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Can price bridge the gap? The case for Biodegradable fishing gear fish premiums in the Newlyn wholesale market

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Abstract:

Abandoned, lost or otherwise discarded fishing gear (ALDFG) poses a threat to sustainable fisheries management through environmental impacts including ghost fishing. Biodegradable fishing gear (BFG) has the potential to mitigate the ghost fishing impact of ALDFG however, fishing efficiency has been identified in various studies as one of the main limiting factors of BFG. We address the potential for higher market prices for BFG fish to offset the economic cost to fishers given the current technical shortcomings of BFG. We find that there is limited potential for BFG fish to achieve higher market prices, respondents were more likely to use the tag of 'BFG fish' as a factor to drive demand. Further research is, therefore, required to address the issues that culminate in reduced fishing efficiency and we conclude that BFG implementation is a technical problem and not an economic one.

1. Introduction

1.1. Marine litter and ALDFG

Early research into marine litter in the 1960s, 70s and 80s was followed by a subsequent lull in the 1990s (Ryan, 2015). However, confirmation in the last two decades that microplastics are a ubiquitous marine pollutant, coupled with the publicity around the formation of garbage patches in oceans, has led to increased public awareness and renewed interest into marine litter (focussing on amounts and sources, ingestion, entanglement, transport, microplastics and policy) (Ryan, 2015). Abandoned, lost or otherwise discarded fishing gear (ALDFG) is one of the driving forces behind the increase in plastics in the marine environment. The European Commission (2018) estimate that 27% of all marine litter in EU sea basins is ALDFG, with waste from the fishing industry noted as a significant source of beach litter. Further, it is estimated that 46% of the great Pacific garbage patch is waste from the fishing industry (Lebreton et al., 2018). Part of the problem lies with poor port reception facilities and commercial ability to recycle end of life fishing gear (Feary et al., 2020; Mengo et al., 2023), which can lead to abandoned and purposely discarded fishing gear (Richardson et al., 2021). For example, it is estimated by the European Commission (2018) that only 1.5% of fishing gear is recycled.

Delbene et al., (2021) note that the complexities and costs inherent within any potential solutions require and understanding of stakeholder's motivations if the most cost-effective strategies are to be identified and adopted. While extended producer responsibility (EPR) has been put forward as a potential solution, and is currently being adopted in some EU countries, (Resource Futures, 2021), recycling supply chains (required for EPR) for fishing gear will not be developed overnight. The recycling of fishing gear remains limited due to the complexity and variety of materials used to make fishing gear, rendering dismantling for recycling difficult (OSPAR, 2020). Currently, this is known to generate a value gap, whereby the recycled raw material is worth less than the cost of producing it.

The development of biodegradable fishing gear (BFG), a potential mitigation to some of the impacts of ALDFG e.g. ghost fishing, has grown in the last two decades. Several funded projects e.g. Glaukos, E-REDES, and a growing base of academic publications, concentrated on fisheries in Norway (Grimaldo et al., 2018; Cerbule et al., 2022a), South Korea (Bae et al., 2012; Kim, Park & Lee, 2014) and the USA (Bilkovic et al., 2012)) have tested the applicability of BFG as either a replacement to traditional fishing gear, or in the case of the US Blue crab fishery (Bilkovic et al., 2012) a biodegradable escape hatch or cord to reduce ghostfishing. In particular, research into the technical development of BFG has grown rapidly, progressing from studies that determined the technical shortcomings of BFG relative to traditional fishing gear to research focussed on overcoming the challenges. Nevertheless, progress has been limited on issues that culminate in reduced fishing efficiency (Grimaldo et al., 2018; Cerbule et al., 2022a; Cerbule et al., 2022b). Moreover, much of the research conducted into BFG has concluded issues (e.g. strength, flexibility) that have ranked BFG low against alternatives (Brown et al., 2005, MRAG, 2020). Further, research that had engaged industry (Brown et al., 2005, MRAG, 2020) highlighted that fishers were not (in general) supportive of BFG as a mitigation measure. These studies tended to conclude that the views of fishers, such as "no faith in the concept", "not a like for like", may result from a lack of understanding of biodegradability and compatibility e.g. a gear that degrades in seawater against current gear that is strong and durable (the latter representing highly desirable characteristics sought by fishers). However, the lack of interest may be related to the magnitude of change required for BFG implementation, compared to the other mitigation measures being discussed at the time (Brown et al., 2005).

