



Department
for Environment
Food & Rural Affairs

CHART 2021 Project Review Report

Date: October 2022

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This review has been quality assured by Cefas science and Defra analytical teams but has not undergone external peer review

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Executive Summary

The CHART 2021 project involved 15 vessels fishing in SW English waters as part of a scientific study to understand the distribution, abundance, and behaviour of Atlantic bluefin tuna. This review document is intended to present an overview of the operational performance of CHART 2021, as well as highlight key metrics on the socioeconomic impact of the project. Data were collected through specific workshops with vessel skippers and the project Steering Group to understand operational performance. Socioeconomic data were collected from vessel skippers and their customers (anglers) using an online survey approach.

CHART 2021 was operationally successful, particularly given the quality and range of data collected, with minimal impact to fish welfare. Positive feedback was received from both skippers and the project Steering Group across the multiple stages of the project. Some improvements could be made to the streamlining the application process, as well as the data collection process during the fishing season. Training sessions were well received, although feedback suggested more targeted training on fish handling would be beneficial. Public facing communication could be improved in subsequent years of CHART.

From a socioeconomic perspective, CHART delivered a range of benefits. Spending from anglers generated a total direct expenditure of approximately £343,000 directly from CHART, with a total economic impact from CHART anglers of £742,000, providing £157,000 of Gross Value Added (GVA) and supporting approximately 9 FTEs. Skippers reported limited profits (mean ~£9000) in CHART 2021 given high levels of initial investment to purchase equipment. However, skippers reported that the project allowed them to fish a longer season than normal, providing viable business later into the year. Additionally, skippers reported a range of other benefits, including enhanced fishing knowledge and opportunities such as a broader clientele base and relationships within the local economy. The opportunity to participate in a scientific project was very much appreciated; all skippers unanimously agreed that they would participate in a future project.

Introduction

Following an increase in the abundance of Atlantic bluefin tuna (*Thunnus thynnus*- hereafter BFT) in English waters, interest from governmental, scientific, and particularly recreational fisheries stakeholders resulted in the proposal, collaborative design, and implementation of a Catch and Release Tag fishery (CHART). The project was operationally delivered by the Centre for Environment, Fisheries and Aquaculture Science (CEFAS), with project oversight by a project Steering Group (SG) consisting of a variety of governmental and recreational fisheries stakeholders¹. The key aims of the project were to:

1. Co-design and develop a science-led CHART programme for BFT.
2. Implement a CHART programme in English waters in collaboration with recreational fishing stakeholders.
3. Evaluate the CHART programme.

The fishery involved 15 specifically selected (via an application process) recreational charter vessels engaged in a scientific tag and release BFT in English waters. Skippers were trained in angling, handling, and tagging techniques for BFT, and vessels were monitored by a combination of observer coverage and universal camera installation. These design points ensured that the project upheld high standards of animal welfare, as well as conforming to both the UK Fishing Plan and ICCAT recommendations for the running of scientific BFT fisheries.

The project resulted in the tagging of 704 fish from 733 fish brought boat side over a 13-week season (16th August-14th November 2021), in which 421 trips were undertaken. Data were collected on length, location, condition following the fight and any incidental mortality. Fish were tagged using coded FLOY tags. 19 Fish were tagged using PSAT tags to gather fine granularity data on post-release mortality and behaviour. CPUE was 1.74 fish per trip, much higher than expected and indicative of a world class fishery. Mortality was significantly lower than expected, with 10 incidental fish mortalities (1.4%, around 1.1 tonnes), remaining well within the limits of the 10-tonne quota set for the fishery. There was limited cetacean (1 incident, no mortalities) and bird (1 incident and 1 mortality) bycatch. A wide range of marine wildlife, including 9 cetacean species and 3 shark species, was observed by vessels engaged in the project.

As part meeting objective 3 this document aims to ensure that any learning is formalised and taken forward for any consequent CHART projects and wider tuna policy and fishery management work. The project evaluation plan was developed by Defra. This had two key aims:

- Evaluate the operational aspects of the project across its various phases and themes.
- Understand the socioeconomic impacts of the project through angler and skipper surveys.

