

The use of European river lamprey as bait by the UK coarse predator angling community

Running headline: Anglers' use of lamprey as bait

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Abstract

Recreational fishing is a commonplace leisure activity within the developed world but can generate tension when activities conflict with conservation agendas. A potential conflict arises over the use of European river lamprey, *Lampetra fluviatilis* (L.), a protected species, by UK coarse (freshwater non-salmonid) predator anglers. This study used geographically stratified interviews with 69 predator anglers to explore attitudes towards the use of lamprey as bait, their conservation status, and knowledge of biosecurity regulations. Most participants used lamprey as bait to some degree and agreed that, if threatened by exploitation, a ban on their use as angling bait should be implemented. Ordinal regression analysis indicated the presence of a subset of anglers who value lamprey as bait more than others and may oppose conservation efforts. The benefits of the potential establishment of bait certification schemes are also considered.

KEYWORDS

Stakeholder conflict, consumptive use, wildlife trade, fisheries management, angling bait, angler questionnaire

1 | INTRODUCTION

An estimated 10 % of the global population partakes in recreational fishing, of which angling is the most common form, especially in more developed regions (Arlinghaus *et al.*, 2002; Arlinghaus & Cooke, 2009). Anglers generally appreciate the value of the natural environment (Holland & Ditton, 1992; Williams & Moss, 2001). Nevertheless, they can inflict damage to it through, for example, the introduction of non-native species (Gozlan, 2008; Rodgers *et al.*, 2011; Kilian *et al.*, 2012) and overexploitation (Almodóvar & Nicola, 2004; Dorow *et al.*, 2010; McClenachan, 2013). Anglers have a tendency to under-estimate their impact on natural ecosystems (Gray & Jordan, 2010), potentially because of shifting baseline syndrome or cognitive dissonance (Thøgersen, 2004; Dorow & Arlinghaus, 2012; McClenachan, 2013; Gallagher *et al.*, 2015; Rees *et al.*, 2017; Soga & Baston, 2018).

Anglers spend large amounts of money on bait, equipment and licence fees (Salado & Vencovska, 2018), and so are economically invested in the fish resources that they utilise. This can be harnessed to fund aquatic ecosystem management (Arlinghaus *et al.*, 2002). A good example of this is the US's Sport Fish Restoration Act (1950) [Dingell-Johnson Act], which taxes angling equipment to directly provide funds for fish stock conservation. Additionally, anglers are often a highly motivated group of stakeholders and possess considerable political power, for example in lobbying for better water quality (Bate,

2001). Since anglers often appreciate the value of natural surroundings and believe that biodiversity should be conserved (Holland & Ditton, 1992; Dorow & Arlinghaus, 2012), they are often willing to support aquatic conservation (Schuett *et al.*, 2014; Williams *et al.*, 2016) and comply with guidelines if it is in their interests to do so (Gray & Jordan 2010; Nguyen *et al.*, 2013).

Anglers often consumptively use fish populations for food and/or recreational pleasure (Duffus & Dearden, 1990), so it is unsurprising that anglers are frequently in conflict with other stakeholders (Arlinghaus *et al.*, 2002). Anglers have been shown to have different perceptions and preferences regarding the management of aquatic ecosystems than researchers, fishery managers or conservation groups (Connelly *et al.*, 2000; Gozlan *et al.*, 2013). Many anglers oppose actions that restrict their activities, such as size restrictions and bag limits (Renyard & Hilborn, 1986; Reed & Parsons, 1999). In extreme circumstances, anglers may oppose conservation actions to establish protected areas out of fear that it will negatively impact recreational fishing (Lynch *et al.*, 2004).

Although anglers appreciate the value of natural ecosystems, they are not always involved in the management decisions of recreational fisheries (Williams & Moss, 2001; Gray & Jordan 2010; Cowx *et al.*, 2010). Hasler & Colotello (2011) showed that although 68% of anglers want to be involved in fisheries management decisions, only 20% of researchers believe anglers should be. Although this disparity may be partly due to poor experiences across sectors, barriers to communication are considered to be a problem of recreational fisheries (Arlinghaus *et al.*, 2002). Clear and effective communication between stakeholders as well as cooperation between stakeholders is vital for successful ecological conservation (Meffe, 2002; Vogler *et al.*, 2017). Lack of communication can cause the failure of conservation efforts as neglected groups may not comply with regulations (Gibson & Marks, 1995). Non-compliance may be more likely within the angling community as they can be sceptical of government agencies and researchers (Smith *et al.*, 1997). Communication and cooperation between stakeholders in recreational fisheries management is crucial to increase voluntary compliance (Arlinghaus *et al.*, 2002).

The use of lamprey as bait is an area where conflict may arise between anglers and other stakeholders. Globally, lampreys are a threatened taxonomic group due to pollution, river barriers, habitat modification and commercial exploitation (Lucas *et al.*, 2020). Several lamprey species, including European river lamprey, *Lampetra fluviatilis* (L.), typically anadromous in life history, are fished for food (Almeida *et al.*, 2021). River lamprey is listed under Appendix 3 of the Convention on the Conservation of European Wildlife and Natural Habitats (1979) [Bern Convention] and Annexes 2 and 5 of the Habitats Directive (1992) of the European Union. This allows limited exploitation, but protection is also required by member states of the

European Union through methods such as the establishment of Natura 2000 sites (Special Areas of Conservation [SACs] in the UK and Ireland).

Since the mid-1990s, adult river lamprey have been used as angling dead bait in the UK for “coarse” (freshwater, non-salmonid) predatory species such as northern pike *Esox lucius* L. (Masters *et al.*, 2006; Foulds & Lucas, 2014). Much angling for freshwater predatory species around the globe occurs with artificial lures (Quinn & Paukert, 2009; Raison *et al.*, 2014), but in the UK and Ireland there is a history of using live and dead fish baits to capture predatory freshwater fish, especially pike. Commercial operators specifically capture, prepare, freeze and package river lamprey (Figure S1) and other fish species, and supply them to angling bait and tackle shops. These lamprey are sourced from England, Western Europe and the Baltic States (Foulds & Lucas, 2014). They are a fairly popular bait, with Foulds and Lucas (2014) indicating that 90,000 river lamprey were supplied to UK anglers in 2011/12. Within England, river lamprey are specifically commercially fished for with extensive lines of lamprey pots, under licence, in the tidal Yorkshire Ouse and Trent, in the Humber River Basin. A total annual catch of 1260 kg (~16,000 lamprey) has been licensed from the Humber for most of the last decade.

