

II –Coastal areas, marine biodiversity and fisheries

Parallel session C – Tuesday 11th March 11:00-12:30

ID N°: [55]

Title: **SEX AT THE EDGE - HOW CLIMATE CHANGE INFLUENCES SEXUAL SELECTION**

Authors: [Nuno Monteiro](#)¹; Natividade Vieira²; Agostinho Antunes³; Adam Jones⁴

Institutions: ¹CIBIO (Research Centre in Biodiversity and Genetic Resources); ²FCUP (Faculty of Sciences of the Porto University); ³CIIMAR (Interdisciplinary Centre of Marine and Environmental Research); ⁴Texas A&M University

Despite the recent surge of attention, the effects of global warming on selective processes remain largely unpredictable. For instance, warming temperatures can be hypothesized to have positive fitness consequences when allowing for extended mating periods resulting in surviving offspring. Alternatively, they might severely impact populations when breeding dates become asynchronous with the emergence of food resources. Although several examples of the impact of global warming in species reproduction are becoming available, we seem still far from being able to produce solid predictive scenarios, namely those related with reproductive patterns and the expression of sexual selection.

Based on the last three decades of coastal seawater surface temperatures, gathered from a range of latitudes encompassing the sex-role reversed worm pipefish geographical distribution, we hypothesize that the pressure of sexual selection should not linearly covary with latitude but instead be heightened near both edges of distribution, where the breeding season is severely constrained by extensive periods of either high or low water temperatures. Data from populations scattered along the species' distribution corroborate our predictions showing that edge-of-range populations display an increased expression of secondary sexual characters, albeit in slightly different ways, but all correctly translating heightened investments in reproductive episodes. Contrasting with the "u-shaped" distribution of sexual selection intensity, sexual size dimorphism denotes a negative relationship with latitude implying that forces other than sexual selection might be accounting for the increasing similarity in male and female length as we move further north.

Given the projected climate change scenarios, it seems reasonable to assume that when a species, such as the worm pipefish, becomes unable to shift its entire distribution northwardly (i.e. the rate of contraction in the south is no longer counterbalanced by the rate of expansion in the north), we will potentially witness the progressive erosion of the "northern branch" of sexual selection intensity. Given that the molecular basis and behavioural mechanisms supporting the expression of sexual selection are not necessarily symmetrical between the edges of a species' distribution, then climate change will certainly not only contribute to a loss of biodiversity but will overtly impact the most bizarre sex-linked phenotypes emerged from within the cold.

Presenter

Name: Nuno Monteiro

Email: nmonteir@fc.up.pt

ID N°: [256]

Title: ASSESSING THE FUTURE AND POTENTIAL FOR ADAPTATION OF ATLANTIC SALMON FACING CLIMATE CHANGE IN SOUTHERN EUROPE

Authors: Etienne Prévost¹; Cyril Piou²; Julien Papaix³

Institutions: ¹INRA, UMR INRA/UPPA Ecobiop, Aquapôle, 64310 Saint-Pée-sur-Nivelle, France; ²CIRAD, Département BIOS, UMR CBGP, Montpellier; ³INRA, CNRS, CEFÉ, Montpellier

Atlantic salmon (*Salmo salar*) is a relevant and challenging case for addressing Climate Change (CC) adaptation issues. It is a poikilotherm and cold water species. Living alternatively in freshwater - where reproduction and juvenile recruitment takes place - and at sea - where it undertakes long range migrations - it is potentially influenced by both terrestrial and marine consequences of CC. It is a heritage and emblematic species too, that has been suffering from the pressure of human activities. It is the target of a fishery exploitation which regulation shall have to adapt to the consequences of CC. This exploitation is selective (bigger and older fish are selectively harvested) and the selectivity can be adjusted by means of simple regulatory measures such as size limits and/or temporal windows. Overall, this places A. salmon among the species potentially strongly impacted by CC.

In terms of public policy, A. salmon is the subject of many management actions aiming at its conservation. There is a strong demand, expressed by a diversity of local to international bodies (local management committees, national ministries, international organizations such as the North Atlantic Salmon Conservation Organization), for assessing the consequences of CC for this species relative to the conflicting objectives of both conservation and exploitation. This cannot be achieved by means of real world experiments. But virtual experiments by simulation techniques can be used and further allow to explore the potential of management strategies fostering the adaptation of A. salmon to CC.

To this end, we have developed an individual based eco-genetic model (Ibasam: Individual Based Atlantic Salmon Model) that represents the combined dynamics of the ecology, evolution and management (including exploitation). This model is mechanistic, stochastic and integrative. It includes various processes by which environmental factors in relation that to CC have an effect on individuals at different stages of the life cycle. It summarizes a vast corpus of knowledge and is currently parametrized in order to mimic a virtual population located at the Southern edge of the species distribution range.

First sets of virtual experiments have shown that over the next 3 decades : (i) CC in freshwater alone should not lead to extinction of southernmost populations of A. Salmon in Europe; (ii) a reduction in oceanic growth due to CC would be a significant threat for population persistence, especially if interacting with increased amplitude in river flow regimes; (iii) CC would lead to significant changes in the demographic structure of population by shortening the life-cycle; (iv) in contrast to CC, which triggers mainly plastic responses, selective fisheries exploitation leads to significant genetic evolution. We discuss these results with regards to the potential of developing intentionally selective exploitation strategies for promote the adaptation of A. Salmon populations to CC.

