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Fishers, Let Us Talk: Validating Métiers in a Multi-Gear Coastal Fishing Fleet

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Abstract: In the multi-gear coastal fleet in the Algarve (South Portugal), fishers own licenses for various fishing gears. However, they generally do not use all these licenses, and therefore, it is difficult to estimate the impacts this fleet has on the local environment. In this study, two types of questionnaires were used directed to the local fishers from the multi-gear fleet during interviews carried out between November 2019 and July 2021 with the objective to validate the métiers proposed for this fleet in a previous study using multivariate analysis on past landing profiles. A total of 10 out of the 11 proposed métiers were validated, including four métiers with gillnets, three with dredges, two with trammel nets, and one with traps. Additional métiers were identified not found in the previous study. The results obtained with the two types of questionnaires are presented, and their usefulness in validating the gear used and the seasonality of fishing activities are discussed, as well as their contribution to a clearer distinction between target species and commercial by-catch.

Keywords: fishing métiers; fisher questionnaires; multi-gear fleet; coastal fleet; fleet-based management

Citation: Szynaka, M.J.; Fernandes, M.; Anjos, M.; Erzini, K.; Gonçalves, J.M.S.; Campos, A. Fishers, Let Us Talk: Validating Métiers in a Multi-Gear Coastal Fishing Fleet. *Fishes* **2022**, 7, 174. https://doi.org/10.3390/fishes7040174

Academic Editors: Dimitrios Moutopoulos and Sanja Matić-Skoko

Received: 22 June 2022
Accepted: 14 July 2022
Published: 19 July 2022

1. Introduction

In the Portuguese multi-gear coastal fishing fleet, the fishers have multiple licenses for different gear types, often varying in their characteristics, such as mesh size and dimensions, giving them the possibility for alternating gear use according to species availability and abundance. This means that the environmental impacts of the fishing activity can vary by vessel throughout the year. The characterization of the different métiers, as well as of the evaluation of their impact on both the living resources and the ecosystems exploited, are important tools in assisting management decisions in fisheries, as they describe the fishing operations with similar exploitation patterns and target species using similar gear during the same time and location [1]. In the DCF (European data collection framework) and the EU-MAP (EU-MAP [2]), six levels are considered when describing métiers, with level 1 corresponding to the activity (fishing versus non-fishing), levels 2 through 4 to gear category, group, and type, respectively, level 5 to the main species type in terms of target assemblages (e.g., demersal fish, crustaceans), and level 6 to fishing gear details, such as mesh size or hook size. Deporte et al. [3] discuss a seventh level that is more specific and based on the target species or species at which the fishing effort is directed [2].

In a previous study, fleet segmentation based on multivariate analysis of the landing profiles of the coastal multi-gear fleet in Southern Portugal resulted in 11 proposed métiers where a correspondence was established between various gears and particular target species [4]. These gears included gillnets and trammel nets, traps and pots, longlines, and dredges, differing in their impacts on the local environment. A total of six métiers were

identified using nets, with gillnets used in four different métiers having as target species the monkfishes (*Lophius piscatorius* and *Lophius budegassa*); the European hake (*Merluccius merluccius*); the bastard sole; and the thickback sole (*Microchirus* spp.), while trammel nets were found to be used in two métiers, targeting cuttlefish (*Sepia officinalis*); and murex (*Bolinus brandaris*). Traps were used in two métiers, one targeting octopus (*Octopus vulgaris*) and the other Norway lobster (*Nephrops norvegicus*); the remaining three métiers were related to the use of dredges for bivalve fishing (*Donax* spp., *Spisula solida*, *Chamelea gallina*). All these were observed to be seasonal métiers except for the bivalve and octopus métiers.

The clustering of landing profiles, an output-based method in métier identification, is commonly used to observe trends in catch across years and seasons, as well as in the main target species. However, this type of analysis can have some limitations, as the métiers defined are not always indicative of "true" or intended targeted species [5]. One possible way to identify the true targeted species is by analyzing logbooks (records of catch and effort at the fishing operations level), which are mandatory for vessels above 10 m in length. More recently, e-logbooks containing detailed georeferenced information are also available, mandatory for all vessels above 15 m (or above 12 m if absent from port for periods longer than 24 h).

For vessels under 10 m, information on landings can be obtained from auction sales slips. However, this information does not provide details on fishing operations and gear characteristics. It is, therefore, necessary to find additional ways to complement and build on the information provided by the landings to evaluate the potential environmental impacts of specific fleets. One possibility is to discover the fishing strategy with the help of direct knowledge from the local fishers themselves. This can be done by developing structured questionnaires with the purpose of collecting information on fishing trips, gear characteristics, and species captured, that can validate previously identified métiers resulting from fleet segmentation. It also allows the possibility to address the fishers' current perceptions on trends in the fishing activity, including landings. However, few studies have focused on métier identification using LEK (local ecological knowledge) in support of the analysis of landing profiles. In a few cases, questionnaires were carried out to assess fishing intentions, as well as to obtain technical information on fishing strategies and gear design regarding métiers [6–8]. In other studies, they were used to observe fishing trends and fluctuations, often focusing on particular species [9]. The perception of older fishers with many years of experience has proven to be particularly important because they can identify trends, whereas younger fishers are unable to detect long-term changes or overexploited species [10,11].

