

	<p>Council</p> <p><i>Overview of adaptive management actions undertaken by Spain to mitigate the negative impacts of climate change, with an assessment of the effectiveness of these actions, and lessons learned</i></p>	<p>CNL(23)56</p> <p>Agenda item: 7a)</p>
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Overview of adaptive management actions undertaken by Spain to mitigate the negative impacts of climate change, with an assessment of the effectiveness of these actions, and lessons learned

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BACKGROUND

This paper accompanies the upcoming presentation to be given at the Theme-based Special Session (TBSS) at NASCO 2023, entitled ‘Informing a Strategic Approach to Address the Impacts of Climate Change on Wild Atlantic Salmon. It provides a Spanish perspective on the impacts of climate change on Atlantic salmon (hereafter salmon) and on the development of management measures that can improve the resilience of salmon and their habitats to ongoing climate change.

INTRODUCTION

The Atlantic salmon finds the southern limit of its natural distribution in the Iberian Peninsula, which means that its populations are small when compared to the populations of other rivers in Northern Europe, also very vulnerable to climatic and hydrological changes. The fact that salmon is in its southern limit of distribution in Spain makes climate change an important issue for the future of the population.

Spain is a country with a decentralized administrative organization, made up of 17 Autonomous Communities (hereinafter CCAA), each with its own government and competences over the conservation of biodiversity and habitats for salmons and aquaculture, for this reason there are 5 Spanish Jurisdictions in NASCO.

The salmon populations are located in the five autonomous communities of the Cantabrian coast, Asturias, Cantabria, Navarra, Galicia and the Basque Country, from all of them the one that represents the greatest number of salmon, with a great difference over the rest, It is Asturias, which brings together in its rivers most of the salmon population of Spain, especially in three rivers, Sella, Deva-Cares and Narcea-Nalón (the largest and most important basin).

In Spain, in general, in the last 5 years, rainfall has decreased considerably, and long periods of drought have been recorded, both phenomena related to climate change, which have very negatively affected salmon. In the Cantabrian rivers, the long series of rainfall and therefore the circulating flows hardly decrease, although in the last 5 years rainfall has decreased.

The situation in relation to the status of salmon populations is different depending on the jurisdiction that is considered.

In Navarra, the salmon population in the Bidasoa basin is going through a critical situation, due to the fact that negative factors have come together in the last two years such as the significant shortage of broodstock and a series of negative environmental conditions (low rainfall and high-water temperatures during the dry season) that limit the survival of the fry, which can cause their collapse.

The data from the main basins in Asturias show a decrease in all rivers (more pronounced in the river Sella), but with a tendency to population stabilization if we consider the last five years 2018-2022. In addition, in this Jurisdiction, with regard to the production of juveniles in the fluvial environment, there is no record of a decrease in their survival after reproduction in recent years, nor of the density of fry, which logically depends on the existence of a minimum number of spawning females, the first factor that conditions population sustainability.

In the case of Cantabria, in the main rivers, Deva and Asón, the biomass of Atlantic salmon shows a slight decrease, although in the last three years it has remained stable.

Galicia and Gipuzkoa also show significant declines in their populations.

ADAPTIVE MANAGEMENT ACTIONS UNDERTAKEN BY SPAIN.

Spain has a Climate Change Adaptation Plan, **The National Climate Change Adaptation Plan 2021-2030 (PNACC)**, which constitutes the basic planning instrument to promote coordinated and coherent action against the effects of climate change in Spain. Without prejudice to the competences that correspond to the Autonomous Communities, the PNACC defines objectives, criteria, areas of work and lines of action to promote adaptation and resilience to climate change. Specifically, the PNACC defines 18 areas of work, specifying objectives for each of them.

The PNACC does not include specific measures for the adaptation of the Atlantic Salmon to climate change, however, some of these measures, aimed at restoring the hydrological cycle and recovering fluvial connectivity, including the elimination of artificial barriers and the restoration of areas floodplains and wetlands and the protection of natural heritage, biodiversity and protected areas, directly affect their adaptation and conservation.

The PNACC also has specific measures to help the Spanish aquaculture sector to adapt to climate change effects both for marine aquaculture and freshwater aquaculture.

LINE OF ACTION: INCORPORATION OF THE CLIMATE CHANGE FACTOR IN NATIONAL CONSERVATION STRATEGIES AND PLANS FOR THE CONSERVATION AND RECOVERY OF THREATENED SPECIES.

Is intended to contribute to the strategies and plans of catalogued species being carried out and/or updated, taking into account the demands imposed by the current context of climate change, reducing their impact on them and increasing their resilience.

It is considered important to update the studies of potential distribution of wild species, and their key habitats, using the most recent climate models provided by the Intergovernmental Panel on Climate Change (IPCC), so that the information provided is useful to manage the biodiversity in a more complete and sustained manner over time.

Within this line, the following **actions that affect salmon** will be carried out:

1. Updating of the atlases of the State Inventory for Natural Heritage and Biodiversity considering the information available on the main climate scenarios.
2. Identification of solutions based on nature, as a reference for good practices for adaptation to climate change.

LINE OF ACTION PLANNING AND MANAGEMENT OF PROTECTED AREAS WITH ADAPTIVE CRITERIA.

All Spanish salmon rivers are located in Special Conservation Areas (ZEC) designated under the EU Habitats Directive (92/43/CEE). Therefore, included in the main European Conservation Network Natura 2000.

According to the Habitats Directive, EU member states are called upon to establish the necessary conservation measures and, if necessary, appropriate management plans with the aim of achieving a favorable conservation status for species and habitat types.

The conservation status of the salmon will be determined with special assessments and evaluation keys in the Management Plans of each ZEC. The management objective will be a favorable conservation status of salmon stocks.

