frontiers | Frontiers in Sustainable Food Systems

TYPE Policy Brief
PUBLISHED 08 July 2025
DOI 10.3389/fsufs.2025.1577917

Check for updates

OPEN ACCESS

EDITED BY
Edward Hugh Allison,
WorldFish, Malaysia

REVIEWED BY
Kamal Azmi,
University of Wollongong, Australia
Emily Howgate,
Consultant to Government and Industry,
Reading, United Kingdom

*CORRESPONDENCE
Priscila M. Silva
✉ phsilva@fc.ul.pt

RECEIVED 16 February 2025
ACCEPTED 23 May 2025
PUBLISHED 08 July 2025

CITATION
Silva PM, Pita C, Costa JL and Teixeira CM (2025) Challenges and opportunities for the Portuguese tuna pole-and-line supply chain from the Portuguese archipelagos of the Azores and Madeira.
Front. Sustain. Food Syst. 9:1577917.
doi: 10.3389/fsufs.2025.1577917

COPYRIGHT
© 2025 Silva, Pita, Costa and Teixeira. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

Challenges and opportunities for the Portuguese tuna pole-and-line supply chain from the Portuguese archipelagos of the Azores and Madeira

Priscila M. Silva[1]*, Cristina Pita[2,3], José L. Costa[1] and Célia M. Teixeira[1]

[1]MARE - Marine and Environmental Sciences Centre/ARNET - Aquatic Research Network, Faculdade de Ciências, Universidade de Lisboa, Lisbon, Portugal, [2]IIM-CSIC - Institute of Marine Research, Spanish National Research Council, Vigo, Spain, [3]CESAM - Centre for Environmental and Marine Studies, Department of Environmental and Planning, University of Aveiro, Aveiro, Portugal

The tuna pole and line artisanal fleet in the Portuguese archipelagos of the Azores and Madeira depends entirely on these seasonal resources. Fishers and stakeholders were interviewed, and they have raised several concerns about the low economic value of the catch, the failure to meet market demand and the threats to the survival of the fleet. Fishers and stakeholders interviewed demonstrate a willingness to see an alternative management scheme that puts an end to the race to fish. Actions to address challenges related to catch quality, prices and market reputation were recommended to ultimately create more opportunities for the Portuguese tuna fleet.

KEYWORDS

fishery, management, sustainability, stakeholders, artisanal

1 Introduction

Tunas have become one of the most important groups of exploited fish species globally, heavily captured to feed international supply chains. This has had significant effects on fishing fleets and tuna markets (Mullon et al., 2017; McKinney et al., 2020). Tuna tops the list of most consumed products in the European Union, where consumers eat 2.96 kg of tuna per capita per annum (EUMOFA, 2024). It is caught with a variety of gears, including purse-seine, longlines and pole-and-line (ISSF, 2021).

Tuna pole-and-line fishing, also known as "baitboat fishing," is a technique based on the use of a pole attached to a short line with a barbless hook to catch tuna one-by-one. This technique requires live baitfish, which is cast in the sea, to attract tuna schools. This fishing has been considered a highly selective method with low levels of bycatch (Marine Stewardship Council, 2025) and a more benign and responsible way of catching tuna (Hobday et al., 2015). An effort to promote tuna pole-and-line fishing has been made since the decline of this fishing technique (Gillett, 2016). Although it represents a small portion of global tuna catches, growing consumer awareness about seafood sustainability (Olson et al., 2014) has increased the demand for pole-and-line caught tuna (ISSF IPNLF, 2019).

Tuna fisheries managed under a Total Allowable Catch (TAC) system, without individual or group property rights—such as the case of bigeye tuna—are often characterized by a competitive race to fish (Sun et al., 2019). The race to fish does not

incentivise the improvement of catch quality (Birkenbach et al., 2017), which ultimately jeopardizes the valorisation of fishery products (Chea et al., 2023). Indeed, the end goal of responsible and sustainable fisheries should be to obtain the greatest benefit and value from every harvested tuna (ISSF IPNLF, 2019), but challenges in the post-harvest—such as fish meat quality, inadequate storage techniques—have created barriers to market competitiveness and hindered the ability to achieve higher product value (Chea et al., 2023).

