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SCICOM Steering Group on Regional Sea Programmes

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First Interim Report of the Working Group on Comparative Analyses between European Atlantic and Mediterranean marine ecosystems to move towards an Ecosystem-based Approach to Fisheries (WGCOMEDA)

1–4 April 2014

Barcelona, Spain

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CIEM Conseil International pour l'Exploration de la Mer

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Executive summary

The 'Working Group on Comparative Analyses between European Atlantic and Mediterranean Ecosystems to move towards an Ecosystem-based Approach to Fisheries (WGCOMEDA)' is intended to be a collaborative platform of research with scientists form the Atlantic and Mediterranean working at different levels from population, through community to ecosystem level. The group was established in 2014 and works in cooperation with other groups within the ICES SCICOM Steering Group on the Regional Seas Programme (SSGRSP) such as ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea (WGIAB). The group (Chaired by Marta Coll, France, and Hilmar Hinz and Manuel Hidalgo, Spain) met for the first time in Barcelona, Spain, 1–4 April 2014, with 20 scientists from European Atlantic and Mediterranean countries attended the meeting (Denmark, France, Germany, UK, Greece, Italy, Spain).

The overall objective of this first-year meeting was to frame the work to be developed by WG. Thus, the group focused on identifying key sensitive ecological processes (from species and population processes, thorough interspecific relationships, to trophic flows) to climate variability and fishing impact on Atlantic and Mediterranean ecosystems. Our first approach, while not restrictive, was to focus on forage fish species in a broader sense, including benthic, demersal and pelagic fish that are prey of upper trophic level predators, and transfer a large proportion of energy in the ecosystems.

The meeting was structured around discussing three main topics:

1) **Key population traits and dynamics of forage species affecting community and ecosystem functioning.** The discussion of the group circulated around the portfolio effect and how to apply it to the demersal compartment of forage species. The group will investigate potential influence of the functional diversity and environmental heterogeneity across geographic gradients.

2) **The resilience – resistance trade-offs at different levels of biological organization (population-community-ecosystem) of forage fish.** The group discussed different keystones to investigate resilience and resistance variations across communities and ecosystems. First, the group discussed to use trait-based analyses to develop a functional description of the forage fish communities that can be used to measure the degree of resilience/resistance of communities. Second, the group discussed how to integrate this vulnerability of species within available ecosystem models to estimate the degree of resilience/resistance of ecosystems.

3) **Biodiversity and ecosystem traits changes at regional scales.** The group first discussed the ecological role of forage fish. To do that the group agreed in investigating the role of forage fish on the abundance, growth and condition (e.g. weight-at-age) of large marine predators, including gadoid species, marine mammals and seabirds. Second, the group discussed how to investigate the relationship between ecosystems and community traits to evaluate how universal and context-specific these relationships are.

The group defined objectives for next year that mainly focus on compiling the information needed to test the scientific questions and perform the planned analyses for the three aforementioned topics. Having set this basis, the group agreed to meet in May 2015 in Palma de Mallorca.

1 Administrative details

Working Group name

WGCOMEDA – Working Group on Comparative Analyses between European Atlantic and Mediterranean Ecosystems to move towards an Ecosystem-based Approach to Fisheries

Year of Appointment

2014

Reporting year within current cycle (1, 2 or 3)

1

Chair(s)

Marta Coll, France

Manuel Hidalgo, Spain

Hilmar Hinz, Spain

Meeting venue

Institute of Marine Sciences (ICM, CSIC) Barcelona, Spain

Meeting dates

1–4 April 2014

Participants group photo of the WGCOMEDA meeting in Barcelona (ICM, CISIC). From the upper left to the right back row: K. Tsagarakis, J. Navarro, I. Catalán, J. Otero, H. Hinz, M. Lindgren, C. Möllmann, M. Hildago, J. Claudet, and J. Steenbeek. Front row from left to right: M. Coll, M. Giannoulaki, I. Palomera, A. Muntadas, C. Peroddi, S. Heyamns, F. Le Loch.

