AAC Recommendation on Blue Crab Emergency in Italy

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Index

I. Background

Two alien species of blue crab are currently present in the Mediterranean Sea: *Callinectes sapidus* from the Atlantic Ocean and *Portunus segnis* from the Pacific Ocean. Over the past decade, both species have caused damage to farms and ecosystems with varying levels of severity depending on the considered species and the areas affected.

From the summer of 2023 onwards, blue crab (*Callinectes sapidus)* proliferation has severely impacted the traditional clam farming sector, the valliculture sector and the entire ecosystem in the Po Delta area (Italy). Since then, clam production has dropped by about 90%. This situation is probably due to the combined effect of blue crab introduction in the area and specific climatic conditions that occurred in 2023, which made its proliferation possible.

This event, like the mussel mortalities observed in the Adriatic Sea in the summer of 2024, affects the shellfish farming sector and, thus, low trophic aquaculture (LTA), which is called to play a key role in the current EU strategies for the sustainable growth of EU aquaculture and a sustainable food system.

More generally, the shellfish farming sector, which, on the one hand, is much more dependent than other sectors on suitable environmental conditions and, on the other hand, is composed mainly of micro-enterprises and SMEs with limited adaptive capacity, is in danger of being significantly downsized if efficient and shared strategies are not established in the short to medium term.

Finally, the invasion of the blue crab (*Callinectes sapidus*) in Italy certainly remains one of the most emblematic cases observed recently in Europe. It deserves to be described and analysed to initiate a debate on the advisability of adapting the EU regulatory framework to support the productive sectors affected by similar events during the time span necessary to research and implement alternative solutions. The urgency of such measures is also determined by the fact that, as a result of persistent climate change, the likelihood of similar events occurring is set to increase.

The EU Regulatory and Policy Framework on Invasive Alien Species (IAS) and Biodiversity

Invasive Alien Species (IAS) are animals and plants that are introduced accidentally or deliberately into a natural environment where they are not normally found, with serious negative consequences for their new environment.

A related international policy framework is the Convention on Biological Diversity of the United Nations (COP 2021).

Related EU policy frameworks include, for example:

- The Regulation (EU) n. 708/2007 of 11 June 2007 concerning the use of alien and locally absent species in aquaculture.[1]

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32007R0708

- Com (2011) 244 of 3 May 2011 on EU Biodiversity Strategy to 2020.[2]
- The Regulation (EU) n. 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of IAS.[3]
- The Commission Implementing (EU) 2016/1141 of 13 July 2016 adopting a list of invasive alien species of Union concern pursuant to Regulation (EU) 1143/2014 of the European Parliament and of the Council. Since 2016, only three updates have been made, with the last one in August 2022.[4]
- Com (2020) 380 of 20 May 2020 on EU Biodiversity Strategy for 2030.[5]

Ongoing EU policy initiatives include, for example:

- The draft of the Commission Implementing (EU) amending implementing Regulation (EU) 2016/1141 to update the list of IAS of Union concern.[6]

Other reference documentation and websites include:

- The 'European Alien Species Information Network' (EASIN) for species search and mapping.[7]
- The IPBES 'Thematic assessment report on invasive alien species and their control'.[8]
- ISPRA – Publications on alien species.

Three aspects of Regulation (EU) 1143/2014 need particular attention:

1) The restrictions listed in Article 7 and the derogations provided for in Article 8 to hinder the containment strategies of the invasive population and any strategies for the valorisation of the concerned alien species in the absence of specific derogations. This needs attention because the restrictive measures under the current regulation make no distinction between alien species introduced accidentally or deliberately.
2) The maximum period of 24 months before registration in the 'Union list' in which the involved member state should complete the 'risk assessment' (Article 10), as well as the periods of 18 months and 3 years after registration, respectively, for 'a comprehensive analysis of the pathways' and 'one single action plan or a set of action plans' (Article 13), are in conflict with the concept of 'emergency' covered by this regulation to protect the marine ecosystem and ensure the perpetuity of the aquaculture sector.

[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52011DC0244
[3] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R1143
[4] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R1141
[5] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52020DC0380
[6] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/14130-Updating-the-list-of-invasive-species-threatening-biodiversity-and-ecosystem-services-across-the-EU_en
[7] http://easin.jrc.ec.europa.eu/
[8] https://zenodo.org/records/11629357

3) The complexity of the registration procedure and the emergency management process, as well as the lack of reference to forms and methods of coordination between EU institutions and member states.

The EU Regulatory and Policy Framework on Climate Change Adaptation

A related international policy framework is the United Nations' Agenda 2030.