An important fact that makes management of tuna species crucial is that bigeye is already considered a global substitute for bluefin tuna (Sun et al., 2019), the most valuable fish in the world (Telesca, 2015). This policy brief presents recommendations for management, addressing challenges that threaten the sustainability of the Portuguese pole-and-line tuna supply chain.

2 Tuna pole-and-line fisheries in Portugal

One of the most important pole-and-line fisheries in the world is practiced in the Portuguese archipelagos of Azores and Madeira (Gillett, 2016) (Figure 1). In 2023, this artisanal tuna fleet was composed of 25 vessels larger than 14 m in total length, with an average crew size of 13 fishers per vessel, and targeted tuna species in the area during their migration, mainly bigeye (*Thunnus obesus*) and skipjack (*Katsuwonus pelamis*) (Table 1). Vessels from both archipelagos move between islands as one fleet, following tuna as they move (Silva et al., 2024). This fleet depends entirely on these resources, as they hold no other fishing licenses, and the seasonal occurrence of these species results in the fleet operating for a maximum of 6 months each year (Table 1).

A total of 27 in-depth interviews were conducted face-to-face between May 2023 and January 2024 with various stakeholders involved in the Portuguese pole-and-line fishery: 16 fishers, one representative from a Producers Organization (PO), six representatives from the transformation and processing industry (including wholesalers, processors, and the canning sector), two representatives from organizations related to pole-and-line fisheries, and two representatives from the administration. The interviews aimed to characterize the Portuguese pole-and-line fishing operation, but all stakeholders interviewed are deeply involved and knowledgeable about the tuna captured by both the pole and line and small-scale fleets. The survey consisted of open-ended questions to collect opinions (e.g. satisfaction with the current management and measures to improve it, the future of the

