



SMALL-SCALE FISHERS' FORUM

Connecting scientists and fishers in the process towards data collection and management of European eel in the Mediterranean

Orbetello, Italy, 28 February – 2 March 2023

Report on the second workshop

Executive summary

This second workshop was organized in the framework of the [SSF Forum](#) and the GFCM [research programme on European eel](#), and aimed to follow up on the outcomes of the first workshop held in Sète, France (14 April 2022), under the hat of the International Year of Artisanal Fisheries and Aquaculture (IYAFA), and of the subsequent webinar (28 October 2022) to continue enhancing the interactions between scientists and fishers for European eel in the Mediterranean, and disseminate the scientific advice emerging from the GFCM research programme on European eel (RP) and the GFCM scientific advisory committee (SAC). Building upon the first workshop and the related webinar, this workshop focused on further strengthening the network of European eel fishers in the Mediterranean region and interactions with the scientific community, and aimed to continue the dialogue on the management and monitoring of European eel fisheries, and to promote knowledge sharing at the regional level, by discussing lessons learned and best practices, based on a series of case studies.

Summary of discussions and key issues

Overview of the GFCM European eel activities

The GFCM Secretariat first recalled that the research programme on European eel (RP) has formed an integral part of the GFCM advisory process, starting with data collection and technical assistance activities which feed into working groups and committees, progressively producing scientific advice for the GFCM annual session and the adoption of decisions. The GFCM Secretariat also reiterated that the main decision guiding GFCM work for the management of European eel is Recommendation GFCM/42/2018/1 on a multiannual management plan for European eel in the Mediterranean Sea, which has the objective of contributing to controlling fishing mortality and ensuring the long-term conservation and sustainable use through transitional measures including temporal closure, reduction of effort and catches, future fisheries restricted areas (FRA), traceability, authorised vessels and landing points, measures addressing illegal, unreported and unregulated fishing (IUU) and an adaptive approach.

The GFCM Secretariat noted that the GFCM research programme on European eel has enabled the collection of data and information on management and protection measures for stock recovery at both the national and local levels, as well as on eel fisheries and eel habitats and the biological and ecological features of local eel

stocks. It also provided the basis for a model-based evaluation of alternative management strategies. The information and data compiled, collected and analysed by the research programme provides the scientific basis for the advice on fishery management measures towards the recovery of eel populations, considered by GFCM experts within technical working groups, and ultimately by the GFCM Scientific Advisory Committee for Fisheries (SAC) and the GFCM annual session.

In terms of next steps, the GFCM Secretariat explained that, acknowledging the critical status of European eel, the low recruitment levels and the results of the research programme, the annual session of the GFCM agreed to implement a second phase of the GFCM research programme on European eel and agreed on the need to strengthen transitional management measures while collecting additional data to inform a long-term management plan. With this in mind, the GFCM Commission adopted Recommendation GFCM/45/2022/1 on a multiannual management plan for European eel in the Mediterranean Sea, amending the previous Recommendation GFCM/42/2018/1.

During ensuing discussions, some fishers commented on the proposed temporal closures of eel fisheries, noting that these closures could be beneficial provided that constructive and productive activities were carried out in the meantime, for example, facilitating habitat restoration or ensuring lagoon management based on traditional management models. Fishers also argued that any additional closures on eel fisheries should be complemented by economic compensation, including to support acceptance from fishers with regards to closures. Speakers agreed that illegal activities were a major challenge in some countries for the sound management of eel fisheries, in particular regarding glass eels, although opinions differed on whether the most effective solution involved improving the effective control of trade or the total prohibition of fishing and trading eel juveniles. Furthermore, the GFCM's mandate on fisheries was underlined as the primary reason for the focus of the discussion on fisheries-related measures, however all participants agreed that a comprehensive discussion, that also considered eel fisheries in the context of environmental issues, was also essential.

Select case studies and best practices in the management of European eel in the Mediterranean

Numerous case studies were presented on good practices and issues relating to eel fisheries management in the countries participating in the research programme. The presentations were jointly delivered by researchers, fishers and, in some cases, local administrators relevant to the case study in question, showcasing how crucial the collaboration between fishers and scientists is for the conservation of European eel, the sustainable management of stocks and effective monitoring. Another case study was also presented on Northern Ireland, as a best practice of interactions between fishers and researchers related to the largest commercial eel fishery in Europe. The fishing community played an important socio-economic role for the welfare of the local community and developed a local management model including conservation measures. This case study generated interest among the participants, as some environmental characteristics of the site (connection to the sea through an estuary) and of the management framework (catch at the weir, assisted migration to enhance natural recruitment, measures to ensure escapement of silver eels) presented similarities with management models in place in some Mediterranean lagoons. While several issues remain local, common needs and challenges in the region and beyond were also highlighted, as outlined in the coming paragraphs.

