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Artisanal fisheries provide essential food and nutrition on the Galápagos Islands: priority areas for policy and sustainability

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This perspective article examines the role of artisanal fisheries in local food security and nutrition in the Galápagos archipelago, Ecuador, an issue that remains underrepresented in conservation and food systems debates. We argue that fish should be understood not only as a natural resource or economic commodity, but as a central component of local diets, livelihoods, and nutritional outcomes. Using the four pillars of food security and nutrition as an analytical lens (availability, access, utilization, and stability), we synthesize how artisanal fisheries contribute to local food systems while also facing vulnerabilities linked to tourism demand, international markets, and conservation policies that insufficiently consider nutrition and livelihood consequences. We outline four priority areas for strengthening food security and nutrition on the Galápagos Islands. These include recognizing fish as food within local food systems, acknowledging the role of gender and social networks in sustaining small-scale fisheries, aligning resource stewardship with sustainable use in marine protected areas, and promoting integrated food systems through a One Health perspective. We conclude that explicitly incorporating food security and nutrition into fisheries governance can help align conservation objectives with local livelihoods in the Galápagos and beyond.

KEYWORDS

artisanal fisheries, fish as food, food security, Galápagos Marine Reserve, nutrition

The role of small-scale fisheries in the Galápagos—A brief overview

The role of small-scale fisheries is often neglected in analyses of food security and nutrition (FSN) (FAO, 2009a, 2015b). This limited perspective is evident in global and national policy discussions, where key reports on food insecurity, such as those from the FAO, rarely mention fish, despite its critical role in combating malnutrition, particularly in coastal communities of the Global South (FAO, 2006, 2015a,b). When fish is mentioned, it is usually in relation to stock depletion, exports, or genetic improvements, rather than as a vital food source (FAO, 2009b, 2015a; United Nations, 2007). Yet, small-scale

fisheries are inevitably crucial for livelihoods and nutrition, employing over 90% of global fishers (FAO, 2024; Kittinger et al., 2013) and supporting 500 million people worldwide (FAO, 2023). Encouragingly, some recent studies and policy discussions have begun to acknowledge fish as an essential component of food security and nutrition (Barange et al., 2022; Basurto et al., 2025; Bennett et al., 2021; Golden et al., 2021; HLPE, 2014).

This perspective addresses this gap by reviewing and synthesizing the peer-reviewed and gray literature that analyze the contribution of artisanal fisheries to food security in the Galápagos Islands (see methods and data description in Appendix). To our knowledge, this is the first high-level overview of food security issues related to artisanal fisheries on the Galápagos Islands, a setting typically framed through a marine conservation lens that neglects local human–nature relations. We offer a unique social-ecological perspective, as these artisanal fisheries operate within the multi-use Galápagos Marine Reserve, where fish extraction is allowed exclusively for a locally based fleet of registered artisanal vessels (DPNG, 2014). Unlike other Ecuadorian fisheries managed by the National Fisheries Authority, those in the archipelago are regulated by the Galápagos National Park (GNP).

Artisanal fisheries make a substantial economic and social contribution to the Galápagos. As of 2021, 1,117 individuals held fishing licenses and 333 vessels were authorized to operate (DPNG, 2021), collectively generating an estimated \$4.35 million per year (Lynham et al., 2015). Before the pandemic, the annual fish demand in the Galápagos was estimated at approximately 871 tons, with about 28,000 residents consuming 31% (272 tons) and tourists consuming the remaining 69% (599.5 tons) (Berman et al., 2018). Furthermore, fish is the most important locally sourced protein in the archipelago. The main commercially important fish species in the Galápagos can be classified into six groups: large pelagic fish, white fish, spiny lobsters, slippery lobsters, sea cucumbers, and a range of smaller fish species, including baitfish. However, most fisheries in Galápagos face (or will eventually face) overfishing and declining biological stock health, mainly due to the lack of sophisticated and species-specific management tools. This deficiency results in high contestability and legal challenges to management measures such as the 2016 zoning regulations and longline ban (Ramírez-González et al., 2022).

We assess the contribution of artisanal fisheries to food security and nutrition (FSN) in the Galápagos using the FAO framework, which defines food security as a state that “exists when all people, at all times, have physical and economic access to sufficient food to meet their nutritional needs for a productive and healthy life” (HLPE, 2014). In this sense, food security is understood as a condition in which individuals have consistent and reliable access to an adequate amount of nutritious and affordable food. Within this framework, FSN is examined through four pillars -availability, accessibility, utilization, and stability—which are interrelated in a dynamic process that facilitates the analysis and approach to food insecurity issues (FAO, 2005). This perspective adopts the four pillars of this framework as an analytical lens to examine how artisanal fisheries interact with local seafood demand and the broader food system in the archipelago. Below we present a conceptual overview of the four FSN framework pillars, including its components and definitions

relating them to the current state and future risk in the Galápagos context (Table 1).

