferred to achieve a good environmental status and preserves the values and services provided by ecosystems. In this context, the use of marine protected areas (MPAs) has taken on greater importance as management option for conservation of the natural heritage, cultural heritage and sustainable production. The studies carried out on the evaluation of the efficiency of the MPAs as useful tool for ecosystems management some showed positive effects with an increase of the fish population's mean trophic level, mean size, biomass and larger size spectrum with the increasing of maximum observed length, etc. However, the researches on the MPAs have to specify the conditions for efficient MPAs in the restoration and/or protection of the ecosystems.

In situ monitoring of a Marine Protected Area: the case of Bamboung bolon inside a tropical estuary, West Africa

Oumar SADIO

Institut de Recherche pour le Développement (IRD), Dpt Environment and resources, UMR195, Co ISRA/CRODT, Dakar, Senegal
Contact: oumar.sadio@ird.fr

Bamboung bolon is a small bay in the Sine Saloum estuary in Senegal included inside a World Biosphere reserve since 1981, situated in West Africa. The protection of this area was undertaken with local fishermen support, and a formal Marine Protected Area (MPA) was created in 2004 by the Senegalese government. The survey of the fish assemblages was initiated in 2003, the year before the fishing ban, and went on until 2012, with 12 sampling sites from 2003 to 2007 and 5 sampling sites from 2008 to 2012 and being monitored three times per year over three main seasons (Dry/Wet/Transition). Sampling has been carry out with a shallow water boat (IRD, Diassanga 12 m) used as research platform and using additional craft to lead fishing operation with local researchers. The objectives of this course are: (1) to introduce and characterize the Bamboung MPA; (2) to show how the monitoring of fish population was made; (3) to speak about the results in the 10 years of biological monitoring; (4) and identification of perspectives.

Use of underwater acoustics in Marine Protected Areas

Patrice BREHMER

IRD Institut de Recherche pour le Développement, Dpt Environment and resources, UMR195 Associated researcher ISRA-CRODT, Dakar, Senegal
Contact: Patrice.brehmer@ird.fr

The presentation reviews a broad range of material from a wide range of established scientists in the fisheries acoustics community. It is a timely and indispensable tool for fisheries scientist and manager dealing with Marine Protected Area (MPA), which needs efficient and standardized procedures for fish sampling. Today, fisheries acoustics is a central discipline for *in situ* observations of aquatic organisms extending from plankton to whales. Acoustic methods are needed for stock assessment exercises and for behavioural studies, starting from freshwater rivers and extending to the open ocean, including inland lakes and estuaries. Present uses of fisheries acoustics are not only directed at assessment methods, but also at ecological and management studies. The main advantage of acoustics is that it provides for the possibility of collecting information either in an instant or over an extended period, with observations being at all scales from mm to km; for example, from fish to schools at the 'micro-scale', school to a cluster of schools at the 'meso-scale' and clusters to populations at the 'macro-scale'. Observations can be made independently of intrusive fishing operations and are not constrained by the limits of visual observation methods. In fisheries science, whether the approach is at the ecosystem level or is just dealing with individual populations using classical models, fisheries acoustics methods are crucial for an accurate validation of some key parameters for MPA management. It should also be born in mind that the observation of marine organisms remains particularly difficult in comparison to aerial or terrestrial animals. Fisheries acoustics is thus very welcome to be used in MPA (non-lethal technique). The techniques and methods of measurement have quickly evolved during the last decades. Formerly, analyses of acoustics data were limited to specialists and required a long time for processing. The developments in personal computers have increased capabilities in all domains such as in central unit processors, virtual memory, as well as in signal and image analysis. These developments now allow data collection, treatment and analysis using adapted software as a real possibility even to the non-specialists. Electronic tagging and tracking techniques of individual macro aquatic organism will be very quickly aborded, reflecting the regrettable 'separation' between the two scientific communities.

Adapted in 2014, from: Patrice Brehmer. 2006. "Fisheries Acoustics: Theory and Practice, 2nd edn". FISH and FISHERIES, 7, 227–228.

Further reading:

- Brehmer P.*, T. Laugier, J. Kantoussan, F. Galgani, D. Mouillot. 2013. Does coastal lagoon habitat quality affect fish growth rate and their recruitment? Insights from fishing and acoustic surveys. Estuarine Coastal and Shelf Science, 126, 01-06.
- Patrice Brehmer, Thang Do Chi, Thierry Laugier, François Galgani, Francis Laloë, Audrey M. Darnaude, Annie Fiandrino, Pablo Ivan Caballero, David Mouillot. 2011. Field investigations and multi-indicators for management and conservation of shallow water lagoons: practices and perspectives. Aquatic Conservation, Marine and Freshwater Ecosystems, 21(7), 728-742. doi 10.1002/aqc.1231.
- Brehmer P.,* T. Lafont, S. Georgakarakos, E. Josse, F. Gerlotto, C. Collet. 2006. Omnidirectional multibeam sonar monitoring: Applications in fisheries science. Fish and Fisheries, 7(3), 165-179.
- Brehmer P., D. Mouillot, T. Do Chi. 2006. Amphidromus fish school diel flow in two Mediterranean lagoons by combining sonar and fishing data. Journal of Experimental Marine Biology and Ecology, 334(1), 139-150.
- Brehmer P.,* F. Gerlotto, J. Guillard, F. Sanguinède, Y. Guénnegan, D. Buestel. 2003. New applications of hydroacoustic methods for monitoring shallow water aquatic ecosystems: the case of mussel culture grounds. Aquatic Living Resources, 16(3), 333-338.