Related EU policy frameworks include, for example:

- Com (2021) 82 of 24 February 2021 on forging a climate-resilient Europe – the new EU strategy on adaptation to climate change.[9]
- Regulation (EU) 2021/119 of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 (European Climate Law).[10]

Related Italian policy frameworks include:

- Strategia nazionale di adattamento ai cambiamenti climatici (SNAC) adopted in 2015.
- Piano Nazionale di Adattamento ai cambiamenti Climatici, with a specific chapter on aquaculture and a specific chapter on alien species in the context of climate change.[11]
- National platform on climate change.[12]

Other reference documentation and websites include:

- AAC Recommendations on Climate Change (AAC, 2022 and 2023)[13]
- AAC Recommendation on the concerning impact of climate change on EU mussels' production level (AAC, 2025)[14]

The Aquaculture Advisory Council (AAC) agrees with the introductory analysis and most of the proposed strategies in Com (2021) 82. However, this document focuses on the potential risks associated with climate change and, therefore, on medium- to long-term strategies aimed at limiting them. This document only marginally deals with the concept of 'post-disaster emergency' in point 2.2.3, citing the possible use of 'solidarity funds', and mentions in point 2.2.3 the possible use of forms of 'insurance'.[15]

[9] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0082
[10] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R1119
[11] https://www.mase.gov.it/notizie/clima-approvato-il-piano-nazionale-di-adattamento-ai-cambiamenti-climatici
[12] https://climadat.isprambiente.it/
[13] https://aac-europe.org/wp-content/uploads/2023/05/2.-AAC-Recommendation-Climate-change-adaptation-and-mitigation_2023_2_.pdf
https://aac-europe.org/wp-content/uploads/2022/09/19.AAC_Recommendation_-_Risks_of_bivalve_pathogen_emergence_in_connection_with_climate_change_2022_19_.pdf
[14] AAC Recommendation on the Concerning Impact of Climate Change on EU Mussel Production – aac-europe
[15] Reference to non-insured economic losses caused by climate-related disasters.

Essentially, this document is projected into the future, with objectives such as maximum adaptation, climate neutrality and reduced vulnerability to the effects of climate change, but does not contemplate short-term strategies to ensure the perpetuity of productive sectors affected by emergency situations.

The Regulatory and Policy Framework References

The above references are only a part of the entire regulatory and policy framework. In fact, the regulatory and policy framework of reference is extremely complex, referring to different but interconnected technical issues and with a scarcely coordinated decision process at global, EU and individual member state levels.

II. Justification

Context Related to Alien Species and Climate Change

Nowadays, IAS are one of the main threats to biodiversity, and the number of introduced species worldwide is still growing with no signs of saturation (Seebens 2017). A recent study estimated that there will be a 64% increase in the number of alien species in Europe by 2050 (Seebens 2020). Italy currently has the highest number of alien species in Europe, with almost 3,500 species present in the national territory, an introduction rate of about 13 species/year in the past decade and an increase of over 500% of new alien species introduced in the last 120 years (ISPRA, 2022).

Furthermore, the scientific community agrees that climate change will exacerbate the negative impact of IAS, with effects on multiple domains (e.g. biodiversity, human and animal health) and productive sectors (e.g. agriculture, forestry, fisheries, aquaculture and transport) (Hulme 2017). Most of the scientific literature indicates that IAS will be favoured or at least not negatively affected by climate change, while native species will be disadvantaged (Vilà 2007; Hellmann 2008; Thuiller 2008).

The Mediterranean basin, often referred to as the Mediterranean hotspot, is an area identified as particularly vulnerable to climate change. At the same time, the Mediterranean marine environment is particularly exposed to the spread of alien species since the progressive warming of the waters, in addition to favouring the arrival and expansion of Lessepsian species, which increases the stabilisation potential of alien species that are introduced into the natural environment with ballast water and hull encrustations (biofouling).

By its nature, aquaculture has close relationships with inland, transitional and marine water environments and is considered among the socioeconomic sectors most vulnerable to climate change (Collins 2020; Falconer 2022). Furthermore, the assessment of the impacts of climate change is complicated by the diversification of production systems, technologies adopted, species, geographical location, environmental characteristics of the territory, and

the possible combination of multiple impact factors. Shellfish farming appears to be the most vulnerable sector, as it is subjected to a greater number of pressures and impacts.[16]

Proliferation of the Atlantic Blue Crab in the Po River Estuarine Area

The Po Delta area is characterised by a high diversity of water bodies (river, lagoon, open sea and 'Valli') and by high salinity variation according to seasons and rainfalls. In this area, shellfish farming is traditionally performed, while extensive fish farming is conducted in some closed areas called 'Valli'. As far as shellfish farming is concerned, clams (*Ruditapes philippinarum)* are cultivated on-bottom, while mussels (*Mytilus galloprovincialis*) are cultivated suspended on structures supported by wooden poles planted in the seabed. Clam production until 2022 was about 18,000–20,000 tons/year.

