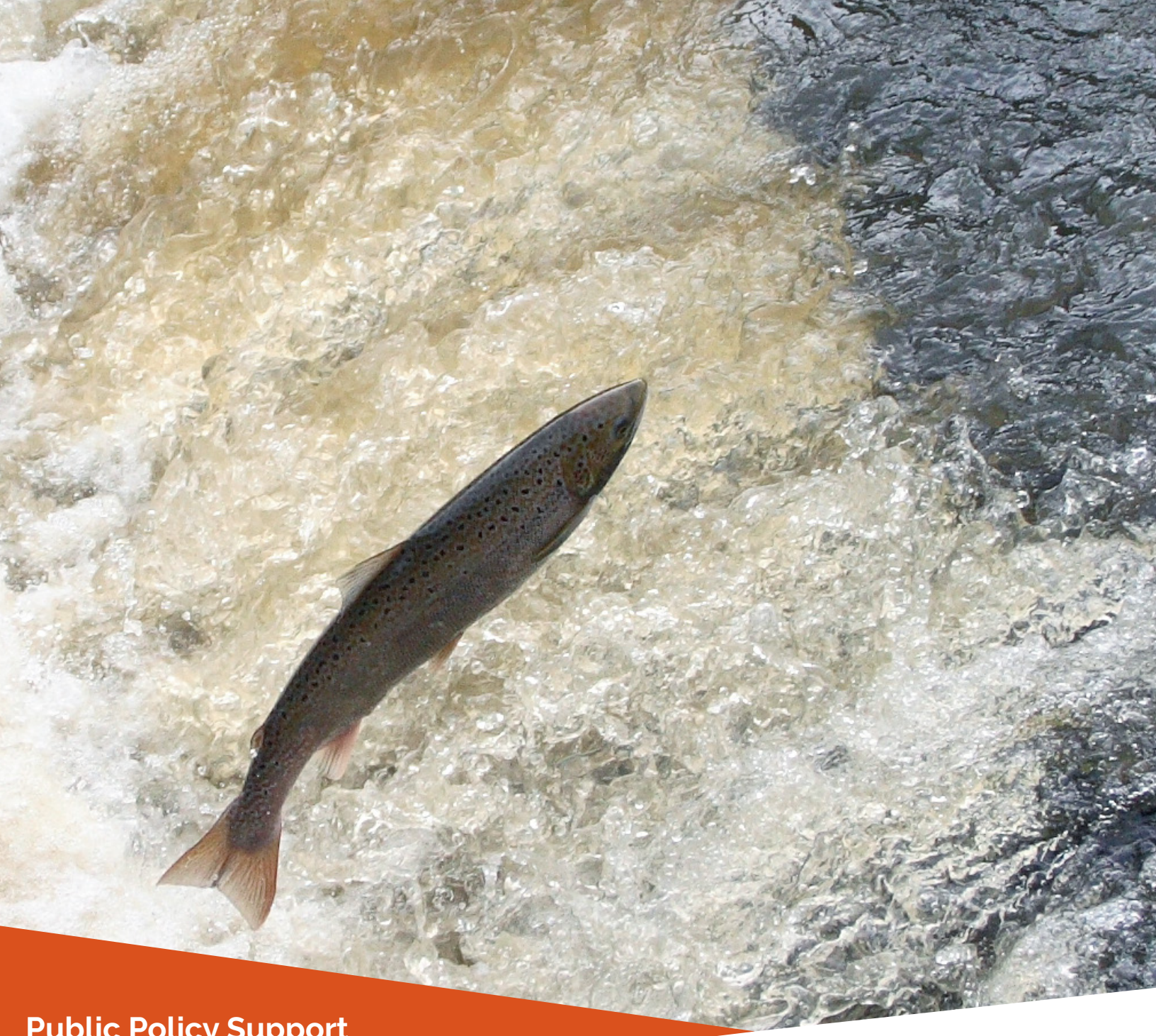

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The MIAME Research & Development Centre: science supporting diadromous fish management

June 2025

In this report

compiled by Joseph Lefeuvre, Gisèle Parfait and Eric Martin (DAPP), Laurent Beaulaton and Jean-Marc Roussel (MIAME Research & Development centre)

Acknowledgements

**We would like to thank everyone who has contributed to compiling this file.
Marie-Laure Acolas, Marie-Andrée Arago, Laurent Beaulaton, Manon Dervin, Caroline Durif, Gaëlle Leprévost, Jean-Marc Roussel, Guillaume Rulin, Jules Wizniak.**

Public Policy Support Collection
Publishing Director: Marion Bardy
Collection Director: Gisèle Parfait
Design and Editorial:
Joseph Lefeuvre, Gisèle Parfait
Proofreading: Océane Jaquin
Reproduction of photographs and illustrations:
Françoise Peyriguer
Mock-up and layout:
EliLoCom - www.elilocom.fr
Printing: Groupe Exprim
June 2025

June 2025

A molecular approach developed by researchers at the MIAME Centre enables the distinction, hitherto impossible, between different species of lamprey at the juvenile stage.

The MIAME Research & Development Centre: science supporting diadromous fish management

Several decades of research have guided public policy in the management of diadromous fish. In 2013, launched by the French Biodiversity Agency (OFB) and INRAE, this long-term collaboration between science and public action led to the creation of a Research & Development Centre. Dedicated to the study of diadromous species in their environment, the Centre was renamed 'MIAME' in 2019. It gathers information on public stakeholders' needs and coordinates scientific work to meet those needs. This report reviews the major achievements and outputs of this collaboration.