In Portugal, interviews with fishers using structured questionnaires have become a commonly used method to provide information to understand fishers' perceptions on landings, as well as on the ecology and biology of the species they are targeting [12–18]. Through questionnaires, information can also be collected on fishing operations and gear characteristics, on the effects of fisheries on megafauna, and on how different local fishing activities affect stocks, many of which are not assessed and are considered by the International Council for Exploration of the Sea, ICES [19], as category 5 (only landings data is available) and category 6 (negligible landings stocks and stocks caught in minor amounts as by-catch). Finally, questionnaires allow scientists to collect fishers' suggestions and LEK that may be potentially useful for improving advice to fisheries.

The main objective of this study is to compare the utilities of two types of questionnaires to explore the possibility of validating previously identified métiers [4] and to add further information to promote efficient management; to investigate changes in licenses from 2012 to 2016; to observe license trends from 2012–2016 and 2019–2020; and to detect shifts in fishing operations.

2. Materials and Methods

2.1. Study Area

Two surveys were carried out during this study, corresponding to the use of two differently structured questionnaires, carried out at seven fishing ports along the south coast of Portugal (Figure 1). The first round of questionnaires was conducted from November 2019 to February 2020 and the second round in July 2021. The vessels selected for the study belong to the multi-gear coastal fleet, with length overall (LOA) of 9 m or more, holding licenses for more than a single gear type.

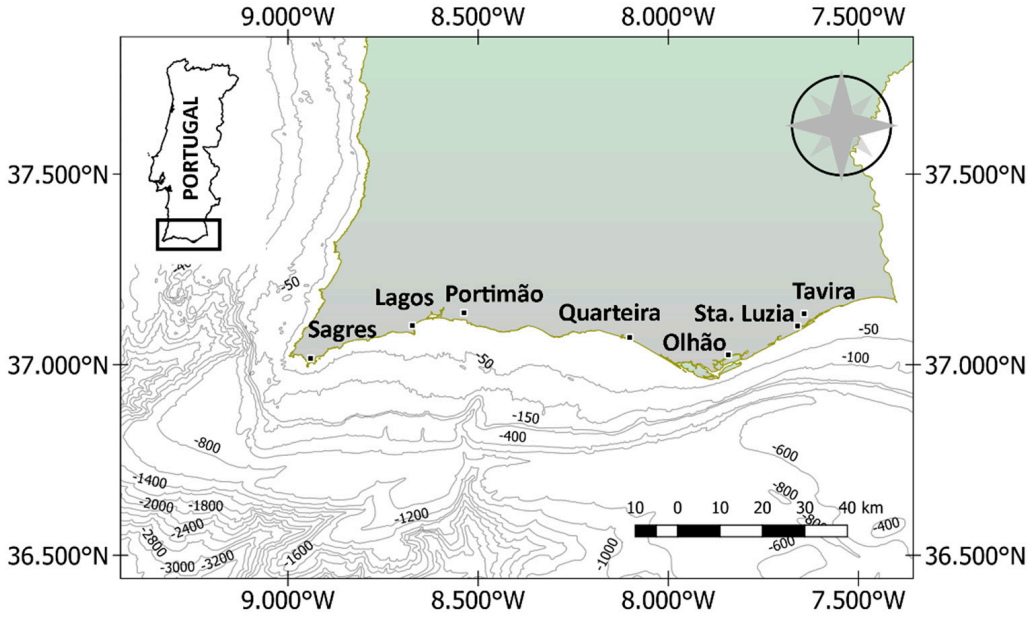

Figure 1. Map of the Algarve with all the ports where questionnaires were conducted.

2.2. Questionnaires

The first questionnaire focused on trip characteristics and details of fishing operations, while the second questionnaire aimed to provide clarification on target species and seasonality. The questionnaires were prepared within the framework of the project, TECPESCAS, and the interviews were carried out with professional fishers by experienced interviewers, including masters' students and one PhD student. The choice to conduct questionnaires with the skippers rather than the crew was made because they are generally more knowledgeable regarding the species names and ecology or the gears' technical characteristics and are the ones responsible for filling in fishing logbooks or landing declarations. The questionnaires were conducted without considering skippers' age, using three methods: (a) in situ search, where fishers were met at the landing dock during regular auction hours when most of the vessels arrive from fishing; (b) obtaining a prepared list of vessels by asking the local auction for names of vessels greater than 9 m in length and licensed for more than a single gear type; (c) using the "snowball effect" during which skippers introduced or provided contacts of other active skippers from this fleet.