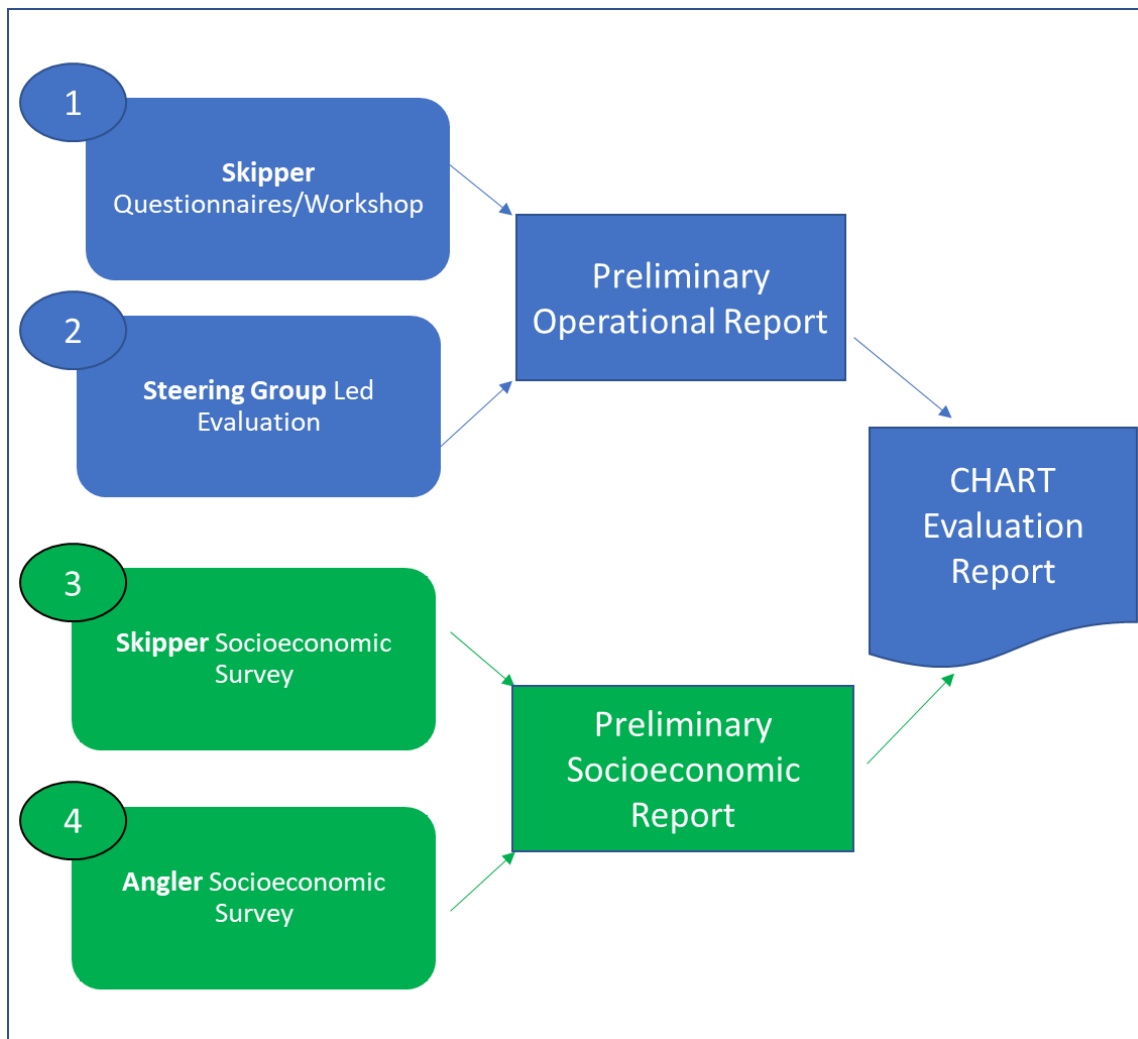
¹ The project Steering Group consisted of officials from Defra, the MMO, Natural England, Cornwall IFCA, as well as key recreational sea angling stakeholders from the Angling Trust and Bluefin Tuna UK.

Overview

Given the various elements requiring evaluation across the project, 4 separate workstreams were utilised to gather data:

1. A skipper workshop based in Falmouth, Cornwall in December 2021. This was led by Cefas but involved all parties as part of small-group and carousel sessions to gather skipper feedback on a variety of operational themes.
2. A series of operational workshops involving members of the SG, informed by an online survey via Qualtrics. This was delivered by Defra.
3. A skipper socioeconomic survey delivered by Defra via Qualtrics. Data were analysed and reported by Defra.
4. An angler economic survey delivered by Cefas via both paper and online formats. Data were analysed and reported by Cefas.

Each of these 4 workstreams are summarised and presented in this paper in order to reflect on the 2021 programme and document learning opportunities for moving forwards in 2022.