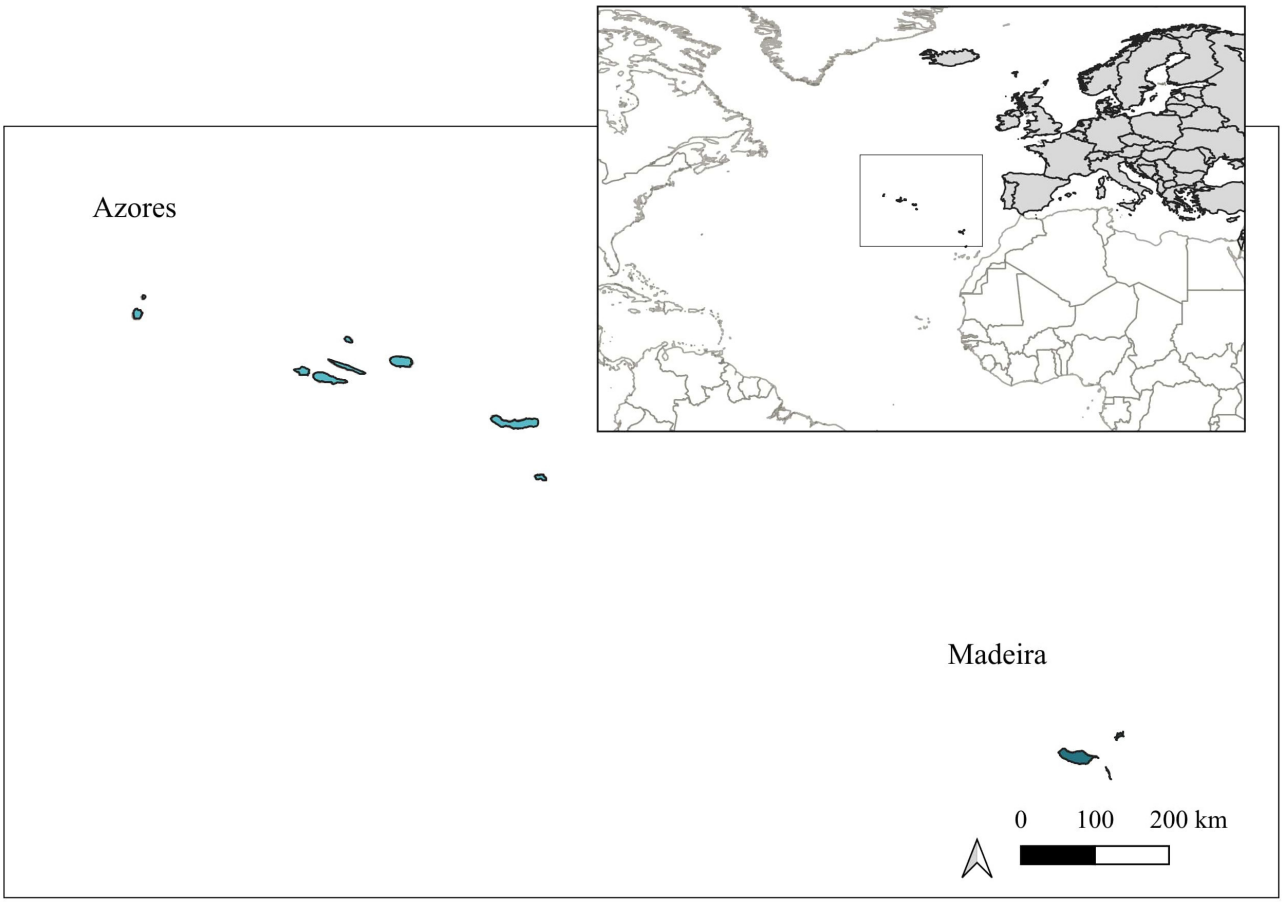

FIGURE 1
Map of the Azores and Madeira archipelagos, showing their geographical location within Europe and the Atlantic Ocean.

TABLE 1 Characterization of Portuguese pole-and-line fishers (n = 16).

Characteristics of respondents	
Age (mean ± std) (years)	48 ± 11.16
Experience fishing (mean ± std) (years)	32 ± 12.77
Experience in tuna fishing (mean ± std) (years)	30 ± 12.44
Tradition fishing (mean ± std) (number of generations of fishers in the family)	3 ± 0.5
Fishers with descendants in the fishing activity (%)	31%
Families related or reliant on this fishery (number)*	325
Skippers (%)	94%
Owners of the vessel (%)	25%
Fishing operation	
Size of vessel (min - max ± std) (m)	14-33 ± 6.48
Crew (mean ± std) (number)	13 ± 2.09
Immigrant crew onboard (min-max) (%)	0–64%

Data are shown as mean (± standard deviation) or percentages. Information was obtained in interviews with fishers from the Portuguese pole-and-line tuna fishery. *The number of families connected to or reliant on pole-and-line tuna fishery was calculated using the average crew size and the number of vessels (13*25 = 325).

fleet, main problems) and the main challenges faced by stakeholders in the supply chain, as well as opportunities for better management. General information on fishers' demographic characteristics was also collected (age, experience fishing, economic dependence on tuna pole-and-line fishing and the fishing activity (e.g. role on board of vessel, number of fishers working on board, nationalities) In a second phase, conducted in April 2025, representatives from the fishing industry—including the tuna pole-and-line fleet and the small-scale multi-gear fleet—were interviewed to discuss and validate the proposed Actionable Recommendations.

3 Main challenges faced by the pole-and-line supply chain

The fishers involved in the artisanal tuna pole-and-line fishery have a long experience in the activity and have been related to it for several generations. Moreover, a significant number of families today remain closely connected to or dependent on this fishery (Table 1).

The end-market, fishing season, prices, quota and management of the two target species differs (Table 2). Fishers start by targeting bigeye tuna, typically caught between April and July, before shifting to skipjack tuna, which is available between July and October.

While skipjack tuna is an open-access fishery, bigeye tuna, the most valuable of the two species, is under quota regulation. Quotas for bigeye are allocated to the tuna pole-and-line fleet and the multi-gear small-scale fleet (Secretaria Regional do Mar e das Pescas, 2023). Despite the Regional Government's attempt to impose management measures on the bigeye tuna quota (see regional management measures in Table 2), in 2023 and 2024, the pole-and-line fleet only started the tuna season middle of March. The quota ended by the end of May in 2023 and the beginning of May in 2024, which means that most tuna vessels only caught bigeye tuna for 1–2 months, since bigeye tuna usually appears in April in the archipelagos' waters.

