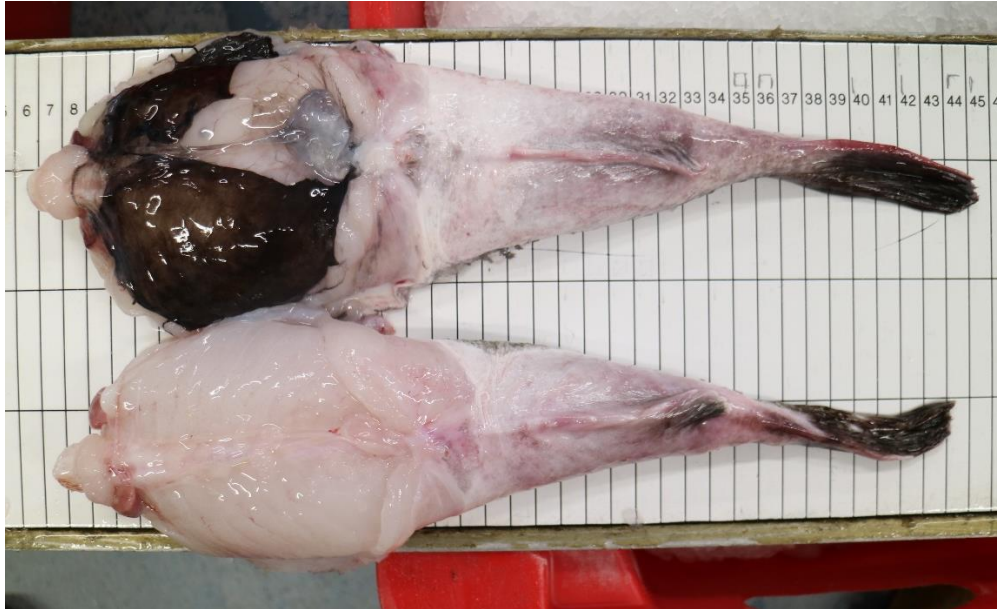




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Fisheries Science Partnership project: Exploring the potential to record species specific monkfish landings data

Author: Robert Forster

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Project Manager:	Mike Fox
Report compiled by:	Robert Forster
Quality control by:	Tom Catchpole
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Executive Summary

Commercial landings of monkfish into UK ports consist of the two species, *Lophius piscatorius* and *Lophius budegassa*, mixed together. There is no EU or UK requirement to report, land, or market the two species separately. This places a limit on the quantity of data that can be generated on catch distributions and size composition for the individual species, with the result that stock assessments are weakened, and management advice for monkfish issued by ICES is precautionary.

This project looked at the possibility of introducing changes to normal working practices of the fishing industry in SW England that would improve the data available for the individual species. Two Newlyn-based beam trawlers took part in a trial, completing a total of 10 fishing trips between September and November 2019 during which the two monkfish species were sorted and landed separately. The landings were sampled on three occasions to validate the accuracy of species identification, which ranged from 87% to 100%. Combined with feedback from fishing crews, this showed that sorting at sea was possible.

Electronic log-books carried on-board the two vessels were not set-up to record daily catches of the two species separately, so the feasibility of obtaining catch distribution data for the individual species could not be determined. Duration of the trial was not long enough to fully assess the impact of sorted landings on market activity, but initial feedback suggested harbour staff could manage the additional work created by handling the two species separately, and prices paid for the two species of monkfish were not notably different. Further work would be needed before the benefits to stock assessments of landing sorted catches for these species can be realised.

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Introduction

The Fishery Science Partnership (FSP) is a Defra-funded programme of scientific research between the UK fishing industry and scientists. The FSP aims to build a positive working relationship between the industry and scientists, whilst providing evidence for fisheries management issues. Since it was established in 2003, the programme has undertaken numerous (about 100) projects including fishing gear selectivity trials, examinations of spatial patterns and catch compositions, investigations into new fisheries and time-series of relative abundance of commercial species. A full description of the development and aims and all completed reports of the FSP programme can be found at the Cefas website (www.cefas.defra.gov.uk/).

This FSP project arose from a UK Fisheries Improvement Programme considering the mixed gear fisheries for monkfish in the Western English Channel. It set out to address data deficiencies on the stocks of monkfish exploited around the UK that impair stock assessments and management advice by considering what information could be generated by the fishing industry in SW England.

Total landings of monkfish caught in European waters ranged from around 50,000 to 70,000 t for the years 1986-2006, (ICES, 2008a, b). Estimates of more recent catches from the two most important regions around the UK are shown in table 1 below. Total landings of monkfish by all UK registered vessels in 2019 accounted for 5.9% of the total value of fish landed, and ranked 6th most important fish species by value; it was the 2nd most important demersal species after Dover sole (MMO, 2019).