BFG is not an all-encompassing solution to the impacts caused by ALDFG and marine litter (Wilcox and Hardesty, 2016). However, BFG may provide mitigation for some impacts of ALDFG and marine litter and often studies conclude the need for further research into BFG to harness the potential as a mitigation to the various environmental and socioeconomic impacts of ALDFG (Gilman et al., 2021; Gilman et al., 2022; Drakeford et al., 2023a). For example, there are some impacts BFG has potential to address e.g. to reduce the ghost catch of fish (which is in direct competition with commercial fishers) and other marine life, and to prevent the degradation of gear into the arguably more damaging microplastic (Napper and Thompson, 2020). However, given the technical challenges around the fishing efficiency of BFG (Grimaldo et al., 2019; Cerbule et al., 2022), and the high level of financial assistance (Standal, Grimaldo and Larsen, 2020; Drakeford et al., 2023b) that is required to engage fishers in BFG development, alternatives to financial assistance should be addressed. In this paper, we address the role of the consumer in the developmental phase of BFG.

1.2. Sustainability and consumer awareness and acceptance

Few studies that have focussed specifically on BFG as a mitigation to the negative externalities created by ALDFG have considered the role of the consumer in BFG implementation. Brown et al., (2005) was one such study that had an indirect link to the role of consumers in BFG use as a mitigation to ALDFG in the Channel fishery. In fact, this is the only study that has addressed such in the Channel fishery. While BFG ranked low as a management response to reduce the impact of ALDFG, the role of consumer awareness and acceptance was suggested by fishers as a potential benefit of using BFG. While not focussing on the Channel fishery, Whitmarsh and Wattage, (2006) also demonstrate the role of consumer awareness, acceptance and also willingness to pay higher prices for sustainably produced fish. Drinkwin (2022) reports on the improvement in public image as a driving force for fishers recovering ALDFG. Taking into consideration the current challenges around developing BFG (e.g. strength, durability), the role of consumer awareness and consumer acceptance is perhaps one of the greatest opportunities for BFG implementation. Kershaw, (2015) and Tsai et al., (2019) have shown that a variety of factors are responsible for differing attitudes towards the marine environment (e.g. age, education, gender, cultural background). Kershaw, (2015), conducted a study on attitudes of European populations and found governments and policy were considered responsible for the reduction of marine litter. There is also some evidence to suggest that human perceptions influence behaviour and that some people are attracted to technological solutions as an alternative to changing behaviour (Klockner, 2013).

1.3. Newlyn and the English Channel Fishery

The English Channel static gear fishery, primarily gill nets and crab and lobster pots, was examined by Drakeford et al., (2023a) and was found to account for 17.4% (value) and 19.4% (volume) of the UK's landings from static gear. Through interviews fishers were found to be broadly unaware of BFG and had reservations about its adoption. Nearly 50%, however, saw that it had some potential as a solution to ALDFG and were broadly in favour of participating in any future trials of BFG Drakeford et al., (2023a). Drakeford et al., (2023b) identified that the majority of economic cost to fishers arises from reductions in fishing efficiency and the level of financial incentive required for fishers to engage with BFG (as a result) would be prohibitive. The costs of implementing BFG in the Channel Fishery were estimated at up to £8m (Drakeford et al., 2023b).

Further, Drakeford et al., (2023b) highlighted that relatively small increases in market price have a relatively larger impact on offsetting the increased costs associated with BFG use. Therefore, if increased market prices can be achieved for BFG fish, the consumer would have an important role in the developmental phase of BFG. This case study area therefore represents an opportunity to examine how the costs of implementing BFG might be offset.