Although there are currently only two licences issued, this is a cause for concern among management agencies in the Humber SAC where river lamprey is a designated conservation feature and for which historical exploitation rates have been estimated to be up to 20% (Foulds & Lucas, 2014). Although a 20% exploitation rate may sound negligible for a species as fecund as *L. fluviatilis*, when combined with factors such as anthropogenic barriers restricting access to spawning grounds and the impacts of hydropower stations (Nunn *et al.*, 2008; Lucas *et al.*, 2009; Bracken and Lucas, 2013), it may present a danger to the long-term sustainability of the population. In addition to this, Foulds and Lucas (2014) found that, in 2011/12, the majority of lamprey for angling bait in the UK were sourced from the Netherlands and Estonia, but in 2012 the Netherlands implemented stringent regulations on lamprey bycatch landings from the Dutch eel fishery, effectively closing that source. When considering the UK’s withdrawal from the European Union, the resulting effects on the import market may intensify lamprey exploitation in the Humber River Basin if it becomes un-profitable to import them. To best deal with the impacts of anglers on UK lamprey populations, it is necessary to understand the opinions of the key stakeholders including the consumers; coarse predator anglers who drive the demand for lamprey in the UK.

Many consumers prefer ecologically sustainable or locally sourced products and are willing to pay a premium to ensure these standards are kept (McClenachan *et al.*, 2016). However, this rise in environmental concern may not apply to specialist predator anglers who, as a

catch-orientated group, might oppose restrictions that affect their chances of catching fish (Arlinghaus & Mehner, 2005; Nolan *et al.*, 2019). Anglers may hold a misconception that parasitic lampreys are damaging to the ecosystem (due to media attention directed to invasive sea lamprey *Petromyzon marinus* L. in the Laurentian Great Lakes) and so be less inclined to support their protection (Lucas *et al.*, 2020). Additionally, anglers may simply be uninformed about the state of lamprey exploitation and thus in need of easily accessible information in order to improve the environmental sustainability of their angling habits. Consequently, it is important to recognise the scale of lamprey use by anglers and their knowledge and opinions regarding angling baits (for the purposes of this study the term bait refers to both natural baits such as fish and invertebrates and artificial lures), in order to properly manage exploitation of river lamprey.

This study's aims were to: 1) understand the fishing behaviour and attitudes of UK coarse predator anglers; 2) determine the proportion of anglers using lamprey as bait and for what purpose; 3) establish the knowledge and opinions of anglers regarding lamprey as bait; 4) determine how willing anglers are to replace lamprey with alternative baits.

2 | MATERIALS AND METHODS

2.1 | Questionnaire design

A questionnaire was employed to collect data on the opinions of anglers towards using lamprey as bait, due to their usefulness in the study of stakeholder opinions regarding human-nature interactions (White *et al.*, 2005). A telephone methodology was chosen because telephone questionnaires can produce a higher response rate, reduce the likelihood of missing data, allow for participants to express opinions in detail and easily cover a large geographical area (Bourque & Fielder, 2003; White *et al.*, 2005). The questionnaire, interview methods, data use and anonymization were approved by Durham University's Ethics Committee.

A questionnaire comprising up to 29 questions in four sections was created (Appendix 1, supplementary information). The first section concerned aspects of the participants' fishing behaviour, such as opinions towards natural baits (including both live and dead fish bait) and artificial lures. The use of live vertebrates as angling bait has been illegal in Scotland since the Aquaculture and Fisheries (Scotland) Act (2007) but it was decided to ask about use of live baits to all anglers, since their fishing activities were not necessarily restricted to their home locality. The second section covered the participants' knowledge and opinions regarding the use of lamprey as bait. This section specifically asked if participants used lamprey as bait and whether they agreed that, if lamprey were threatened by exploitation, a ban on their use as angling bait should be implemented. The

third section was an open question where participants could comment on their previous answers and the wider subject of angling. The final section determined the demographics of the participant.

The questionnaire was designed to obtain extra information from anglers that use lamprey as bait. This was achieved through question 13: 'When using natural dead baits, how regularly do you use lamprey; Always, Often, Sometimes, Rarely or Never?' Participants that responded with 'Never' were not asked questions 14 to 21 as these investigated the participants' knowledge and opinions of using lamprey as bait. Participants who gave any other answer than 'Never' were asked the full set of questions.

Closed questions dominated the questionnaire as these are quicker to complete and easier to analyse (Rowley, 2014). Many of these were seven-point Likert scales where the responses ranged from Strongly Agree to Strongly Disagree. As an example, respondents were asked to rate their opinion towards the statement "Lamprey are responsibly sourced for bait" according to the scale of Strongly Agree, Agree, Slightly Agree, Neutral, Slightly Disagree, Disagree, Strongly Disagree. As recommended by Frary (1996), the 'Neutral' response was not explicitly offered to participants. However, some participants could not choose a non-neutral response to questions and thus a neutral response was recorded.

Section three consisted of an open question asking participants to expand upon any answers they previously gave if they so wished. This was included to further engage participants in the questionnaire and reveal any issues or novel aspects with the use of lamprey as bait that were missed by the questionnaire (O'Cathain & Thomas, 2004). Answers given to this section were transcribed. Statements that appeared multiple times across responses were identified and their frequency recorded.

Non-sensitive questions were randomly positively or negatively worded when the questionnaire was designed as exact phrasing of questions or statements can affect both the validity of the responses given and the willingness of participants to provide an answer (Petrinovich & O'Niell, 1996). To ascertain participants' attitudes towards certain aspects of using lamprey as bait, it was necessary to ask sensitive questions, defined by Tourangeau & Yan (2007) as questions that potentially stimulate a socially undesirable response. Sensitive questions were situated at the end of section two of the questionnaire to minimise the risk of participants terminating the questionnaire before completion (Marshall, 2005). Sensitive questions about using lamprey as bait were split into two versions; one positively worded (e.g. lamprey should be conserved) and one negatively worded (e.g. lamprey should not be conserved). Allocation of the negative/positive wording between participants was randomized. All responses were converted to the positively worded phrasing for use in analysis. For example, respondents that strongly disagreed that

“lamprey should not be conserved” were recorded as strongly agreeing that “lamprey should be conserved”. A short pilot test ($n = 3$) was conducted to ensure the wording of questions was easy to understand before data collection began.

2.2 | Data collection

Lamprey is used as a bait for coarse predatory fish across the UK, but in some regions more than others (Foulds, 2013; Foulds & Lucas, 2014). To stratify sampling, the UK was split into five regions, comprising Northern England, Southern England, Wales, Scotland and Northern Ireland (Figure 1). Angling clubs were contacted to gather responses, as it was assumed that members of angling clubs, both local and national, would be committed anglers and willing to participate in the study. An online directory (<https://fishbuddy.directory>) was used to randomly select up to five angling clubs per county. This produced a slight sampling bias towards Southern England (Figure 1), a region of the UK that contains the greatest number of counties and so more angling clubs (which are usually segregated by county). Therefore, additional angling networks were contacted to provide more even coverage across the UK. Such networks ranged from associations of predator anglers, such as the Pike Anglers' Club of Great Britain (PAC), to advertising within broader forms of angling media (for example, an interview on Talksports' "Fisherman's Blues" radio show).

