

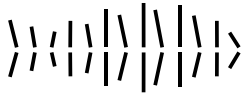


From Fish to Architecture in Angeiras

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Leaving Nothing Behind, International Conference 2023,
Department of Architecture of the University of Bologna





From Fish to Architecture

The Fishing Community of Angeiras in Northern Portugal

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This paper aims to present the results of a workshop conducted in a small fishing community in northern Portugal, developed within the context of an interdisciplinary research project on the relationships between fishing and architecture. The focus of the workshop was on identifying, describing, and visually representing the most common species, fishing gear and equipment, boats and huts, navigation routes, fishing spots, and types of seabed. The research employed a combination of quantitative and qualitative data collection methods, including direct observation, surveys, and interviews. With a strong emphasis on graphical materials, both collected and created, the workshop capitalized on the potential of architectural representation. Techniques ranged from hand drawings and precise CAD drawings to 3D scanning. Each graphical representation was complemented by numerical data, encompassing landings, measurements of fishing gear, and the periodicity and coordinates of fishing routes. The results reveal a complex system of relationships and interdependencies, not only between fishing dynamics and the built environment but also among the species themselves and their respective ecosystems. The experience of this workshop was especially valuable for the research team, as it elucidated the possibilities of disciplinary relationships between architecture, archaeology, and marine biology, the combination of quantitative and qualitative methods, the integration of fishermen's knowledge, and the potential of the architectural approach for surveying and representation purposes in research.

Keywords

Fishing Architecture, Marine Biology, Ecology,
Socioecology, Seascapes

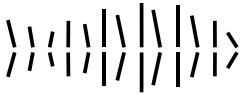
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Introduction

Small-scale fishing is of major significance both in Portugal and within the broader European context (Pita & Gaspar, 2020). This significance is acknowledged in economic and sociological terms, owing to the substantial reliance, both direct and indirect, that numerous individuals have on this sector (FAO, 2015). Additionally, small-scale fishing is recognized as a contributing factor in the preservation of local biocultural diversity (UNESCO-CBD, 2014).

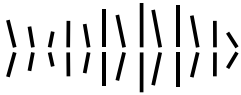
This article presents the outcomes of a workshop conducted in Angeiras, a small fishing community in northern Portugal, as part of a research project focused on the interconnections between marine ecosystems, fishing, and the associated material culture. The workshop, which extended over eight days, from June 14 to 22, 2023, was based on fieldwork and studio sessions. The work team was organized into thematic groups according to different scales of information (micro, medium, and large). Data collection encompassed freehand drawing, 3D scanning, GPS mapping, structured questionnaires, and informal conversations with fishermen and local residents.

The main objective was to establish meaningful engagement with an active fishing community and foster an experiential understanding of fishing practices. Additionally, it served as a practical testbed for the fieldwork methodologies intended for subsequent case studies within the research project. The outputs consisted of vectorial drawings and data sheets, ranging from fish traps to vessels trajectories, fishing effort, landings, and fish species. The results highlighted the areas in which some of the fishermen were working, making it possible to represent their architectural support in relation to specific fishing spots and measurable catches.

The relevance of small-scale fisheries

Small-scale fisheries (SSF) have historically received less scientific and policy attention than their industrial counterparts (Smith & Basurto, 2019). However, in recent decades, there has been a notable increase in academic publications, coupled with the emergence of global policy instruments dedicated to the small-scale sector and coordinated efforts to comprehensively assess the global significance and impacts of small-scale coastal fishing.

SSF operations are typically characterized by multi-gear and multi-species approaches; they play a pivotal role in supporting household and community livelihoods, while making substantial contributions to both local and global trade in fish products (Kittinger et al., 2013). According to the Food and Agriculture Organization of the United Nations (FAO, 2015), SSF represent approximately 80% of the European Union's (EU) fishing fleet and contribute significantly to the overall fishing effort. However, in terms of catch volume, the SSF sector represented only 5.4% of the total catch in 2019, amounting to about 0.5 million tons (EU Committee



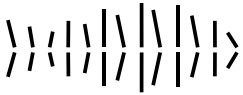
on Fisheries, 2022). Nevertheless, it is worth noting that this report underscores the sector's relative species selectivity and reduced wastefulness compared to large-scale fishing. Moreover, it highlights its substantial role in enhancing food security, fostering social cohesion, and preserving cultural heritage, from material culture to artisanal fishing methods, in numerous coastal areas (EU Committee on Fisheries, 2022).