Harnessing MPA networks to increase management effectiveness

Dominique DUVAL-DIOP

Regional Network of Marine Protected Areas in West Africa, Dakar, Senegal
Contact: duvaldiop@rampao.org

Over the past 10 years, efforts throughout the world have been undertaken to increase the number of marine protected areas in response to the international call to better protect our coastal and marine assets. In West Africa, 11 marine protected areas (MPAs) during this period, spanning a diversity of governance approaches. The creation of these MPAs increased the amount of surface area protected from nearly 1,587,000 ha in 2004 to over 2,722,000 ha in2014, representing 12.7% of territorial waters. To support the conservation of the West African coastal ecoregion, we must go beyond creating MPAs to providing the tools to build their capacity and thus increase their effectiveness.

The West African Network of Marine Protected Areas (RAMPAO) is a regional ecological and social network that comprises a range of different types of MPAs located in five countries in West Africa. The network's 27 member MPAs are managed at varying levels of effectiveness and engage a diversity of actors and institutions. Ensuring the effectiveness of these conservation tools is of great concern to actors at the site, national and regional levels and to the RAMPAO network.

This talk will provides a description of the management effectiveness challenges facing the RAMPAO MPAs, and presents various approaches to assessing management effectiveness that have been applied in the region as well as other best practices. The talk will be followed by a participative discussion, allowing participants to exchange their own experiences.

Potential socioeconomic effects in the implementation of MPAs

Heino O. FOCK

Thünen Institute, Institute of Sea Fisheries, Palmaille 9, 22676 Hamburg, Germany.
Contact: heino.fock@ti.bund.de

Two general aspects are highlighted based on evidence from European and North American MPA examples: (1) changes in the spatial distribution of fishing, and (2) technical regulations affecting fleet structure in certain areas. Changes in fishing patterns lead to a displacement of effort into areas that were formerly less fished. Economic and ecological consequences of displacement are analysed. Specifying technical regulations for local fleets leads to constraints in technological

development that may change the structure of a fleet in way that it is not competitive in markets outside the protected area. This has strong implications with regards to changes in MPA management.Data needs on fisheries distribution and fleet structure, methodological approaches to map and analyse displacement, and technological implications are shown.

Further reading:

- Bastardie F, Nielsen JR, Eigaard RO, Fock HO, Jonsson P, Bartolino V (2014) Competition for marine space: modelling the Baltic Sea fisheries and effort displacement under spatial restrictions. ICES J Mar Sci in press
- Beare D, Rijnsdorp AD, Blaesberg M, Damm U, Egekvist J, Fock HO, Kloppmann M, Röckmann C, Schröder A, Schulze T, Tulp I, Ulrich C, Hal Rv, Kooten Tv, Verweij M (2013) Evaluating the effect of fisheries closures: Lessons learnt from the Plaice Box. Netherlands Journal of Sea Research 84:49-60
- Berkenhagen J, Döring R, Fock HO, Kloppmann MHF, Pedersen SA, Schulze T (2010) Decision bias in marine spatial planning of offshore wind farms: Problems of singular versus cumulative assessments of economic impacts on fisheries. Mar Policy 34:733-736
- Pedersen SA, Fock HO, Sell AF (2009) Mapping fisheries in the German exclusive economic zone with special reference to offshore Natura 2000 sites. Mar Policy 33:571-590

MPA planning and the meta-population concept

Heino O. FOCK

Thünen Institute, Institute of Sea Fisheries, Palmaille 9, 22676 Hamburg, Germany.
Contact: heino.fock@ti.bund.de

Connectivity between sites with viable sub-populations by means of dispersal of specimens during their migratory stage is a key process to sustain protected populations in designated MPA sites. Migratory processes for closely connected sites as well as for remote sites (i.e. seamounts) are compared. The use of tagging studies to derive key parameters for conservation will be shown, and 2 modelling approaches are introduced.

Further reading

- Fock, H. O. & Zidowitz, H. Episodic recruitment to seamount populations: Evidence from Zenopsis conchifer (Lowe, 1852) at the Great Meteor

Seamount (subtropical North-east Atlantic). Archive for Fishery and Marine Research 51, 287-293 (2004).
- Munroe, D. M., Klinck, J. M., Hofmann, E. E. & Powell, E. N. A modelling study of the role of marine protected areas in metapopulation genetic connectivity in Delaware Bay oysters. Aquatic Conservation: Marine and Freshwater Ecosystems 24, 645-666 (2014).
- Fock, H. O., Probst, W. N. & Schaber, M. Patterns of extirpation. II. The role of connectivity in the decline and recovery of elasmobranch populations in the German Bight as inferred from survey data. Endangered Species Research 25, 209-223 (2014).

Marine Protected Areas: An introduction to governance

Philipp GORRIS

Leibniz Center for Tropical Marine Ecology (ZMT), Bremen, (Germany);
Bremen International Graduate School for Marine Sciences – GLOMAR (Germany);
Jacobs University, Bremen (Germany)
Contact: philipp.gorris@zmt-bremen.de

Presentation at Round Table on 4th of December 2014
Duration: ca. 15 min

This introductory talk deals with MPAs from a social science perspective and briefly elaborates basic concepts and approaches related to governance.
It was generally believed for centuries that the resources of the oceans are inexhaustible and can be seen as a stable source of food for humans. Today, marine ecosystems in many regions of the world show alarming signs of degradation and fish stocks all over the world are heavily depleted. Marine Protected Areas (MPAs) are perceived to provide an institutional solution for sustainable marine resource management. The many of these areas, however, are indeed officially protected but not managed effectively and provide only very little contribution to the protection and recovery of marine resources.
This presentation addresses the question why the implementation of MPAs may be difficult and why so many of them result in so-called “paper parks”. Drawing from recent theories on governing natural resources, participants will be given a brief overview of the common-pool resource concept and get introduced to governance approaches. Hereby, this talk seeks to provide the participants with an introduction to governing MPAs as an institutional arrangement for governing common-pool resources in order to set the stage for further discussions during the round table.