Networks were sent an introductory paragraph outlining the research aims. Any specific mention of obtaining anglers' opinions on the use of lamprey as bait was excluded to avoid potential respondent bias. Networks were requested to inform their members of the research so that interested individuals could get in contact. Since a considerable proportion of UK coarse predator anglers are not members of angling associations, 'snowball sampling' (Biernacki & Waldorf, 1981) was used by asking participants to recommend the questionnaire to fellow anglers. A total of 152 clubs and other networks was contacted (Figure 1). It is impossible to calculate the response rate as networks did not disclose how many anglers they notified of the questionnaire. As all questionnaires were conducted by the same individual, interviewer bias was avoided.

At the outset of the questionnaire, the participant was reminded of the research aims and informed that: the questionnaire would be recorded; all data obtained would be kept confidential and anonymous; the data may be used in a scientific paper; data would be retained for a period of 2 years; and answering the questionnaire was voluntary. Consent to record was then requested and, if not given, the questionnaire was terminated. Participants were first asked if they fished for freshwater predatory fish such as pike, if they responded negatively the questionnaire was terminated. Questionnaires took 10-15 minutes to

complete. Afterwards, participants were reminded that they could withdraw their consent up until the point that the data was used in a thesis or scientific publication. Data were collected from March 2020 to July 2020.

After data collection, additional variables were derived from the collected data. Firstly, a binary variable was added describing whether the participant used lamprey as bait to any degree. Secondly, during the questionnaire, participants were asked to report what species of fish they commonly used as bait. This list was then compared with the ICUN Red list (<https://www.iucnredlist.org>) and another binary variable was added to determine if the participant used a species of fish rated as vulnerable or at greater risk for bait.

2.3 | Analysis

Mann-Whitney *U* tests were conducted to compare opinions between participants who used lamprey as bait to some degree and participants that did not. Logistic regressions were performed to determine what factors affected the likelihood of participants using lamprey as bait and the likelihood of a participant preferring lamprey for bait to be sourced from the UK. For each of these response variables, the data were subset into numerous global models, demographics, general fishing behaviour, environmental attitude and bait attitudes. Each of these models were then dredged with the MuMIn package (Barton, 2009) to select subset models with a $\Delta AIC < 2$. These subset models then underwent a model averaging procedure to create the final models. Final models were tested with an ANOVA function utilising a χ^2 test. To investigate pairwise differences in non-binary variables, Tukey post hoc tests were performed. Ordinal regressions, using data on Likert scales, were conducted to investigate what factors affected the opinions of participants regarding the use of lamprey as bait, following a similar approach to that described above.

3 | RESULTS

3.1 | Demographics

Sixty nine questionnaires were conducted and completed. All participants gave consent to be recorded and confirmed that they fished for coarse predatory species. No individuals terminated the questionnaire early or withdrew permission after completion of the questionnaire. All participants were male and British. Over half (55.1 %) of participants were members of a specialist angling club but fewer (30.4 %) were members of an environmental organisation (Table 1). The most frequent age range was 55-64 and a university degree was the most frequently achieved highest level of education. Table 1 shows other aspects of participant's demographic data.

3.2 | Fishing behaviour and bait choice

Over half of participants (59.4 %, $n = 41$) went coarse predator fishing at least once a week in the year prior to the study and only three (4.3 %) had not gone coarse predator fishing during the previous year. The bait most commonly used by participants when fishing for coarse predatory species was natural dead fish baits (47.8 %), followed by artificial lures (44.9 %), non-fish baits (5.8 %) and live fish bait (1.4 %). Most participants (65.2 %) used several bait methods when coarse predator fishing according to place and conditions. Only 39.1 % of participants explicitly stated that they do not use live bait, whilst 5.8 % stated that they do not use any form of fish dead bait. This indicates that 60.9 % and 94.2 % of respondents, respectively, used live fish bait or dead fish bait to some degree. Catch and release (C&R) was prevalent with 87.0 % ($n = 60$) of participants claiming to always practice C&R across all forms of angling.

Twenty one species of fish were identified as being commonly used for bait by participants (Figure 2). Participants used an average of 3.4 (± 0.2 SE) species of fish for bait. Three species were identified to be of conservation concern at a global scale by the International Union for the Conservation of Nature (IUCN); Atlantic horse mackerel *Trachurus trachurus* (L.), pollan *Coregonus pollan* Thompson and European eel *Anguilla anguilla* (L.) (Freyhof & Kottelat, 2008; Smith-Vaniz *et al.*, 2015; Pike *et al.*, 2020) and 17.4 % ($n = 12$) of respondents stated that they commonly used these species for natural fish bait. Atlantic mackerel *Scomber scombrus* L. was the most frequently used bait.

Overall, anglers slightly agreed that artificial lures were more expensive than natural baits, natural dead baits tended to catch bigger fish than artificial lures, and that predatory fish were more likely to be deep hooked by natural live and dead baits than artificial lures. They slightly disagreed with the statement that that natural dead baits resulted in fewer takes than artificial lures (Table 2). Opinions regarding natural baits and artificial lures between lamprey users and non-lamprey users did not differ (Mann-Whitney tests, $p > 0.05$).

3.3 | Use of lamprey and knowledge regarding use of lamprey

Most participants (95.6 %, $n = 66$) were aware that lampreys are currently used for coarse predator bait. Lamprey was also widely used among participants: 67.8 % ($n = 44$) stated that they used lamprey as dead bait for predators to some degree. Fishing location significantly affected the likelihood of a participant using lamprey as bait (ANOVA, $F_{(3,64)} = 13.398$, $p < 0.01$). All participants who fished most frequently in Scotland used lamprey as bait (Table 1).

Specialist angling club membership significantly affected the likelihood of a participant using lamprey as bait (ANOVA, $F_{(1,63)} = 4.696$, $p = 0.0302$) (Table 3), with the odds of members of such clubs using lamprey being 3.4 times higher than non-members ($\beta = 1.219$, $SE = 0.580$, $d.f. = 1$, $Z = 2.102$, $p = 0.0355$). The use of threatened species (excluding lamprey) as bait significantly affected the likelihood of a participant using lamprey as bait (ANOVA, $F_{(1,67)} = 5.878$, $p = 0.0153$) (Table 3) with a near-significant effect in the multifactor model output ($\beta = 2.030$, $SE = 1.104$, $d.f. = 1$, $Z = 1.839$, $p = 0.066$). Forty eight (69.6 %) respondents stated they were unaware of the conservation status of lampreys.

Pike was the major target species of the participants that used lamprey as bait, targeted by 97.7 % of participants ($n = 43$). Zander (pikeperch) *Sander lucioperca* (L.) (13.6 %, $n = 6$) and wels catfish *Silurus glanis* L. (4.5 %, $n = 2$) were less frequently targeted. Uses for lamprey besides from predator fishing were rare with a single participant stating that they used it as bait for the common barbel *Barbus barbus* (L.). Participants generally used lamprey for bait within their local area, with only 29.5 % ($n = 13$) taking lamprey with them on angling trips outside their home region (within the UK), without specifying where. Participant knowledge of lamprey was sparse (Figure 3) with only 11.4 % ($n = 5$) of respondents who used lamprey as bait claiming to know what species of lamprey they used. Two of these respondents identified the species of lamprey they used to be river lamprey (i.e. *Lampetra fluviatilis*). Only 13.6 % ($n = 6$) of respondents who used lamprey as bait claimed to know the source of their lamprey. One participant believed that lampreys were farmed to provide bait.