TABLE 2 Characteristics of the Portuguese pole-and-line tuna fishery and the management measures in place.

Operation	Skipjack tuna	Bigeye tuna
Fleet	Artisanal [>14 m length overall (LOA)]	
Gear used	Exclusively pole-and-line	
Proportion of landings in total catch in value (%)		
Year 2022	35%	58%
Year 2023	38%	45%
Proportion of landings in total catch in quantity (%)		
Year 2022	53%	43%
Year 2023	56%	35%
Annual national quota (tonnes)		
Year 2023 & 2024	No quota[a]	2823.84[b,c]
Species occurrence	July-October	April-July
Average price (€ per kilo)	1.6 €	2 €
Final market	Canning industry	Fresh and frozen
Management measures		
Minimum landing size (MLS)	None	10 kg[d]
Landing quantity limits	Different limits in quantity landed per day for vessels of different sizes, reaching a maximum of 20 tonnes per day for vessels ≥25 m LOA when cold storage reaches 60% capacity[e]. When cold storage reaches 80% capacity, the same limits in quantity are applied every 3 days.	Different limits in quantity landed every 48 h for vessels of different sizes, reaching a maximum of 18 tonnes every 48 h for vessels ≥25 m LOA[f] (imposed on 26th April 2024). Different limits in quantity landed every 72 h for vessels of different sizes, reaching a maximum of 9 tonnes every 72 h for vessels ≥25 m LOA[g] (imposed on 3rd May 2024).

[a]TAC implementation is planned by ICCAT, according to the information shared by the Portuguese fisheries management authority, the Directorate General for Natural Resources, Safety and Maritime Services (DGRM)

[b]Council Regulation (EU) 2024/257 of 10 January 2024

[c]Council Regulation (EU) 2023/194 of 30 January 2023

[d]Portaria n.o 230/2023 de 4 de abril de 2023

[e]Portaria n.o 70/2023 de 4 de agosto de 2023: vessels ≥ 25 m LOA up to 20 tonnes; vessels with LOA from 20 to < 25 m up to 15 tonnes; vessels with LOA from 14 to < 20 m up 10 tonnes; vessels with LOA from 12 to <14 m to 8 tonnes; vessels with LOA from 10 to < 12 m up to 5 tonnes; and vessels with LOA <10 m up to 2 tonnes.

[f]Portaria n.o 20/2024 de 26 de abril de 2024: vessels ≥ 25 m LOA up to 18 tonnes; vessels with LOA from 20 to < 25 m up to 13 tonnes, vessels with LOA from 14 to < 20 m up to 10 tonnes; vessels with LOA from 12 to < 14 m up to 8 tonnes; vessels with LOA from 10 to < 12 m up to 4 tonnes; vessels with LOA < 10 m up to 2 tonnes; open deck vessels up to 1 tonne.

[g]Portaria n.o 24/2024 de 3 de maio de 2024; vessels ≥ 25 m LOA up to 9 tonnes; vessels with LOA from 20 to <25 m to 6.5 tonnes; vessels with LOA from 14 to < 20 m up to 5 tonnes; vessels with LOA from 12 to <14 m up to 4 tonnes; vessels with LOA from 10 to <12 m up to 2 tonnes; vessels with LOA from < 10 up to 1 tonnes; open deck vessels up to 0.5 tonnes.

TABLE 3 The main challenges faced by the pole-and-line tuna fleet as identified by fishers and other stakeholders.