Both fishers and researchers have a crucial role to play. Common themes from the presentations were that fishers remain the guardians of European eel and their habitats and should be involved in the monitoring and control of eel fisheries as they carry an important cultural value and great knowledge and experience, and should be protected for these reasons. However, pressure on eel stocks is linked to several issues involving other actors outside of the fisheries sector; this is why interactions with relevant administrations should be encouraged to support fishers and identify most adequate management measures.

The presence of dams and hydropower barriers on rivers prevent eels from undertaking their regular upstream and downstream migrations causing significant eel mortality – which in the northern part of the European eel distribution range have been estimated to be of a similar entity as those cause by fisheries – and changing water flow. This impact is identified as a crucial one to manage along with fisheries and other non-fisheries impacts.

The presence of cormorants is an issue faced by some eel fishers in the region. While methods have been developed to mitigate interactions with cormorants, including the use of boats and anti-cormorant nets, these aquatic birds remain considerable predators and have a harmful impact on eel fisheries. It was agreed that balanced measures and solutions should be identified to support fishers, while also preserving cormorants' role as part of biodiversity.

Interactions between European eel and non-indigenous species (NIS) also have a damaging impact on eel stocks in some countries. In particular, throughout the region blue crab has been affecting eel fisheries, causing notable damage to the nets and gear used. Although blue crab (*Callinectes sapidus*) was first observed in the northern Mediterranean, it is spreading across the region, and countries are undertaking studies to effectively catch and commercialize it in order to reduce its impact. The ongoing GFCM research programme on blue crab was recalled, noting that it could present an opportunity to better understand interactions between European eel and blue crab, including how to capitalize on blue crab as a resource, targeted with blue crab-specific gears, that could complement income loss from eel fishing during closed seasons.

A further common issue identified was climate change, which has a tremendous impact on the status of eel stocks, including through changing hydrological (e.g. water exchange and water level) and physicochemical (e.g. salinity) characteristics of lagoons and changing temperatures and weather patterns affecting eel reproductive seasons and consequently the fishing seasons. Pollution is another multi-dimensional issue that threatens fisheries and requires the establishment of a framework to counteract pollution in all eel habitats.

To address the numerous cases of IUU fishing in the countries concerned, fishers have underlined the strong role they have to play in monitoring and control, ensuring they are provided the necessary tools for effective management. Poaching has a direct impact on glass eels and silver eels.

Comments were also received from other countries in the region, which were not involved in the research programme and which may have points in common with regard to eel fisheries, environmental issues and management models.

Meeting participants all agreed that, while lagoon environments differed from one area to another, European eel is a shared stock and, therefore, action at a local level would not be sufficient, but rather a framework of common rules at a national and regional level for consistent action was required. Such a framework, it was underlined, needed to leave space for local administrations to act according to local needs and involve all relevant administrations, including environmental ones. There was consensus that such a forum of discussion was a good place to start developing good practice models and common minimum criteria, allowing countries to implement local actions bringing together administrations, fishers and scientists within a global framework. Science and work have been carried out in recent years highlighting good practice management actions and should be explored in this context.

A final preminent issue underlined in the discussions was the lack of generational turnover in eel fisheries, and in small-scale fisheries more widely, throughout the whole Mediterranean region. Policy-makers should acknowledge this issue in view of encouraging the younger generation to become a fisher or get involved in the fisheries sector. Although the fishing profession may be a difficult one, there are attractive opportunities which should be shared and advertised, such as fishing tourism (pescaturism) and other diversifying activities. Fishers present during the meeting expressed their view that the next generation of fishers would be a generation of entrepreneurs that looked for innovative strategies to optimize their revenues. To encourage generational turnover, support must be provided to help the younger generation find passion in the sea by transmitting knowledge, experience, and creating schools and education programmes to stimulate interest

and raise awareness, but also ensuring young fishers have the necessary equipment and support to start fishing activities.

Socio-economic survey of European eel fisheries in the Mediterranean

The GFCM Secretariat explained that, while the first phase of the research programme on European eel had ended, a second phase had been foreseen. This second phase foresees carrying out, among other things, a socio-economic survey in 2023 to capture a snapshot of the economic status of the European eel fishery in the Mediterranean, prior to the entry into force of the latest GFCM Recommendation. The information collected through this socioeconomic study is foreseen to serve as baseline information, facilitating understanding of the socioeconomic impacts of the management measures and facilitating consideration of economic issues by fishery managers when taking decisions.