Whether eels, salmon or lamprey, these diadromous fish spend some of their lives in the sea and the rest in freshwater. These species, which are highly valuable to the heritage of several regions around the world, are now endangered. The decline in their population is due to factors such as the degradation of water quality, overfishing, and dams and other obstacles to their movement in rivers. The European sturgeon, European eel and twaite shad are recognised as critically endangered on the International Union for Conservation of Nature (IUCN) national red list of threatened species. Atlantic salmon, two species of lamprey, two species of shad and European smelt are also classified as endangered or near threatened.

Since the 1970s, national and European regulations have been devised to protect these diadromous species. Today, a raft of regulations, decrees, laws and national plans govern their management and benefit from the continuous production of new scientific knowledge and methods. Firstly,

The MIAME Centre – Key Figures:

– Gest'Aqua (2013) becomes the MIAME Centre in 2019;

– 4 institutions come together;

– 39 tenured staff members, 6 from the OFB, 2 from the University of Pau et des Pays de l'Adour, and 30 from INRAE; 30 contractual staff members (2023);

– 6 geographical locations across France;

– 7 contributing entities.

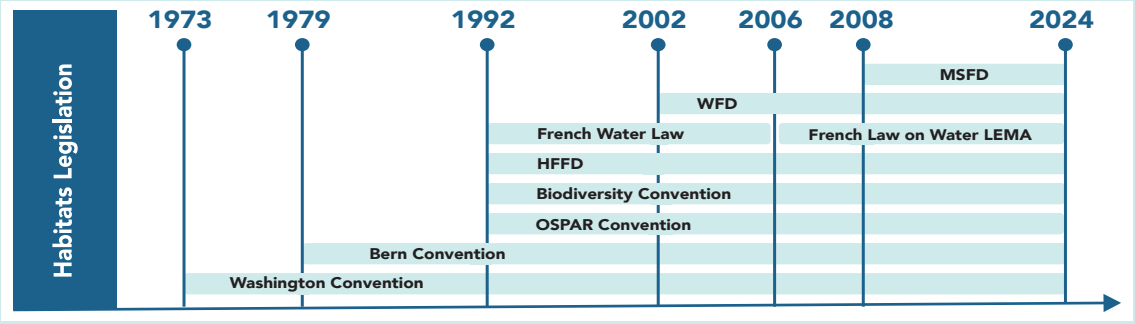
Regulations for Migratory Fish Management

International public policy for the protection of species and habitats

Many international regulations govern the protection of fragile species and habitats, and have a direct impact on diadromous fish. The Bonn Convention, signed in 1979, encourages signatory states to implement international plans for listed species, including sturgeon and eel today. The Bern Convention, also signed in 1979 and in force in France since 1990, provides for inter-state measures to protect fragile species and encourages the implementation of management plans. Since then, in 1992, France ratified the Convention for the Protection of the Marine Environment of the North-East Atlantic, known as the OSPAR Convention. It promotes the establishment of marine protected areas (MPAs) and the protection of endangered or declining species and habitats. This cooperation between signatory states and EU members also prepared them for the 2008 Marine Strategy Framework Directive (MSFD), which laid out a framework for Community action in marine policy. It aimed to maintain or restore the proper functioning of marine ecosystems, with the goal of achieving good ecological status in the marine environment by 2020. Also at European level, the European Habitats–Fauna–Flora Directive (HFFD) established the Natura 2000 network in 1992, which specifically targets the sea lamprey, river lamprey, twaite shad, allis shad and Atlantic salmon. It legislates on their conservation and the restoration of natural habitats, wildlife and flora. It highlights diadromous species and their heritage value, classified as 'species of Community interest'. Europe's 2002 Water Framework Directive (WFD) and its translation into French law with the 2006 Law on Water and Aquatic Habitats (LEMA) requires the restoration of the ecological continuity of watercourses and the preservation of habitats. LEMA revises, by extension, the 1992 Water Act and the resulting water development and management master plans (SDAGE). The SDAGE sets out six-year guidelines for achieving the expected objectives of 'good water status' in each basin in mainland France and overseas.

Trade in diadromous fish is also regulated internationally. The Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora, ratified by France in 1973, added sturgeon in 1983 and the European eel in 2009. This commitment ensures the species' protection with regard to international trade and thus has a significant impact on fishing in France.

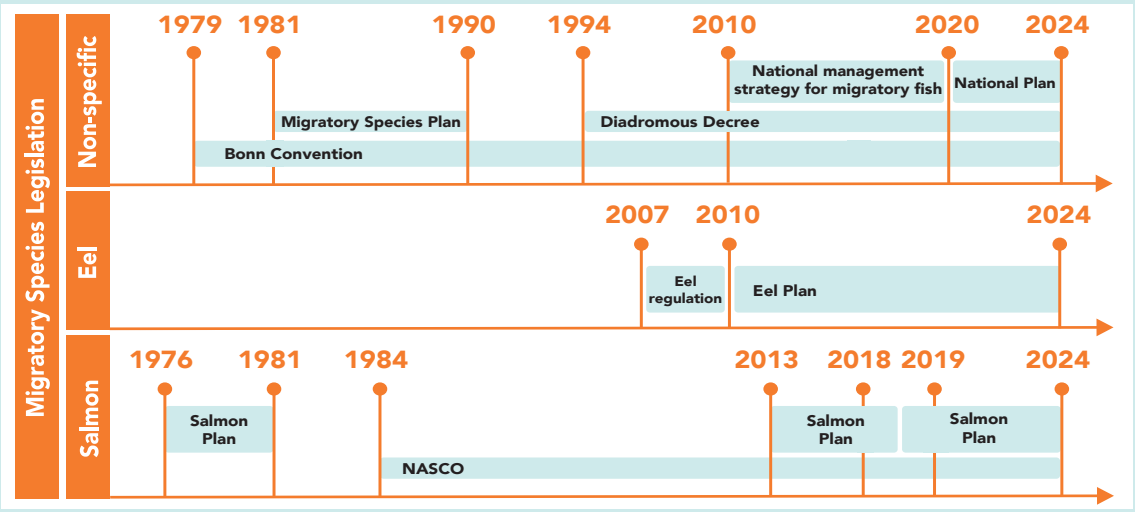
These international regulations represent a long-term commitment by France to the preservation of diadromous species and their habitats.