Part 1: Operational Review

Prior to the workshops in December 2021, skippers and crew were asked to complete a questionnaire to give their initial feedback on the CHART 2021 project across each of its key stages. Answers to questions were generally provided in the form of a Likert scale response from 1-10, 1 being negative and 10 being positive. Responses were received from 10 of the 15 vessels, key points are summarised below by category:

Topic	Question	Mean Score/Response
Application	How easy was the application process to understand?	6 (moderately easy)
	Did the Application Pack cover all you needed to know?	7
	Based on the application pack how much have your expectations of CHART been met	8
	How adequate was the feedback you received regarding your application?	8
	Given your experience of the application process, would you recommend others to apply to CHART in the future?	8
Training	Did you understand the need for the training workshop?	Yes (unanimous)
	Overall, did you find the workshop helpful?	8
	Did you feel that you were better prepared for the fishing season after the workshop had taken place?	8
	Was 2 days too long/too short?	Just right (x6)
Fieldwork and data collection	How easy were the data sheets to complete?	7
	Was the information you were asked to record	7 (slightly too much)
	How easy was it to submit the datasheets?	10
	Were the data-sheets easier to complete as you got more experience?	Yes (x9)
	Should the season be extended/shortened/earlier/later	Extend (unanimous)
Observer Coverage	How did you find the presence of Cefas observers onboard	9
	If CHART runs next year, what level of observer coverage would you support for	5% existing skippers, 10% new skippers
	How much of an impact did having the cameras aboard have?	Installation (5-moderate), Other (8-low)
Fishing experience	How much help did you receive in developing your tuna fishing & handling skills over the season?	8 (enough)
	Where did you receive your MAIN source of help in developing your tuna fishing?	Other skippers (8)
	Overall, how much do you think your customers enjoyed the tuna fishing experience?	9 (more than enough)
	Do you think that there is a larger appetite for tuna fishing than the CHART programme provided	Yes (8)
Comms	Was there adequate communication between Cefas and the skippers	Yes (8)
	Were the channels of communication diverse enough	Yes (unanimous)
	Was there adequate communication between the key stakeholders* and the skippers?	Just right
	Would you have liked Cefas to have provided more information in the weekly CHART infographic?	No (9)

Skipper Workshops

Skippers and crew members were asked eight questions to gather feedback on the operational aspects of CHART 2021, from the application phase to the end of the season, with specific focus on the fishing and data collection stage of the project. These questions were delivered in a carousel format, where smaller groups of skippers/crew took turns to answer, thereby encouraging wider participation. The first four questions covered potential changes to key stages of the project if it were to run in 2022, with the following responses by skippers and crew:

1) Application process

- a. The application forms should be simplified – especially the vessel coding and safety sections- to avoid duplication and effort, but that it was important to ensure that the application process is robust so that places in CHART are well earned.
- b. The call for applications should be made earlier (cf. April) – and up to 12-months in advance- to facilitate the management of charter bookings and to avoid interference with fishing activity, which was difficult with an April 2021 application.
- c. The online only process made it harder for less computer literate skippers to complete, and more effort was needed to make the application process more accessible to all

2) Training Programme

- a. More attention should be focussed on practical elements of training to facilitate dealing with novice anglers (e.g., how to fit a harness to an angler properly) and also on different fishing techniques tailored to individuals (e.g., rod holder fighting, stand up and chair).
- b. Leadering and lip hooking needs to be covered in detail because this is the most critical aspect of the fishing process in terms of dropped fish, crew safety and fish welfare. Good technique is key.
- c. In-season training facilitated by industry experts (including CHART skippers) should be implemented more formally (e.g., 2-days guaranteed support for each vessel at the start of the year) and more in-season support to be called upon would be ideal to troubleshoot any issues.

3) Data Collection

- a. The collection of data on paper forms should be streamlined, and ideally could be facilitated with a phone app or website.
- b. Developing data collection forms that use more pictorial and tick-box entries would make data collection easier and more consistent between skippers.
- c. Skippers/crew understood the need for most of the data they were asked to record, but that some aspects were difficult and needed more thought to encourage completion (e.g., sightings data).

4) *Project Communication*

- a. A good skipper community developed during the project. The communications between skippers led to collaborative success.
- b. Some boats would have liked to have received more 'stakeholder rep involvement' mid-season.
- c. Mixed views on the public facing communications, noting that these could be increased to capture local interest and drive increases in custom.