The Portuguese fishing sector represents 10% of the EU's fleet in terms of numbers and 12% in terms of employment (European Commission, 2016). The small-scale sector constitutes a fundamental component of Portuguese fisheries, as further elaborated below. A significant majority (approximately 85%) of the Portuguese fishing fleet consists of small-scale vessels. More particularly, with respect to small-scale fishing landings, the numbers exceed EU averages, accounting for about 20% of the total catch in the country (Pita & Gaspar, 2020).

Fishing in Portugal is deeply rooted in tradition, with a rich historical legacy (Viegas, Moniz, & Santos, 2014). This cultural significance is evidenced by the prominent role of fish in the traditional Portuguese diet. As emphasized by Pita and Gaspar (2020), Portuguese individuals rank as the highest consumers of fishery products within the European Union on an annual per capita basis (56.8 kg). This level of consumption is more than double the EU average (24.9 kg).

Despite the deep social, economic, and cultural significance of SSF in Portugal, there is a significant knowledge gap with regard to the environmental and human dimensions of this sector. As referred to by Viegas et al. (2014), this gap hinders the sustainable management of the fishing fleet, resources, and the ecosystems where fishing takes place.

In line with trends observed in the European Union, there has been a gradual decline in SSF economic performance since the start of the century (in Pita & Gaspar, 2020). This decline can be attributed to, among other things, diminishing catch volumes and escalating operational costs. However, signs of improvement have surfaced since 2012, potentially reflecting increased fish prices at initial auctions and reduced fuel costs.



Fishing and biocultural diversity

Despite the economic and social arguments, there is also a recognition of the role of SSF in preserving cultural and biological diversity. The Florence Declaration on the Links between Biological and Cultural Diversity (UNESCO-CBD, 2014) underscores the intricate connection between rural and urban livelihoods and well-being to the status and trends in biological and cultural diversity. Specifically, it acknowledges that landscapes enriched with biocultural diversity are often under the stewardship of small-scale farmers, traditional livestock keepers, and small-scale fisheries (Dyrset, Margaryan, & Stensland, 2022).

Conversely, the La Coruna Declaration (2010), emphasizes that the small-scale coastal fishing fleet is usually engaged in non-intensive practices and utilizes a variety of seasonally diverse fishing methods across multiple species, with a relatively small ecological footprint.

As highlighted by Viegas (2012), the coastal regions housing these small-scale fishing communities are not only biologically productive but also remarkably susceptible to fluctuations in environmental quality and various forms of human occupancy. García-Flórez et al. (2014) argue that small-scale fisheries exhibit a pronounced dependency on coastal inshore waters, and their limited mobility renders them highly reliant on local and regional ecosystem resources. At the local level, threats such as overexploitation and land-based pollution can precipitate adverse impacts on fishery resources and habitats, thereby imperiling livelihoods, food security, and the cultural practices entwined with fishing activities (Kittinger et al., 2013).

On the other hand, the absence of safeguards is apparent for these communities, as observed by Dyrset et al. (2022) This absence forms part of a broader pattern of biocultural homogenization, reflecting a tendency to prioritize monetary metrics, oversimplify intricate sociocultural contexts, and undervalue traditional knowledge concerning natural resource utilization. This scenario raises questions on the resilience of these communities, many of which have sustained their livelihoods for millennia (Viegas, 2012).

Within this framework architecture is neglected. The case of Angeiras is one of many examples where the SSF and their communities are intimately associated with a significant architectural heritage. Hence our aim to articulate the understanding of fishery dynamics with the development and character of the associated building culture.

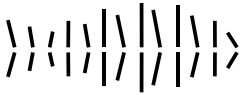


Figure 01. Fishing Community of Angeiras. Photo by Jorge Nogueira

The case of Angeiras

Angeiras is located in the north of Portugal, in the municipality of Matosinhos, and its relationship with the sea dates back to the Roman Empire. Near to the beach, remnants of Roman tanks carved into rocky outcrops dating from the 2nd to 4th centuries AD bear witness to the salting of fish and the production of garum (Viegas, 2012), a fermented fish sauce produced through the maceration of fish and small crustacean viscera, combined with olive oil, wine, and aromatic plants (Santos, 2022).

The role of fishing in Angeiras, coupled with agriculture, has constituted a pivotal economic activity essential for the dynamism of the municipality (Lima, 1963). During specific periods, such as the sardine fishing season, Angeiras experienced an influx of people from across the country, ushering in a period of heightened activity characterized by increased boat traffic and human presence—a testament to the vibrancy of a territory rooted in maritime and fishing endeavors.