Year	Southern Celtic Sea, Bay of Biscay (7b-k, 8a,b,d)	Skagerrak + Kattegat, North Sea, Rockall + West of Scotland (3a, 4, 6)
2010	30,664	13,839
2011	33,771	13,679
2012	36,323	12,265
2013	40,816	12,139
2014	38,054	13,287
2015	37,274	16,043
2016	38,974	19,505

Table 1. Estimates of combined catches of monkfish (tonne) around the UK, 2010-16. (ICES, 2018)

Commercial landings of monkfish in the NE Atlantic consist of two species – *Lophius piscatorius* and *Lophius budegassa*. *L. piscatorius* occurs from Iceland and the southwestern Barents Sea to the Strait of Gibraltar, including the Mediterranean and the Black Sea (Caruso, 1986). *Lophius budegassa* coexists with *L. piscatorius* over most of the range of the latter, although it has a more southerly distribution, from the British Isles to Senegal (Caruso, 1986). The most common habitat of the genus *Lophius* is bathydemersal over the continental shelf and upper slope down

to depths >1000 m, on soft to hard sand and gravel substrata. The fish stay in the water column as eggs and larvae, then shift to a benthic existence as juveniles and adults.

Monkfish are caught in bottom trawl mixed or target fisheries, or as target species using gillnets (Fariña *et al*, 2008). Both species are caught on the same grounds by the same fleets and are landed and marketed together, but *L. piscatorius* is the more abundant. In ICES sub-area 7 (the area of greatest relevance to this study), for example, the proportion of *L. piscatorius* in the catch reported by different European member states for 2015 varied from 60 to 85%.



Figure 1. Black belly (*Lophius budegassa*) and white belly monkfish (*Lophius piscatorius*), caught off Cornwall.

Total catches of *L. piscatorius* in sub-area 7 and divisions 8.a-b and 8.d in 2018 were estimated to be 18,886 tonnes. UK registered vessels caught an estimated 4,186 tonnes (22%), based on an inferred proportion of landings of the two species, compared with those of France (9,898 t), Ireland (2,148 t), and Spain (1,810 t).

As the distribution and size compositions of the two species are quite different, as well as having different growth, recruitment, and other life history characteristics, stock assessments for each species need to be done separately to effectively manage the two stocks. Data used in the stock assessments include species specific landings data from countries other than the UK, fisheries research surveys and scientific observer commercial catch sampling programmes. The Irish and French surveys are the most extensive annual surveys of monkfish in the NE Atlantic but still only cover a fraction of the stock. Assessments are further hampered by the unreliability of methods to determine age, and the marked difference in growth rates between males and females of both species.

ICES provides advice for the management of three stocks in European waters: North Sea (Divisions 3a, 4a-c, and 6a,b), Northern (Divisions 7b-k and 8a,b,d), and Iberian (Divisions 8c and 9a) stocks, but the biological justification for this has yet to be substantiated owing to large scale movement of individual fish, as demonstrated by tagging studies (Laurenson *et al*, 2005),

and the drift or mixing of early life history stages across current stock boundaries. Furthermore, genetic studies have found no conclusive evidence for separate biological stocks (O'Sullivan *et al*, 2005). The uncertainty of stock identity brings an additional element of doubt into the stock assessment.

Overall, uncertainties remain around maturity, sex ratio, species ratio, growth and length frequencies of the catch, and improvement in these data are still needed (ICES, 2018). As a result, ICES provides precautionary management advice for the catches of monkfish under a combined total allowable catch, which is unsatisfactory for controlling the exploitation rate of each species and does not rule out the possibility of either one being overexploited.

Although it would be possible for vessel operators to report catches of monkfish species separately using eLog, the combined species code is invariably used in practice. There has been no published request from the Marine Management Organisation for recording of monkfish by species. Elsewhere in Europe recording to species level is more common. There are anecdotal suggestions that fish buyers in Spain and Portugal prefer *L. budegassa* and that, therefore, species are separated for sale in some ports. Vessels landing to Breton ports, however, land monkfish to the market as one species (Le Floc'h *et al*, 2012), as do Scottish and Irish vessels.

Inconsistency in the reporting at the species level of monkfish catches and landings reduces the value of official data to the stock assessments of the individual species. Some member states (UK, France, Spain and Ireland) have developed their own algorithms for splitting unspiciated landings figures based on data obtained from catch sampling programmes and fisheries-independent research surveys (ICES, 2018).