Chronology of legislation to protect habitats and species affecting diadromous fish

Salmon, a 'sentinel' species and precursor for migratory fish management

The Atlantic salmon was the first diadromous fish to benefit from a protection plan in 1976. 1984 saw the creation of the North Atlantic Salmon Conservation Organization (NASCO), the first intergovernmental organisation to work towards the conservation, restoration, enhancement and rational management of stocks of a diadromous species in the North Atlantic Ocean. The contracting parties are the United States, Canada, Norway, Denmark and the European Union. Subsequently, numerous public policies for the management of various diadromous species were introduced, some common to all species and others specific to certain species.



Chronology of legislation to protect diadromous fish

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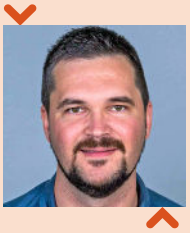
this file presents the challenges in protecting diadromous species and reviews management policies. It then presents a selection of recent scientific productions and public policy initiatives from the MIAME Centre, most from the special issue of the journal *Sciences Eaux & Territoires* (2025) on the Centre's activities.
The Research & Development Centre for the management of diadromous fish in their environment (MIgrateurs AMphihalins dans leur Environnement, MIAME) was established in its initial format in 2013 by the French Biodiversity Agency (OFB, formerly Onema) and INRAE (formerly INRA), joined by the Institut Agro and the University of Pau and the Pays de l'Adour (UPPA) in 2019. In order to support government departments, the MIAME Centre brings together research and teaching organisations and the OFB, a public institution dedicated to biodiversity conservation. The OFB's research & development centres, which are unique in their kind, bring together researchers and public policy managers, either alone or in partnership with one or more other organisations. These centres facilitate discussions, acculturation and the joint development of research programmes to best meet the needs of public action.



Laurent Beaulaton
Head of the MIAME R&D Centre, Special Adviser - Migratory Fish at the OFB

The Research & Development Centre, created in 2013 and devoted to diadromous fish, brings together the skills of three research and further education organisations - INRAE, the Institut Agro and the UPPA – and the OFB, the institution of ministries responsible for the environment and agriculture.
The acculturation thus enabled between scientists and public actors facilitates the joint development of≈conservation strategies for these species, which are currently endangered. The Centre's diverse skills and project financing model ensure continuity between knowledge and action. The centre has thus become a key partner whose expertise is essential for managing and protecting diadromous fish.

Jean-Marc Roussel
Deputy Head of the MIAME R&D Centre, INRAE Head of Research at the UMR DECOD, Rennes

he MIAME Centre represents more than 50 years of collaboration between researchers and public authorities on the management of diadromous fish. Supplementing the fundamental work carried out upstream, the finalised research supported by the Centre motivates the forty or so scientists working in the field. Our task is to ensure the completion of the projects we fund via the cooperation agreement between organisations. The managers who benefit from the scientific findings provide researchers with new scientific questions. A genuine relationship of trust has been established between scientists and the OFB, with the latter liaising with the relevant ministries.

Diadromous fish - endangered in both rivers and seas

Diadromous fish are characterised by a life cycle that alternates between freshwater and the sea. Depending on the species, the marine phase can represent between 15% and 90% of their life cycle and allows species to perform essential functions such as growth or reproduction. They face various anthropogenic pressures including water pollution, amateur and professional overfishing, and disruptions to ecological continuity. France has the greatest diversity in Western Europe, with 12 diadromous species in its waters. Most have been affected by a marked decline in their populations, especially sturgeon, eels, twaite shad and salmon.
The numerous ecosystem services linked to the presence of these species are thus affected by their widespread decline. These include supply services, both amateur and professional, in terms of biomass from exploited species, but also cultural services such as recreational fishing, associated tourism, local identity, art and tradition and the environmental educational value of diadromous species. Studies have examined the ecosystem regulation and maintenance services provided by these species through large-scale nutrient and carbon cycles and transfers on land-sea continuums, sediment dynamics and habitat maintenance, food chain control (fertilisation and predation), biodiversity and the resilience of these ecosystems.
Efforts to save these species have led to extensive regulation with multiple challenges and on multiple geographical scales.

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Common texts and texts specific to different species

The 1976 'Salmon Plan' was updated in 1981 with the 'Migratory Fish Plan' to include shad, lamprey and the European eel. It remained in force until 1990 and provided for measures to navigate obstacles to migration, the release of juveniles raised in fish farms and the restoration of natural habitats. The 1994 diadromous decree decentralised the management of diadromous fish and established migratory fish management committees (COGEPOMI). Organised by major river basins, they provide a forum for consultation, debate and information-sharing between the main stakeholders involved in managing these fish populations. They include government departments, local authorities, public institutions and associations. Their role is to ensure the consistent management of migratory fish throughout their reference basins. Their principal mission consists of drawing up management plans (PLAGEPOMI) for the migratory fish in their drainage basins. These plans address measures regarding population assessment, restoring stocks, the sustainable management of fishing and reducing impacts on habitats.