The first type of questionnaire (first round) with open ended questions is often used for initiating a discussion. It can take longer to respond in comparison to the one with close ended questions that can be answered in a shorter time span, but on the other hand, it leaves room for discussion and can result in collecting extra, potentially useful information. This type comprised two main sections: 1. vessel and contact information; 2. fishing activity—2.1 trip characteristics and 2.2 fishing gear characteristics. The questions related to fishing trip characteristics addressed the number of trips and their duration, hours and port of departure, average number of trips per week, number of gears regularly used, gear loss, and soak time. Questions on fishing operations addressed any license changes from

the period of 2012–2016, setting and hauling speed, total length of the gear, total number of traps and pots, mesh size for nets and hook size for the longlines, and the species being targeted (including commercial by-catch).

A second set of questionnaires was conducted using a similar method (second round). This questionnaire differs from the former one in that it contained close-ended questions and was constructed with the top six species per cluster, representing a minimum of 73% of the cluster in landings. This group included those species that were present in the yearly and seasonal trend clusters from the original multivariate analysis conducted on the fleet-landing profiles from 2012–2016 [4]. Each skipper was given a list of species and the percentage of each species represented in the cluster and were asked to identify the gear, gear characteristics, fishing season, and depth based on their experience and knowledge.

All the information was treated anonymously and is protected (Article 89 of the GDPR) under the personal data protection regulation of Portugal. Responses to all questions within the questionnaires were optional, and each skipper gave verbal consent to use the information for the study.

2.3. Analysis

The tables and figures are presented for the different gear types with details on: (a) fishing trips, operations, and gear characteristics; (b) gear type comparisons between 2012–2016 and late 2019–early 2020 (the first questionnaire time period), and (c) the existing métiers. The primary and secondary gears found for each vessel in the EU fleet register were compared to the gears currently in use to search for and identify trends in gear use along time. The data from the questionnaires were cross checked with the previously identified métiers [4] in the first round by gear type and in the second by both gear type and season with the purpose of validating the métiers. The two questionnaire forms are compared by species, fishing gears, gear characteristics, depth, and season. The consistency of responses among vessels, as well as the skipper's confidence in answering the questions, were noted. The responses to the second round of questionnaires regarding depth, season, gear characteristics, and gear type by target species were compared with similar information in the proposed métiers.

3. Results

3.1. Interviews: First Round Using Questionnaire 1

A total of 40 vessels (skippers) were interviewed in the various ports, corresponding to 66 gear licenses being actively used (Table 1), with 15 vessels (37.5%) between 9 and 11.99 m in total length, while 25 (62.5%) were equal to or more than 12 m in total length. A total of 10 different métiers were identified through the questionnaires, comprising vessels operating a similar type of gear, including the same mesh or hook size, and targeting similar species. A total of 31 out of the 40 vessels (77.5%) were operating a single gear type per trip, while the remaining vessels operated two different gear types, mostly gillnets and trammel nets.

In general, the crews in this fleet are between two and five fishers, not including the skipper. For trammel nets and gillnets, the fishers stated they go out to sea up to six days a week with the majority carrying out three to five fishing trips a week. The fishers using pots and traps stated that they carry out between three and five trips weekly and those using longlines between one and four trips. The setting and hauling speeds reported are similar for trammel nets, gillnets, pots, and traps and higher than those reported for longlines. Vessels operating nets leave early in the morning, and those using pots, traps, and longlines leave in the afternoon or late in the evening. The longest soak times reported are for pots and traps, varying from 5 h to an entire week, while for longlines and nets they are up to 24 h. The longest trip duration was found to be for longlines, around 36 h from departure to arrival at port, while for trammel nets, gillnets, and pots, fishing trips take up to 16 h and for traps up to 48 h. While bottom gillnets and longlines were used for various métiers, differing in fishing depth, mesh size, and hook size, the vessels using trammel nets stated

their main target species was cuttlefish. For those using traps and pots, octopus was the target species.

Table 1. Average trip and gear characteristics by gear type of the interviewed vessels, number of crew per vessel, number of trips per week, setting and hauling speed, time of departure from port, net length, number of traps or hooks, mesh size (mm) or hook number, setting and soaking time (h), and trip duration.