However, the urbanization of the coastal area in Angeiras is a recent phenomenon, primarily evolving from the 20th century onwards (Viegas, 2012). This transformation was spurred by intensified demand, growing familiarity with maritime activities, and the availability of affordable coastal land. Initially, this proximity to



the shoreline, functioning as an extension of the older Angeiras settlement situated further inland, was motivated not solely by fishing but also by the collection of sargassum for agriculture (Santos, 2022).

Historically, the challenging conditions of Angeiras have posed safety concerns for fishermen, resulting in numerous casualties on the beach and out at sea (Viegas, 2012). Fishing activities in Angeiras have always been seasonal and intricately tied to the sea conditions. Any degree of turbulence could hinder fishermen's ability to embark and disembark, potentially necessitating the offloading of their catches at the port in Matosinhos.

Municipal documentation (in CA, 2017) revealed that before the establishment of the breakwater in July 2021, safe navigation for both departures and arrivals was only possible for around 30% of the year, approximately 110 days. The construction of the breakwater aimed to reduce the number of inoperative days by half (CA, 2017). Fishermen acknowledge the importance of this intervention in enhancing sea access, but they also emphasize the need for a dedicated pier (JN, 2021). Currently, the way boats enter the water involves first being dragged by a tractor on the beach, and then pushed out to sea. This practice raises problems with boat deterioration, necessitating frequent maintenance (JN, 2021). Like many other places in Portugal, Angeiras has also experienced a notable decrease in its small-scale fishing fleet. According to Viegas (2012), the fleet numbered 130 boats in 1950, which dwindled to 60 within a decade. In 2005, the number of registered vessels fell to 27.

Presently, the fishing community comprises approximately 16 vessels, operating within a 6-mile limit from the shoreline, with varying seasonal fishing orientations. The fishing calendar includes shrimp from October to May and octopus throughout the year, along with catches of crab, conger, pouting, seabass, and other species. During the workshop conducted in June, the primary focus was on octopus, although significant landings of velvet crab, pouting, conger, and sea bass were also reported. The main fishing methods employed include fish traps, longlines, and gill nets (Figure 01).

Aims and methods

The preparation of this workshop in the Angeiras fishing community was guided by three objectives. The first was the possibility of experimenting with methodological approaches in a concrete and logistically viable case study, during a short and intensive period, in order to inform future fieldwork activities as part of the research project. Another objective was to enable members of the work team to have direct experience within the context under examination, either through contact with a real fishing scenario or through contact with its participants, the fishermen, who are of major importance in this type of study. Finally, this workshop was intended to understand the relevance of the topic in question and the possible

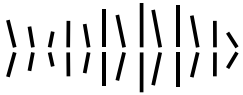
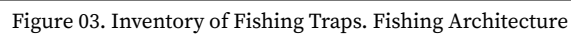


Figure 02.
Cartography of
Angeiras with
Fieldnotes. Photo
by Jorge Nogueira

contributions of this work, whether from a scientific point of view or for the local community itself.

When conducting the fieldwork, a wide range of data collection methods were used, based on direct and participatory observation (Figure 02), structured questionnaires, and informal conversations, mainly considering qualitative data, supplemented with quantitative data. Along with traditional field notes, various documentation tools were used, such as freehand drawing, photography, 3D scanning, and GPS mapping, used depending on the participants' expertise. Both graphical and numerical evidence was then processed in study sessions, organized in a set of synthesis panels and a structured spreadsheet. Part of the work developed in the workshop was presented to the local community at the end of the work period, as a way of discussing the results and obtaining feedback.



In order to optimize data collection and production, workshop participants were organized into four working groups, each consisting of two members. Each group was assigned a specific theme and a set of initial tasks and informed about the expected outcomes, including both graphical and numerical data.