When comparing lamprey to other natural dead baits, participants that used lamprey disagreed that lamprey is cheaper, more difficult to use or tends to catch smaller sized predatory fish than other natural baits. Participants were neutral towards the statement that using lamprey as bait results in more predator 'takes' than other natural baits (Table 4).

3.4 | Opinions regarding lamprey

Most participants (56.5 %, $n = 39$) had no opinion on where they would prefer lamprey bait to be sourced from, with 39.1 % ($n = 27$) stating that they would prefer lamprey to be sourced from the UK for bait and 4.4 % ($n = 3$) stating that they would prefer lamprey to be sourced from the European Union. The participant's fishing frequency (Figure 4) and how much they agreed that natural dead baits result in fewer takes than artificial lures when fishing, significantly affected the likelihood of preferring lamprey sourced from the UK (ANOVA, $F_{(4,62)} = 9.950$, $p = 0.0413$; ANOVA, $F_{(6,62)} = 17.023$, $p < 0.01$ respectively).

Participants strongly agreed that bait companies should source their bait in an environmentally sustainable fashion (Table 5), with five respondents explicitly stating that they trusted suppliers to source sustainable bait. Respondents also overwhelmingly agreed that lamprey should be conserved and, if threatened by exploitation, a ban on their use as angling bait should be implemented, with 92.8% ($n = 64$) of participants agreeing with the prior statement to some degree. Although participants were, overall, neutral towards the statement that lamprey are responsibly sourced for bait, participants that did not use lamprey for bait disagreed with this statement more than participants that did (Mann-Whitney test, $W = 343$, $p = 0.004$). Seventeen participants explicitly stated that they would prefer lamprey to be from a sustainable source and six expressed a preference towards farmed lamprey.

Participants disagreed that lamprey could not be replaced with other natural baits. Thirteen respondents explicitly stated that there was little difference between natural fish baits in their utility. Participants slightly disagreed that lamprey could not be replaced with artificial lures. Twenty-two participants noted that they thought lamprey are a good bait for predatory fish. Several factors affected participants' opinions towards the use of lamprey as bait (Table 6). Notably, participants who agreed (to some degree) that lampreys could not be replaced with other natural baits had odds of agreeing more that lamprey should be conserved 89.9 % lower than participants who disagreed that lampreys could not be replaced with other natural baits.

4 | DISCUSSION

4.1 | Demographics

All participants surveyed in this study were male and the majority were middle aged or older (>45). It appears that participants who did not use lamprey as bait may have a higher level of education than those that use lamprey as bait, with 56.0% of non-users possessing an university degree compared with 31.8% of lamprey users (Table 1). These demographics are somewhat comparable to the findings of Braga *et al.* (2019, 2020) who showed that Portuguese lamprey fishers were almost exclusively male and elderly. However, the fishers interviewed by Braga *et al.* were generally from lower education backgrounds than the participants in this study. This may result from Braga specifically targeting members of low-income artisanal fisheries, whilst this study was concerned with recreational fishing, an activity that appeals to a variety of economic backgrounds. Conversely, this disparity may simply result from Portugal's overall lower education rate than the UK (St. Aubyn, 2005).

4.2 | Fishing behaviour

This study, with a modest sample size, indicates that dead fish baits are, marginally, the most common coarse predator fishing method in the UK. This is consistent with wider freshwater fishing behaviour across the UK, but differs to the USA where use of artificial lures are often the predominant method (Radomski *et al.*, 2006). Nonetheless, artificial lures are commonplace in the UK. As most participants commonly employed a variety of fishing methods, according to environmental conditions and personal factors, it is likely that many anglers surveyed use artificial lures to some degree. Almost all coarse predator anglers surveyed practiced catch and release (C&R) near exclusively across all forms of fishing, the prevalent attitude in the UK. UK anglers may be motivated to fish for catch-oriented reasons such as the desire to catch large “trophy” fish (Arlinghaus & Cooke, 2009; Rees *et al.*, 2017) or non-catch reasons such as the appreciation of nature (Holland & Ditton, 1992; Rees *et al.*, 2017).

Scottish participants may have been reluctant to disclose their use of live fish bait, potentially biasing the results. Since just 1.4% of all respondents used live baiting as the most common method, this potential bias was probably minor. Nevertheless, since 39.1% of all respondents stated they never used livebaiting, it can be inferred that it remains quite frequently used by the UK coarse predator fishing community. This is a concern as the release of bait after angling sessions has resulted in the introduction of invasive species and novel pathogens into waterways (Gozlan, 2008; Rodgers *et al.*, 2011; Kilian *et al.*, 2012). The use of species of conservation concern as angling bait is also worrying. Despite its critically endangered status across the EU, European eel was found to be used for bait in this study and can be purchased readily from retailers (Figure S2). The source of these eels is unclear and warrants investigation, though they may be sourced from licensed Ueel fisheries. European eel is listed on Appendix II of CITES, with trade to or from the EU essentially prohibited (Nijman, 2017). Now that the UK has left the EU, there is a need to understand the origin of European eel sold for bait in the UK.

Participants slightly agreed that natural baits caught larger fish than artificial lures, consistent with a previous study of American anglers (Hunt & Ditton, 1998). Fish size has been shown to be a factor affecting the motivations of UK predator anglers (Rees *et al.*, 2017). This may explain the prevalence of dead fish baits as catch-orientated trophy anglers aim to maximise their perceived chances of catching larger fish. This opinion is partially supported in the literature, with Arlinghaus *et al.* (2008) showing that natural dead baits caught larger pike than artificial lures, although this was at least partly due to a bait size effect. Questionnaire participants slightly agreed that natural baits resulted in a higher chance of deep hooking than artificial lures. This contrasts with widespread evidence

of greater rates of deep hooking and post-release mortality than with artificial lures (Siewert & Cave, 1990; Arlinghaus *et al.*, 2008; Weltersbach *et al.*, 2019). This may be a result of anglers' tendency to de-amplify risks associated with activities that they enjoy, provided that acute effects are not immediately visible (Burger, 2000).

4.3 | Use and opinions of lamprey as bait

The use of lamprey as bait is widespread within the UK coarse predator angling community, being used to some degree by 67.8 % of participants, mainly for pike. Few participants would prefer lamprey bait to be sourced from outside of the UK and over 39 % would prefer lamprey to be sourced from within the UK.

Although no studies comparing preference towards domestic or imported angling baits exist, these results broadly reflect the wider view of UK consumers, who prefer UK-origin domestic goods, especially food items (Knight, 1999). Coarse predator angling is popular in the UK, the PAC . comm.) and over 920,000 coarse/non-migratory trout rod licences were issued in 2018 - 2019 in England (Environmental Agency, 2020). Therefore, it seems that a preference for UK-sourced lamprey offers strong market support for the current lamprey fishery within the Humber River Basin.