Gear	No. of Crew	Trips per Week	Setting Speed (kn)	Hauling Speed (kn)	Time of Departure	Net (m)/No. of Traps/No. of Hooks	Mesh Size (mm)/Hook No	Setting Time (h)	Soak Time (h)	Duration of Trip (h)
Trammel nets	3.0–7.0	3.0–6.0	3.0–7.0	0.5–3.0	01:00–06:00	500–6000	100–120 *	0.5–2.5	1.0–24.0	7.5–15
Bottom Gillnets	3.0–5.0	2.0–6.0	1.0–5.0	1.0–2.0	4:00–17:00	4000–6000	35–40	0.5–1.5	24.0	8.0–12.0
Bottom Gillnets	3.0–5.0	3.0–4.0	5.0–7.0	2.0–3.0	00:00–01:00	9000–13,000	60–79	1.0	2.0–24.0	11.0–15.0
Bottom Gillnets	3.0–5.0	2.0–6.0	3.0–5.0	0.5–2.0	02:00–14:00	600–10,000	80–99	0.5–1.0	0.5–24.0	7.5–16.0
Bottom Gillnets	3.0–5.0	3.0–4.0	6.5	1.0	14:00–22:00	600	100–150	0.5	0.5–12.0	7.0–16.0
Bottom Gillnets	5.0	6.0	5.0–8.0	0.5–3.0	01:00–04:00	4500–10,000	200–220	0.5–1.0	0.5–24.0	7.0–10.0
Pots	3.0–4.0	2.0–5.0	2.0–8.0	1.5–3.0	14:00–22:00	1000–2500	NA	2.0–8.0	24.0–72.0	8.0–12.0
Traps	2.0–5.0	2.0–5.0	2.5–8.0	1.0–4.0	14:00–07:00	750–2400	30–50 mm	0.5–3.0	5.0–168.0	7.0–48.0
Bottom Longlines	4.0	1.0–4.0	3.0–5.0	1.0–5.0	17:00–23:00	3000–5000	5–8	3.0–5.0	24.0	36.0
Bottom Longlines	3.0–4.0	1.0–5.0	1.5–4.0	1.0–1.5	22:00–23:00	900–2000	9–13	1.0–3.0	2.0–24.0	11.0–48.0

* inner mesh size for trammel nets.

The comparisons of the responses of the first interviewing period (2019–2020) and the period of the landing profiles from the multi-variate analysis (2012–2016) show an increase in the number of vessels using traps/pots (Figure 2). From a total of fourteen gear license combinations, eight combinations were found to be no longer used by the interviewed vessels, including combinations of traps; traps and longlines, gillnets and longlines, and traps and trammel nets. A decrease was found in two license combinations, (i) only gillnets and (ii) a combination of gillnets and trammel nets; a single license combination was found to persist (gillnets and traps); one new license combination was identified (gillnets, traps, and longlines). Two license combinations (one including traps and pots, and the other including also longlines) were more represented in 2019–2020. A total of nine vessels indicated changes in their licenses, eight of which added trap licenses, and one added a gillnet license.

The ten métiers identified in this study are defined in Table 2, from which six had been already proposed by Szynaka et al. [4]. Two longline métiers were identified, with three vessels operating with small hook sizes (numbers 9, 10, 12, and 13) and two with large hooks (numbers 5 to 8). The blackbelly rosefish (*Helicolenus dactylopterus*), forkbeard (*Phycis phycis*), conger eel (*Conger conger*), and wreckfish (*Polyprion americanus*) were targeted with large hook size ranges, while for the red porgy (*Pagrus pagrus*), axillary seabream (*Pagellus acarne*), common pandora (*Pagellus erythrinus*), forkbeard, blackbelly rosefish, and common two-banded seabream (*Diplodus vulgaris*), hook sizes 9–13 were used.