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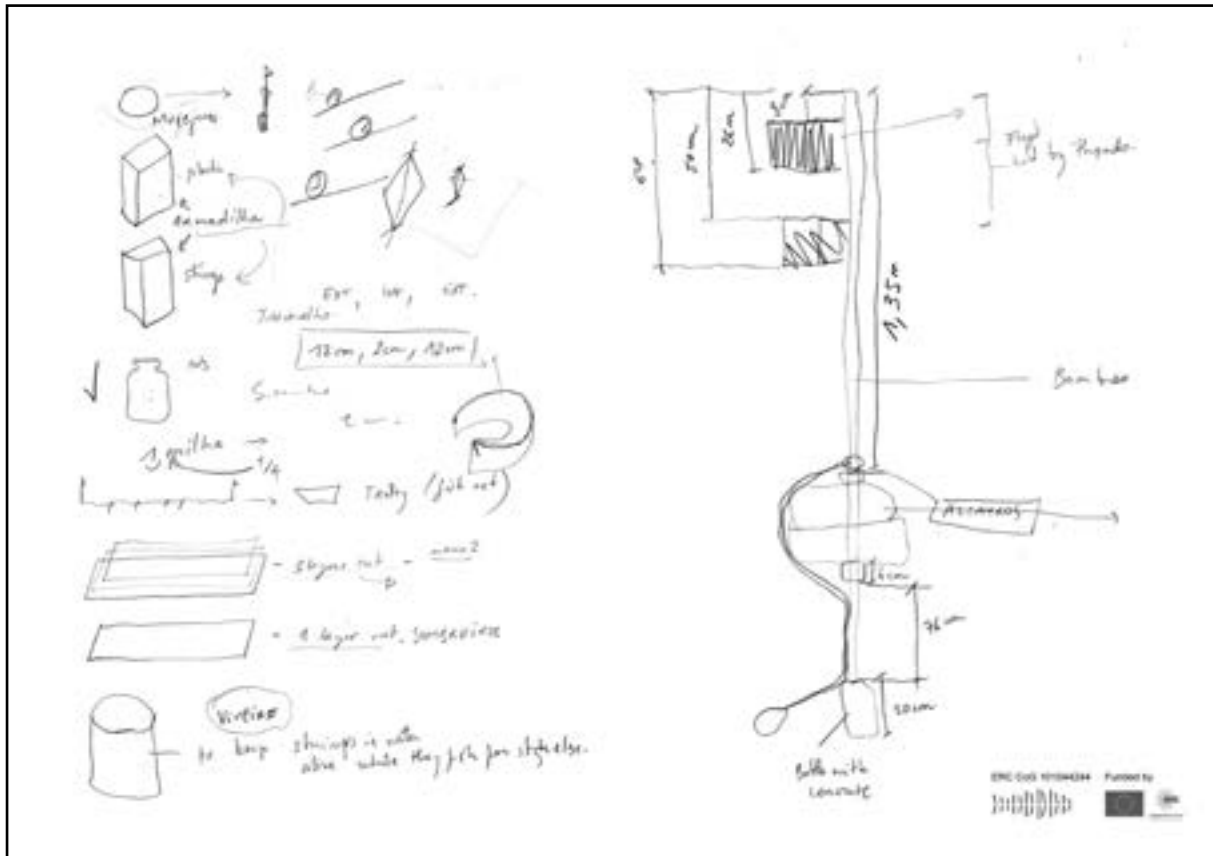
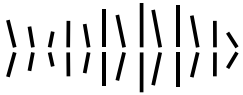


Figure 04. Hand Drawing Surveys. Fishing Architecture

The final materials produced by this group consist of a comprehensive inventory of the fishing gear used, presented in vector drawings with plans, elevations, and axonometric views, organized into categories like 1) Traps, 2) Nets, and 3) Lines (Figure 03). Furthermore, the hand drawings created by this group during the fieldwork exhibit significant expressive and communicative value, showcasing the potential of drawing as an instrument for recording, similar to ethnographic drawings (Figure 04).

The work carried out by this group involved a comprehensive survey of the elements occupying the Angeiras beach, including boats, equipment, and fishermen's shelters (both interior and exterior), using a 3D scanning application. By combining these surveys into a single model, the group created a general representation of this fishing community in Angeiras, with all the elements surveyed in detail and to scale (Figure 05).