Four questions covered the lessons learnt by skippers with regard to fishing practice across the CHART season. These are summarised below:

- Skippers utilised natural cues such as diving birds and dolphins to find baitfish and therefore tuna. Collaboration and communication between vessels (both CHART and other local vessels) were useful to locate baitfish.
- Although most skippers learnt by experience and identified what worked for them, more training/guidance was required before the programme began on leadering and restraint of fish as this the most dangerous/difficult part of fishing. Essential to manage fishing deck and give clear instruction to anglers/crew to ensure safety when fish is alongside.
- Anglers were happy to be part of an official scientific programme, but more could be done to ensure this element was a success (e.g. manage expectations with regard to photographs and fight times, provide certificates with tag numbers, and allow them to bring own gear/explore new methods).
- With regard to fish welfare, skippers learning on the job, with all being confident by the end of 2021 season. Fish vitality indicators (colour, tail beat, eye movement, posture, and positioning) were identified and shared across skippers. Guidance from training sessions on fish welfare was considered too rigid with more skipper discretion needed.

Steering Group Survey and Workshops

In parallel with work to understand skipper perspectives of the 2021 project and areas for improvement for 2022, it was important to engage the project steering group to gather similar information. An initial online survey was delivered via Qualtrics to provide high level data on the Steering Group's views of the project as a whole. These data were then utilised to design 3 targeted workshops in which key themes were explored from the perspective of taking lessons into a potential 2022 CHART project. These were titled:

- Fish Welfare and Conservation
- Scientific and Socioeconomic Contributions
- Communications, Co-Design, and Collaboration

Steering Group Survey

The results of the Steering Group Survey were generally positive about the project, with useful feedback provided across a number of themes. However, it should be

noted that responses were limited, with 6-8² SG members providing the majority of feedback.

- CHART 2021 was unanimously considered to be successful, both generally and in meeting its key objectives, which were appropriate in their scope.
- The **scoping phase** answered its key questions in determining whether a 2021 was feasible. It was felt that this stage of the project involved the right stakeholders.
- Similarly, the **design phase** of the project was considered to have met its specific objectives and involved all required stakeholders, although feedback indicated that further engagement was unnecessary given lack of opposition to the project. Additional feedback on the design phase indicates that the workload given the short time frame (April-August) to get the project running following the scoping phase was unsustainable, and that the socioeconomic evaluation should have been incorporated into design initially, rather than being added in at a later stage.
- The **delivery phase** was largely considered to be successful in meeting its objectives, and that these objectives were appropriate in scope, although feedback from RSA stakeholders indicated a reduction in engagement at this stage, compromising their ability to evaluate and monitor the progress of the project. It was also suggested that allowances for a skipper representative on the Steering Group during the delivery stage would have been useful to ensure that skipper views and specific expertise were represented.
- In terms of **fish welfare**, this was generally favourable, points are made about it being essential to remain adaptive to new information during fishing and capture and take forward key learning from the projects operational phase, as this would support fish welfare outcomes, particularly around lip hooking.
- **Training** was also considered unanimously to be successful.
- The **observer programme** was effective in maintaining CHART's fish welfare standards, but further understanding on fishing techniques could improve the observer assessments moving forwards.
- CHART effectively dealt with **bycatch issues**, as training, protocols and forms were in place to address this.
- Feedback on **data gaps** suggested that CHART in 2021 provided data against all identified data requirements but in moving forwards with 2022 there is significant potential to gather more data.
- The **socioeconomic evaluation** of the project was considered to be poor in its initial design and implementation but was generally well received as a final product. Improvements should be made to ensure effective data collection in 2022. This should include having a functioning survey from project start, and the engagement with local economies to understand differing socioeconomic impacts associated with CHART.
- From a **project management** perspective, CHART delivered on time with an appropriate spend prioritisation, despite the project significantly overspending.

² It should be noted that there were only ~10 regularly active SG members given the variety of roles and organisations represented.

The escalation system was considered to be well designed, although feedback suggested that potentially flagged participants should be able to put their case to Cefas before the flag is assigned. This would ensure that learning could be taken from the escalation case, and that participants are given the opportunity to explain their position in a fair manner.

- From a **co-design and collaborative working** perspective, CHART was successful, although further work could be done to communicate with the wider public, potentially through enhanced media coverage and social media channels. Local authorities could be involved in the future to deliver a narrative around socioeconomic impact.
- The **Steering Group** was considered to be effective, but changes around communications, conflicts of interest, roles, and skipper representatives were suggested. ToRs were considered to be appropriate but some issues with adherence and clarity of roles were raised.

Steering Group Workshops

A series of 3 targeted workshops were undertaken in response to the Steering Group Survey results. These were broken down by key sections by theme, again based on the questions asked in the surveys.