Newlyn, in South West of England on the Channel coast, is the largest fishing port in England by volume landed by UK vessels, 16,183 tonnes, and second to Brixham by value, £38.5m (MMO, 2022). It is also the third and fourth largest fishing port in the UK by those measures.

Newlyn's fishing industry is centred on the Newlyn Pier that encloses the harbour and where Newlyn Fish Market is sited. Newlyn is home to six wholesalers dealing in fish landed into the market or direct from vessels.

1.4. Consumers, sustainability and higher market prices for BFG fish – is there a link?

Interest in sustainable production, consumption and the role of the consumer in adopting a sustainable lifestyle have grown in recent decades. There is evidence that consumers elicit preferences for sustainability (Roheim et al., 2011; Menozzi et al., 2020) and that price is the main factor in consumer decisions around sustainability (Pieters et al., 2022). However, the assertion that preferences are strongly driven by products and price is challenged by a number of studies for food products. For example, Stemle et al., (2016) found ambiguous results across a variety of fisheries regarding the willingness of consumers to pay higher prices for sustainable fish. Asche and Bronnmann (2017) note that consumers are willing to pay high premiums for some fish species (30% for cod), moderate premiums of 9% for trout and 6% for tilapia and no premium for saithe. Vitale et al., (2020) found that seafood eco-labels could increase consumer willingness to pay between 16% and 24%.

A behavioural survey of fishers conducted for the Indigo project (INdIGO, 2022) found that Consumers' willingness to pay more to buy fish caught using BFG was noted by 76.48% of respondents as Very or Extremely influential on the fisher's willingness to adopt BFG. Therefore, it is clear that fishers view this as important in helping them make their decision but what is not known is whether the consumer will pay more for fish caught using BFG.

Some studies report that cost is the main driver of sustainable choices i.e. consumer readiness to pay more for variant of a typical product e.g. BFG caught vs. non-BFG caught fish. Pieters et al., (2022) note consumers face a trade-off between what is sustainable for the planet and what is sustainable for their wallets, noting a general decline (across a survey of 21,304 participants) of sustainability purchases with consumers citing cost as the main reason. In addition, while not linked directly with fishing gear, consumers indicated most strongly that sustainability and biodegradability, or recyclability (as well as being responsibly sourced or harvested and supporting biodiversity) were important sustainability considerations (Deloitte, 2023).

1.4.1. Labelling, sustainability and higher prices

Eco-labels are a promising means to support consumers in making sustainable choices (Thgersen, 2021). However, only 25% perceive a link between labelling and the product being sustainable (e.g. sustainably sourced or manufactured labels), with only 20% rating labelling as very important when considering a purchase (Deloitte, 2023).[1]. However, given an era of increasing prices, caused by global events (pandemic, the Russian invasion), Deloitte (2023) note that 52% cite cost as the main barrier to sustainable choices, although lack of interest in sustainability and lack of information on sustainability score similarly. The is supported by the Marine Stewardship Council (MSC), who found that the majority of consumers think supermarket/brand claims about sustainability need to be clearly labelled by an independent organisation (MSC, 2022) – in other words adding independent credibility to sustainability claims is important. This may be important for achieving higher prices for BFG fish (especially as consumers are likely to be unaware of the benefits of BFG use in fisheries). Therefore, education on sustainable production and consumption may help in shaping consumer decisions, particularly for new innovations like BFG.

The remainder of the paper is laid out as follows. The method is presented in Section 2. Section 3 presents the results of the stakeholder engagement and a discussion of the role of labelling, sustainable fisheries and the potential for higher prices and linking with BFG through the existing literature and scenarios created from the results of the stakeholder engagement. Finally, Section 4 concludes and discusses areas of future research for BFG.

2. Method

2.1. Stakeholder engagement

Our research will examine wholesalers' attitudes in Newlyn towards issues surrounding BFG that were surfaced in the research conducted with fishers.