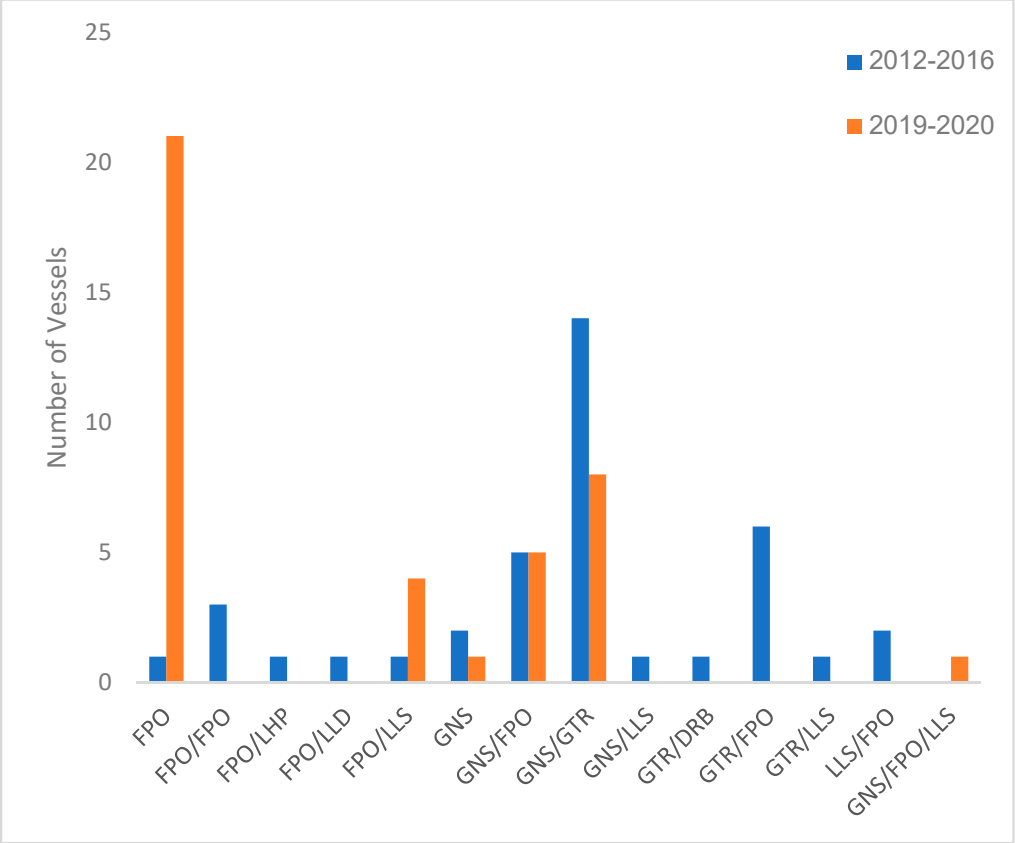

Figure 2. Comparison of gear license combinations (actively used) between 2012–2016 and 2019–2020 complementing Appendices A and B and Tables A1 and A2 [FPO = pots and traps; LLD/LLS = drifting/set longlines; GNS = gillnets; GTR = trammel nets; DRB = dredge].

Small mesh gillnets (35–40 mm and 60–79 mm) were operated by two and three vessels, respectively, targeting pouting (*Trisopterus luscus*), hake, thickback sole (*Microchirus variegatus*), axillary seabream, common pandora, bastard soles, and red mullet (*Mullus surmuletus*). Eight vessels fished with 80–99 mm mesh size gill nets, targeting European bass (*Dicentrarchus labrax*), hake, thickback sole, red mullet, thornback ray (*Raja clavata*), red porgy, axillary seabream, sole (*Solea solea*), and bastard soles. Three vessels were operating with gillnets of mesh sizes between 100 and 200 mm, targeting European seabass, red mullet, red porgy, axillary seabream, and gilt-head seabream (*Sparus aurata*), and three more vessels used mesh sizes of 200 mm or greater to target blackbellied angler (*Lophius budegassa*), john dory (*Zeus faber*), monkfish, and *Lophius* spp. (the blackbellied angler and monkfish). Eight vessels operated with 100 mm or greater mesh-size trammel nets, targeting blackbelly rosefish, European seabass, cuttlefish, meagre (*Argyrosomus regius*), thickback sole, soles, white seabream (*Diplodus sargus*), and bastard soles. Pots and traps were used by a total of eight and twenty-seven vessels, respectively, to target octopus, with some traps used to target finfish, such as the common two-banded seabream and the blackspot seabream (*Pagellus bogaraveo*).

A total of six métiers proposed by Szynaka et al. [4] were validated by the skippers in this round of interviews, including four gillnet métiers and a trammel net métier targeting a variety of species and a métier using traps [4].

Table 2. Gear type with mesh size or hook number, the targeted species and the number of vessels operating with the métier and the validated potential métiers [FAO Code: ANK = blackbelly angler; BIB = pouting; BRF = blackbelly rosefish; BSS = European seabass; COE = conger eel; CTB = common Two-banded seabream; CTC = cuttlefish; FOR = forkbeard; HKE = hake; JOD = john dory; MGR = meagre; MKG = thickback sole; MON = monkfish; MNZ = *Lophius* spp, MUR = red mullet; OCC = octopus; PAC = common pandora; RJC = thornback ray; RPG = red porgy; THS = bastard soles; SBA = axillary seabream; SBG = gilthead seabream; SBR = blackspot seabream; SOO = sole; SWA = white seabream; WRF = wreckfish].

Gear Type	Mesh Size/ Hook Number	Species	No. Vessels Targeted	Validated Potential Métiers
LLS	H 5–8	BRF, COE, FOR, WRF	2	-
LLS	H 9–13	BRF, CTB, FOR, PAC, SBA, RPG	3	-
GNS	35–40 mm	BIB, HKE, THS, SBA	2	HKE-GNS, THS-GNS
GNS	60–79 mm	BIB, HKE, PAC, MKG, MUR, THS, SBA	3	HKE-GNS, MKG-GNS
GNS	80–99 mm	BSS, HKE, MKG, MUR, RJC, RPG, SBA, SOO, THS	8	HKE-GNS, MKG-GNS, THS-GNS
GNS	100–200 mm	BSS, MUR, RPG, SBA, SBG	3	-
GNS	200+ mm	ANK, JOD, MNZ, MON	3	MON-GNS
GTR	100+ mm	BRF, BSS, CTC, MGR, MKG, SOO, SWA, THS	8	CTC-GTR
FPO	Traps	OCC, CTB, SBR	27	OCC-FPO
FIX	Pots	OCC	8	-

3.2. Interviews: Second Round Using Questionnaire 2

A total of 48 vessels were interviewed, totaling 71 gear licenses being used. Twenty-eight vessels were between 9 and 11.99 m (58.3%), and 20 were 12 m or larger (41.7%). Thirty-six use traps to target octopus, four target clams with two types of dredges, one vessel targets hake with bottom longlines, and 14 vessels target hake, cuttlefish, monkfish, and bastard soles with gillnets and trammel nets. 10 of the 11 métiers proposed by Szynaka et al. [4] based on the multivariate analysis of landing profiles were validated by the questionnaire used (Figure 3).

