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National Fisheries Profile Germany

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Preface

The German National Fisheries Profile (NFP) has been compiled to contribute to the series of National Fisheries Profiles initiated by DG MARE of the European Commission. NFPs are regarded as essential instruments for understanding the broader social context in which fisheries operate. The primary objective of an NFP is to deliver a comprehensive overview of the fisheries sector with particular emphasis on its social dimensions and to ensure that the best available science is used to inform decision-making and societal dialogues.

The framework for developing NFPs was established by the Scientific, Technical and Economic Committee for Fisheries (STECF) of the European Commission and is detailed in the report on Social Data in Fisheries (STECF 2024b). While the German NFP closely follows the template and methodologies proposed by the STECF, it also incorporates additional elements to capture the specific characteristics and nuances of the German national context. We believe this document will serve as a valuable resource for policymakers, researchers, and stakeholders, promoting informed decision-making and supporting sustainable management of fisheries.

The data used in the preparation of this report were those that were verified and reliably available by the end of 2024.

Executive summary

General overview of the structure of the fisheries sector

The German fisheries sector is diverse and has undergone a significant structural change. Over the past decade, this change has been accelerated by a range of ecological, economic, political, and social factors. These include, but are not limited to, the decline of herring and cod stocks in the Baltic Sea, increasing fuel costs, the loss of fishing quotas due to Brexit, a demographic change (which currently results in an average age of 54 years among fishers), increasing (recreational) fisheries regulations as well as competition for fishing grounds at sea, inter alia due to the establishment of marine protected areas and offshore wind farms.

In 2022, the German fishing fleet comprised 858 active vessels, with a combined gross tonnage (gt) of approximately 53,000 gt. Additionally, 316 vessels were inactive, mostly small-scale fisheries (SSF). SSF (<12 m length) represent three-quarters of registered vessels, while large scale fisheries (LSF) (>12 m length and less than 500 gt) and distant-water fisheries (DWF) (>500 gt) on the other hand comprise 96% of fishing capacity in terms of gross tonnage. The number of vessels has declined constantly over the years. While SSF vessels (almost exclusively operating in the Baltic Sea) tend to exit the sector, capacities concentrate in the LSF (operating mostly in the North Sea) and DWF (operating mainly in the North Atlantic and Eastern Arctic area). Studies focusing on social aspects suggest that different types of German fisheries are associated with distinct traditions, agencies, habitus, and ways of life. In addition to the German commercial fleet, there are 220,000 marine recreational anglers in Germany, who are increasingly relevant in the utilization of fish as a resource.

Governance system

German fisheries are regulated under the EU Common Fisheries Policy (CFP). As a Federal Republic, Germany has five coastal federal states that collaborate to implement the CFP. These states are responsible for the implementation of structural policy measures – particularly those related to the European Maritime, Fisheries and Aquaculture Fund (EMFAF) – as well as for regulating coastal waters up to 12 nautical miles (nm). Every federal state has its fishery authority, responsible for inland fisheries, aquaculture, recreational fisheries, and marine fisheries in coastal waters. Management beyond coastal waters in the exclusive economic zones (EEZ) takes place at the national level through the Federal Office for Agriculture and Food (BLE). The utilization of the EEZ is governed by marine spatial plans, where fisheries have either no or minimal priority areas.

One of the main management tools is the allocation of fishing quotas. Most of the fishing quotas in Germany are attached to fishing vessels. A permanent transfer of quota is only possible by purchasing or selling vessels. Nonetheless, short-term and non-permanent quota swaps between fishers within a season are possible. Furthermore, there are community quotas not allocated to individual vessels but open for all fishing companies licensed for those fisheries. Those quotas are mostly for managing by-catch species in fisheries on more important stocks where the vessels have individual quotas. Fishing rights of SSF can also be regulated through technical measures, such as the limitation of space for trap nets, a maximum length of gillnets, number of traps and hooks per fisher and area and through closed seasons or closed fishing grounds.

Producer organizations (POs) play a crucial role in facilitating the achievement of the CFP's goals. In 2024, 12 POs were active in Germany. Due to the dynamic development of the fleet, the sector is currently reorganizing, resulting in the dissolution of some POs. Furthermore, fishers are organized in associations which represent their interests in public and in policy context, with the Deutscher Fischereiverband e.V. (DFV) being the national umbrella organization of commercial and recreational fishers. One of the member organizations, the umbrella organization of the German angling association – Deutscher Angelfischerverband e.V. (DAFV) – represents 500,000 recreational (inland and marine) anglers.

The EMFAF sets incentives for the sustainable use of aquatic and maritime resources. Important EMFAF measures are the temporary and permanent decommissioning of fishing vessels, other EMFAF grants include the establishment of Fisheries Local Action Groups; compensation payments for damages caused by grey seals; the Brexit Adjustment Reserve to compensate for quota loss due to Brexit, or subsidies to lower fuel and other cost increases due to the war in Ukraine. Moreover, Germany established a fund for the sustainable transformation of fisheries, which has received capital from the auctions of areas for offshore wind farms.

Social, cultural and economic aspects of fisheries

The economics of fisheries are well surveyed, but there is limited knowledge about the social and cultural aspects of fisheries.

Economic aspects

Employment in fisheries declined from about 7,000 employees and self-employed skippers in 1970 to about 1,200 in 2022, mainly caused by the decline of Germany's DWF between 1975 and 1990, and a continuous trend of decommissioning in SSF and LSF. The average landings of the German fleet from 2013-2023 were around 211 kt of seafood, which resulted in an average revenue of €234 million and an average net profit of €2.4 million; including peak years like 2016 with net profits of €30.8 million and net loss of €-29.1 million in 2021. After a period of loss in the years 2019-2022, tentative results for 2023 and 2024 from the EU Data Collection Framework (DCF) indicate a turnaround towards a positive economic trend.
Catch landed by the German fleet in national and international harbours, including aquaculture and freshwater fisheries, covered nominally about 18% of the national seafood demand in 2023. However, since seafood landed by German vessels abroad is only partially reallocated to the domestic market, the effective self-sufficiency rate is lower.
The industry related to fishing supports more than 30,000 jobs, including production, processing, and retail (also including the processing of imported goods for own consumption and further export). In 2024, German seafood industries accounted for a total revenue of about €13 billion. In addition, marine recreational fishers support around 4,500 jobs in upstream companies, with anglers investing estimated €248 million in equipment.

Social and cultural aspects

SSF and LSF are located in coastal communities along the coast, and their socio-economic importance differs locally. Therefore, the approaches of place-based and practise-based communities can be helpful to understand the social dimension of fisheries' communities. Following a place-based approach, fisheries communities are linked to registered vessels, resulting in 78 harbours in fisheries communities along the German coast. Linking communities to landing ports identifies 138 landing ports and, therefore, fisheries communities along the German coast. A practice-based approach enables a typology of different fisher types, as shown for German gillnet fishers in the Baltic Sea. Case studies investigating the social dimensions of fisheries and their communities reveal diverse outcomes regarding the local significance of fisheries. These studies present results, e.g., on sense of place in fisheries communities, fishers´ attitudes, the construction of sea and land, or human-wildlife conflict management.

Social aspects of fishers´ work encompass, inter alia, social security systems and traineeship. Fishers are generally insured by the German social security system as employees or self-employed workers, covering pension insurance, unemployment benefits, as well as insurances for occupational illnesses and accidents at work. Additionally, there is a special pension scheme available, allowing for early retirement at age 56 in some cases.

In fisheries and aquaculture, the number of trainees has more than halved since 2007. Fisheries experience the general effect of demographic change in Germany. In parallel with a declining number of fishing companies, the marine fisheries sector is facing a critical shortage of trainees and qualified masters. Currently, additional training for fishers to become Sea Rangers is supporting fishers to diversify their business. The limited recruitment in the fisheries sector is influenced not only by economic factors but also by social dynamics. For instance, the pronounced gender imbalance suggests that fisheries are widely perceived as either unattractive or inaccessible to women.

Current trends, issues and developments

Germany's fisheries sector is diverse, and the elements of its structure are dynamic. The structural change of German fisheries has been speeded up in the last decade by several ecological (e.g., decline of herring and cod stocks in the Baltic Sea), economic (e.g., increased fuel prices), political (e.g., quota loss due to Brexit) and social phenomena (e.g., demographic change). Strengths (marked by a " + ") and challenges (marked by a " – ") of the German fishing sector with regard to political, economic, social, technological and legal aspects are depicted with a PESTLE analysis (Figure 1).

German fisheries benefit from substantial funds for training programs for fishers, for initiatives from fishers, for the development of new vessels as well as for an agency tasked with the facilitation of fisheries´ transformation. There is also a growing recognition of the sector's potential relevance (including recreational fisheries) to local communities and coastal tourism could benefit indirectly from fisheries' presence in harbours. However, until now, apart from some initiatives of SSF fishers' direct marketing, fisheries have not succeeded in transferring their non-market values into economic benefits on a broader scale. Furthermore, the sector currently faces several challenges, including declining commercially important stocks in the Baltic Sea, a declining number of new entrants, a lack of incentives for female participation, and an observed increased dissolution of fisheries cooperatives and associations in recent years.

Keywords: National fisheries profile, German Fisheries, North Sea, Baltic Sea, Structural change, Social dimension of fishing

Figure 1: PESTLE analysis, design of figure adopted after Konstantidelli et al. (2023)

Methods and data

This national fisheries profile is based on a desk study using a variety of sources and data on German fisheries. It combines primary and secondary sources, personal communication with stakeholders, and expert knowledge.

The main data sources are:

- Reports and statistics from the Federal Office for Agriculture and Food
- Reports from the Thünen Institutes of Baltic Sea Fisheries and Sea Fisheries, a federal research institute of the Federal Ministry of Agriculture, Food and Regional Identity
- Statistics from the Federal Statistical Office of Germany and statistics from the federal states' fisheries authorities
- Reports of the Scientific, Technical and Economic Committee for Fisheries (STECF)
- Statistics from the vocational school for fisheries apprenticeship
- Statistics from the Knappschaft Rail & Sea as the pension insurance provider for fishers
- Scientific publications
- Reports from fisheries associations
- Grey literature, such as reports, working paper, posters, students´ research
- Various websites on specific fisheries' issues

Working on the NFP, there have been some methodological insights:

- On various topics such as compensation schemes or fisheries communities, it is especially helpful for the researcher to be a native speaker when contacting people in various agencies and offices.
- Fisheries data are largely collected in the departmental research institutions of the Ministry of Agriculture, Food and Regional Identity. Direct contact or access to these institutions was essential.
- The number of vessels and labour force in fisheries depends on the data source used. Different data-collecting institutions use different definitions of the population (e.g., including or excluding fishers operating in estuary waters in the population of marine fisheries) or methods (survey based on self-assessment or registration based on external assessment). However, deviations are not significant, and identified social and economic trends persist. To be transparent on this, we have made the sources explicit in the relevant sections.
- The selected case studies in the chapter on fisheries communities are subject to the authors' best knowledge. They might be incomplete due to limited access to grey literature, particularly in the case of students´ work.

1 General description of the society

Germany has approximately 84 million inhabitants, and covers an area of 357,588 km². Germany's population is undergoing a process of demographic aging, evidenced by both the increasing absolute number of individuals at retirement age and their growing proportion of the total population: a rising number of German residents are over 65 years old, with the proportion of elderly individuals being particularly pronounced in structurally weak regions. Nearly half of the population resides in families with children, while one-fifth lives alone. However, single-person households constitute the most prevalent household type (Demografie 2024).

Germany has a temperate climate and a diverse landscape, ranging from coastal areas in the north to the Alps in the south. The country's coastline—including its islands—extends nearly 2,400 km (Statista 2024). Coastal regions are predominantly rural, characterized by sparse residential development, low population density, a high proportion of land used for agriculture and forestry, and a peripheral location relative to major urban centres. These areas also tend to have comparatively low average incomes (based on total gross income per taxpayer), a relatively underdeveloped infrastructure (e.g., limited access to general practitioners), and limited municipal economic capacity—particularly along the Baltic Sea coast (Thünen Institute 2024c).

Germany is a federal republic comprising 16 federal states. Prior to reunification in 1990, Germany was divided into two distinct states: the German Democratic Republic (GDR), which emerged from the Soviet occupation zone and was subject to substantial political, economic, and military influence from the Soviet Union; and the Federal Republic of Germany (FRG), which originated from the Western occupation zones (administered by the USA, Great Britain, and France) and maintained close cooperative ties with Western nations. This division entailed divergent fisheries policies. After reunification, the former GDR regions adapted the political system of the FRG, resulting in a systemic shift for fishers from the former GDR, who transitioned from operating within a centrally planned economy to a market-oriented economy. The effects of this transition on individual fishers are not well documented.

2 Structure of the fisheries sector

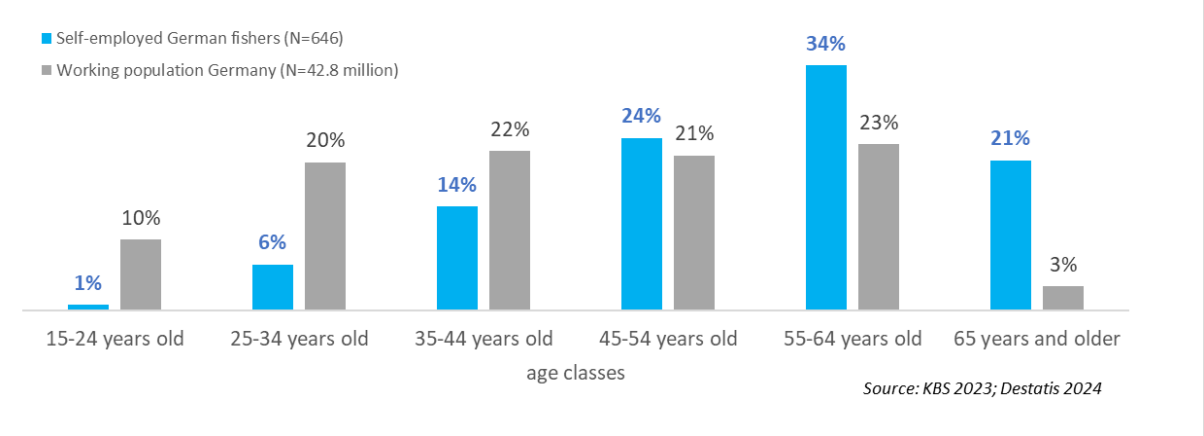
Germany's fisheries sector is diverse and the elements of its structure are dynamic. The structural change of German fisheries has been speeded up in the last decade by several ecological (e.g., decline of herring and cod stocks in the Baltic Sea), economic (e.g., increased fuel prices), political (e.g., quota loss due to Brexit) and social impacts (e.g., demographic change). It is generally challenging for scientists and managers to categorize the German fleet into reasonable analytical clusters (Sulanke et al. 2025), which reflect reality adequately, and are useful for meaningful research and regulation improvement. The vessels vary in technical parameters, fishing practices, target species, operating sea basins (Natale et al. 2015), commercial landings, and seasonality (Meyer and Krumme 2021). Other studies infer, that different types of German fisheries seem to be related to unique traditions, agencies (Barz 2022), habitus (Lasner et al. 2024), or way of life (Kube 2013); be it as a crew member of a distant water vessel fishing abroad, as an employed deckhand targeting brown shrimp in the North Sea, as a plaice fisher on a Baltic or North Sea demersal trawler or as a part-time fisher in Baltic coastal waters, working with gillnets.

2.1 General overview

During the 20th century, German fisheries first experienced an economic rise after the Second World War (Dierks 1961), where German vessels were part of large international fleets. This resulted in overcapacities and collapsing fish stocks (Cushing 1992). The industrial trawler fleet mostly operated in international waters. The establishment of Exclusive Economic Zones (EEZs) in 1977 (Coull 1991), occurring amidst overcapacity, declining fish stocks, and growing recognition of the value of marine resources, resulted in the loss of traditional northern fishing grounds for the German fleet, notably in Icelandic waters, significantly altering the landscape of German fisheries. Later, the German reunification and the decommissioning of the GDR distant water fleet (DWF) in the 1990s led to a further shift of the German fleet. Nowadays, only a few large and internationally organized companies with seven distant water vessels are left in the sector (STECF 2024a). Landings in Germany are dominated by the brown shrimp fisheries (in value) and cutter fleet (large-scale fisheries, LSF), which operates mainly in the southern North Sea. In terms of the numbers of vessels and self-employed fishers, the coastal small-scale fisheries (SSF) represent the largest group of fishers but with weak economic and political influence.

While there were 7,003 employees or self-employed skippers active in fisheries in 1970 (BMELV 2003), in 2022, fisheries offered only 1,184 jobs (STECF 2024a), of which 646 were self-employed fishers, as mandatorily recorded in the statutory pension scheme. 29% of the self-employed fishers were registered as working part-time. The continuing aging of the European population affects German fisheries in particular (Figure 2). On average, skippers are 54.4 years old (in 2023). Most of the self-employed fishers (34%) are between 55 and 64 years old; younger age cohorts are underrepresented, which can partly be explained by the fact that the decision to set up an own business often takes place in the mid-life of the entrepreneurs. In addition to the single-owner type of companies, 53 corporate entities were active in fisheries in 2023, most of them in Lower-Saxony (communication from federal states' fisheries departments, 2024). In general, employees are younger than self-employed fishers; self-employed fishers working part-time are older than self-employed fishers working full-time; and fishers of the North Sea are younger than fishers operating in the Baltic Sea.

Figure 2: Age structure of self-employed fishers and German working population, 2023



Source: Thünen Institute (according to Knappschaft Bahn See (KBS) and national statistical agency (Destatis))

The annual gross salary of employees in fisheries per full-time position was €86,000 on average, including DWF (STECF 2024a). The Federal Ministry for Agriculture listed profit for a sample of SSF and LSF, mainly owner-operated fisheries, as profit per labour force (BMEL 2024b). The annual gross profit varies between €54,553 and €83,936 per labour force in 2022 (on average €68,625 per labour force) and depends highly on the type of fisheries. The exemplary average of salary and profit per labour force in the sample for 2022 still shows potentially existing economic attractiveness of the sector, but it is not representative for the whole fleet, e.g., one year before, the companies in the sample that operated in the Baltic Sea gained a gross profit of only €29,974 per labour unit (BMEL 2024a). Further, 112 of 646 registered self-employed skippers were exempted from public mandatory pension insurance, which means they earned less than €9,300 per year as fishers (KBS 2024a). However, the livelihood of German fishers depends on several factors: the specific type of fishery, the company's organization and its scale, external environmental conditions, as well as access to and the status of the exploited marine resource. Even with today´s technical advantages, fisheries remain an economically and technically risky business. Notwithstanding, self-employed fishers of small companies are motivated to stay in fisheries as long as possible to maintain the (family) tradition and their way of life, even if it is not economically feasible (Lewin et al. 2023a).

2.2 Summary of fleets

In 2022, the German fisheries fleet consisted of 858 active vessels with a combined gross tonnage of around 53,000 gt (Figure 3), and a combined machine power of 12,000 kW (STECF 2024a). In addition, 316 vessels were inactive, mostly SSF. Following EU definition (Natale et al. 2015), SSF (<12m length) represent three-quarters of vessels. In contrast, LSF (>12m length and less than 500 gt) and DWF (>500 gt) comprised 96% of fishing capacity in terms of gross tonnage (Table 1).

Table 1: Structure of the German fishing fleet following DCF vessel length classes. Depicted are the official DCF length class codes, the corresponding vessel length range, and the prevalence of the length class in the German fishing fleet. The prevalence is given in percentage of the segment in relation to the entire fleet with regard to the number of vessels and the gross tonnage for the year 2022.

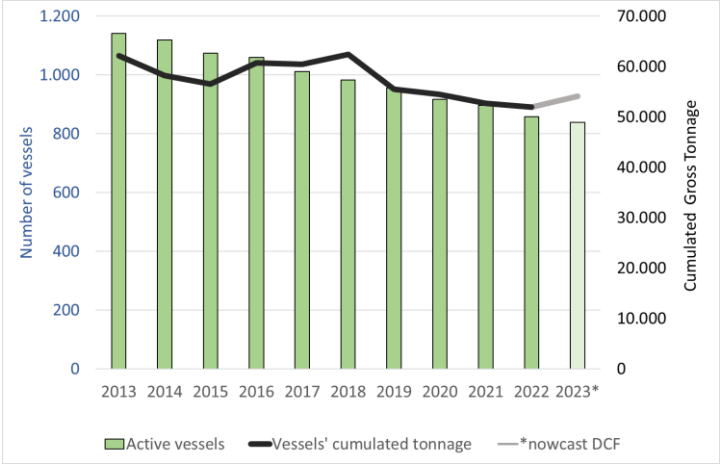
Vessel length [m]	**Share of German fishing fleet 2022**	
	Vessels (%)	**Gross tonnage** (%)
0 – 10	69.30	2.45
10 – 12	5.87	1.31
12 – 18	12.42	7.1
18 – 24	9.03	10.96
24 – 40	2.03	10.92
> 40	1.35	67.26

Source: Sulanke et al. 2025

In total, the German fleet spent 74,000 days at sea and consumed an estimated 57.9 million liters of fuel in 2022. The German SSF operates almost exclusively in the Baltic Sea. LSF cutters operate in the North Sea and some in the Baltic Sea. German DWF operates mainly in the North Atlantic and Eastern Arctic, but in some years and to a limited extent, it also engages in fishing activities in African and South Pacific waters. (STECF 2024a).

165,000 t of fish and seafood were landed by the fleet in 2022. In addition, 9 vessels landed around 12,000 t of blue mussels. Vessels targeting and culturing mussels are defined solely as marine aquaculture activity (STECF 2024a) and will not be considered in the following if not stated otherwise. The main target species of German fishing companies are herring, blue whiting, cod, mackerel, common shrimp, and Greenland halibut. In most years, over 70% of the German catches are landed abroad (BLE 2024a, 2024c). Ports in the Netherlands and Denmark are important destinations, followed by landings in Iceland, Norway, and others. In terms of weight, herring was the dominant species in 2022, whereas the highest revenue was generated through brown shrimp (STECF 2024a). Brown shrimp is landed almost exclusively in domestic ports. The number of vessels has declined constantly over the years. Figure 3 shows how the number of active vessels has developed from 2013 to 2022 (in addition 2023 as data under review, so called nowcast) and the development of gross tonnage over time.

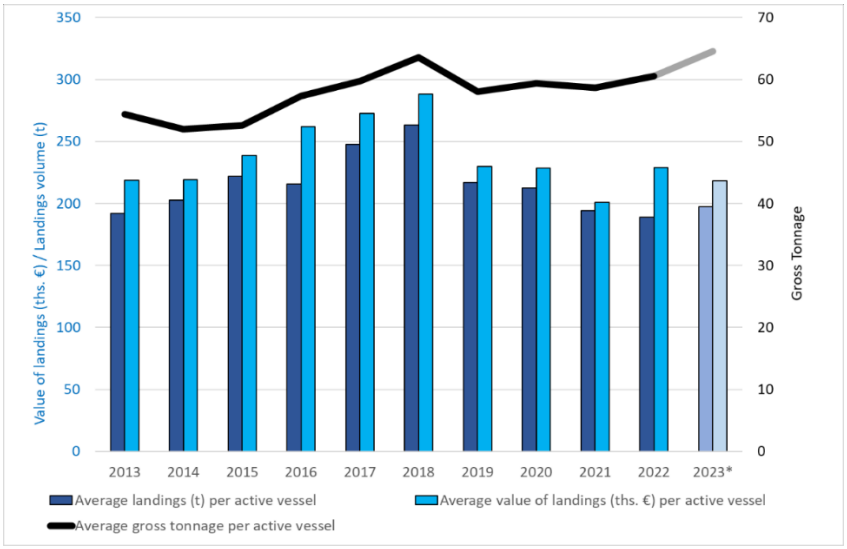
Figure 3: Number of active vessels and the cumulated gross tonnage of the German fishing fleet without considering inactive vessels 2013-2023



Source: Thünen Institute (according to data from STECF, 2024a)

Although there is a downward trend in the number of vessels, the average capacity per active vessel ($\frac{total\ GT}{number\ of\ activ\ vessels}$) has not changed proportionately over the same period (Figure 4). It is important to note that calculating a single average for diverse fisheries, such as SSF, LSF, and DWF might be misleading in interpreting the data. Notwithstanding, the averages of volume of landings, value of landings, and gross tonnage per active vessel over time, effectively demonstrate the increasing concentration within the sector, characterized by a smaller number of vessels (and companies) that are consolidating their fishing capacities (and profits). Due to a currently discussed decommissioning program for the German fleet, this trend might be intensified soon.

Figure 4: Average volume of landings (t/vessel), average value of landings (ths. €/vessel), and average gross tonnage per active vessel (gt/vessel) 2013-2023

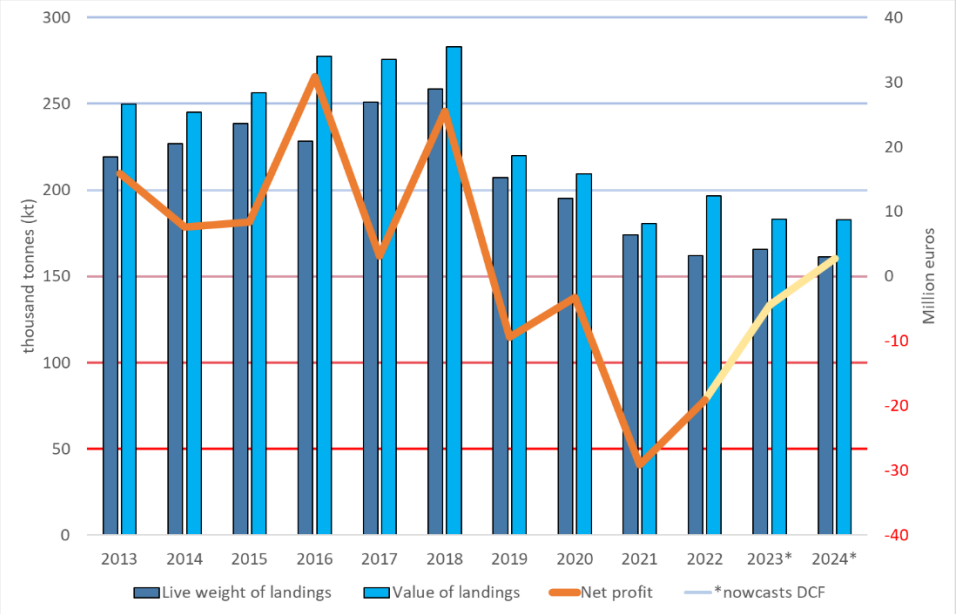


Source: Thünen Institute (according to STECF, 2024a)

SSF vessels from the Baltic Sea exit the sector (Lewin et al. 2023a), while capacities concentrate in the LSF and DWF. In 2013, the average landings per active vessel was 192 t, the average gross tonnage was 54 gt per active vessel and the value of landings per active vessel was €219,000 (STECF 2024a) (Figure 4). While average landings and catch values decreased between 2019 and 2021/2022, average gross tonnage per

active vessel increased to 61 gt in 2022 and 65 gt in 2023. Regarding landings and profitability of the German fisheries, the fleets' productivity increased from 2013 to 2018 (STECF 2024a) (Figure 5). Several ecological (e.g., declining stocks, changed climate conditions) and social (e.g., Brexit, unstable seafood supply chains due Covid-19 pandemic, increased fuel prices due to war in the Ukraine) stressors led to lower landings and negative net profits from 2019 to 2022. In 2022, the fleet landed 162 kt live weight of fish and crustaceans with a total value of €197 million, resulting in a net loss of €-19.2 million.

Figure 5: Live weight of landings, value of landings, and net profit of the German fishing fleet 2013-2024



Source: Thünen Institute (according to STECF, 2024a)

Except for North Sea beam trawlers with a length of 12-24 m, all segments of the fleet faced losses in 2022, but for different reasons. Regarding the fluctuations in fisheries' landings in general, economic evidence can only refer to a longer period, not in the short term. The average landings of the German fleet from 2013-2023 were around 211 kt of fish and crustaceans, which resulted in an average revenue[1] of €234 million and an average net profit[2] of €2.4 million; including peak years like 2016 with net profits of €30.8 million and net loss of €-29.1 million in 2021. Tentative DCF results (so-called nowcasts) for 2023 and 2024 indicate a turnaround towards a positive economic trend after 2021 (STECF 2024a).

The DCF segmentation of the fishing fleet does not consider crucial fishing components like targeted stocks or catch profiles (EC 2021) and - at least for Germany - its focus on length class and dominant gear leads to a lack of information needed to describe the fleet concerning targeted stocks (e.g., for brown shrimp beam trawlers, Goti-Aralucea et al. 2021).

Alternatively, Sulanke et al. (2025) propose a fleet segmentation approach that incorporates both fishery- and stock-based aspects, such as fishing effort and vessel characteristics linked to landing data. This method results in the identification of 15 distinct and consistent fisheries that more accurately reflect the practices of the German fleet. The following sections describe these fleet segments that are typical of German fisheries. For indicators on all 15 segments, we refer to the Appendix on fishing structure where a table shows the alternative fleet segments of the German fleet by Sulanke et al. (2025).

[1] Revenue is the value of production (sale of landed seafood products) and additional income (STECF 2024a, p. 516).

[2] Net profit is the difference between revenue and explicit costs and opportunity costs (ibid.).