Our review brings together evidence suggesting that local seafood in the Galápagos has a rather permanent availability and stability in its provision. Supply generally meets the demand for fish and seafood by local inhabitants over extended periods of time, even though a significant portion of the supply is exported to national and international markets (e.g., tuna, lobster, and sea cucumber). Furthermore, the availability of local seafood products meets almost all the demand from visitors, except for tourists preferring imported seafood like salmon and shrimp. Accessibility also proved to be good, given the ability of fishers to go on fishing journeys based on the fishing calendar, the fishing regulatory instrument, and the willingness of the active fisher population. Yet, an aging fishers’ population with no replacement at sight could, in the mid and long term, become a constraint to maintain the fishing practice alive, the fishing community viable, and food security sustained. On the other hand, considering the prices that the market assigns to the different fish species with commercial value, we conclude that the affordability of fish at local markets is rather constant. Yet, some species exhibit prices that are out of local households’ budget, whereas at the same time, certain species are caught exclusively for a specific market (i.e., sea cucumber for the Asian market) and are not demanded in national markets. Additional findings show that local supply of seafood is also observed to be highly resilient due to the adaptability and responsiveness of artisanal fishers to external crises, evident during the COVID-19 crisis. Our study also reveals elements that make the local seafood system vulnerable, not only in terms of food security but also in terms of the conservation and sustainability of the fish resource. International market forces, including visitors’ demand, shape the supply of seafood in the archipelago. Such forces dictate how much fishing effort is exerted and distributed among fisheries, based on the demand from restaurants, hotels and households which can generate scarcity of some products in the local market. This situation has shown different risk levels within the pillars assessed, for instance: weak availability when fishing effort is concentrated on export-oriented products, and less stability, adding extra stress to the already overfished species favored by tourists (e.g., scorpion fish). Physical access to seafood products could be jeopardized by: (i) the lack of infrastructure for artisanal fisheries, especially high-quality handling facilities to process fish and add value to the catch¹; (ii) conservation-driven management policies that regulates harvests of key species without integrating food security concerns and ignoring the fish-as-food notion in the islands, and (iii) a continuously aging fisher population without renewal strategies so far. Other aspects affecting food security on the Galápagos Islands are those that reduce the effective use of seafood, for instance, the unsatisfied basic needs on the islands -lack of adequate drinking water and waste disposal systems- hinders fresh fish preparation in households diminishing

¹ In 2024, the only landing facility where fish was cleaned and sold to the local public was closed by the Puerto Ayora Major, after a politically-driven dispute that caused no agreement to deal with the harbor facility (Erazo, 2024).

TABLE 1 The current state and future risks of food security and nutrition on the Galápagos Islands are organized within the four pillars of the FSN framework.

Food Security and Nutrition (FSN) framework components and definitions	Current state and future risks on the Galápagos Islands
<p>Availability</p> <p>Presence of sufficient quantities of food—through production, distribution, and exchange.</p>	<p>Seafood availability seems to be quite stable all year long, although it may vary depending on the season and whether there is any management instrument in place, e.g., temporal closures for specific fisheries like lobsters. During crises and temporal shocks, however, the availability could become compromised (Castrejón et al., 2024; Viteri Mejia et al., 2022) and seafood is not always available.</p>
<p>Access (economic and physical)</p> <p>The ability of individuals and households to obtain food—economically and physically</p>	<p>Galápagos fishers' population is formed by an ageing group of fishers who have not found the generational shift needed for the sector to remain active and healthy in the long run. Before the pandemic, 1,100 fishing license holders and 333 vessels were registered by the Galápagos National Park Directorate (GNPD) (Castrejón et al., 2024). Yet, only 36% of fishers and 44% of vessels are active in the fishing sector as full-time or part-time fishers (Castrejón and Charles, 2020). A fishing license is required to participate in small-scale commercial fishing, and with it, the holder has the right to fish any type of shellfish and finfish species commercially permitted in the reserve.</p>
<p>Utilization</p> <p>The proper biological use of food, requiring a diet with sufficient energy and nutrients, clean water, sanitation, and healthcare.</p>	<p>Nutrition and diet information of local Galápagos residents is scarce or absent in many cases. For example, Pera et al. (2019) highlight household food insecurity and limited availability of fresh products, but do not provide disaggregated information on how much fish or seafood contributes to diets. We would anticipate the actual contribution of fish and seafood in the human diet in Galápagos has not been assessed, though, posing the risk of underestimating the importance of seafood for nutrition in policy, and failing to identify tradeoffs or vulnerabilities.</p>
<p>Stability</p> <p>Consistent access to adequate food at all times, without risk of losing it due to shocks or cyclical events.</p>	<p>Seafood and fish produce offer remain constant over normal seasonal cycles, but vulnerability to external shocks (e.g., global economic crisis, or climatic variability like <i>El Niño</i>) may pose risks to long-term stability. Fishers have shown adaptive responses (changing spatial patterns, adjusting markets, developing products) which help buffer against shocks (Castrejón and Charles, 2020).</p>