Governing marine protected areas: adaptive capacity, robustness and the problem of scale

Philipp GORRIS

Leibniz Center for Tropical Marine Ecology (ZMT), Bremen, (Germany);
Bremen International Graduate School for Marine Sciences – GLOMAR (Germany);
Jacobs University, Bremen (Germany)
Contact: philipp.gorris@zmt-bremen.de

Talk on 7th of December 2014
Duration: 60 min

This presentation centers on the problem of scale-mismatches for governing MPAs and examines possibilities and constraints for robust and adaptive governance on a regional scale. MPAs frequently suffer from mismatches of scale and integrating larger marine territories into spatial planning and governance has been strongly promoted over the past decade. Yet, approaching governance at larger scales poses new organizational challenges. A particular challenge of MPA governance is that it requires rapid responses in context of complexity, diversity and unpredictable multi-scale dynamics, and at same time it needs to be robust. This constitutes the need to connect multiple stakeholders into a robust network that is capable of continuously generating appropriate social-ecological knowledge and of facilitating its accumulation at certain interfaces and decision-making bodies. This provides for the incorporation of social-ecological feedbacks into environmental governance systems to arrive at timely and informed management decisions.
The thematic talk is structured into two parts. In a first step, the problem of scale-mismatches will be elaborated together with the participants. Subsequently, two governance networks in Brazil and in Indonesia are presented and their strengths and weaknesses in context of robustness and adaptive capacity discussed. A particular focus is given to the relations among governance actors, how relations are structured into an overall network and how actors are positioned within networks. Hereby, this thematic talk seeks to improve the participants understanding of the problem of scale-mismatches for MPA governance and elaborates opportunities on how to address this challenge.

Marine spatial planning and spatial modelling approaches

Xochitl CORMON[1] and Henrike RAMBO[2]

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Xochitl Cormon, Xochitl.Cormon@ifremer.fr

Since the World Summit of Sustainable Development in Johannesburg (2002) and its implementation plan calling nations to manage and conserve important marine areas, the use of Marine Protected Areas (MPAs) is on the top of the international agenda. However, in order to choose the area to be protected, it is necessary from an ecological standpoint to define the MPA's management objective, whether it is conservation of biodiversity, management of single species, specific life-stages, etc., and to understand their spatial distribution and dynamics. Spatial modelling techniques are of great use in these matters as they allow to map present distributions but also to predict future distributions depending on different environmental variables, e.g. temperature. In spatial fisheries ecology, there are two main modelling approaches: geostatistics and regression techniques, which can be combined. In this course, we will give an overview of these two approaches, compare their advantages and drawbacks and discuss their respective technical and/or statistical constraints,. We will finish the theoretical part with a discussion about the common issues related to marine spatial modelling with a focus on spatial autocorrelation challenges. The second part of this lecture will allow the application of the theory by using R and ArcGIS going through minimalistic examples and to discuss prospects for the students in their use of these techniques.

Keywords: spatial distribution modelling, geostatistics, regression techniques

Further reading:
Cormon Xochitl, Loots Christophe, Vaz Sandrine, Vermard Youen, Marchal Paul (2014). *Spatial interactions between saithe (Pollachius virens) and hake (Merluccius merluccius) in the North Sea.* ICES Journal Of Marine Science, 71(6), 1342-1355. http://dx.doi.org/10.1093/icesjms/fsu120

Ecological Indicators to monitor MPAs

Modou THIAW

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The Marine Protected Areas (MPAs) as a tool for fisheries management are often seen as a means to protect the exploited resources or increase incomes of fishermen and associated communities, when fishing pressure is high. MPAs are thus an important tool to protect habitats for reproduction and growth of the fish and shrimps juveniles. These areas can play a key role in the conservation of biodiversity of the ecosystems. Their effectiveness to fishery purposes is based on the following assumptions: effects within the MPA, effects outside the MPA ("Spillover") and effects to the ecosystem scale.
In West Africa, coastal ecosystems undergo both global changes and local anthropogenic pressures. The high exploitation of living resources, and other anthropogenic pressures especially in coastal areas, alters the biodiversity and ecosystem functioning and threaten the sustainability of their ecosystem services. This led to an ecosystem approach to the management of stocks and marine and coastal ecosystems. This approach attempts to take into account the human impact on all compartments of the ecosystem. The results show that some ecosystems may have dynamic collapse, resistance or resilience according the intensity and duration of resources exploitation.
The training allows participants to (i) improve their knowledge on coastal ecosystems and population dynamics of exploited resources and (ii) to understand the tools for analyzing the impact of anthropogenic pressures and methods of assessing the impact of management measures. For this, a set of ecological indicators and biodiversity and conservation-based indicators will be reviewed by providing details of their definition, the data required for their calculations, and their interest. This multidisciplinary training aims to train professionals and students for the development of responsible fisheries and integrated management of coastal zones and aquatic ecosystems.
Key words: Marine ecology, ecosystem approach to fisheries, food webs and ecological indicators