Small-scale passive gear fisheries

Coastal SSF, with vessels having a length between 4-12 m, account for the largest proportion of vessels in Germany (655 in 2022), although their share of landings and values is negligible (Sulanke et al. 2025). This segment is traditionally featured along the Baltic Sea Coast in the federal states of Schleswig-Holstein and Mecklenburg-Western Pomerania. Fishers operate mostly with gillnets without additional crew members and within coastal waters up to three nautical miles (nm); sometimes using fish traps in the lagoons, estuaries or bays. The vessels used are small (8.35 m length over all on average). Important target species are or were herring (*Clupea harengus*), plaice (*Pleuronectes platessa*), cod (*Gadus morhua*, now only as by-catch), flounder (*Platichthys flesus*), pike (*Esox lucius*) and other freshwater species from the inner coastal waters. Surveys indicate that fishers categorized in this segment work often part-time (ca. 50%) and almost one-third are older than 65 years (Lewin et al. 2023a). The decline of herring (starting in 2007) and cod stocks (starting in 2015) in the Baltic Sea poses a significant threat to the long-term viability of small-scale passive gear fisheries.

North Sea brown shrimp fishery

163 active beam trawlers were specialized in the catch of brown shrimp (*Crangon crangon*) and operated in the North Sea in 2022 (Sulanke et al. 2025). Although most vessels of this group are classified as LSF by EU DCF definition, it is meaningful to consider brown shrimp fishery as coastal fisheries and as an own group, using vessels mostly between 8 and 24 m in length (Döring et al. 2020; STECF 2024a; Sulanke et al. 2025). Brown shrimp fisheries are mostly owner-operated (Goti-Aralucea et al. 2021) and their main effort takes place inside 12 nm from shore (Schulze 2018). Small vessels even operate inside the 3 nm zone (STECF 2024a) and the mean trip duration of the vessels is two days (Sulanke et al. 2025). Brown shrimp fisheries are socially embedded in the regions of East and North Frisia and are producers of a product that is typical for the Wadden Sea (Döring et al. 2020). Captains work together with a deckhand on board full-time. Brown shrimp fisheries count among the most valuable coastal fisheries in Germany (Döring et al. 2020) and are seen as the `backbone of the cutter fleet` (STECF, 2024a, p. 353). With a weight of not more than one ton per gear, the beam trawls can be considered as light active gears with low impact to the endofauna (Fock et al. 2023). A public debate regarding a general ban on bottom trawling (EC 2023) has led to fishers and markets experiencing uncertainty. Some fishers left the shrimp beam trawling and invested in pots targeting brown crab (*Cancer pagurus*) and lobster (*Homarus gammarus*). In 2022, five vessels were active in this newer segment.

Sole fisheries

With lengths between 36 to 42 m, these beam trawlers are significantly larger than the beam trawlers used in brown shrimp fisheries, although the fishing technique is similar. The five vessels of this specialized segment operate exclusively in the North Sea and target mainly sole (*Solea solea*) and plaice (*Pleuronectes platessa*). Beam trawlers which target flatfish in the North Sea use heavier gear (three to six tons per gear) and have more impact on the sea bed than the smaller gear used in brown shrimp fisheries (Sciberras et al. 2018). In the face of increasing fuel prices, the ban on pulse trawl and reduced quotas for sole, some trawlers of the segment started to catch European squid (*Loligo vulgaris*) as a new target species using Scottish seines and other gear. Nevertheless, due to the high fuel costs of operating large beam trawlers, this fleet segment will likely disappear in 2025/2026 and vessels might be decommissioned.

Demersal trawlers

This category of trawlers includes different segments, which can be summarized under the term of smaller high-sea fisheries (Sulanke et al. 2025). The vessels have a length between 14 and 37 m and have a greater flexibility and range in selecting their operational areas. Usually, larger vessels are active in the North Atlantic, smaller demersal trawlers operate mainly in the North Sea and/or in the Baltic Sea (STECF 2024a). In total, 37 vessels of the North Sea mixed demersal fishery (19), saithe and cod fisheries, Baltic mixed demersal and forage fish fisheries (18) are categorised in this category in 2022 (Sulanke et al. 2025). Depending on the operational area and fishing practices, the trawlers catch saithe (*Pollachius virens*), cod (*Gadus morhua*), Norway lobster (*Nephrops norvegicus*), turbot (*Scophthalmus maximus*), plaice (*Pleuronectes platessa*), flounder (*Platichthys spp*), dab (*Limanda limanda*), and sprat (*Sprattus sprattus*). Also, one or two vessels of this segment moved partly to European squid (*Loligo vulgaris*) as a new target species, which have multiplied by 2024 (five vessels), making it currently one of the most valuable species in the North Sea mixed demersal fishery.

Passive gear fisheries

Larger passive gear fisheries (length between 12-32 m) use gillnets, pots, and traps. 11 vessels were listed in this segment in 2022 (Sulanke et al. 2025). Most of the vessels are specialized in the catch of up to four of the following species: cod (*Gadus morhua*), sole (*Solea solea*), plaice (*Pleuronectes platessa*), flounder (*Platichthys spp*.), turbot (*Scophthalmus maximus*), anglerfish (*Lophius budegassa, & piscatorius*), blue ling (*Molva dypterygia*), and red deep-sea crab (*Chaceon quinquedens*). They operate in the Baltic Sea, the North Sea, British Waters, the Celtic Sea, and the Faroes.

High seas demersal fishery

High seas demersal fishery includes four of the largest vessels of the German fleet, ranging from 80 to 90 m. The vessels have powerful engines with 3.000 to 4.000 kW and operate in the Northeast Arctic and Greenland waters. They are specialized in fishing for cod (*Gadus morhua*) as their main target species and Greenland halibut (*Reinhardtius hippoglossoides*).

Pelagic fisheries

Pelagic fisheries use midwater trawls and operate with five vessels ranging from 52 to 140 m. The segments include the largest vessel of the German fleet (140.8 m). Pelagic fisheries operate in the Northeast Atlantic and North Sea targeting herring (*Clupea harengus*), sprat (*Sprattus sprattus*), mackerel (*Scomber scombrus*), and blue whiting (*Micromesistius poutassou*). The newest vessel built in 2023 is a polyvalent vessel, able to catch pelagic and demersal species. The smallest of these vessels targets sprat (*Sprattus sprattus*) and herring (*Clupea harengus*) at certain times of the year in the Baltic Sea. Few smaller (17-25 m) Baltic Sea trawlers considered demersal trawlers catch sprat and caught herring in the past after switching to pelagic gear (being polyvalent).

While the first two segments, small-scale passive gear fisheries and brown shrimp fisheries, consist mainly of single-ownership companies, where family labour is often involved in the fishing business or at least in the supportive care work, the share of corporate companies increases with the length of the vessels (and needed investments) in the segments of pelagic, high seas demersal, large passive gear, demersal trawl, and sole fisheries. The larger the vessel and the farther the fishing grounds from the German coast, the more international are the segments – marked by international partnerships instead of single ownership, crews from Europe, Africa, or Asia instead of local owner-operators with with local assistance (e.g., deckhand), by vertically diversified industries (processing and marketing) or by being part of a corporate group instead of specialized primary production.

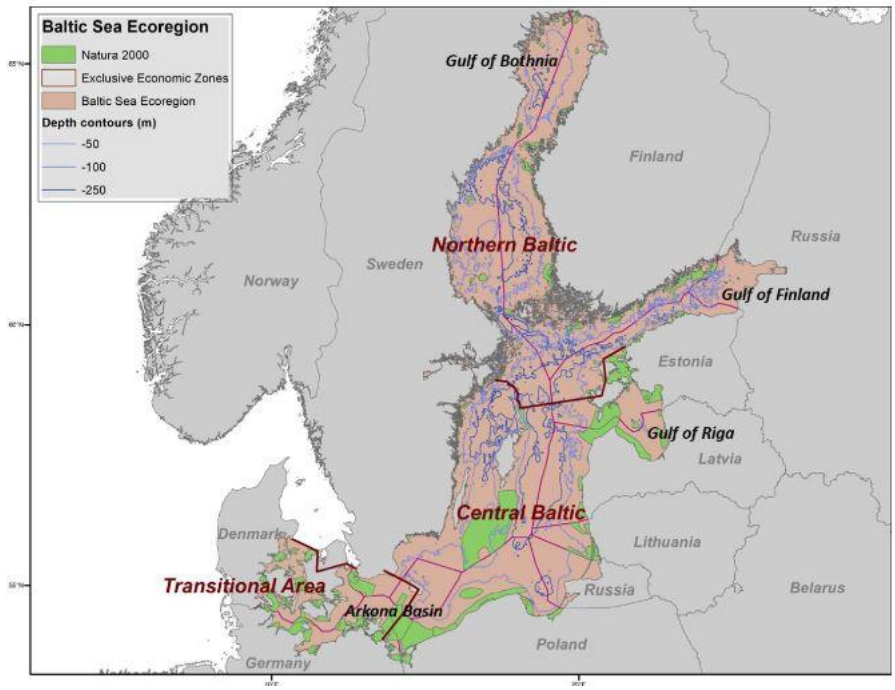
2.3 Geographic areas

There are 78 ports along the North and Baltic Sea coasts, where most of the German fishing vessels are registered (with a few exceptions in the German high seas fishery), which are listed and differentiated in chapter 4.4.

2.3.1 The Baltic Sea ecoregion

The Baltic Sea, a semi-enclosed brackish water body spanning 420,000 km², is characterized by its shallow depth and complex hydrography. With an average depth of 60 m, one-third of the Baltic Sea is less than 30 m deep. This ecoregion features numerous islands and a diverse coastline, particularly in the northern Baltic Sea that, however, is of no relevance to German fisheries. Significant temperature and salinity gradients exist, transitioning from relatively warmer and saltier waters in the southwest to colder, nearly freshwater conditions in the northernmost parts. Much of the Baltic Sea experiences persistent vertical stratification. The northernmost areas are prone to ice coverage during winter.

Figure 6: Baltic Sea ecoregion



Source: ICES, 2022

Throughout the Baltic Sea, a network of protected areas has been established to safeguard valuable marine and coastal habitats. This network comprises HELCOM Baltic Sea Protected Areas (BSPAs) and Natura 2000 sites designated under the EU Birds Directive (EC 2009) and EU Habitats Directive (EC 1992). The Baltic Sea's network of marine protected areas (MPAs) is steadily expanding and currently covers approximately 15% of the total sea area. Further EU key policies include the Biodiversity Strategy for 2030, Offshore Renewable Energy Strategy, Common Fisheries Policy, Marine Action Plan, and Nature Restoration Law.

Key issues in the Baltic Sea ecoregion:

- Fishing is impacting the ecosystem via selective extraction of species
- Agriculture, forestry, wastewater discharge as well as atmospheric intake from burning fossil fuels pose widespread pressure on the ecosystem through nutrient and organic enrichment, with effects on fish production and thus fisheries in the ecoregion
- Shipping, wastewater discharge and land-based industry (including oil and gas extraction and refining) are mostly responsible for the input of contaminating compounds into the Baltic Sea; sediments may contain large amounts of heavy metals and persistent organochlorines from earlier periods of pollution
- The Baltic Sea is naturally susceptible to low oxygen conditions, but since the mid-1990s the extent of anoxic zones in its deeper basins has expanded, driven partly by eutrophication and further intensified by global warming
- A shift towards earlier, more prolonged spring blooms (but with lower average biomass) has taken place in the central Baltic Sea with changes having subsequent effects on ecosystem functions
- Zooplankton composition has shifted because of climate-induced changes, eutrophication, and predation, leading to a decline in large copepods and an increase in small-bodied cladocerans and rotifers
- The decline of cod (*Gadus morhua*) stocks has led to the release in predation pressure on the fish community. Pelagic species strongly dominate the fish community. Increasing stickleback densities may have resulted in impaired recruitment of piscivorous fish and enhanced the effects of eutrophication through promoting the production of filamentous algae
- The Baltic Sea harbour porpoise (*Phocoena phocoena*) remains in a critically endangered state, this requires active management of the pressures threatening its survival
- Climate change is causing changes in water temperature, salinity, and stratification, affecting growth, spatial distribution and abundance of several species in the ecoregion. Cascading effects are likely to occur throughout the ecosystem, with consequences to fisheries
- Extreme climate-related events, such as heatwaves, are increasing in frequency and spatial extent in the ecoregion
- Eutrophication causes major effects on several properties of the ecosystem, including changes in plankton species composition and overall productivity of the system. Phytoplankton blooms have become more frequent and extensive through eutrophication, and cyanobacterial blooms have increased in the ecoregion, leading to trophic lengthening (Steinkopf et al. 2024)
- The number of tourists, as well as profitability of and employment in the coastal and marine tourism sector, has increased over the past decade but degrading environmental conditions are estimated to reduce annual benefits in the future

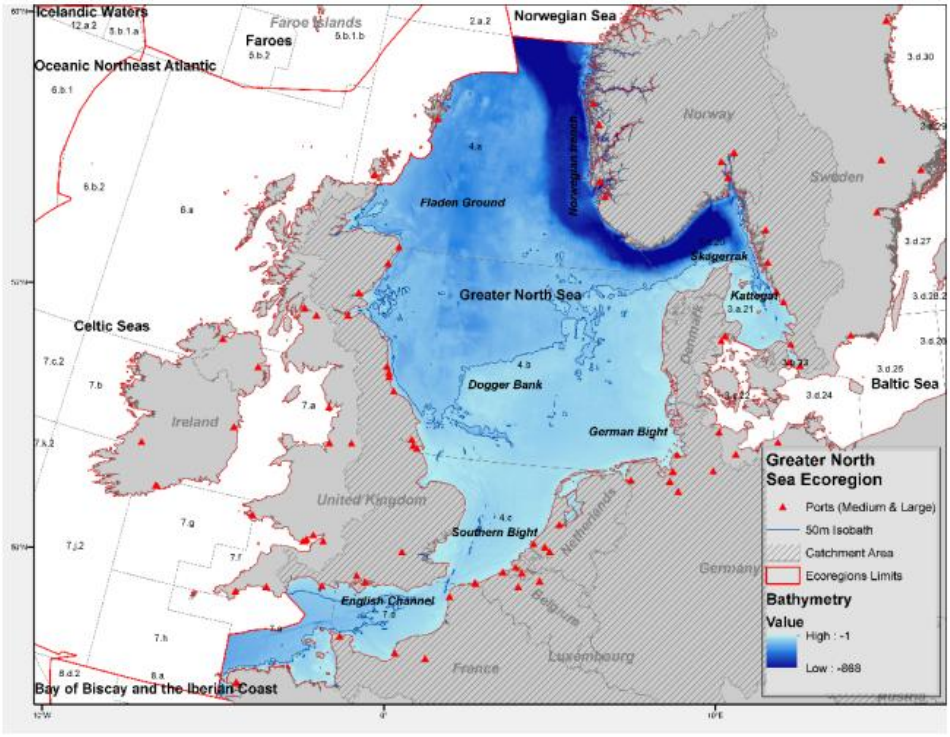
(ICES 2024a)

2.3.2 The Greater North Sea ecoregion

The Greater North Sea ecoregion, a temperate, semi-enclosed coastal shelf sea, extends across the northern European continental shelf from Brittany, France, to the Danish Straits in the east and the Orkney and Shetland archipelagos, Scotland, in the north. It is interconnected with the Norwegian Sea, Celtic Seas, Bay of Biscay, Iberian Coast, and Baltic Sea ecoregions. The ecoregion's oceanography is characterized by a permanently thermally mixed water column in the southern and eastern sectors, while seasonal

stratification prevails in the north. Additionally, it experiences exchanges with the adjacent Atlantic and Baltic waters.

Figure 7: Greater North Sea ecoregion



Source: ICES, 2024b

Key EU conservation policies include the Birds and Habitats Directives (including Natura 2000), Marine Strategy Framework Directive (MSFD), and Biodiversity Strategy 2030. Marine mammal issues are addressed collaboratively through the North Atlantic Marine Mammal Commission (NAMMCO). Human activities in the EU are primarily regulated by the Integrated Maritime Policy, Maritime Spatial Planning (MSP) Directive, and Blue Growth Strategy. Oil and gas activities are managed at the national level within the framework of the OSPAR Convention and Bonn Agreement.

Key issues in the North Sea ecoregion:

- Fishing causes pressure through species extraction (most commercially exploited species are above MSY) and physical seabed disturbance (mostly between 0-200m depth) – the southern North Sea (including German waters) is less sensitive because of high natural disturbance
- Introduction of non-indigenous species, mostly through shipping followed by aquaculture
- Energy production pressures the ecosystem through contaminants and physical habitat loss
- Decline of abundance of many seabirds
- Climate change causing warming of surface water temperature and therefore changing the ecosystem, e.g., spatial distribution of plankton and fish species
- Increasing construction of offshore wind parks and cable routes

(ICES 2024b)

2.4 Processing, trade and markets

Catch landed by the German fleet in national and international harbours, including aquaculture and freshwater fisheries, covered nominally about 18% of the national seafood demand in 2023 (BLE 2025). However, since seafood landed abroad is only partially allocated to the domestic market, the effective self-sufficiency rate is lower. The industry related to fishing supports more than 30,000 jobs, including production, processing, and retail (also including the processing of imported goods for domestic consumption and further export) (FIZ 2024). In 2024, German seafood industries accounted for a total revenue of about €13 billion.

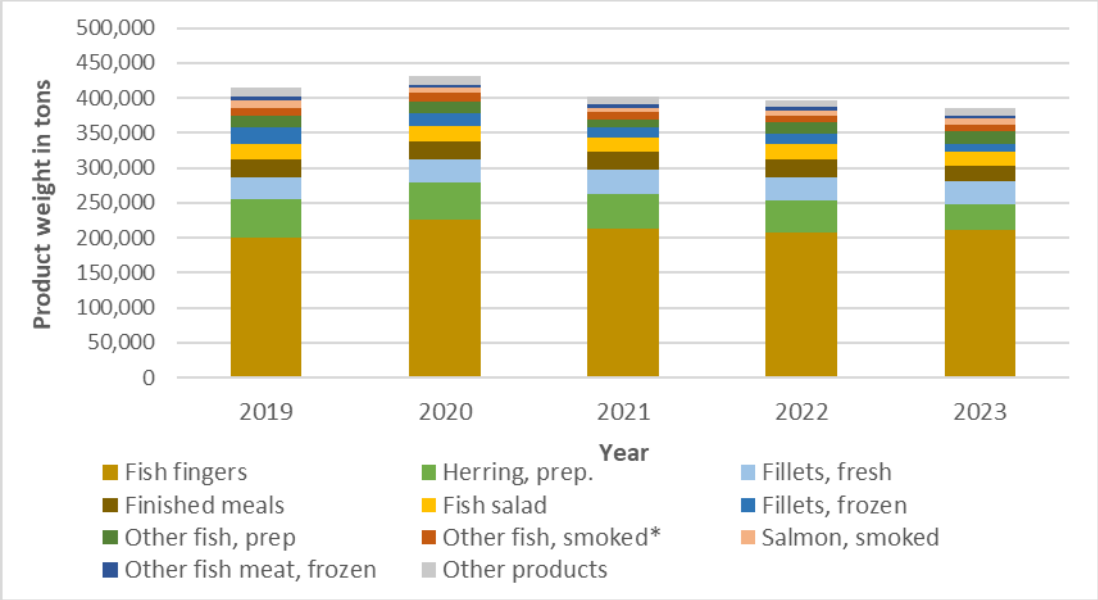
2.4.1 Landings & production

The average landings of the German fleet from 2013-2023 were around 211 kt of seafood, which resulted in an average revenue of €234 million and an average net profit of €2.4 million (STECF 2024a) (see chapter 2.2 for details). The primary species contributing to these catches include herring, blue whiting, cod, mackerel, brown shrimp, and Greenland halibut. In addition, marine aquaculture account for an average production of 12.8 kt (2008-2020) of blue mussels (*Mytilus edulis*) with an average revenue of €21 million (STECF 2023).

2.4.2 Processing industry

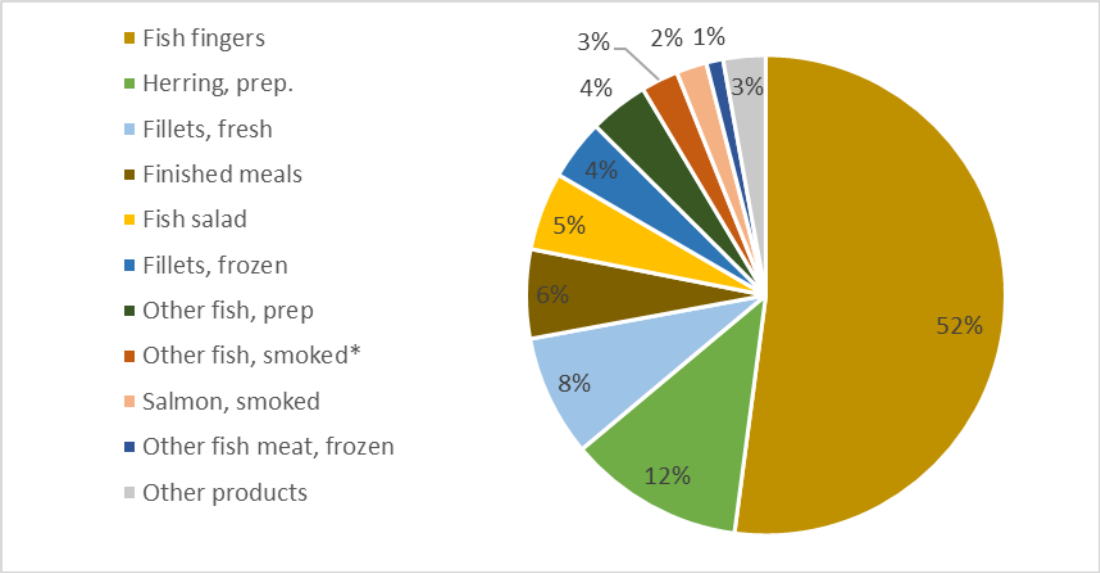
In 2022, according to the Federal Statistical Office, there were 55 companies in Germany with 20 or more employees whose main activity was fish processing. A total of 6,320 people were employed in these companies, generating a revenue of €2.6 billion. Between 2019 and 2023, these companies produced an average of 405 kt of fisheries and aquaculture products annually. On average, these processed products had a value of €2.2 billion. By trend, the production weight decreased by 7% from 2019 to 2023 (Figure 8). The majority of the total production weight is made up of fish fingers, accounting for about 52%, followed by prepared herring (cans and marinades) at 12% (Figure 9). Notably, the production weight of prepared herring has decreased significantly by 33% (Figure 8).

Figure 8: Time series (2019-2023) of the top 10 fishery and aquaculture products processed in Germany by product weight (*excl. smoked herring)



Source: Thünen Institute

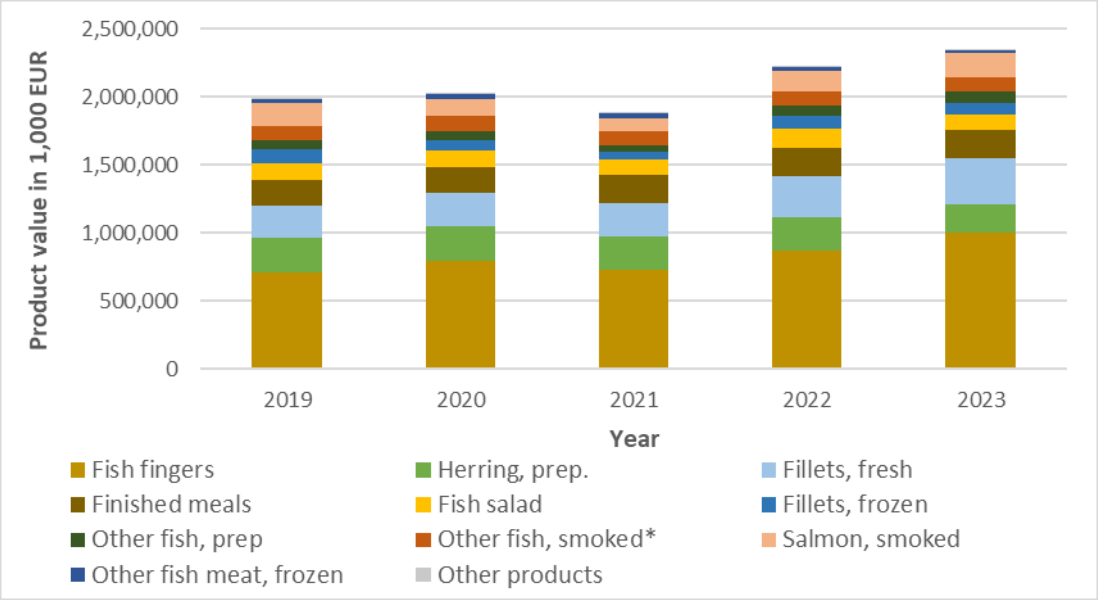
Figure 9: Share of weight of the top 10 fishery and aquaculture products processed in Germany (average 2019-2023) (*excl. smoked herring)



Source: Thünen Institute

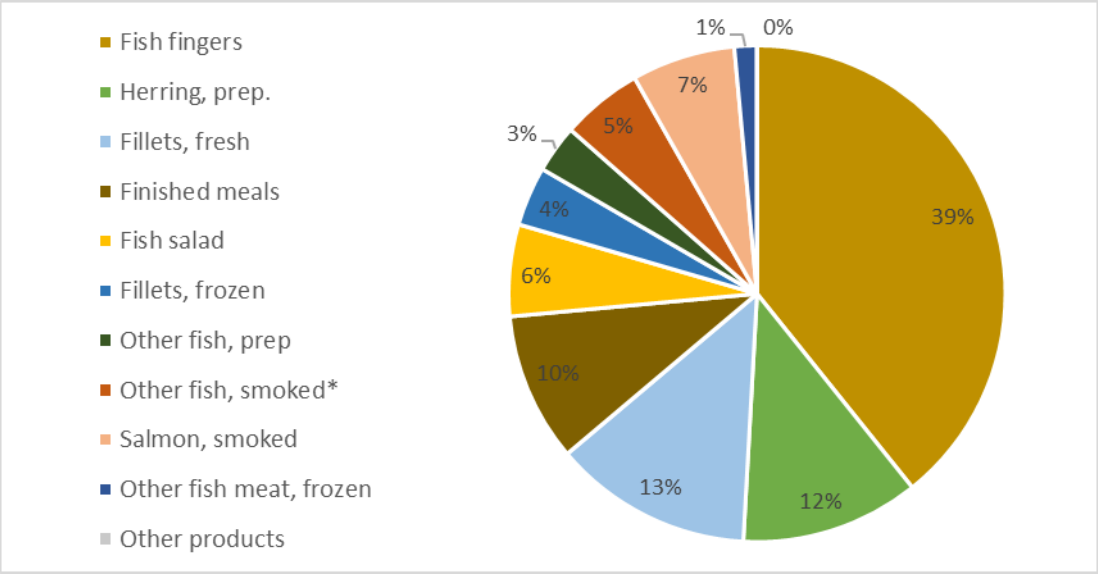
In 2021, the value of the goods produced was €1.96 billion, which was 7% lower than in 2019. Subsequently, the production value increased and reached €2.39 billion in 2023, representing a 22% rise compared to 2021 (Figure 10). As seen in Figure 9, fish fingers account for 52% of the total production weight; however, since this is a product with a relatively low price, they represent only 39% of the total product value (Figure 11).

Figure 10: Time series (2019-2023) of the top 10 fishery and aquaculture products processed in Germany by product value (*excl. smoked herring)



Source: Thünen Institute

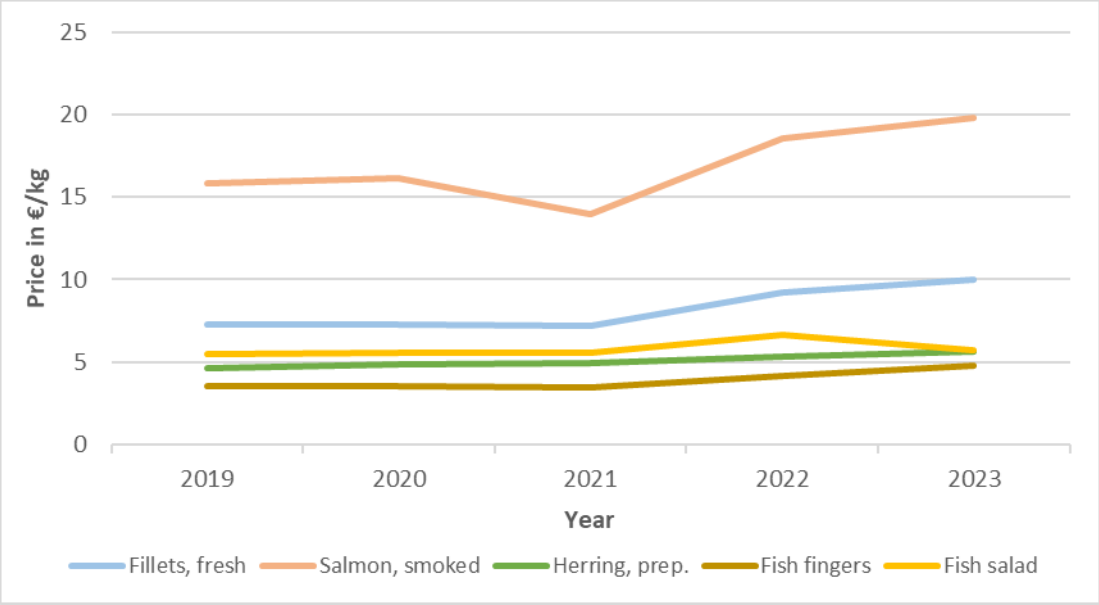
Figure 11: Share of value of the top 10 fishery and aquaculture products processed in Germany (average 2019-2023) (*excl. smoked herring)



Source: Thünen Institute

When calculating the price for various products based on available data on values and weight, significant price differences emerge. Figure 12 illustrates how prices for five important fishery and aquaculture products changed between 2019 and 2023, with all of them following an upward trend. Fish fingers have the lowest price, ranging from €3.55 to €4.75 per kilogram. Herring is priced approximately €1.00 higher, with a range of €4.62 to €5.63 per kg. In contrast, the price range of smoked salmon is between €14.00 and €20.00 per kilogram.