The final panels produced by this group, highlighting the surveyed elements of the built environment, serve as an informative map of the infrastructure and equipment directly associated with fishing at Angeiras beach. The panels present

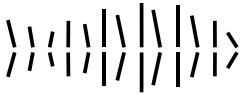
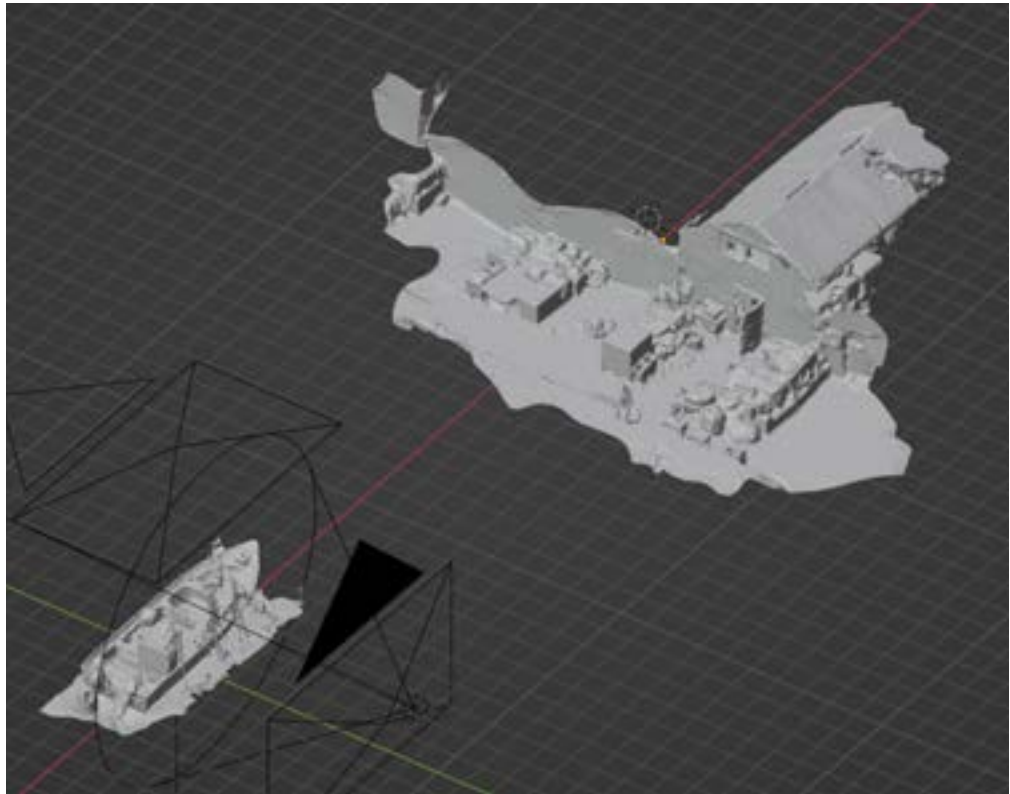


Figure 05.
3D Survey
of a Fishing
Shelter and a
Boat. Fishing
Architecture



both a plan view and axonometric projections, providing additional volumetric information (Figure 06). In addition to the panels, the group created a general survey of these elements at a 1:50 scale, resulting in a 3D library containing all the boats, equipment, and fishermen's shelters in Angeiras. This library will serve as an essential base material for future work.

The data collected by the third group yielded two types of materials. Firstly, a set of panels was created, featuring cartographies representing the routes followed by the fishermen of Angeiras, categorized into three groups based on the distance covered, i.e., short (<20 km), medium (20–40 km), and long (>40 km) distances. These boat movements, documented using GPS mapping devices and organized in a GIS file, also offer valuable insights into the fishing spots and the types of fishing gear used (Figure 07). In addition to these materials, information about the fishing spots was gathered from the fishermen, including their name, depth, seabed type, distance from the coast, and targeted species. When combined with GPS information, this data holds significant value for mapping the fishing area in Angeiras.

The second type of material developed by this group involved representing some of the fishing spots, including the boat and the fishing gear used. To achieve this, representations in plan, section, and axonometry were used, providing insights