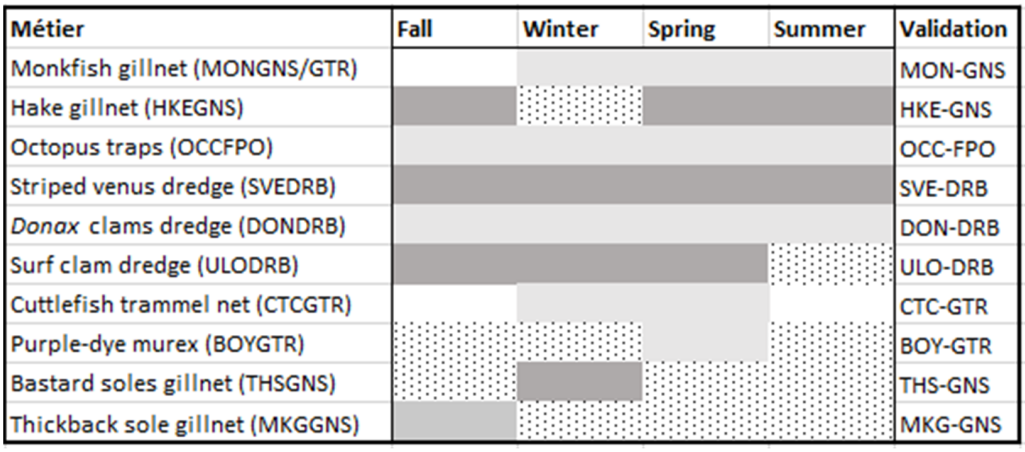

Figure 3. Métiers (common name, gear type, FAO code, and DGRM gear abbreviations) with the characteristic season (in which the highlighted seasons represents an overlap with the landing profile potential métiers from 2012–2016 and the dotted pattern solely represents the questionnaire responses), and validated metiers.

The 10 métiers validated were: monkfish targeted with both 200 mm mesh or larger gillnets and trammel nets from winter through summer in areas up to 400 m deep; hake and bastard soles (including thickback soles) targeted with 80–99 mm mesh gillnets year

round at depths up to 200 m; octopus targeted with traps (mesh size 30–50 mm) and pots year round at depths up to 400 m; the striped venus, *Donax* clams and surf clams targeted with dredges year round; cuttlefish targeted with 100–120 mm mesh size trammel nets in winter and spring at depths up to 100 m; and purple-dye murex targeted by trammel nets (of varying mesh sizes) year round at depths up to 200 m. A total of 21 skippers operated various other gears along with the gears they are currently using.

4. Discussion

As previously mentioned, many fisheries in Portugal are considered as stock category 5 and 6 by ICES [19], as is the case for fisheries by the multi-gear coastal fleet in Southern Portugal, making it difficult to understand what species are actually being targeted. A total of 11 métiers could be defined through the analysis of species composition associated to gear licenses [4]. However, a few questions remained concerning validation of métiers, as well as their persistence in time. According to previous studies, landings information can be gathered using fishers' knowledge, and their knowledge can also be used for the validation of potential métiers by collecting information on catch data (catch composition and catch rates), fishing operations, and gear technical characteristics [6,7,20,21]. LEK was used in this study to validate the previous multivariate analysis [4].

4.1. Methods

Open- and closed-ended questionnaires were used during interviews, and nearly every skipper answered the questions with confidence. One of the challenges faced was not to overwhelm the fishers with too many questions, especially after they had just come back from sea. While some were initially hesitant to answer the questionnaires, they realized the format was not too long (especially the second-round format), and thus, encouraged their colleagues to answer as well. This contributed to strengthen the relationship between those issuing the questions and the respondents, positively influencing the willingness to respond [5].

In terms of the first round of questionnaires, the open-ended questions and the variety of questions resulted in an in-depth characterization of the fishing trips and gear types. On the other hand, the second round of questionnaires, with close ended questions, where target species were defined a priori, resulted, as previously expected, in the definition of specific métiers. While the majority of the respondents answered that they only switch between fishing gears when one of the species they are targeting is less available, very few indicated that this switch is related to closures for certain species, such as the monkfish in January and February (Ordinance 315/2011).