Figure 12: Time series (2019-2023) of value per weight of five important fishery and aquaculture products processed in Germany



Source: Thünen Institute

2.4.3 Market supply

The German fish processing industry depends on imports. The self-sufficiency rate (considering marine fishery, aquaculture and freshwater fishery) was higher than 40% in the 1980s but has declined continuously. Between 2011 and 2023, it ranged from 17% (lowest) to 25% (highest), with an ongoing downward trend (Table 2). The latest verified self-sufficiency rate nominally amounted to around 18% in 2023 (BLE 2025). However, 84 % of the German catch is landed abroad (BLE 2025), predominantly in the Netherlands (68%, mainly herring, mackerel and blue whiting, landed for the most part by DWF), Denmark (mainly sprat, herring and saithe, landed by SSF and LSF), and Morocco (mainly pilchard and Atlantic chub mackerel, landed by DWF) and only parts of these landings are reimported and therefore available for national consumption, leading to a lower de-facto self-sufficiency rate. The decreasing self-sufficiency rate in general is attributed to significantly reduced catches. Additionally, aquaculture production has stagnated for many years (Lasner and Gimpel 2024) and is unable to compensate for the losses in wild catches. The most important species here are mussels, trout and carp.

General consumption of seafood rose slightly by around 2%. However, not more but fewer products were imported (7% less imports), but much less was exported (22% less exported products) (Table 2).

Table 2: German production, import, export, consumption (kt) and self-sufficiency rate (%) 2011-2023, in live weight equivalent (*marine fishery, aquaculture and freshwater fishery)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Production (kt)*	255	227	247	262	280	272	290	301	247	230	209	189	203
Import (kt)	2,051	1,952	1,909	2,015	1,967	1,986	1,964	2,033	1,969	2,002	1,901	1,967	1,837
Export (kt)	1,044	998	1,057	1,104	1,124	1,054	1,076	1,131	1,029	997	979	939	924
Consumption (kt)	1,262	1,181	1,097	1,174	1,123	1,205	1,168	1,203	1,188	1,234	1,131	1,218	1,116
Self-Sufficiency rate (%)	20.2	19.2	22.3	22.4	24.9	22.6	24.8	25	20.8	18.6	18.5	15.5	18.2

Source: Thünen Institute (data according to BLE)

In 2022, the German production of fish and seafood was around 189 kt of live weight equivalent (Table 2), with a downward trend from 300 kt since 2018. Marine fisheries account for around 85% of German production, the remainder originates from aquaculture and freshwater fishery. Herring was the most important species caught in marine fisheries by weight with around 52 kt, accounting for 35% of catches (Table 3).

Table 3: Top 5 species caught by German marine fisheries in 2022 (in weight)

Species	**Share (%)**
Herring	35
Blue whiting	15
Sprat	11
Mackerel	10
Brown shrimp	6
Others	24

Source: Thünen Institute (data according to BLE)

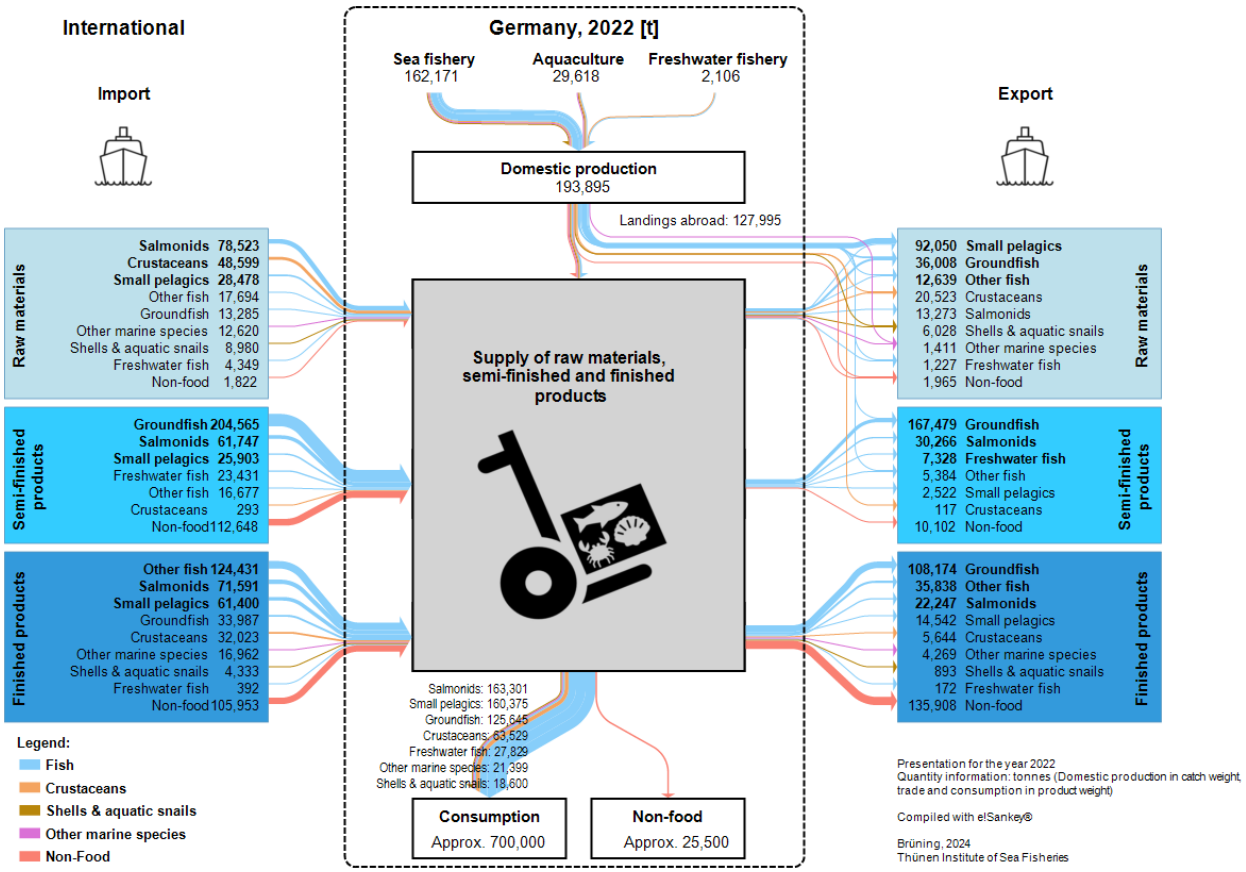
This domestic production volume contrasts with a calculated demand for fisheries and aquaculture products of 700 kt (corresponding to a catch weight of approx. 1,200 kt). To meet this demand, Germany relies on large quantities of imports.

The material flow in Figure 13 shows the quantities of fish and seafood as live weight (for domestic production) or product weight (for trade and consumption) along the entire value chain. All products are categorised into 9 commodity groups. Different commodity groups are imported at various processing stages depending on domestic processing capacities and consumer preferences. For example, salmon is processed in Germany and is imported either as whole fish or pre-processed fillets. Additionally, large quantities of finished salmon products, mainly smoked salmon, are also imported. For the production of fish fingers, Alaska pollock (included in groundfish commodity group) is imported as frozen fillets in blocks.

Furthermore, products are also exported from Germany. A significant share of exports results from landings by the German fleet abroad (particularly small pelagic species such as herring, mackerel, sprat, and blue whiting). The majority of exported semi-finished products are fillets like Alaska pollock and cod (groundfish group), followed by salmon fillets. Fish fingers constitute the largest share of finished processed products,

followed by other prepared Alaska pollock products and smoked salmonids, such as salmon and trout. Approximately 700 kt of fish and seafood remain for domestic net consumption, after deducting exports. The largest share of this amount consists of salmonids (especially salmon), followed by small pelagic species (notably herring) and groundfish (Alaska pollock and cod).

Figure 13: Material flow of fishery and aquaculture products in Germany for 2022, divided into the most important commodity groups and sorted in descending order



Source: Thünen Institute

The following section presents the material flows of herring and salmon as illustrative examples of fishery and aquaculture products that are particularly relevant to the German market—both in terms of consumer demand and processing volume—and for which data were available (Figure 14 and Figure 15). Although a material flow for Alaska Pollock is currently not available, it holds ongoing relevance for the German market.

Herring

Herring has played a pivotal role in Germany's fisheries economy and culinary landscape, historically driving prosperity in numerous regions through fishing and related industries. However, the German herring industry has seen a dramatic decline, from annual catches exceeding 200 kt in the mid-20th-century to roughly 50 kt in recent years.

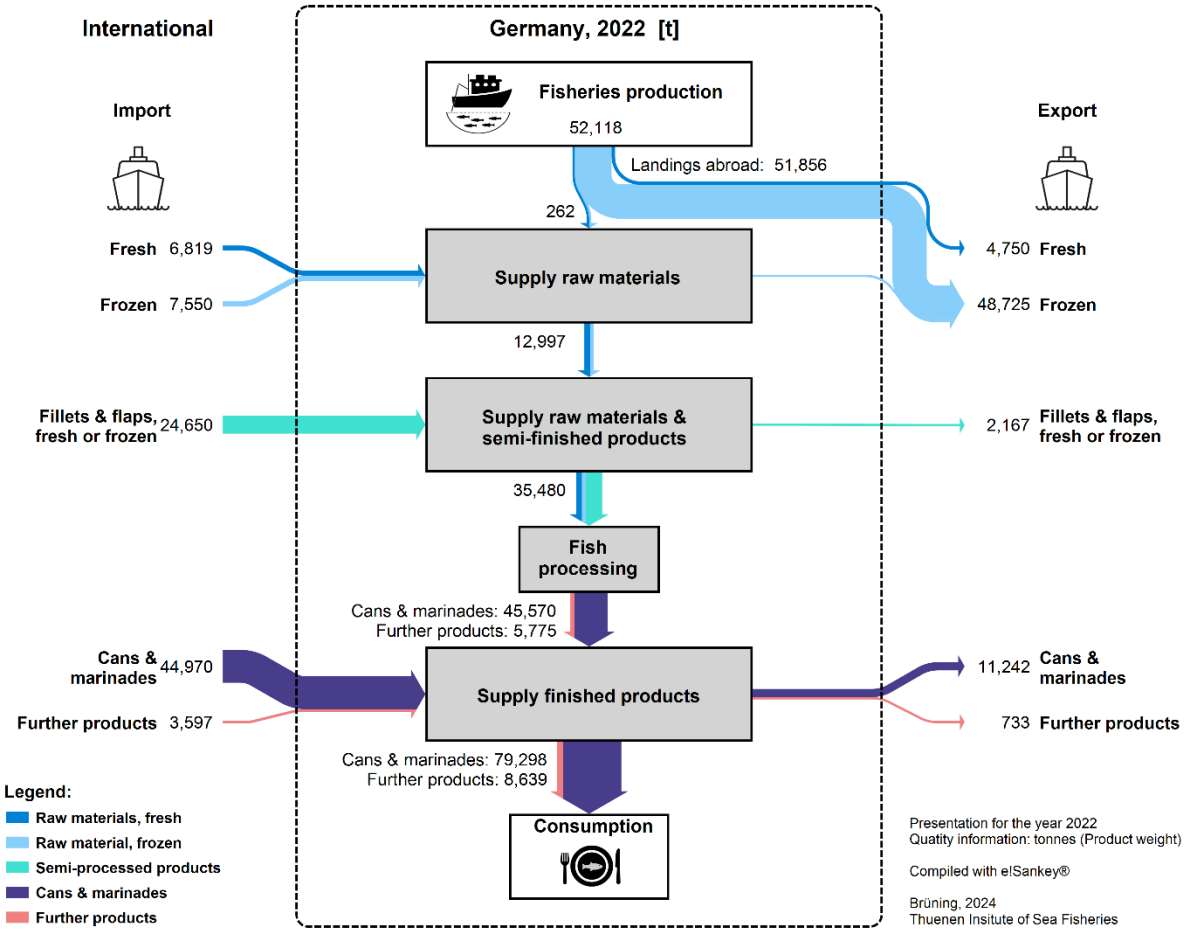
Concurrently, nominally the German self-sufficiency rate for herring is around 30%[3]. Like many other industries, the sector faces significant challenges due to rising costs in the areas of energy, personnel, and

[3] As discussed previously, herring is also landed by German vessels abroad and is therefore only partially available to the domestic market.

raw material. Access to raw material has become a particular challenge for the German herring processing industry, largely due to decreasing fish stocks, fluctuating quotas, the turmoil surrounding Brexit and shifts in productive fishing grounds. Due to a consistent domestic demand for herring and its products, Germany now increasingly relies on imports to satisfy its appetite for both raw and processed herring products.

In 2022, the German fleet caught around 52 kt of herring (Figure 14), the majority of which (90%) was fished by the DWF and landed as frozen goods in foreign ports (mainly in the Netherlands and Denmark). In that year, imports of fresh and frozen unprocessed herring amounted to only 14 kt, in contrast to the import weights of the years prior, which normally ranged between 40 to 55 kt. This significant reduction can be attributed to the closure of the primary processing department of Euro-Baltic in Neu Mukran (see chapter 4.4 on fisheries communities), the largest herring processing company in Germany (Fischmagazin 2023). The import of semi-finished and finished goods consisted of around 25 kt of fillets and flaps as well as 48 kt of herring marinades and other herring products. Around 50 kt of additional herring marinades and other herring products were produced in the remaining factories. Compared to 2015, the amount of produced finished goods decreased by 32%. Adding imports to domestic production and subtracting exports results in a consumption of 88 kt herring marinades and other herring products, which has been relatively stable in recent years. The effects of the closure of the remaining part of Euro-Baltic in 2024 on the German fleet, processing, and trade will become apparent in the future.

Figure 14: Material flow of herring in Germany for 2022

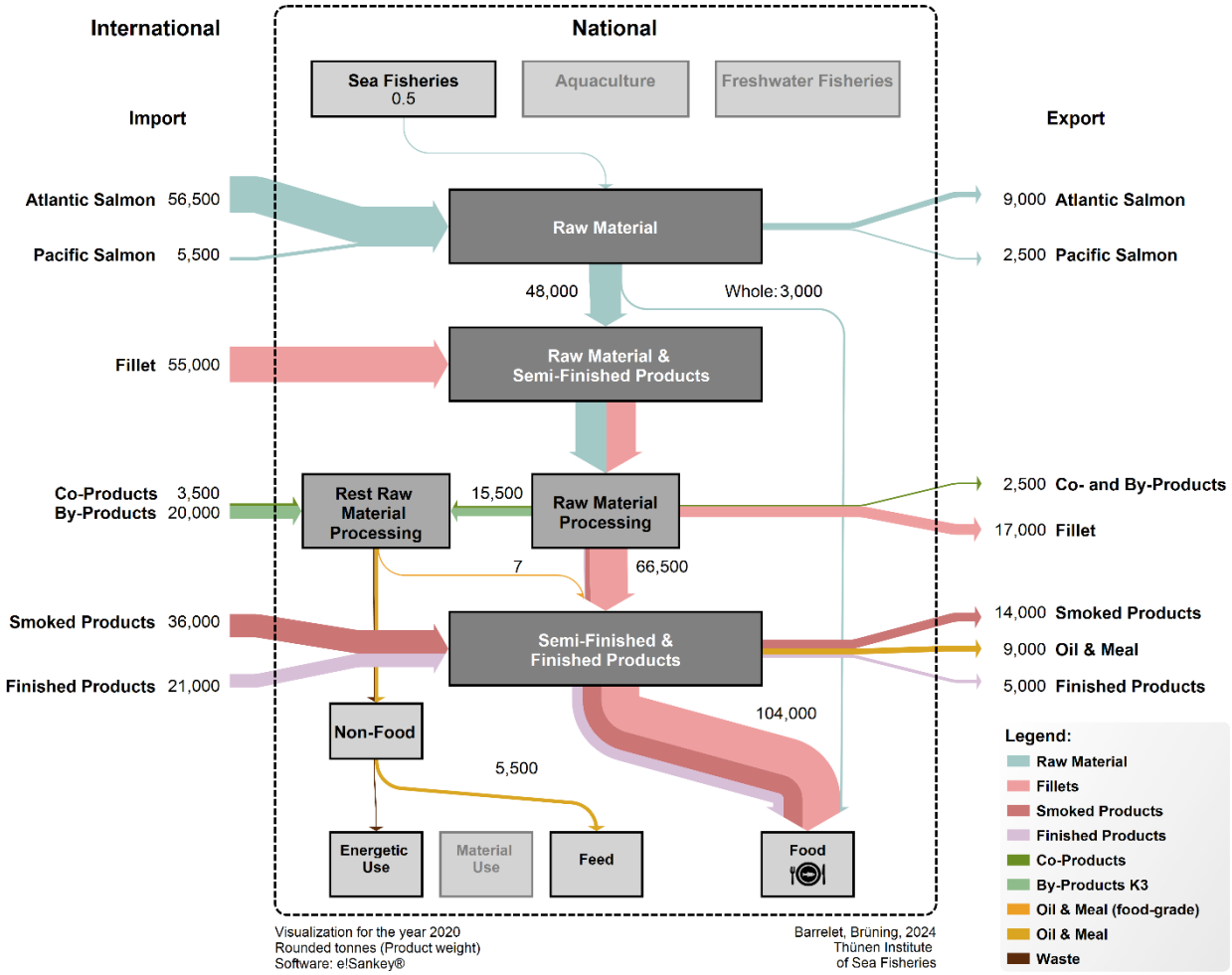


Source: Thünen Institute

Salmon

"Salmon was the most popular fish by consumers in Germany with a market share of 19% in 2020 [calculation based on the weight of fish, crustaceans and molluscs] (FIZ 2023). This product was almost exclusively imported, only 0.5 t resulted from wild catches, stemming from by-catch from the German [sea fishery] fishing fleet. The vast majority of imported salmon was farmed in Norway. In 2020, around 60,000 t of salmon raw material were imported and around 10,000 t exported (Figure 15). Nearly 3,000 t of whole salmon were sold directly, without further processing, the rest went into German processing plants, where over 65,000 t of finished products were produced. This resulted in almost 16,000 t of rest raw material, which went into further processing, along with over 20,000 t of imported rest raw material. After raw material and rest raw material processing over 100,000 t of final products (whole, semi-finished and finished salmon products) were sold for human consumption, 5,500 t (salmon meal and oil) were used for animal feed and a very small fraction was disposed of and used for energy production." (Brüning & Barrelet, 2024)

Figure 15: Material flow of salmon in Germany for 2020



Source: Brüning & Barrelet, 2024

2.5 Fisheries innovation

Next to small modifications to most fishing gear used in German fisheries over recent decades, there have been numerous technical developments, new gears, modern fishing vessels, and other devices, which are in different stages of implementation. However, the widespread voluntary adaptation within the fishing industry of ready to use gear is not well documented and difficult to monitor. Germany does not yet have a systematic approach to tracking the uptake of innovative gear in fisheries. However, this could be implemented if fisheries observers were tasked with documenting the use of newly developed or adapted gear. Additionally, a study with German gillnet fishers highlights that e.g., classic gillnets without modifications are well established out of ecological (little unwanted fish bycatch, high selectivity), economic (inexpensive in purchase) and habitual reasons (the same gear has been used for generations) (Barz 2022).

The following tables present developments in German fisheries innovations on fishing gear (Table 4), vessel technique (Table 5) and other devices, that can be implemented in commercial fishing or in fisheries research (Table 6).

Table 4: Fisheries innovation - fishing gear

Category	Name of device	Description	Implementation stage
Trawl development & modifications	Roofless	Trawl modification with an escape window in the upper section of the trawl to reduce unwanted bycatch of cod in flatfish directed fisheries to support the recovery of the stock (Santos et al. 2022; Stepputtis et al. 2020)	Developed; prolonged implementation process (approval from BALTFISH, STECF, implemented as technical measure: EC 2024a, 2024b)
	SMC_125	Square Mesh Codend with a min. mesh size of 125 mm to increase escape probabilities of a wide range of length classes of cod compared to traditional BACOMA codend in flatfish fisheries (Madsen et al. 2021; Wienbeck et al. 2014)	
	T90_125_LR	Modification of trawl net with increased mesh size of 125 mm with attachment of lastridge ropes to the codend selvedges	
	King Grid	Sorting grid for bycatch reduction in shrimp fishing (Santos et al. 2023)	Under development
	CRANNET	Optimized codends for an ecologically and economically sustainable shrimp fishery in the North Sea (Günther et al. 2021; Santos et al. 2018; Schultz et al. 2015)	Based on the research results, there was systematic increase in codend mesh size in commercial shrimp fishery - it was also prerequisite to keep the MSC certification
	Ascending trawl	Intended to render Dolly Ropes obsolete to reduce marine plastic pollution in bottom trawling (Stepputtis et al. 2022)	Tested in research and commercial conditions, ready to be implemented in commercial fishery but requiring further evaluation of performance
Demersal seines	Mini Seine	Towed gear, applicable for small vessels. The Mini-Seine systems have the potential to mitigate seal predation and reduce seabed disturbance relative to other active fishing techniques (Thünen Institute 2023)	Construction under further development, commercial testing for feasibility
Static gears	Fish pots	Reduce bycatch of marine mammals and sea birds and protect catch from seals (Chladek et al. 2021; Thünen Institute 2024b)	Construction under further development, commercial testing for feasibility
	Pontoon trap	A trap designed to prevent bycatch of protected species and seals, while simultaneously mitigating seal predation on the catch by restricting access to the trap's chambers (Thünen Institute 2024b; Ljungberg et al. 2025)	Construction under further development, commercial testing for feasibility
	PearlNet	Gillnet with pearls that deter harbour porpoises, therefore minimizing bycatch (Kindt-Larsen et al. 2024; Kratzer et al. 2021)	Construction under further development, commercial testing for feasibility
	Passive shrimp fisheries	Applying passive gear in the shrimp fishery, such as anchor pits and pots	Forthcoming in 2025

Source: Thünen Institute

Table 5: Fisheries innovation – vessel techniques

Name of device	**Description**	**Implementation stage**
Fishing vessels of the future I: large coastal fisheries	Based on a previous co-design research project with fishers on a concept of an energy-efficient fishing vessel, the University of Applied Science in Emden-Leer and Thünen Institute of Sea Fisheries will commission and test a prototype of a new vessel type for coastal fisheries	With reservation, project forthcoming in 2025
Fishing vessels of the future II: small coastal fisheries	The Thünen Institute of Baltic Sea Fisheries will concept, commission and test up to two vessels in co-design with fishers for small coastal fisheries	With reservation, project forthcoming in 2025

Source: Thünen Institute

Table 6: Fisheries innovation - other devices

Name of device	**Description**	**Implementation stage**
Contactless brown shrimp de-shelling technique	Funded by the state of Lower Saxony, scientists at the Thünen Institute of Sea Fisheries, together with the Georg August University of Göttingen and the company US Processing Klever UG, are investigating whether and how brown shrimps could be mechanically de-shelled in the fishing region to rebuild a regional value chain	Project accomplished 5/2025; technical feasibility is tested, economic feasibility currently remains uncertain (Niemann and Lasner 2025)
HyFiVe	Autonomous measurement system to be installed on board of fishing vessels, to provide wider monitoring of temporal and spatial data of physical ocean data (Hermann et al. 2023)	Under further development, commercial testing, rollout expected in late 2025
PAL	Acoustic alerting device to alert porpoises and deter cetaceans from gillnets, therefore mitigating bycatch (Chladek et al. 2020)	Implemented in the Western Baltic Sea, currently developed further and commercially tested
MOFI	Smartphone application for self-reporting of fishing activities (Meyer et al. 2022)	Was implemented, currently used in isolated cases, especially for research purposes
SimuNet	Software for simulating the hydrodynamics and deformation of nets (Breddermann et al. 2023)	Applied in research
SmartFishing	Sensorsystem for smart fishing trawls with AI-powered image recognition for commercial fisheries and fisheries research. This system aims to facilitate precise targeting of marine organisms and enable resource-efficient, minimally invasive surveys of fish populations (Thünen Institute 2021)	Under development
iFO	Low costs, open-source based infrared video surveillance system for underwater surveillance (iFO) (Hermann et al. 2020)	Developed and tested under various conditions

Source: Thünen Institute

3 Governance system

3.1 Responsible authorities

Germany, as a federal republic, is composed of sixteen states, including five coastal states (Lower-Saxony, Bremen, Hamburg, Schleswig-Holstein, and Mecklenburg-Western Pomerania). These coastal states collaborate to implement the CFP within Germany. They are responsible for the implementation of the structural policy, notably EMFAF, and for regulations governing coastal waters, and each has its fishery authority (marine fisheries departments and control institutions or corporation), responsible for inland fisheries, aquaculture, recreational fisheries, and fisheries in coastal waters. Additionally, some states have chambers of agriculture which include fisheries in their area of responsibility (Lower-Saxony and Schleswig-Holstein). These public corporations perform the work of agricultural administration and consult with their own fisheries units. In these states, fishers are mandatory members of the corporations. Management of the exclusive economic zones (EEZ) takes place at the national level through the Federal Office for Agriculture and Food (Bundesanstalt für Landwirtschaft und Ernährung, BLE). These responsible authorities are complemented by research institutes: The Johann Heinrich von Thünen Institute (Thünen Institute 2024a), and the Max Rubner-Institute (Max Rubner-Institute 2024) are federal research institutes, which analyze almost all aspects of Germany's marine living resources and products, their exploitation, their processing and their users, to provide scientific advice to policy makers, mainly the Federal Ministry of Food and Agriculture. They also represent Germany in various national and international scientific committees.

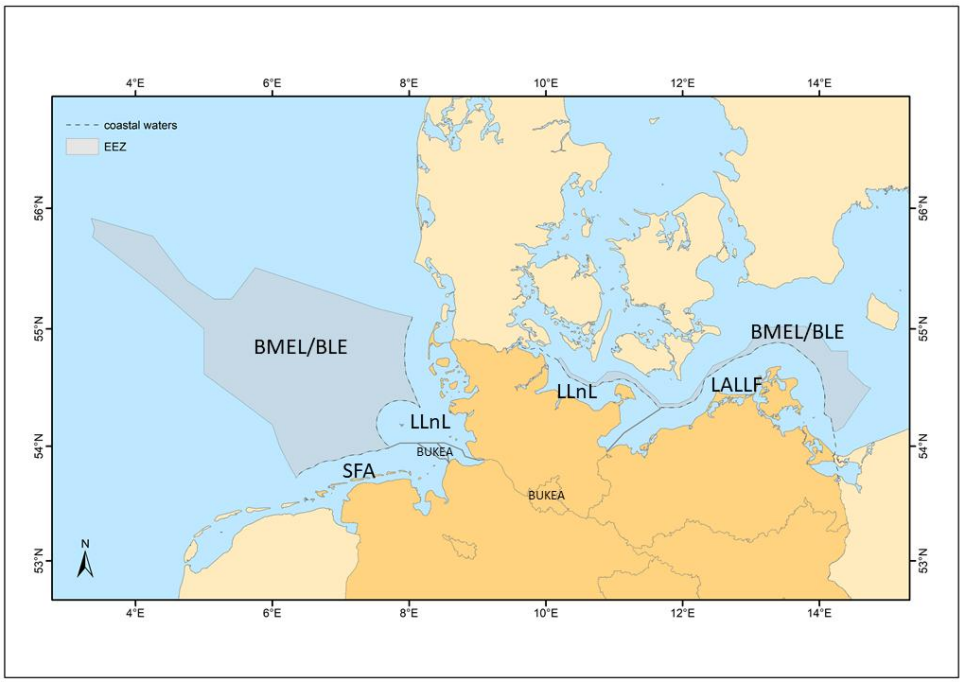
Further information on the respective responsible authorities and executive agencies, primarily related to fisheries are depicted in Figure 16 and listed in Table 7.