This will allow fishers to see whether the importance that they place on this is mirrored by the willingness of these groups to pay more for fish caught with BFG. And, ultimately, if the key to unlocking the development of BFG is the willingness of the consumer to pay more for sustainable BFG fish. This can then be tested against the increase in market price determined in the economic impacts task to enable breakeven.

The six wholesalers in Newlyn were contacted and invited to take part in the research, with five agreeing. They were invited to take part in our research through phone calls and contact made directly. Commercial sensitivities and confidentially prevent the identification of respondents and, given the consolidation and vertical integration within the UK fish supply chain (Hopkins, 2024), it is not possible to identify market share. The results therefore must be viewed as particular to Newlyn with care taken when extrapolating results to other fisheries/markets. An in depth, expert interview of 30-60 minutes was conducted with questions on their awareness and perceptions of marine litter, BFG, environmental concerns in the supply chain and their view of the potential impact of the introduction of BFG on prices that could be achieved for fish in the supply chain.

The questions used to guide the discussion are attached as Appendix 1 and covered the key themes of:

- Awareness of marine litter, impacts and BFG;
- Awareness and importance of MSC labelling, eco-labelling and provenance;
- Impact on price.

A mixture of numerical and non-numerical analysis was performed on the data. This enabled us to supplement the presentation of the data with direct quotes to add additional context to the findings. Drakeford et al., (2023b) built upon an economic model (Brown et al., 2005) that allowed for the creation of scenarios for different levels of ghost fishing, fishing efficiency of BFG, cost of BFG and any potential sales price increase from marketing fish as caught using BFG. The data gathered from the stakeholder engagement, regarding impact on price, could then be input into the model to understand how this would potentially influence the economics of introducing BFG to the fishery.

3. Results, Discussion and Policy Implications

3.1. Stakeholder engagement

3.1.1. Awareness of marine litter, impacts and BFG

Across the respondents, awareness of the issue of marine litter (5 of 5 where a response was recorded) and the adverse impacts on the environment (4 of 4 where a response was recorded) was high.

The awareness of BFG was uniform, but in the negative with none of the five respondent's having any awareness of BFG.

While the respondent's awareness of BFG was low, the belief that BFG could address the impacts of marine litter was higher with three believing it could and two where no response was recorded.

It should be noted that all of those who answered yes introduced caveats into their answer regarding the performance and cost of BFG. Two quotes that sum up the response are "Yes. As long as it is robust enough", "Yes but will it be as good as plastic? On environment it will certainly help." and "Yes but with caveats on affordability, fishing efficiency and cost"

3.1.2. Awareness and importance of MSC labelling, eco-labelling and provenance

Three of the respondents had heard of some form of ecolabelling with two saying they had not. The three respondents that had heard of ecolabelling all referenced the MSC label. This was the only labelling scheme that was mentioned by the respondents. Two of the respondents considered MSC accreditation to be central to their operation.

Regarding the purchase of fish, three of the respondents responded positively to the idea that the consideration that the fish was environmentally friendly was important to them. One respondent said that it wasn't with one no response. One respondent, who answered yes, summed up their ethos as "Buy from small artisanal, local family boats. No large trawlers." But the respondent who responded negatively said "MSC costs a lot and unsure of the benefit except for supermarkets where it is an entry requirement." Even among the three who responded positively one was clear that the impact was limited "Price is the main driver. MSC seen as gold standard. Other ways to prove sustainability but case by case."

3.1.3. Impact on price

4 of the 5 respondents believed that fish caught with BFG, if advertised as such to the customer, would likely have no impact on the price that fish would achieve. The main reason given was that while customers may be interested and it may help as an advertisement, it would not lead to them being willing to pay more. Two respondents outlined this view "Handful that would pay but bulk no. It would gain a big response from customers though." and "Would drive

growth and interest over longer term. Not something that people understand. They imagine all fish comes from a small boat.”.

Another reason given is that volume and price dictate the market and any change would have to come from regulatory intervention with one respondent saying “80% is exported to EU. Any driver would be from regulation not commercial”.