seafood consumption and affects the local diet, which could be contributing to observed high levels of overweight and obesity.

In light of these challenges, this perspectives article identifies four critical areas that can serve as strategic guidelines for strengthening food security and nutrition on the Galápagos Islands: (i) recognizing fish as an essential component of the local diet (*fish as food*); (ii) acknowledging the importance of gender roles and social networks for maintaining a healthy small-scale fisheries sector; (iii) aligning resource stewardship with sustainable use within marine protected areas; and (iv) promoting integrated food systems within the One Health perspective. Policy interventions aligned with these critical areas could address FSN challenges in a systemic manner and potentially generate positive externalities for the conservation of local ecosystems. For example, the development of robust local food systems could reduce dependency on imported food, thereby lowering the inflow of external materials to the islands and decreasing pollution as well as the risk of introducing invasive species. The remainder of this paper explores each of these four strategic guidelines in greater depth to support the enhancement of FSN.

Recognizing fish as essential food

Capture fisheries and aquaculture provide half of the world's population with at least 15% of their average per capita intake

of animal protein (FAO, 2022; HLPE, 2014). However, access to seafood is increasingly expensive for the 52% of Galápagos residents classified as poor under the Unsatisfied Basic Needs (UBN) method (Feres and Mancero, 2001). Locally caught fish is more expensive than imported food products from mainland Ecuador, at the same time, the Galápagos province records the highest overweight and obesity rates in the country (Freire et al., 2018). Tourism further constrains access, as visitors consume an estimated 69% of the local seafood. While this supports local livelihoods, it also restricts access for poorer residents. Nearly all local fish is sold commercially, with only 2% of fishers fish for their own consumption (non-commercial) (Berman et al., 2018).

Shifting governance narratives and approaches to view fish as essential food will better recognize the strong interdependencies local communities have with nature and other economic sectors such as tourism. Recognizing these social, economic and nutritional dependencies of local residents and the political economy of food from local marine ecosystems can help re-frame policies away from pure cost-benefit analyses and toward risk-opportunity assessments (Partelow et al., 2023). Understanding risk and how to govern risk appropriately to avoid harms and improve benefits, requires understanding the linkages between local values, culture, livelihoods and knowledge of food systems. When fish is valued as food in policy, conservation initiatives are more effective because they can better address the reality of human uses in the area, avoiding misaligned incentives that undermine people and food system economies. Comprehending public and ecosystems health

requires deepening our knowledge of local cultural and relational values to the marine environment and the challenges being faced. This requires governance approaches and policy to broaden the scope of their target outcomes beyond economic benefits, trade balance, limited species or ecosystem indicators. Multi-purpose policies that recognize system connectivity will better tackle interconnected issues such as public health, ecosystems conservation, livelihood security, and the maintenance of traditional knowledge, food heritage, and cultural practices that strengthen and empower local communities. Sustaining these balances benefits both local people and ecosystems, while offering opportunities for responsible tourism that supports, rather than erodes, food system resilience.

Recognizing gender roles in food system sustainability

Gender approaches in small-scales fisheries and the role women play within this sector have been widely ignored, especially and for decades, in research on Galápagos fisheries. This neglect has caused it to remain as a rather untouched matter that obscures the actual dynamics of the fisheries systems (i.e., the governing system and the natural and social systems to be governed). For this reason, we claim that the lack of visibility of both women's and men's roles within this productive activity perpetuates the idea that fisheries are a fully masculine dominated sector. Nevertheless, over the past 5 years, two initiatives in the Galápagos have sought to document and highlight the role women play across the small-scale fisheries value chain, both in the archipelago and in two major fishing ports on mainland Ecuador—Manta and Jaramijó. One effort critically revisited the Pescado Azul (Blue Fish) initiative after two decades of implementation, examining why and how this previously successful aid-based program came to an end (Bustamante Velarde et al., 2024). A second effort compiled narrative testimonies of women involved at different stages of the small-scale fisheries value chain in the Galápagos, bringing their lived experiences into focus (Rodríguez Jacome et al., 2024). This work nicely illustrates how, when, and where these women have initiated and grown their relationship with fisheries—even from early moments in their lives as young girls—recounting it from both their personal and professional standpoints, giving us insights of the intricacies of their fluid role as women in fisheries. In both cases, the main findings show how relevant women's role is within the different stages of the fish value chain in the Galápagos. These studies also document the intimate articulation between personal and professional spheres for women who have been born into or leading—fishing-oriented family households, simultaneously featuring both the paid and unpaid jobs of the fisheries business, as well as of household care and reproductive work.