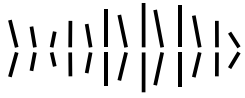


Figure 06. General Axonometry of Angeiras.
Fishing Architecture

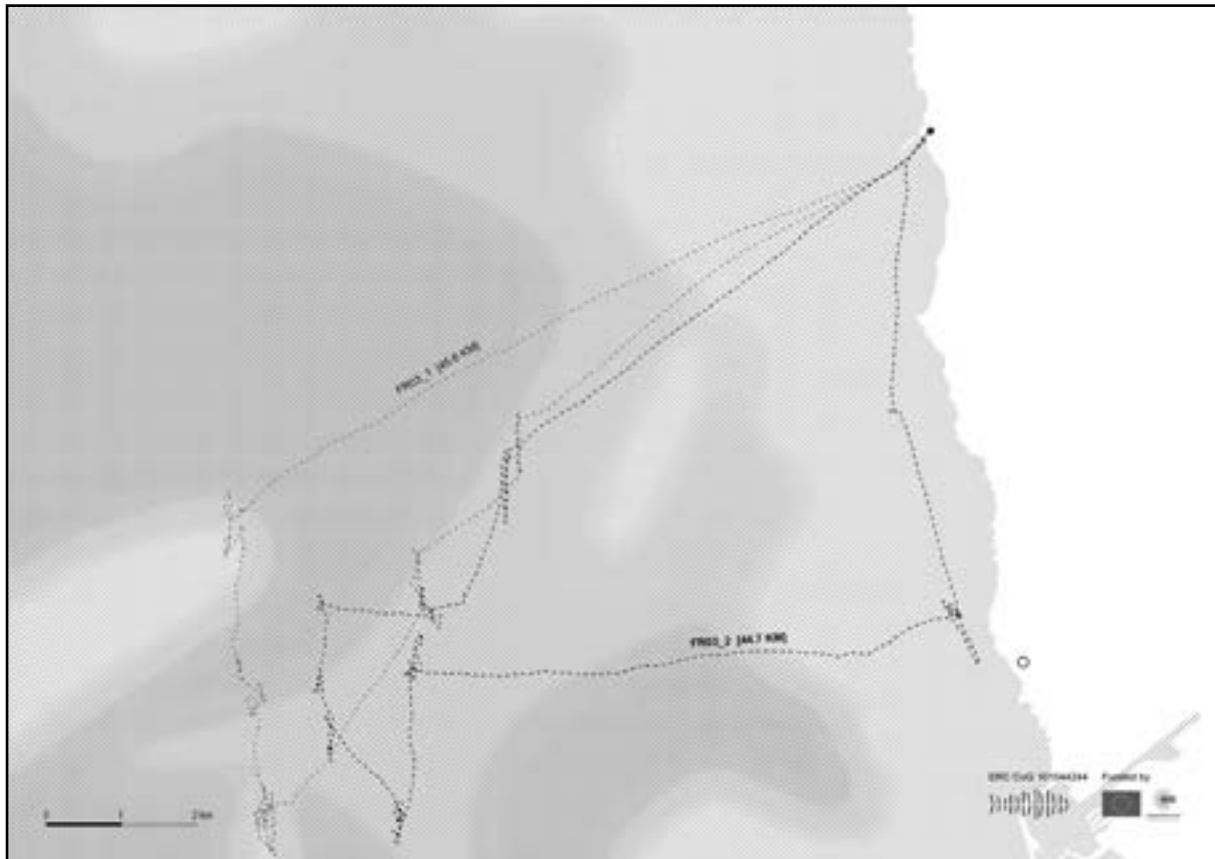
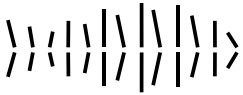


Figure 07. Long Distance Fishing Route. Fishing Architecture

into the dimensions and scales involved (Figure 08). This process relied on the material and data collected by other groups, notably the survey of traps (WG01), the survey of boats and shelters (WG02), and specific data about fishing spots (WG04).

The fourth working group, consisting of marine biology students, played a pivotal role in gathering and processing numerical data on fish landings, including species and respective abundance. They utilized a customized questionnaire provided by the IPMA, specifically tailored to align with the objectives of this workshop. The group's primary focus was on creating full profiles for each fisherman and vessel, gathering essential general information that would help establish a detailed register for each participant. Additionally, throughout the workshop, the group diligently recorded data from each fisherman, including their daily itineraries, the species they caught, collected, and unloaded, the duration of their time at sea, and the fishing spots they visited. As the workshop progressed and valuable insights were obtained, the questionnaire underwent continuous refinement to enhance its efficacy, especially in facilitating seamless integration and correlation of the collected data.