The blue crab (*Callinectes sapidus*) comes from the U.S. East Coast. It was first noticed in the Mediterranean Sea in 1949. In the Goro Lagoon, it was first noticed in 2007. In the last decade, a slow increase in catch has been observed, but without any effect on other local species and on aquaculture activities. The blue crab is a benthonic carnivorous species with very high fertility.

The invasion began at the beginning of 2023 due to specific climatic circumstances:

- A long drought period from all of 2022 to April 2023, which caused salty seawater to penetrate for many kilometres in the Po River, creating a suitable condition for the females to reproduce more easily.
- Intense rainfalls and flooding in May 2023 that led to an unusual dispersion of the larvae and juveniles in all the delta area.
- These events occurred just before the summer temperature increased, and blue crab metabolism reached its maximum levels.
- Summer temperatures have been higher compared to average previous ones.

[16] *Scientific bibliography*

Seebens et al. (2017) – No saturation in the accumulation of alien species worldwide. Nature Communications, 8, 14435.
Seebens et al. (2020) – Projecting the continental accumulation of alien species through to 2050. Global Change Biology, 27(5), 970–982.
ISPRA (2022). Annuario dei Dati Ambientali 2021.
Hulme, P.E. (2017) – Climate change and biological invasions: evidence, expectations, and response options. Biological Reviews, 92(3), 1297–1313.
Vilà et al. (2007) – Linking plant invasions to global environmental change. In Canadell (eds), Terrestrial ecosystems in a changing world. Springer-Verlag, New York, 93–102.
Hellmann et al. (2008) – Five potential consequences of climate change for invasive species. Conservation Biology, 22, 534–543.
Thuiller et al. (2008) – Will climate change promote alien plant invasions? In Nentwig, W. (ed), Biological invasions. Ecological studies, vol 193. Springer, Berlin, Heidelberg, 197–211.
Collins et al. (2020) – Impacts of climate change on aquaculture. MCCIP Science Review 2020, 482–520.
Falconer (2022) – Impact of climate change on farm-level aquaculture production and carrying capacity.

Even if the phenomenon has still to be studied to better understand the dynamics of the invasion, it results in both the involuntary introduction of an alien species and climate change. The Po Delta, similar to blue crab origin areas in the USA, probably offers suitable conditions for this species to reproduce. However, the complex relationships between fertility, food availability, salinity, temperature and the environment make it difficult to understand the key factors that regulated the observed proliferation event.
The blue crab catches increased from 180–200 tons in 2022 to 1,500–1,600 tonnes in 2023 and 1,800–2,000 tonnes in 2024, indicating that predatory pressure has not yet begun to decrease.

To date, mussel cultivations have been marginally impacted, as mussels are harvested before predation from the blue crab reaches its maximum level (higher metabolism during summer).

In the entire Po Delta area and in the 'Valli', benthonic fauna has also been drastically reduced, leading to an alteration of the ecosystem food chain and a reduction of biodiversity. The effective impact on biodiversity is yet to be scientifically assessed. As far as welfare is concerned, an adapted protocol still needs to be defined.

Socioeconomic Provisions

In 2023, some provisions were immediately undertaken to allow farmers and fishermen to catch blue crabs to reduce the population. Subsidies were allocated for this purpose.
A 'state of calamity' has been declared in the two concerned regions, and a commissioner has been appointed to coordinate the local strategies. ISPRA (Research centre) has also been appointed to coordinate scientific concerns in collaboration with the commissioner. In 2024, in some production zones, fenced areas have been authorised, initially covering 10% of the cultivation areas prior to the crisis and more recently up to 30% (the cost of fencing averages €10,000 x 10,000 sq. metre). For 2025, a new plan was launched on April 15, which provides for a reimbursement of €1.0/kg for catch and €0.5 for disposal.
In this emergency phase, many financial instruments were preconceived and/or used:

- National funding based on national laws for emergencies
- Unemployment subsidies
- EMFAF funds

The total amount made available is over €50 million, but only part of it has been disbursed. After a two-and-a-half-year crisis, it is estimated that around 750 people from the sector have already moved on to other professions, that in an area to be considered 'disadvantaged'.