Governance system

Level	Responsible ministry	Executive agency	Responsibility of executive agency	Legal basis
European Union	European Commission	Directorate-General Maritime Affairs and Fisheries (DG MARE)	DG MARE develops and carries out the Commission's policies on Ocean and Fisheries. DG MARE promotes maritime policies, stimulates a sustainable blue economy, and promotes ocean governance at the international level by working out the legal framework for the EU Member States.	Common Fisheries Policy (EU 2013c)
National	Federal Ministry of Food and Agriculture (BMEL)	Federal Agency for Agriculture and Food (BLE)	The BLE is responsible for the implementation of the Common Organization of the Markets in Fisheries and the Common Fisheries Policy, the management of national fishing quotas, and the compilation of a directory of commercial fish species. Furthermore, it operates three fisheries protection vessels and three fisheries research vessels. The coordination and execution of marine fisheries control also falls within the purview of the BLE (BLE 2024e).	Seefischereigesetz (SeeFischG 1984)
Schleswig-Holstein (state)	Ministry of Agriculture, Rural Areas, Europe and Consumer Protection	State Agency for Agriculture and Sustainable Land Management (LLnL)	LLnL is responsible for carrying out fisheries-related tasks, with a focus on: fisheries law, fisheries control, coastal fisheries, inland fisheries and aquaculture, angling, and fisheries funding (Schleswig-Holstein 2023).	Küstenfischereiverordnung (KüFVO 2018)
Bremen and Lower Saxony (states)	Ministry of Food, Agriculture, and Consumer Protection of the State of Lower Saxony	State Fisheries Agency Bremerhaven (SFA)	The State Fisheries Agency is responsible for monitoring compliance with regulations pertaining to net mesh sizes, fish length limits, and catch quotas for regulated species. Additional responsibilities of the office include: reconciliation of logbook entries with purchaser invoices; promotion, particularly through public funding (EU, federal, and state governments of Lower Saxony and Bremen), of modernization measures for commercial fishing vessels; shellfish fisheries management; issuance of fishing licenses for full-time and part-time coastal and offshore fishing vessels; promotion of training for fish farmers; and provision of expert opinions on fisheries-related or fisheries-biological measures, as well as on projects that may have impacts on fisheries (Fischereiamt Niedersachsen 2024).	Niedersächsische Küstenfischereiverordnung (NKüFischO 2006)
Mecklenburg-Western Pomerania (state)	Ministry for Climate Protection, Agriculture, Rural Areas and the Environment	State Agency for Agriculture, Food Safety and Fisheries of Mecklenburg-Western Pomerania (LALLF)	Responsibilities include: fisheries surveillance on and in the waters of the state of MWP; monitoring specific marketing regulations for fishery products in accordance with EU and federal law; supervision of aquaculture facilities as per EU regulations; engagement of voluntary fisheries wardens; investigation and fine proceedings for legal violations; issuance of all conceivable types of fishing permits, including coastal fishing licenses for fishers and anglers, fishing tax stamps, exceptional permits, trap site permits, and fishing licenses for fishers; recognition of angling proficiency certificates from other federal states; registration of fishing businesses and fishing vessels for coastal and inland fisheries; catch recording and maintenance of fisheries statistics; and promotion of coastal fisheries (LALLF 2024).	Küstenfischereiverordnung (KüFVO M-V 2006)
Hamburg (state)	Senator for Environment, Climate, Energy and Agriculture	Environment and Energy Agency (BUKEA)	Fisheries in Hamburg is mainly focused on the promotion, implementation and regulation of recreational fishing (BUKEA 2024). However, the Fisheries and Angling Act is intended to strengthen commercial fishing (HmbFAnG 2019).	Hamburgisches Fischerei- und Angelgesetz (HmbFAnG 2019)

Table 7: Primarily to fisheries related authorities, their executive agency, and legal basis (as of Jan. 2025) (pg. 25)

Figure 16: Responsible authorities for fishing in coastal waters and the EEZ (as of Jan. 2025)



Source: Thünen Institute

3.1.1 National organizations

According to the European Common Market Organization policy (CMO) and article 6 of the Council Regulation No 104/2000 and following, producer organizations are central institutions to achieve the objectives of the CMO and CFP in fisheries management and to shape the fisheries and seafood market management (EU 2013b). At its starting point, the CMO listed 16 producer organizations for Germany (EU 2005). In the last public list known by the authors (EU 2013a), 12 producer organizations are mentioned. To the best of our knowledge, in 2024, the following 12 producer organizations were still active (personal correspondence T. Lasner with PO CEOs, April 16th, 2024 and federal fisheries agencies):

- Vereinigung der deutschen Kutterfischerei GmbH, Hamburg
- Erzeugerorganisation Wismarbucht e.G., Wismar
- Erzeugerorganisation Fischfang und Fischverwertung Stralsund und Umgebung GmbH, Stahlbrode
- Erzeugerorganisation ZAG Rügenfang e.G., Sassnitz
- Erzeugerorganisation Usedomfisch e.G., Freest
- Erzeugergemeinschaft Küstenfischer der Nordsee GmbH, Großheide
- Fischerei Genossenschaft Elsfleth e.G., Brake
- Erzeugergemeinschaft der Deutschen Krabbenfischer GmbH, Cuxhaven

- Erzeugergemeinschaft der Nord- und Ostseefischer GmbH, Cuxhaven
- Erzeugerorganisation der Küstenfischer Tönning, Eider, Elbe und Weser w.V.
- Erzeugerorganisation Küstenfischer Nord eG, Heiligenhafen
- Erzeugerorganisation schleswig-holsteinischer Muschelzüchter e.V., Neukirchen

Due to the dynamic development of the fleet, the sector is currently reorganizing, resulting in the dissolution of some producer organizations. Further, some companies are not organized in a producer organization recognized by the EU, but participate in a different form of cooperation in the market, e.g., mussel producers in Lower Saxony.

Following Germany's federal structure, fishers are organized in associations which represent their interests in the public and in the politics. The national umbrella organization of fishers is the Deutscher Fischerei-Verband e.V. (DFV), a union of commercial and recreational fishers, with, according to its information, more than one million commercial and recreational fishers as members of the association (DFV 2024). The DFV is a member of diverse European fishing organizations (e.g., Europêche) and national associations of primary producers (e.g., German Agriculture Association – Deutscher Bauernverband). It is organized into four segmental organizations:

- Distant Water Fisheries (Deutscher Hochseefischerei-Verband e.V.)
- Cutter and Coastal Fisheries (VDKK, Verband der Deutschen Kutter- und Küstenfischer e.V.)
- Inland Fisheries and Aquaculture (VDBA, Verband der Deutschen Binnenfischerei und Aquakultur e. V.)
- Recreational Fisheries (DAFV, Deutscher Angelfischerverband e.V.)

The segments are the umbrella organizations for most of the various federal, regional, or local fishers' associations across Germany.

Civil servants and fisheries researchers in federal state departments are represented by the association Verband der Fischereiverwaltung and Fischereiwissenschaft e.V., which cooperates with the DFV. In addition to the listed organizations there is a range of authorities and NGOs that have a stake in marine fisheries. To name just a few involved on national level:

- Bundesamt für Naturschutz, Federal Agency for Nature Conservation (https://www.bfn.de/en)
- Deutsche Allianz Meeresforschung, Alliance of German Marine Research (https://www.allianz-meeresforschung.de/en)
- Konsortium deutsche Meeresforschung, German Marine Research Consortium e.V. (https://www.deutsche-meeresforschung.de/en/)
- Deutsche Umwelthilfe, Environmental Action Germany (https://www.duh.de/englisch/)
- Marine Stewardship Council (https://www.msc.org/de/ueber-uns/organisation)
- Bundesmarktverband der Fischwirtschaft e.V., Federal Association of Seafood Economy (https://www.bundesmarktverband-fisch.de)

3.2 Management instruments

3.2.1 Licence to fish and fishing quotas

The federal government is responsible for the fishing license system and distribution of fishing opportunities. Most of the other regulations from the CFP, especially the structural policy, are administered by the federal states. As the CFP regulations are directly binding for Member States (opposite to, for example, Nature Conservation Regulations like Natura 2000 where Germany needed to adopt a law to implement them) the national and regional authorities are in a role of guaranteeing that the fishing sector follows the rules by issuing control and enforcement efforts (see chapter 3.1). The German laws and regulations therefore regulate the access to fisheries, the distribution of fishing opportunities (the German share of the overall EU quota), and the implementation of the structural policy.

License to fish

In Germany, fishers need a license to fish, which is obtained through training of at least 3 years (`Fischwirt`, see chapter 4.3). If fishers want to steer vessels, they also need a licence as a captain or steersman (larger vessels must have at least enough fishers with steersman licences for around the clock steering of the vessel). In an unregulated fishery like the brown shrimp fishery in the Wadden Sea, fishers can enter fishing without obtaining a fishing quota. However, they need a capacity licence to guarantee that the introduction of the vessel is not exceeding the German capacity ceiling for this segment. Usually, fishers gain such a capacity licence by buying an existing vessel but there is also the possibility to buy capacity from fishers who left fishing without selling their vessel (e.g., scrapped the vessel without public funding). Those fishers who leave fishing without receiving public funding keep a so-called 'sleeping' capacity licence.

In case new fishers want to enter fishing, they can then obtain a capacity license of an old vessel to build a new one. This new vessel needs to have the same capacity as the old one due the capacity ceilings in the EU which do not allow to introduce new capacity into a fleet segment. The overall capacity ceiling would be reduced if the vessel was scrapped with public funding as it happened in 2022 and 2023 with larger trawlers in the Baltic Sea. Then no new vessel can enter into fishing unless old capacity licenses are available.

Fishing quotas and fishing rights

Many of the fishing quotas in Germany are attached to the fishing vessels and cannot be transferred, resp. sold without the vessel; there is no system of individual transferable quotas. The quotas were originally distributed in 1982 following a relative stability key developed from historical landings of the vessels in 1977 and 1978. Fishers declared landings on which authorities calculated the share of that specific vessel. The fisher as an owner didn't receive the quota - it was attached to the vessel, a mechanism still active today. However, if a vessel is maintained in a condition to go out fishing, its quota may also be fished by another vessel within the same enterprise. There is also a possibility to exchange quotas between vessels and with fishers of other MS, arranged by the German authorities. Those exchanges are not unusual as the quota distribution of the early 1980s does not always reflect the current catches, changes in the ecosystems or the introduction of new commercial species. This can lead to problems, e.g., with the landing obligation. Germany, for example, has a low quota for Northern hake but the stock increased substantially over the last years. Therefore, fishers have to be careful not to reach their hake bycatch quota as catches of this species could choke the fishing for other species with much higher quotas.
In other cases, so-called community quotas are open for all fishing companies. Here most of the species are by-catch species in fisheries on more important stocks where vessels have individual quotas. Also, species where quotas were introduced after 1982 often fall under this category (e.g., plaice in the Baltic Sea).

Along the Baltic Sea coast, SSF are subject to additional regulations by the respective federal states. The main additional management instruments are the limitation of space for trap nets and a maximum length of gillnets per fisher. Therefore, the vessels may have a fishing quota on stocks (mainly herring, cod and plaice) and have additional input regulations on how much fishing gear they are allowed to deploy (for the catch of regulated but also unregulated species). Additionally, fishing is regulated through closed seasons or fishing grounds. There are, for example, closed areas for spawning seasons, where no fishing is allowed (§12 KüFVO M-V, 2006). These closed seasons were identified in a joint effort between authorities and fishers.

3.2.2 Government support to fisheries

EMFF/EMFAF (European Maritime, Fisheries and Aquaculture Fund)

The EMFAF runs from 2021 to 2027 and supports the CFP, the EU maritime policy and the EU agenda for international ocean governance, like the EFF (2007-2013) and the EMFF (2014-2020) have done before. It provides support for developing innovative projects ensuring that aquatic and maritime resources are used sustainably. The fund helps achieve sustainable fisheries and conserve marine biological resources. This improves food security through the supply of seafood products, growth of a sustainable blue economy, healthy, safe and sustainably managed seas and oceans. It also helps achieve the sustainable development goal 14 ('conserve and sustainably use the oceans, seas and marine resources'), to which the EU is committed. Furthermore, EMFAF supports the fulfilment of the objectives of the European Green Deal, the roadmap for the EU climate and environmental policies. In Germany, the BLE, on behalf of the Federal Ministry of Food and Agriculture, is responsible for the implementation of tasks within the framework of the EMFAF. Table 8 outlines the allocation of funds from the EMFAF, demonstrating the financial contribution to different project / items.

Table 8: Fisheries related projects funded under the EMFAF in Germany in 2022/2023

Project / items	**EMFAF contribution 2022/2023 in €**
Data Collection Framework implementation	37,195,489
Fisheries control	12,306,986
Research	5,660,962
Equipment for fishing, fish processing, processing and sale of own catches	3,353,574
Eel management	3,190,658
Scrapping 2021/2022	1,821,728
Strengthening tourism in connection with commercial fishing	1,346,878
Water police	919,203
Compensation for the temporary closure of the Baltic cod fishery 2022/2023	587,105
Compensation for damage by grey seals and harbour seals 2022/ 6M 2023	343,016
Compensation for the temporary closure of the Baltic herring and sprat fishery 2022	250,000
Regional management FLAG	212,521
Compensation for the temporary closure of the Baltic herring fishery 2022/2023	154,635

Source: Thünen Institute (data according BLE)

FLAGs

The European Fisheries Fund established Fisheries Local Action Groups (FLAGs) in 2006 to promote community-driven development in coastal areas. These groups bring together fishers, businesses, and public entities. Each FLAG creates a local development strategy addressing economic, social, and environmental needs specific to their region. These strategies offer valuable insights into how fishing communities perceive their current situation and envision their future. However, the importance placed on fisheries within these plans varies. Actions directly related to the fisheries sector are not always prioritized. Although there is extensive literature on the impact and design of FLAGs in Europe (e.g., Freeman and Svels 2022; Linke and Siegrist 2023), there is no published scientific literature for Germany.

The following FLAGS with relation to coastal fisheries were funded under EFF (2007-2013), EMFF (2014-2020) or EMFAF (2021-2027).

Table 9: Established FLAGs under EFF, EMFF and EMFAF

FLAG	Region / Sea	Programming period	Main objectives
LAG AktivRegion Nordfriesland Nord e.V.	Schleswig Holstein, Northern North Friesland, North Sea	2007-2013 2014-2020 2021-2027	• Conservation of fisheries: Fishing in the area should be maintained or re-established. • Particular attention is paid to the area of the mussel fishing. • Preparation of coastal culture / fisheries: The knowledge of fishing history is to be recorded and passed on to preserve historical heritage. This will include the production of information material on the history of fishing and coastal culture, as well as the establishment of tourist and cultural products and activities in this area. • Strengthening direct marketing: The direct marketing of fishery products in the area is to be expanded through measures such as on-site processing, networking and information, cooperation between fishers and the gastronomy sector, or consumer behaviour through targeted information. • The focus will be on the tourism area.
LAG AktivRegion Südliches Nordfriesland e.V.	Schleswig Holstein, Southern North Friesland, North Sea	2007-2013 2014-2020 2021-2027	• Conservation of fisheries: Fishing in the area should be maintained or re-established. • Particular attention is paid to the area of the mussel fishing. • Preparation of coastal culture / fisheries: The knowledge of fishing history is to be recorded and passed on to preserve historical heritage. This will include the production of information material on the history of fishing and coastal culture, as well as the establishment of tourist and cultural products and activities in this area. • Strengthening direct marketing: The direct marketing of fishery products in the area is to be expanded through measures such as on-site processing, networking and information, cooperation between fishers and the gastronomy sector, or consumer behaviour through targeted information. • The focus will be on the tourism area.
LAG AktivRegion Dithmarschen e.V.	Dithmarschen, North Sea	2007-2013 2014-2020 2021-2027	• Development and expansion of fisheries-related tourism and marketing activities. • Development of “Adventure ports” in Büsum and Friedrichskoog, which will contribute to preserving a certain level of fishing activities in these ports. • Long-term preservation of jobs in fisheries and tourism. • Reviving existing networks and building new networks between the sectors (fisheries, gastronomy and tourism).

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LAG AktivRegion Steinburg Fischwirtschaftsgebiet Glückstadt	Steinburg, North Sea	2007-2013 2014-2020 2021-2027	• Development of the marketing of fisheries aimed at tourists. • Development of the harbour of Glückstadt into an “Adventure port” while preserving its cultural heritage. • Long-term preservation of jobs in fisheries and tourism. • Intensification of existing networks of fishing, catering trade and tourism.
LAG Rügen	Rügen, Baltic Sea	2007-2013 2014-2020 2021-2027	• The diversification of fisheries activities into other sectors such as tourism, utilising the island's rich fisheries heritage. • To further develop the area's tourism and service industry and thus create new jobs for the local population; focused particularly on those who can no longer sustain a living from fisheries.
LAG Ostsee-DBR	Bad Doberan, Baltic Sea	2007-2013 2014-2020 2021-2027	• Supporting the diversification of fishers´ employment activities. • Strengthening the competitiveness of the area’s fisheries and tourism sectors. • Safeguarding the survival of rural communities and their way of life. • Promoting social inclusion and the protection of cultural heritage. • Stimulating networking, social involvement and coexistence.
LAG Westmecklenburgische Ostseeküste	West Mecklenburg, Baltic Sea	2007-2013 2014-2020 2021-2027	• Diversification in the fisheries sector. • Increase the added value and development of touristic marketing. • Promote social prosperity and cultural heritage. • Strengthen fishing communities through local development.
LAG AktivRegion Innere Lübecker Bucht	Inner Luebeck Bay, Baltic Sea	2007-2013 2014-2020	• The strategy aims to help fishers stay competitive, for example by supporting methods of diversification or direct marketing. • The FLAG seeks to increase knowledge about the local fishing industry as well as fish as a valuable source of food including fish cultivation as cultural heritage. • Projects that have a relationship to the boost of tourism development will be very important in this context.

Governance system

LAG AktivRegion Ostseeküste	Schleswig Holstein, Baltic Sea	2007-2013 2014-2020 2021-2027	• Diversification of fisheries. • Promotion of added value in fisheries products. • The ecologically and environmentally friendly orientation of fisheries. • Social prosperity and sea protection. • The maintenance of cultural heritage of local fisheries history and coastal culture. • Tourism within the context of fisheries.
LAG AktivRegion Hügelland am Ostseestrand	Schleswig Holstein, Baltic Sea	2007-2013 2014-2020	• A better image for fishers, fishing, and fishing heritage. • Better ports that can support sustainable fishing. • Stronger linkage of the fisheries sector with fishing tourism. • More events, information and awareness-raising about fishing. • Better cooperation between the regional fishing industry and municipalities.
Lokale Fischerei Aktionsgruppe (FLAG) Schlei-Ostsee	Schleswig Holstein, Baltic Sea	2007-2013 2014-2020 2021-2027	• Maintain jobs, especially for young people. • Develop harbour infrastructure, improving selling and processing. • Diversification and maritime tourism. • Maintenance of the historical heritage of fishery. • Environmental and sea protection. • Awareness raising and public relations.
LAG AktivRegion Wagrien-Fehmarn e. V.	Schleswig Holstein, Baltic Sea	2007-2013 2014-2020 2021-2027	• Improving the marketing of local products related to fish. • Stronger linkage of the fisheries sector with fishing tourism. • Better training and qualifications for local actors, taking place in all municipalities of the FLAG area • Better cooperation between the regional fishing industry and the municipalities.
FLAG Bremerhaven	Bremerhaven, North Sea	2007-2013 2014-2020 2021-2027	• Promoting the local tradition of the fishing industry as well as recent fishery development by increasing the attractiveness of the area for tourists and the fisheries sector. • Strengthening the image of fish and enhancing the dissemination of information about fish in general and about the local fishing harbour in particular. • Preservation and valorisation of the socio-cultural maritime and architectural heritage. • Creating and strengthening networks and cooperation between the local research and development sector and the local fishing industry.

LAG AktivRegion Niedersächsische Nordseeküste	Lower Saxony, North Sea	2007-2013 2014-2020 2021-2027	• Diversification of income opportunities and adding value to fisheries. • Maintaining and securing fishing opportunities and activities. • Supporting tourism with a clear link to fisheries. • Preserving sociocultural heritage related to fishing. • Increasing environmental protection, particularly in relation to fisheries.
LAG Nordvorpommern	Mecklenburg-Western Pomerania, Baltic Sea	2014-2020 2023-2027	• Strengthening and securing fisheries at the locations of the region, in particular by developing new and expanding existing income opportunities • Improvement of the tourist offer and the infrastructure, in particular in the surroundings of the fishery and its ports as well as highlighting unique selling points • Preserving and better utilising the fishing tradition and maritime cultural heritage • Strengthening the image of fishers and the fishing industry, including the product "fish" • Building a fisheries network - networking of regional actors, activities and regional offers
FLAG Eckernförder Bucht c/o Agenda Regio GmbH	Schleswig Holstein, Baltic Sea	tba	tba
Vom Peeneland zur Waterkant	Mecklenburg-Western Pomerania, Baltic Sea	2023-2029	tba

Source: EC 2024c, BLE Germany, personal communication F. Barz with LLnL

Further government support to fisheries

- **Compensation payments for fisheries related damage caused by grey seals**

Along the German Baltic Sea coast, particularly in Mecklenburg-Western Pomerania (MWP) , the increasing population of seals has led to a corresponding rise in seal-related damage to fishing gear and catch. In response, the state of MWP has established an advisory board on a seal-fishery conflict management. This board is currently developing a tender for the creation of a conflict management plan (Fräger et al. 2023). In the meantime, compensation payments are available to fishers who can demonstrate that their equipment or catch has been damaged by seals. Eligible recipients are commercial fishers primarily engaged in coastal fishing in MWP, operating vessels under 12 m length and without trawling gear. Specifically, the program covers damages through seals to catches, to gillnets rendering them unusable, and to eel traps, resulting in their inapplicability (Schwerin 2024). Damage reports have been increasing and are also increasingly approved. Actual damages are likely to be higher than those reported. The majority of reports pertain to gillnets and herring consumption. In 2022 damages to catches by seals were distributed as follows: herring (77%), mackerel (12%), eel (5%), cod (1%), and roach (1%). It is currently not possible to make any statements regarding the future prospects of compensation payments (Robben AG 2024).

- **Brexit Adjustment Reserve (BAR) (BLE 2024d)**

Germany is one of the countries affected by quota reductions of important shared stocks with the UK following the Trade and Cooperation Agreement (TCA) after Brexit. In some fleet segments, the loss accumulates to approximately 25% of the level before the TCA. With the BAR the EU Commission has provided funding to mitigate these impacts.
Germany initiated a process to discuss necessary measures that resulted in a three-step process. Initially, companies impacted by the closure of Norwegian fishing grounds in early 2021, resulting from the delayed EU-Norway fisheries agreement due to the late TCA approval, received compensation for lost income. The second step entailed the implementation of a regulation outlining several measures: temporary and permanent cessation of fishing activities, measures to improve marketing of fish, social support measures, investments in equipment for fishing vessels, and support for fish processing companies. However, the strict timeline limited the opportunity for extensive discussions with the sector and limited time to adopt market measures or launch investments on fishing vessels (e.g., for diversification of fishing activities). Consequently, only a limited number of concrete projects could be initiated. The main measure implemented was the permanent cessation of four large vessels, two from the long-distance fleet and two demersal trawlers operating in the North Sea. As a third step, Germany implemented a compensation scheme for individual companies affected by the loss of fishing quotas. As quotas are attached to individual vessels, the EU´s decision to reduce the overall quota directly impacted the companies. The compensation was calculated based on a projected loss of a 10% profit margin over 15 years following the implementation of the TCA.

- **Crisis measures 2022-2024 (Ukrainian war, BMEL 2024a)**

In response to the surge in fuel costs following the onset of the Ukrainian war, Germany introduced a preliminary crisis measure in 2022. This initial support was limited to the increase in fuel costs relative to the 2019 baseline (the year before the COVID-19 pandemic and the first year for which economic data was available at that time), with a cap of 80% to prevent overcompensation. To streamline the application process and ensure swift payments to fishing companies, the 2022, 2023, and 2024 regulations adopted a simplified approach, providing equal payments to vessels within the same fleet segment (e.g., PG1012). For 2023, the support scheme was broadened to encompass additional cost increases, recognizing the substantial rise in various cost categories beyond fuel. In response to criticism regarding the uniform treatment of vessels within a segment in the 2022 scheme, the 2023 scheme introduced a payment system based on kilowatt capacity. This approach aimed to better reflect vessel-specific characteristics, such as length and engine power, which significantly influence fuel consumption. Furthermore, certain segments were consolidated to accommodate similar vessel types, such as shrimp vessels with comparable engine power but in different length categories. The support was extended into 2024, with the EU Commission authorizing the disbursement of compensation payments for both the initial six months of 2024 and later the entire year. Minor adjustments were made to the per-kilowatt calculation to more accurately reflect variations in vessel length.

- **Returns from the auction of marine areas for offshore wind farms**

As part of the implementation of the European Renewable Energy Directive III, the German government aims to accelerate the expansion of offshore wind energy through the `act on the development and promotion of offshore wind energy` (WindSeeG 2016). The law stipulates, inter alia, that up to 5% of the funds generated from the auctioning of offshore wind farm areas be invested in fisheries' sustainable development and transformation, and another 5% into environmental protection. These fractions were later reduced to 1% and 4%, respectively. In total, the Federal Ministry of Food and Agriculture is expected to receive approximately €134 million from the first auctioning of offshore wind energy areas to invest in the future of fisheries in the Baltic and North Seas. In deciding on how to distribute the funds, the BMEL was supported by the "Commission on the Future of Fisheries", an advisory board that, among other things, provides recommendations on specific measures (BMEL 2024a). However, due to the premature dissolution of the German government (November 2024) and subsequent provisional budget management, few funds were allocated to projects until mid-2025.

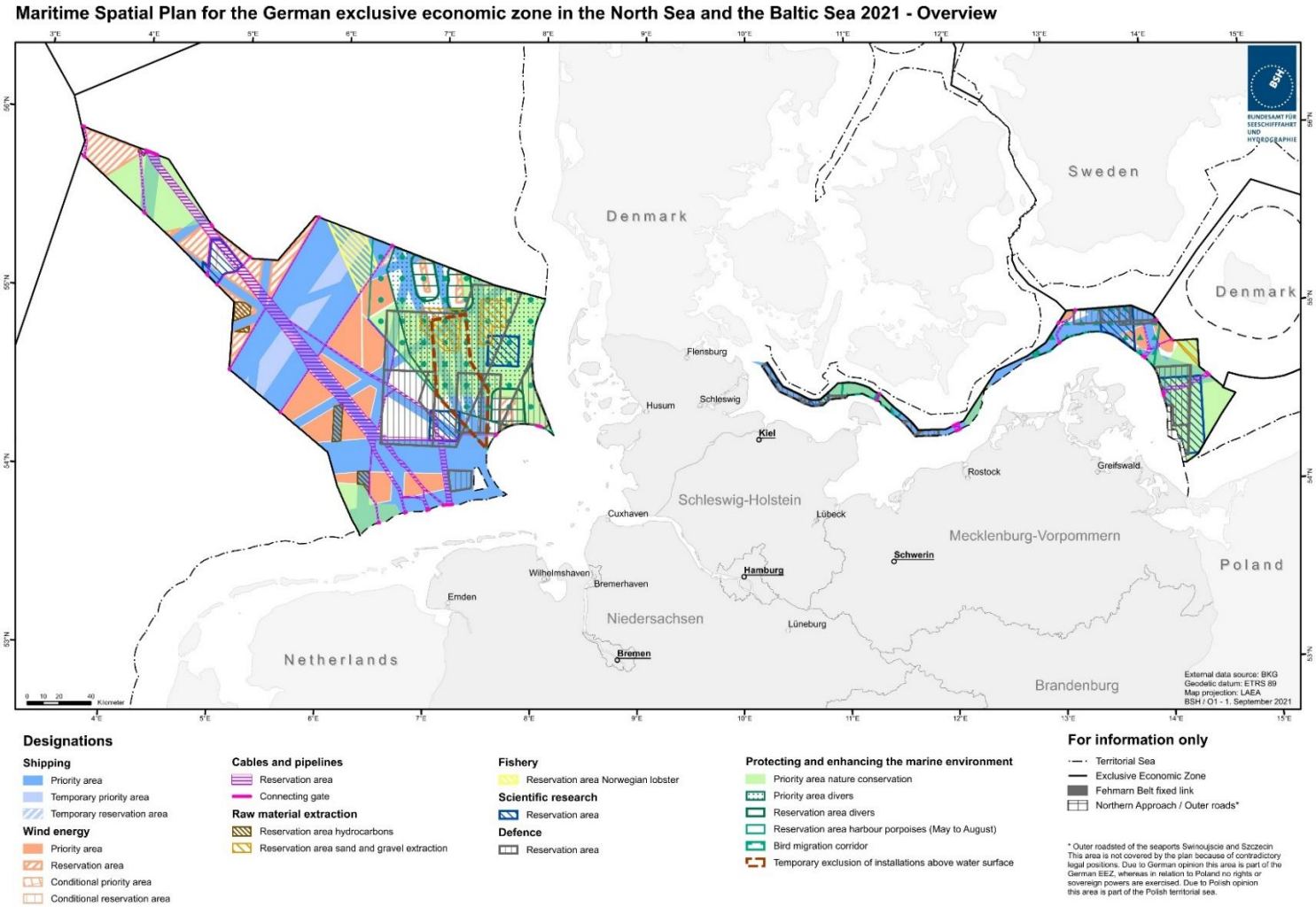
3.3 Marine spatial planning

In 2021, Germany updated its existing marine spatial planning framework, which governs the utilization of the Baltic and North Seas within its EEZ. Following extensive national and international consultations with authorities, the public, and relevant federal ministries, the updated spatial plan came into effect on September 1, 2021 (Figure 17) (BSH 2024). Given the seasonal and annual variation of major fishing grounds, the new maritime spatial plan does not designate specific areas for fisheries' priority, except a reserved zone for Norway lobster fishing in the north western North Sea EEZ (Salomon and Schumacher 2022). Consequently, fisheries have either no or very small priority areas within the EEZ of the North Sea and Baltic Sea (see Figure 17 in yellow).

The competing demands for marine space have led to conflicts. Currently, these are particularly evident between the fishing industry and the planning and construction of offshore wind farms. The ongoing and projected development of marine renewable energy primarily affects trawl fisheries, which target various groundfish and crustacean species. The density of existing installations is highest in the North Sea and Baltic Sea, with the UK leading in terms of allocated sea space for marine energy totalling 1,483 km², and Germany and Denmark following closely behind (Stelzenmüller et al. 2020). Insurance issues can be seen as key obstacles to conducting fisheries in and around offshore wind farms. Currently, in Germany, fishing with passive gear can take place beyond a buffer zone of 150 m around outer offshore wind installations (Bonsu et al. 2024). Additionally, the fuel consumption needed per catch unit in the North Sea and Baltic Sea might be strongly impacted when fishing grounds need to change, potentially leading to decreased profits (Bastardie et al. 2015).