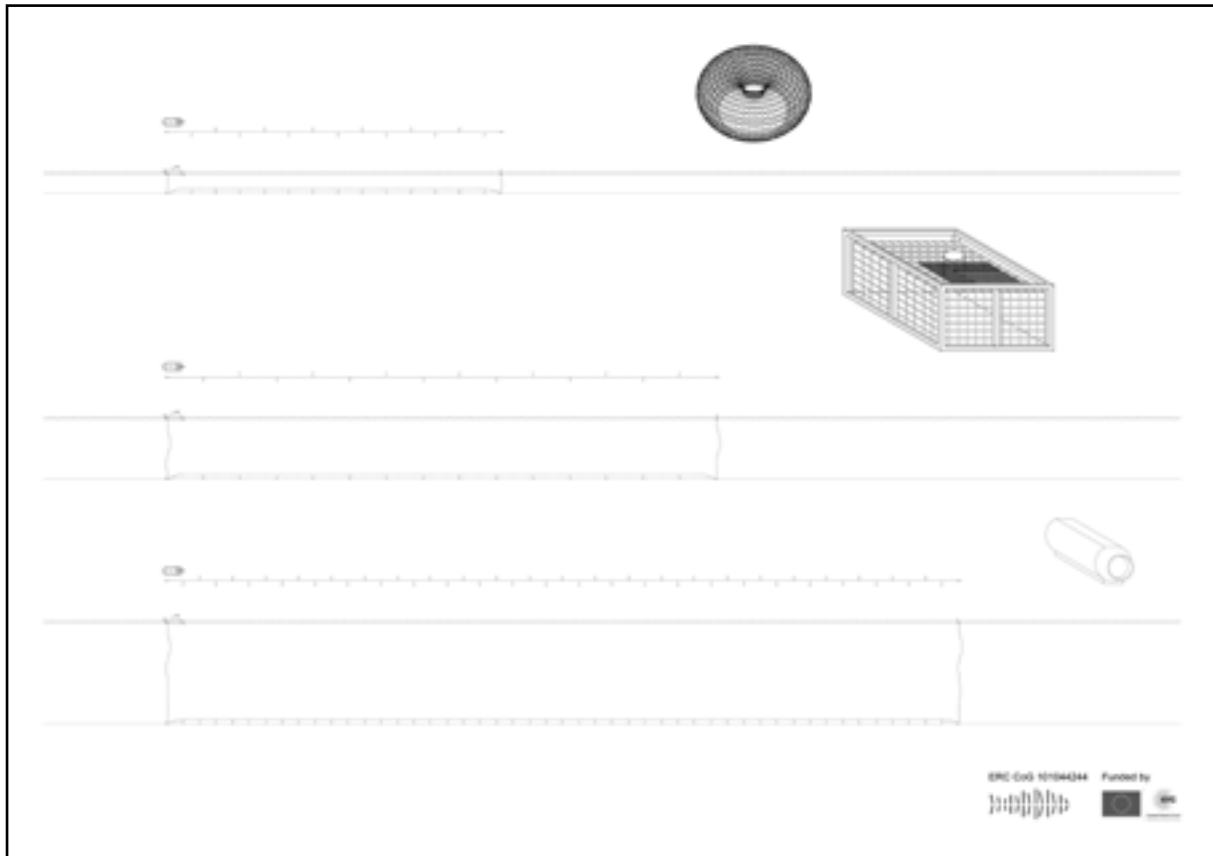
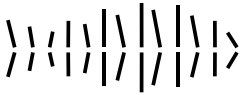


Figure 08. Fishing Spots with Different Traps. Fishing Architecture

The data gathered by this group will be significant for the advancement of our work, particularly when combined with the GIS database, allowing for associations between fishing routes and specific fishing spots. Due to its detail and accuracy, such data has proven its value in complementing the official landing statistics.

Conclusions

The workshop conducted in Angeiras brought significant and valuable results for understanding the relationships between fishing and the local material culture, including fishing vessels and gear, onshore facilities, and fishing routes and spots. The direct experience provided by a multidisciplinary team, in close collaboration with local fishermen, allowed for deep immersion in the study context. This methodological approach proved effective in gathering a wide range of data, both qualitative and quantitative, enriching our knowledge about the fishing dynamics in Angeiras. The efficiency of multidisciplinary work was obvious, as the different backgrounds of the participants enriched the discussions and allowed for a more comprehensive approach to the subject. Furthermore, the methodological flexibility adopted during



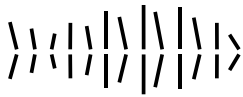
the workshop, which allowed for adjustments and adaptations throughout the process, proved essential in dealing with challenges encountered in the field.

From the perspective of the fishing community, it became clear that there is intense appreciation of the ecosystem in which they live and on which they depend for their subsistence. Although the research materials were not aiming to assess the topic, SSF, as practiced in Angeiras, demonstrated care and protection for the environment. The ecological relevance of small-scale fishing, and especially its relation to prized architectural heritage, highlights the potential of intertwining the built environment and natural ecosystems as a contribution to the preservation and sustainability of marine resources.