A national management strategy for migratory fish (StraNaPoMi) was drawn up in 2010, followed by the national plan for diadromous species in 2020 which defined national guidelines for their conservation. The aim of the national plan is to provide an overview of the conservation status and management practices for all diadromous species, making the most of existing species conservation, planning and management mechanisms such as SDAGEs and PLAGEPOMIs. The plan promotes synergy between these measures and the implementation of complementary actions. Eels, salmon and sturgeon also benefit from specific action plans.

Since 2007, the European sturgeon, classified as a 'species in danger of extinction', has been the subject of an international restoration plan adopted by the Standing Committee of the Bern Convention. It has been broken down into various national action plans in France for their conservation and restoration, with the current plan ending in 2029.

With regard to salmon, France is developing French salmon conservation plans in line with the recommendations issued by the North Atlantic Salmon Conservation Organization following studies by the International Council for the Exploration of the Sea (ICES). The measures to be taken concern fisheries, habitat protection and restoration, and restocking activities.

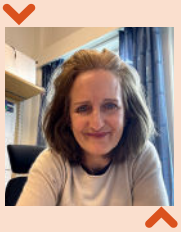
In 2010, France designed a specific eel management plan following the European Eel regulation. This plan covers all anthropogenic mortality, either by adopting specific measures (on fishing, for example) or by mobilising existing tools (e.g. application of the WFD). The plan also provides for measures to monitor and assess populations. ■

Diadromous fish management: a challenge in many respects

though the management of diadromous species is now governed by extensive legislation both nationally and internationally, the first regulations in France date back to the Middle Ages. The numerous challenges involved in the conservation of these species have resulted in complex and overlapping regulations. Diadromous fish are now among the most protected species. At first, general regulations for the protection of habitats, not specific to diadromous species, were developed in the second half of the 20th century. Texts and agreements were implemented at various levels, such as the Convention for the Protection of the Marine Environment of the North-East Atlantic, known as OSPAR, and the Water Framework Directive.
In addition to this general regulation are regulations to protect biodiversity, in which diadromous species are explicitly mentioned. Again, several texts overlap and contribute to strengthening the protection of these species. The Convention on Migratory Species of wild animals (CMS), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Habitats-Fauna-Flora Directive (HFFD) and recently the latest European nature restoration law are some examples of the texts that currently structure their regulatory protection.

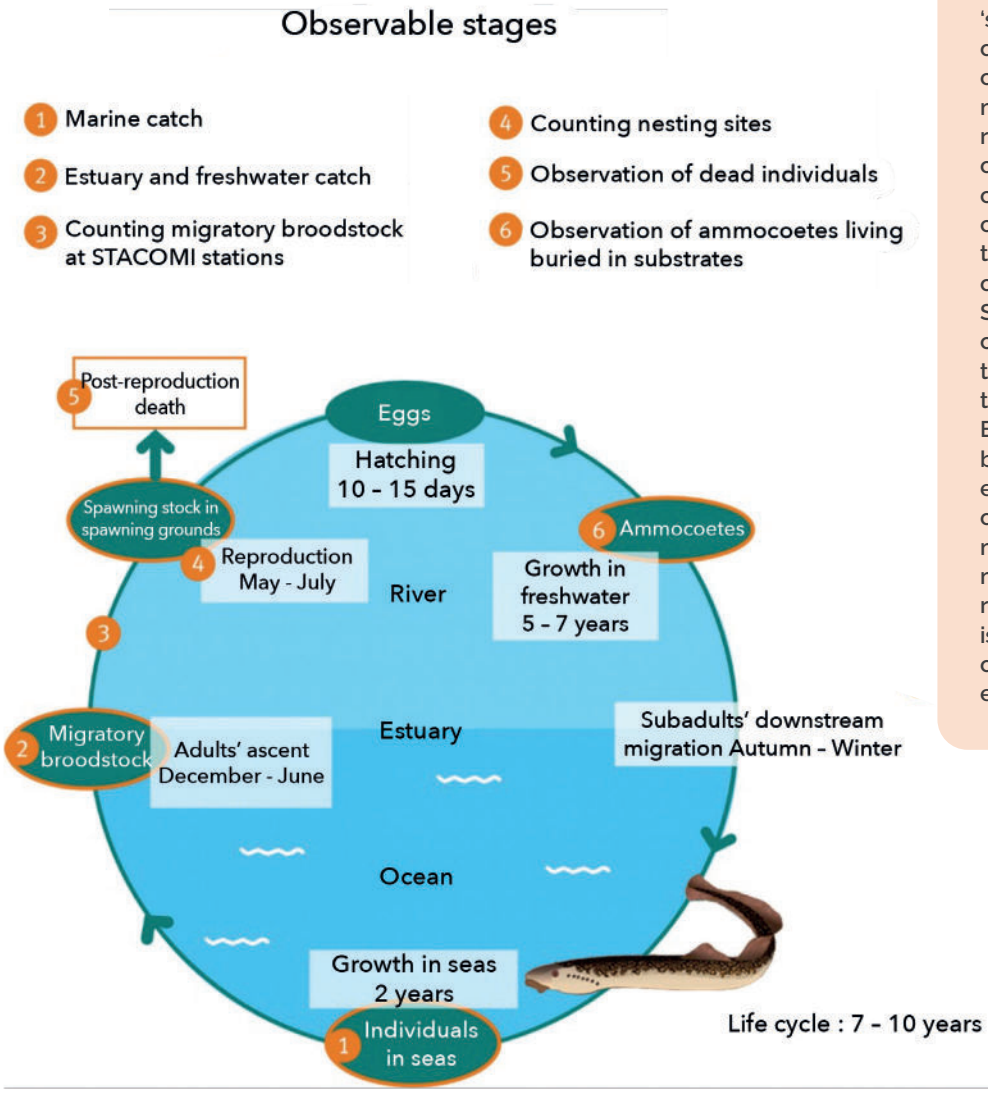
Protections specific to certain diadromous species have been added to the legislation applicable in France. Salmon represent a sentinel species for the implementation of these legal texts. Since the 1960s, global stocks of wild salmon have fallen dramatically and the significant impact of Greenland fisheries on the species has been pointed out by scientists. This iconic species has already disappeared from many rivers flowing into the Atlantic, hence the urgent need for regulation. Since then, numerous international, EU and national commitments have regulated the fishing of diadromous species, starting with salmon and then extending to other species. The diadromous decree,