One respondent believed it could but at less than a 5% price premium and remarked that they could definitely imagine changing views and interest.

3.2. Scenarios

The results show that the overwhelming majority of respondents (80%) do not view the introduction of BFG as likely to have an impact on price and the respondent that did only believed that a marginal (<5%) increase was likely. The following scenarios, developed by introducing the results from 3.1.3 Impact on price to the economic model developed in Drakeford et al., (2023b), allow for the size of the economic gap, that would need to be bridged, for the introduction of BFG to be calculated, based on the level of price increase that can be achieved.

The scenarios both assume 5% impact from ghost fishing (Drakeford et al., 2023b). The Low impact scenario then assesses a 5% increase in cost and a 5% decline in fishing efficiency with the High impact assessing a 20% increase in cost and a 20% decline in fishing efficiency (Drakeford et al., 2023b).

These two scenarios are then adjusted to remove the benefit of the absence of ghost fishing as this benefit would only be achieved by the adoption of BFG for the whole fishery, not an individual vessel.

A range of economic gaps, that would need to be bridged to breakeven, can then be produced against a rise in price achieved for fish caught, from 0% to 25%.

These parameters were applied to the economic model (Drakeford et al., 2023b) to develop the scenarios below:

Table 1 – Static gear <10m

Static gear u10	*This assumes immediate ghost fishing benefit							**Approx.**
	0%	**1%**	**5%**	**10%**	**15%**	**20%**	**25%**	**breakeven**
Low impact	£461	£1,848	£7,394	£14,327	£21,260	£28,193	£35,126	c.0%
High impact	-£22,635	-£21,248	-£15,702	-£8,769	-£1,836	£5,097	£12,030	c.16%
Static gear u10	*Adjusted to remove ghost fishing benefit							
	0%	**1%**	**5%**	**10%**	**15%**	**20%**	**25%**	
Low impact	-£7,606	-£6,245	-£804	£5,998	£12,799	£19,601	£26,402	c.6%
High impact	-£30,423	-£29,063	-£23,621	-£16,820	-£10,018	-£3,216	£3,585	c.23%

Table 2 – Static gear >10m

Static gear o10	*This assumes immediate ghost fishing benefit							Approx.
	0%	1%	5%	10%	15%	20%	25%	breakeven
Low impact	-£10,828	-£6,909	£8,766	£28,360	£47,953	£67,547	£87,141	c.3%
High impact	-£74,786	-£70,867	-£55,192	-£35,598	-£16,005	£3,589	£23,183	c.19%
Static gear o10	*Adjusted to remove ghost fishing benefit							
	0%	**1%**	**5%**	**10%**	**15%**	**20%**	**25%**	
Low impact	-£20,990	-£17,137	-£1,725	£17,541	£36,806	£56,072	£75,338	c.6%
High impact	-£83,962	-£80,109	-£64,696	-£45,431	-£26,165	-£6,899	£12,366	c.22%

The output is such that for an under 10m vessel the range of price increase required to reach a breakeven point, with no benefit from reduced ghost fishing, is c.6% in the Low impact scenario and c.23% in the High impact scenario. For a 10m and over vessel the range is c.6% and c.22%.

The results from the fieldwork demonstrate that an increase in price is unlikely across the supply chain but that an upper bound of 5% can be assessed.

For an under 10m vessel this would reduce the economic gap from £7,606 to £804 in the Low impact scenario and £30,423 to £23,621 in the High impact scenario. For a 10m and over vessel this would reduce the economic gap from £20,990 to £1,725 in the Low impact scenario and £83,962 to £64,696 in the High impact scenario.

3.2.1. Impact of Fishing efficiency and Cost increase changes

Taking the high impact scenario and manipulating the Fishing efficiency and the Cost increase factors to improve them from -20% to -15% and 20% to 15% respectively allows us to view the impact of the factors.

