



International Workshop AWA-PREFACE “Socio economic impact of climate change in West Africa: insight from modeling and questionnaires”

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The 17th February 2014,

*at the Sub Regional Fisheries Commission,
Dakar, Senegal*





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Program

Chair Jörn Schmidt (CAU, Germany) and Patrice Brehmer (IRD, France)

9h00: Welcoming and opening speech by SRFC.

Her excellence Marième Diagne Talla (CSRP)

9h15: Dr Jörn Schmidt (CAU)

Title: Socio-economic approaches to investigate artisanal fisheries in West Africa.

09h30: Key note Speaker: Pierre Auger (UMMISCO)

Title: Mathematical modeling of fishery: Effect of price variation.

09h45: Aliou Ba (IUPA-IRD-CRODT)

Title: Evolution of the small scale Senegalese fishery.

10h00: Timothée Brochier

Title: Cross-shore *Sardinella aurita* population structure: consequences for industrial and artisanal fisheries dynamics.

10h15: coffee break

10h30: Sidy Ly (UCAD-UMMISCO)

Title: A model of a multi-site fishery with variable price: Number of sites optimizing the total capture.

10h45 : Fulgence Mansal (UMMISCO)

Title: Control of a multi-site fishery model.

11h00: Mathieu Rouault (UCT)





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Title: Coastal Climate change and variability around Southern Africa.

11h15: Asberr Mendy (FD)

Title: Overview of Gambia fishery.

11h30 : Moustapha SALL

Title: Simulating the effects of Marine Protected Areas in Senegales coast.

12h00: Lunch break

13h00: Workshop about AWA PhDs (Asberr Mendy, Gambia) and (Aliou Ba Senegal)

14h00: Link with the EU project PREFACE

15h00: Opening discussion (round table)

16h15: coffee break

17h30: End of meeting, closing by Mika Diop

17h30-18h30: AWA Administration meeting





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Participants list

Senegal :

Hamady Diop (CSRP), Adama Mbaye (ISRA-CRODT), Aliou Ba (UCAD, IRD-CRODT), Fulgence Mansal (UCAD), Moustapha Sall (UCAD), Sidy Ly (UCAD), Mouhamadou Makhtou Seck (CSRP), Ismaïla Baldé (AIMS), Dienaba Beye Traore (CSRP), Amadou Oumar Toure (CSRP), Mika Samba Diop (CSRP), Abdou Khadir Diakhaté (CSRP), Marième Diagne Talla (CSRP).

Excused: Massal fall, Djiga Thiao and Mustapha Deme (ISRA-CRODT)

Gambia:

Asberr Mendy (FD).

France:

Patrice Brehmer (IRD-CRODT, AWA), Pierre Auger (IRD, Ummisco), Timothée Brochier (IRD-CRODT, AWA), Mathilde Vienne (IRD, AWA), Didier Jouffre (IRD-IFAN, Ecosym).

Excused : Philippe Estrade and Amadou Gaye (UCAD/ESP-LPAOSF)

Germany:

Joern Schmidt (CAU), Linda Kleenmann (CAU).

South Africa:

Mathieu Rouault (UCT).

Institutions:

CSRP, ISRA/CRODT, IRD, UCAD (ESP/LPAOSF and IFAN/Labep), AIMS, FD, CAU, UCT, UMMISCO, Lemar, Ecosym, ESP.





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Subject: Cross-shore *Sardinella aurita* population structure: consequences for industrial and artisanal fisheries dynamics.

Authors: Timothée Brochier, Pierre Auger, Philippe Estrade, Ismaïla Baldé, Patrice Brehmer.

Address: IRD UMR Lemar, BP1386 Dakar, Sénégal.

E-mail timothee.brochier@gmail.com

Small scale fisheries are a major part of the Senegalese socio-economic system, an heritage of a long fishing tradition. Although the techniques are artisanal (i.e. outboard motor, wooden canoe), the total amount of fish landed largely out-pass local industrial fleet, and is more or less equivalent to the foreign industrial fleet catch level. Round sardinella (*Sardinella aurita*) is one of the main small pelagic fish species exploited in Senegal. Round sardinella juveniles are found near the coast while mature fish are usually located offshore, a population structure that is typical to a number of others small pelagic fish species. The cross-shore structure of the coastal upwelling has been described analytically (Estrade, 2006) and displays three main regions with distinct levels of enrichment by nutrients, which determines primary production and thus small pelagic fish carrying capacity. The near shore area has the highest carrying capacity all the year round, while the mid-shelf and shelf break area display more seasonal variability. The offshore area has a poor carrying capacity. Industrial fisheries have legal limitations that prevent them to fish near the coast, and thus operate only offshore, where the mature fish are. By contrast, artisanal fisheries operate from the shore and suffer no legal restrictions, but the fishing costs increase with distance from shore. Therefore most of the artisanal fisheries efforts concentrate near shore, where the juveniles are. In this context, we propose a mathematical approach to model this complex system. A set of eight differential equations describe the evolution of (1) the fish population, structured in adults and juveniles; (2) the industrial fishing effort; and (3) the artisanal fisheries effort. The possible equilibriums between fish population and artisanal and industrial fisheries will be explored. The conditions for solution existence will be defined following the parameters of the systems as (1) the natural mortality and the catchability 'q' of the juvenile and adult fish, or (2) the costs of the fishing effort for artisanal and industrial fisheries.