2 Terms of Reference a) – d)

ToR	Description	Background	Science Plan topics addressed	Duration	Expected Deliverables
A	Provide a **comparative synthesis** of current understanding, data and tools available to move towards an ecosystem-based approach in Atlantic and Mediterranean European Seas.	a) The ToR requires an integrated view on what are the drivers and functions shaping marine ecosystems in both seas (Atlantic and Mediterranean), in addition to data available and methodologies used to date. b) This ToR requires a broad knowledge on the topic for all specific regions from the different scientists attending the WG. c) ToR A will benefit from the attendance of scientists from other WGs from SSGRSP such as WGIAB, WGEAWESS or WGINOSE. c) ToR also requires a good coordination with other WGs of other institutions carrying out parallel work on EAF such as SFTEC – EAF, INDESEAS initiatives, CREAM EU FP7 action.	1.1	Year 1	**1.1.** First section of Working Document synthesising available information, highlighting challenges in data and methodological approaches for each sea.
B	Identify key **sensitive ecological processes** (from species and population processes, thorough interspecific relationships, to trophic flows) to climate variability and fishing impact in Atlantic and Mediterranean exploited ecosystems.	a) The ToR requires the participation of experts with a good knowledge on ecological processes in both seas. b) ToR B will benefit from the attendance of scientists from other WGs from SSGRSP such as WGIAB, WGEAWESS or WGINOSE.	1.2	Year 1	**2.1**. Second section of the working document synthesising available information and sensitive ecological processes in each sea. **2.2**. Design the analyses to be performed in the next future (ToR C)

C	Analyse the **role of climate and fishing** drivers to explain the potential commonalities and differences in structural and functional ecosystem properties using results from both available indicators and models.	a) The ToR requires the access to datasets and previously developed analysis and models to perform further analysis and integration of data. b) ToR also requires a good coordination with other WGs of other institutions carrying out parallel work on EAF such as SFTEC – EAF or INDESEAS initiatives.	2.1	Year 2	**3.1.** Implementation of analyses. **3.2.** Comparative synthesis of results. **3.3.** Paper with both a reviewing and an analytical component.
D	Identify how **knowledge gained in previous and current work at different seas can provide feedback** among regional systems to improve the scientific support for an integrated assessment of the Mediterranean and Atlantic regions for ecosystem approaches to science and management.	a) Outreach of this ToR will be provided in close collaboration with SFTEC – EAF WG ('*Linkages to other committees or groups*' bellow) and other WGs from SSGRSP such as WGIAB, WGEAWESS or WGINOSE.	3.1	Year 3	4.1. Document to be disseminated to several management and assessment institutions and agencies in Europe.

3 Summary of Work plan

YEAR 1	1.1 Comparative synthesis of current data and tools available to move towards an ecosystem-based approach in Atlantic and Mediterranean European Seas The first step will aim at providing a review of all the data available and all the methodologies used in regional seas to present an accurate state-of-the-art to advance science for EAF to be used as a white document of the WG. This work needs to be performed in close collaboration with complementary initiatives already in place such as the ones lead by SFTEC – EAF WG, IndiSeas initiative, or CREAM EU FP7 action. 1.2 Identify sensitive ecological processes to climate variability and fishing impact in both Atlantic and Mediterranean exploited ecosystems The success of EAF measures relies on an effective assessment and management of the most sensitive ecological processes to be potentially affected by fishing and/or climate. This work will be performed using a comparative platform of research including Atlantic and Mediterranean systems. The group will identify key sensitive processes at the species and population level, thorough interspecific relationships, to trophic flows. The outreach of this review will complement the work document to be provided after the first year of WG. During this first year we will also plan the analyses to be performed during Year 2 in order to provide the opportunity to the WG participants to prepare before the second meeting in 2015.

YEAR 2	2.1. Analyse the role of climate and fishing drivers to explain the potential commonalities and differences in structural and functional ecosystem properties using results from both available indicators and models, The group will use the knowledge obtained during the first year to specifically analyse those sensitive ecological processes previously identified and assess the role that climate and fishing play in driving them. Results should lead to the development of a publication with both a review and an analytical component.
YEAR 3	3.1. Identify how knowledge gained in previous and current work in other seas can provide feedback among regional systems to improve the scientific support for an integrated assessment of the Mediterranean and Atlantic regions for ecosystem approaches to science and management. During the third year the WG participants will produce an integrative synthesis of all the knowledge gain by the group that can improve the effectiveness of EAF. The group will emphasize the feedback of knowledge between regions in the Atlantic and Mediterranean Sea. The group will provide a document to be disseminated to all the management and assessment institutions in Europe. This work needs to be performed in close collaboration with SFTEC – EAF WG ('Linkages to other committees or groups' bellow) and other WGs from SSGRSP such as WGIAB, WGEAWESS or WGINOSE to avoid work overlapping.