4.2. Trip Characteristics

Most vessels are between 9 and 15 m, resulting in the use of increasing gear numbers and dimensions, crew, and, thus, higher catches and potentially longer trips compared to small-scale or artisanal vessels (<9 m). In the first round of questionnaires, most skippers reported that they operate with a single gear type during each fishing trip, with only a few reporting the use of two different gear types. In terms of legal issues, many of the vessels appear to be fishing within regulations set by the Portuguese national fishing authority, DGRM, (Directorate General for Natural Resources, Security, and Maritime Services), except for those targeting octopus with traps. These vessels are allowed to operate with 1000 or 1250 baited traps based on vessel size. However, some own up to 2400 baited traps and are exceeding the amount allowed on a daily basis.

4.3. Changes in Gear and Target Species

The observed shift in gears towards traps can suggest either that the fish stocks targeted with longlines and nets are in decline and/or that the use of traps is economically more profitable, justifying the effort and costs associated with the change. This highlights the importance of using questionnaires to investigate fleet dynamics over the study period,

either over the course of a year or over a longer, multi-year period [22–24]. Part of the vessels present seasonal shifts from one net type to another (e.g., targeting monkfish and hake in summer and fall with gillnets and cuttlefish and soles in winter and spring with trammel nets). Some of the vessels that target clams with dredges stated that they change to octopus traps during harmful algal bloom events affecting the clams. However, the majority stated that their shifts in fishing gears is due to shifts in the availability of the main target species, similar to what was reported in previous studies [22,25].

In previous studies, it was found that trends in gear shifts can be identified by properly structured questionnaires. There has been a considerable shift towards landing octopus with traps, as demonstrated in the previous study on landing profiles [4] and by comparing the results of the questionnaire with the public fleet data. This can either be a result of the depletion of many finfish stocks, of the abundance and high first sale price of octopus, or both [26–28]. Some fishers stated during the informal discussion part of the questionnaire that there is a decline in the willingness of young workers to become fishers, with some skippers going as far as having to sell their coastal category boats due to lack of labor force available, which could be another reason for a shift to "easier" fishing gear (i.e., fewer hours on the vessel and less effort in retrieval of individuals from the fishing gear, as appears to be the case with octopus traps). This lack of information, especially regarding the rapid development of the octopus fleet segment, decreases the possibility of effective management. Acknowledging the continuous increase in vessels targeting octopus with traps and pots should shift the focus of management from the entire fleet to this specific segment, reformulating the existing regulations based on fishers' suggestions. The current octopus fishery regulations may need to be addressed and restructured, with the main problem being the very high number of traps being set, leading to excessive occupation of fishing grounds and competition among vessels, originating conflicts. Previously proposed management measures included establishing a fishing schedule, setting seasonal closures and a maximum allowable catch, and increasing the minimum landing weight DGRM [28,29] of which only the closure of fishing on weekends was implemented.

4.4. New Information

As previously mentioned, questionnaires can help gather information to fill in gaps on seasonality in fishing activities, as well as on target and by-catch species not identified in landing profiles analyses due to their low-catch rates. Although hake, surf clam, and bastard soles appeared to be seasonally targeted, according to Szynaka et al. [4], the answers to the questionnaires indicated that these species are being targeted year-round. Inversely, species that were indicated as "target catch" by the fishers in the first round of questionnaires are most likely commercial by-catch, which is either a result of poor phrasing, misunderstanding by the fishers, or as previously mentioned, simply the lack of a clear distinction between target species and commercial by-catch.

Some bottom longline métiers reported here were not identified in the previous study [4], most likely due to the small number of vessels still operating with longlines. However, these métiers can still be important due to the large areas that these longlines can cover [30]. Again, the results of the surveys confirm the decline in the use of longlines, especially for hake [30,31], with longliners now mainly targeting wreckfish, forkbeard, and conger eel at greater depths. This confirms the results of previous studies where a clear shift to fishing deeper is reported in Portugal starting in the early 1980s [32].

4.5. Validation of Métiers

A total of 10 out of the 11 métiers proposed by Szynaka et al. [4] were validated during the two rounds of interviews with respect to gear type. According to the first round using the open-ended questionnaire, the majority of the vessels do not engage in seasonal activity but instead land most species year-round. However, this round of interviews resulted in the validation of only six out of the 11 métiers identified. By comparison, the second round was

formatted to validate métiers by species rather than by gear type. This resulted not only in the validation of target species and the respective gear types, but also of season. During this round, 10 of the 11 métiers were validated, with the inclusion of the clam species targeted with dredges. In future studies it will be important to address the definition of target species and what this means to the fishers, as it often appears to correspond to the species that they retain to sell. A further question deserving some attention concerns the seasonal character of some fisheries and the number of gears used, as fishers may bias their answers towards what they know they are allowed to do according to the regulations.

5. Conclusions

The current study addresses the specific fishing operations, the métiers, the variables affecting landings, and finally, the trends in fishing gear use between 2012 and 2016, prior to the questionnaire surveys (2019–2021). All this information adds to the previous knowledge on potential métiers, allowing the observation, to some extent, of the impact of these coastal fisheries on the exploited stocks, including the fishing effort and how it changed over time based on shifts in fishing gears used. An example is the increase in fishing effort for octopus with the shift towards traps.