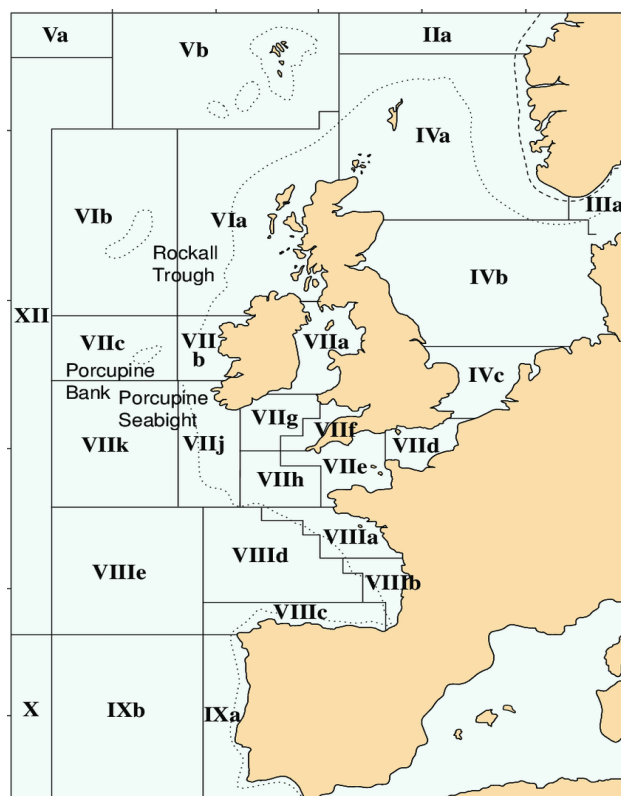


Figure 2. Map of ICES divisions and sub-areas of the NE Atlantic. The dotted line denotes the 200m depth contour.

Cefas and NFFO carried out a study in 2017 (Mangi *et al*, 2018) of strategic actions that might enable fishing industry generated data to be included in management decisions, which are generally weakened by the low coverage of other data collection programmes. A rapid appraisal of stock assessments relevant to the UK fishing industry revealed that those for some monkfish stocks were data deficient, so the SW monkfish fishery was chosen as one of four case studies to consider what data could be generated by the industry to make good the shortage.

The monkfish case study concluded that the industry would be able to address only a few items on the data 'wish list', namely the physical separation of the two species and the logging of sorted catch weights. The issue of spatial coverage by UK commercial fishing operations being representative of monkfish over its range was identified as a potential weakness, which could be addressed by re-instatement of the FSP-funded monkfish surveys carried out by SW beam trawlers in the years 2003-12 (Readdy *et al*, 2013). Furthermore, the intensity and coverage of industry data collecting activity that would be needed to make any significant improvement to the stock assessments should be defined to promote buy in from the industry to participate.

The present FSP project originally proposed that:

1. Fishing crews should be trained in sampling techniques to obtain paired total length and tail length data for retained and discarded fractions of each species of monkfish;
2. Skippers of participating vessels should log catches of the two species separately;
3. Catches of each species should be boxed and landed separately to the markets;
4. Fish market operators should grade and lay out each species for sale separately;
5. Grading machines should be programmed to enable catch weight data to be extracted;
6. A system for recovering the data from vessels and markets, and transmitting it to Lowestoft should be established;
7. Cefas field scientists would provide periodic training and validation of crews' sampling practices, species identification and length measurements at sea; on the market as part of on-going sampling programmes; and act as a conduit for data transmission.

The central aim of the project was to understand how far the fishing industry could, and was willing to, participate with these changes, bearing in mind a set of guidelines that was established recently for industry-science data collection (Mangi, *ibid.*), and to learn what barriers exist.

Objectives

To approach fishing vessel owners and operators, market managers, auctioneers, and fish buyers and try and win support for enhancing species specific data collection on monkfish and to invite suggestions on how to proceed.

Carry out a trial on a number of vessels to see how well crews could sort the monkfish species at sea, and identify any problems experienced.

Put pre-sorted monkfish landings through the market and assess how operations might be affected.

Methods

One of the main challenges encountered when working out how to instil changes to practices in the fishing industry is communication. There is also a big difference between the feasibility of ideas proposed by fishermen's representatives, managers, and scientists, and what is considered to be reasonably practical by fishing skippers.

One of the main operational details included in the proposal was to hold a couple of workshops to explain the programme and to train fishermen how to identify the two species of monkfish and record the required data.

From informal conversations held with a variety of individuals from all sectors of the fishing industry, both at sea and ashore, it was clear that initial responses to the idea of participation ranged from indifference to negative, with concerns raised about additional efforts required in the physical handling of fish and data, prices, and how the information would be used. It was also evident that the task of implementing the changes to all SW vessels targeting monkfish, and all markets, was far too big for this project, so a much more strategic approach was deemed necessary to secure agreement to address some of the basic questions. The idea of a trial was discussed with vessel owners, trawler agents, and market managers to test the feasibility of sorting species at sea and the impact on the subsequent handling and sale on the markets.

An outline plan for the project is shown in Appendix 1.

It was decided to hold two meetings – in Newlyn and Plymouth – to provide the industry with an opportunity to hear the arguments for participative science from a fisheries management perspective, and to draw up a plan of action. A Cefas scientist, who was a member of the relevant ICES Working Group and fully conversant with the weakness of present monkfish stock assessments, gave the keynote presentation on the science and the sort of data that was hoped for.

Unfortunately, attendance at the meetings was low – Newlyn 5, Plymouth 2 – but the individuals who turned up were, however, perfectly positioned to advise on the next steps. Although vessel owners and markets covering the eastern half of the fleet were willing to participate, it seemed premature to mobilise vessels and market staff when the quantities of *Lophius budegassa* caught were estimated to be a few individuals per 6-day trip out of a total landing of monkfish of around 400 kg.