Main challenges regarding the skipjack tuna fishery
• Captures are not enough to provide the canning industry in the archipelagos, due to a lack of fishing capacity/effort during the skipjack occurrence • The infrastructures of the fishing ports have no capacity to deal with high quantities landed in short periods of time
• Lack of freezing capacity onboard results in poor quality of fish landed, as vessels can spend 4–5 days at sea • An excessive amount of landings saturates the market in a short period, causing a decrease in value
Main challenges regarding the bigeye tuna fishery
• The fleet only operates for about 2 months due to the exhaustion of the quota: Quota start and end dates in 2023: 01/01–30/05 Quota start and end dates in 2024: 01/01–09/05 • Lack of governmental organization (e.g., landing quantity limits only imposed in April, one month before the quota ran out) • Associations claim that maximum day catch limits are not being respected • Slow landings in fishing ports, landings are done one vessel at a time further increasing the time between capture and sale causing a decrease in tuna quality (and price). Vessels can wait days in the fishing port until they can land • Frequently tuna quality does not match market requirements • Limits in the quantity of landings imposed by law do not prevent market saturation and subsequent decrease in prices • Difficulties getting tuna off the islands due to lack of aerial transport space, especially in the Azores • Fish auction fees are more expensive in the Azores than in Madeira
Main challenges faced by the pole-and-line tuna fleet in general
• Most tuna vessels are only able to start the fishing season in March, due to vessel repairs, inspections, and finding and contracting crew • Fishers and representatives of fishing associations feel that there is a lack of political interest in maintaining the fishery • Lack of crew, with vessels being dependent on migrant workers in order to have the mandatory crew onboard

For 2025, the Regional Governments reduced landing quantity limits to 3 tons every 48 h per vessel from January to March. From April onwards, limits will range between 16 and 3.2 tons, depending on the vessel size. Additionally, an annual maximum landing limit of 110 tons per vessel, regardless of vessel size, has been established, along with a maximum monthly quantity landed of 80 tons in January, 120 tons in February, and 140 tons in March (Secretaria Regional do Mar e das Pescas, 2024). Nonetheless, the management strategy remains focused on imposing maximum quantity limits.

The early exhaustion of the bigeye tuna quota means that the pole-and-line fleet must remain idle, waiting for the skipjack tuna to appear while the waters are still full of bigeye tuna. Besides concerns regarding the duration of the quota allocated (from April to May), fishers and other stakeholders have raised additional concerns about the tuna fishery, including the low economic value of the catch, the failure to meet market demand and worries about the survival of the fleet (Table 3). The challenges include the quality of tuna that does not match market requirements and the lack of crew.

The challenges differ for each species, mainly due to different end markets and requirements by these markets. Skipjack tuna is primarily used in the canning industry, where presentation standards are less stringent, whereas bigeye tuna is sold in fresh markets, which demand higher quality and stricter appearance standards. Ultimately, fishers would like to see an alternative management scheme that would put an end to the race to fish and allow them to continue the fishing practice they have upheld for generations.

4 Actionable recommendations

Several recommendations to improve the management of the pole-and-line fleet in the archipelagos of the Azores and Madeira were provided by stakeholders. Most recommendations focus on bigeye tuna, which gets a higher market value.

Recommendations to improve the management of the pole-and-line tuna fleet and the rationale for each recommendation are provided. These recommendations are aimed as a first step to start a discussion about improving the management of bigeye tuna in Portugal. Further discussions are needed between the fishing sectors and management authorities for the practical implementation of (some) of these recommendations, and additional research is needed on the social and economic impacts of these recommendations.

Recommendation 1. Increase the share of bigeye tuna quota allocated to the archipelagos of the Azores and Madeira

The Azores and Madeira pole-and-line fleet depend heavily on this resource and captures in the mainland are low. Currently, the archipelagos hold 85% of the national quota but between 1993 and 2022, 99% of all bigeye and skipjack tuna landed in Portugal occurred on the archipelagos (Silva et al., 2024). Given the pole-and-line fleet dependence on this seasonal species and having been responsible for almost the total landings of this species in the last two decades, the allocation of 90%−95% of the quota to the archipelagos' tuna pole-and-line fleet would constitute a fairer allocation and improvement of management of the national quota of bigeye tuna. Representatives of both the tuna pole-and-line and small-scale recognized that a small fraction of the quota should be left for bycatch.