The transboundary biosphere reserve in West Africa, the example of Senegal River delta

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Implementation of artificial habitats: inside or outside the marine protected areas? Insights from a mathematical approach

Timothée BROCHIER
Institut de Recherche pour le Développement (IRD), ISRA/Centre de Recherche Océanographique de Dakar-Thiaroye (CRODT), UMR 195, BP 1386 Dakar, Senegal
Contact: Timothee.Brochier@ird.fr

At the world scale, many exploited species are currently threatened or undermined by human activities, particularly fishing. Given this situation, establishing Artificial Habitats (AHs) and Marine Protected Areas (MPAs) is seen as a way of both conserving biodiversity and managing fishing activities. AHs have two main effects: (1) they attract fish from the surrounding areas and concentrate them in the AH, and (2) they increase the capacity of the environment, as a result of the installation of new individuals or, in some cases, of new species. MPAs decrease fish accessibility by constraining the spatial distribution of the fishing effort. We have developed a system of ordinary differential equations (ODEs) that can be used to describe the evolution of fish density, fishing effort, and landings depending on whether AHs are deployed in a MPA or in a fishing area. The analytical study of the ODE system is simplified by means of assuming that processes occur on different time scales. Fish reproduction and landings were assumed to occur at a "slow" time scale, whereas fish displacement was assumed to occur at a "fast" time scale. For both scenarios of AHs implementation (in an MPA or in a fishing area), we show the existence of different equilibria according to hypotheses based on a purely attractive or purely productive effect of the AH. In all cases, the deployment of AHs in the fishing area leads to an equilibrium with lower fish biomass and lower fish landings than when AHs are deployed within the MPA. This suggests that AHs should not be fished in order to maximise long term fish productivity and fish landings in the surrounding areas. In addition, we attempt to establish a correspondence between our theoretical results and the management plan for artisanal fisheries on the Senegalese coast, which includes the implementation of both AHs and MPAs. This suggests that there is not enough coordination between the non-governmental organizations deploying the AHs and the institutions managing MPAs. Indeed, AHs are usually either immersed in an MPA or subject to local fishing ban, but in fact regulation is inadequate. In this context, the deployment of AHs as part of fisheries

management would be premature and could have potentially adverse effects on the resource.

Further reading:

- Hieu, N.T., Brochier, T., Tri, N.-H., Auger, P., Brehmer, P., 2014. Effect of Small Versus Large Clusters of Fish School on the Yield of a Purse-Seine Small Pelagic Fishery Including a Marine Protected Area. Acta Biotheoretica 62, 339–353. doi:10.1007/s10441-014-9220-1
- Brochier, T., Ecoutin, J.M., de Morais, L.T., Kaplan, D.M., Lae, R., 2013b. A multi-agent ecosystem model for studying changes in a tropical estuarine fish assemblage within a marine protected area. Aquatic Living Resources, 26, 147–158. DOI: http://dx.doi.org/10.1051/alr/2012028
- Kaplan, D.M., Planes, S., Fauvelot, C., Brochier, T., Lett, C., Bodin, N., Le Loc'h, F., Tremblay, Y., Georges, J.-Y., 2010. New tools for the spatial management of living marine resources. Current Opinion in Environmental Sustainability 2, 88–93. doi:10.1016/j.cosust.2010.02.002

The Giant MPA

David M. KAPLAN
Virginia Institute of Marine Science (VIMS), Dpt Fisheries Science, Gloucester Point, Virginia, USA
Contact: dmk@vims.edu

Large Marine Protected Areas (MPAs) are increasingly being used for conservation of mobile pelagic and demersal species. Among the propositions for improving the status of these species with spatial management are large, offshore MPAs and "dynamic" MPAs that follow fish around for part or all of their life-cycle. For these and other proposed strategies for applying spatial management to pelagic and demersal species, issues surrounding mobility (fish, fisher or MPA) are central to assessing MPA efficacy and designing a successful MPA network for the global ocean. Due to the innovative nature of these type of MPAs, there are currently relatively few theoretical or empirical studies specifically directed at them. Nevertheless, existing MPA literature can be used to draw numerous basic lessons on how offshore and mobile MPAs are likely to impact marine ecosystems. For example, existing literature on diffusive movements and MPAs, fisher behavior after MPA creation, efficacy of MPAs for specific types of fish movement (e.g., spawning migrations), and detailed movement studies for some species can all be leveraged to understand how mobile and offshore MPAs are likely to function. In this presentation, I first provide an overall presentation of history and trends in the use of MPAs for mobile species, before launching into the theoretical underpinnings of our understanding of how MPAs for mobile species are likely to function and then ending up with several case studies that provide real-world insight into the value of offshore MPAs.

Further reading: Pelagic MPAs: the devil is in the details DM Kaplan, E Chassot, A Gruss, A Fonteneau (2010) Trends in ecology & evolution 25 (2), 62-63

Annoucement Summer School MPA

Summer School 2014 Teledetection and its Oceanographic Applications

Summer School

Teledetection and its Oceanographic Applications

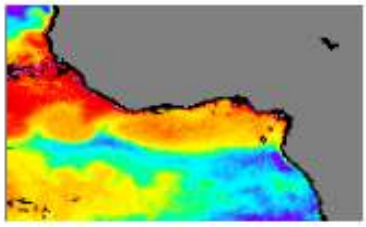
Cotonou, Republic of Benin, 18-24 October 2014

organised by the International Chair in Mathematical Physics and Applications (ICMPA) and the Research Institute for Development (IRD)

Satellite observations are essential to monitor and study the oceans. They provide an unmatched spatial and temporal coverage of such key oceanic variables as sea surface temperature and salinity, sea level, ocean color and surface winds. Most ocean satellite data are freely available on the web for research studies. Some satellite observations are also available in real time to scientific centers (like ICMPA) equipped with the EUMETCast reception system for operational applications. The lectures will give an overview of existing satellite products and their relevance to the physical and biological oceanographic processes occurring in the tropical Atlantic. The main goal of the school is, through hands-on training, to provide software tools and give technical skills to the participants, to help develop marine research capabilities in African countries.