To mitigate spatial use conflicts, measures can be taken such as 1) early stakeholder consultation to identify potential conflicts and acknowledge all interests; 2) facilitated negotiation processes and guidelines for expansion; and 3) compensation for disturbance and economic losses (Stelzenmüller et al. 2020). At present, fishers are not directly compensated for the loss of fishing opportunities. However, 1% of the funds from auctioning areas for offshore wind farms is currently allocated to support the sustainability and transformation of coastal fisheries (WindSeeG 2016) (see chapter 3.2.2).

Figure 17: Marine spatial plan, effective as of September 1, 2021. Priority fishing areas within the EEZ are marked in yellow



Source: BSH, 2024

3.4 Fighting IUU fishing

Illegal, unreported and unregulated (IUU) fishing is a global issue with significant economic, environmental, and social impacts (Temple et al. 2022). The European Union has taken steps to combat IUU fishing through Regulation (EC) No 1005/2008 (EU 2008), which includes harbour measures, catch documentation schemes, and IUU vessel listing.

The latest review of fisheries in OECD countries from the OECD, which generally includes some information on IUU, is based on data from 2009. For Germany it states that the Joint Maritime Emergency Reporting and Assessment Centre took up its activities in Cuxhaven in January 2007. This crisis management centre constitutes the operational core of the Maritime Safety and Security Centre, an organisation intended for sea surveillance, improvement of hazard control and accident management. In the process, federal authorities and authorities of the coastal federal states collaborate in a network. The federal authority responsible for fisheries monitoring and control is also present at the crisis management centre around the clock. This is a major step towards improving fisheries monitoring, particularly with regard to enforcing prohibitions of entry into harbour for IUU vessels (OECD 2010).

Data and grey literature on IUU fishing in Germany are scarce. While not officially documented, there have been recurring informal reports of IUU fishing activities in Germany. These anecdotal accounts often highlight issues with the fishing of species such as eel and cod. Furthermore, there have been suggestions of inadequate oversight of fishing vessels, particularly concerning the self-reported landing declarations and a general disregard for the landing obligation. It's important to note that these concerns remain unconfirmed by official records.

3.5 Landing obligation

The federal government and the federal state authorities enforce and control the legal requirements from the decisions on EU level. This includes the regulations for the landing obligation (LO). According to EFCA (2024) the probability of detecting a breach of the law at sea is quite low and to the best of our knowledge, there is no additional data for Germany on compliance in connection to the landing obligation. However, we have identified substantial discrepancies between Vessel Monitoring System (VMS) data and observations from maritime inspections, with reported variations, for instance, from 0.5% to 12%. Despite these persistent indicators of non-compliance, current regulations offer no mechanism for enforcement or sanction. This appears to be a fundamental deficiency, inherent in the design of the LO as integrated into the CFP reform. Additionally, numerous exemptions for fisheries have contributed to maintain the status quo, making it difficult to detect any significant social or economic impacts of the LO.

Germany argued at the beginning of the implementation that there are only two species, northern hake and boarfish, were there may be a risk of a choked fishery (quota exhausted in a mixed fishery before other quotas could be fished out). However, so far this was not the case also due to the possibility to exchange quotas with other countries. As many other countries, the German government was actively participating in the discussions in the regional groups on exemptions from the LO and requests for derogations. This includes especially the shrimp fishing sector, where an exemption from the requirement to land small specimens of plaice and sole is implemented.

The Thünen Institute of Baltic Sea Fisheries has a department for research on fishing technologies and issued several projects to improve the selectivity of fishing gears (see chapter 2.5, e.g., improvement of trawl selectivity or development of new sensor technology). With an improvement in selectivity there could be better avoidance of unwanted catches which in turn could improve the implementation of the LO in the longer term.

4 Social, cultural and economic aspects of fisheries

4.1 Fisheries in the national societal context

At a national economic level, the importance of the fisheries sector is negligible, amounting to less than 0.005% of the German GDP (own calculations - in comparison, the whole agriculture sector, including fisheries, contributed 0.8% to the GDP in 2021, Destatis 2021). The average landings of the German fleet from 2013-2023 were around 211 kt of seafood, which resulted in an average revenue of €234 million. Nominally, the German fleet covered about 18% of the national domestic demand for seafood in 2023[4] and is part of the seafood industry's supply chain in Germany, including production, processing (including imported and to be exported seafood), and retail (without wholesalers) standing for 30,000 jobs in 2024. In 2024, German seafood industries accounted for a total revenue of about €13 billion (FIZ 2024). However, as fisheries are concentrated in specific coastal areas, their local economic importance differs widely, and their indirect significance for other sectors, such as tourism, may be higher (Schmücker and Schmüdderich 2010). In addition, marine recreational fishers support around 4,500 jobs in upstream companies, where anglers invest estimated €248 million in equipment (Strehlow et al. 2023) (see chapter 4.6).

The following chapters offer a contextualization of the role of fisheries within society, with particular attention to their social dimensions. This includes an examination of the social security system in which fishers are embedded: while generally integrated into the standard German social security framework, fishers also benefit from specific sectoral provisions (see chapter 4.2). Education and vocational training are also addressed. The commercial fishing sector follows a formal apprenticeship model, comprising a three-year program that combines theoretical instruction with practical experience and leads to the acquisition of the required professional licenses. In recent years, however, the number of apprentices has declined significantly, posing a challenge to generational renewal within the sector (see chapter 4.3). Additionally, chapter 4.4 addresses fisheries communities by presenting two approaches to their identification, alongside case studies examining social dimensions and the significance of fisheries. The findings reveal diverse outcomes concerning the local importance of fisheries, fishers' attitudes, perceptions of the sea–land relationship or approaches to conflict management (see chapter 4.5).

4.2 Social security systems and other social benefits

Fishers are generally covered by the German social security systems, similar to employees and self-employed workers in other sectors. All gainfully employed persons in seafaring are also compulsorily insured in the sense of basic coverage under the above conditions. This also includes part-time fishers. Seafaring persons, both employed and self-employed, are subject to statutory pension insurance. This includes coastal seafarers and fishers who work as crew members on their vessels or independently without a vessel, regularly employing no more than four insured employees. This provision also covers seafaring personnel as defined under § 1 of the SGB VI - seafaring employment is defined as employment carried out in German territorial waters or beyond, inland waters are not included. The obligation to insure exists both for the general pension insurance (retirement age 65-67 years) and for the social insurance for seafarers which offers a `Seamen´s Pension` (`Seemannskasse`) from 56 years onward. This pension is a bridging benefit until the regular retirement age is reached. It takes into account the fact that fishers are subject to particular strains such as long periods away from their families, working in shifts, and health risks, and they

[4] Seafood landed by German vessels abroad is only partially reallocated to the domestic market, resulting in a lower de-facto self-sufficiency rate.

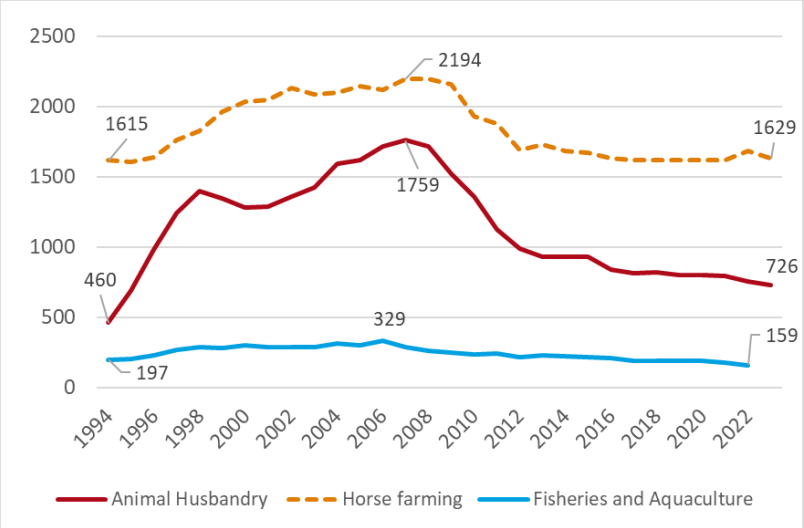
may have to give up their seafaring activities due to old age or other reasons prior to the official retirement age. The bridging benefit also applies in the event of unemployment and can be used to top up unemployment benefits (KBS 2024b).

Fishers are also covered by the BG Verkehr: employers' liability insurance association in Germany. It advises and supports the affiliated employers and their employees in the prevention of accidents at work, work-related health hazards and occupational illnesses, and provides rehabilitation and compensation in the event of accidents at work, on the way to and from work and occupational illnesses. The Ship Safety Division of BG Verkehr performs tasks in the field of ship safety, the Maritime Medical Service and in accordance with the Ship Equipment Directive.

4.3 Education and training

In Germany, occupations in fisheries and aquaculture are part of `green professions`, ranging from farmer to forester. While the overall number of green job trainees increased from 1994 (29,409) to 2007 (42,887), it decreased from 2007 to 2014 (33,441) (BLE 2024b). For the last ten years, the numbers have been more or less stable at around 33,000 trainees per year. However, the developments in the trainee programs differ. While farming is still quite highly demanded (1994: 5,941 / 2007: 9,709 / 2023: 9,084), other programs (e.g., animal husbandry or horse farming) have recorded a decrease in the number of trainees. In fisheries and aquaculture, the number of trainees has more than halved since 2007 (Figure 18).

Figure 18: Number of trainees in selected green professions from 1994 - 2022



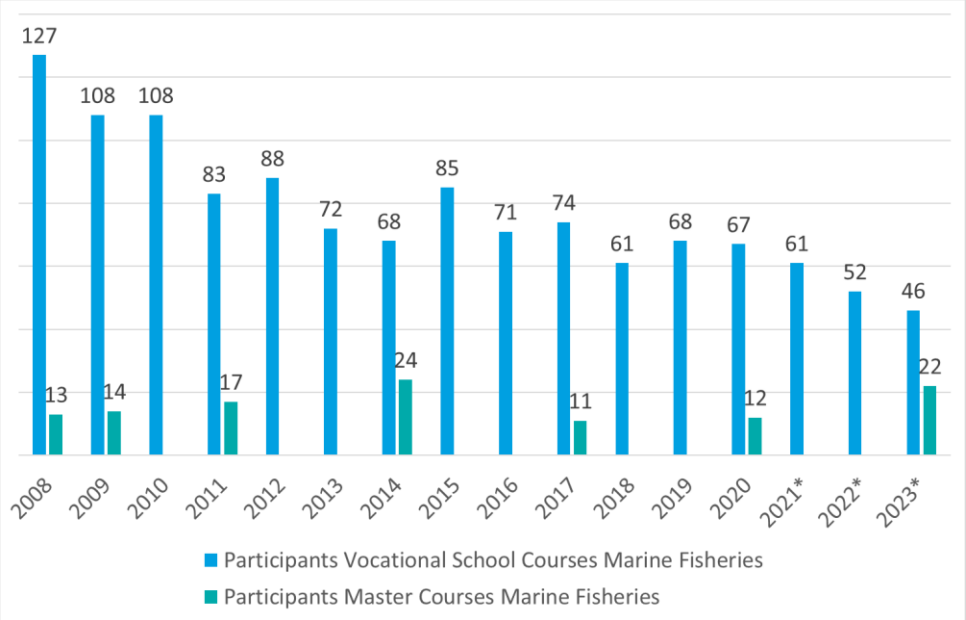
Source: Thünen Institute (data according to BLE, 2024b)

In 2023, only 132 trainees did an apprenticeship in fisheries and aquaculture; a historically low level. Reasons for the overall trends in the development of green job trainees could be the demographic change with less strong birth cohorts, an education shift from apprenticeships to study programs, the relatively low training salary and the economic uncertainty of some green professions.

The apprenticeship for fishers follows the dual principle in Germany's job training system and commonly lasts three years (this can be shortened to two years if specific conditions are met). It consists of practical work at an apprenticing company and a training course at a vocational college. The apprenticeship ends with a successful theoretical and practical exam at the vocational college. During the vocational training and also afterwards, fishers have to undertake mandatory safety training. The vocational colleges are

specialized and, in the case of a traineeship in fisheries and aquaculture, offer block teaching because of the relatively small number of trainees and large catchment area. Since a reform of the training program in fisheries and aquaculture in 2016, there are three potential professional specializations trainees can pass the exam in: inland fisheries, aquaculture, or marine fisheries (FischwAusbV 2016). Today, there are five vocational colleges for trainees of fisheries and aquaculture: Staatliche Berufsschule Starnberg (Bavaria, South Germany), Fischereischule Königswartha (Saxony, East Germany); Justus-von-Liebig Schule Hannover (Lower-Saxony, Central North Germany), Landesberufsschule für Fischwirte Rendsburg (Schleswig-Holstein, North Germany) and Berufsschule Sassnitz (Mecklenburg Western-Pomerania, North Germany). Only the last two offer courses in marine fisheries and the number of trainees follows a declining trend (Figure 19). There was no data on trainees available for Berufsschule Sassnitz, however participation has been very low over the last years, with 1 apprentice left in 2025 (NDR 2025). After successfully completing an apprenticeship and gaining at least two years of professional experience, fishers in Germany are eligible to register for a master (`Meister`) examination. The `Meister` title is a recognized qualification in Germany that signifies advanced expertise and professional mastery. Alternatively, individuals who have completed training in an agricultural profession and have at least three years of relevant work experience may also qualify to register for the fishery `Meister` examination. The preparatory course for the exam, held in Rendsburg, lasts eight weeks. It is offered when a minimum number of participants is met.

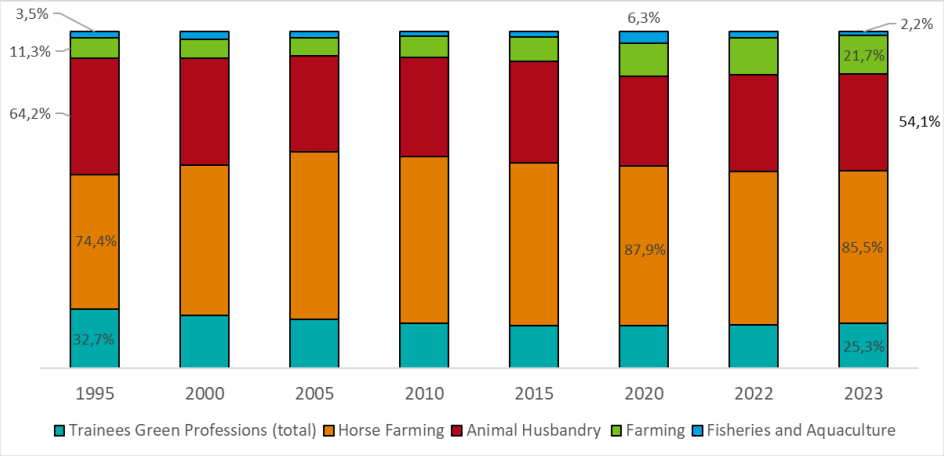
Figure 19: Participants of marine fisheries apprenticeship and master courses at Landesberufsschule für Fischwirte Rendsburg 2008-2023



Source: Thünen Institute (data 2008-2020 from the Annual Reports Landesfischereiverbandes Schleswig-Holstein; data 2021-2023 derived from communication with Berufsbildungszentrum am Nord-Ostsee-Kanal Rendsburg; without data from Berufsschule Sassnitz)

Given the aging demographic in German marine fisheries (Figure 2), and the historical shortage of fishery trainees and qualified masters, it is questionable if the present form of fisheries can be maintained, even under optimal economic and ecological conditions. To some extent, the sector's limited ability to attract new talent appears to be a structural issue, as evidenced by the pronounced gender gap in fisheries and aquaculture, indicating that positions on fishing vessels hold limited appeal for women (Figure 20).

Figure 20: Share of female trainees in selected green professions 1995-2023



Source: Thünen Institute (data according to BLE, 2024d)

Except for fields like horse farming and animal husbandry, the majority of trainees in green professions are male, often comprising up to three-quarters of the total. Furthermore, in some formerly male-dominated professions like farming, the number of women has doubled in the last 28 years. In fisheries and aquaculture, female trainees are almost not represented, neither in the past nor today. The traditional, almost exclusively patrilinear-orientated succession arrangements between fishers seem to be a social risk for the sector in addition to the economic performance and the state of the exploited marine resources.

4.3.1 Sea Ranger training program

“The traditional job profile of Baltic Sea fishers is becoming less economically feasible, as reflected in the low recruitment rates observed in Mecklenburg-West Pomerania (MWP), where recent years have seen minimal new entrants into the Baltic Sea coastal fishery (Graaf et al. 2023). To address these challenges, initiatives are emerging to equip fishers with the skills necessary for a more diversified livelihood, such as “Sea Ranger” advanced training program in MWP. Over six months, fishers are trained in the fields of fisheries biology, environmental law, environmental monitoring, communication, public relations, project management, as well as diversification and marketing strategies, including a four-week internship (FG Wismarbucht eG 2024). The Sea Ranger MV e.V. association was established to streamline the process of hiring fishers for coastal service projects. However, the program faces challenges: specific duties and funding opportunities for Sea Rangers remain undefined, with presently no guaranteed access to public funds or contracts (as of end of 2024). This lack of clarity could hinder the program's effectiveness. Currently, the program is limited to MWP, but might be expanded to another German coastal federal state (Müller 2023)” (Barz et al. 2025)

4.4 Fisheries communities

Depending on how fisheries communities are defined (e.g., place-based communities, communities of practise, communities at sea, e.g., STECF 2024b) the overall picture of German fisheries communities changes.

In the following we have mapped fisheries communities following place-based approaches, according to the number of registered vessels (Table 10, Table 11) and landings per harbour (Table 12, Table 13). However, the attribution of vessels and landings to a particular harbour does not necessarily mean that a fisheries community is located there as well. For ports such as Bremerhaven with high volumes of landings due to a few DWF or Rostock where Germany's largest pelagic trawler is registered, this needs to be questioned.

4.4.1 Place-based fisheries communities: registered vessels

The place-based approach, linking communities to registered vessels, shows 15 homeports in the North Sea with 147 registered vessels (Table 10) in 2023. At the same time, in the Baltic Sea there are 594 vessels registered in 62 homeports (Table 11). According to the numbers of registered vessels, the main German fisheries communities are Büsum (43), Freest (36), Cuxhaven (19), Rerik (19) and Vitte (19). To gain an understanding of some of these communities, there have been case studies collected on the communities of Freest and Sassnitz in the Baltic Sea (Henke 2023) and on Wittdün on the island of Amrum, Büsum, Neuharlingersiel, and Greetsiel in the North Sea (Albrecht 2025) (see chapter 4.5).

Table 10: Number of German vessels registered in North Sea ports (n=15), 2023

Name of port – North Sea	**No. of vessels**
Büsum	43
Cuxhaven	19
Greetsiel	14
Norddeich	10
Accumersiel	8
Hoernum-Sylt	8
Husum	7
Dorum	6
Neuharlingersiel	6
Ditzum	5
Pellworm	5
Bremerhaven	4
Federwardersiel	4
Hooksiel	4
Wremen	4

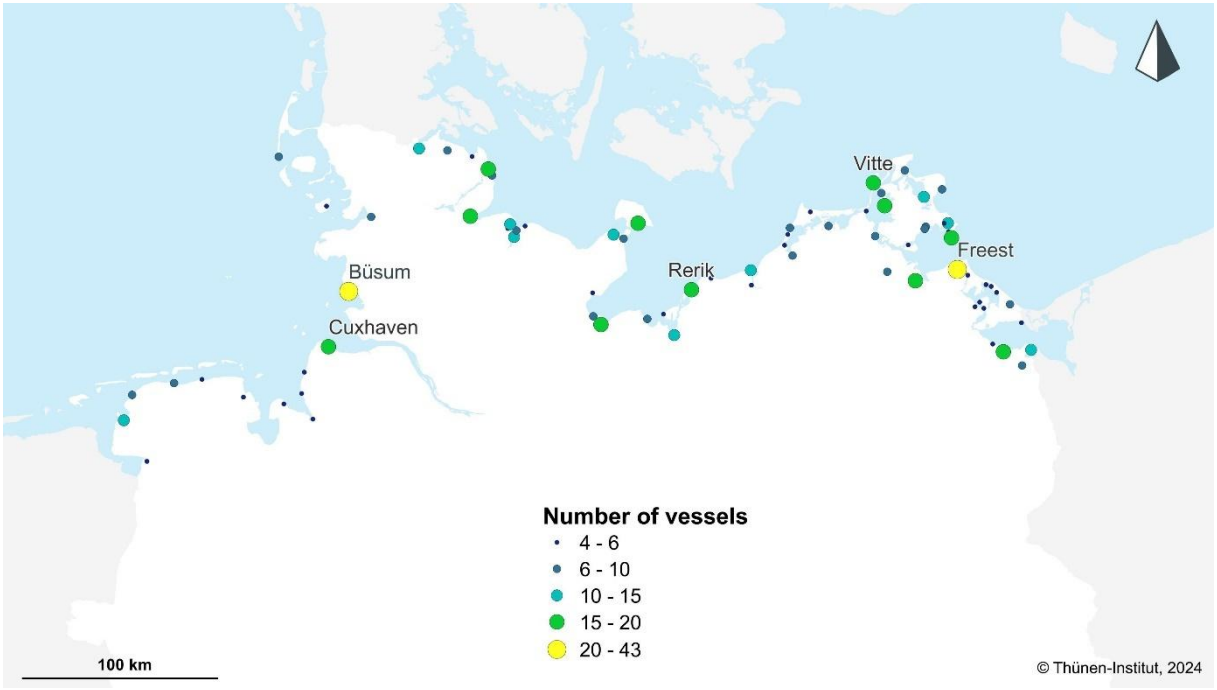
Source: Thünen Institute (data according to BLE)

Table 11: Number of German vessels registered in Baltic Sea ports (n=62), 2023

Name of port - Baltic Sea	No. of vessels	*Name of port – Baltic Sea*	No. of vessel
Freest	36	*Stahlbrode*	8
Rerik	19	*Tarnewitz*	8
Vitte	19	*Usedom*	8
Burgstaaken	17	*Ahlbeck*	7
Eckernförder	17	*Großenbrode*	7
Travemünde	17	*Laboe*	7
Thiessow	17	*Langballigau*	7
Ückermünde	17	*Gelting*	6
Greifswald	16	*Gager*	6
Maasholm	16	*Koserow*	6
Ummanz	16	*Kühlungsborn*	6
Heiligenhafen	15	*Mönkebude*	6
Altwarp	14	*Neustadt (Holstein)*	6
Warnemünde	14	*Rankwitz*	6
Wismar	14	*Seedorf*	6
Baabe	13	*Ückeritz*	6
Lietzow	13	*Kiel*	5
Flensburg	12	*Lassan*	5
Heikendorf	12	*Timmendorf*	5
Strande	11	*Wendtorf*	5
Barth	10	*Wustrow*	5
Kappeln	10	*Zempin*	5
Lauterbach	10	*Zudar*	5
Neuendorf H	10	*Barhoeft*	4
Sassnitz	10	*Dierhagen*	4
Stralsund	10	*Kamminke*	4
Niendorf	8	*Karlshagen*	4
Ahrenshoop – Altenhagen	8	*Prerow*	4
Breege	8	*Rostock*	4
Ribnitz	8	*Warthe*	4
Schaprode	8		

Source: Thünen Institute (data according to BLE)

Figure 21: Number of vessels registered in harbours, 2023



Source: Thünen Institute (data according to BLE)

4.4.2 Place-based fisheries communities: landing ports

A place-based approach linking communities to landing ports identifies 102 landing ports for the Baltic Sea (Table 12) and 36 landing ports for the German North Sea (Table 13). The German landings into North Sea ports accumulate to 13 kt in 2023, while the landings in the Baltic Sea accumulate to 7 kt (excluding Neu Mukran: 3 kt). Neu Mukran, close to the former fisheries community of Sassnitz, is an artefact in the list and has been a landing port where pelagic vessels landed directly into a processing plant. Since mid-2023, the processing plant was temporarily and from May 2024 onwards permanently closed and thus no landings were possible. The facility is still used as a cold storage and logistics hub (Fischmagazin, 2023). According to landings volume, the main fisheries communities are in the North Sea: Bremerhaven (7 kt), Büsum (2 kt), and Cuxhaven (1 kt) (Table 13).

Table 12: German landings (t) by fishing ports of the German Baltic Sea (n=102), 2023

Name of port - Baltic Sea	Volume (t)
*Neu Mukran**	3443.89
Freest	706.09
Sassnitz	452.80
Maasholm	188.25
Kappeln	171.61
Ueckermünde	166.42
Lietzow	143.57
Schaprode	133.68
Heikendorf	123.50
Heiligenhafen	116.03
Usedom	109.61
Mönkebude	95.49
Warthe	76.23
Travemünde	72.43
Barhöft	47.65
Altwarp	47.64
Niendorf	38.66
Ückeritz	36.85
Greifswald	34.25
Gager	31.66
Strande	31.21
Ribnitz	26.86
Burgstaaken	24.41
Warnemünde	23.53
Kamminke	23.46
Eckernförde	23.09
Baabe	22.50
Stralsund	22.25
Wendtorf	20.73
Wiek a. Darß	18.83
Lippe	18.68
Tarnewitz	16.26
Barth	14.92
Laboe	13.24
Thiessow	12.74
Neuenkirchen	12.46
Rerik	11.45
Ahlbeck	10.14
Kühlungsborn	9.68
Breege	9.59
Grossenbrode	9.43
Lauterbach	8.70
Vitte	8.25
Wustrow	8.10
Zempin	7.83
Wismar	7.57
Neuendorf auf Hiddensee	7.01
Rankwitz	6.72
Wittow	5.71
Karlshagen	5.40
Flensburg	4.86
Ummanz	4.85
Koserow	4.36
Stahlbrode	4.23
Gelting	4.11
Prerow	4.07
Wiek auf Rügen	3.90
Pruchten	3.59
Dierhagen	3.46
Langballigau	2.54
Seedorf	2.51
Binz	2.45
Dranske auf Rügen	2.03
Rostock	1.99
Born	1.96
Schönberger Strand	1.94
Damp	1.85
Kloster	1.72
Kloster	1.72
Lassan	1.68
Heringsdorf	1.66
Kirchdorf	1.52
Glowe	1.48
Neustadt (Holstein)	1.36
Zinnowitz	1.36
Zudar	1.06
Zingst	1.01
Bansin	0.90
Vitt-Arkona	0.87
Bodstedt	0.85
Wolgast	0.73
Schleswig	0.69
Kiel	0.52
Sierksdorf	0.49
Boiensdorf	0.48
Timmendorf	0.42
Orth	0.39
Ahrenshoop-Althagen	0.34
Bockholmwik	0.27
Dahme	0.21
Redentin	0.20
Lübeck-Gothmund	0.19
Schubystrand	0.13
Dassow	0.11
Stein	0.10
Friedrichsort	0.09
Trassenheide	0.08
Klein-Zicker	0.08
Haffkrug	0.07
Gristow	0.04
Grömitz	0.03
Zecherin	0.03

*Neu Mukran marks a processing plant, closed in 2024

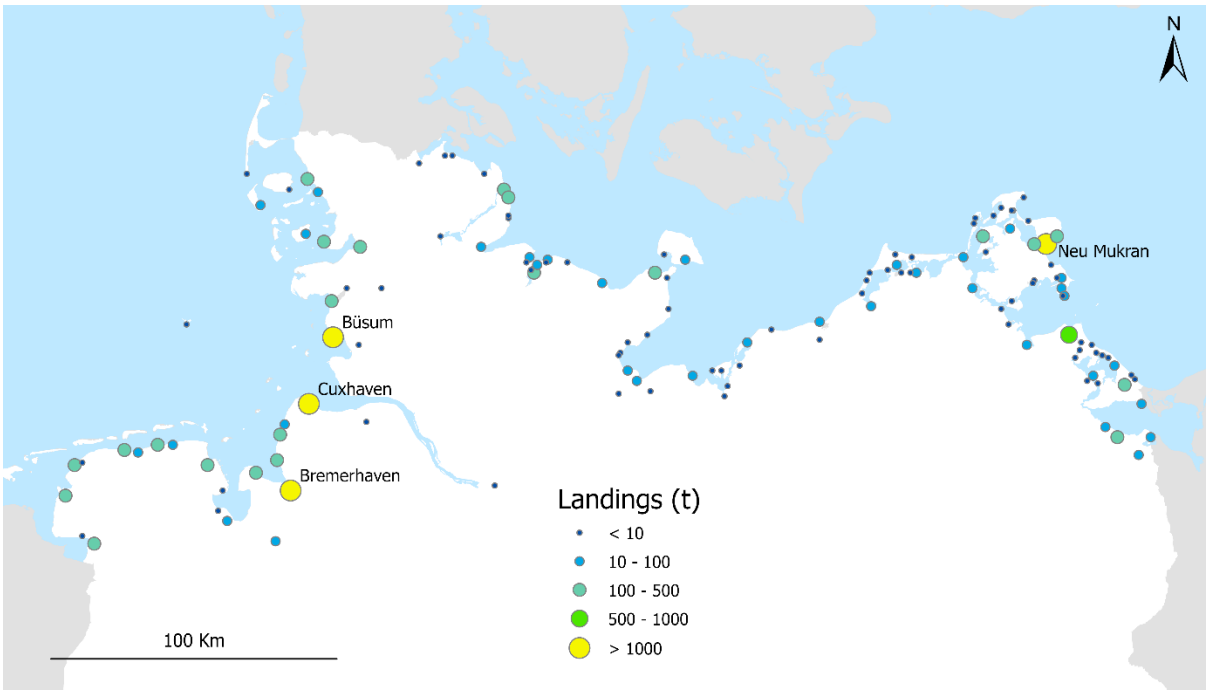
Source: Thünen Institute (data according to BLE)

Table 13: German landings (t) in fishing ports (n=36) of the German North Sea, 2023

Name of harbour - North Sea	**Volume (t)**
Bremerhaven	7037.03
Büsum	1861.67
Cuxhaven	1216.83
Greetsiel	337.03
Fedderwardersiel	298.08
Norddeich	260.57
Accumersiel	237.58
Eidersperrwerk	217.18
Ditzum	208.39
Husum	206.38
Dorum	164.36
Nordstrand	151.17
Hooksiel	146.81
Neuharlingersiel	129.77
Wremen	111.75
Dagebüll	109.06
Pellworm	97.59
Brake	81.19
Schlüttsiel	58.56
Spieka-Neufeld	56.44
Bensersiel	42.66
Varel	29.55
Amrum	28.66
Harlesiel	25.65
Tönning	7.09
Helgoland	5.07
Geversdorf	4.43
Dangast	3.91
Hennstedt	2.00
Hamburg	1.68
Emden	1.55
Wyk auf Föhr	1.31
Norden	0.63
Wilhelmshaven	0.21
Hörnum-Sylt	0.14
Meldorf	0.03

Source: Thünen Institute (data according to BLE)

Figure 22: German landings (t) in German ports, 2023



(Neu Mukran marks a processing plant, closed in 2024)

Source: Thünen Institute (data according to BLE)

4.5 Fisheries through the social lens – selected case studies

In the following section, we present a selection of relevant case studies on the social dimensions of fisheries in Germany. To the best of our knowledge, these case studies represent some of the most pertinent contributions offering a social science perspective on fisheries communities, the habitus, agency and perspective of fishers, and the cultural significance of fisheries.