Technical Provisions

Some preliminary studies have been conducted in August 2023 (ISPRA), November and December 2023 (Veneto Agricoltura) and June 2024 (WWF). Another important research project on both blue crab species has been launched by the GFCM[17] in the Mediterranean.

Where the depth was not too much and fences could be installed, enclosed areas have been created. In areas where the depth is higher, some trials to protect cultivated clams from crabs

[17] https://www.fao.org/gfcm/activities/fisheries/scientific-advice/research-programmes/blue-crabs/en/

have been done by covering the cultivated areas with nets that are changed periodically. As fouling has been limited, these attempts had a positive outcome. Nevertheless, the system entails a possible alteration of the water circulation with risks of anoxia in the cultivated areas. Further trials must be done to understand if such a strategy can be extended. Some producers have moved to cupped oyster farming in suspended and closed devices to diversify their production. Furthermore, the hypothesis of introducing other species to grow in place of Manila clams, particularly *Mercenaria sp*, is also being studied, but since it is an exotic species, in-depth studies are needed with long lead times before significant productions can be obtained.

Finally, the possible exploitation and valorisation of the blue crab have also been investigated. In the USA region where this species comes from, exploitation is well assessed, and authorities are trying to keep the population stable to allow economic activities to carry on. Investigations are ongoing on how to transform the blue crab and create new opportunities. Some small-sized enterprises have already transformed the blue crab in Italy, but it remains a niche market, and current processing capacity is still limited to a few tons a day. The main obstacles are that the meat content is very low (under 15% of the live weight), meat extraction is quite difficult to automate, and the manpower cost in Italy is very high. Furthermore, the proportion of crabs of a size suitable for processing stands at 15%–25 % of the product caught; the rest is currently sent for disposal. One ton of product of a suitable size for processing accounts for 5,000 to 7,000 crabs. Some producers' organisations (OPs) are beginning to export frozen crabs for processing in Sri Lanka and other non-European countries where labour is cheaper. Some attempts to produce crab meal are also being studied.

Perspectives

From previous experience with other alien species, it is expected that the blue crab population will decrease and stabilise on lower levels according to natural ecosystem evolution together with anthropic efforts to control its population. Nevertheless, at this time, it is impossible to forecast how long it will take for the blue crab population to decrease or stabilise. It is equally impossible to say if the final density of the blue crab population will be compatible with the updated aquaculture practices.

As far as clams and oyster production are concerned, new production techniques have still to be studied, and possible results are not expected immediately. The economic impact of transitioning to more sophisticated production methods with higher costs will have to be carefully evaluated.

Estimated clam production in the coming years is unlikely to exceed 20% of the pre-crisis level. In the meantime, local processing and valorisation of blue crab, alongside exports, are expected to grow progressively.

Atlantic Blue Crab and Pacific Blue Crab's Impact in Other Mediterranean Areas

Other traditional fish farming areas in the Mediterranean Sea experienced similar problems.

Particularly heavy impacts due to *Callinectes sapidus* have also been recorded in the Ebro Delta in Spain and the Thau Lagoon in France. Since 2025, other Italian areas that had previously been spared have seen a significant increase in the presence of the predator. An impact on *Venus gallina* wild stocks has also been reported.

Another blue crab species from the Pacific Ocean, *Portunus segnis*, also entered the Mediterranean Sea from the opening of the Suez Canal. This alien species has already spread along the coast of North Africa, particularly in the Sfax Gulf in Tunisia, where wild stocks of *Ruditapes Decussatus* have been heavily impacted. Probably as a result of temperature increases, the species is now spreading northward to Europe's South Coast.
Over the last few years, populations of both species have fluctuated significantly, even disappearing unexpectedly in some areas. Comparative studies on population evolution in the various affected areas are needed to better understand how to manage the consequences on production systems and ecosystems.