Recommendation 2. Allocate the bigeye tuna quota exclusively to pole-and-line vessels (tuna fleet)

The tuna pole-and-line fleet exclusively targets tuna species and the landings of tuna by the local multi-gear small-scale fleet (<14 m LOA) saturates the market and decreases prices. The pole-and-line fleet typically begins its fishing season in March, following necessary vessel repairs, inspections, and finding and contracting crew. This results in the local small-scale fleet starting to fish for

tuna first, flooding the market with lower quality products and decreasing prices.

Tuna fisheries are seasonal, and the pole-and-line vessels are economically dependent exclusively on tuna species, not capturing any other species during the year. In 2022, the tuna pole-and-line fleet was responsible for 90% of all bigeye landings in weight and 85% of its value. To add to this, bigeye tuna represented 58% of the total value of the tuna pole-and-line fleet landings (DGRM data).

The local small-scale multi-species and multi-gear fleet operates all year round capturing mainly demersal species (Menezes et al., 2013) with a higher first-sale value than tunaonly targeting tuna opportunistically, not guaranteeing cold chain conditions on board, landing tuna of less quality. Bigeye tuna catches represented in 2022 solely 4% of the total value and 5% of the total weight landed by this fleet (DGRM data). The representative of the small-scale and multi-gear fleet interviewed disagreed with this recommendation, arguing that occasional catches should be allowed. Nonetheless, those captures could be accommodated through a portion of the quota reserved for bycatch.

Recommendation 3. Add value to the bigeye tuna

Some wholesalers only buy high-quality bigeye tuna for high-end clients, and referred their struggle to find high-quality products. We recommend that to have an exclusivity to the quota, the tuna fleet should have to treat tuna is a way as to add-value to the catch, e.g., employing the ikijime method and better handling practices onboard. The ikijime practice—traditional Japanese method of quickly slaughtering, severing the spinal cord, and draining the blood of the fish to ensure high quality after it is matured delays degradation, improves taste and quality, and decreases animal suffering (Josse and Brent, 2021). This practice has already started to be used by a few fishers using handlines (vessels <14 m LOA), but it is still not a practice in the tuna pole-and-line fleet. Handling practices onboard should be improved to guarantee high-quality tuna to the market.

Bigeye tuna is one of the potential substitutes for bluefin tuna for Japanese consumers (Sun et al., 2019). Increasing the quality of the catch would put in the market tuna of interest to high-end markets and contribute to increase the value of this species at auction. The representative of the tuna fleet, as well as the representative of the small-scale fisheries fleet and recognized the need to add value to bigeye captures.

Recommendation 4. Implement an individual quota per vessel for bigeye tuna

When the fishing season starts, vessels compete to catch as much tuna as possible until the quota runs out.

An annual individual quota per vessel would allow each vessel to handle individual tuna carefully and provide the time and motivation for the crew to learn and implement methods that enhance the quality of the tuna, such as employing the ikijime technique. The practical implementation will be challenging. The ways in which to implement and monitor this recommendation should be further discussed to explore the efficiency with which the measure can be implemented. The representatives of the fishing industry consulted believed that this recommendation could be effective if implemented within an annual individual quota system.

Recommendation 5. Improve conditions onboard of the fleet

Tuna vessels can stay at sea for 4–5 days due to the fishing technique "mancha" (in which the fishing vessel acts as a floating object) that allows fishers to retain a school of tuna. Wholesalers complain about the quality of bigeye tuna landed and better conditions onboard are needed to guarantee good quality tuna. Representatives of the fishing industry agreed that measures to increase the value of bigeye are of utmost importance.

Recommendation 6. Develop an adaptive annual strategy for the fleet

When tuna occurs, vessels and crew tend to not be prepared to start the fishing season. The fishing industry should plan vessel repairs, vessel inspection, and contract the fishing crew in a more timely manner. Management authorities should publish management measures earlier, which has been done for the coming fishing season. The development of an adaptive annual strategy for the pole-and-line fishery could improve the challenges presented, and ways to conduct it effectively should be further discussed. Representatives of the fishing industry recognized the importance of a well-planned strategy.