Participants' views of the mediocre effectiveness of lamprey as a bait is intriguing. Participants disagreed that lamprey was cheaper than other natural baits (frozen lamprey retail ~ £5 for a pack of two to three lamprey) but were neutral towards the statement that lamprey resulted in more takes when angling for predatory fish. Despite this, many participants explicitly stated that they thought lamprey were a good bait. This belief in lamprey's effectiveness as bait may result from angling media influences. Lamprey are promoted as a good bait for pike by facets of the angling media who claim its "high blood content" creates a scent trail to attract predators (<https://www.anglingtimes.co.uk>). This may affect the purchasing decisions of anglers (Byrum, 2019), leading them to purchase lamprey over other baits. Discussions regarding the effectiveness of angling methods are commonplace in the angling media, but studies comparing the true effectiveness of natural baits in angling are scarce (but see Arlinghaus *et al.*, 2017). A study into the effectiveness of different dead baits may be warranted to determine claims made by the angling media.

Anglers may view lamprey as a good bait because of their wider perspective of bait effectiveness. Several participants ($n = 8$), 75 % of whom used lamprey as bait, believed bait effectiveness varies across fishing locations and sessions. The catch rate of pike by anglers is affected by factors such as angling site, temperature and wind speed (Kuparinen *et al.*, 2010; Arlinghaus *et al.*, 2017). It is likely that, to compensate for a perceived variability in bait effectiveness, anglers purchase lamprey to create a wide array of baits.

Participants who used globally threatened species of fish for bait were more likely to use lamprey as bait. It is most likely that this use of threatened species stems from anglers underestimating their environmental impacts (Gray & Jordan, 2010) and unintentional ignorance towards the status of fish populations across Europe. Increasing public awareness within the angling community of the threats to some bait fish species and investigating the motivations of anglers using threatened species could reduce the use of threatened species for angling bait (Easman *et al.*, 2018).

4.4 | Knowledge regarding the origin of bait

Few participants knew the species of lamprey they used as bait. Only two participants correctly identified the species they used as river lamprey (*Lampetra fluviatilis*), the only species of lamprey currently known to be sold commercially as angling bait in the UK (Foulds & Lucas, 2014). This is again comparable with Braga *et al* (2020), whereby numerous lamprey fishers were unaware of some aspects of lamprey biology. However, all fishers could successfully identify *P. marinus*, unlike most participants in this study who did not know what species of lamprey they used as bait. This ignorance could be problematic given the widespread media attention on invasive *P. marinus* in the North American Great Lakes (Lucas *et al.*, 2020). Media coverage plays a significant factor in raising public awareness and interest regarding non-native and invasive species (Gozlan *et al.*, 2013). Thus, there is a risk that UK anglers use lamprey as bait under the misconception they are an invasive species. Improved public awareness of the lamprey native to the UK is therefore needed.

Very few participants claimed to know the geographic source of the lamprey they used as bait. As previously mentioned, Foulds and Lucas (2014) found that, in 2011/12, the majority of lamprey for angling bait in the UK were sourced from the Netherlands and Estonia. Due to a moratorium on lamprey fishing in the Humber in several recent years, at least one major wholesale bait supplier (Baitbox) was forced to exclusively import lamprey from Estonia (P. Bird, Baitbox, pers. comm.). The opaqueness of the angling bait industry complicates locating the origin of dead fish baits as bait packaging lacks features that informs consumers of the baits' source. If the majority of lamprey are imported into the UK, there is a potential risk of disease transfer.

Viral pathogens present the largest threat of disease transmission in dead fish bait. Finnish river lamprey have been found to carry a strain of the negative strand RNA virus Viral Haemorrhagic Septicaemia (VHSV) and it is theorised that lamprey may act as a mechanical vector of VHSV into host fish (Gadd *et al.*, 2010). Viral Haemorrhagic Septicaemia is known to cause mortality in salmonids and pike, the latter of which can

contract it through ingestion of infected prey items (Ahne, 1985; Cabon *et al.*, 2020). Moreover, the industry standard for the preparation of angling dead baits is blast freezing to -21 °C, (BaitBox, pers. comm.). This is often insufficient to reduce viral loads of infected fish below the critical threshold (Phelps *et al.*, 2013). As a result, there is a risk of anglers acting as vectors of disease through infected and insufficiently treated lamprey. The degree of disease transmission risk that previously frozen dead fish to UK waters poses relative to other angler-related sources such as on damp nets and un-sanitized equipment is open to question and has not been assessed.

4.5 | Attitudes regarding lamprey conservation

The environmentally sensitive mindset of many anglers (Holland & Ditton, 1992; Williams & Moss, 2001) was reflected in this study, as anglers overwhelmingly agreed that lamprey should be conserved and that, if threatened by exploitation, a ban on the use of lamprey as angling bait should be implemented. While, over its whole range, European river lamprey is listed by IUCN as Least Concern, it has become much rarer and locally extinct in many regions (Lucas *et al.*, 2020). European river lamprey does exhibit population structuring, such that UK stocks, including those in the Humber River Basin, require sensitive management (Bracken *et al.*, 2015). Combined with the participants' overall opinion that, lamprey could be replaced with other natural or artificial lures, it seems that UK freshwater predator anglers would support conservation actions to protect UK stocks of lamprey if given sufficient evidence.

However, because lamprey users considered lamprey to be responsibly sourced whilst non-lamprey users opined this to be less so, indicates the presence of a subset of anglers that highly value lamprey as angling bait. The use of lamprey as dead bait reflects that these anglers are an inherently consumptive group and so are likely less accepting of regulation (Aas & Kaltenborn, 1995; Dorow *et al.*, 2010). This subset of lamprey-centric anglers may oppose legislative restrictions to the use of lamprey as bait out of fear that it will negatively impact their fishing experience. Non-legislative methods may present a more desirable alternative to both environmental and angling groups.

One such technique could be voluntary restrictions by anglers and in this study anglers showed a willingness not to use lampreys as bait if they were made aware that they require conservation. Education is often used to increase public awareness of conservation issues (Novacek, 2008) and provide a guide towards sustainable practice. An example would be the Marine Conservation Society's "Good Fish Guide" which recommends more sustainable sources of seafood to consumers (www.mcsuk.org). Anglers are often aware of and comply with the best C&R practices available (Nguyen *et al.*, 2013; Delle-Palme *et al.*, 2016) and

have been shown to socially sanction anglers who do not follow best practices (Guckian *et al.*, 2019). A “Good Bait Guide” could be created and circulated throughout angling networks, to instil a voluntary set of “best bait practices” into the angling community, potentially reducing the use of threatened species such as river lamprey as bait and bait sources at risk from pathogen transmission (Vollmar *et al.*, 2015).