Attention was, therefore, focussed on owners and operators of, and agents for, the SW beam trawlers regularly encountering a mix of the monkfish species, which translates to those operating in the English Channel to the west of Lizard Point, and the Celtic Sea. The fundamental pre-condition for generating any additional data that might improve stock assessments is the physical separation of the two species at sea. Markets were simply not geared up to sort mixed landings, and market staff are thought would have rejected such a request. Re-consideration of project objectives is explained in the review shown in Appendix 2.

As a result of the two industry meetings and further 1:1 meetings, a trial was designed involving a limited number of beam trawlers as shown in the Skipper's Briefing Document (Appendix 3). Even though four vessels were volunteered from Plymouth and two from Brixham, it was the three vessels from Newlyn that were the key participants. It was agreed that they would undertake five trips each, sorting and logging catches of the two species at sea, and landing them separately. A small cash incentive was provided to the fishing crews according to the areas fished. It was further agreed with the vessel owners and market manager that appropriately labelled catches would be graded and laid out for sale separately, to enable the accuracy of sorting to be checked and effects on the market to be recorded.

With respect to logging of catches, the MMO advised that the current version of eLog systems installed on fishing vessels might not cater adequately for logging the two monkfish species separately. In some cases, the official species codes may not have been loaded, or they may not have been included in the 'list of favourites' chosen by individual skippers. Either way, there was genuine concern that the trial might cause difficulties in interpreting log entries and inadvertent misreporting of catches because it takes time for new procedures to take effect. To avoid delays, it was decided to request participating skippers to keep a separate hand-written log of daily monkfish catches, and to continue making normal eLog entries in parallel.

One other major factor which limited the trial to just two vessels was its timing. Unfortunately, it coincided with the onset of the cuttlefish fishery that occurs off S Devon in the autumn and winter seasons, which is a very important source of revenue for beam trawlers and otter trawlers, and allows them at the same time to conserve quota, primarily for Dover sole. Sea conditions are generally calmer in the central part of the English Channel than those further west, and it was inevitable that participating vessels would be drawn to this fishery and away from grounds where both species of monkfish are found in comparable numbers.

When notice of landings by participating vessels was received, and other circumstances allowed, the accuracy of sorting by the crew was validated on the market prior to sale by a Cefas scientist. At least one full 25kg box of each size grade was sampled by confirming the identity of each 'tail' and recording its length). Smaller size grades were sub-sampled (e.g. measure one, throw three) to allow time for the whole landing to be examined; all boxes of fish in Grades 1 and 2 were examined as these tend only to contain 5-10 fish per box. Cefas sampling protocols generally work on a minimum sample size of 30 fish per size grade.

Results

Two Newlyn-based beam trawlers successfully completed the trial consisting of five 5-6 day trips that took place between 6th September and 7th November 2019, sorting at sea and landing the species separately. Of the total fishing effort for both vessels, six trips were made to the west where monkfish catches consist of a mix of the two species. From the haul details recorded by one vessel, and details of trip duration for both vessels, it is estimated that around 185 hauls were sorted in total. The vessels were each paid an average of £200 per trip for their efforts.

There were variations between the two vessels in the details recorded on the daily log of catches. Only one of the vessels recorded the daily catch of each species, as requested in the

brief; the other only provided the total weight of *L. budegassa* caught for the trip. At the initial briefing, skippers and crews made it clear that they could distinguish between the 'black' and 'white' tails (as shown in Appendix 3), so no provision was made for liaison or validation during the trial, the simple aim of which was to see if crews could sort the species at sea and land them separately. A lack of consistently recorded daily catches for each species in any future arrangement with vessel operators would limit the value of such logs to the understanding of abundance and size distribution across the grounds.

Vessel PZ532					
Trip dates	Sea area	<i>L. piscatorius</i>		<i>L. budegassa</i>	
		Weight (kg)	Total value (£)	Weight (kg)	Total value (£)
6-11 Sep 2019	VIIG/30E3	609		102	924.25
13-19 Sep 2019	VIIIE+H/28E3+28E4	825		293	2,506.10
26 Sep-2 Oct 2019	VIIIE/28E5	670		7	
4-9 Oct 2019	VIIIE/28E5	426		6	
10-15 Oct 2019	VIIIE/28E5	415		3	

Vessel PZ512					
Trip dates	Sea area	<i>L. piscatorius</i>		<i>L. budegassa</i>	
		Weight (kg)	Total value (£)	Weight (kg)	Total value (£)
13-18 Sep 2019	VIIF+G/29E3+30E3	549	4,443.55	397	3,298.70
20-22 Sep 2019	VIIF+G/29E3+30E3	183		260	2,422.30
15-21 Oct 2019	VIIF+G/29E3+30E3	1037		334	3,369.30
26-30 Oct 2019	VIIG/30E3	626	5,210.65	227	2,163.22
4-7 Nov 2019	VIIIE/28E5	336		15	

Table 2. Details of fishing trips and monkfish catches of the two Newlyn-based beam trawlers that took part in the trial of landing sorted catches.