Program:

- Regional oceanography of the tropical Atlantic
- Data processing and visualisation with Python software
- Introduction to satellite oceanography
- Installation, maintenance and data management of a EUMETcast station
- Satellite altimetry and its applications
- Fisheries applications of teledetection



Lecturers: G. Alory (IRD/ICMPA, Cotonou, Benin), T. Okey (ICMPA, Cotonou, Benin), D. Dagorne (IRD, Brest, France), F. Niño (IRD, Toulouse, France), H. Demarcq (IRD, Sete, France)

Coordinators: G. Alory (IRD/ ICMPA, Cotonou, Benin) and E. Baloitcha (ICMPA, Cotonou, Benin)

- The summer school is open to young African scientists, including students with at least MSc level, with a maximum of 20 participants.
- Participants are required to bring their laptop for hands-on training.
- Lectures will be in French and English.
- Limited funding is available.

Deadline for application: september 15th, 2014

Applicants are required to submit their CV, the filled applicant form (attached), a 1-page motivation letter and a supporting letter from their supervisor or institution in a message titled "summer school" to the coordinators at: gael.alory@legos.obs-mip.fr and ezbalo@yahoo.fr .

Flyers ICAWA 2014
ICAWA 2014 ANNOUNCEMENT & AWA Project

Project structure

WP 0. Project management

WP 1. Observation and modelling of ocean physics supporting the ecosystem approach to marine management

WP 2. Variability of pelagic productivity in West-African waters

WP 3. Physical-biogeochemical coupling: processes and control of small pelagic fish

WP 4. Economics integrated into the ecosystem approach to marine management

WP 5. Education, Training and Capacity-building. Capacity Development in physical oceanography and marine ecology in West Africa

FUNDERS

Joint proposals by the Federal Ministry of Education and Research (BMBF/Germany) and the IRD (France) under the patronage of the French Ministry for Higher Education and Research (MESR) and the French Ministry of Foreign and European Affairs (MAEE).

Locally implemented by the SRFC Sub Regional Fisheries Commission (Dakar, Senegal)

CLUSTERS OF EXCELLENCE

AWA

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Trilateral German-French-African research initiative in Sub-Sahara Africa

AWA

Ecosystem Approach to the management of fisheries and the marine environment in West African waters

BENIN CABO VERDE IVORY COAST GAMBIA GUINEA GUINEA BISSAU MAURITANIA SENEGAL

AWA Context

Coastal countries in West Africa are heavily dependent on the Atlantic ocean. Consequently, social development, fisheries, and tourism all face major changes associated with the impact of climate variability and of global warming on the upwelling système. Overexploitation combined with rapid climate change puts marine ecosystems under severe pressure. Local climate variability is one of the causes of coastal erosion and modulates the upper ocean temperature, which detemines the suitability of a marine area for fish. Many fish stocks in the species-rich and highly productive West African waters are being depleted.

Toward a West African observatory of marine environment using a modeling and observation platform

The ecological models which reproduce biological interactions of marine organisms in their habitat need coordinated efforts in several disciplines to characterise effectively global change introduced on the continental shelf of West Africa. Though, currently such a tool is nearly the only approach to major investigations for the dilemmas which decision-makers are faced in the context of climate change and overexploitation. Best practices will be to work on observational methods which allow validation of Key ecological processes for efficient assessment and scenario simulation purposes.

Objectives

The main processes which drive ecosystem dynamics are identified and their knowledge improved;

- Disentangling the effects of fishing and climate change ;
- The knowledge of the interplay between ocean physics, biogeochemistry, marine life and human impact is strengthened;
- The EAMME tools are developed;
- A more rational and sustainable use of living marine resources is achieved;
- Build the foundation of a West African observatory;
- Create a sub-regional task force on the ecosystem approach to the management of fisheries and the marine environment in West African waters under the effect of climate change.

Important dates

Call for abstract: 4th August 2014.

Deadline for Abstract submission: 17th November 2014.

Deadline for registration: 28th November 2014.

Manuscript deadline: 8th January 2015.

Local technical organizing Committee

- Patrice BREHMER, ISRA-IRD
- Hamady DIOP, SRFC
- Marie Madeleine GOMEZ, SRFC
- Amadou TOURE, SRFC
- Toussainte BOISSY, SRFC
- Oumar SADIO, IRD

Press / communication
- Mame Fatou TOURE, SRFC

Finance
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- BREHMER Patrice, IRD-Senegal
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- DIALLO Ibrahima, CNSHB-Guinea
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- FOCK Heino, TI-Germany
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- GONZÁLEZ-SOLÍS Jacob, UB-Spain
- JOUFFRE Didier, IRD-France
- LAZAR Alban, UPMC-France
- MACHU Eric, IRD-France
- SCHMIDT Jorn, CAU-Germany
- SIDIBE Aboubacar, Guinea
- SOW Bamol Aly, UASZ-Senegal
- TALEB SIDI Mahfoudh, IMROP-Mauritania

PRESS BRIEFING

To register as a media representative contact
Mame Fatou TOURE: mamefatou.toure@spcsrp.org

SOCIAL EVENT

Visit small scale fishing harbor, Mosque of divinity, Lighthouse of the Mammelles and Statute of the African renaissance.
You must be registered before, no fee.