1. *Fish Welfare and Conservation*

- a. Fish welfare procedures:** A significant barrier to immediate action from steering group members in addressing incidental mortalities and fish welfare issues was the lack of available real-time information. This was due to the use of paper data collection sheets, requiring app-based or online solutions in 2022. There will also need to be a formalisation of stakeholder roles.
- b. Skipper training sessions:** Essential that willing skippers involved in 2021 are bought in as mentors for new entrants to the project in 2022. This could be both in classroom and on vessels. Renumeration will have to be considered to pay those that wish to be involved in the mentoring scheme. The provision of better lip hooking training was also reiterated during discussions.
- c. Observer scheme:** Although there was an overwhelmingly positive perception of the observer scheme, it was felt that observers could be given a better overview of fishing gear and take a wider approach to measuring variables during the fighting of fish. Stakeholders offered to co-design an observer workshop or co-develop a check sheet. It was also agreed that observers need to be deployed more efficiently in 2022, looking at a risk-based approach to ensuring coverage on new vessels or vessels that may need extra support.
- d. Conservation and environmental impacts:** Further work needs to be undertaken to address bycatch issues, with the potential requirement to undertake a Habitats Regulations Assessment (HRA).

2. *Scientific and Socioeconomic Contribution*

- a. **Data gaps:** It was considered essential to build a comprehensive understanding of the fundamental data required and what could be considered to be additional or ancillary. Further to this, it was also crucial to understand what scientific work is possible with the data collected, as well as fit 2021 data into wider timeseries collected through external projects.
- b. **Scientific development:** A number of additional scientific workstreams were proposed for 2021, including genetic work, EDNA collection and the use of stable isotope analysis. It was noted that CHART 2022 should avoid undertaking too much, and that trials or externally conducted scientific work should be used to determine the viability of any future work.
- c. **Data quality and utility:** Whilst data quality was very high, there was room for improvement for sightings data. Cefas agreed to work with stakeholders to improve this and check for errors. Attendees agreed that it is crucial to identify opportunities to improve the way qualitative information was collected, such as providing more guidance for skippers providing answers or by seeking new ways to capture information (i.e., via online surveys). It was also noted that future quantitative standardisation is important through definitions and training. Future data collection should be automated, again collection through apps or online surveys should be considered.
- d. **Design of socioeconomic evaluation:** Improvements in communication strategies around the socioeconomic evaluation are required in order to help respondents understand the need for such data. Further improvements in widening the scope of the evaluation to quantify the programme impact on the local economy is also required. Streamlining surveys is also required, as is the addition of a willingness to pay approach. External bodies could help with the delivery of the evaluation, including tackle trade, academia, and other scientific bodies.

3. *Communication, Co-Design and Collaboration*

- a. **Communications:** There was agreement that a broader approach was needed in 2022, with additional coverage on themes around environmental and ecological elements of the programme. To achieve a broader approach, widening audiences on local and national scales (as per below) will also be required. Alongside this it was highlighted that there is a need to be clear of who is in charge of broader communications for CHART 2022.
- b. **Audience:** Need for more local and industry engagement. In particular using local businesses to raise the profile and potentially the tackle industry.
- c. **Co-Design:** Appraised over the two key project stages (design and delivery). Comments around additional partners in the design phase were raised, and that a correspondence list could be developed for

interested parties that do not sit on the Steering Group. A rolling project impact assessments from an environmental/ecological perspective, during the design phase, was suggested. In the delivery stage, points were raised around a separate strategy for delivering training and the actual project execution. A point was also raised around providing timely updates to skippers by sharing an overview of the previous week's fishing.

- d. **Collaboration:** It was noted that further resource may need to be found to ensure a collaborative approach is applied across the project. In 2022, it will be essential to formalise roles of the Steering Group and outline all conflicts of interest for participants. Further discussions are required on skipper attendance at steering group meetings, and if this is not appropriate a forum for skippers to share feedback is required. There is also a need to incorporate an ecosystem-based approach.

Conclusion

Overall, CHART 2021 was an operational success, as shown from feedback provided by both skippers and the project's Steering Group. This success was shared across each of the key project phases, although it was agreed that the timelines for the design phase resulted in a large workload for Cefas, and that the socioeconomic evaluation should have been incorporated into the project design. On the specifics of the socioeconomic evaluation, the project Steering Group felt that effective data collection would require a functioning survey from project implementation, and greater involvement with local authorities and businesses. RSF Stakeholders were concerned about a perceived lack of engagement during the delivery phase.