It is, thus, important to describe the different fleets, especially in countries, such as Portugal, where the fishing sector has a high socio-economic importance in the local communities, not only in terms of direct employment but also along the entire value chain. The present study resulted in the validation of 10 of the 11 métiers that were identified by a previous study that conducted cluster analysis on landings data from 2012–2016, providing evidence that these métiers are current and that the method of analysis of landing profiles successfully identified métiers within this multi-gear, multispecies fleet. The next step to further validate the métiers, as well as to describe the fishing operations, is to develop an onboard observation program to record fishing locations, depths, bottom type, and information on the entire catch.

Author Contributions: M.J.S.: conceptualization, methodology, formal analysis, writing—original draft, visualization, project administration. M.F.: investigation, writing—review & editing, M.A.: investigation, writing—review & editing. K.E.: conceptualization, writing—review and editing, supervision, project administration. J.M.S.G.: conceptualization, writing—review and editing, supervision, project administration, funding acquisition. A.C.: conceptualization, methodology, writing—review and editing, supervision, project administration, funding acquisition. All authors have read and agreed to the published version of the manuscript.

Funding: This work was supported by project TECPESCAS MAR2020, Portugal 2020 and the European Maritime and Fisheries Fund (EMFF) [Grant reference 16-01-04-FMP-0010]; and the Portuguese Science and Technology Foundation (FCT) through projects UIDB/04326/2020, UIDP/04326/2020 and LA/P/0101/2020 to CCMAR and the fellowship grant for Monika S. [SFRH/BD/137818/2018].

Institutional Review Board Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: The authors would like to acknowledge all the skippers who participated in this study by answering the questionnaires; DocaPesca for providing information on coastal vessels and respective landing ports; the European Commission for the Fleet Registry data (https://oceans-and-fisheries.ec.europa.eu/fisheries/rules/fishing-fleet-capacities_en (accessed on 1 January 2022), and DGRM (Directorate General for Natural Resources, Security and Maritime Services) for providing information on the laws pertaining to regulations for the fleet. Bottom sediments charts were derived from the European Marine Observation Data Network (EMODnet) Seabed Habitats initiative (www.emodnet-seabedhabitats.eu (accessed on 1 January 2022)), financed by the European Union under Regulation (EU) No 508/2014 of the European Parliament and of the Council of 15 May 2014 on the European Maritime and Fisheries Fund. Finally, a thank you to all those who were involved in all aspects of the project.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. The original ordinances used to describe gear and trip characteristics including the most recent amended ordinance (where applicable) per gear type.

GEAR TYPE	GEAR CHARACTERISTICS	TRIP CHARACTERISTICS
GILL- & TRAMMEL NETS	No. 1102-H/2000, 22/11 *Recent Amendment:* *No. 594/2010, 29/07*	No. 296/94, 17/05
CAGE TRAPS	No. 1102-D/2000, 22/11 *Recent Amendment:* *No. 255/2019, 12/08*	No. 296/94, 17/05
SHELTER TRAPS (POTS)	No. 1102-D/2000, 22/11 *Recent Amendment:* *No. 230/2012, 03/08*	No. 296/94, 17/05
LONGLINES	No. 1102-C/2000, 22/11	No. 296/94, 17/05

Appendix B

Table A2. Primary and secondary gears in EU Fishing Fleet data (2012–2016) and presently used (2019–2020) per vessel questionnaireed and the number of vessels per trend. [FPO = traps (in bold); LHP/LLD/LLS = longlines (pelagic/drift/bottom); GNS = Gillnets; GTR = traps; DRB = dredges]. The first vessel in the table was under a different name and the fishing crew was different between 2012–2016.

Primary/Secondary Gear (2012–2016)	Gear Type (2019–2020)	N° of Vessels
(Change of fishers/name)	**FPO**	1
FPO	**FPO**	1
FPO/**FPO**	**FPO**	3
FPO/LHP	**FPO**	1
FPO/LLD	**FPO**/LLS	1
FPO/LLS	**FPO**/LLS	1
GNS	**FPO**	1
GNS	GNS/**FPO**	1
GNS/**FPO**	**FPO**	1
GNS/**FPO**	GNS/**FPO**/LLS	1
GNS/**FPO**	GNS/GTR	1
GNS/**FPO**	GNS/**FPO**	2
GNS/GTR	**FPO**	5
GNS/GTR	GNS	1
GNS/GTR	GNS/GTR	7
GNS/GTR	GNS/**FPO**	1
GNS/LLS	GNS/**FPO**	1
GTR/DRB	**FPO**	1
GTR/**FPO**	**FPO**/LLS	2
GTR/**FPO**	**FPO**	4
GTR/LLS	**FPO**	1
LLS/**FPO**	**FPO**	1
LLS/**FPO**	**FPO**	1
	Total	**40**

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