ACCOMMODATION

Rooms are available at half board negotiated conference rates at the conference Hotel (Hôtel Le NDIAMBOUR)

Hôtel Le NDIAMBOUR
Dakar Plateau, 121 Rue Carnot
www.lendiambour.com

CONFERENCE CONTACT

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https://www.facebook.com/TheAwaProject

Ecosystem Approach to the management of fisheries and the marine environment in West African waters

2nd announcement:

ICAWA

INTERNATIONAL CONFERENCE

9-11 December, Dakar, Senegal

BENIN CABO VERDE IVORY COAST GAMBIA GUINEA GUINEA BISSAU MAURITANIA SENEGAL

Context

Within the framework of AWA, financed by IRD (France) and BMBF (Germany), the SRFC is to support the member states and associated West African partners with concrete actions and enhanced advisory capacities on the new fisheries management approaches.

It must be noted that coastal states of the sub-region face host of problems, notably, overexploitation of fisheries resources together with rapid hydro-climatic changes. The consequences of the two phenomena on the fisheries resources are at the heart of debates between managers to which researchers of the sub-region take part. The multidisciplinary approach adopted in AWA allows the interaction of ecologists, biogeochemists, physical oceanographers, socio-economists and climatologists. The long term objective of this conference is to promote the development of a platform to monitor, simulate and predict key parameters of the ecosystem of North West Africa.

Scope of the Conference

The primary objective of the conference is to permit member states of the SRFC and partners from West African and northern countries to put in place a sustainable fisheries and marine environment management systems based on biological, ecological, laws, economic and social state of the art knowledge. In this way the conference organizer would like:

- to enhance fisheries management mechanisms in West Africa and particularly of the member states of the SRFC;
- Improve knowledge on the effects of climate change on living marine resources relative to the functioning of their habitats;
- and enhance and train students including researchers of institutions and universities of West Africa in view of propagating AWA in the region.

Conference Topics

The conference will be structured in thematic sessions and side events.

- **Session 1: "Observation and modelling of ocean physics supporting the ecosystem approach to marine management"**
  Chairman: Peter BRANDT (GEOMAR, Germany), Alban LAZAR (UPMC, France) and Bamol Ali SOW (UASZ, Sénégal)
- **Session 2: "Variability of pelagic productivity in West-African waters"**
  Chairman: Heino FOCK (TI, Germany), Carlos F. SANTOS (INDP, Cabo-Verde) and Patrice BREHMER (IRD, Senegal)
- **Session 3: "Physical-biogeochemical coupling: processes and control of small pelagic fish"**
  Chairman: Éric MACHU (IRD, France), Vamara KONÉ (CRO, Ivory Coast) and Hamet DIADHOU (CRODT, Senegal)
- **Session 4: "Economics integrated into the ecosystem approach to marine management and economic benchmarking"**
  Chairman: Didier JOUFFRE (IRD, France), Ibrahima DIALLO (CNSHB, Guinea), and Hamady DIOP (SRFC)
- **Session 5: "Environmental marine law"**
  Chairman: Pr. Ibrahima LY (UCAD, Senegal), Dr Marie BONNIN (IRD, France), and Dienaba Beye Traoré (CSRP)
- **Session 6: "Ecosystemic Seabird / Fishery interactions"**
  Chairman: Jacob GONZÁLEZ-SOLÍS (UB, Spain) and Ross WANLESS (UCT, South Africa)

During the conference some majors "side event" will be organized at the sub regional level.

- **"1st International Workshop "Ecosystem Indicators for the Management of Fisheries and the Marine Environment in West African Waters (IndiAWA)"**
  Chair by, Ibrahima DIALLO (CNSHB, Guinea) and Didier JOUFFRE (IRD, France)
- **"West African scientific fleet, toward a sub-regional coordinating commission"**
  Chair by Mahfoudh ould TALEB SIDI (deputy director IMROP, Mauritania) and Yves GOURIOU (Head of IRD-US Imago, UMS Flotte, France)
- **"Marine Protected Area (MPA) in West Africa"**
  Chair by Dominique DUVAL-DIOP (Rampao), and Modou THIAW (ISRA/CRODT)
- **"Coastal erosion; monitoring, processes and impact on societies in West Africa"**
  Chair by Moussa SALL (CSE, MOLOA), and Rafel Almar (IRD)

Thematic round table discussions will be organized pre and post conference for the AWA partners exclusively (Monday 8th and Friday 12th). Please contact your AWA's PI (principal investigators) for more information.

The AWA project is a trilateral German-French-African Research Initiative in Sub-Sahara Africa

COMMISSION SOUS-RÉGIONALE DES PÊCHES
SUB-REGIONAL FISHERIES COMMISSION

2nd ANNOUNCEMENT

International conference "Ecosystem Approach to the Management of Fisheries and the Marine Environment in West African Waters" (AWA)

Dear colleagues,

The Permanent Secretary of the Sub Regional Fisheries Commission is honoured to inform you that the first International conference "***Ecosystem Approach to the Management of Fisheries and the Marine Environment in West African Waters (AWA)***" will be held the 9th, 10th and 11th December 2014 at LE NDIAMBOUR Hotel, in Dakar, Senegal. (www.lendiambour.com , Dakar Plateau, 121 Rue Carnot, Phone: (+221) 33 889 42 89).