Improvements can be made to the application process through earlier delivery, simplification, and ease of access for all skippers. The training workshops, while being considered exceptionally successful, could also be improved through additional practical sessions, particularly on leadering and lip-hooking. Future training sessions should be resourced using experienced skippers and industry experts alongside Cefas scientists, particularly as skippers learnt a range of lessons from their fishing experiences in 2021 that are crucial to formalise and pass on for future projects. In-season training should also be considered and delivered to those vessels identified by real-time (or as close to) monitoring of fishing data. This could also support an adaptive approach to fish welfare and enable skippers to access support to further increase fish welfare, as well as access information on the fishery performance.

To enable to real-time data collection, the use of an app, website or online survey should be considered. This would result in a less resource intensive process for data collection, cleaning, and analysis, and would mean that data could be shared more easily. The observer programme was well received and regarded by both skippers and the project Steering Group, although this could be improved with specialised training for observers on BFT fishing techniques. The Remote Electronic Monitoring

(REM) camera system had a low impact on skippers, although installation was flagged as an issue through the skipper survey.

Communications should be improved by widening the scope of the communications strategy to involve the public and businesses (including the tackle trade), through enhanced social media coverage and local/national press. Whilst some skippers had mixed feelings towards this, others agreed that it would lead to enhanced custom. Going forwards, the project will need to communicate more effectively on why all data is being collected, and also ensure sufficient resource is provided to communications.

On data and science, it was agreed that additional data gaps and associated scientific work would need to be scoped out and checked for viability and utility prior to any future projects. A number of options were discussed.

From a project management perspective, CHART 2021 delivered all of its objectives to the set deadlines, although the final cost exceeded the original budget significantly. The project Steering Group was agreed to be effective, although it was agreed that all participants should have formalised roles and have declared conflicts of interest prior to future projects. It was also discussed that skippers should either be able to attend Steering Group meetings or have a suitable forum to share feedback with the Steering Group.

Part 2: Socioeconomic Evaluation

Alongside the evaluation of the operational aspects of CHART 2021, it is essential to understand the wider socioeconomic impact of the project to inform on the benefits delivered to both skippers and local coastal communities, but also understand how further development of the project and potential future BFT fisheries may bring additional socioeconomic gain to those involved as well as local and national economies. Therefore, two separate surveys were undertaken. Firstly, an angler socioeconomic survey was delivered by Cefas with support from Defra. Secondly, a specific skipper socioeconomic survey was developed by Defra, with support from the project Steering Group to inform survey design. Both elements are reported below.

Angler Socioeconomic Survey

Design and methodology

To evaluate the economic and social benefits of the CHART programme, a survey was designed. Initially this was administered on paper, but response rates were low, so an online survey was developed halfway through the season using the platform Qualtrics. Anglers were asked to complete the survey at the end of the trip, and reminders were distributed to anglers by the skippers at the midpoint and end of the season. The survey asked anglers for their personal characteristics, motivations for angling, and expenses with regards to their CHART trip. The responses of the

anglers were analysed to estimate the overall economic impact and social benefits of CHART in 2021 (Figure 1).

As this study aimed to identify economic impact of anglers, responses were only kept if the angler indicated they were a paying customer on their trip. Responses relating to the angler characteristics were assessed to identify the types of anglers taking part and the trip they took. The distance travelled by anglers for CHART was calculated as the direct line from the centre of their home postcode to the port associated with the vessel. To ensure anonymity of anglers, only the first half of the postcode (outward postcode) was requested. The opinions of anglers about CHART programme were also collected.

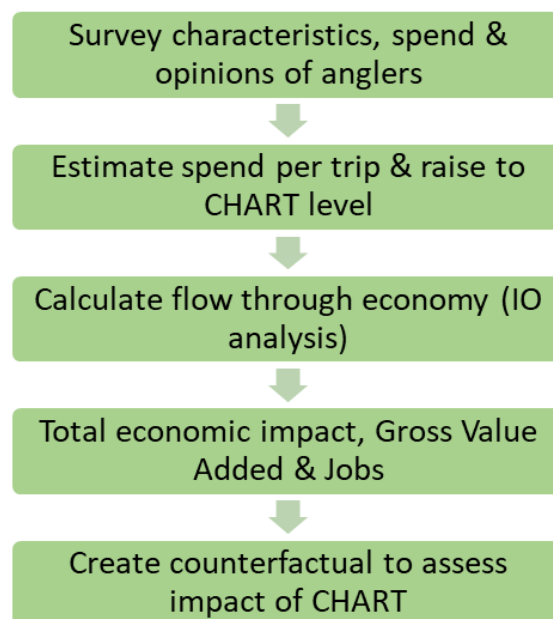


Figure 1: Conceptual framework of methodology for socio-economic effects of CHART 2021.