Table 3 - Scenarios

	High impact	**Fishing efficiency to -15%**	**Reduction in Cost increase to 15%**
Ghost fishing	0%	0%	0%
Fishing efficiency	-20%	-15%	-20%
Cost increase	20%	20%	15%
Price increase	5%	5%	5%
Static gear u10	**-£23,621**	**-£16,820**	**-£22,817**
Static gear o10	**-£64,696**	**-£45,431**	**-£62,971**

This shows that the improvement in Fishing efficiency by 5% has a reduction of £6,801 in the economic gap for the under 10m vessel (£19,265 for 10m and over) whereas the improvement in Cost increase by 5% has a reduction of £804 in the economic gap for the under 10m vessel (£1,725 for 10m and over).

Therefore, any change to fishing efficiency has an eight-fold impact compared to the same change in cost for the under 10m vessel (eleven-fold for 10m and over).

3.3. BFG, sustainable fisheries and labelling – is there potential to link objectives and achieve higher market prices?

Evidence suggests that sustainable fisheries return higher yields in the long term (Costello et al., 2020; MSC, 2021; OECD, 2022), thus suggesting that if properly managed, wild fisheries can contribute to sustainably feeding the world's expected population growth. However, in order to achieve sustainable and resilient aquatic food systems, a blue transformation is required (FAO, 2021). In fact, according to the FAO's Blue Transformation initiative, the sustainable management of the world's wild capture fisheries is imperative in feeding a growing global population.

This is further supported by the 'UK consumers insights' consumer research survey conducted on behalf of the MSC. The overall finding "while ocean anxiety is high, British seafood consumers are feeling more empowered and increasingly believe the choices they make can have a positive impact on the health of our oceans" (MSC, 2022). Relevant for BFG, consumers (90%) are worried about the state of the world's oceans, with 66% stating that this concern had grown in the last two years. While no direct evidence is noted, this may be linked with the rapid increase in attention paid to marine litter in the last couple of years. Motivators for purchasing labelled seafoods are largely centred around sustainability e.g. 'by buying ecolabelled fish and seafood I am helping ensure there will be plenty of fish left in the sea for future generations" (MSC, 2022).

A global assessment of marine litter and plastic pollution was published by the United Nations Environment Programme in 2021, which suggests that without meaningful action the amount of marine litter and plastic pollution in the marine environment will nearly triple by 2040. Given that lost or abandoned fishing gear is a significant source of marine litter, a fishing gear with a controlled lifespan in the marine environment has the potential to improve on the current situation – and thus contribute to improved sustainability. A clear picture emerges on the relationship between the consumer and sustainability, especially that cost (what is affordable to the consumer) is one of the main driving factors. It is also clear that in general consumers want to make sustainable decisions (Deloitte, 2023; MSC, 2022). Given that MSC labelled fish products are seen a sign of sustainability in global fisheries, linking of BFG fisheries and fish with MSC or some other mark of sustainable fisheries (e.g. the Lyme Bay Reserve Seafood) could enhance the role of BFG in sustainable fisheries. Evidence suggests that some consumers are willing to pay price premiums for sustainable fish (Asche and Bronnmann, 2017). Jaffry et al., (2014); Asche and Bronnmann, (2017); Maesano et al., (2020); Whitmarsh and Wattage, (2006) and Vitale et al., (2020) found that consumers attribute a preference for sustainable (e.g. labelled) fish, which creates an economic incentive for environmental improvements. However, there is only one example (Korean fisheries) of consumers being willing to pay higher prices for BFG fish. Park, Park and Kwon (2010) conducted a WTP study. Park, Park and Kwon (2010), estimated the economic benefits to the fishing industry adopting BFG using a contingent valuation technique. The study looked at the role of consumer willingness to pay for BFG to address marine litter. While the average willingness to pay (household level) was less than £5 (currency equivalent), extrapolating to the national level gives a willingness to pay of around £52 million for biodegradable fishing net development and supply. This could be translated as consumers' willingness to pay higher prices for sustainable low impact fisheries – and thus has relevance for BFG implementation.