5 Conclusions

Well-managed fisheries have the potential to meet the growing global demand for food while also sustaining livelihoods and supporting the communities that depend on them (McCluney et al., 2019). The complexity of managing marine resources calls for stronger stakeholder participation to enhance the knowledge that supports effective management strategies (Steins et al., 2020). The recommendations in this policy brief mark a first step toward improving management of the tuna supply chain in Portugal informed by the opinions and expertise of stakeholders in the tuna supply chain. The next step should focus on discussions between the fishing sector, other interested parties and authorities to analyse the recommendations presented in this policy brief and their practical implementation. Further challenges identified, such as the difficulties of getting tuna off the islands and auction costs should also be considered in discussions, but it could be expected that a more valuable high-quality tuna could contribute to mitigate this challenge as there would be more demand for it and an interest in improving cold chain and transportation. Recognizing the valuable contributions of stakeholders is essential, and their input should help shape management advice to address specific situations occurring in fisheries (Sampedro et al., 2017). There is

a general discontentment and a call for change in management amongst the Portuguese pole-and-line tuna fishery supply chain actors. While the findings are locally focused, this approach can—and should—be adapted and applied to other case studies, as pole-and-line fisheries are common in various regions worldwide (Gillett, 2016). Sustainable collaboration between scientists and stakeholders, along with meaningful integration of stakeholders' knowledge, requires ongoing effort and attention (Steins et al., 2020). Therefore, this policy brief should be seen as a starting point, one that will require continuous evaluation and refinement.

Author contributions

PS: Conceptualization, Investigation, Writing – original draft. CP: Conceptualization, Supervision, Writing – review & editing. JC: Writing – review & editing. CT: Supervision, Writing – review & editing.

Funding

The author(s) declare that financial support was received for the research and/or publication of this article. This publication was financed by the Fundação para a Ciência e a Tecnologia (FCT) through the project UID/04292-Centro de Ciências do Mar e do Ambiente, awarded to MARE, through project LA/P/0069/2020 (https://doi.org/10.54499/LA/P/0069/2020) granted to the Associate Laboratory ARNET and the Centre for Environmental and Marine Studies (CESAM) under the project/grant UID/50006 + LA/P/0094/2020. PS acknowledges FCT for the Ph.D. grant 2020.04416.BD (https://doi.org/10.54499/2020.04416.BD) and CP acknowledges FCT for the research contract 2020.02510.CEECIND/CP1589/CT0018 (https://doi.org/10.54499/2020.02510.CEECIND/CP1589/CT0018).

Acknowledgments

The authors would like to express their gratitude to all the stakeholders that took part in the survey.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declare that no Gen AI was used in the creation of this manuscript.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

Birkenbach, A. M., Kaczan, D. J., and Smith, M. D. (2017). Catch shares slow the race to fish. *Nature* 544, 223–226. doi: 10.1038/nature21728

Chea, R., Ahsan, D., García-Lorenzo, I., and The, L. (2023). Fish consumption patterns and value chain analysis in north-western Cambodia. *Fisheries Res.* 263:106677. doi: 10.1016/j.fishres.2023.106677

EUMOFA (2024). *The EU fish market. 2024 Edition. European Market Observatory for Fisheries and Aquaculture Products*. Brussels: European Commission, 130.

Gillett, R. (2016). *Pole-and-line tuna fishing in the world: status and trends. IPNLF Technical Report No.6*. International Pole and Line Foundation, 17. Available online at: https://ipnlf.org/wp-content/uploads/2020/11/ipnlf-tech-report6status-and-trends-of-pole-and-line-tuna-fishing.pdf (accessed January 15, 2025).

Hobday, A. J., Bell, J. D., Cook, T. R., Gasalla, M. A., and Weng, K. C. (2015). Reconciling conflicts in pelagic fisheries under climate change. Deep-Sea Res. II. *Top. Stud. Oceanogr.* 113, 291–300. doi: 10.1016/j.dsr2.2014.10.024

ISSF (2021). *Status of the World Fisheries for Tuna. Mar. 2021. ISSF Technical Report 2021-10*. Washington, DC: International Seafood Sustainability Foundation, 120.