A third vessel that initially agreed to participate landed sorted monkfish on a couple of occasions, but discontinued for undisclosed reasons. Lack of liaison early on, or negative feedback from the market, may have been contributing factors. Incompletely sorted landings, or instances when sorted landings had been re-mixed on the market, were witnessed on a couple of occasions, which suggests boxes may not have been clearly identified, or the market staff had simply been too busy/forgotten on those occasions.

Monkfish is normally sorted into seven size grades on Newlyn market, and catches are laid out in 25kg boxes. Landings in excess of 1000kg are commonplace and a significant amount of space is required on the market floor to present it for sale. Sorted monkfish landings doubles the space requirement and, in addition, the time taken to grade and lay them out. The market manager needs to know the size and number of landings expected each day to be able to organise staff and how the fish is to be laid out. Apart from an outline brief of the trial, communications with the market manager relating to the vessels participating and when they were due to land was an internal affair. Market staff would have been under greater pressure when handling sorted and combined monkfish landings on the same day. The success of the trial was due in large part to their patience and flexibility.

Sorted landings were inspected and sampled on Newlyn market on three separate occasions. This consisted of a random selection of boxes being sampled at each grade for each species. For the larger size grades (grades 1-3) all tails in a box were examined, whereas smaller size grades were sub-sampled depending on box weights, e.g. a full box of grade 7 tails was sub-sampled at the rate of one in three.

A total of 21 boxes were examined over the course of the trial. The accuracy of sorting achieved (expressed as a percentage of the total numbers of fish in a given box that were correctly sorted) varied between 87 and 100%, and was generally better for the larger sizes of fish.

Vessel	Date	Species code	Landed weight (kg) by Grade						
			I	II	III	IV	V	VI	VII
PZ532	12/09/2019	MON	35*	65*	182*	140.5*	29*	136*	-
		WAF	6.3*	30*	32.5*	25.3*	6.7*	2*	-
PZ512	19/09/2019	MON	5.0	57*	105.0	153.0	228*	-	-
		WAF	-	27.5	105.5*	101*	162.0	-	-
PZ512	22/10/2019	MON	51.0	112.0	349.0	312*	58*	39*	116*
		WAF	21.0	76.5	89.0	87.0	49.5*	11.0	-

Table 3. Summary of sampling effort (*denoted by **) on Newlyn market to validate accuracy of sorting (MON = *Lophius piscatorius*; WAF = *Lophius budegassa*).

Landing	BOX		Sample weight (kg)	Landed weight (kg)	MON	WAF	Accuracy %
	Species	Grade					
PZ532	MON	I	35	35	12	1	92
12/09/2019	MON	II	65	65	62	3	95
	MON	III	50	182	68	5	93
	MON	IV	25	140.5	61	5	94
	MON	V	28.9	28.9	123	11	92
	MON	VI	11.3	136	76	7	92
	WAF	I	6.3	6.3	0	3	100
	WAF	II	30	30	1	22	96
	WAF	III	32.5	32.5	3	42	93
	WAF	IV	25.3	25.3	5	66	93
	WAF	V	6.7	6.7	3	27	90
	WAF	VI	2	2	1	12	92
PZ512	MON	II	57	57	57	2	97
19/09/2019	WAF	III	25	105	6	33	89
	WAF	IV	25	101	7	57	89
	MON	V	12.5	228	62	7	90
PZ512	MON	IV	25	312	35	1	97
22/10/2019	MON	V	25	58	69	3	96
	MON	VI	14.2	39	62	6	91
	WAF	V	25	49.5	8	61	88
	MON	VII	11.4	116	97	14	87

Table 4. Summary of weights of monkfish sampled and numbers of each species in sampled boxes used to validate accuracy of sorting. (MON = *Lophius piscatorius*; WAF = *Lophius budegassa*)

Contact with fishing crews during and after the trial revealed that the sorting of monkfish catches had minimal impact on work routines on deck and in the fish room. From observations made on other commercial fishing trips sampled by Cefas scientists, all monkfish are picked off the conveyor during sorting of the catch and placed in boxes/baskets or on a gutting table. A member of the crew 'tails' the monkfish, discarding the head and guts, at which point, according to verbal reports from the crews, the different species are sorted into different baskets ready for washing. These are then passed down to the fish room with the rest of the catch, transferred to boxes with ice, and the boxes arranged and stacked according to the vessel's fish room plan. Apart from simplifying the process of inspection by enforcement officers, stacking boxes by species enables the crew to keep a daily tally of catches, which is reported on eLog. On this trial, once established, the changes were quite easily adopted, and, based on the three inspections of landings made on Newlyn market, sorting was reasonably accurate.

It should be mentioned, however, that the participating fishing crews were familiar to industry-science programmes, and, for over 15 years, the skippers have accommodated Cefas observers employed to record data on the composition of commercial catches and fishing activity in line with the EU Data Collection Framework. On randomly selected vessels, observers work around fishing crews as catches are sorted to obtain estimates of the quantities of catches and discards, and size distribution measurements, for all species. Sampling rates and the number of hauls sampled are used to estimate sum figures for the whole trip. The response from crews less familiar with this type of work, or less receptive to the motives, is unknown. Cash incentives cannot be a long-term feature of industry-generated science, and, in the absence of other incentives, withdrawal is likely to affect participation negatively.