4 Supporting information

The 'Working Group on Comparative Analyses between European Atlantic and Mediterranean marine ecosystems to move towards an Ecosystem-based Approach to Fisheries (WGCOMEDA)' aims to investigate and improve the EAF of European Seas.

Moving forward from analytical and theoretical EAF to an efficient and applied management of marine living resources based in the ecosystem knowledge is the main challenge of marine and fisheries ecologists in the 21st century. This needs an intensive effort of integrating knowledge from different ecosystems and approaches to link the ecosystem knowledge to the assessment procedures. The degree of success of such integrative procedures is inherently linked to capability to identify the more sensitive species and/or ecological processes to be managed within the ecosystem dynamics, and thus assessing their potential responses to exogenous forcing.

There are important challenges to deal with EAF in both the Mediterranean and Atlantic areas, and different ways of approaching the challenges in both regions. But since they are partially in European Seas we should have an integrated view on what the drivers and functions shaping ecosystems in both seas are, and what is common or specific from each region. This working group aims at generating comparative knowledge of processes and knowledge in both regions to inform EAF. It also aims to strengthen the scientific basis for regional and integrated ecosystem approach through a comparative platform of research.

A comparative approach of marine ecosystems is essential to learn how Mediterranean and Atlantic ecosystems are structured, how they function, and which are the more sensitive species or ecological processes to be managed within the ecosystem dynamics. This working group will investigate common processes and scientific challenges to contribute to the comparative knowledge of both systems within the context of regional European Seas.

5 List of Outcomes and Achievements of the WG in this delivery period

As this is a new working group and this was the first working group meeting the working group has as yet not produced outcomes. However, the group has submitted an abstract to the ICES ASC 2014 (Session N) entitled "The ICES Working Group on Comparative Analyses between European Atlantic and Mediterranean marine ecosystems – a new effort towards developing Ecosystem-based Fisheries Management (WGCOMEDA)" and authored by all the participants to the first meeting of WGCOMEDA: M. Hidalgo, M. Coll, H. Hinz, I. C. Catalán, J. Claudet, M. Demestre, M. Giannoulaki, J. J. Heymans, F. Le Loch, M. Lindegren, C. Möllmann, A. Muntadas, J. Navarro, P. Olivar, J. Otero, I. Palomera, C. Piroddi, J. Steenbeek, K. Tsagarakis and other WGCOMEDA participants.

6 Progress report on ToRs and workplan

With respect to the terms of reference the WG started to **identify key sensitive ecological processes ToR B** that would be investigated with respect to **climate variability and fishing ToR C**. The key sensitive ecological component that was identified as a starting point for a **comprehensive system comparison ToR A** between Atlantic and Mediterranean ecosystems was, after expert opinion of the Co-Chairs, decided to be forage fish species. The term forage species was defined relatively broadly as small fish that are highly abundant and can therefore be considered as of key importance to maintaining ecosystem functioning and productivity. The WG definition of forage fish is not only related to pelagic species but would also include demersal fish species as well. As Atlantic and Mediterranean ecosystems may be differently structured with respect to forage fish community differences in the response to climate and fishing stressors may be expected. Within the context of forage fish three subtopics have been identified that will be led by the three Co-Chairs.

a) Key population traits and dynamics of forage species affecting community and eco-system functioning (Lead: M. Hildalgo). Within this context it was discuss to use the portfolio effect to investigate the roles of forage species across Atlantic and Mediterranean regional seas. Within this subtopic the WG aims to investigate the link between population indicators and life-history traits of forage species, and traits and characteristics at community level. The objective is to evaluate both general and system-specific patterns that influence the forage species compartment in the ecosystem.