After a presentation of the potential methodology to be used, discussions centered on the need to work together with stakeholder groups to identify the population of fishers from which to select the survey sample. Participants agreed on the need to stratify the sample by fishing gear and habitat in order to standardize data collection across homogenous groups, as well as to collect data about all relevant species captured and sold by eel fishers, not just European eel. As next steps, it was agreed that the GFCM Secretariat would prepare a first draft of the questionnaire and survey plan, to be further refined in consultation with relevant experts and stakeholders. Select stakeholder groups expressed their eagerness to collaborate with this study and it was agreed that the study could be piloted in a few select sites with select fishing cooperatives, in order to better refine and adapt the study to the realities of eel fisheries in the region.

Giving a voice to the fishers on the way forward and capacity building needs

The meeting concluded with a general discussion on key conclusions and next steps to build capacity in the region, as outlined in the next section. In general, the next main steps include defining key sites and coordinating the methodologies and use of data collected. The need for financial resources to support monitoring at local level was stressed, as well as the need to define a minimum level of monitoring. It was agreed that low cost methodologies could be explored, involving fishers in simple protocols but within a long-term regional framework, and that efforts should be directed first towards identifying sites and a simple framework for monitoring.

Main conclusions and way forward

A SWOT analysis (Appendix 3) identified the strengths and weaknesses, opportunities and threats of each case study presented. The main weaknesses involved poaching, the lack of inclusion of fishers in the decision-making process, IUU fishing, fragile ecosystems and environment, including related to impacts of climate change, lack of awareness of fishers and other stakeholders on environmental issues and the importance of adequate management, obsolete regulatory frameworks and lack of funding opportunities.

In parallel, each case study highlighted strengths, including among others, co-management, long-term scientific monitoring, selective gear, prohibition of glass eel fishery, effective collaboration between fishers, researchers and sometimes with the administration, data collection and biological sampling of eel, efforts towards improved monitoring, regulations adopted based on scientific advice.

Most of the countries involved in the research programme face similar threats, such as climate change (eutrophication, droughts, low rainfalls, increase in salinity, etc.) and pollution leading to habitat degradation and loss, cormorant predation, alien species, and illegal fishing. However, fishers have succeeded in creating opportunities, in particular through co-management, which has been developed throughout the Mediterranean region. The scientist-fisher collaboration continues to pave the way for the identification of new opportunities, including enhanced fisheries through protection and integration of natural recruitment,

the improvement of environmental conditions, long-term monitoring programmes, reduction of predation, but also the diversification of livelihoods.

Participants from Spain confirmed the need for further studies, including on fishery-independent assessment of recruitment and escapement levels; life history patterns of eels (age, growth, sex ratio), parasites and contamination of eel local stocks, in selected sites of the Mediterranean basin; and the effects of climate change on the biology and ecology of eel.

Finally, the participants agreed on the following set of conclusions:

- Poaching is a widespread and important issue especially in relation to glass eels: there is a need for a better control system and the inclusion of controllers around discussion tables in the concerned countries;
- Crucial importance of fisher knowledge towards correct management of lagoons and the fishery (co-management): many actions are already being undertaken by fishers and should be highlighted;
- Eel is an umbrella/iconic species that can be used to address all issues relevant to lagoon management: crucial need for integration of habitat-related measures and of fisheries management actions. There is an important role to be played by administrations (local and national) in supporting the liaison between the two topics;
- Management actions should be under a general framework of minimum overall measures applicable generally, coupled with local measures to tailor for peculiarities. Best practice models should be adaptable to different local situations and additional species;
- Post-capture management is also important in order to effectively contribute to the regeneration of stocks, the release of eels, etc;
- Conduct awareness activities in schools to incentivise younger generations to fishing;
- Scientists, administrations agree to collaborate on and support a socioeconomic study in the next few months towards establishing a baseline;
- Monitoring and the way forward:
 - Crucial importance of fishers in eel monitoring (both fishery-dependent and fishery independent);
 - Need to devise minimum monitoring framework with a coordinated but locally-adapted methodology for all life-stages;
 - Based on the huge amount of work done thus forth, identify key sites where to explore the way forward;
 - There is a need for coordinated analysis and use of emerging data;
 - Proposal to set up a basic monitoring plan for recruitment (index of recruitment/peaks) using the *flottang* that will be distributed to all;
 - Webinar suggested to discuss and identify needs to the way forward.