Discussion

Issues of trust and uncertainty about the use of industry-generated science, as highlighted in the 2017 FSP study, continue to present barriers to participation for the catching sector. The general concern amongst fishers revealed by that study is that improved data collection could as likely result in fishing opportunities being restricted as being opened up. In the present study, one commonly posed question was if one of the monkfish species was shown to be over-exploited, how would they be able to continue fishing for the other? How would that affect future fishing opportunities in the SW mixed fishery?

Even though the concept of close collaboration between all stakeholders trying to utilise industry capacity for generating data is attractive to many, and there are several successful examples reported in the scientific literature, the skippers and crews encountered in the present study had more immediate concerns relating to quota, 'choke' species, by-catch allowances, and other aspects of the Landing Obligation.

Opportunistic conversations with fish buyers assembling for the auction revealed a range of attitudes towards the separation of monkfish species. On each of the three occasions when sorted landings were examined, there were at least 20 buyers present for the auction, although the bulk of monkfish (about 80% by weight) is purchased by 5 buyers. It was these individuals whose opinions were sought. Some admitted they were completely ignorant of the existence of more than one species, whereas others felt that it would draw unwelcome attention to a

difference in perceived quality that would complicate their businesses. It was interesting, therefore, that the auctioneer reported no significant difference in the prices made by each species over the course of the trial. It was further reported that there were buyers who did show an exploratory, possibly preferential, interest in the sorted landings – some favouring *L. piscatorius* ('white tail'), others favouring *L. budegassa* ('black tail').

Once landing of sorted catches becomes accepted by the industry, the next objective in securing scientific data for monkfish stock assessments is size data from different fishing grounds. The programme of onshore sampling of landings carried out by Cefas scientists meets the requirements of the EU Data Collection Framework, which allows for sampling of mixed landings of monkfish but still leaves the size data required for length-based assessments of the individual species lacking. There is very limited scope for increasing sampling effort for monkfish size distribution data beyond existing levels owing to finite scientific data collection resources.

Automated fish weight grading machines on Newlyn, Plymouth, and Brixham markets, however, represent a potentially substantial source of size data. The feasibility of tapping into weight measurements made by grading machines has been assessed (Ribeiro *et al*, 2018 unpub.), and could provide very significant quantities of size data for all species. For monkfish species, however, the growth and maximum lengths reached by males and females are very different, so it remains to be seen how useful data obtained from grading machines might be for improving stock assessments as sex cannot be visually determined once the fish has been tailed.

The trial of sorting at sea did not last long enough to explore what monkfish data could be extracted from grading machines beyond what was available from the auctioneer's office, i.e. total weights sold by grade. Although this sales information would only give a relatively crude indication of size distribution, it might be possible in the future to obtain this data on a regular basis from the Newlyn Fish Market Auctioneers.

Conclusions

The trial demonstrated that monkfish catches could be sorted reliably at sea, and the subsequent landings of the separated species could be graded and sold successfully. No conclusions can be made, however, regarding the performance of other vessels targeting monkfish, how it would be affected by removal of the cash incentive, or for how long the new practices would be maintained.

Daily catches should be recorded on eLog because keeping separate hand-written logs results in vessel-to-vessel variation in the information recorded. Although it served the purposes of the trial, hand-written logs require too much effort on the part of the skipper and, furthermore, the transmission of information is too haphazard and labour-intensive.

The potential for fishing crews to undertake length measurements at sea is nil. Existing duties at prevailing crewing levels and the perceived lack of incentive for the crew pose barriers.

Building upon this trial, for future initiatives to generate monkfish data by the industry, it is recommended that:

1. Trials need to be longer, involve more vessels, and take place outside the cuttlefish season (February-August). There also needs to be provision for more intensive, dedicated liaison. This should provide a larger, more continuous flow of sorted monkfish landings, which would allow onshore handling processes the chance to get used to the presence of both species and, crucially for continued vessel participation, any perceived drop in quality or price to be revealed.
2. There needs to be better information provided to market managers, including details of the vessels intending to land monkfish sorted at sea, and how those landings would be identified.
3. Alternatively, it could be made a legal requirement for all monkfish catches to be logged, landed, and laid out for sale as the two species separately. This would need to be backed up with technical assistance and a period of grace to allow new practices to bed in.
4. Instructions should be circulated to all vessels that are required to use eLog how to install the appropriate species codes (see Appendix 4) on their systems.
5. Further time needs to be spent with the market managers, with technical support from the manufacturer of the grading machines, to establish what data can be extracted from them and how this is achieved.