Conclusions

From what has been previously described regarding the proliferation of blue crab in Italy in the context of the current regulatory framework, the following conclusions emerge:

1) The phenomenon has been extremely fast, highlighting the following:
   - The need, in similar situations, for rapid responses both on the technical-scientific level and the economic perspective and the need for funding tools to support the impacted activities to properly ensure their perpetuity during the crisis period.
   - The need to make a clear distinction between funding instruments intended for emergency management that, in fact, do not exist and funding instruments for a restart that are already part of the EMFAF, but which have excessive implementation times when it comes to a restart in precarious economic conditions and not simply invest in an established economic context.
   - After two and a half years, the crisis has led to the loss of over 750 jobs in a disadvantaged coastal area.
2) Separate from the blue crab crisis, the risks associated with alien species and climate change effects on both ecosystems and human activities are well documented at a scientific level. Consequently, the related regulatory and policy framework at the EU and national levels has been developed over time to avoid spreading and mitigate their impacts.
3) The blue crab proliferation in Italy is not a fortuitous phenomenon; the first reports date back to the postwar period, and actions could probably have been taken earlier. There has been a lack of effective monitoring and prevention activities regarding the spreading of this alien species, whose presence has been reported since 1949, despite the existence of an EU policy framework on IAS, biodiversity preservation and climate change adaptation, which have proven to be ineffective or, in some cases, ignored to not create further constraints. The poor results appear to be attributable to the

excessive complexity of the procedures, implementation times that are not congruent with the concept of emergencies and a lack of coordination between EU institutions and member states.

4) At the beginning of the emergency, there was no immediately accessible data on climate change, and it took months for the abnormal climate trend to be properly described and made available to producers and decision-makers.

5) The fact that officially recognised EU production data are 2–3 years behind results in poor collective awareness and leads to significant delays in assessment and decision-making processes. In the specific case of emergencies such as the blue crab proliferation in 2023 and mussel mortality in the Adriatic in 2024, this lack of up-to-date data becomes a major obstacle to any form of short-term response.

III. Recommendations

There is a clear underestimation of the systemic risks posed by alien species. These are no longer occasional phenomena, but dynamics closely linked to the globalisation of trade, climate change and the lack of shared protocols on an international scale. **Without integrated governance, the blue economy will continue to suffer setbacks from each new biological introduction**. There is a need to shift the focus from consequence management to building an effective prevention network capable of identifying threats early and activating coordinated responses among institutions, research and producers.

This recommendation does not claim to be exhaustive. On the contrary, **it calls for more in-depth studies that consider the complexity of the technical issues addressed** and the policies to be implemented at global, European and national levels to mitigate the impact of such emergencies. In this regard, the AAC recommends, in addition to possible studies, **giving priority to decision-making mechanisms that include a multidisciplinary approach and maximum concertation**, such as through the creation of multi-skilled expert groups.

Given the above conclusions, the AAC recommends:

To the European Commission to:

1. **Create an EU coordination unit** with shared management among the various Directorate Generals and with decision-making capacity **regarding the management of the impacts of invasive alien species** on aquaculture and ecosystems.
2. **Create an EU coordination unit** with shared management among the various DGs and with decision-making capacity **regarding the management of the impacts of climate change** on aquaculture and ecosystems.
3. **Review the regulatory and policy framework for the prevention and management of invasive alien species** in the light of the biodiversity strategy and climate change adaptation with regard to:

- Reviewing Articles 7 and 8 of the Regulation (EU) 1143/2014, making a distinction between alien species introduced accidentally or deliberately to enable managing emergencies effectively without adding unnecessary constraints.
- Updating the 'list of invasive alien species of Union concern' annually, making the registration procedure transparent and efficient.
- Developing the concept of 'post-disaster emergency' with related tools such as 'solidarity funds' and 'insurance' to ensure the perpetuity of productive sectors affected by emergency situations. With climate crises becoming increasingly frequent, EU climate change policies can no longer be limited to adaptation strategies.

4. **Establish a permanent monitoring platform for climate change impacts at the EU level** based on the data provided by the Copernicus system, as foreseen in the Ocean Pact.
5. **Develop a reporting mechanism with member states and producers' associations to provide stakeholders with up-to-date insights on recent production trends,** complementary to the Eurostat data and STECF reports that are 2–3 years behind.
6. **Support research** in the context of short/medium-term strategies for immediate response and in the context of long-term strategies for the relaunch of productions and capitalise experience on both alien species and climate change impacts.

To the EU Member States to:

7. Integrate in the Multiannual National Strategic Plan for aquaculture development **specific and separate chapters on management plans for emergencies due to invasive alien species and emergencies attributable to climate change**.
8. **Appoint a national contact person for invasive alien species** management in direct and permanent contact with the relevant EU coordination unit.
9. **Appoint a national contact person for the management of climate change impacts** in direct and permanent contact with the relevant EU coordination unit.
10. Introduce the **obligation in the official accounting documents of companies of the sector to distinguish between incomes from productive activities and incomes from other activities** and refer exclusively to production incomes in procedures for funding or economic subsidies with national or European funds.

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