3.4. Policy implications

An increase in price achieved for the fish caught with BFG would be unlikely and even if achieved at the upper level would still necessitate bridging of an economic gap, whether with subsidies or similar interventions, to preserve the current economics of the fishery. The most important factor governing this is the fishing efficiency of BFG and as a result the highest barrier to overcome is the technical challenge of ensuring that it closely mirrors the performance of traditional gear. The research conducted within the small-scale fishery suggests that the adoption of BFG is not a commercially viable proposition and as such would need to attract significant levels of subsidy. This would have to remain in place while the significant technological barrier of mirroring the performance of traditional fishing gear is overcome. The implication for policymakers is that the adoption of BFG in the Channel small-scale fishery is unlikely to occur organically within the market. Policies to bridge the economic gap caused by a reduction in fishing efficiency, or significant investment in the technology behind BFG production, are required in order to achieve the replacement of traditional non-biodegradable fishing gear.

4. Concluding remarks

The main issue, declines in fishing efficiency (catch per unit effort), are such that more than 90% of the costs of using BFG are related directly to the reduction in fishing efficiency and less than 10% relates to the cost of investing in BFG (Drakeford et al., 2023b). Therefore, all else remaining constant, BFG will not be accepted by the fishing industry. Even it is was, the level of financial assistance to offset the fishing efficiency impact on profitability would be prohibitive. Standal et al. (2020) found that the adoption of BFG in the Norwegian cod gillnet fishery would result in a decline in fishing efficiency of 21%, with a figure of circa 20% supported by the literature (Cerbule et al., 2022a, 2022b; Grimaldo et al., 2019; Grimaldo et al., 2020; Wang et al., 2020).

The most responsive scenario modelled in reducing the impacts of declines in fishing efficiency was increases in market prices for fish caught using BFG, with small increases in price having a relatively larger increase in offsetting the costs associated with reduced fishing efficiency (Drakeford et al., 2023b). Addressing this by testing whether the consumer (buyers and sellers of fish at the wholesale, fishmonger, restaurateur level) would accept higher prices, we found that respondents were more likely to use the tag of 'BFG fish' as a factor to drive demand, but mostly they didn't think they would be able to achieve increased prices. This demonstrates, that while BFG is often considered as a potential mitigation to ALDFG and some impacts like ghost fishing, further research is required to address the issues that culminate in reduced fishing efficiency. We therefore, conclude that BFG implementation is a technical problem and not an economic one.

5. Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Benjamin Drakeford reports financial support was provided by INTERREG FRANCE-CHANNEL PROGRAMME.

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7. Appendices

7.1 Appendix 1

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<u>Interview questions</u>

1. Are you aware of marine litter?
2. Are you aware of the damage it can cause in the marine environment? For example, habitats, fish, seabird, turtles etc.?
3. How aware are you (if at all) of biodegradable fishing gear?
4. Do you think biodegradable fishing gear (that if lost at sea naturally biodegrades within a max of two years) could help tackle the environmental impacts fishing gear can have if it is lost or abandoned at sea? (For example, it can continue to catch and kill fish, seabirds and other marine life, cause entanglements and eventually breaks down into microplastic).

   Context: It is estimated that 27% of marine litter comprises fishing gear, so fishing gear is a significant problem in the stock of marine litter. More and more fishing waste is found in beach cleans around the country.
5. Have you heard about certification schemes, like the Marine Stewardship Council or what is known as eco labelling?

   Context: Have you heard about scheme like the Marine Stewardship Council for fisheries products, do you think that they contribute to sustainable fisheries management?
6. Are you more inclined to buy fish that are caught in an environmentally friendly method (whether MSC, eco-labelled etc or not)?

   Context: BFG could be seen as a complement (rather than substitute) to MSC, eco-labelling with regards to environmentally friendly fishing methods.
7. (For sellers) Do you believe that you could sell fish caught with biodegradable fishing gear at a higher price and if so, how much?

<5%
5%
10%
15%
20% or more