Furthermore, participants expressed a strong desire that bait companies should source their bait sustainably. No methods to validate the origin or sustainability of baits currently exist. This could be used to the economic benefit of bait suppliers as consumers often prefer certified sustainable or local goods (Jaffry *et al.*, 2004). In the case of seafood, consumers were willing to pay 14 % more for certified sustainable products and 12.6 % more for locally produced products (Zander & Feucht, 2018). The use of certification schemes in the angling bait supply chain could improve transparency and increase revenue if it is supported by the angling community. Therefore, studies into anglers’ preference for and willingness to pay for certified sustainable baits are crucial to test the viability of this scheme. Multiple participants expressed a preference towards purchasing hypothetical farmed lamprey. Several species of lamprey, including river lamprey, are artificially propagated for research and population restoration needs (Lampman *et al.*, 2020), but only through the egg to larval stage, currently precluding the possibility of culturing lamprey to the adult stage as bait.

4.6 | Conclusion

Although natural dead baits are the most frequently used bait by the UK coarse predator angling community, artificial lures are also commonplace. The prevalence of lamprey as bait within the coarse predator angling community and the preference for UK-sourced lamprey suggests that the current UK commercial lamprey fishery will continue, as long as it is sustainable and does not impact SAC status. However, the generally favourable disposition of the angling community towards the conservation of lamprey and sustainability of angling baits could stimulate a movement to increase transparency and sustainability within the UK angling bait market.

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Table 1: The demographic data collected from the questionnaire participants

		Non-lamprey users (<i>n</i> = 25; %)	Lamprey users (<i>n</i> = 44; %)	Total (<i>n</i> = 69; %)
Location	Southern England	76	40.8	53.6
	Northern England	12	20.5	17.4
	Wales	8	11.4	10.1
	Scotland	0	22.7	14.5
	Northern Ireland	4	4.5	4.3
Age	18-24	16	2.3	7.2
	25-34	12	11.4	11.6
	35-44	12	22.7	18.8
	45-54	8	18.2	14.5
	55-64	28	34.1	31.8
	65-74	20	11.4	14.5
	≥75	4	0	1.4
Highest education level achieved	Pre-16	0	6.8	4.3
	Post-16	12	20.5	17.4
	College diploma	16	22.7	20.3
	University degree	56	31.8	40.6
	Specialist professional qualification	16	18.2	17.4
Member of specialist angling club	Yes	32	31.8	55.1
	No	68	68.2	44.9
Member of environmental organisation	Yes	60	25	30.4
	No	40	75	69.6

Table 2: The mean scores and standard errors of participant responses towards statements comparing natural baits and artificial lures. Scores are calculated for all participants, participants that used lamprey as bait and participants that did not use lamprey as bait. Measures are based on a 7-point Likert scale where; 1= Strongly disagree, 2= Disagree, 3= Slightly disagree, 4= Neutral, 5= Slightly Agree, 6= Agree and 7= Strongly agree.

Statement	Non-lamprey users (<i>n</i> = 25; Mean \pm SE)	Lamprey users (<i>n</i> = 44; Mean \pm SE)	Total (<i>n</i> = 69; Mean \pm SE)
Artificial lures are more expensive than natural baits	5.0 \pm 0.4	4.9 \pm 0.3	4.9 \pm 0.2
Natural dead baits result in fewer takes than artificial lures	3.6 \pm 0.4	3.0 \pm 0.3	3.2 \pm 0.2
Natural dead baits tend to catch bigger fish than artificial lures	5.2 \pm 0.3	4.7 \pm 0.3	4.9 \pm 0.2
Predators are more likely to be deep hooked by natural live and dead baits than artificial lures	5.4 \pm 0.4	5.1 \pm 0.3	5.3 \pm 0.2

Table 3: Frequency of use of lamprey as bait in relation to membership of specialist angling clubs and use of other threatened fish species as bait

		Non-lamprey users (n= 25; %)	Lamprey users (n= 44; %)	Lamprey users (n= 44; %)
Member of specialist angling club?	Yes	32.0	68.2	55.1
	No	68.0	31.8	44.9
Use non-lamprey threatened species as bait?	Yes	4.0	25.0	17.4
	No	96.0	75.0	82.6

Table 4: The mean scores and standard errors of participants responses towards statements comparing lamprey to other natural baits. Scores are only calculated for participants who used lamprey as bait. Measures are based on a 7-point Likert scale where; 1= Strongly disagree, 2= Disagree, 3= Slightly disagree, 4= Neutral, 5= Slightly Agree, 6= Agree and 7= Strongly agree.

Statement	Lamprey users (n= 44; Mean \pm SE)
Lamprey is cheaper than other natural baits	2.0 \pm 0.2
Lamprey is more difficult to use than other natural baits	1.9 \pm 0.2
Using lamprey as bait results in more takes when fishing for predators than other natural baits	3.6 \pm 0.3
Using lamprey tends to catch smaller-sized predator fish than other natural baits	2.8 \pm 0.3

Table 5: The mean scores and standard errors of participants responses towards statements regarding the use of lamprey as bait, scores are calculated for all participants, participants that used lamprey as bait and participants that did not use lamprey as bait. Measures are based on a 7-point Likert scale where; 1= Strongly disagree, 2= Disagree, 3= Slightly disagree, 4= Neutral, 5= Slightly Agree, 6= Agree and 7= Strongly agree.

Statement	Non-lamprey users (<i>n</i> = 25; Mean \pm SE)	Lamprey users (<i>n</i> = 44; Mean \pm SE)	Total (<i>n</i> = 69; Mean \pm SE)
Bait companies should source their bait in an environmentally sustainable fashion	6.5 \pm 0.2	6.7 \pm 0.1	6.6 \pm 0.1
Lamprey are responsibly sourced for bait	3.4 \pm 0.2	4.5 \pm 0.2	4.1 \pm 0.2
You could not replace lampreys with other natural baits	2.4 \pm 0.3	2.2 \pm 0.2	2.3 \pm 0.2
You could not replace lampreys with artificial lures	3.4 \pm 0.4	3.2 \pm 0.3	3.2 \pm 0.3
Lampreys should be conserved	6.3 \pm 0.2	6.0 \pm 0.2	6.1 \pm 0.1
Lampreys have been sufficiently protected in the UK	3.2 \pm 0.3	3.3 \pm 0.2	3.3 \pm 0.2
If lampreys were threatened by exploitation a ban on their use as angling bait should be implemented	6.0 \pm 0.3	6.3 \pm 0.1	6.2 \pm 0.1

Table 6: Factors that had a significant effect on participant's opinions towards the use of lamprey as bait. The statement in question, the significant factor, the odds ratio, β , standard error, t value and p value are included.