References

Estrade P (2006) Mécisme de decollement de l'upwelling sur les plateaux continentaux larges et peu profonds d'Afrique du Nord-Ouest. These doctorat, Université de Bretagne Occidentale, Brest, France, 135pp.





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the intensification of the Agulhas Current on the ecosystem has not yet been studied and provides also a new paradigm to explain the observed changes in the marine ecosystem. Further north, Namibia and Angola water has considerably warmed up by up to 1.5 C. Such warming may be a symptom of an intrusion of low-nutrient, low-oxygen tropical water into the Benguela upwelling system and potentially having a detrimental effect on the marine ecosystem. Those regions are influenced by the variability of the Tropical Atlantic Ocean and warm events there are called Benguela Niños by analogy to the Peruvian El Nino. These warm events had a strong impact on the ecosystem when low-oxygen, nutrient-poor tropical water was advected into the upwelling system.

Subject: A model of a multi-site fishery with variable price: Number of sites optimizing the total capture.

Authors: Moustapha Sall, alassane Bah, Pierre Augier.

Address: UMI IRD 209 UMMISCO and UCAD

E-mail : taphasall@gmail.com

Experience has demonstrated the relevance of the use of marine protected areas (MPAs) as a management tool. However, it raises the question of what fraction of a marine region should be allocated to these areas to maximize catches, while ensuring the sustainability of the resource. Also, would it make more sense to protect a single large area rather than several smaller ones? In this paper, we present a simulation model designed with the GAMA platform. The model uses as input a map representing the Senegalese coast which we divide into multiple cells where a cell may be a reserve. We perform several simulations of this model with various parameters of size and number of MPAs and we note their impact on the density of fish and catches. From these simulations, we observe that catches at equilibrium admit a maximum for a certain percentage of area dedicated to marine protected areas.

Subject: Socio-economic approaches to investigate artisanal fisheries in West Africa

Authors: Joern Schmidt

Address: University of Kiel

E-mail : jschmidt@economics.uni-kiel.de





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In Africa, fisheries play an important economic, social and environmental role. Historically, in South Africa and other countries, research and data collection pertaining to the oceans mainly focused on exploited fish populations and their management. In recent years, however, uncertainty associated with effects of changing environmental conditions on marine ecosystems has prompted scientists to suggest the adoption of a precautionary approach with a shift in policy focus towards an ecosystem-based approach (Bottsford et al. 1997; Link, 2002; Pikitch et al. 2004). Although distant water fleets are currently a major pressure on stocks in West Africa and thus the local fisheries, global warming will be an important and likely irreversible additional pressure (Sumaila et al. 2011, Lam et al. 2012).

The main objective of the socio-economic work within the AWA and PREFACE projects is to understand the effect of climate change on small scale fisheries and coastal communities and to derive an understanding of the effect of uncertainty in projections and possible implications for management and fishing communities. The aim is to develop coupled ecological-economic models for key species and investigate perceived and realised threats for coastal fishing communities.

References

Bottsford, L.W., Castilla, J.C., and C.H. Peterson (1997). The management of fisheries and marine ecosystems. *Science*, 277: 509–515.

Lam VWY, Cheung WWL, Swartz W, Sumaila UR (2012). Climate change impacts on fisheries in West Africa: implications for economic, food and nutritional security. *African Journal of Marine Science*, 34(1)103-117.

Link, J.S. (2002). What Does Ecosystem-Based Fisheries Management Mean? *Fisheries* 27(4):18-21.

Pikitch, E.K., Santora, C., Babcock, E. A., Bakun, A., Bonfil, R., Conover, D. O., Dayton, P., Doukakis, P., Fluharty, D., Heneman, B., Houde, E.D., Link, J., Livingston, P., Mangel, M., McAllister, M., Pope, J. & K.J. Sainsbury (2004). Ecosystem-based fishery management. *Science* 305 (5682):346-347.

Sumaila UR, Cheung WWL, Lam VWY, Pauly D, and S Herrick (2011). Climate change impacts on the biophysics and economics of world fisheries. *Nature Climate Change*, 1:449-456.



Subject: Overview of Gambia fishery.

Authors: Asberr Mendy,

Address: Fisheries department, Banjul, Gambia

E-mail : asberr.mendy@gmail.com

No abstract