Scientific Communications and Posters

Participants who wish to make presentations, can submit, no later **15th November 2014,** to the Scientific Committee of the Conference an abstract of their communication(s) or poster(s) presentation via the following e-mail mariemadeleine.gomez@spcsrp.org with copy to patrice.brehmer@ird.fr and hamady.diop@spcsrp.org. You will receive a notification within fifteen days after the submission of yours abstract.

Invitation letters

The participants who need invitation letters to attend the meeting can submit their request to assistant program who can reach through the following e-mail: mariemadeleine.gomez@spcsrp.org.

Terms of references

The terms of references of the International conference was joined to the announcement and are available at the both websites of the project www.awa-project.org and SFRC www.spcsrp.org

Accommodations

Rooms are available at half board negotiated conference rates of 84 € (55 000 F CFA) at:

Hôtel Le NDIAMBOUR
Dakar Plateau, 121 Rue Carnot
www.lendiambour.com

Other available hotels within the vicinity of the conference venues at no-negotiated rate are:

Hôtel Al Afifa
Dakar Plateau, 46 Rue Jules Ferry
Phone : (+221) 889 90 90

Hôtel Ganalé
Dakar Plateau, 38 Rue Amadou Assane Ndoye
www.ganalehotel.com

Hôtel du Plateau
Dakar Plateau, 62 Rue Jules Ferry
Phone: (221) 33 823 15 29 or (+221) 33 823 44 20

Registration

Online registration will be made at the SRFC's website: www.spcsrp.org
In case of online registration problems, you may contact directly the assistant of the program through the following e-mail mariemadeleine.gomez@spcsrp.org with copy to patrice.brehmer@ird.fr and hamady.diop@spcsrp.org and the mail object should read « Registration to AWA Conference 2014 ».

Registration Fees

- 50 € for students;
- 100 € for the partners and affiliates to the project;
- 300 € for others participants.

Registrations fee can be paid by bank transfer, credits cards or in cash. Registration fees could be waived upon request for Sub-Saharan citizens (e-mail mariemadeleine.gomez@spcsrp.org).

Visa

Information on visa requirements for Senegal is available at: http://www.snedai.sn
For visa processing, you may be asked to justify lodging accommodation. In that case please submit a case request for the hotel booking justification to your hotel of choice.

Advice to travelers

Please refer to the following website www.diplomatie.gouv.fr/fr/conseils-aux-voyageurs/conseils-par-pays/senegal-12357/

Other information

Additional information will be posted on the website of both the AWA project www.awa-project.org and SFRC www.spcsrp.org

Yours Sincerely.

Please accept our apologies for any duplications.

COMMISSION SOUS-RÉGIONALE DES PÊCHES
SUB-REGIONAL FISHERIES COMMISSION

2nd ANNONCE

"Ecosystem Approach to the Management of Fisheries and the Marine Environment in West African Waters" (AWA)

Mesdames, Messieurs,

Le Secrétariat Permanent de la Commission Sous Régionale des Pêches (CSRP) a le plaisir de vous annoncer la tenue de la première Conférence internationale « ***Ecosystem Approach to the Management of Fisheries and the Marine Environment in West African Waters*** *(AWA)*» qui se tiendra les 9, 10 et 11 décembre 2014 à l'Hôtel Le Ndiambour, Dakar, Sénégal (www.lendiambour.com , Dakar Plateau, 121 Rue Carnot, Tél : (+221) 33 889 42 89).

Communications et Posters scientifiques

Les participants désirants soumettre au comité scientifique de la conférence un **résumé** de leur communication et/ou leur **poster** doivent l'envoyer à l'adresse courriel suivante mariemadeleine.gomez@spcsrp.org avec copie à patrice.brehmer@ird.fr et hamady.diop@spcsrp.org au plus tard le 15 novembre 2014. Une notification d'acceptation vous sera renvoyée sous quinzaine suivant la réception.

Lettres d'invitation

Les participants qui ont besoin d'une **lettre d'invitation** pour prendre part à la conférence, peuvent en faire la demande auprès de l'assistant de programme par courriel : mariemadeleine.gomez@spcsrp.org

Termes de références

Les termes de références de la conférence AWA sont joints à cette présente annonce et seront disponibles sur les sites du projet www.awa-project.org et de la CSRP www.spcsrp.org

Hébergement

Des chambres sont disponibles au niveau de l'hôtel de la conférence au coût préférentiel de 84 € (55 000 F CFA) en demi-pension :

Hôtel Le NDIAMBOUR
Dakar Plateau, 121 Rue Carnot
www.lendiambour.com

D'autres hôtels sont également aux alentours (tarifs non négociés):

Hôtel Al Afifa
Dakar Plateau, 46 Rue Jules Ferry
Tél: (+221) 889 90 90

Hôtel Ganalé
Dakar Plateau, 38 Rue Amadou Assane Ndoye
www.ganalehotel.com

Hôtel du Plateau
Dakar Plateau, 62 Rue Jules Ferry
Tél : (+221) 33 823 15 29 ou (+221) 33 823 44 20

Inscription à la conférence

Un formulaire d'inscription en ligne sera mis à votre disposition sur le site internet de la CSRP www.spcsrp.org
En cas de problème de connexion internet, il vous est possible de contacter directement l'assistant de programme par courriel mariemadeleine.gomez@spcsrp.org avec copie à patrice.brehmer@ird.fr et hamady.diop@spcsrp.org avec en objet « Inscription à la conférence AWA 2014 ».