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Appendix 1:

Monkfish Data Improvement FSP – INITIAL OUTLINE PLAN – 24th April 2019

1. Sorting the species

- Approach PO's, and a cross-section of merchants and individual skippers of all the three main métiers (OT, GN, BT) to present context in brief, gauge interest, and identify next steps;
- Check for potential price differential between species; if none, discourage crews from removing black lining to belly cavity to aid sorting;
- Provide technical training (species ID, length measurement, data recording) either by workshop, hands-on training on a DCF trip, or both.

2. Markets

- Advise market managers of the desire to improve data on monkfish species by landing and grading separately; agree how this can be handled on the market;
- Identity of participating vessels to be confirmed, and landings data to be recorded by species and by grade;
- Request help to access data on individual tail weights for participating vessels.
- Advise interest in obtaining tail length measurements using cameras which could be paired with individual tail weights to enable more accurate conversion. (The development and implementation of this component is imponderable at present. Allocation of effort should be considered at a later date separately.)

3. At sea

- Select one or two vessels from each metier and plan to obtain data for up to 9 months from each vessel;
- Enlist additional vessels as and when the opportunity arises, bearing in mind the limited resources to train and do quality checks;
- Issue equipment to participating vessels and confirm sampling plan;
- Periodic validation trips to check accuracy of species separation and assist with length measurements; take motion compensating scales to get individual tail weights of measured fish to start body of data for conversion factors in case camera recordings not feasible; observers undertaking routine DCF trips should assist with this, if possible, to provide additional technical assistance;
- Receiving data at end of each month;
- Data entry (primarily total and tail length compositions by species for sampled hauls, and total and tail length paired measurements; also, landings weights by species).

4. Markets

- Periodic inspection of landings on market to check quality of sorting;
- Extraction/collection of grading machine data

Appendix 2

SW Monkfish Project – Review (14th August 2019)

Meetings were staged in Newlyn and Plymouth at the end of July to introduce the SW Monkfish Data Collection Project to the fishing industry. Lisa Readdy (Cefas) explained how important data improvement was to the stock assessments. Turn-out was low but the meetings helped to identify barriers to the sorting of the two species of monkfish that will be required. Separate discussions that also took place with key individuals and organisations around this time were also very valuable in this respect.

As a result, I think the project could proceed to trial stage involving a number of beam trawlers and all three principal SW fish markets for a limited period of time, depending on sufficient vessels participating and sufficient *L. budegassa* being landed.

The main components of this trial will include:

- Fishing crews of participating vessels requested to separate the two species as they are tailed on deck or boxed in the fish room. An illustrated briefing document will be circulated before sailing, and fisheries observers can reassure/clarify if they happen to be sampling those vessels, and as work patterns allow.
- Skippers requested to log daily catches of each species separately. MMO has identified the correct species codes (MON for *Lophius piscatorius* and ANK for *Lophius budegassa*), and can request updated versions of the eLog software to be issued. Data on distribution and relative catches over the course of a fishing trip will be extremely valuable to future stock assessments.
- Fisheries observers collecting total length, tail length, and tail weight for individual fish at sea to improve length-weight relationships. As existing workloads and availability of motion-compensating scales allow.
- Monkfish landed and graded as two species. Market managers at Newlyn, Plymouth, and Brixham requested to arrange this. The aim here is to acquire data from grading machines of individual tail weights or, failing that, the total weights of each size grade. Mixed perceptions amongst buyers regarding a difference in quality and price between the two species suggest they could be mixed together again before sale but that could be decided later. That would require considerable effort on the part of Newlyn graders. The industry might wish to conduct separate marketing trials.

Waterdance has volunteered two vessels, 'Julie of Ladram' and 'Barentszee', and Interfish has put forward all four of its beam trawlers, to participate in a trial. Barry Young and Alison Pessell have both expressed willingness to handle the two monkfish species separately on Brixham and Plymouth markets, respectively. W Stevenson & Son is consulting with skippers before making any commitment. David Stevens offered to land 'Crystal Sea' monkfish sorted for one trip per quarter.

The task of sorting effort will be borne by the crews of vessels working west of the Lizard. For the purposes of the trial, a daily payment equal to the present 'Skipper's Payment' (£50 per day) would seem an appropriate incentive to the crew for those days when the vessel is working in areas VII f, g, and h. Although both species are likely to be encountered in VII e, monkfish will

be predominantly *L. piscatorius*, and most of the vessels working east of the Lizard will be targeting cuttlefish from October, if not before. I think a crew incentive for those trips could be pitched at £25 per day.

If sorting of monkfish is to become fully adopted as standard practice, the trial needs to run for such duration that skippers and crews can see that there is no financial penalty, i.e. there is no drop in price received at first sale. Buyers may be sceptical at first. Responses from their customers may take several months to filter down as retailers and restaurants become aware of the two species, and preferences could be affected by taste and perceptions of quality, and by appreciation of sustainability issues.

If 8 participating vessels were asked to complete 5 trips each, consisting of 6 days fishing, we might have to find £12,000. More likely, with Waterdance and Interfish vessels tending to work east of the Lizard, the incentive costs will be considerably less.