Response	Factor	Odds ratio	β	SE	t value	p
Lamprey should be conserved	Member of environmental organisation	2.95	1.08	0.466	2	0.046
	Agree that you could not replace lampreys with other natural baits to some degree	0.101	-2.3	0.868	-2.64	<0.01
Lamprey are responsibly sourced for bait	Member of specialist angling club	3.78	1.331	0.466	2.85	<0.01
	Age (45 to 54 against 18 to 24)	21.5	3.07	1.03	2.98	<0.01
	Age (55 to 64 against 18 to 24)	15.9	2.77	0.886	3.12	<0.01
	Member of environmental organisation	0.196	-1.63	0.512	-3.19	<0.01
	Use lamprey as bait	3.29	1.19	0.455	2.62	<0.01
If lampreys were threatened by exploitation a ban on their use as angling bait should be implemented	Agree that you could not replace lampreys with artificial lures to some degree	0.303	-1.2	0.568	-2.11	0.035
You could not replace lampreys with artificial lures	Mostly use lures (against mostly use dead bait)	0.328	-1.11	0.486	-2.3	0.022



Figure 1: The approximate locations of the angling clubs contacted across the UK during the study. Note angling networks are not marked as these are more diffuse organisations and so not restricted to any specific location.

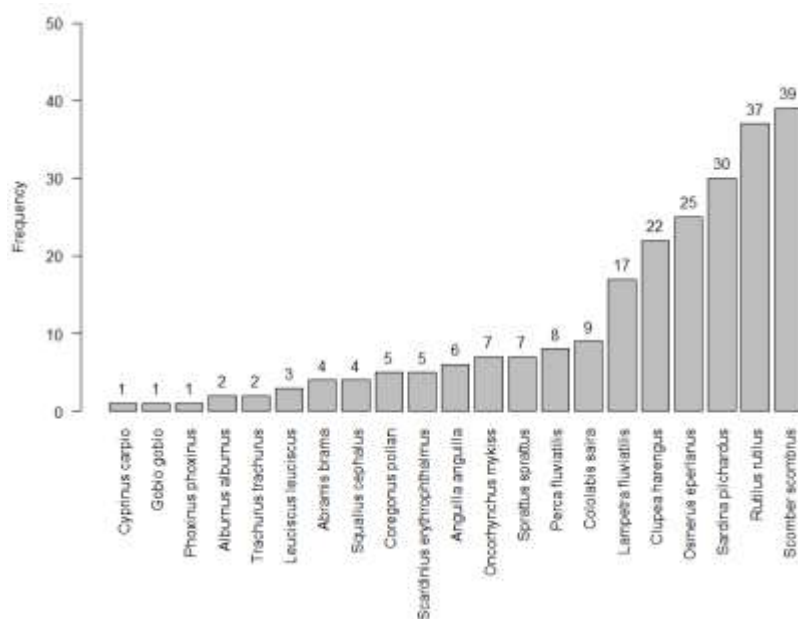


Figure 2: The frequency of each species of fish that participants claimed to frequently use as bait whilst fishing for predatory freshwater fish.

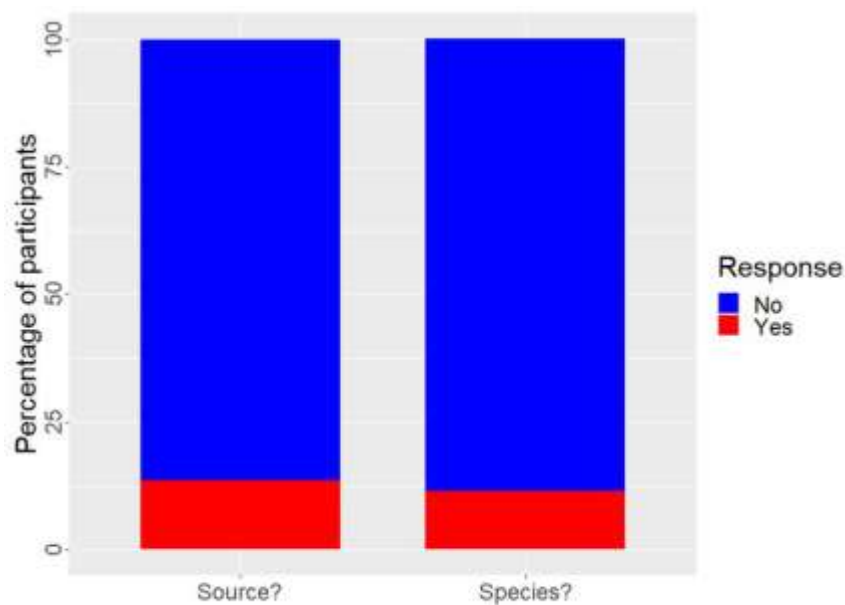


Figure 3: The percentage of participants who claimed to know or not know the source of the lamprey they used as bait and the species of lamprey they used as bait respectively.

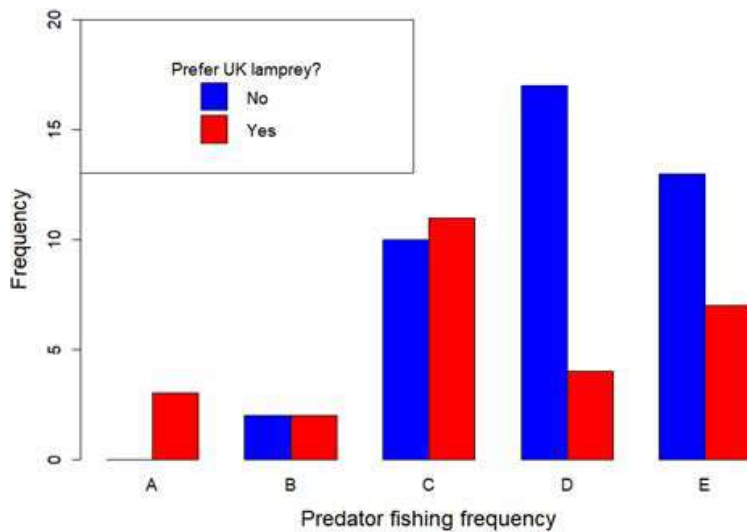


Figure 4: The frequency of participants that preferred/did not prefer lamprey to be sourced from the UK for bait respectively split by their fishing frequency during the last year where; A= Never, B= Less than once a month, C= Once a month, D= Once a week and E= More than once a week.

SUPPORTING INFORMATION



Figure S1: Example of frozen lamprey sections sold as angling bait for coarse predator fishing. Reproduced from www.baitbox.com.



Figure S2: Example of European eel (*Anguilla anguilla*) frozen and sold as angling bait. Image reproduced from <http://www.baitbox.com/>

Appendix 1: A copy of the questionnaire asked to all participants

Prior to beginning questionnaire flip a coin, the results determine which version of potentially socially sensitive questions is used. Heads = **Bold text**, Tails = Underlined text.

Introduction: My name is Atticus Albright and I'm from the University of Durham. I am conducting a series of interviews in order to investigate British anglers' views on freshwater predator angling baits. Would you be willing to help me by completing a 20 to 30 minute long telephone questionnaire? Participation in this study is completely voluntary. This conversation will be recorded and a transcript made, however all participants will be kept anonymous and you can withdraw your consent from this questionnaire at any time. Data obtained from this questionnaire will be retained for two years. Do I have your consent to continue?