ISSF and IPNLF (2019). *Skippers' Guidebook to Pole-and-line Fishing Best Practices*. The International Pole and Line Foundation. Available online at: https://ipnlf.org/wp-content/uploads/2021/02/pl-guidebookipnlfissffinal.pdf (accessed January 15, 2025).

Josse, T., and Brent, Z. W. (2021). *How do Communities Support Fisheries? The Who, What, Why and How of Community-supported Fisheries*. Amsterdam: Transnational Institute, 24.

Marine Stewardship Council (2025). *Pole and Line Fishing*. Available online at: https://www.msc.org/what-we-are-doing/our-approach/fishing-methods-and-gear-types/pole-and-line (accessed March 15, 2025).

McCluney, J. K., Anderson, C. M., and Anderson, J. L. (2019). The fishery performance indicators for global tuna fisheries. *Nat. Commun.* 10:1641. doi: 10.1038/s41467-019-09466-6

McKinney, R., Gibbon, J., Wozniak, E., and Galland, G. (2020). *Netting Billions 2020: A Global Tuna Valuation*. Washington, DC: The Pew Charitable Trusts.

Menezes, G. M., Diogo, H., and Giacomello, E. (2013). Reconstruction of demersal fisheries history on the Condor seamount, Azores archipelago (Northeast Atlantic). Deep Sea Res Part II. *Top. Stud. Oceanogr.* 98, 190–203. doi: 10.1016/j.dsr2.2013.02.031

Mullon, C., Guillotreau, P., Galbraith, E. D., Fortilus, J., Chaboud, C., Bopp, L., et al. (2017). Exploring future scenarios for the global supply chain of tuna. Deep Sea Res Part II. *Top. Stud. Oceanogr.* 140, 251–267. doi: 10.1016/j.dsr2.2016.08.004

Olson, J., Clay, P. M., and da Silva, P. P. (2014). Putting the seafood in sustainable food systems. *Mar. Policy* 43, 104–111. doi: 10.1016/j.marpol.2013.05.001

Sampedro, P., Prellezo, R., García, D., Da-Rocha, J. M., Cerviño, S., Torralba, J., et al. (2017). To shape or to be shaped: engaging stakeholders in fishery management advice. *ICES J Mar. Sci.* 74, 487–498. doi: 10.1093/icesjms/fsw160

Secretaria Regional do Mar e das Pescas (2023). *Portaria n. 32/2023, de 12 de abril de 2023, Jornal Oficial I Serie - Número 45, Série I*. Available online at: https://jo.azores.gov.pt/api/public/ato/a7457d1c-2f91-40e9-b62c-8472825db71c/pdfOriginal (accessed January 15, 2025).

Secretaria Regional do Mar e das Pescas (2024). *Portaria n.o 111-A/2024, de 31 de dezembro de 2024. Jornal Oficial I Serie – Número 149, Série I*. Available online at: https://jo.azores.gov.pt/pdf/atos/111-A-I-Portaria-2024-12-31.pdf (accessed January 15, 2025).

Silva, P. M., Pita, C., and Teixeira, C. M. (2024). Two realities in the Portuguese tuna fishery: what happens in the largest EEZ of

European Union? *Reg. Stud. Mar. Sci.* 77:103719. doi: 10.1016/j.rsma.2024.103719

Steins, N. A., Kraan, M. L., van der Reijden, K. J., Quirijns, F. J., van Broekhoven, W., Poos, J. J., et al. (2020). Integrating collaborative research in marine science: recommendations from an evaluation of evolving science-industry partnerships in Dutch demersal fisheries. *Fish Fish*. 21, 146–161. doi: 10.1111/faf.12423

Sun, C. H., Chiang, F. S., Squires, D., Rogers, A., and Jan, M. S. (2019). More landings for higher profit? Inverse demand analysis of the *Bluefin tuna* auction price in Japan and economic incentives in global *Bluefin tuna* fisheries management. *PLoS ONE* 14:e0221147. doi: 10.1371/journal.pone.0221147

Telesca, J. E. (2015). Consensus for whom?: gaming the market for Atlantic *Bluefin tuna* through the Empire of Bureaucracy. *Camb. J. Anthropol.* 33, 49–64. doi: 10.3167/ca.2015.330105