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**Authors:**

**Rachel Tiller**
NTNU
E-mail :
rachel.tiller@svt.ntnu.no

**Murat Van Ardelan**
NTNU
E-mail :
Murat.v.ardelan@ntnu.no

**Gunnar Bratbak**
UBERGEN
E-mail :
Gunnar.Bratbak@uib.no

**Juan-Carlos Molinero**
GEOMAR
E-mail :
jmolinero@geomar.de

**Can Bizsel**
DEU-IMST
e-MAIL:
kcbizsel@gmail.com

**Robert Thorpe**
CEFAS
e-MAIL:
robert.thorpe@cefas.co.uk

**Russell Richards**
Griffith University
e-MAIL:
r.richards@griffith.edu.au

**OCEAN CERTAIN**
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**Deliverable 4.9**
Report of Meeting with other projects

**WP's leader: University of Bergen**
**Task leader: NTNU**

**Principal investigators:**
*Rachel Tiller*, **NTNU**(N)

**Project's coordinator:**
*Yngvar Olsen,* **NTNU** (N)

## 1. Introduction

Deliverable D4.3 reflects on the

Consilience: In OCEAN-CERTAIN Consilience is understood to be the interdisciplinary activity of linking together of data, information and scientific principles from the social and natural sciences, giving it an added value surpassing that of the individual disciplines. The Consilience element of OCEAN-CERTAIN requires that the experts in different disciplines and sectors (including invited experts outside of the consortium) work together consistently within a framework of pre-defined tasks, in a planned, continuous and systematic way. This approach cuts across disciplinary language barriers and links principles and knowledge across disciplines/sectors on defined tasks at a work package level.

Consilience is a term first minted by the English scientist and philosopher William Whewell in 1840 to denote a "coming together" of different strands of evidence pointing to the same conclusion, and therefore increasing confidence in it. Its relevance for Ocean-Certain is that an integration of approaches from different disciplines in the natural and social sciences can produce a holistic analysis of the behavior of the food web and biological pump, and of their impact on ecosystem goods and services of benefit to society which is more credible and valuable than any single discipline considering the overall problem from its standpoint alone.

## 2. COLLABORATIONS & MEETINGS WITH OTHER PROJECTS

### 2.1 ICE-ARC

Both NTNU and GEOMAR collaborate closely with the EU FP7 funded project ICE-ARC (Ice, Climate, Economics- Arctic Research on Change).

GEOMARs collaborations are with the Greenland Institute of Natural Resources (GINR). GINR is a partner institution in ICE-ARC which, similar to Ocean Certain in structure and focus, is a transdisciplinary project investigating the effect of climate change on Arctic ecosystems. Collaboratively with colleagues at GINR, Mark Hopwood at GEOMAR investigates how increased meltwater fluxes from the Greenland Ice Sheet are affecting the biogeochemical cycles of macro and micro nutrients in coastal waters and how this is likely to impact marine ecosystems.

Ocean Certain has conducted fieldwork in a high latitude fjord (Patagonia, Chile) and within the vicinity of Arctic glaciers (Svalbard, Norway). Both of these field sites are examples of water bodies where climate change is, by affecting fresh water fluxes into the near-shore environment, resulting in direct changes to multiple chemical and physical parameters simultaneously. Increasing freshwater runoff in these high latitude environments is directly affecting salinity, temperature, turbidity, pH, dissolved organic carbon, macronutrients and trace metal concentrations in enclosed coastal waters. These changes are much more extreme in magnitude than the effects of climate change on the open ocean. The fjords of Greenland are similarly impacted by increasing freshwater fluxes, but the effect on chemical and physical parameters is much greater than that observed in Svalbard due to the high, increasing runoff volumes delivered into Greenland's fjords within a relatively short annual melt season.

A huge advantage of working with colleagues at the GINR is that they have extensive, comprehensive monitoring programs in both terrestrial and marine environments around Greenland. Ongoing work at GINR includes monthly monitoring of a large west Greenland fjord system. This long term dataset is complementary to the mesocosms and multiustressor experiments performed by Ocean Certain as it allows quantification of the rate at which climate change is affecting coastal biogeochemical cycles. Combining the results of our high-latitude Ocean Certain fieldwork, mesocosms and multistressor experiments with longer term observations in Greenland we will be able to quantify how increasing freshwater input into the Arctic affects nutrient biogeochemistry and in turn assess what impact this is likely to have on coastal and marine eocsystems.