various national plans, the European eel regulation and the national action plan for the European sturgeon are all regulations that now structure the protection of diadromous fish and establish national and local organisation for their management.
The applications of all this legislation overlap and work together to ensure better protection for diadromous fish. Actions taken to protect these species include management measures in continental waters, fishing quotas, adjusting obstacles by installing fish ladders, and the resulting restoration of habitats. To determine the best course of action, public authorities and policymakers have access to a wealth of knowledge and solutions produced by and in collaboration with the MIAME Research & Development Centre.
The MIAME Centre represents a scientific database and expertise resource that public policymakers and administrators can draw upon. It also participates in implementing regulatory measures and developing management plans at national and international levels.



Caroline Durif
Head of Research at the Norwegian Institute of Marine Research

I run the International Council for the Exploration of the Sea (ICES) Working Group on Eels in Europe and the Mediterranean (WGEEL), which brings together 103 members from 30 different countries. European scientific studies, including those carried out by the MIAME Centre, help us to produce an annual 'scientific opinion' on the status of eel populations in member countries. However, effectively modelling the connection between recruitment and the number of reproducing adults is a scientific challenge that is still particularly complex. At the end of its life, the European eel leaves its river of growth to reproduce in the Sargasso Sea. The recruitment rate corresponds to the number of elvers that arrive in rivers, from Norway to Morocco, after reproduction. Eels then adopt very different behaviours depending on their environment. An eel in Norway and one in Spain, born in the same year, may migrate to the Sargasso Sea more than 30 years apart. Modelling recruitment rates and fishing quotas is essential for the conservation of the species, as is the quality and ecological continuity of waterways.



Example of the life cycle of a diadromous species – sea lamprey (*Petromyzon marinus*).

Marie-Laure Acolas
Conservation biology researcher. Aquatic Ecosystems and Global Changes Unit (EABX), INRAE Bordeaux

I'm a researcher at the EABX Unit, which became part of the MIAME Centre when INRAE was created in 2020. We act as experts on diadromous species, monitoring and studying populations, their distribution, habitats and the effects of anthropogenic and environmental factors. We provide an overview of scientific knowledge on these species to support public decision-makers, as well as contributing to European regulatory reports. In particular, I coordinate research projects on the European sturgeon, whose fishing is not covered by COGEPOMIs. Since sturgeon reproduction management began 15 years ago, sturgeon from restocking programmes can now be seen swimming back up estuaries. The resulting reproduction in natural conditions is eagerly awaited, as it will make the reintroduction of sturgeon in France scientifically possible. Our goal is to learn more in order to protect better, so that diadromous fish are not forgotten.

The MIAME Research & Development Centre: at the interface between science and public initiatives

A LONG-TERM COLLABORATION BETWEEN SCIENCE AND PUBLIC ACTION

Since the 1970s, various scientific and technical institutions, including INRA and the French High Council for Fisheries, have been setting up initiatives to acquire knowledge and provide support for ecosystem restoration and species conservation, sometimes working together. Now brought together in the MIAME Centre as INRAE, OFB, the Institut Agro and the University of Pau and Pays de l'Adour, they offer advice and technical support to numerous institutional partners on these issues. Seven bodies contribute to it in six geographical locations: the OFB-DRAS division, the OFB-DSUED division, the UAR PatriNat, the UMR DECOD and ECOBIOP, the UR EABX, and the UE U3E.

Since 2013, the Centre has been developing its activities in research, expertise and support for managing diadromous species and their habitats, both nationally and internationally. The Centre's areas of focus draw on the complementary and long-established expertise of its member organisations. The Centre's research & development activities have led to a significant increase in the scientific knowledge of migratory fish.

As a public institution under the supervision of the Ministry of Ecology, the OFB supports the Water and Biodiversity Directorate and the Directorate-General for Maritime Affairs, Fisheries and Aquaculture, which are themselves responsible for policies relating to the management of diadromous species. The Centre brings together public stakeholders' needs and scientific contributions, thus ensuring these needs are better taken into consideration in research activities. The collaboration of three research organisations with the OFB brings together the main research teams working on these species and enables the effective transfer of scientific findings into public action, strengthening the acculturation between these two worlds. Operational knowledge is thus directly applied to the complex management of diadromous species, connecting a diverse network of stakeholders.

Lastly, with the proximity it offers between these stakeholders, the research carried out in line with public policy, and the complementary expertise of numerous researchers on the subject, the Centre actively supports the dynamic of this community of diadromous specialists.