The success of the trial will be judged on:

- (a) how much harder fishing crews have to work, and whether they think it's worth it;
- (b) how easy skippers find entering the catch data on eLog;
- (c) how accurately and consistently the two species are sorted (tested by market sampling);
- (d) the response of market staff to the extra work; and
- (e) effects on the running of the auction, the behaviour of buyers, and prices.

Obviously, it would be nice to recover individual tail weight data from the grading machines, but no guarantees can be made at this stage.

Appendix 3

SW Monkfish FSP 2019/20 – Data Improvement

A trial to sort and log monkfish catches at sea – SKIPPER'S BRIEF

Introduction

One of the suggestions put forward for the improvement of fisheries management in the SW is to address the deficiency of catch and size composition data that are needed to perform stock assessments of the two species of monkfish, *Lophius piscatorius* and *Lophius budegassa*, separately. This FSP project aims to test the willingness of the industry to adopt new practices both at sea and on the market, which will hopefully result in more reliable stock assessments and wider reassurance to markets and end-customers of the sustainability of fish resources.

Plan

1. Sorting of monkfish into *Lophius piscatorius* (white belly) and *Lophius budegassa* (black belly) at sea. They are easily distinguished by the absence/presence of a black lining to the belly cavity (peritoneum), and could be sorted as the fish is tailed or catches are put away and boxed in the fish room.



2. Logging daily catches of monkfish on eLog as the two species separately. Codes for the two species exist (MON/ANK) but may not presently be found in current installed versions of eLog software. Hand-written logs would be OK if eLog proves to be too difficult.
3. Landing the two species in separate boxes (labelled 'black' or 'white').

Reservations about the extra burden this will inevitably place on skippers and fishing crews are understood.

The plan is to find around 8 SW beam trawlers willing to participate in a trial lasting 5 trips of standard duration (7 days). Vessels will be rewarded £50 per day working in areas VII f, g, h, and e (west of 5° W), and £25 per day working in area VII e (east of 5° W), considering the higher

proportion of black-bellied monkfish found further west and the greater workload that will result. Skippers will be issued with invoices similar to those used by Cefas fisheries observers used on routine catch sampling trips; they can submit them after each trip, and will be approved once the fishing areas have been verified.

The timing of trips will need to be co-ordinated so that landings can be graded separately, and sampled by Cefas scientists to obtain size composition data and to validate the accuracy of sorting. A text advising likely landing date would be much appreciated.

Another aspect of this trial is to record how prices are affected at first sale. It is hoped participating vessels will undertake all 5 trips but are obviously free to withdraw if prices are unduly affected.

Contact: Rob Forster (07896 696723); robert.forster@cefas.co.uk

Appendix 4

Instructions for updating eLog to access monkfish species codes (adapted from Phil Whitby, MMO).

There are three main eLog providers. Below are the details of what needs to happen in order that skippers can use all the necessary codes depending on which eLog they have.

Note the general code for mixed species of monkfish is **ANF**; *Lophius piscatorius* ('white belly') is **MON**; and *Lophius budegassa* ('black belly') is **ANK**.

E-Catch – Already had ANF and MON. ANK has recently been added to the species database. To make the info available to skippers, they must:

- Establish an internet connection
- Go to **Settings** and then **Updates** – run the update online and the systems species database will be updated.
- Add any of the Anglerfish codes to their favourites if they want.
- Go fishing.

OLRAC – Again ANF and MON were already available. The provider will add ANK to their species database, but individual vessels will need to add the details for ANK as per instructions below:

Go to **Tools | Lookup Tables**

- Scroll down to **Catch**
- Select **Conversion Factor** | then **Add**
- **Add Product Type**
- Select **Species** | then **Hide/ Show/ Add**
- **Add** the **ANK** species
- Fill in the rest of the **Product Unit** details (these will be the same as for ANF and MON)
- **Save Changes**

CatchLog – This system only had ANF. To add ANK and MON, vessels using CatchLog will need to either:

- Contact the Support by opening up “CatchLog Online Support” using the desktop icon on the laptop or
- Contact patrick@catchlogmailer.com



Centre for Environment Fisheries & Aquaculture Science



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We are the Government's marine and freshwater science experts. We help keep our seas, oceans and rivers healthy and productive and our seafood safe and sustainable by providing data and advice to the UK Government and our overseas partners.

We are passionate about what we do because our work helps tackle the serious global problems of climate change, marine litter, over-fishing and pollution in support of the UK's commitments to a better future (for example the UN Sustainable Development Goals and Defra's 25 year Environment Plan).

We work in partnership with our colleagues in Defra and across UK government, and with international governments, business, maritime and fishing industry, non-governmental organisations, research institutes, universities, civil society and schools to collate and share knowledge.

Together we can understand and value our seas to secure a sustainable blue future for us all, and help create a greater place for living.

Head office

Pakefield Road
Lowestoft
Suffolk
NR33 0HT
Tel: +44 (0) 1502 56 2244
Fax: +44 (0) 1502 51 3865

Weymouth office

Barrack Road
The Nothe
Weymouth
DT4 8UB

Tel: +44 (0) 1305 206600
Fax: +44 (0) 1305 206601

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