The NTNU collaboration are both at a managerial and project level. At the managerial level, contact has been ongoing with the leaders of both projects, and currently, attempts to collaborate more closely have been made. During the General Assemblies and meetings in 2015, the two projects are planning on attending each other's meetings and present each other's` results and experiences to each other. The projects also talk on social media, most specifically on Twitter. Experiences are shared freely between the participants.

At the project level, the SINTEF branch of ICE-ARC and the Ocean-Certain NTNU group are collaborating on a project proposal for the Research Council of Norway for the program KLIMAFORSK on a related project where the results of each project are built upon, and the focus will be on the Antarctic, as it complements both projects. The name of the proposal is CLIMANT, and is due on September 9th 2015.

***2.2* COMPARE (Impact of climate variability on zooplankton community structure and function in estuarine ecosystems) is funded by the Portuguese national funding agency for science, research and technology (FCT).**

GEOMAR collaborates with Portuguese colleagues to investigate the long term changes of hydrographic conditions in the Ibearian coast and their impacts on the pelagic food webs. These results are of interest for OCEAN CERTAIN as the major climate drivers affecting the Iberian coast, i.e. North Atlantic Oscillation and Atlantic Multidecadal Oscillation, also shape interannual and decadal variations in the marine ecosystems of the Mediterranean and Arctic Seas. A first manuscript deciphering underlying causes in the strength of interactions climate-plankton is in the second review in PLOS ONE. Current activities are the preparation of a second manuscript where the aim is to model the pelagic food web in the framework of contrasting regimes of climate forcing. The manuscript is planned to be finished by the end of October 2015.

## *2.3 MED-JELLLYRISK is funded by the ENPI-CBC MED (new European Neighbourhood Policy, Cross-border Cooperation in the Mediterranean Sea).*

The project target trophic and socio-economic risks of jellyfish outbreaks in the Mediterranean Sea under mounting anthropogenic and climatic impacts. GEOMAR has therefore developed close collaboration to model long term data of jellyfish in the Mediterranean Sea. In particular with the Tunisia team who has made available their long term jellyfish data of the southern Mediterranean coasts, the less known area in the Mediterranean basin. Current activities include the preparation of a manuscript on Pelagia noctiluca (Decadal changes of Pelagia noctiluca unveil

warming effects in the southern Mediterranean Sea). This species is probably the most studied jellyfish in the basin, but little is known in the long term changes in the southern coasts of the Mediterranean basin, which are likely the most vulnerable to climate change and anthropogenic stress. The manuscript is planned by early October 2015.

### *2.4 BALTIC SEA*

Collaboration has been established with the Institute of Marine Research, Swedish University of Agricultural Sciences (Professor Michele Casini, scientific responsible of the Swedish component of the Baltic International Trawl Survey headed by the ICES) and GEOMAR as well. Prof. Casini has made available the long term data of Baltic Sea pelagic food web. These data will be analyzed in a common framework with the other European Seas (North, Mediterranean and Black Seas) to quantify changes in pelagic food webs and to identify potential risks European ecosystems face in future scenarios of enhanced warming and anthropogenic pressures.

### *2.5 TAIWAN*

GEOMAR collaboration has also been established with the National Taiwan Ocean University (NTOU), Prof. Jiang-Shiou Hwang, who has made available the long term food web data collected in the East China Sea. Likewise the Baltic and North Seas, the East China Sea has been presented in the General Assembly and past meetings of OCEAN-CERTAIN as a complementary ecosystem to the target sites (Patagonia, Artic and Mediterranean Seas) providing long term field observations to assess multiple stressors in food webs.

Current activities consist in data mining focusing in deciphering the strength of climate influence on key components of the food web (phytoplankton, copepods and fish larvae) and to provide a global quantitative picture of the interactions climate-hydrology-food web. A first manuscript is under review in Fisheries Oceanography, and a follow manuscript is planned to be submitted by the end of August.