The voluntary catch declaration for sea trout (Salmo trutta) provides the MIAME Centre with a series of long-term data representative of this fishery.

PUBLIC POLICY SUPPORT MISSIONS

Today the MIAME Centre serves as a national and international reference for managing the biodiversity of migratory fish and the health of their continental, estuarine and marine ecosystems. Its wide-ranging activities are organised into major missions, illustrated here using examples from studies published in the journal *Science, Eaux & Territoires*.

Knowledge closely aligned with operational needs

As part of its primary focus, the MIAME Centre conducts in-depth research to produce and disseminate operational knowledge of diadromous populations in partnership with national and international institutions. The main topics addressed are the demography and evolution of migratory populations, the study of their responses to anthropogenic impacts, the quality of their habitats and ways to preserve or restore them. The studies cover France's entire territory including its overseas territories, although given the available resources, developments in these latter areas are more limited. Operational research projects may be developed in their own right or as part of wider programmes in which the Centre works in partnership (European projects, Interreg, FEAMPA, Horizon Europe).

To quote just a few of the striking results of recent research, the development of molecular markers enables taxonomic identification at early stages of evolutionarily closely related species, thereby allowing for a better definition of the habitats to be protected. The compilation and analysis of available data on diadromous catches at sea has made it possible to draw up occurrence maps, identifying sensitive areas to be monitored. Other studies are updating their native origins and migratory routes, using telemetry or basic analysis of individuals to establish the risks associated with migration.

Estimating the stock of migratory fish populations in their various habitats is the subject of numerous studies, making it possible to quantify their demography fluctuations. A new model to estimate salmon stocks, produced by the Centre for the different geographical zones of the North Atlantic, is used to manage this species on a European scale. The data used to feed these models come from a network of observatories limited to a few index rivers (see below), which constitutes a real limitation to stock estimation. The Centre is therefore studying alternative methodologies to extend data collection on diadromous migrants to other watercourses, such as counting using acoustic cameras that are insensitive to water clarity, or DNA fragments circulating in open water (or eDNA).

Observatories and Open Science: long-term data

The Centre manages experimental installations that enable the evolution of migratory populations and their habitats to be monitored under the effects of environmental changes. They are grouped together at the Environmental Research Observatory on Diadromous Fish in Coastal Rivers (ORE DiaPFC). The chronological series and samples collected feed into the Centre's research aimed at assessing the status of populations and management methods for diadromous fish in France. These data are made available at national and international level, in line with FAIR and open data initiatives (GBIF, data paper,

Gaëlle Leprévost

Head of the Bretagne Grands Migrateurs Association

The Bretagne Grands Migrateurs (BGM) association brings together the four departmental federations for fishing and the protection of the aquatic environment in Brittany, and implements the operational programme of the migratory fish management plan (PLAGEPOMI) for Brittany's waterways. We coordinate actions and run the network of stakeholders and the Migratory Fish Observatory. The observatory collects, stores and promotes a set of data from various stakeholders in the field and benefits from the scientific and technical support of the MIAME Centre. We also produce indicators that show trends regarding the state of populations. Salmon, the region's iconic species, have been in continual decline, which led to COGEPOMI Bretagne banning its fishing in 2025. Fishers are committed to preserving and maintaining aquatic ecosystems, which must go hand in hand with combating climate change and water pollution and restoring freshwater habitats to protect these fragile species.

Cooperation between the OFB and INRAE in research & development centres

In the early 2010s, France's National Office for Water and Aquatic Environments (ONEMA) established a direct link between public authorities and the research community by creating research & development centres. The four centres bring together staff from the OFB, responsible for policy for the Ministry of Ecology, and staff from public scientific and technological institutions and higher education establishments. This interface between science and public action promotes partnerships and references on issues of high importance for biodiversity.

In 2020, INRAE and the OFB redefined their partnership after their respective fusions. The two new establishments signed a new pluriannual framework agreement on 25th February 2020, renewed on 1st March 2024. This agreement defines a general framework for collaboration on three main topics. The main objective of the two research & development centres connected with INRAE is to provide policy support to conserve water resources and aquatic habitats.

Secondly, they provide policy support for the preservation and restoration of land-based biodiversity and sectoral policies that affect biodiversity. Lastly, through their joint management of the centres, the two organisations support interactions between agriculture and biodiversity in the context of ecological transition.

Three questions for
Manon Dervin

Special Adviser - fishing authorisation management
& monitoring of diadromous species
Ministry for Ecological Transition
Directorate-General for Maritime Affairs, Fisheries and Aquaculture
Sustainable Maritime Fishing and Aquaculture Division/ Fisheries
Resources Subdivision
Resource Management Office

What role does the DGAMPA play for diadromous species?

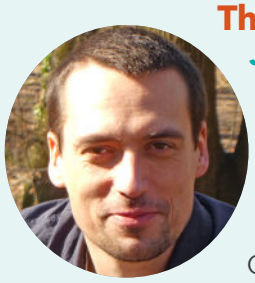
The regulatory framework applicable to the management of diadromous fish requires balancing the preservation of these species with the socio-economic challenges associated with fishing. Two departments of the Ministry of the Environment are involved in their management: the Water and Biodiversity Department (DEB) for freshwater and the DGAMPA for the maritime domain (seas and estuaries, within the limits of water salinity). Currently, eels are subject to national management while other diadromous species (such as salmon, shad and lamprey) fall under the jurisdiction of the prefecture and management plans developed with the COGEPOMI at the level of major French river basins.

In concrete terms, what does your office do to manage these species?