Aligning stewardship and use in marine conservation

Marine protected areas (MPA) and reserves are important area-based tools for the protection of marine ecosystems and

resources. According to the International Union for Conservation of Nature (IUCN), MPAs by definition prioritize the conservation of nature (IUCN and WCPA, 2018). Globally, 11.92% percent of the marine territorial waters are currently protected (World Bank, 2025), and more and more areas are being designated as marine protected areas. These efforts are aligned with the 15th UN Biodiversity Conference (COP15) commitment to bring 30% of the Earth's surface under effective protection by 2030 (the “30 by 30” initiative) as part of the Kunming-Montreal Global Biodiversity Framework (GBF). But, conservation outcomes remain challenged: it's been suggested that up to 27% of the world's MPAs may be such “paper parks,” where harmful activities persist or conservation measures are implemented inadequately (Relano and Pauly, 2023). This is because it is still unclear how protected areas can be made ecologically effective, while also being socio-economically fair. The implementation and/or expansion of protected areas is often in conflict with the needs of traditional user groups such as small-scale fishing. Often, marine conservation efforts over-emphasize the “availability” argument under the assumption that food security will follow on naturally from increased fish stocks derived from better fisheries management or conservation—yet in many cases the enhanced availability of fish does not necessarily result in improved food security (Fabinyi et al., 2017). Misaligned policy targets not only challenge the achievement of conservation objectives but also put livelihoods and food security of local communities at danger (Fabinyi et al., 2025). Therefore, making efforts for aligning resource stewardship with sustainable use within marine protected areas turns crucial, as well as rights-based approaches to development that enable small-scale fisheries and marine conservation to move forward together.

The Galápagos Marine Reserve has a long history, mainly being promoted for its biodiversity conservation targets. Since its creation in 1998, fishing is allowed within the reserve exclusively for a locally based fleet of registered artisanal vessels (DPNG, 2014). Yet, an ever-growing local population (driven by immigration from mainland Ecuador) and increasing number of visitors have given rise to increased demand for seafood; challenging seafood availability and access for locals. This, together with anthropogenic (chemical pollution, ocean plastics, overfishing) and environmental (El Niño, climate change) pressures, have given rise to sustainability concerns (Alava et al., 2023; Jones, 2013). Prioritizing local food security by ensuring continuous seafood availability and accessibility, even in times of high tourism demand, should therefore become a central objective of local governance policies, requiring a shift toward promoting a *fish as food notion*, and implementing measures to sustainably manage valuable marine resources. For this, and to address food security implications of fisheries management, coordination among fisheries and public health sectors should be also promoted (Roberts et al., 2023).

Promoting integrated food systems within the One Health perspective

A One Health approach recognizes that outcomes of public health, economic stability, and environmental sustainability are intricately connected through the many people, institutions,

markets, ecosystems, and species that shape them. The policy-relevant 2019 “Food in the Anthropocene” report from the EAT² Lancet Commission outlines five strategies for achieving sustainable food systems: (1) intentional commitments to shift toward healthy diets, (2) reorienting agricultural priorities away from “more” food toward “better” food, (3) sustainably intensifying food production with high-quality output, (4) stronger and coordinated governance of land and oceans, and (5) reducing waste in line with global sustainable development goals (Willett et al., 2019). In the Galápagos, governance policies need to intentionally commit to prioritizing a food system approach that balances food security needs, economic stability, and marine conservation. Setting this agenda toward a systems approach can foster governance dialogues and approaches that better recognize the land-sea connectivity. When artisanal fisheries are supported—and local access to seafood can improve and stabilize—the ability of local residents to access healthy high-quality diets from local fisher livelihoods has a stronger possibility for re-establishment. For example, conservation approaches need to recognize local dependencies of people on catching food, and how restrictions on doing so have social, livelihood, and public health implications. Furthermore, policies promoting tourism and economic opportunity need to consider how they shape food security and nutrition, particularly through shifting prices, as well as import and export needs of locally produced seafood. One Health approaches (Adisasmito et al., 2022) are conceptually useful for facilitating dialogue among stakeholders involved in policy decisions, offering a clear framework for thinking about system interactions that are adaptable to local contexts. Core tenets include equity between sectors in governance (and scientific disciplines), parity in rights and opportunities for all people, social-ecological balance, and stewardship that promotes human behavior change toward more sustainable relationships between people and nature (Adisasmito et al., 2022; Fabinyi et al., 2025). It is evident on the Galápagos that there are linkages between marine conservation policy, local artisanal fishery livelihoods, the tourism economy, and the public health outcomes of local people. Governing these sectors in isolation makes it more difficult to meet the vision of a One Health approach. Considering their connectivity through deliberation and dialogue among key stakeholders can be a fruitful starting point to make governance progress.