The WG is aiming to approach this subtopic by analysing the Portfolio effect of forage fish for different regional seas and compare these accordingly. Species-rich communities are thought to be temporally more stable as the complementary or independent dynamics among populations stabilizes the ecosystem. This dampening of the variance within communities is referred to as a portfolio effect and is analogous to the effects of asset diversity on the stability of financial portfolios. We are thus interested in both mean values and variability across time-series of forage fish (i.e. coefficient of variation) in both Atlantic and Mediterranean systems. We will aim with this analysis to highlight general and system-specific patterns of the influence of the forage species compartment in the community structure and dynamics. The Portfolio effect can also be used to highlight resilience or vulnerabilities of a system to stressors such as climate change and overfishing. Additionally variance tests for synchrony and asynchrony of time-series variation have been suggested as another possible indicator to analyse in

conjunction with the Portfolio effect. The Portfolio effect may be further related to environmental variables or stressors in the different systems as well as to other indicators e.g. ecosystem traits.

As a first step to progress with this type of analysis it is planned to create a traits database relevant to the identification of forage fish and for the later trait related analysis. In a second step the group will analyse time-series from different regional seas supplied by the participants with respect to the Portfolio effect and in a final step these data will be synthesized in a comparative approach among regional seas. Thus far it was decided to limit the time frame of time-series most likely starting from 1993–1994. As there are differences in the sizes of regional seas datasets these will need to be weighted according to the size of the sampling area within the analyses.

b) Investigating the resilience – resistance hypothesis at different levels of biological organization (population-community-ecosystem; Lead: H. Hinz). The aim of this subtopic is to compare forage fish communities with respect to their resilience to environmental change across the regional seas. Overfishing, impacts of fishing on habitats and climate change may affect different the forage fish community differently depending on its specific composition. Both Mediterranean and North Atlantic are differently structured possibly making faunal components more or less resilient to environmental change.

The group discussed different approaches to investigate resilience and resistance variations across communities and ecosystems. First, the group discussed to use trait-based analyses to develop a functional description of the forage fish communities that can be used to measure the degree of resilience/resistance of communities. Second, the group also discussed how to integrate this vulnerability of species inside the ecosystem models to simulate and estimate the degree of resilience/resistance of ecosystems to different types of disturbance. Furthermore, it was discussed if time-series analysis could be used to test resistance and resilience of the forage fish communities using known stressor events. A biomass reorganisation indicator analysis was suggested as a possible way forward. The group finally decided that as a first step the descriptive approach using traits data would be the most appropriate. Especially since this type of data would be a prerequisite in many ways for both ecosystem modelling and time-series analysis. It was further decided that in parallel the group would investigate how best to approach ecosystem modelling and time-series analysis to progress this topic.

During the meeting it surfaced that many participants are also interested in comparing benthic ecosystems across regional seas within the context general community descriptors and traits and with respect to resilience. It was decided that in parallel with the forage fish work the development of a benthic component within the working group will be developed.

c) Biodiversity and ecosystem trait changes at regional scales (Lead: M. Coll). This subtopic aims to analyse changes of diversity, at regional scales, using species, community and ecosystem traits (including species richness, abundance, functional and trophic diversity) and relate them with environmental and anthropogenic divers. Analysis will be developed spatially (between areas/regions comparisons) and temporally to understand changed in space and time. The aim is to find common patterns of change in both Mediterranean and Atlantic systems, and also identify regional specificities. We will use ecological indicators at the species to ecosystem level, and considering indicators proposed in different frameworks such as the MSFD (at European level) and IndiSeas project (at global level).

The WG decided that within this subtopic to first assess the role of forage fish at maintaining higher trophic level. Moving from single-stock assessment evaluations to the idea of an ecosystem approach to fisheries that ensures the overall health of the ecosystem it is vital have a sound understanding of trophic linkages between the key ecosystem components. Within this context the question which has remained largely unanswered is if forage fish are fished at recommended single-stock MSY will predatory species have enough prey to eat to maintain healthy populations. In many instances we are missing information on key predation-prey relationships. The group assessed how best to tackle this question and it was decided that purely looking at abundance data of top predator might not be an adequate indicator of population health. Other indicators were suggested as being more appropriate such as the role of forage fish on the growth and condition (e.g. weight-at-age) of large marine predators including gadoid species, marine mammals and seabirds. Second, the group also discussed how to investigate the relationship between the ecosystems traits and the community traits to evaluate how universal and context-specific are these relationships. Data-analysis and modelling tools will be used in a second phase to analyse the initial results of this topic and investigate the functional responses between preys and predators.