The DGAMPA, along with the DEB, co-signs ministerial decrees setting fishing periods, quotas and management measures for eel fishing at all stages, in accordance with European Regulation 1100/2007 and the national management plan. To ensure the 'sustainable exploitation' of this segment as permitted by European regulations, the DGAMPA interacts with all stakeholders: the European Commission, scientists, professional fishers and the public. The Resource Management Office is also responsible for designing economic aid measures (temporary stoppages, fleet exit plans) that contribute to reducing the fishing effort.

How do scientists support public policy on migratory fish?

A scientific committee including researchers from the MIAME Centre guides the segment's piloting with its studies and modelling. For example, every year, it contributes to setting the annual fishing quota for elvers. In a context of uncertainty linked to climate change, scientists play a crucial role in helping us plan public policy and manage this struggling sector. While fishing has been identified as a pressure that can be regulated, a major scientific challenge remains in quantifying the impact of other anthropogenic pressures on diadromous species.



Three questions for
Jules Wizniak

Special Adviser
Ministry for Ecological Transition
Water and Biodiversity Department (DEB)
Sub-Directorate for the Protection and Management of Water, Mineral Resources and Aquatic Ecosystems
Office of Water Resources, Aquatic Habitats and Freshwater Fisheries

What challenges does the DEB face when managing diadromous species?

Managing salmon, eel, shad and lamprey populations represents a key challenge for the 'freshwater' sub-division of the DEB. The Ministry is working to protect these declining diadromous species using an integrated approach to preserving aquatic ecosystems. The challenge is both ecological and regulatory. It involves restoring habitats, ensuring the ecological continuity of waterways and adapting practices in the face of climate change, but also regulating commercial and recreational fishing, in particular via decrees co-signed by the DGAMPA and the DEB. We are interdependent, as these migratory species are fished both at sea and in freshwater.

How is this management organised with fishers?

The management of diadromous species is designed in a logic of concertation, in particular via migratory fish management committees (COGEPOMI), set up since 1994. These forums mean national policies can be adapted to local circumstances, under the authority of prefects, using management plans for diadromous species. For example, the decisions to halt salmon fishing in 2025 in the Brittany, Adour-Garonne and Seine-Normandy basins were taken locally, without the need for a ministerial decree. This makes it possible to involve fishers in the processes, taking into account the reality of each area. The balance between economic activities and environmental issues is also subject to intense concertation between the DGAMPA, the DEB and professional fishing representatives.

How does research support the DEB's work?

The MIAME Centre is a key partner for public initiatives, acting in an advisory capacity. It supplies scientific evaluations that are crucial for decision-making, especially monitoring catches, population dynamics and impact assessments. For example, the Centre helps define elver fishing quotas within the framework of the 2007 European Directive, as well as assessing diadromous repopulation in watercourses. Furthermore, the MIAME Centre supports the DEB in emerging topics such as climate change, catfish predation and water quality. The DEB puts great trust in scientific assessment, especially in a context where the causes of diadromous decline are multifactorial and complex. Research thus makes it possible to specify ministerial responsibilities and prioritise the actions to be taken.

DCF). Furthermore, the Centre summarises knowledge of populations and national and international pressures, including data from partners and users, and makes them available via reporting systems. For example, from 2020, the aggregated datasets from the ORE DiaPFC observatories were published on the TEMPO and GitHub portals, as well as on Ponapomi, the national portal for data on migratory fish.

Marie-Andrée Arago
Head of Regional Police Services in the Brittany Regional Directorate of the OFB

Faced with salmon's widespread decline in watercourses, several COGEPOMI decided to ban salmon fishing in 2025. The OFB Environmental police's mission is essential to ensure these decisions are respected. Knowledge of the marine cycle and the impact of climate change on migratory fish is still a 'black box' that scientists are gradually deciphering, which limits our capacity to act on these pressures. The regulation of freshwater fishing is one of the actions in our power to contribute to the return of salmon in freshwater. By improving freshwater survival rates as much as possible, we maximise the changes of seeing the return of this iconic migratory fish and can then authorise its fishing again. These measures are accepted by most stakeholders thanks to the relationship of trust between MIAME scientists, public decision-makers and the majority of fishing stakeholders. For many years, this has facilitated the designing of sustainable and ambitious strategies to manage diadromous species.

For several years, these activities have made it possible to monitor the evolution of recreational and professional catches of various species. More recently, the marine distribution of diadromous species has been updated thanks to the compilation of bycatch data from the sea, and scientific campaigns, which had previously been scattered and decentralised. These data, which have been made public, provide valuable decision-making support when implementing management measures, particularly in Marine Protected Areas such as marine nature reserves and Natura 2000 sites.
Since 2000, European Union member states are responsible for collecting data from the fishing industry, needed for conducting the Common Fisheries Policy (CFP). The framework programme for the collection and management of these data is called the Data Collection Framework (DCF). Each year, the Centre supports the ministry responsible for sea fishing in its DCF reporting on the previous year's monitoring of eel, salmon and sea trout, regardless of whether or not the Centre is the primary producer of the data.