The multiannual management plan for cod in the Baltic Sea: reactions and sentiments in two German fishing communities (Strehlow 2010)

Just before and one and a half years after the implementation of the Multiannual Management Plan for the cod stocks in the Baltic Sea in 2007, the same two fishing communities on the German Baltic coast were visited to understand the impacts of the plan. Such information is a prerequisite for policy-makers to mitigate possible negative consequences on specific fleet sectors. During semi-structured interviews, observations, and group discussions, information on the reactions and the sentiments about the plan prevailing in the communities was collected. In general, the plan found widespread approval, because it improved planning reliability for fishers and cooperatives considerably. Conversely, the unavoidable reduction in fishing effort stipulated in the plan has had strong adverse effects on small-scale fishers. The survey furthermore revealed that this fishery segment using passive fishing gear is among the most vulnerable, being the group with the lowest income, little resilience to cope with further restrictions, and no lobby to improve their position.

Biographical perspectives of small-scale Baltic fishers to understand social-ecological transformations (Braun 2022)

The German SSF in the Baltic Sea is facing one of its most severe crises due to several complex, interrelated social-ecological changes. Most lately, directed fishing for the main target species, cod and herring, has been largely closed. The study examined how changes in the social-ecological system influence both the livelihoods and the sense of agency of small-scale Baltic fishers in Mecklenburg-Western Pomerania. It was investigated as to what extent diminished agency constrains sustainable livelihoods and which methods support SSF, to fulfil their roles as agents capable of freely determining their goals and achieving them without undermining their livelihoods. Biographic interviews were conducted with five SSF fishers and analysed using thematic qualitative text analysis. Incorporating sequences into a recently published framework to operationalise agency, this study shows that the current changes in the social-ecological system diminish the sense of agency of small-scale Baltic fishers. Their ability to be agents of their wellbeing and stewards of their environment decreases, which undermines their livelihoods. Short term and low threshold measures that reduce the risk of livelihood failure include the exploration of the potential to market catches as regional products. Long term and profound measures should instead encourage and support fishers to act politically and focus on co-learning and co-managing strategies to enhance the effectiveness of fisheries management.

Fishing livelihood of gillnetters – a community of practise (Barz 2022)

The comprehensive study on German gillnet fishers showed, inter alia, that fishing can be seen as a patrilinear inherited occupation. Fishers usually come from a long line of fishers and start at a young age to learn from their fathers. Later, they might inherit vessels or other resources to start their own fishing business with low initiating costs. This leads to an institutionalization of bequeathing practices between generations. At the same time, this mechanism also restricts the possibilities of fishing, depending, for example, on a certain gear or range of the vessel.

Fishers enjoy being with nature and the freedom and independency they ascribe to fishing, which are two factors that function as action guiding. Emphasizing the values of satisfaction and freedom distances fishing from other notions of gainful employment, where the purpose of earning money dominates. However, fishers also state that it is nevertheless a matter of profitable work, which must also bring revenue.

The fishers document a close attachment to their fishing practice with gillnets. This attachment to gillnets is made plausible in different ways: ecological advantages, economic advantages, and habit. Nevertheless, there are fishers who already apply other gears than gillnets, and some argue that anything else would not make sense, regardless of whether they have used other gears than gillnets before. The fishers that decide to stick only to gillnet fishing document evaluative reflections when they narrate how they have tried different gears before, such as trawls or long line, but ended up with applying mostly gillnets after these trials.

The working days of gillnet fishers are divided into several phases, oriented towards specific time frames: preparation, fishing, and post-processing. The preparation phase consists of getting dressed in work clothes, checking and maintaining the engine and vessel in detail, and checking for all the equipment so that they do not miss anything once they are at sea. In other cases, the morning routine at home is already thematized as part of the workday. In these cases, there is no spatial break between the private sphere and the work sphere. Preparation is followed by the fishing itself, during which fishers drive to their fishing grounds, check their nets, and retrieve and set them again. Logically, fishing is always bound to the range of the vessel and the Baltic Sea or Greifswald Bay, respectively. Most fishers are alone during this phase of the work. It is followed by the post-processing: back at the harbour the fish is processed, regardless of the different marketing channels pursued by the fishers, and nets are cleared as well as fixed. Helping hands regularly join the workday during this phase—often supplied by pensioners or wives who assist in the processing of the fish. This mostly informal work is an important resource for fishers, enabling them, for example, to pursue the more time-consuming but more profitable direct marketing.

With a praxeological view and in applying the concept of agency (Emirbayer and Mische 1998), three types of fishers´ dominating agency within the study group were distinguished:

(i) Fishers with a dominating projective (future-oriented) agency plan long term, keep abreast of current developments in the fishery and develop teleological projects.

(ii) Fishers with a dominating evaluative (present-oriented) agency constantly evaluate and re-evaluate their situation. Evaluative social practices are not teleological and are rather characterized in the fishery by decisions that are directed to present situations. This can also show in deviant behaviour.

(iii) Fishers with a dominating iterative (past-oriented) agency are characterised through the iteration of known schemes of action, which therefore reproduce social practices constantly. Such iterative aspects can be seen in fishers who solely apply gillnets

Barz concludes that considering the social practices of resource users may be an important contribution to design effective natural resource management instruments. The inclusion of sociology, sociologically established theories, and qualitative reconstructive methods has led to practice-relevant insights into how knowledge on human behaviour may inform management.

The importance of fisheries for 'Sense of Place' in Sassnitz and Freest (Henke 2023)

In her master´s thesis, Henke (2023) investigated the relationship between local fisheries and the local Sense of Place (SoP) in two coastal regions in north-eastern Mecklenburg-Western Pomerania: Sassnitz and Freest. Henke applied semi-standardized, semi-structured expert interviews (Döring and Bortz 2016) which were analysed applying qualitative content analysis (Mayring 2016) to capture the views of stakeholders from different dimensions (fishing, cultural, touristic and political). In both ports, fishing has played or plays an important cultural role, especially regarding tradition, history and as an attraction for tourists. However, the changes due to the decline of fishing businesses are evident in both regions, albeit to different degrees.

In Sassnitz, the harbour as a focal point is increasingly marketed for tourism and will probably continue to be subject to this change in the future. A culture of remembrance is coming to the fore to preserve the fishing history and its contribution to urban development. With the decline of the generations that have experienced or practiced fishing to a different extent, the emotional bond in the form of memories of fishing in the area could also continue to dwindle. A change in the SoP could be the consequence.

In Freest, fishery is still an economic factor. Cognitive elements of fishing tradition are present and the connection of the community to local fishing is more pronounced via different perceptible symbols. Efforts are being made to preserve the fishing industry and its cultural heritage. A loss of fishing would have consequences for the fishing village, also in adjacent areas such as hospitality industry, as fishing and the harbour seem to be the main attractions of Freest.

Both regions are working to preserve their local fishing heritage so that it does not lose its cultural value despite declining economic relevance. Understanding the ways in which people are connected to local fisheries and how this influences their behaviour is an important insight into the feasibility of (policy) management measures, which should always consider the social dimension of sustainability.

Return of grey seals (Fräger et al. 2023)

The frequency and severity of interactions between humans and wild animals are increasing worldwide. These interactions can cause considerable economic damage to users of natural resources or result in the decline of (protected) wildlife populations, creating human-wildlife conflicts. In this context, effective management plans are crucial for mitigating the increasing human-wildlife conflicts, a significant threat to wildlife conservation. Grey seals were long considered extinct along the German Baltic Sea coast. However, since 2005, they have been recolonizing the Baltic Sea coast, including Mecklenburg-Western Pomerania. The return of the grey seal is a major challenge for the German coastal fishery in the Baltic Sea due to interactions with seals as they are eating fish already caught in gillnets, which at the same time can be damaged by seals. In addition, seals are being caught as bycatch in fishing traps. To reduce the conflict between seals and fisheries, a participatory process for developing a fisheries-seal conflict management plan was initiated in March 2019, and an advisory board was appointed. The project by Fräger et al. aimed to enrich the process of creating a seal management plan with a social science dimension.
Based on a framework of key success factors for developing management plans addressing human-wildlife interactions identified in a preceding study, we conducted qualitative, semi-structured interviews and evaluated this (incomplete) process of developing a seal management plan. The framework was operationalized by defining specific measures for the active monitoring and management of successful processes. These include integrating professional facilitation, considering diverse knowledge systems, and ensuring equitable representation of various sectors to prevent one group, such as fishers, from being outnumbered.

The results of a qualitative analysis show that the issue is discussed in a multifaceted way by stakeholders. There is broad agreement on the precarious state of coastal fisheries and on the principle that achieving coexistence between fisheries and seals should be a central objective of the management plan. Conflicting perspectives of the stakeholders are found especially with regard to the population status of seals and the effectiveness of compensation schemes (see chapter 3.2.2). The progress of the process so far for creating a management plan is seen as `tough` by interviewed stakeholders due to a lack of continuity in meetings, missing responsibilities, a lack of personnel capacity, or different prioritization of the topic within the institutions. We identify further elements of success factors for processes involving human-wildlife interactions, such as adequate time management to prevent prolonging such processes, and the political will to complete them.

Professional identity in the lifespan: How do fishers along the Baltic coast in Mecklenburg experience the potential disappearance of their profession? (Orlok 2023)

“Very little is known about the complexity of the vocational identity across the lifespan of small-scale fisheries of the Baltic Sea of Mecklenburg-Western Pomerania, Germany. This study examines fishers working at the Baltic Sea Coast and their experiences of possible losses of their occupational profile. Six narrative interviews with fishers aged 32 to 74 years were conducted between October 2022 and February 2023 at their work sites. These were coded according to the Grounded Theory methodology. Fishers along the Baltic Sea coast of Mecklenburg-Western Pomerania in Germany experience the impossibility to maintain their occupational ideal image. The fishing and family milieu shaped by the GDR era influences their esteemed professional ideal image. This moderates the strategies of dealing with the impossibility of maintaining their occupational ideal image. The economic framework of local fisheries as well as the milieus have an impact on resilience, resources and coping strategies of the fishers. However, despite a poor prognosis for regional fisheries, they persist in the profession with sometimes individually different consequences at the cognitive, emotional, or behavioural levels.” (Orlok, 2023, pg. II)

Social Practice in Fisheries (Lasner et al. 2025, forthcoming)

Fisheries across the European Union are experiencing significant stress. The economic crisis in German fisheries, as an example, has become increasingly evident over the past decade, with resulting structural challenges rooted in post-productive developments within coastal communities. Lasner et al. conceptualize social adaptive capacity as the human ability to anticipate, respond to, and recover from various stressors in peoples´ environment, extending the term from its origins in climate change studies to a wider sociological scope, encompassing broader social and economic challenges. The authors challenge the traditional view of fisheries as solely economic profit maximizing, arguing that a narrow economic perspective fails to account for diverse coping strategies fishers employ in response to the structural changes within the fishing industry.
The authors apply Pierre Bourdieu's sociological framework to the context of fisheries, conceptually engaging with the notion of social practises, which encompass habitus (the internalized dispositions guiding actions), various forms of capital—cultural, economic, and social (resources used to act)—and social fields (the arenas in which agents act). These concepts are utilized to explore how fishers' social practices influence the adaptive capacity of fisheries in the context of impending structural change.
Applying an abductive research approach and a Bourdieusian theoretical lens, German fisheries serve as a case study to illustrate the sector's adaptation to ecological, economic, and political transformations. Fishing practices and fishers´ experiences are examined based on interviews and group discussions with 98 fishers conducted between 2018 and 2023 across several research projects.

From an economic capital perspective, a fisher's practice has been evaluated through production success, understood as more than volume and value of landings. Rather, it is the landed catch, reflecting the outcome of a complex interplay between vessel, gear, target species, fishing location, and fishers´ knowledge, all influenced by seasonal conditions, weather, sea currents, and market prices. Additionally, investments in vessels, as expressions of economic capital, serve as tangible indicators of fishing careers and strategic decisions regarding future opportunities.
Knowledge of good fishing practices is often rooted in generational involvement in the profession, referred to by the authors as biographical heritage. This generational transmission of knowledge represents a form of cultural capital, serving as a key source of expertise in fishing. At the same time, a fisher's family ties and relationships within the fishing community contribute to the development of social capital. This social capital facilitates access to information about current fishing opportunities, supports the adoption of innovations—such as new species, gear, vessels, or markets—and provides informal support through unpaid labour and care work.

Freedom is a core concept underlying fishers' social practices and is commonly understood as the degree of flexibility in decision-making. From the fishers' perspective, however, the previously autonomous social field of fisheries has shifted towards increased dependency. Fishers often experience a sense of powerlessness in relation to the growing presence of diverse marine user groups and the growing impacts of climate change and human exploitation. Consequently, their flexibility diminishes, leading to a reduced social adaptive capacity in the face of systemic change.

To enhance fishers' social adaptive capacity, the authors recommend strengthening the various forms of capital identified in their analysis. This includes bolstering economic capital through mechanisms such as investment funds that provide financial support for fishers' innovative initiatives; strengthening social capital by facilitating the development of professional networks; and preserving cultural capital through initiatives aimed at generational renewal to ensure the transmission of fishing knowledge amid structural change.

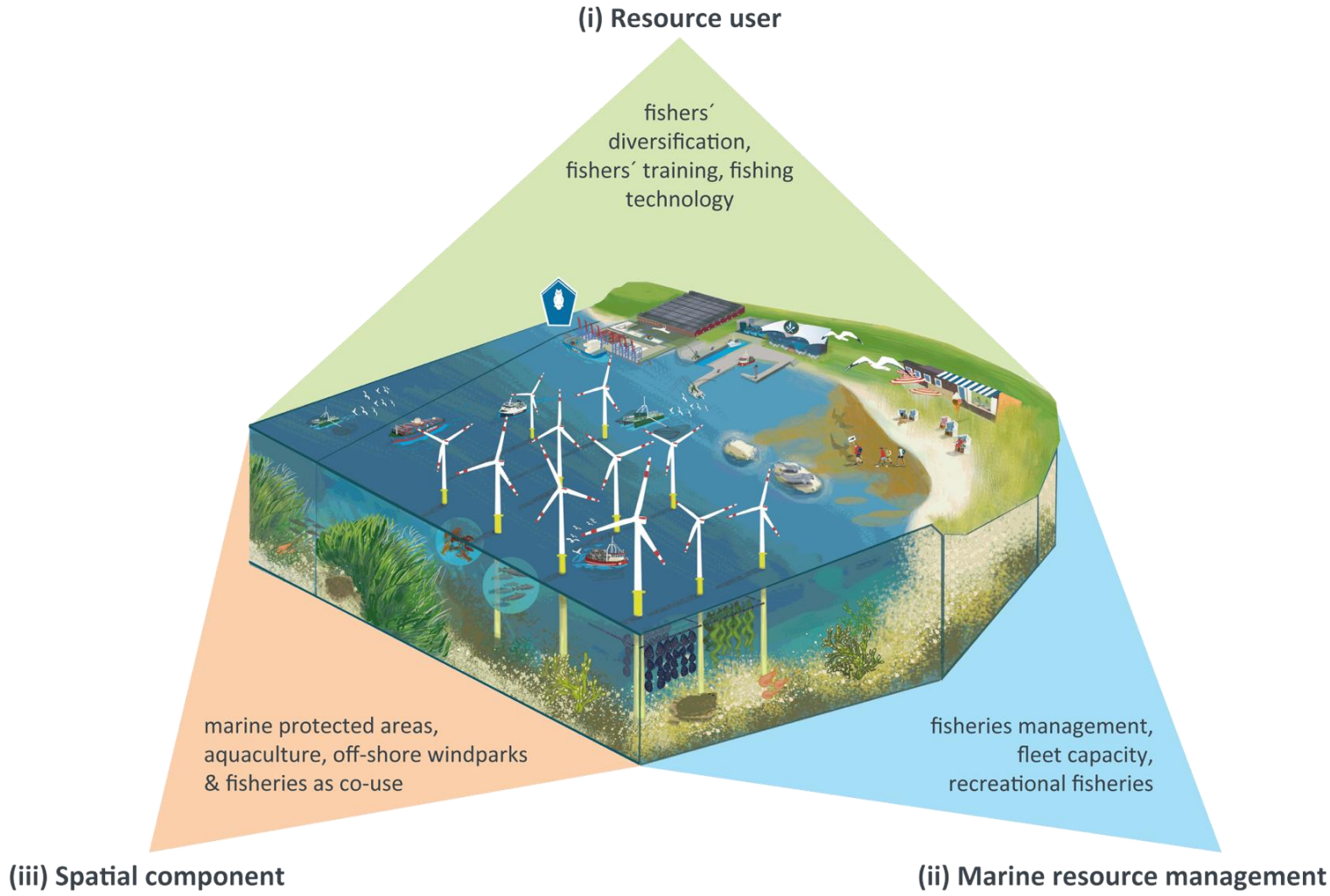
German Coastal Fisheries 2045 – visions from a future workshop (Lasner and Barz 2023)

Climate Change, degrading fish stocks, fishing bans, BREXIT, an overaged fleet, a lack of successors, Covid-19 and increasing spatial competition: Nowadays, coastal fisheries in the North and Baltic Sea face many challenges. A group of 14 opinion leaders from municipal politics, nature conservation, tourism, seafood trade, marine spatial planning, science, and commercial and recreational fisheries developed a shared vision for German fisheries in a future workshop. Shared visions of the future are forward-looking pictures that are specific enough to guide decision-making in marine management on the one hand. On the other hand, the set time frame up to 2045 allowed participants to conceptualize solution-orientated thinking and scenarios without being completly affected by present events. The target pictures draft marine space as a bustling area, where many different stakeholders operate, exploit marine resources and fisheries will be permitted in most marine areas as parallel users. In addition, fishing companies diversify their business strategies to ensure profitability. Aquaculture, processing and marketing become part of an enhanced regional future seafood value chain. Future fisheries' organisations further offer diverse marine services as part of their tomorrow business portfolio. The target pictures illustrate a demanding transmission process for the sector, which enables an economical feasible, commercial small-scale fishery. At this early stage of research, the concrete implementation of the target pictures is still unclear, but the pictures already provide a valuable contribution towards the political discourse about the future of coastal fisheries in Germany

An analysis of a stakeholders´ vision on the future of coastal fisheries in Germany (Barz et al. 2025)

Coastal fisheries in Germany are undergoing significant structural changes. Key challenges include the declining productivity of commercially important fish and shellfish stocks, the loss of traditional fishing grounds, a dwindling interest of the younger generation to become fishers, high fuel prices and an aging fishing fleet. In this context a workshop was convened to develop a future vision for German coastal fisheries. This study builds upon the findings of the "Future Workshop Coastal Fisheries 2045", where nine core elements were discussed by participants: diversification strategies for fishers, fishers´ training, technological advancements, fisheries management, fleet capacity, recreational fisheries, aquaculture, marine protected areas, and offshore wind farms. Our interdisciplinary team of authors described these elements in light of current knowledge, critically examined their implications, and explored potential implementation strategies. Three perspectives were then identified: the resource user perspective, the marine resource management perspective and the spatial dimension (Figure 23). Our findings underline the necessity of an interdisciplinary and transdisciplinary approach of integrating fisheries into a multi-use concept of marine space in the future. This research contributes to the fields´ future research, while offering foundational knowledge about the present state of research on specific aspects of German fisheries. This study also provides valuable insights for policymakers, practitioners, and stakeholders in other EU countries undergoing fisheries transformations.

Figure 23: Divergent perspectives on the future of German coastal fisheries



Source: Barz et al. 2025

Ports as transition spaces of sea- and land-life worlds (Albrecht 2025)

Albrecht (2025) did four case studies in the fishing ports of Büsum, Neuharlingersiel, Greetsiel, and Wittdün along the North Sea Coast in the Wadden Sea. The ports were chosen based on the principle of contrasting cases (Strübing, 2018) in the federal states of Schleswig-Holstein and Lower Saxony. In addition to participant observation and the accompaniment of a three-day fishing trip on a shrimp fishing vessel, 24 interviews were conducted with active and former fishers, mayors, restaurant owners, managing directors of fishing supply companies, and employees of harbour management. The field research included multiple visits to these locations between November 2022 and December 2023. The analysis of the interviews followed the principles of Grounded Theory (Clarke and Friese 2007). Preliminary findings from the ongoing research indicate that the sea constitutes an integral part of fishers' local context, with perceptions and interactions shaped by vessel size and geographic areas of operation. For the fishers, the transition between 'land' and 'sea' takes place at the port. Although the lifeworlds 'on land' and 'at sea' are temporally, spatially, and semantically separated, they form an existentially intertwined unit. 'The port' seems to be a focus for both sea people and land people where perspectives meet - be it as a safe arrival, for supplying the ship, for landing catch, for looking at the vessels and fishers, as a location for shipyards, restaurants, suppliers and buyers of seafood or as a place to stay. The intertwining of the lifeworld aspects 'at sea' and 'on land' could only be considered through the equal investigation of both aspects. Further, a distinction can be made between nomadic and sedentary fishers. There is a statistically measurable focus of sedentary fishers in the geographic centre of the German Bight. Nomadic fishers are more likely to be found in the northern and western waters of the North Sea. In the land-sea living space of the fishers, there are various forms of community (networks) that function as learning communities in which family relationships appear to play a significant role. These communities are relevant for career opportunities of fishers, the search for qualified employees, and fishing opportunities. In all four ports, fishing, local culture, and tourism are closely interwoven. These are not simple, direct relationships, but rather multifaceted connections at commercial, social, structural, and symbolic levels. Various local agreements allow fishers to continue their work despite increasing tourism. It is still unclear how the different social networks and the tangible infrastructure on-site affect the fisher's ability to adapt to structural change. However, initial results allow the following (hypothetical) conclusions:

- Fishers along the North Sea coast form a community of practice with several centres in the German Bight.
- Fishers are willing to adapt to new fishing practices, such as fishing for new species.
- Fishers are generally open to innovations (within fisheries) but do not want to take high risks due to low equity reserves.
- Adaptation opportunities beyond fishing (e.g., new business areas, diversification) are seen as exit strategies by some fishers and are rarely considered voluntarily.

Intangible world cultural heritage

It is worth mentioning that the German small scale coastal fishery of the Baltic Sea has submitted an application to the responsible Standing Conference of the Ministers of Education and Cultural Affairs of the Länder to have its fishery recognized as an intangible UNESCO world cultural heritage in 2024. Our latest information is that there has not yet been a decision on this application (January 2025).

4.6 Marine recreational fisheries

In addition to commercial fisheries, recreational fishing plays a significant role in the utilization of fish as a resource in Germany. Based on the most recent representative population survey, the number of marine anglers in Germany was estimated at a total of 220,000 in the Baltic Sea and the Bodden waters (coastal lagoons in the Baltic Sea), and 68,000 in the North Sea (Lewin et al. 2023b). The North Sea accounted for around 128,000 fishing days, the Baltic Sea for around one million and the Bodden waters for around 252,000. The majority of anglers (93%) are men with an average age of around 50 years who live in 2 to 3-person households. Most of them started fishing in their youth.

Marine recreational fishing in Germany is concentrated in the Baltic Sea, not only because of the length of the German Baltic Sea coast (around 2,400 km), but also because of its varied structure with alternating sandy beaches and rocky shores, which are suitable for fishing from the shore. In addition, the Baltic Sea has a low tidal range and weather conditions that favor boat fishing, making it an attractive fishing area (Lewin et al. 2023b; Strehlow et al. 2012). Fishing is not only practiced from the shore, but also from piers, small boats and larger charter boats (fishing cutters). In the Baltic Sea, around 60% of anglers fish from the shore, 30% from boats, 5% from fishing boats and 5% could not be assigned (Lewin et al. 2023b).

Key target species are cod (*Gadus morhua*), flatfish (especially dab (*Limanda limanda*), plaice (*Pleuronectes platessa*), flounder (*Platichthys flesus*)), herring (*Clupea harengus*), garfish (*Belone belone*), sea trout (*Salmo trutta*) and salmon (*Salmo salar*) in the open Baltic Sea, as well as pike (*Esox lucius*), zander (pikeperch, *Sander lucioperca*) and perch (*Perca fluviatilis*) in the coastal lagoons of the Baltic Sea (Lewin et al. 2023b; Arlinghaus et al. 2023; Koemle et al. 2021; Weltersbach et al. 2021). The most popular target fish species in the North Sea were sea bass (*Dicentrarchus labrax*), flatfish (particularly plaice (*Pleuronectes platessa*)), cod (*Gadus morhua)* and mackerel (*Scomber scombrus*) (Weltersbach et al. 2021; Lewin et al. 2023b).

Studies show that the majority of Baltic Sea anglers are domestic fishing tourists that travel considerable distances between their place of residence and their fishing spot (Lewin et al. 2021; Lewin et al. 2023b). The average travel distance for cod anglers was 163 km, which was significantly longer than that of herring anglers, who traveled 81 km (Lewin et al. 2023b). A comparison of travel distances in the period 2016/17, which was characterized by a sharp decline in the cod stock in the western Baltic Sea and the first-time introduction of harvest limits, showed that the number and travel distances of cod charter vessel anglers declined after the introduction, while the number and trip distances of boat and shore anglers fishing for cod remained constant despite overall declining catch rates (Lewin et al. 2021). This study demonstrates the effects of management decisions on angler behavior and thus also the social and economic impacts on the sector.

The motives for marine recreational fishing are diverse. German Baltic Sea anglers rated those motives high, which were associated with relaxation and experiencing nature (Lewin et al. 2023b). For example, more than 95% of respondents agreed with the statements `I appreciate the peace and relaxation of fishing`, `I like to spend time in nature` and `I like to spend time in beautiful surroundings`. Statements such as `I go fishing to escape from everyday life`, `I want to spend time with friends or family` and `I go fishing to get fresh fish as food` also achieved comparatively high approval ratings. This does not mean that catching fish is irrelevant for cod anglers, as some studies show (Bronnmann et al. 2023). Cod anglers in particular are interested in catching cod for consumption, but catching fish for the kitchen is not a decisive factor in the overall fishing experience of cod anglers. Only around 17% of the sea anglers surveyed agreed to the statement `I would like to catch as many fish as possible`. Cod fishing is therefore more of a holistic experience that combines both catch and non-catch aspects (Lewin et al. 2023b).

Annual marine recreational fisheries expenditure was estimated at €248 million. An economic impact study found that the annual expenditure of all German marine anglers generated a total production value of €472 million in the German economy, corresponded to a gross value added of €214 million and supported around 4,500 jobs (Strehlow et al. 2023). The Baltic Sea and Bodden waters accounted for the largest share (€413 million and 3,777 jobs). The same study showed that the economic impact of marine anglers in Germany was important to the local economy providing income to coastal communities from outside these areas (Strehlow et al. 2023). The data shows that marine recreational fishing is a relevant economic sector in Germany. Fishing tourism is of particular importance to society because it brings money into coastal regions that would not be spent there without recreational fishing (Weithman 1999). Recreational fishing tourists frequently visit coastal areas during periods of low general tourist activity. Data also show that of the €210 million in economic impact and the 2,044 jobs supported by angling in Mecklenburg-Western Pomerania, 89% were attributable to domestic fishing tourists from other federal states, while only 11% were generated by local anglers. (Strehlow et al. 2023). Assuming a similar distribution for the entire German marine angling sector, this would mean that €190.5 million of gross value added and 4,035 jobs were generated by domestic angling tourists.

While marine recreational fisheries in Europe are often highlighted for their socio-economic contributions, particularly in terms of supporting local economies, tourism, and providing recreational benefits (Strehlow et al. 2023), their contribution to food security should not be overlooked. Generally, marine recreational fisheries provide an important additional source of fresh fish for many coastal communities, contributing directly to human nutrition (and thus food security) and reducing dependence on commercial fish markets (Cooke et al. 2018; Nieman et al. 2021; Pitchon and Norman 2012). Other aspects encompass cultural aspects where individual recreational fishers are part of poor, indigenous, diasporic or immigrant communities (Pitchon and Norman 2012; Nieman et al. 2021; Nyboer et al. 2022), as well as the social-cultural services marine recreational fisheries can provide (Liu et al. 2019; Nieman et al. 2021).