Conclusions

Since the mid-twentieth century, small-scale fisheries were brought into the Ecuadorian political and economic agenda as a sector that promised wealth, prosperity, and food. The demand for fish and the consequent boost of the small- and large-scale fisheries sectors during the following decades highlighted the importance of fish as food for most of the households in the coastline region. Yet, in the Andean mountainous region, the access to fish as food still remains low and is compromised by the poor geographical

connectivity, the lack of infrastructure, and the limited knowledge of nutritional practices involving seafood. The Galápagos, on the contrary, has included fish within the household diets since the incipient *galapagueña* society, who came from mainland Ecuador to tame and conquer the “wild and empty” spaces in the islands. Fish as food in the archipelago has consolidated as “the” local source of protein for early inhabitants who settled in the seaside towns.

Currently, within the four pillars that describe the Food Security and Nutrition (FSN), only availability, accessibility and affordability seem to be well-characterized, illustrated, and documented. The pillar of stability, however, remains insufficiently understood, requiring systematic and sequential evidence to illustrate how “stable” fish-as-food is around the Galápagos Islands. This may be due to the absence of a fish traceability assessment from catch into the market to consumption, particularly for the catch that remains in the local market all year around. Future studies should look further at the stability pillar to complete the picture of food security in the Galápagos, while policies should consider all four aspects and how they interact over time. Yet, applying the FSN framework serves to set important grounds for discussing and recognizing the role of seafood in nutritional and cultural practices of this community and beyond.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

CM: Conceptualization, Writing – original draft, Resources, Funding acquisition, Validation, Project administration, Investigation, Writing – review & editing, Formal analysis, Supervision, Methodology, Software, Data curation. SP: Writing – review & editing, Writing – original draft, Funding acquisition, Conceptualization, Investigation, Resources, Project administration, Formal analysis, Validation, Methodology, Supervision. LK: Writing – review & editing, Project administration, Validation, Supervision, Investigation, Resources, Funding acquisition. CS-Z: Writing – original draft, Supervision, Writing – review & editing, Investigation. MT: Project administration, Supervision, Writing – review & editing. OE: Formal analysis, Validation, Writing – original draft, Investigation. GR: Project administration, Methodology, Supervision, Writing – original draft, Investigation, Conceptualization. MB-P: Resources, Funding acquisition, Conceptualization, Validation, Writing – review & editing, Methodology.

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Conflict of interest

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Appendix

Methodology and data sources

The supporting evidence for this study was assembled through a comprehensive review of secondary sources focusing on the contribution of artisanal fisheries to food and nutrition security in Galápagos. A total of 96 documents published between 2020 and 2022 were systematically identified and synthesized, complementing earlier bibliographic references compiled in [Arteaga-Bengoa \(2020\)](#). Sources included academic publications, technical reports, government statistics, and institutional documents. Search terms during late 2021 combined concepts such as food security, insecurity, fisheries, seafood, and Galápagos in both English and Spanish, using Google Scholar and institutional repositories as primary entry points.

All information was organized in a database structured around the four internationally recognized pillars of food security: availability, access, use, and stability ([FAO, 2005](#)). For each pillar, relevant variables were extracted and coded according to definitions from [FAO \(2005\)](#) and subsequent applications in the Galápagos context. The database integrates both qualitative and quantitative variables, with some indicators corresponding to previously established indices. In addition to fisheries, a smaller number of variables reflect agri-food production, acknowledging complementarities between marine and terrestrial food systems.

The distribution of information across pillars is uneven. The pillar of use and consumption is most frequently documented, followed by availability, then access (both physical and economic dimensions), and finally stability. This variation reflects differences in data production efforts and the relative emphasis of prior research. A database was created to provide a transparent record of sources and variables for each pillar, serving as a reference for the synthesis presented in the main paper.