The workshop made evident that studying the relationships between ecosystems and fishing communities can provide valuable information for both science and the local community. Thus, the work carried out in Angeiras can serve as a basis for future research, contributing to the construction of a replicable model in other fishing villages along the Portuguese coast.

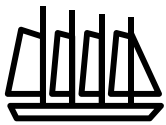
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Bibliography

- CA. *Obra Marítima de Abrigo na Zona Piscatória de Angeiras*. Agência Portuguesa do Ambiente, Centro de Ecologia Aplicada – Instituto Superior de Agronomia, Comissão de Coordenação e Desenvolvimento Regional do Norte, Direção-Geral do Património Cultural, 2017.
- Dyrset, Guri, Margaryan, Lusine and Stensland, Stian. “Local Knowledge, Social Identity and Conflicts around Traditional Marine Salmon Fisheries: A Case from Mid-Norway.” *Fisheries Management and Ecology* 29 (2022): 131–142.
- Ellefsen, K. O. and Lundevall, T. *North Atlantic Coast: A Monography of Place*. Oslo: Pax Forlag, 2019.
- European Commission. *Facts and figures on the Common Fisheries Policy: Basic Statistics Data*. European Commission Publications Office, 2016.
- EU Committee on Fisheries. *Report on the Small-Scale Fisheries Situation in the EU and Future Perspectives*. 2022.
- FAO. *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication*. Rome, 2015.
- García-Flórez, Lucía, Morales, Jesús, Gaspar, Miguel B., Castilla, David, Mugerza, Estanis, Berthou, Patrick, García de la Fuente, Laura et al. “A Novel and Simple Approach to Define Artisanal Fisheries in Europe.” *Marine Policy* 44 (2014): 152–159.
- Jornal de Notícias*. “Angeiras ganha dia ‘histórico’ com quebra-mar pronto.” July 31, 2021.
- Lima, Maria Alves, “Matosinhos: Contribuição para o estudo da linguagem, etnografia e folclore do Concelho.” BSc diss., University of Coimbra, 1955.
- Kittinger, John N., Finkbeiner, Elena M., Ban, Natalie C., Broad, Kenneth, Carr, Mark H., Cinner, Joshua E., Gelcich, Stefan et al. “Emerging Frontiers in Social-Ecological Systems Research for Sustainability of Small-Scale Fisheries.” *Current Opinion in Environmental Sustainability* 5 (2013): 352–357.
- Pita, Cristina and Gaspar, Miguel. “Small-Scale Fisheries in Portugal: Current Situation, Challenges and Opportunities for the Future,” in *Small-Scale Fisheries in Europe: Status, Resilience and Governance*, edited by José J. Pascual-Fernández, Cristina Pita, and Maarten Bavinck. Cham: Springer International Publishing, 2020.
- Santos, Filipa Rodrigues Dias Ferreira dos. “Entre a Terra e o Mar: Uma etnografia visual da cultura do sargaço na comunidade piscatória de Angeiras, Matosinhos.” MSc diss., Institute of Social Sciences, University of Minho, 2022.
- Smith, Hillary and Basurto, Xavier. “Defining Small-Scale Fisheries and Examining the Role of Science in Shaping Perceptions of Who and What Counts: A Systematic Review.” *Frontiers in Marine Science* 6 (2019): 1–19.
- Starkey, D. J. and Heidbrink, I. *A History of the North Atlantic Fisheries*. Bremen: Hauschild, 2009.
- Tavares, A. and de Souza, D. I. “Moving Seascapes: The Architecture and Biology of Fishing and Canning on the Portuguese Coast.” *Revista de investigación y arquitectura contemporánea* 11 (2021): 14–31.
- Tavares, A. and de Souza, D. I. *Arquitectura do Bacalhau e Outras Espécies: Uma leitura crítica da paisagem construída pelas pescas portuguesas*. Porto: Dafne, 2022.
- UNESCO-CBD. *Florence Declaration on the Links between Biological and Cultural Diversity*. Florence, 2014.
- Viegas, Maria do Céu. “Comunidades piscatórias e bio-recursos marinhos: Estratégias para políticas de desenvolvimento e de gestão sustentáveis.” PhD diss., School of Science and Technology, Nova University Lisbon, 2012.
- Viegas, Maria Do Céu, Moniz, António B. and Santos, Paulo T. “Artisanal Fishermen Contribution for the Integrated and Sustainable Coastal Management: Application of Strategic SWOT Analysis.” *Procedia-Social and Behavioral Sciences* 120 (2014): 257–267.



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