Further aspects that could be considered for application in the German marine recreational fishery are as follows. Recreational Fisheries also contributes to peoples´ health: Marine recreational fisheries contributes to public health by reducing stress, improving sleep quality (Nieman et al. 2021; Pita et al. 2022) and generally increasing well-being through recreation in blue spaces (White et al. 2021); Individuals who participate in marine recreational fisheries may consume more fish, leading to higher fish consumption and thus positive health outcomes (Cooke et al. 2018; Nieman et al. 2021; Pita et al. 2022); And while fish consumption may have positive health effects, wild fish may be contaminated; therefore, food safety monitoring and identification of vulnerable communities are important policy considerations (Cooke et al. 2018; Pitchon and Norman 2012; Wiech et al. 2021).

The concepts and methods used in these international studies have not been applied to the marine recreational fisheries in Germany, but they provide a basis for consideration in Germany and elsewhere.

5 Current trends, issues and developments

5.1 PESTLE analysis

A PESTLE analysis categorizes issues according to their political (P) economic (E), social (S), technological (T), legal (L) and environmental (E) dimensions (Mantziaris et al. 2024). Based on the national fisheries profile and the authors´ expertise, the PESTLE dimensions focus on the strengths (marked by a " + ") and challenges (marked by a " – ") of German fisheries as summarized in Figure 24.

Political aspects of German Fisheries

The German fisheries policy demonstrates a commitment to the sector's preservation, as evidenced by the recent establishment (and their completion as well as their final reports) of two political commissions dedicated to fisheries future. This commitment is further supported by research projects investigating future trajectories for the industry, alongside funding provisions for fishers´ training, the development of new vessels, gears, exploitation (and management) of new species, and the establishment of an agency tasked with facilitating fisheries´ transformation. Further, the returns prescribed by law (WindSeeG 2016) from the auction of marine areas for offshore wind farms form a budget to finance initiatives from fisheries, innovations and new measures aiming for transformation of the sector. Notwithstanding, policy makers and fisheries managers have not transferred these positive developments into a concrete roadmap for fisheries' future in Germany. Therefore, a planning uncertainty for fishing companies regarding future investments can be seen as a crucial barrier for a successful transformation of the sector.

Economic aspects of German Fisheries

Despite the current crises in the fishing industry overall, the DWF and parts of the LSF are still able to operate profitably in mid- and long-term. They still offer comparably high salaries and profit per labour force in some selected fishing segments, showing the potentially existing economic attractiveness of the sector, while SSF at the Baltic Sea are struggling. Additionally, irregularly recurring scrapping bonuses offer some financial relief in the fishing sector, the diversification skills of some fishers provide a degree of adaptive capacity and recreational fisheries generate significant local economic impact. In general, commercial fisheries cover nominally around 18% of the domestic market demand for seafood (2023). However, since seafood landed by German vessels abroad is only partially reallocated to the domestic market, the effective self-sufficiency rate is lower.
In face of economic difficulties, including the inefficiency of small-scale Baltic Sea fisheries, limited bargaining power among shrimp fishers due to the market dominance of three major retailers, elevated fuel costs affecting certain fleet segments, and low investment levels, a concentration of fishing capacities towards fewer companies, vessels and fishing ports is ongoing.

Social aspects of German Fisheries

German fisheries benefit from a qualified scientific workforce dedicated to ensuring sustainable resource exploitation. There is also a growing recognition of the sector's potential relevance (including recreational fisheries) to local communities. However, the sector faces challenges, including a declining number of new entrants, a lack of incentives for female participation, and an observed increase in the dissolution of fisheries cooperatives and associations in recent years. Further, the social and cultural value of fisheries is not well explored, but the coastal tourism could benefit indirectly from fisheries' presence in ports. However, apart from some initiatives of SSF fishers' direct marketing, fisheries have not yet succeeded in transferring their non-market values into economic benefits on a broader scale.

Technological aspects of German Fisheries

There is scientific and financial capacity for research on and further development of modern vessels and fishing gear in Germany. However, challenges remain regarding the untraceable voluntary adoption of alternative devices within the fishing sector and regarding the in parts suboptimal level of collaboration between fisheries and the scientific community in the development of new technologies.

Legal aspects of German Fisheries

The political commitment to the preservation of fisheries is evidenced by the statutory allocation of financial resources in laws and regulations (e.g., revenues from the auctioning of offshore wind farm areas or compensation payments for seal-related damages), as well as the establishment of political commissions dedicated to the future of fisheries.

A key challenge of the CFP lies in its reliance on a fixed, historically based quota allocation, which no longer reflects the current composition of catches and fleet structures. The main reasons are changes in the distribution of species due to climate change and the loss of fishing opportunities due to Brexit. Today, fishers are partly not able to utilise the available resources. The present quota system allows for swapping of quotas between nations as a way to provide more flexibility, but bureaucratic burdens are high and Brexit has worsened swap options with the United Kingdom. For some of Germany's fisheries, such as the Norway lobster fishery, it is essential to swap. A reform of the CFP can be key and greater flexibility for fishing would be useful to enable fisheries' adaptive capacity towards a changing environment.

Further, there are shortcomings in data collection in fisheries. For instance, although German fisheries have benefited from national governance initiatives aimed at their preservation, as well as from the development and brief implementation of the MOFI app—designed to enable the traceability of fishing activities—several challenges continue to hinder effective management. These include the non-implementation of the MOFI app in the long term, the lack of traceability for vessels under 12 m in length, the absence of mandatory bycatch recording for marine mammals and seabirds, and the potential displacement of fishing activities due to the expansion of offshore wind farms and marine protected areas.

Environmental aspects of German Fisheries

German fisheries demonstrate positive developments in the Northeast Atlantic, including improved stock status and sustainable exploitation of key target species. New commercial species like lobster, crabs, squid, and others have spread in the North Sea and fisheries have adapted accordingly. However, effective management measures for new species have yet to be established. Simultaneously, the brown shrimp stock in the North Sea is subject to uncertainty regarding its abundance, while commercially important stocks such as cod and herring in the Baltic Sea appear to be severely affected by climate change. Despite historically low fishing pressure, these stocks remain in poor state with limited prospects for recovery. Additionally, Baltic Sea flatfish stocks are increasing, but the individual fishes' condition is relatively poor. Fisheries with gillnets in the Baltic Sea are also affected by a growing seal population which extract catches from static nets and occasionally cause damage to netting. Last but not least, the Baltic Sea ecosystem is severely affected by eutrophication and oxygen depletion.

Figure 24: PESTLE analysis, design of figure adopted after Konstantidelli et al. (2023)

5.2 Future research questions

Analyses presented in the chapters of the NFP reveal several research gaps regarding social and economic considerations. However, as fisheries are part of a social-ecological system, other aspects of sustainability, such as ecological and technical aspects to achieve sustainable transformation of fisheries, must not be ignored. Due to the substantial pressures currently confronting the sector, research prioritizing its sustainable transformation and its advancement is of particular importance. Accordingly, future research on social and economic aspects should prioritize:

- future development of ports considering the current structural change
- generational renewal, including the inclusion of women in the active fishing sector
- how the fishing sector could be meaningfully categorized and represented from a community perspective, given the sector's fragmentation and the potential increasing importance of approaches such as community of place and community of practise (e.g., recreational fishers as a community of practise)
- compliance in fisheries
- the development of (social) indicators that could be applicable to the targeted future development of fisheries, fishing communities, and fishing ports, encompassing both commercial and recreational fishing
- how much added (non-market) value is created by commercial fishing locally
- (low-conflict) co-use/multi-use of marine space, e.g., offshore wind farms and fishing corridors
- food security aspects in recreational fisheries
- minorities in commercial and recreational fisheries
- the development of social indicators that allow recreational fisheries to be included in the CFP
- potential to invest in new vessels and new fishing gear (especially for the small-scale fishing sector) to adapt to changing fishing conditions
- economic potential of new species for the future of fisheries, especially in the warming Southern North Sea
- alternative (shortened) value chains, including the potential of community supported fisheries
- new business strategies for fishers (enhanced direct marketing) and new seafood products
- organisation of fishing in cooperatives or other forms of business organisation as an alternative to the classic single ownership
- new sources of income and business fields for fishing communities
- technical aspects, such as the development of modern, low-emission fishing vessels; new, more selective, low-impact, environmental-friendly gears (e.g., made from biodegradable yarn); environmental impact of different fisheries in comparison to other food production systems worldwide

Appendix

Appendix on fishing structure

Table 14: Fleet segments of the German fishing sector detected using the alternative segmentation approach. Included are the name and size of the new fleet segment, main fishing gear of the vessels and length, engine power, and mean trip duration. All described by minimum, maximum, and mean in parentheses. Also depicted are the main target stocks (official ICES stocks are indicated in bold, otherwise species abbreviation and FAO area are indicated), and the DCF segments of the vessels included in the new segment.

Fleet segment	Number of vessels	Main fishing gear	Main target stocks	Vessel length (m)	Engine power (kW)	Mean trip duration (d)	DCF segments included
Brown shrimp fishery	163	Beam trawls (TBB)	- Brown shrimp (*Crangon crangon,* CSH.27.4abc)	7.85-24.55 (18.02)	37-221 (209.38)	2	VL1824_TBB, VL1218_TBB, VL0010_PG, VL2440_TBB, VL1012_TBB, VL0010_TBB
Brown crab & lobster fishery	5	Pots and traps (FPO)	- European Lobster (*Homarus gammarus* LBE.27.4abc*)* - Brown crab (*Cancer pagurus* CRE.27.4abc)	7.92-21.99 (18.8)	53-221 (207.89)	3.02	VL1824_TBB, VL1824_FPO, VL0010_PG
Sole fishery	5	Beam trawls (TBB)	- North Sea sole (*Solea solea*, **sol.27.4)** - North Sea plaice (*Pleuronectes platessa*, **ple.27.4.20**)	36.28-41.82 (39.75)	749-1440 (1232.71)	4.15	VL2440_TBB, VL40XX_TBB
North Sea passive gear fishery	2	Gillnets and stow nets (DFN)	- North Sea cod (*Gadus morhua,* **cod.27.47d20**) - North Sea sole (*Solea solea*, **sol.27.4**) - North Sea plaice (*Pleuronectes platessa*, **ple.27.4.20**)	16.7-21.44 (17.01)	221-221 (221)	3.66	VL1824_PGO, VL1218_DFN
Baltic passive gear fishery	6	Gillnets (DFN)	- Western Baltic flounder (*Platichthys* spp., **bwq.27.2425**) - Baltic plaice (*Pleuronectes platessa*, **ple.27.24-32**) -Baltic turbot (*Scophthalmus maximus*, **tur.27.22-32**)	12.21-19.2 (14.15)	59-221 (194.22)	1.16	VL1824_DFN, VL1218_DFN, VL1218_HOK
High seas passive gear fishery	3	Gillnets (DFN), Pots and traps (FPO)	- Anglerfish, North Sea and British Isles (*Lophius budegassa, & piscatorius*, **an f.27.3a46**) - Blackbellied anglerfish, Celtic Sea and - Biscaya (*Lophius budegassa*, **anf.27.78abd**) - Blue ling, Celtic Sea and Faroes - Grounds (*Molva dypterygia,* **bli.27.5b67***)* - Red deep-sea crab (*Chaceon quinquedens*, KEF, 27.6. u. 27.7)	27.77-32.36 (29.65)	412-441 (424.46)	30.6	VL2440_DFN, VL2440_FPO
Small-scale passive gear fisheries	655	Mixed passive gears (PG)	- Western Baltic herring (*Clupea harengus,* **her.27.20-24**)	3.89-11.99 (8.35)	0-221 (60.86)	0.42	VL0010_PG, VL1012_PG

			- Plaice, Kattegat, Belt Seas and the Sound (*Pleuronectes platessa*, **ple.27.21-23**) - Eel (*Anguilla anguilla,* **ele.2737.nea**) Pike-Perch (*Sander lucioperca*, FPE, 27.3)				
Coastal pelagic forage fish fishery	2	Midwater trawls (TM)	- Baltic sprat (*Sprattus sprattus,* **spr.27.22-32**) - Norwegian spring-spawning herring (*Clupea harengus*, **her.27.1-24a514a**) North Sea sprat (*Sprattus sprattus,* **spr.27.3a4**)	51.72-53.55 (52.88)	2030-2309 (2207.4)	6.15	VL40XX_TM
High seas pelagic fishery	3	Midwater trawls (TM)	- Northeast Atlantic Blue whiting (*Micromesistius poutassou,* **whb.27.1-91214**) - Norwegian spring-spawning herring (*Clupea harengus*, **her.27.1-24a514a**) - Northeast Atlantic Mackerel (*Scomber scombrus*, **mac.27.nea**)	86.33-140.8 (115.58)	2863-8640 (5782.01)	24.46	VL40XX_TM
Baltic demersal forage fish fishery	7	Demersal trawls (DTS)	- Baltic sprat (*Sprattus sprattus,* **spr.27.22-32**) - Plaice, Kattegat, Belt Seas and the Sound (*Pleuronectes platessa*, **ple.27.21-23**) - Western Baltic flounder (*Platichthys* spp., **bwq.27.2425**) - Baltic plaice (*Pleuronectes platessa*,**ple.27.24-32**)	14.1-25.05 (17.89)	100-221 (203.95)	1.91	VL1218_DTS, VL1824_DTS, VL2440_DTS
Baltic mixed demersal fishery	11	Demersal trawls (DTS)	- Plaice, Kattegat, Belt Seas and the Sound (*Pleuronectes platessa*, **ple.27.21-23**) - Western Baltic flounder (*Platichthys* spp., **bwq.27.2425**) - Baltic dab (*Limanda limanda,* **dab.27-22-32**)	14.28-23.96 (18.62)	100-221 (202.36)	2.04	VL1218_DTS, VL1824_DTS
North Sea mixed demersal fishery	14	Demersal trawls (DTS)	- North Sea plaice (*Pleuronectes platessa*, **ple.27.420**) - Norway lobster in the areas 5 und 33 (*Nephrops norvegicus*, **nep.fu.5**, **nep.fu.33**) - North Sea turbot (*Scophthalmus maximus*, **tur.27.4**)	16-32.9 (26.15)	220-1124 (433.54)	5.83	VL2440_DTS, VL1824_DTS, VL1218_DTS
Saithe & cod fishery	5	Demersal trawls (DTS)	- Saithe, North Sea and adjacent waters (*Pollachius virens*, **pok.27.3a4a**) - Northern hake (*Merluccius merluccius*, **hke.27.3a46-8abd**) - North Sea cod (*Gadus morhua,* **cod.27.47d20**)	30.34-37.05 (35.86)	600-1720 (1201.31)	6.21	VL2440_DTS
High seas demersal fishery	4	Demersal trawls (DTS)	- Cod, Northeast Arctic (*Gadus morhua*, **cod.27.1-2**) - Western Greenland halibut (*Reinhardtius hippoglossoides,* **ghl.27.561214**) - Eastern Greenland cod (*Gadus morhua*, **cod.2127.1f14**)	80.35-90.66 (81.87)	3000-4000 (3245.08)	48.18	VL40XX_DTS

Source: Sulanke et al. 2025

Publication bibliography

Albrecht, Felix (2025): Reden über die Fischerei: Die Perspektivendifferenz ‚zur See' und ‚an Land´. In Angelika Proferl, Norbert Schröer (Eds.): Perspektivendifferenz: Zur Ethnographie des kommunikativen Handelns. Beiträge der 9. Feldarbeitstage. Essen: Oldib-Verlag, in publishing process

Arlinghaus, Robert; Rittweg, Timo; Dhellemmes, Félicie; Koemle, Dieter; van Gemert, Rob; Schubert, Hendrik et al. (2023): A synthesis of a coastal northern pike (*Esox lucius*) fishery and its social-ecological environment in the southern Baltic Sea: Implications for the management of mixed commercial-recreational fisheries. In *Advances in the Analysis and Application of Harvest Policies in the Management of Fisheries* 263, DOI: 10.1016/j.fishres.2023.106663.

Barz, Fanny (2022): 'Boat´s don´t fish, people do'- a sociological contribution towards holistic bycatch management. Dissertation. Universität Rostock. Institut für Soziologie und Demographie. Available online at https://www.thuenen.de/media/publikationen/thuenen-report/Thuenen_Report_95.pdf, checked on 12/20/2024.

Barz, Fanny; Lasner, Tobias; von Dorrien, Christian; Doering, Ralf; Goti, Leyre; Probst, Wolfgang Nikolaus; Kraus, Gerd; Kreiß, Cornelia M.; Krumme, Uwe; Reiser, Stefan; Schulze, Torsten; Stelzenmüller, Vanessa; Stepputtis, Daniel; Simons, Sarah; Strehlow, Harry V.; Zimmermann, Christopher (2025): An analysis of stakeholders' vision of the future of coastal fisheries in Germany. In *ICES Journal of Marine Science* 82 (6), DOI: 10.1093/icesjms/fsaf074.

Bastardie, Francois; Nielsen, J. Rasmus; Eigaard, O. R.; Fock, H. O.; Jonsson, P.; Bartolino, V. (2015): Competition for marine space: modelling the Baltic Sea fisheries and effort displacement under spatial restrictions. In *ICES Journal of Marine Science* 72 (3), pp. 824–840. DOI: 10.1093/icesjms/fsu215.

BLE (2024a): Anlandungen deutscher Fischereifahrzeuge im Ausland. BLE 531, Tabelle Nr. 4060500. Available online at https://www.bmel-statistik.de/fischerei/tabellen-zur-fischerei, checked on 12/20/2024.

BLE (2024b): Berufliche Bildung. Ausbildung. Daten des Statistischen Bundesamtes, Statistische Ämter und meldende Behörden der Länder. Available online at https://www.bmel-statistik.de/landwirtschaft/berufliche-bildung/ausbildung, checked on 12/19/2024.

BLE (2024c): Die Hochsee- und Küstenfischerei in der Bundesrepublik Deutschland im Jahre 2023. Bericht über die Anlandungen von Fischereierzeugnissen durch deutsche Fischereifahrzeuge. Available online at https://www.ble.de/SharedDocs/Downloads/DE/Fischerei/Fischwirtschaft/Anlandestatistik2023.pdf?__blob=publicationFile&v=2, checked on 12/20/2024.

BLE (2024d): Fischereiunterstützung. Available online at https://www.ble.de/DE/Themen/Fischerei/Fischereiunterstuetzung/Unterstuetzung_node.html, checked on 12/19/2024.

BLE (2024e): Unsere Themen - Fischerei. Available online at https://www.ble.de/DE/Themen/Fischerei/fischerei_node.html, checked on 12/19/2024.

BLE (2025): Tabelle 192. Versorgung mit Fischen. Bundesanstalt für Landwirtschaft und Ernährung (531), BMEL-Statistik. Available online at https://www.bmel-statistik.de/ernaehrung/versorgungsbilanzen/fisch, checked on 12/20/2024.

BMEL (2024a): BMEL verlängert Betriebshilfen für Fischerinnen und Fischer bis Jahresende. Insgesamt fünf Millionen Euro zur Abmilderung der Folgen des Ukrainekriegs. Available online at

https://www.bmel.de/SharedDocs/Pressemitteilungen/DE/2024/068-betriebsbeihilfen-fischer.html, checked on 11/26/2024.

BMEL (2024b): Die wirtschaftliche Lage der Kleinen Hochsee- und Küstenfischerei 2022. Edited by Bundesministerium für Ernährung und Landwirtschaft (BMEL), Referat 723 – Statistik, Planungsgrundlagen, Wissensmanagement. Available online at https://www.bmel-statistik.de/fileadmin/daten/0022000-2022.pdf, checked on 12/20/2024.

BMELV (2003): Die deutsche Fischereiflotte. Entwicklung seit 1970. Tabelle 0520110-2010. Available online at https://www.bmel-statistik.de/suche/monatsberichte-details?backUrl=%2Fsuche%3Fsearch%255BsubmitButton%255D%3D%26tx_solr%255Bq%255D%3DFischerei%2520Besch%25C3%25A4ftigte%26cHash%3D2e35dfbe0ada8866c35900f9b317b17c&tx_monatsberichte_details%5Baction%5D=View&tx_monatsberichte_details%5Bcontroller%5D=Monatsberichte&tx_monatsberichte_details%5Buid%5D=13488&cHash=311c1c9bdff67fa1435f83ae6b6bbc21, checked on 12/20/2024.

Bonsu, Prince Owusu; Letschert, Jonas; Yates, Katherine L.; Svendsen, Jon C.; Berkenhagen, Jörg; Rozemeijer, Marcel J.C. et al. (2024): Co-location of fisheries and offshore wind farms: Current practices and enabling conditions in the North Sea. In *Marine Policy* 159, DOI: 10.1016/j.marpol.2023.105941.

Braun, Marjan (2022): Biographical perspectives of small-scale Baltic fishers to understand social-ecological transformations. Bachelors´ Thesis. Leuphana Universität, Lüneburg.

Breddermann, K.; Lichtenstein, Uwe; Kosleck, S.; Stepputtis, Daniel (2023): SimuNet - Ein Werkzeug zur Fanggeräteoptimierung: Abschlussbericht. Bericht Nr. 6316 0061-A-6/2023. Edited by Universität Rostock, Thünen-Institut für Ostseefischerei.

Bronnmann, Julia; Koemle, Dieter; Meyerhoff, Jürgen; Weltersbach, Marc Simon; Strehlow, Harry V.; Arlinghaus, Robert (2023): Willingness to pay for harvest regulations and catch outcomes in recreational fisheries: A stated preference study of German cod anglers. In *Advances in the Analysis and Application of Harvest Policies in the Management of Fisheries* 259, DOI: 10.1016/j.fishres.2022.106536.

Brüning, Simone; Barrelet, Johna (2024): Aquatic biomass. In: Monitoring the German Bioeconomy. Universität Kassel, Center for Environmental Systems Research (CESR), pp. 120–124.

BSH (2024): Maritime Spatial Plan 2021. Available online at https://www.bsh.de/EN/TOPICS/Offshore/Maritime_spatial_planning/Maritime_Spatial_Plan_2021/maritime-spatial-plan-2021_node.html, checked on 11/26/2024.

BUKEA (2024): Fisheries in Hamburg. Available online at https://www.hamburg.de/politik-und-verwaltung/behoerden/bukea/themen/agrarwirtschaft/fischerei, checked on 1/22/2025.

Chladek, Jérôme; Culik, Boris; Kindt-Larsen, Lotte; Albertsen, Christoffer Moesgaard; Dorrien, Christian von (2020): Synthetic harbour porpoise (*Phocoena phocoena*) communication signals emitted by acoustic alerting device (Porpoise ALert, PAL) significantly reduce their bycatch in western Baltic gillnet fisheries. In *Fisheries Research* 232, DOI: 10.1016/j.fishres.2020.105732

Chladek, Jérôme; Stepputtis, Daniel; Hermann, Andreas; Kratzer, Isabella M.F.; Ljungberg, Peter; Rodriguez-Tress, Paco et al. (2021): Using an innovative net-pen-based observation method to assess and compare fish pot-entrance catch efficiency for Atlantic cod (*Gadus morhua*). In *Advances in the Analysis and Application of Harvest Policies in the Management of Fisheries* 236, DOI: 10.1016/j.fishres.2020.105851.

Clarke, Adele E.; Friese, Carrie (2007): Grounded Theorizing Using Situational Analysis. In Antony Bryant, Kathy Charmaz (Eds.): The SAGE handbook of grounded theory. 1. publ. Los Angeles, Calif.: SAGE Publ, pp. 363–397.

Cooke, Steven J.; Twardek, William M.; Lennox, Robert J.; Zolderdo, Aaron J.; Bower, Shannon D.; Gutowsky, Lee F. G. et al. (2018): The nexus of fun and nutrition: Recreational fishing is also about food. In *Fish and Fisheries* 19 (2), pp. 201–224. DOI: 10.1111/faf.12246.

Coull, J. R. (1991): The North Sea herring fishery in the twentieth century. In Ed. by H. D. Smith, and A. Vallega (Ed.): The Development of Integrated Sea Use Management. New York: Routledge, pp. 122–138.

Cushing, D. H. (1992): A short history of the Downs stock of herring. In *ICES Journal of Marine Science* (49), pp. 437–443.

Demografie (2024): Bevölkerungsstruktur, -zahl. Available online at https://www.demografie-portal.de/DE/Fakten/Fakten.html, checked on 12/20/2024.

Destatis (2021): Basistabelle Bruttowertschöpfung: Sektor Landwirtschaft. Available online at https://www.destatis.de/DE/Themen/Laender-Regionen/Internationales/Thema/Tabellen/Basistabelle_LWWertschoepfung.html?nn=379006, checked on 1/20/2025.

DFV (2024): Deutscher Fischereiverband. Available online at http://www.deutscher-fischerei-verband.de/, checked on 12/20/2024.

Dierks, August (1961): Männer. Trawler. Meere. Bremen: Carl Schünemann.

Döring, Nicola; Bortz, Jürgen (2016): Forschungsmethoden und Evaluation in den Sozial- und Humanwissenschaften. 5. vollständig überarbeitete, aktualisierte und erweiterte Auflage 2016. Berlin, Heidelberg: Springer (SpringerLink Bücher).

Döring, Ralf; Berkenhagen, Jörg; Hentsch, Solveig; Kraus, Gerd (2020): Small-Scale Fisheries in Germany: A Disappearing Profession? In José J. Pascual-Fernández, Cristina Pita, Maarten Bavinck (Eds.): Small-Scale Fisheries in Europe: Status, Resilience and Governance, Vol. 23. Cham: Springer International Publishing (MARE Publication Series), pp. 483–502.

EC (1992): Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Available online at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:01992L0043-20130701, checked on 12/20/2024.

EC (2009): Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version). In *Official Journal of the European Union*. Available online at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0147, checked on 12/20/2024.

EC (2021): Decision. COMMISSION DELEGATED DECISION (EU) 2021/1167 of 27 April 2021 establishing the multiannual Union programme for the collection and management of biological, environmental, technical and socioeconomic data in the fisheries and aquaculture sectors from 2022. Publications Office of the European Union. Luxembourg. Available online at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021D1167, checked on 12/20/2024.

EC (2023): EU Action Plan: Protecting and restoring marine ecosystems for sustainable and resilient fisheries. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Brussels (COM/2023/102 final). Available online at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023DC0102, checked on 12/20/2024.

EC (2024a): COMMISSION DELEGATED REGULATION (EU) 2024/3093 of 13 October 2022 amending Regulation (EU) 2019/1241 of the European Parliament and of the Council as regards specific technical measures to reduce by-catches of cod in the Baltic Sea. Publications Office of the European Union. Luxembourg. Available online at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32024R3093, checked on 12/20/2024.

EC (2024b): COMMISSION IMPLEMENTING REGULATION (EU) 2024/3094 of 27 November 2024 laying down detailed rules on certain selective devices to reduce incidental catches of cod in the Baltic Sea provided for in Annex VIII to Regulation (EU) 2019/1241 of the European Parliament and of the Council. Publications Office of the European Union. Luxembourg. Available online at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32024R3094, checked on 12/20/2024.

EC (2024c): Europäische Commission: Farnet. Available online at https://webgate.ec.europa.eu/fpfis/cms/farnet2/on-the-ground/flag-factsheets-list_en%3Ffield_term_country_tid=121&field_term_theme_tid=All.html, checked on 3/20/2024.

EFCA (2024): Remote Electronic Monitoring (REM). Available online at https://www.efca.europa.eu/en/content/remote-electronic-monitoring-rem.

Emirbayer, Mustafa; Mische, Ann (1998): What Is Agency? In *American Journal of Sociology* 103 (4), pp. 962–1023. DOI: 10.1086/231294, checked on 12/20/2024.

EU (2005): Liste der anerkannte Erzeugerorganisationen im Sektor Fischerei und Aquakultur (2005/C 293/07). Amtsblatt der europäischen Union. Council of the European Union.

EU (2008): COUNCIL REGULATION (EC) No 1005/2008 establishing a community system to prevent, deter and eliminate illegal, unreported and unregulated fishing, amending Regulations (EEC) No 2847/93, (EC) No 1936/2001 and (EC) No 601/2004 and repealing Regulations (EC) No 1093/94 and (EC) No 1447/1999. In *Official Journal of the European Union*, Article L 286. Available online at https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=celex%3A32008R1005, checked on 12/20/2024.

EU (2013a): Liste der anerkannten Erzeugerorganisationen im Sektor Fischerei und Aquakultur. Amtsblatt der europäischen Union. Available online at https://op.europa.eu/de/publication-detail/-/publication/e334f6ba-8801-11e2-b5c3-01aa75ed71a1/language-de, checked on 12/19/2024.

EU (2013b): REGULATION (EU) No 1379/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2013 on the common organisation of the markets in fishery and aquaculture products, amending Council Regulations (EC) No 1184/2006 and (EC) No 1224/2009 and repealing Council Regulation (EC) No 104/2000. In *Official Journal of the European Union*. Available online at https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32013R1379, checked on 12/19/2024.

EU (2013c): Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC. In *Official Journal of the European Union*. Available online at http://data.europa.eu/eli/reg/2013/1380/oj, checked on 12/19/2024.

FG Wismarbucht eG (2024). Available online at https://www.myfish-ostsee.de/ausbildung.html, checked on 2/16/2024.

Fischereiamt Niedersachsen (2024): Zwei Länder - eine gemeinsame Behörde. Available online at https://fischereiamt.niedersachsen.de/startseite/behoerde/aufgaben_und_zustaendigkeiten/, checked on 12/19/2024.