Overall, there is a pressing need for an integrated approach to management that includes the environment dimension as well and not just the eel fishery. The creation of a network of Mediterranean eel experts and fishers is a crucial starting point to continue reinforcing collaboration and monitoring which have already been ongoing. The key is coordination in the region to define a global framework and ensure effective and consistent action towards the sustainable management of European eel.

Agenda

1. Welcome and introduction to the SSF Forum
2. Overview of the GFCM European eel activities
3. Select case studies and best practices in the management of European eel in the Mediterranean and beyond
4. Field trip to the Orbetello lagoon
5. Closing discussions: way forward and identification of capacity building needs

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SWOT Analysis

ALBANIA

<p>Strengths Biological sampling of eel; Absence of Anguillicola, for now; Fishery dependent sampling; Extensive exploitation with traditional/artisanal practices; Fishery Management Organizations established in some lagoons with approved co-management plans</p>	<p>Weaknesses Significant reduction in eel population; Poor reporting system; Absence of strategic and specific management plans for coastal lagoons in Albania; High pollution levels; Fragmented management of coastal lagoons; Poor maintenance the hydraulic systems in the lagoons</p>
<p>Opportunities Involvement of fishers in research and monitoring; Co-management</p>	<p>Threats Fishing; IUU fishing/poaching; Habitat degradation; Predation (birds + blue crabs); Climate change: variations in hydrology, salinity, depth and the eutrophication processes, frequent algal blooms; Non-indigenous species; Lack of harmonious management towards environment, conservation and fisheries goals</p>

ALGERIA

<p>Strengths Scientist-fisher collaboration for data collection; Beginning to use passive traps to monitor recruitment; Prohibition of glass eel fishery; Beginning of the escapement monitoring using mark-recapture; High biodiversity; Eel quality studies (parasites); Legislative framework specific to eel (gear, season, licenses limitation); Cooperation with local fisheries administrations</p>	<p>Weaknesses Old regulatory framework; Lack of funding opportunities; Lack of data for stock quality and habitat</p>
<p>Opportunities Fisher involvement in monitoring; Concession system for eel exploitation</p>	<p>Threats Piscivorous birds (cormorants); NIS (Blue crabs, Carassius spp); Pollution ; Climate change (droughts, low rainfall, increase salinity); Parasites (Anguillicola); Dams; High cost of hydrological management; Disturbance of the ecological continuity</p>

EGYPT

<p>Strengths Data collection in collaboration with fishers</p>	<p>Weaknesses Low awareness of fishers and aquaculture investors on environmental issues and the importance of management measures; IUU</p>
<p>Opportunities Close glass eel fishery; Fight IUU; Improve environmental conditions; Efforts of the government in dredging lagoons</p>	<p>Threats Habitat degradation; Pollution; Spread of aquatic plants; Siltation; IUU; Eutrophication</p>

FRANCE (Mediterranean coast)

<p>Strengths More than 10 years collaboration between fishers, scientists and the administration; Silver eel release programme; No glass eel fishery ; Local management system (prud'homies); Environmental monitoring; Data collection; Eel quality studies (fat content): parasites, chemical contamination; Satellite tagging; <i>Flottang</i> for recruitment</p>	<p>Weaknesses Hydraulic management: French administration does not allow to open river mouths/tidal channels impeding the monitoring of blue crab and conflicts with other uses; Increase in IUU from recreational fisheries; Measures taken: fishery measures inhibit working well on real issues</p>
<p>Opportunities Continue efforts to collaborate with fishers in data collection and the management of the environment (mark recapture, etc... with state financial support); Release of eels to increase the population; Livelihood diversification; Diversification of approaches and work towards environmental improvement: involvement of fishers to preserve the lagoon environments</p>	<p>Threats Habitat degradation/loss; Parasites (<i>Anguillicola</i>); Pollution; NIS (blue crab); Increase in salinity</p>

GREECE

<p>Strengths Tagging of silver eel with fishers; Monitoring efforts; Collaboration with fishers on monitoring</p>	<p>Weaknesses Administrative issues: problems related to obtaining sampling permission, lack of data from western Greece</p>
<p>Opportunities Co-management</p>	<p>Threats Pollution; Low dissolved oxygen; High pH values; Cormorants; Very low transparency; Blue crabs</p>

ITALY (ORBETELLO)

<p>Strengths Water pump management; Co-management; Harvesting of algae; Long term scientific monitoring of all eel stages</p>	<p>Weaknesses Poaching</p>
<p>Opportunities Involvement of fishers in management (co-management); Restocking; Release activities of glass eels with a quota system Reduction of predation; Enhancement of processing to maintain local traditions and value products</p>	<p>Threats Excessive growth of macroalgae; Anoxic crises; Predation by ichthyophagous birds + Blue crab</p>