Presenter

Name: Etienne Prévost

Email: eprevost@st-pee.inra.fr

ID N°: [225]

Title: SHORE MEADOWS IN THE BALTIC SEA- CONSEQUENCES OF CLIMATE CHANGE FOR SPECIES DIVERSITY AND COMPOSITION

Authors: Alma Strandmark¹

Institutions: ¹Stockholm University

The Baltic Sea is a brackish semi-enclosed water body with a distinct latitudinal gradient in salinity and climate. The catchment area is large and the coastline that has been intensively exploited by humans is divided between 9 countries. The coast is heterogeneous and dominated by rocky shores in the north and shallow beaches in the south. There are about 200 000 islands of various sizes within the Baltic Sea from which about 35 000 are situated in the Stockholm archipelago. Shore meadows in the archipelagos are usually small isolated habitats surrounded by rocks or forest creating a patchy landscape for species living there. Our studies aim to understand species composition and diversity in Baltic shore meadows, primarily in the Stockholm archipelago and on the island Öland. Species composition and biodiversity is investigated in relation to island and habitat size, connectivity, exposure and species traits. Rising sea levels and larger fluctuations in water level, increased storm frequencies and elevated temperatures are climate induced changes that will probably change species composition and diversity in these habitats. Higher sea levels will lead to further fragmentation of coastal habitats and more frequent flooding, due to larger fluctuations, will cause a higher salinity stress for plant species living on the shores. Today, low sea levels during spring coincide with large fresh water inflow, lowering the salinity in soils which is essential for germination of many plant species. However with larger, less predictable fluctuation conditions might be less favorable during spring, with consequences for many sea shore plants. There is a large diversity of arthropods on Baltic shore meadows. Many herbivore species are closely linked to one or more plant species and are thereby not only affected directly by climate but also indirectly by how the host plant is affected. The most common arthropod predators are habitat and food generalist species of carabid beetles and wolf spiders. Preliminary results show that island size influences the diversity and species number of plants and beetles but not of spiders. Spiders are not as dependent on terrestrial resources, as are plants and beetles. A large proportion of the diet of wolf spiders is comprised of insects with aquatic larvae and therefore the size of the island or terrestrial habitat might be of little importance for species abundance. Further analysis of the data will include species composition in relation to habitat size and connectivity and predictions of habitat and diversity loss due to climate change. Future studies will concern ecosystem services of coastal habitats in the Baltic Sea and the conflict between conservation of coastal habitats and human interests in the coastal zone, a conflict that will probably be intensified by climate change.

Presenter

Name: Alma Strandmark

Email: alma.strandmark@su.se

ID N°: [137]

**Title: THE FRENCH NATIONAL CLIMATE CHANGE OBSERVATORIES NETWORK
IFRECOR**

Authors: Allenbach Michel¹; Touraivane²; Malau A³; Porcher M⁴; Hoibian T¹

Institutions: ¹University of New-Calédonia, BP R4, Noumea, New Caledonia; ²) University of New-Calédonia, BP R4, Noumea, New Caledonia; ³Department of Environment, Administrative City Mata-Utu, Wallis and Futuna; ⁴S2C, 150, Chemin Robert Gravier – 13100 Aix-en-Provence, France

The paper will describe one of the objectives of the National Action Plan IFRECOR (French Initiative for Coral Reef) 2011-2015. IFRECOR is a national policy instrument focusing on coral reefs and their associated ecosystems in French oversea territories. Since 2000, this program is designed and implemented through five-year plans at local, national and international levels.

All the IFRECOR actions contribute to a better understanding and management of French coral reefs spread over the three oceans. Six strategic axis are defined within IFRECOR framework:

1. Planning of IFRECOR actions
2. Reducing negative impacts of human activities and promote sustainable development;
3. The development of research, monitoring and decision support tools;
4. Information, training and education;
5. The development of regulation policies and financial tools;
6. The development of local and regional cooperation;

The National Action Plan (NAP) IFRECOR for 2011-2015 set up a TIT (transverse thematic area of interest) on "Adapting to climate change" in 2011. His long term goal is to benefit from the IFRECOR actions and recommendations to raise awareness of economic actors and policy makers on reef environments and associated ecosystems, with the view to contribute to the design of appropriate plans for overseas regions. It is also to proposing specific technical, measures scientific for socio-economic development. It also aims to encourage French overseas communities to define a strategy for adapting to climate change taking into account the reef environments.

This creation is a continuation of actions already undertaken and under the umbrella of TIT "Monitoring networks". Communication is to present the network and indicators. Carried out by Wallis and Futuna Department of Environment (South Pacific) with the support of S2C consultant, University of New Caledonia (UNC) and the National observatory on the effects of global warming (ONERC) various products are made et visible on scientific interoperable portal developed within the University of New Caledonia (<http://portail-scientifique.univ-nc.nc>). It provides access to data compiled in the different French overseas territories on indicators identified to be relevant to assess climate change in reef environment (sea surface temperature, acidification, coastal development, state of health of the reefs). This portal has been designed following the recommendations of ONERC.

Presenter

Name: Porcher Michel

Email: porchers2c@orange.fr