Fischmagazin (2023): Rügen: Euro-Baltic wird reiner Kühl- und Lagerlogistik-Standort. Available online at https://www.fischmagazin.de/willkommen-seriennummer-107471.htm, checked on 11/27/2024.

FischwAusbV (2016): Verordnung über die Berufsausbildung zum Fischwirt und zur Fischwirtin – Fischwirtausbildungsverordnung vom 26. Februar 2016. Bundesgesetzblatt Jahrgang 2016 Teil I Nr. 10. In *Bundesgesetzblatt*. Available online at https://www.bibb.de/dienst/berufesuche/de/index_berufesuche.php/regulation/FischwirtVo2016.pdf, checked on 12/19/2024.

FIZ (2023): Fischwirtschaft: Daten und Fakten 2023. Edited by Fisch-Informationszentrum e.V. Available online at https://www.fischinfo.de/images/broschueren/pdf/FIZ_DF_2023.pdf, checked on 12/19/2024.

FIZ (2024): Fischwirtschaft: Daten und Fakten 2024. Edited by Fisch-Informationszentrum e.V. Available online at https://www.fischinfo.de/images/broschueren/pdf/FIZ_DF_2024.pdf, checked on 12/19/2024.

Fock, H. O.; Dammann, R.; Mielck, F.; Kraus, G.; Lauerburg, R.A.M.; López González, A. et al. (2023): Auswirkungen der Garnelenfischerei auf Habitate und Lebensgemeinschaften im Küstenmeer der Norddeutschen Bundesländer Schleswig-Holstein, Hamburg und Niedersachsen (CRANIMPACT). Johann Heinrich von Thünen Institute (Thünen Institute). Braunschweig (Thünen Report, 107). Available online at https://d-nb.info/1287197183/, checked on 12/19/2024.

Fräger, Clara; Barz, Fanny; Strehlow, Harry V. (2023): Abschlussbericht: Rückkehr der Kegelrobbe. Akzeptanzförderung eines Prozesses zur Erstellung eines Konfliktmanagementplans Fischerei-Kegelrobben für die Küstengewässer der deutschen Ostsee - AZ 35468. Available online at https://www.dbu.de/OPAC/ab/DBU-Abschlussbericht-AZ-35468_01-Hauptbericht.pdf, checked on 11/26/2024.

Freeman, Richard; Svels, Kristina (2022): Women's empowerment in small-scale fisheries: The impact of Fisheries Local Action Groups. In *Marine Policy* 136, DOI: 10.1016/j.marpol.2021.104907.

Goti-Aralucea, Leyre; Berkenhagen, Jörg; Sulanke, Erik; Döring, Ralf (2021): Efficiency vs resilience: The rise and fall of the German brown shrimp fishery in times of COVID 19. In *Marine Policy* 133, DOI: 10.1016/j.marpol.2021.104675.

Graaf, Kai de; Schwermer, Heike; Wagner-Ahlfs, Christian; Greve, Oliver; Hunklinger, Carla; Riekhof, Marie-Catherine (2023): Sea Ranger – Idee zur Diversifizierung des Berufsbildes Küstenfischerei. In *Zeitschrift für Fischerei* 3, DOI: 10.35006/fischzeit.2023.34

Günther, Claudia; Temming, Axel; Santos, Juan; Berkenhagen, Jörg; Stepputtis, Daniel; Schultz, Sebastian et al. (2021): Small steps high leaps: Bio-economical effects of changing codend mesh size in the North Sea Brown shrimp fishery. In *Advances in the Analysis and Application of Harvest Policies in the Management of Fisheries* 234, DOI: 10.1016/j.fishres.2020.105797.

Henke, Kimberley (2023): Die Bedeutung der Fischerei für den ‚Sense of Place' in Sassnitz und Freest. Masterarbeit. Universität Greifswald, Greifswald.

Hermann, Andreas; Chladek, Jérôme; Stepputtis, Daniel (2020): iFO (infrared Fish Observation) - An open-source low-cost infrared underwater video system. In *HardwareX* 8, DOI: 10.1016/j.ohx.2020.e00149.

Hermann, Andreas; Stepputtis, Daniel; Furkert Frederik; Björner, Mathis; Naumann, Michael (2023): Hydrography on fishing vessels - a feasability study leads to an open source development. Conference Paper. Proceedings of the 15th international workshop on methods for the development and evaluation of maritime technologies (DEMat), 12.-15.09.2022, pp. 91-101. Rostock, Germany.

HmbFAnG (2019): Hamburgisches Fischerei- und Angelgesetz (HmbFAnG) vom 28. Mai 2019. Available online at https://www.landesrecht-hamburg.de/bsha/document/jlr-FischGHA2019rahmen, checked on 1/22/2025.

ICES (2022): Baltic Sea ecoregion – Ecosystem Overview. Available online at https://ices-library.figshare.com/articles/report/Baltic_Sea_Ecoregion_Ecosystem_overview/21725438?file=38559566 checked on 12/19/2024.

ICES (2024a): Baltic Sea ecoregion – Ecosystem Overview. Available online at https://ices-library.figshare.com/articles/report/Baltic_Sea_Ecoregion_Ecosystem_Overview/27256635?file=50813523, checked on 12/19/2024.

ICES (2024b): Greater North Sea ecoregion - Ecosystem Overview. Available online at https://ices-library.figshare.com/articles/report/Greater_North_Sea_ecoregion_-_Ecosystem_Overview/25714239?file=46002360, checked on 12/19/2024.

KBS (2024a): Individual fishery entrepreneurs by main and part-time occupation, and exemption from the obligation to pay contributionsas of 30 August 2022. Data prepared for the Thünen Institute of Sea Fisheries (unpublished). Context available online at https://www.kbs.de/DE/Seemannskasse/Versicherte/versicherte_node.html, checked on 12/20/2024.

KBS (2024b): Enter a Safe Haven with the Social Insurance for Seafarers. Available online at https://www.kbs.de/EN/Seemannskasse/seemannskasse_node.html, checked on 11/26/2024.

Kindt-Larsen, Lotte; Noack, Thomas; Brooks, Mollie Elizabeth; Kroner, Anne-Mette; Glemarec, Gildas (2024): Pearls are not just for girls: Plastic spheres do not interfere with target catches in a set net fishery. In *Advances in the Analysis and Application of Harvest Policies in the Management of Fisheries* 276, DOI: 10.1016/j.fishres.2024.107032.

Koemle, Dieter; Beardmore, Ben; Dorow, Malte; Arlinghaus, Robert (2021): The Human Dimensions of Recreational Anglers Targeting Freshwater Species in Coastal Ecosystems, with Implications for Management. In *North American Journal of Fisheries Management* 41 (5), pp. 1572–1590. DOI: 10.1002/nafm.10672.

Konstantidelli, Vasilia; Liontakis, Angelos; Mantziaris, Stamatis, Sintori, Alexandra; Tsirimokos, Christos; Tzouramani, Irene (2023): National Fisheries Profile: Greece. Agriculture Economics Research Institute (AGRERI) - Hellenic Agricultural Organization DEMETER. Athen

Kratzer, Isabella Maria Friederike; Brooks, Mollie Elizabeth; Bilgin, Sabri; Özdemir, Süleyman; Kindt-Larsen, Lotte; Larsen, Finn; Stepputtis, Daniel (2021): Using acoustically visible gillnets to reduce bycatch of a small cetacean: first pilot trials in a commercial fishery. In *Advances in the Analysis and Application of Harvest Policies in the Management of Fisheries* 243, DOI: 10.1016/j.fishres.2021.106088.

Kube, Kristin (2013): Hochseefischer. Die Lebenswelt eines maritimen Berufstandes aus biografischer Perspektive. 1. Aufl. Münster: Waxmann Verlag GmbH (Beiträge zur Volkskultur in Nordwestdeutschland, Bd. 123).

KüFVO (2018): Landesverordnung über die Ausübung der Fischerei in den Küstengewässern (Küstenfischereiverordnung - KüFVO) vom 3. Dezember 2018. Available online at https://www.gesetze-rechtsprechung.sh.juris.de/bssh/document/jlr-K%C3%BCFischVSH2019rahmen, checked on 12/19/2024.

KüFVO M-V (2006): Verordnung zur Ausübung der Fischerei in den Küstengewässern (Küstenfischereiverordnung - KüFVO M-V) Vom 28. November 2006. Available online at https://www.landesrecht-mv.de/bsmv/document/jlr-K%C3%BCFischVMV2006rahmen, checked on 12/19/2024.

Lallf (2024): Fischerei und Fischwirtschaft. Available online at https://www.lallf.de/fischerei/, checked on 12/19/2024.

Lasner, Tobias; Barz, Fanny (2023): Küstenfischerei 2045 - Erste Zielbilder der Zukunftswerkstatt. In *Zeitschrift für Fischerei* (3), DOI: 10.35006/fischzeit.2023.22.

Lasner, Tobias; Barz, Fanny; Döring, Martin; Gee, Kira; Kannen, Andreas; Schaper, Jürgen (2024): ‚Beggar today, king tomorrow, – A spotlight on the habitus of fishers in Germany. Rethinking the Blue Economy: Socio-ecological Impacts and Opportunities. Poster at the RethinkBlue Conference in Zadar, April 23rd-25th. Croatia.

Lasner, Tobias; Gimpel, Antje (2024): Aquaculture as a dysfunctional system of action; Why does fish farming stagnate in Germany? In *Marine Policy* 170, DOI: 10.1016/j.marpol.2024.106405.

Lasner, Tobias; Barz, Fanny; Döring, Martin; Gee, Kira; Kannen, Andreas; Schaper, Jürgen (2025): Social practice in fisheries – How field, capital and habitus limit the adaptive capacity of fishers in Germany. Unpublished data, forthcoming.

Lewin, W.-C.; Weltersbach, M. S.; Haase, K.; Strehlow, H. V. (2021): Who travels how far: German Baltic sea anglers' travel distances as precondition for fisheries management and coastal spatial planning. In *Making Marine Science Matter: Issues and Solutions from the 3rd International Marine Conservation Congress* 209, DOI: 10.1016/j.ocecoaman.2021.105640.

Lewin, Wolf-Christian; Barz, Fanny; Weltersbach, Marc Simon; Strehlow, Harry V. (2023a): Trends in a European coastal fishery with a special focus on small-scale fishers – Implications for fisheries policies and management. In *Marine Policy* 155, DOI: 10.1016/j.marpol.2023.105680.

Lewin, Wolf-Christian; Weltersbach, Marc Simon; Strehlow, Harry Vincent (2023b): Eine Charakterisierung der marinen Angelfischerei in Deutschland - Besonderheiten und Perspektiven. DOI: 10.35006/fischzeit.2023.35.

Linke, Sebastian; Siegrist, Nathan (2023): Aligning top-down and bottom-up modes of governance? How EU Fisheries Local Action Groups support small-scale fisheries and coastal community development in Sweden. In *Sociologia Ruralis*, DOI: 10.1111/soru.12452.

Liu, Yajie; Bailey, Jennifer L.; Davidsen, Jan G. (2019): Social-Cultural Ecosystem Services of Sea Trout Recreational Fishing in Norway. In *Frontiers in Marine Science* 6, DOI: 10.3389/fmars.2019.00178.

Ljungberg, Peter; Lunneryd, Sven-Gunnar; Hillström, Lars; Fridh, Glenn; Lundin, Mikael (2025): The hovering pontoon trap: The tougher, younger sibling in the pontoon trap family. In *Advances in the Analysis and Application of Harvest Policies in the Management of Fisheries* 281, DOI: 10.1016/j.fishres.2024.107214.

Madsen, Niels; Ingólfsson, Ólafur A.; Nilsson, Hans; Suuronen, Petri (2021): Improving species and size selectivity in the Baltic cod trawl fishery with two simple codend designs. In *Advances in the Analysis and Application of Harvest Policies in the Management of Fisheries* 236, DOI: 10.1016/j.fishres.2020.105846.

Mantziaris, Stamatis; Tzouramani, Irene; Liontakis, Angelos (2024): Identifying the External Environment of Greek Fisheries. In: The 17th International Conference of the Hellenic Association of Agricultural Economists. International Conference of the Hellenic Association of Agricultural Economists. Basel, Switzerland

Max Rubner-Institute (2024). Available online at https://www.mri.bund.de/en/home/, checked on 12/19/2024.

Mayring, Philipp (2016): Einführung in die qualitative Sozialforschung. 6., neu ausgestattete, überarbeitete Aufl. Weinheim: Beltz.

Meyer, Steffi; Krumme, Uwe (2021): Disentangling complexity of fishing fleets: using sequence analysis to classify distinguishable groups of vessels based on commercial landings. In *Fisheries Management and Ecology.* DOI: 10.1111/fme.12472.

Meyer, Steffi; Krumme, Uwe; Stepputtis, Daniel; Zimmermann, Christopher (2022): Use of a smartphone application for self-reporting in small-scale fisheries: Lessons learned during a fishing closure in the western Baltic Sea. In *Making Marine Science Matter: Issues and Solutions from the 3rd International Marine Conservation Congress* 224, DOI: 10.1016/j.ocecoaman.2022.106186.

Müller, Kay (2023): Vom Fischer zum Sea Ranger – abgesenkte Fangquoten zwingen zum Umdenken. In *Schleswig-Holsteinischer Zeitungsverlag*, 2023. Available online at https://www.shz.de/deutschland-welt/schleswig-holstein/artikel/neues-projekt-in-sh-geplant-vom-fischer-zum-sea-ranger-45891814, checked on 2/14/2024.

Natale, Fabrizio; Carvalho, Natacha; Paulrud, Anton (2015): Defining small-scale fisheries in the EU on the basis of their operational range of activity The Swedish fleet as a case study. In *Advances in the Analysis and Application of Harvest Policies in the Management of Fisheries* 164, pp. 286–292. DOI: 10.1016/j.fishres.2014.12.013.

NDR (2025): Ab Februar nur noch ein Fischer-Azubi in MV. Available online at https://www.ndr.de/nachrichten/mecklenburg-vorpommern/Ab-Februar-nur-noch-ein-Fischer-Azubi-in-MV,fischereiazubis100.html, checked on 7/18/2025.

Nieman, Cassandra M.; Rudman, Alexie N.; Chory, Margaret L.; Murray, Grant D.; Fairbanks, Luke; Campbell, Lisa M. (2021): Fishing for food: Values and benefits associated with coastal infrastructure. In *PloS one* 16 (4), DOI: 10.1371/journal.pone.0249725.

Niemann, Melina; Lasner, Tobias (2025): Bringing Processing Back Home? Profitability of German Brown Shrimp Fisheries and the Limits of a new Shelling Technology in becoming an Entrepreneurial Game-Changer. In *Regional Studies in Marine Science, under review*.

NKüFischO (2006): Niedersächsische Küstenfischereiordnung (NKüFischO). Available online at https://voris.wolterskluwer-online.de/browse/document/39d9ea2b-5e9f-325b-9436-9000bf5eb3ec, checked on 12/19/2024.

Nyboer, Elizabeth A.; Embke, Holly S.; Robertson, Ashley M.; Arlinghaus, Robert; Bower, Shannon; Baigun, Claudio et al. (2022): Overturning stereotypes: The fuzzy boundary between recreational and subsistence inland fisheries. In *Fish and Fisheries* 23 (6), pp. 1282–1298. DOI: 10.1111/faf.12688.

OECD (2010): Review of Fisheries in OECD Countries 2009. Policies and Summary Statistics. Paris: OECD Publishing. Available online at https://www.oecd.org/en/publications/review-of-fisheries-in-oecd-countries-2009_rev_fish_pol-2009-en.html, checked on 12/19/2024.

Orlok, Ludger (2023): Berufliche Identität in der Lebensspanne: Wie erleben Fischer an der mecklenburgischen Ostseeküste ein mögliches Verschwinden ihres Berufsbildes? Masters´ Thesis. MSB Medical School Berlin, Hochschule für Gesundheit und Medizin, Berlin. Naturwissenschaftliches Department Psychologie. Available online at https://neues-kunsthaus-ahrenshoop.de/media/pages/ausstellungen/ungewissheiten/b8cfdb1c6d-1736249661/ludger-orlok-masterarbeit.pdf, checked on 1/22/2025.

Pita, Pablo; Gribble, Matthew O.; Antelo, Manel; Ainsworth, Gillian; Hyder, Kieran; van den Bosch, Matilda; Villasante, Sebastián (2022): Recreational fishing, health and well-being: findings from a cross-sectional survey. In *Ecosystems and People* 18 (1), pp. 530–546. DOI: 10.1080/26395916.2022.2112291.

Pitchon, Ana; Norman, Karma (2012): Fishing off the Dock and Under the Radar in Los Angeles County: Demographics and Risks. In *Bulletin, Southern California Academy of Sciences* 111 (2), pp. 141–152. DOI: 10.3160/0038-3872-111.2.141.

Robben AG (2024): Protokoll Robben AG MV 2024. Stralsund.

Salomon, Markus; Schumacher, Jochen (2022): Maritime spatial planning: Germany as a forerunner in ecosystem-based management? In *Planning Practice & Research* 37 (6), pp. 739–750. DOI: 10.1080/02697459.2022.2119511.

Santos, Juan; Herrmann, Bent; Stepputtis, Daniel; Günther, Claudia; Limmer, Bente; Mieske, Bernd et al. (2018): Predictive framework for codend size selection of brown shrimp (Crangon crangon) in the North Sea beam-trawl fishery. In *PloS one* 13 (7), DOI: 10.1371/journal.pone.0200464.

Santos, Juan; Stepputtis, Daniel; Oesterwind, Daniel; Herrmann, Bent; Lichtenstein, Uwe; Hammerl, Constanze; Krumme, Uwe (2022): Reducing cod bycatch in flatfish fisheries. In *Ocean & Coastal Management* 220, p. 106058. DOI: 10.1016/j.ocecoaman.2022.106058.

Santos, Juan; Furkert, Frederik; Stepputtis, Daniel; Schütz, Annemarie (2023): Neues Sortiergitter-Konzept zur Beifangreduktion in der Krabbenfischerei. In *Fischerblatt* 71 (12), pp. 21–25.

Schleswig-Holstein (2023): Organisation der Fischereiverwaltung. Available online at https://www.schleswig-holstein.de/DE/fachinhalte/F/fischerei/organisationFischereiverwaltung, checked on 12/19/2024.

Schmücker, Dirk; Schmüdderich, Suitbert (2010): Gutachten zur Bedeutung und zum Einfluss der Fischerei auf den Wirtschaftsfaktor „Tourismus“. Available online at https://www.gdws.wsv.bund.de/SharedDocs/Downloads/DE/Planfeststellungsverfahren/200_Ausbau_Aussenems/Planunterlagen/Unterlage_K/K2_Tourismus_OZ4.pdf?__blob=publicationFile&v=1, checked on 12/19/2024.

Schultz, Sebastian; Günther, Claudia; Santos, Juan; Berkenhagen, Jörg; Bethke, Eckhard; Hufnagl, Marc et al. (2015): Optimierte Netz-Steerte für eine ökologisch und ökonomisch nachhaltige Garnelenfischerei in der Nordsee (CRANNET). Projektabschlussbericht. Available online at https://www.thuenen.de/media/institute/sf/Projektdateien/468_-_CRANNET/CRANNET_Abschlussbericht.pdf, checked on 12/19/2024.

Schulze, Torsten (2018): International fishing activities (2012-2016) in German waters in relation to the designated Natura 2000 areas and proposed management within. Edited by Thünen Institut of Sea Fisheries. Hamburg. Available online at https://literatur.thuenen.de/digbib_extern/dn059700.pdf, checked on 12/19/2024.

Schwerin (2024): Application for compensation payments for loss of catches of grey seals and harbour seals in the second half of 2023 and in 2024. Available online at https://www.schwerin.de/politik-verwaltung/dienstleistungen/verwaltungsleistungen/Ausgleichszahlungen-bei-Fangausfaellen-durch-Kegelrobben-und-Seehunde-im-2.-Halbjahr-2023-und-im-Jahr-2024-beantragen/, checked on 11/20/2024.

Sciberras, Marija; Hiddink, Jan Geert; Jennings, Simon; Szostek, Claire L.; Hughes, Kathryn M.; Kneafsey, Brian et al. (2018): Response of benthic fauna to experimental bottom fishing: A global meta-analysis. In *Fish and Fisheries* 19 (4), pp. 698–715. DOI: 10.1111/faf.12283.

SeeFischG (1984): Gesetz zur Regelung der Seefischerei und zur Durchführung des Fischereirechts der Europäischen Union (Seefischereigesetz - SeeFischG). Seefischereigesetz in der Fassung der Bekanntmachung vom 6. Juli 1998 (BGBl. I S. 1791), das zuletzt durch Artikel 2 Absatz 31 des Gesetzes vom 20. Dezember 2022 (BGBl. I S. 2752) geändert worden ist. Available online at https://www.gesetze-im-internet.de/seefischg/SeeFischG.pdf, checked on 12/19/2024.

Statista (2024): Ranking der Top-20 Länder nach Küstenlänge. Available online at https://de.statista.com/statistik/daten/studie/699751/umfrage/laender-mit-der-laengsten-kueste/, checked on 12/20/2024.

STECF (2023): Economic report on the EU aquaculture (STECF-22-17). With assistance of Raúl Prellezo, Evelina Carmen SABATELLA, Jesper L. ANDERSEN, Edo AVDIC MRAVLJE, Jörg Berkenhagen, Suzana Cano et al. Edited by J. Guillen, J. Virtanen, R. Nielsen. Publications Office of the European Union. Luxembourg (Reports of the Scientific, Technical and Economic Committee for Fisheries). Available online at https://data.europa.eu/doi/10.2760/51391, checked on 12/20/2024.

STECF (2024a): Scientific, Technical and Economic Committee for Fisheries (STECF) - The 2024 Annual Economic Report on the EU Fishing Fleet (STECF 24-03 and 24-07). With assistance of Raúl Prellezo, Evelina Carmen SABATELLA, Jesper L. ANDERSEN, Edo AVDIC MRAVLJE, Jörg Berkenhagen, Suzana Cano et al. Edited by Raul Prellezo, Evelina Sabatella, Jarno Virtanen, Montserrat Tardy Martorell, Jordi Guillen. Publications Office of the European Union. Luxembourg (Reports of the Scientific, Technical and Economic Committee for Fisheries). Available online at doi:10.2760/5037826, checked on 12/19/2024.

STECF (2024b): Social data in fisheries (STECF-24-05). With assistance of Ballesteros, M., Kraan, M., Schreiber, M., Avdic Mravlje, E., F. Barz, G. Carpenter, D. Cepic, M. Cozzolino, I. Davidjuka et al. Edited by M. Ballesteros, M. Kraan, M. Tardy Mortell, J. Virtanen, J. Guillen. Publications Office of the European Union. Luxembourg (Reports of the Scientific, Technical and Economic Committee for Fisheries). Available online at https://data.europa.eu/doi/10.2760/461821, checked on 12/19/2024.

Steinkopf, Markus; Krumme, Uwe; Schulz-Bull, Detlef; Wodarg, Dirk; Loick-Wilde, Natalie (2024): Trophic lengthening triggered by filamentous, N2-fixing cyanobacteria disrupts pelagic but not benthic food webs in a large estuarine ecosystem. In *Ecology and evolution* 14 (2), DOI: 10.1002/ece3.11048.

Stelzenmüller, Vanessa; Gimpel, Antje; Letschert, Jonas; Kraan, Casper; Döring, Ralf (2020): Research for PECH Committee – Impact of the use of offshore wind and other marine renewables on European fisheries. European Parliament, Policy Department for Structural and Cohesion Policies. Brussels.

Stepputtis, Daniel; Noack, Thomas; Lichtenstein, Uwe; Hammerl, Constanze; Santos, Juan; Mieske, Bernd (2022): Verringerungen von Kunststoffmüll aus der Krabbenfischerei durch Netzmodifikationen – Dolly Rope Suspension (DRopS) : Projekt- Abschlußbericht. Johann Heinrich von Thünen-Institut. Braunschweig (Thünen Report, 101). Available online at https://literatur.thuenen.de/digbib_extern/dn065718.pdf, checked on 12/19/2024.

Stepputtis, Daniel; Santos, Juan; Mieske, Bernd; Lichtenstein, Uwe; Schütz, Annemarie; Stechert, Rainer (2020): CODEX (CodEXcluder) – Netzmodifikationen zur Reduktion des Dorschbeifanges: Abschlussbericht. Thünen Institute of Baltic Sea Fisheries. Rostock. Available online at https://literatur.thuenen.de/digbib_extern/dn063252.pdf, checked on 12/19/2024.

Strehlow, Harry; Schultz, Norbert; Zimmermann, Christopher; Hammer, Cornelius (2012): Cod catches taken by the German recreational fishery in the western Baltic Sea, 2005–2010: implications for stock assessment and management. In *ICES Journal of Marine Science* 69 (10), pp. 1769–1780. DOI: 10.1093/icesjms/fss152.

Strehlow, Harry V.; Korzhenevych, Artem; Lucas, Jorrit; Lewin, Wolf-Christian; Weltersbach, Marc Simon; Riepe, Carsten; Arlinghaus, Robert (2023): Economic impact of resident and nonresident marine anglers to the local economy in Mecklenburg-Western Pomerania, Germany. In *Fisheries Management and Ecology*, DOI: 10.1111/fme.12664.

Strehlow, Harry Vincent (2010): The multiannual management plan for cod in the Baltic Sea. Reactions and sentiments in two German fishing communities. In *ICES Journal of Marine Science* 67 (9), pp. 1963–1971. DOI: 10.1093/icesjms/fsq127.

Strübing, Jörg; Hirschauer, Stefan; Ayaß, Ruth; Krähnke, Uwe; Scheffer, Thomas (2018). Gütekriterien qualitativer Sozialforschung. Ein Diskussionsanstoß. In *Zeitschrift für Soziologie* 47(2), pp. 83–100. DOI: 10.1515/zfsoz-2018-1006

Sulanke, E.; Rubel, V.; Berkenhagen, J.; Bernreuther, M.; Stoeck, T.; Simons, S. (2025): Amending the European fishing fleet segmentation based on machine learning and multivariate statistics. In *Fisheries Research* 281, DOI: 10.1016/j.fishres.2024.107190.

Temple, Andrew J.; Skerritt, Daniel J.; Howarth, Philippa E.C.; Pearce, John; Mangi, Stephen C. (2022): Illegal, unregulated and unreported fishing impacts: A systematic review of evidence and proposed future agenda. In *Marine Policy* 139, DOI: 10.1016/j.marpol.2022.105033.

Thünen Institute (2021): OTC-Smart Fishing. Available online at https://www.thuenen.de/en/institutes/baltic-sea-fisheries/projects/fisheries-and-survey-technology/otc-smart-fishing-sensorsystem-fuer-smarte-fischernetze, checked on 11/22/2024.

Thünen Institute (2023): MiniSeine – eine kleine Snurrewade für die deutsche Küstenfischerei. With assistance of Thomas Noack. Available online at https://www.thuenen.de/de/fachinstitute/ostseefischerei/projekte/fischerei-surveytechnik/miniseine, checked on 11/22/2024.

Thünen Institute (2024a). Available online at https://www.thuenen.de/de/, checked on 12/19/2024.

Thünen Institute (2024b): Gill net fisheries: Development of alternative management approaches (STELLA2). Available online at https://www.thuenen.de/en/institutes/baltic-sea-fisheries/projects/fisheries-and-survey-technology/stella2, checked on 11/22/2024.

Thünen Institute (2024c): Landatlas. Available online at https://karten.landatlas.de/, checked on 12/20/2024.

Weithman, S. A. (1999): Socioeconomic benefits of fisheries. In C. C. Kohler, W. A. Hubert (Eds.): Inland fisheries management in North America. 2 ed.: American Fisheries Society, pp. 193–213.

Weltersbach, Marc Simon; Riepe, Carsten; Lewin, Wolf-Christian; Strehlow, Harry Vincent (2021): Ökologische, soziale und ökonomische Dimensionen des Meeresangelns in Deutschland. Braunschweig (Thünen Report, 83). Available online at https://www.thuenen.de/media/publikationen/thuenen-report/Thuenen_Report_83.pdf, checked on 12/20/2024.

White, Mathew P.; Elliott, Lewis R.; Grellier, James; Economou, Theo; Bell, Simon; Bratman, Gregory N. et al. (2021): Associations between green/blue spaces and mental health across 18 countries. In *Scientific reports* 11 (1), DOI: 10.1038/s41598-021-87675-0.

Wiech, Martin; Djønne, Christine; Kolding, Jeppe; Kjellevold, Marian; Ferter, Keno (2021): Targeted risk assessment of mercury exposure of recreational fishers: Are nephrops fishers in Norway at risk? In *Environmental science and pollution research international* 28 (36), pp. 50316–50328. DOI: 10.1007/s11356-021-14093-0.

Wienbeck, Harald; Herrmann, Bent; Feekings, Jordan P.; Stepputtis, Daniel; Moderhak, Waldemar (2014): A comparative analysis of legislated and modified Baltic Sea trawl codends for simultaneously improving the size selection of cod (*Gadus morhua*) and plaice (*Pleuronectes platessa*). In *Advances in the Analysis and Application of Harvest Policies in the Management of Fisheries* 150, pp. 28–37. DOI: 10.1016/j.fishres.2013.10.007.

WindSeeG (2016): Gesetz zur Entwicklung und Förderung der Windenergie auf See (Windenergie-auf-See-Gesetz). Available online at https://www.gesetze-im-internet.de/windseeg/BJNR231000016.html, checked on 1/20/2025.

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