In addition, the Water Framework Directive (Directive 2000/60/EC) establishes that monitoring of fish populations, invertebrates, chemical state of the water, morphology, in each individual body of water (including rivers and streams) must be carried out. .

Any body of water classified as unfavorable must have corrective measures prepared through the Program of Measures to meet the objectives established to obtain Good Ecological Status.

On the other hand, climate change constitutes a major challenge for these areas, as it causes environmental changes that can substantially modify their own starting conditions (zoning, restrictions established in management plans, etc.). Despite all this, there are still few protected areas that deeply incorporate the climate change factor into their planning and management.

Within this line, the following **actions that affect salmon** will be carried out:

1. Preparation of management guidelines for the Natura 2000 Network with criteria for adaptation to climate change.
2. Support for the inclusion of climate change adaptation criteria in protected area management plans and instruments.
3. Evaluation of the future representativeness of the networks of protected natural spaces under different climatic scenarios.
4. Implementation of the Framework for Action against climate change of the Natura 2000 Network

LINE OF ACTION IMPROVING THE ADAPTIVE CAPACITY OF GREEN INFRASTRUCTURE

Included measures aimed at restoring the hydrological cycle and recovering fluvial connectivity, including the removal of artificial barriers and the restoration of floodplains and wetlands.

The Green Infrastructure supposes, within its multifunctional character, an enhancement of the important relationship between connectivity and the configuration of the landscape and how this affects the movement and dispersion of species.

Therefore, in this line of action there will be room for:

-Interventions aimed at maintaining or improving the provision of ecosystem services, mainly those of regulation.

-Interventions aimed at improving the ecological permeability of the territory and ecological connectivity.

-Interventions aimed at reducing pressures on natural systems (changes in agricultural practices, livestock management, forest management, hunting and fish farming management, etc.).

-Interventions aimed at the ecological restoration of ecosystems.

Within this line, the following **actions that affect salmon** will be carried out:

- Development of green infrastructure adapted to climate change.
- Integration of the improvement of knowledge on the vulnerability and resilience of wild species and habitats in the face of climate change in the National Green Infrastructure Strategy.

LINE OF ACTION INCORPORATION OF THE CLIMATE CHANGE FACTOR IN THE CONSERVATION OF THE TYPES OF NATURAL AND SEMI-NATURAL HABITATS AND IN THEIR ADAPTIVE MANAGEMENT

The incorporation of the 'climate change' factor in the conservation and adaptive management of habitat types can take the form of actions such as the identification, restoration, and protection of especially important areas to mitigate the impacts of climate change.

Adaptation measures of habitat types to climate change. It would include, among other adaptive management measures, those aimed at reducing the non-climatic pressures that act on the types of habitats; improve the resilience of habitat types; maintain the abiotic conditions required by the types of habitats; reduce the impact of extreme weather events or identify climate refuges.

Within this line, the following **actions that affect salmon** will be carried out:

- Promotion of the creation of "climate refuges" as a tool for adaptation to climate change of biodiversity. In this sense, protected areas and breeding refuges for salmon have been increased.

In relation to this, small dams (smaller than 80-90 cm), can create pools and in summer contribute to creating micro-habitats protected from thermal rises and that contribute to being shelters due to their depth therefore keeping them should be considered rather than tearing them down.

LINE OF ACTION STRENGTHENING THE ADAPTATION TO CLIMATE CHANGE OF THE COMMON FISHERIES POLICY IN THE AQUACULTURE SECTOR.

Climate change and ocean acidification are profoundly altering marine ecosystems, with consequent impacts on fisheries and aquaculture. The effects on the coasts, on river ecosystems and on the people who live in these areas test the resilience of the blue economy and of society as a whole and threaten the sustainability of aquaculture activity.

Different studies have indicated the repercussions of climate change on aquaculture, and the need to adapt the activity to face risks from a biological, economic and social point of view:

To promote the adaptation of aquaculture to climate change in Spain, the new Spanish Aquaculture Strategy, the Contribution of Spain to the Strategic Guidelines for a more Sustainable and Competitive EU Aquaculture 2021-2030 It includes actions to incorporate the climatic variable into the spatial planning of aquaculture, both marine and freshwater aquaculture, that means the identification of the areas least exposed to the effects of climate change for the development of aquaculture.

In this regard, the following actions are planned:

1. Diagnosis and risk assessment in the coastal marine environment due to climate change, in current and future areas of marine aquaculture.
2. Diagnosis and risk assessment, due to climate change, in current and future areas of continental aquaculture.

CONCLUSION

The number of salmon in Spain is decreasing and the **environmental conditions derived from climate change seem the most logical explanation, although for the moment it lacks a sufficient scientific basis.**

- Climate change is negatively influencing salmon dynamics, affecting:
- Weather conditions, which determine the flow and temperature of the water.
- Oceanic conditions, which determine the success of migrations and the availability of food in growth areas.
- Conditions of the fluvial habitat, which determine its availability and quality for reproduction and fry.
- Increase in predation in rivers and estuaries (otter, cormorant).

Influencing the first two groups of conditioning factors (climatic and oceanic) require the assumption of global measures, many times outside the scope of the competent administrations in terms of conservation and recovery of the species, so the efforts of international administrations and organizations that ensure the conservation of the species focus on the recovery of the fluvial habitat and the reduction of mortality caused by human beings.

But while the impact of river habitat restoration measures on the salmon population often takes longer periods of time, reducing mortality, especially that of spawners, can offer more immediate results as increased production of fry will be directly reflected in the next cohort.

Finally, the adaptive measures that also seem effective are the reduction of catches and days of fishing, the limitation in the use of fishing gears and even the carrying out of biological stops such as the one proposed for the Bidasoa river in 2023.

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