A total of 111 anglers (from 1069) provided data on their spend across a range of categories generating a breakdown for their whole trip. Trip spending categories included: accommodation; charter fees; accessories; transport; flights; food (from restaurants, takeaways, and shops); fuel; parking; and other additional spending. This was used to calculate the mean spend per angler for one fishing trip, accounting for the different length of trips, numbers of anglers, and numbers of CHART fishing trips each response related to. Where a response was received from more than one angler on the same CHART trip, the mean of the spending was taken. Survey responses were matched with trip information from the skipper logbooks to identify trip details such as number of anglers aboard. Where trip information from a survey response did not match to a trip that took place, it was assumed to be an error in the recording of the date of the trip. As such, the survey response was matched to the trip information of the vessel from nearest available date. This resulted in responses for 80 of the 407 trips that took place with paying anglers aboard. Spend was

multiplied by the number of anglers aboard each trip to calculate total spending for each individual trip. From this, mean spend for each individual spend category was calculated giving an estimate for the total expenditure per trip.

Although anglers were more likely to respond if BFt was caught and tagged, it was assumed that the 80 trips represented a random sample of the whole population (407 trips). This was because it was not possible to account for all the differences between trips with the limited number of responses. Assuming a random sample of trips, allowed raising the spend per trip to the total angler spend on CHART. For this step, the *srvyr* package in R was used (Freedman Ellis & Schneider, 2021; R Core Team, 2021). An Input-Output (IO) methodology was used to derive the total economic impact, Full Time Equivalent employment (FTEs), and Gross Value Added (GVA) from the total angler spend (see Hyder et al. (2020) for a detailed description of the approach). To do this, angler spend on each of the different categories was partitioned into the relevant industrial sectors, imports and taxes removed, and an IO table used to generate total economic impact and jobs supported. IO tables were taken from the supply and use tables (SUT) published by the Office for National Statistics (ONS)³.

The economic impact generated by anglers fishing within CHART is not the same as the total impact that CHART generated. This is because it does not account for what these anglers would do instead. For example, some of the anglers may still go fishing on a charter boat if CHART was not available to target other species or engage in non-angling activities. This is known as the counterfactual. To assess the counterfactual, anglers were asked what they would do if CHART was not available. According to the responses, 72% of anglers indicated they would not have come to the area if CHART were not available, with approximately one third of all anglers indicating they would still fish for tuna elsewhere. Thus, a proportion of CHART angler spend would have occurred anyway. Spend directly attributed to CHART was identified based on the activity anglers would do if CHART were unavailable using several assumptions (Table 1). Trip spend was partitioned into five groups using the proportion of anglers that would take part in each alternative activity (Table 1). Spend attributed directly to CHART was calculated based on the assumptions for each group (Table 1).

³<https://www.ons.gov.uk/economy/nationalaccounts/supplyandusetables/datasets/inputoutputsupplyandusetables>

Table 1: Assumptions made to calculate counterfactuals based on angler activity if CHART were not available.

Activity if CHART were unavailable	% Of Responses	Spending without CHART	Spending attributed to CHART	Assumptions
Go tuna fishing elsewhere	39%	Only accessories.	Everything apart from accessories.	Sea anglers would need to go abroad to fish for tuna elsewhere. Accessories would still be bought within the UK, but all other spending would go abroad.
Go angling elsewhere	31%	Angling spending.	Spending above average trip spend	Sea anglers would spend the average trip spend by sea anglers 2017 (adjusted for inflation).
Do nothing or a different activity elsewhere	16%	No spending.	All spending.	All recorded spending was attributed to CHART as they would spend nothing otherwise.
Go angling in the Southwest	10%	Trip spend but with a cheaper charter tour.	Difference in charter fees and accessories.	Anglers would have the same trip spend with the exception of the higher cost of CHART charter fees (approximately £200 higher) and additional accessories.
Do something else in the Southwest	4%	Trip fee minus charter fee and accessories.	Charter fee and accessories.	Anglers would likely need to spend the same amount on their trip minus fees directly related to angling

Spend per trip was adjusted to calculate the economic impact of CHART using the assumptions for each group of anglers (Table 1). These were combined to generate trip spending attributed to CHART, giving an estimate for the total expenditure. Trip spending was raised to the whole of CHART using the same method as before for the total economic impact of anglers fishing within CHART. Imports and taxes were removed from the total spending before being scaled to the UK using the IO analysis.