Yes- Thank you very much, I shall begin the recording now (begin recording). This questionnaire will consist of mostly multiple choice options but there will be an open section near the end for you to illustrate any point you wish to raise. For future reference you will be given an personal identity code. Your code is (X), kindly remember it for future contact. Have you made a note of your code? (*Go to 1*)

No- Thank you, have a nice day. (*Terminate questionnaire*)

- 1)** Please confirm that you fish for predatory freshwater species (such as pike, perch, zander and catfish)

Yes (*go to 2*)

No (*Terminate questionnaire*)

- 2)** During last year's season, how often did you go predator fishing on average?

A) Never (*go to 3*)

B) Less than once a month (*go to 3*)

C) Once a month (*go to 3*)

D) Once a week (*go to 3*)

E) More than once a week (*go to 3*)

- 3)** In which area of the UK do you fish most frequently?
- A) Scotland (*go to 4*)
 - B) Northern Ireland (*go to 4*)
 - C) Wales (*go to 4*)
 - D) Northern England (*go to 4*)
 - E) Southern England (*go to 4*)
- 4)** May I ask if you are a member of a specialist angling club (such as the Pike Anglers Club of Great Britain)?
- Yes (*go to 5*)
- No (*go to 5*)
- 5)** Can I ask if you or any member of your household is a member of one or more environmental/conservation organisations or charities (such as the RSPCB or WWF)?
- Yes (*go to 6*)
- No (*go to 7*)
- 6)** Does that organisation (or one of them) specialise in conservation of waterways (such as the Canal and River trust)?
- Yes (*go to 7*)
- No (*go to 7*)
- 7)** What fishing method do you most often use when predator fishing?
- A) Live fish bait (*go to 8*)
 - B) Dead fish bait (*go to 8*)
 - C) Lure - including flies (*go to 8*)
 - D) Non fish bait such as shrimp, worm etc (*go to 8*)
 - E) Tend to use several of the above according to place/conditions - If so, which?
(*go to 8*)
- 8)** When using live fish bait, do you obtain your bait at the same water you intend to fish at?
- Yes (*go to 9*)
- No (*go to 9*)

- 9)** Across all forms of fishing, how often do you practice catch and release?
- A) Always (*go to 10*)
 - B) Often (*go to 10*)
 - C) Sometimes (*go to 10*)
 - D) Rarely (*go to 10*)
 - E) Never (*go to 10*)
- 10)** Please describe your opinion on the following statements under the scale; Strongly agree, Agree, Slightly agree, Slightly disagree, Disagree, Strongly disagree.
- A)** Artificial baits are more expensive than natural (*go to B*)
 - B)** Natural deadbaits result in fewer takes than artificials (*go to C*)
 - C)** Natural deadbaits tend to catch bigger fish than artificials (*go to D*)
 - D)** Predators are more likely to be deep hooked by natural live and deadbaits than artificials (*go to 11*)
- 11)** When using natural baits, what species of fish do you often use for predator bait?
- Open question (go to 12)*
- 12)** Are you aware that lamprey is used as a predator bait?
- Yes (*go to 13*)
 - No (*go to 13*)
- 13)** When using natural deadbaits, how often do you use lamprey?
- A) Always (*go to 14*)
 - B) Often (*go to 14*)
 - C) Sometimes (*go to 14*)
 - D) Rarely (*go to 14*)
 - E) Never (*go to 22*)
- 14)** Could you specify what predator species you target whilst using lamprey as bait?
- Open question (go to 15)*
- 15)** Do you take lampreys with you on fishing trips to other nations within the UK (e.g. from Wales to England), or to Ireland?
- Yes (*go to 16*)
 - No (*go to 16*)

- 16)** Do you have other uses for lamprey besides predator fishing?
Yes (*go to 17*)
No (*go to 18*)
- 17)** Could you specify what else you use lamprey for? *Open question (go to 18)*
- 18)** Do you know what species of lamprey you use as bait?
Yes (*go to 19*)
No (*go to 19*)
- 19)** Could you specify what species of lamprey you most commonly use as bait?
A) River lamprey (*go to 20*)
B) Sea lamprey (*go to 20*)
C) Brook lamprey (*go to 20*)
D) Other, please specify (*go to 20*)
- 20)** Can I ask for your opinion on the following statements using the scale; Strongly agree, Agree, Slightly agree, Slightly disagree, Disagree, Strongly disagree?
A) Lamprey is cheaper than other natural baits (*go to B*)
B) Lamprey is more difficult to use than other natural baits (*go to C*)
C) Using lamprey as bait results in more takes when fishing for predators than other natural baits (*go to D*)
D) Using lamprey tends to catch smaller-sized predator fish than other natural baits (*go to 21*)
- 21)** Do you know where the lamprey you use are sourced from?
Yes (*go to 22*)
No (*go to 22*)
- 22)** If given the choice, would you prefer that lamprey for bait come from the UK or EU?
UK (*go to 23*)
EU (*go to 23*)
No opinion (*go to 23*)

23) Please describe your opinion on the following statements under the scale; Strongly agree, Agree, Slightly agree, Slightly disagree, Disagree, Strongly disagree.

- A)** Bait companies **should not/should** source their bait in an environmentally sustainable fashion (*go to B*)
- B)** The government imposes too strict restrictions on UK anglers (*go to C*)
- C)** Lamprey are responsibly sourced for bait (*go to D*)
- D)** You could not replace lampreys with other natural baits for predator fishing and still catch as effectively (*go to E*)
- E)** You could not replace lampreys with artificial baits for predator fishing and still catch as effectively (*go to F*)
- F)** Lampreys **should/should not** be conserved (*go to G*)
- G)** Lampreys **have not/have been** sufficiently protected in the UK (*go to H*)
- H)** If lampreys were threatened by exploitation a ban on their use as angling bait **should /should not** be implemented (*go to 24*)

24) Are you aware of the conservation status of lampreys?

Yes (*go to 25*)

No (*go to 25*)

25) If there are any aspects of previous questions and answers that you would like to expand on, please do so now. Let me know if you need a reminder of the questions.

Open question (go to 26)

26) May I ask what your age category is?

18 to 24 (*go to 27*)

25 to 34 (*go to 27*)

35 to 44 (*go to 27*)

45 to 54 (*go to 27*)

55 to 64 (*go to 27*)

65 to 74 (*go to 27*)

Older than 75 (*go to 27*)

27) Could you tell me what gender you identify as?

Male (*go to 28*)

Female (*go to 28*)

Other (*go to 28*)

28) What is your nationality? *Open question (go to 29)*

29) If it's not too much to ask, what is the highest degree of education you have obtained?

- A) Pre-16 education with no qualification (*Terminate questionnaire*)
- B) Post-16 education with qualification e.g. O'levels, GCSE (*Terminate questionnaire*)
- C) College diploma or similar (*NVQ, HND etc*) (*Terminate questionnaire*)
- D) University degree (*Terminate questionnaire*)
- E) Specialist professional (but non-University) qualification (*Terminate questionnaire*)