### *2.6 BIOACID II*

BIOACID II, funded by the Germany Federal Ministry of Education and Research (BMBF), aims at assessing future biological responses to ocean change, in particular acidification and warming, and their possible socio-economic consequences. Ulrich Sommer leads the pelagic consortium, which focus on ecological, biochemical and evolutionary responses of plankton to mounting acidification.

Experimental data from this project will be included in a general data set, currently under preparation, that will be provided to WP2 to feed the population dynamic matching model (PDMM) that will be used to investigate the impacts of CO2 on the food web. The work will be carry out by CEFAS (A. Rossberg & A. Farcas) as output of WP2.

### *2.7 CINTERA*

The RCN (Research Council of Norway) project CINTERA has been the growth phase of the collaborations between several of the members of OCEAN-CERTAIN, and the socio-economic workpackage of OceanCertain relies on the methodologies developed in this project and builds heavily upon it.

### *2.8 WGCOMEDA (ICES Working Group on Comparative Analyses between European Atlantic and Mediterranean marine ecosystems to move towards an Ecosystem-based Approach to Fisheries)*

This working group aims to investigate and improve the Ecosystem-based Approach to Fisheries of European Seas. Cooperation has been developed with this working group (Chair Dr. Manuel Hidalgo) to investigate under a common framework how Mediterranean and North Atlantic ecosystems have been affected by enhanced anthropogenic pressure (i.e. fisheries) and warming in the last decades. Current activities consist in the analysis of underlying mechanisms of ecological shifts recorded in both ecosystems during the last decades.

### *2.9 A.I. CLIMATE*

The RCN (Research Council of Norway) project A.I. CLIMATE served as the initial research sphere in which an App was created for stakeholder workshops, the App2Adapt. This app was tested in the CINTERA project (2.7) and has been refined and will be tested in an enhanced version during OceanCertain as well.

### *2.10 SPICOSA*

EU-FP6 - SPICOSA - Science and Policy Integration for COastal System Assessment (2007-2011)-Funding: EU 6th Framework Program. WP leader Model Support Work package. Architecture Model Library. Component-based modelling. This project uses the same software we use for OCEAN-CERTAIN (ExtendSim) and is based on a system dynamics approach.

### *2.11 Blueprint for a System Dynamics Model of Flanders (2015)*

OCEAN CERTAIN also builds on this project, commissioned by the Flemish Environment Agency (VMM-MIRA). This project builds on the experience of the feasibility study carried out in 2013, this project is aimed at developing a System Dynamics Model of Flanders, Belgium. The model is to describe the key feedback mechanisms between the demography, economy and environment of the region for the years 2010-2050. This project also uses the same software we use for OCEAN-CERTAIN (ExtendSim) in WP5 DSS and is based on a system dynamics approach.

### *2.12 DEVOTES [DEVelopment Of innovative Tools for understanding marine biodiversity was and assessing good Environmental Status] Grant agreement no: 308392.*

DEU-IMST is partner in this project, which was supported within the theme [ENV.2012.6.2-3] Innovative Tools for Understanding and Assessing Good Environmental Status (GES) of Marine Waters ('The Ocean for Tomorrow'). One of the WPs in this project focuses specifically on

Human Pressures and Climate Change which feeds into or related to OC work of DEU-IMST in Turkey.

### *2.13 MicroPolar*

University of Bergen is involved in the NRC Polar Program funded project MicroPolar (RCN: Polar Program. Project Number 225956/E10), which together with Ocean Certain conducted a joint experiment at the Marine Lab in NyÅlesund / KingsBay in June-July 2015. The aim of our field experiment was to improve our ability to predict the effects of climate related changes on marine microbial food webs in the Arctic. The mesocosm experiment in Kings Bay in 2015 was part of the Arctic field campaigns and experimental studies conducted by the MicroPolar project to investigate the structure and function of the microbial food web. In addition, it wasone of the mesocosm experiments planned by the Ocean Certain project for different regions (Arctic, Antarctic and temperate) to study the combined effect of climate drivers on the marine food web.

### *2.13 "Fisheries and Environmental Integration"*

Fisheries and Environmental Integration is a DEFRA UK Govt project MF1225 which CEFAS works on that is doing related work to OCEAN-cERTAIN. Both are concerned with the ecosystem aspects of fisheries management and with the joint effects of environmental and fisheries induced changes.