ITALY (SARDINIA)

<p>Strengths Long term fishing effort reduction (five months fishing season since 1990s); Glass eel fishery not in place; Long term scientific monitoring on eel stock and management effects; Regulation based on scientific advice; Good interactions between Fishers-Researchers-Administration</p>	<p>Weaknesses Illegal Unreported Unauthorized (IUU) fishing; Low number of fish ladders on dams; Periodical lack of lagoon connectivity; Torrential streams and river fragmentation</p>
<p>Opportunities Involvement of fishers in management (co-management); Experimental local management measures; Improve collaborations in monitoring and data collection</p>	<p>Threats Alien species invasion; Predation by ichthyophagous birds; Pollution and loss of eel habitat</p>

ITALY (TEVERE)

<p>Strengths Good interaction Fishers-Researchers; Long term time series for recruitment; Tevere has become an observatory: fishery dependent and then fishery independent data (including CPUE); Environmental data collection over time; Biological sampling of eel</p>	<p>Weaknesses Recruitment fell to zero and fishery was closed; Lack of river connectivity</p>
<p>Opportunities Continue involving fishers; Long-term monitoring times series to be maintained</p>	<p>Threats Dams; IUU; Water depuration sites; Pollution; Water level</p>

SPAIN (Catalonia)

<p>Strengths Management decisions are made in collaboration and consensus between fishers, scientists and the administration through co-management; Joint data collection by fishers and scientists; Release of silver eel (migratory phase) and glass eel in lagoons; Monitoring of glass, yellow and silver eel in rivers and lagoons; Availability of daily sales notes of eel catches from the professional fishing sector; Reduction on the eel fishing effort of 37% (since 2018 GFCM Recommendation); Closed season for both glass eel and yellow-silver eel of more than 7 consecutive months</p>	<p>Weaknesses Measures to prevent illegal, unreported and unauthorized (IUU) fishing; Lack of connectivity between water masses due to low rainfall in recent years.</p>
<p>Opportunities Enhance eel management measures through co-management agreements considering socioeconomical aspects; Maintain the release of silver eel (migratory phase) into lagoons</p>	<p>Threats Non-anthropogenic threats affecting the eel population (low rainfall, pollution, presence of physical barriers preventing migration, low water flow); Illegal fishing; Gradual disappearance of a historical fishing sector Socio-economic dependence on eel fisheries for 97 fishers</p>

TUNISIA (Ghar El Melh lagoon)

<p>Strengths Gear, seasons, licenses limitations with a dedicated legal framework to eel fishery</p>	<p>Weaknesses Lack of inclusion of fishers in discussion tables on environment management; Fragile ecosystems; Pollution; Update of scientific research and studies should be carried out; Conflicts between gears; Slow legislation uptake</p>
<p>Opportunities Conversion to an alternative fishery for blue crabs (using dedicated gears); Monitoring of glass and yellow eels and more in depth information on the transitions from yellow to silver eel; Involvement of fishers in management (co-management via local committees and the creation of fisher organizations)</p>	<p>Threats Siltation in transition areas (tidal channels); Climate change (droughts, low rainfall); High cost of hydrological management + difficult interactions with involved stakeholders; NIS (blue crab)</p>

TUNISIA (Tunis Northern lagoon)

<p>Strengths Improvement of water circulation; Co management of eel fisheries (gear limitations, geographical and métier, licensing....); Exclusive allocated areas for specific gears; Prohibited zones for silver eel fishing (protected area allowing free eel migration); Existence of a fishermen cooperative (SMSP Arous Al Bouhayra)</p>	<p>Weaknesses Possible conflicts with the company that manages the lagoon (Société de Promotion du Lac de Tunis SPLT); Fragile ecosystems; Updated scientific research and studies should be carried out; Slow legislation uptake</p>
<p>Opportunities Monitoring of glass and yellow eels and more in depth information on the transitions from yellow to silver eel; Possibility of fisher's income diversification</p>	<p>Threats Climate change (droughts, low rainfall); High cost of hydrological management + difficult interactions with involved stakeholders; NIS (blue crab)</p>

TÜRKIYE

<p>Strengths Interaction between fishers and scientists in management and data collection; High biodiversity; Management of lake by a cooperative</p>	<p>Weaknesses</p>
<p>Opportunities Co-management</p>	<p>Threats Cormorants, blue crabs, sea turtles; Pollution; Ecosystem changes in response to threats; Reduction of eels in the lake</p>