- *Cooperation with other WG*

The working group has established contact to the following working groups: ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea (WGIAB) and ICES Baltic Fisheries Assessment Working Group (WGBFAS) and is in the process in securing collaboration with Working Group for North-east Atlantic Continental Slope Survey (WGNEACS) among others.

- *Cooperation with Advisory structures*

The WG has secured the official support from the General Fisheries Commission for the Mediterranean (GFCM). Furthermore GFCM sees the COMEDA group as a possible vehicle to ask specific scientific questions with respect to the overarching theme of the WG. Following the memorandum of understanding that exist between the two organizations, the WG can develop as an important vehicle in perusing this collaboration between both ICES and GFCM by both organizations.

7 Revisions to the work plan and justification

Thus far nothing to report.

8 Next meetings (Interim reports only)

The next meeting will take place in May 2015 in Palma de Mallorca, Spain.

Annex 1: List of participants

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Annex 2: Recommendations

Recommendation	Adressed to
1. WGCOMEDA will acknowledge the collaboration and data accessibility of other ICES experts and regional groups, as well as ICES Data centre, in order to succeed in the ToRs and specific objectives.	SCICOM/ACOM Steering Group on Integrated Ecosystem Assessments (SSGIEA), and ICES Data Centre.

Annex 3: Agenda

ICES Working Group on Comparative Analyses between European Atlantic and Mediterranean marine ecosystems to move towards an Ecosystem-based Approach to Fisheries

(ICES WGCOMEDA)

Barcelona, Spain, 1–4 April 2014

Institute of Marine Sciences (IIM, CSIC)

Tuesday 1/04/14

9.00. Arrival of participants

9.30 – 10.00. **Welcome, practical information and revision of the agenda** (Marta Coll, Manuel Hidalgo, and Hilmar Hinz)

10.00 – 10.30. **Framework, objectives and ToRs of WGCOMEDA** (Hilmar Hinz

10.30 – 11.00. Coffee break

11.00 – 12.00. **Description of topics to be approached by the group.**

- *Topic 1: Key population traits, dynamics and roles of forage species investigated at the population, community and ecosystem level (Manuel Hidalgo)*
- *Topic 2: Investigating the resilience – resistance hypothesis at different levels of biological organization (population-community-ecosystem; Hilmar Hinz)*
- *Topic 3: Biodiversity and ecosystem trait changes at regional scales (Marta Coll)*

13.30 – 14.30. Lunch

14.30 – 16.00. **Description of data available and potentially available**

16.00 – 16.30. Coffee break

16.30 – 18.00. **Focused discussion on Topic 1**

- Clear definition of feasible objectives on the basis of the available data
- Potential parallel works within the topics
- Suggestion of potential analyses
- Expected findings

Short summary and definition focused questions to be discussed next day

Wednesday 2/04/14

09.00 – 10.30. **Final discussions on the topic 1: summary of agreements, work to be developed, timing and definition persons in charge**

10.30 – 11.00. Coffee break

11.00 – 13.30. **Focused discussion on Topic 2**

- Clear definition of feasible objectives on the basis of the available data
- Potential parallel works within the topics
- Suggestion of potential analyses
- Expected findings

13.30 – 14.30. Lunch

14.30 – 16.00. **Final discussions on the topic 2: summary of agreements, work to be developed, timing and definition persons in charge**

16.00 – 16.30. Coffee break

16.30 – 18.00. **Focused discussion on Topic 3**

- Clear definition of feasible objectives on the basis of the available data
- Potential parallel works within the topics
- Suggestion of potential analyses
- Expected findings

Thursday 3/04/14

09.00 – 10.30. **Focused discussion on Topic 3**

- Clear definition of feasible objectives on the basis of the available data
- Potential parallel works within the topics
- Suggestion of potential analyses
- Expected findings

10.30 – 11.00. Coffee break

11.00 – 13.30. **Final discussions on the topic 3: summary of agreements, work to be developed, timing and definition persons in charge**

13.30 – 14.30. Lunch

14.30 – 18.00. Planning of papers, tasks and working groups

- Planning of abstract to submit to ICES ASC 2014
- Presentations of participants

Friday 4/04/14

09.00 – 10.30. **Wrapping-up of the main agreements and work to be develop during the coming year for each topic**

10.30 – 11.00. Coffee break

11.00 – 13.00. **Report preparation**

13.00. **Meeting closure and lunch**