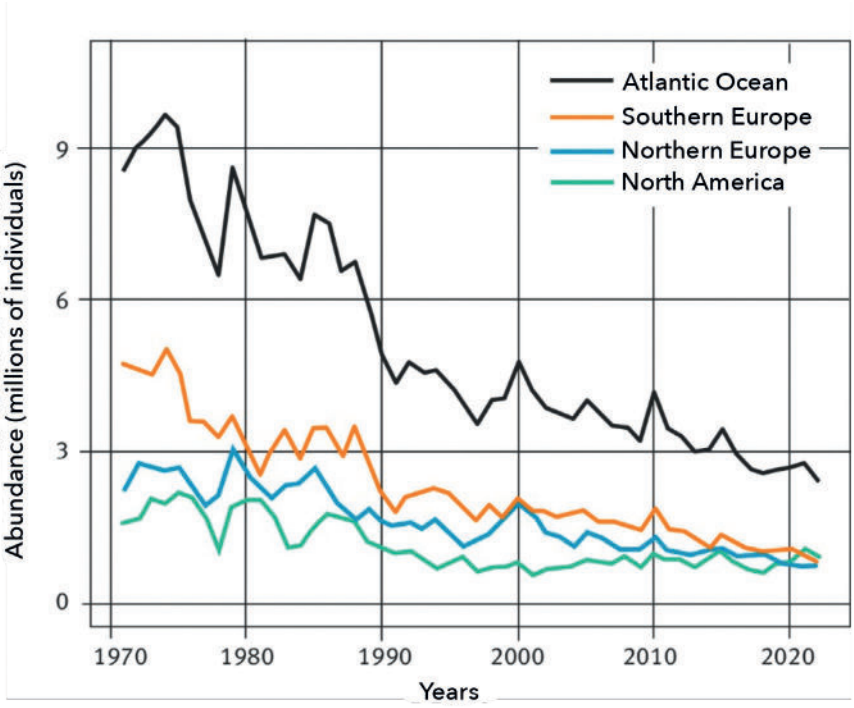
Pilot Sites: open air laboratories

Around the pilot sites, the Centre accompanies "real-scale" operations. Their aim is to test innovative tools and methods to manage migratory fish populations alongside local actors involved in drainage basin management. The current pilot site is the Sélune, a coastal river to the Mont Saint-Michel Bay where the stakes for diadromous fish are high, and for which the Centre coordinates the scientific programme on restoring ecological continuity. Since 2012, multidisciplinary scientific monitoring of this site has been assessing the consequences of dismantling two large dams on biodiversity, water quality and the local area. Spectacular results have been observed ever since continuity was restored with the return of five diadromous species in the upper section of the river after more than a century's absence. MIAME scientists are carefully documenting the recolonisation processes, which will provide useful feedback particularly for water authorities when implementing other continuity restoration projects in the future.

Source: ©U3E

The l'ORE DiaPFC monitoring station at the mouth of the Scorff enables stocks of several migratory fish to be estimated

Source: ICES (2024)



Estimated loss of salmon abundance at the end of their first year in the ocean

Guillaume Rulin
Project Manager - 'Marine environment and combating trafficking in migratory species' at the OFB

As part of the OFB's police division, I'm responsible for inspecting fishing and practices that impact diadromous species. To carry out their duties, the long-distance migratory fish police and OFB environmental inspectors implement a strategy and technical measures that are constantly adapted to scientific research and findings. By documenting species, pressures and the state of migratory species, the MIAME Centre is a crucial partner. It means we can mobilise technical arguments and frames of reference in our 'migratory fish police' network, the aim of which is to provide local stakeholders – departmental services, prefects, prosecutors, elected officials and other public stakeholders involved in the management of diadromous species – with inspection strategies, issue briefs, and assessments of ecological damage and poaching, for example.

Scientific expertise to guide action

The MIAME Centre regularly supplies scientific expertise and decision-making assistance to support the management of species and ecosystems to meet the needs of mangers and public policy-makers. The beneficiaries are located at all geographical levels: prefectural services or marine nature parks at local level, COGEPOMI (management plan establishments) at regional level, ministries (quota or management plan assessment) at national level, and lastly, the working groups of the International Council for the Exploration of the Sea at international level.
For example, a large-scale decision-making support exercise was undertaken with the COGEPOMI for Britanny's waterways to preserve salmon stocks, and new measures to regulate salmon line-fishing were implemented in 2023.

Knowledge transfer via innovation and training

The Centre is perfecting new tools to improve the management of migratory fish, and testing them in the field. From testing available solutions (acoustic cameras) to perfecting tools in-house (biometric table, measurement of substrates using underwater photogrammetry) or in private partnerships (scientific electric fishing gear prototypes), licences may also be filed. But this innovation is not solely material; it can also involve models of varying degrees of sophistication made available to managers via software libraries. Recent examples include a model of Atlantic salmon population dynamics in the Allier River, estimation of adult lampreys in rivers by counting nests, and estimation of migratory flows by double underwater counting. Expert models are also developed to assess Atlantic salmon stocks across the North Atlantic. These missions that structure the Centre's activities provide invaluable public policy support and, in particular, contribute to the sustainable management of fishing. They also make it possible to assess the effectiveness of the regulatory measures implemented in France and internationally. And lastly, the Centre participates in training biodiversity managers. Continuous education (via the Institut Agro, UPPA, OFB and INRAE) specifically targets managers while the contribution to introductory training (Institut Agro, UPPA) transfers the knowledge produced to tomorrow's professionals.

The MIAME Centre: an innovative scientific collaboration for public action

The MIAME Centre is a key player supporting diadromous species management in France and internationally. With all its missions – whether research activities, observatories or role as expert – it makes a significant contribution to adapting public policy to protect French diadromous species. Thanks to its innovative, collaborative format, it ensures the production of new knowledge needed for action and quality data, and accompanies numerous local, national and international institutional partners. This expertise, crucial for designing effective strategies to protect migratory fish and restore their habitats, is enriched by the close relationship between the Centre and public policymakers. ■

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