Frais d'enregistrement

Les **frais d'enregistrement** à la conférence internationale AWA sont de :

- 50 € pour les étudiants ;
- 100 € pour les partenaires du projet ;
- 300 € pour les autres participants.

Ils sont payables par cartes bancaires, virements bancaires, cash. Les frais d'enregistrement peuvent être pris en charge par le projet AWA uniquement sur demande (par courriel mariemadeleine.gomez@spcsrp.org) pour les ressortissants des pays sub-sahariens.

Visa

Les informations nécessaires à la demande de **visa** d'entrée au Sénégal sont disponibles sur le lien suivant : http://www.snedai.sn . Pour le processus de demande de visa, s'il vous est demandé de justifier votre hébergement, il vous faudra dans ce cas, vous adressez directement au service de l'hôtel de votre choix.

Conseils aux voyageurs

Veuillez vous reporter au niveau du site www.diplomatie.gouv.fr/fr/conseils-aux-voyageurs/conseils-par-pays/senegal-12357/

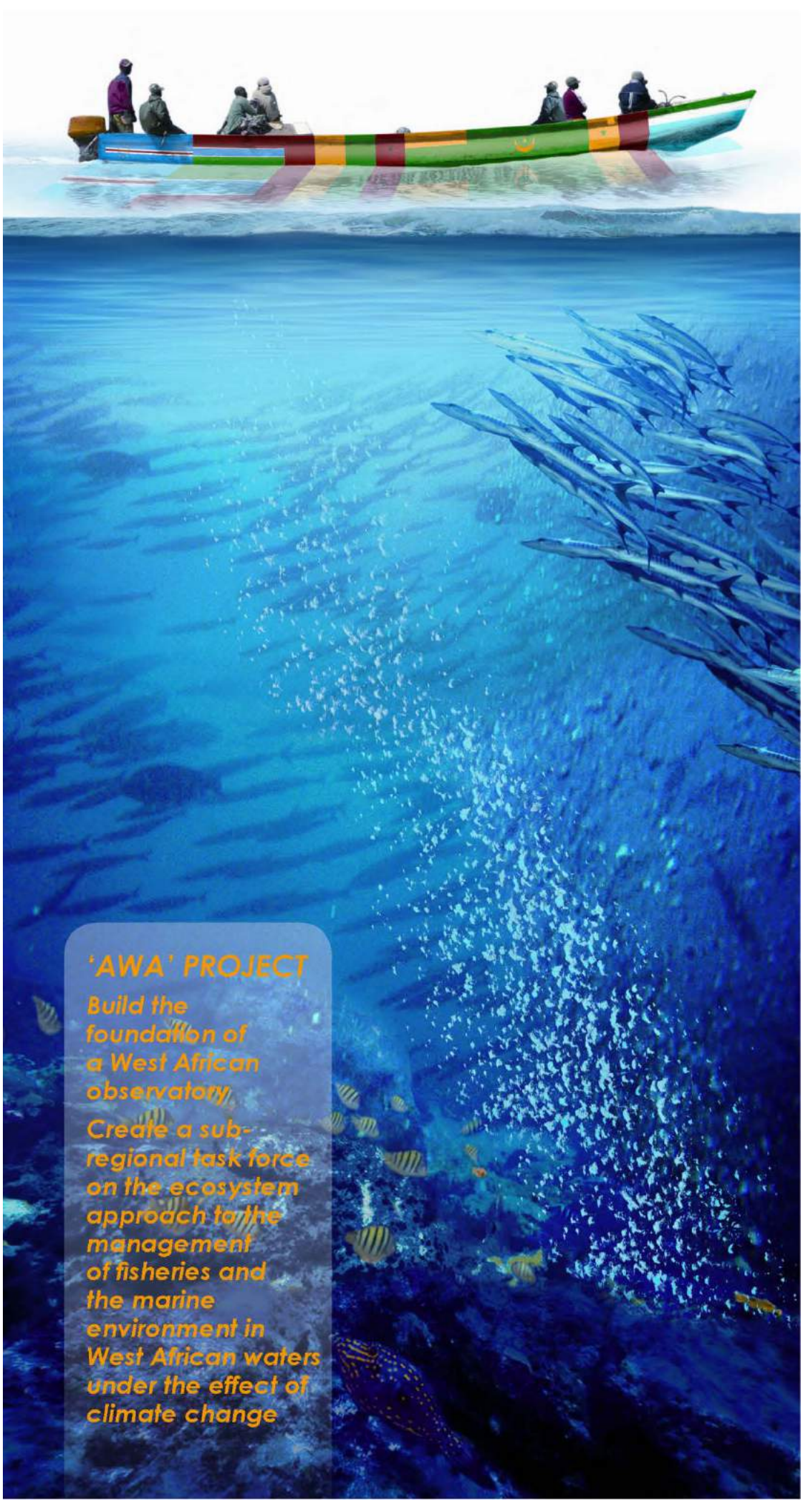
Autres informations

Des informations additionnelles seront disponibles et mises à jour sur les sites internet du projet www.awa-project.org et de la CSRP www.spcsrp.org

Dans l'espoir de vous accueillir sous le climat clément du Sénégal, pays de la « Téranga » (Bienvenue), au mois de décembre, veuillez agréer, **Mesdames, Messieurs**, l'assurance de ma considération distinguée.

Some pictures ICAWA 2014

S.E. Omar GUEYE, Minister of Fisheries and Marine Economy meets the press after the ICAWA opening.



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