Results

Angler Characteristics

Fifteen vessels took part in the CHART programme operating a total of 407 trips with paying anglers. Approximately 111 (10%) of the 1069 CHART anglers completed the survey. These anglers went on 80 different trips across 12 vessels. The number of responses from each vessel was variable, with three vessels accounting for more than half of the responses. This is likely due to the different amount of fishing effort per vessel or skippers actively promoting uptake of the survey. (Figure 2a).

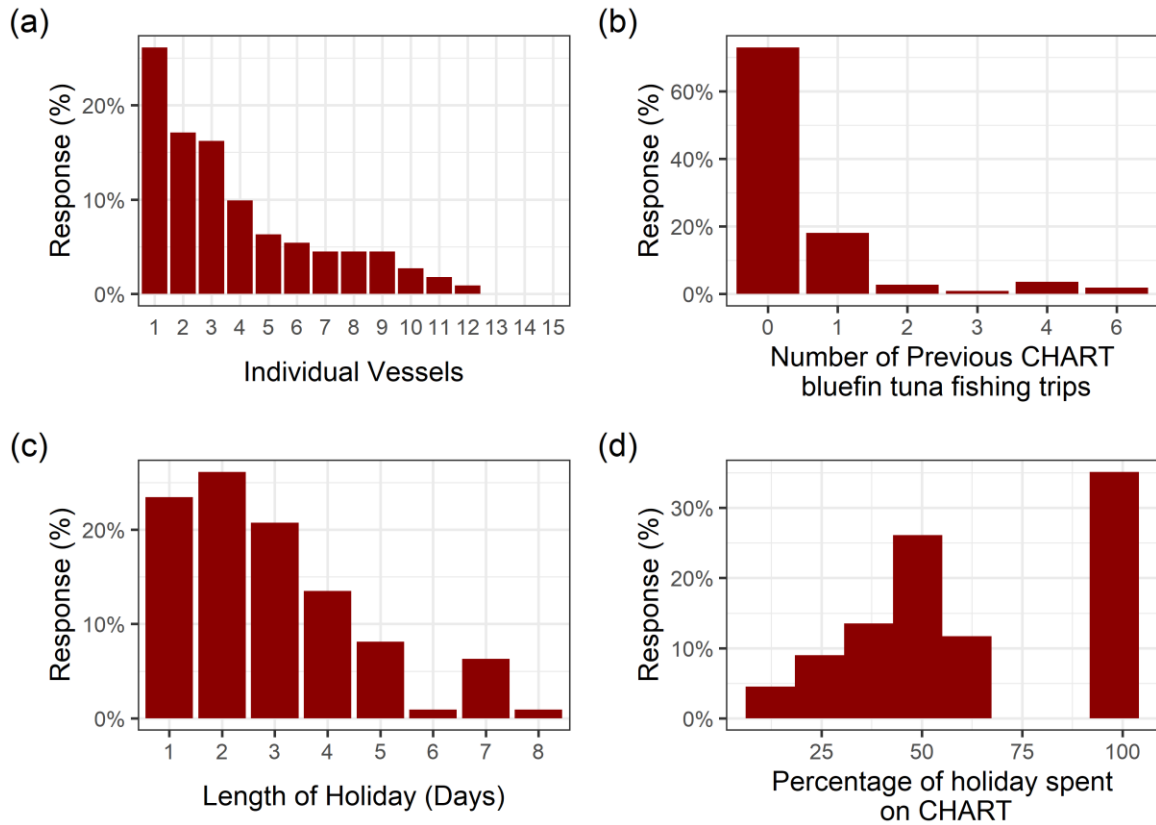


Figure 2: Trip characteristics of the anglers responding to the survey with the percentage of responses received from different vessels (a), numbers of previous CHART trips (b), holiday lengths in days (c), and proportion of holiday spent on CHART (d).

Most anglers had travelled to the area specifically to take part in CHART (Figure 2d) with nearly three quarters travelling in a group. The majority of anglers were new to CHART (Figure 2b), spending an average of 2.9 days in the area (Figure 2c), fishing for an average of 1.5 days, but did not spend all their trip fishing (Figure 2d). Anglers that responded to the survey were from across the UK, with most from the south or southwest of England (Figure 3). Anglers travelled an average of 254 km each way, with the maximum distance travelled 818 km each way.

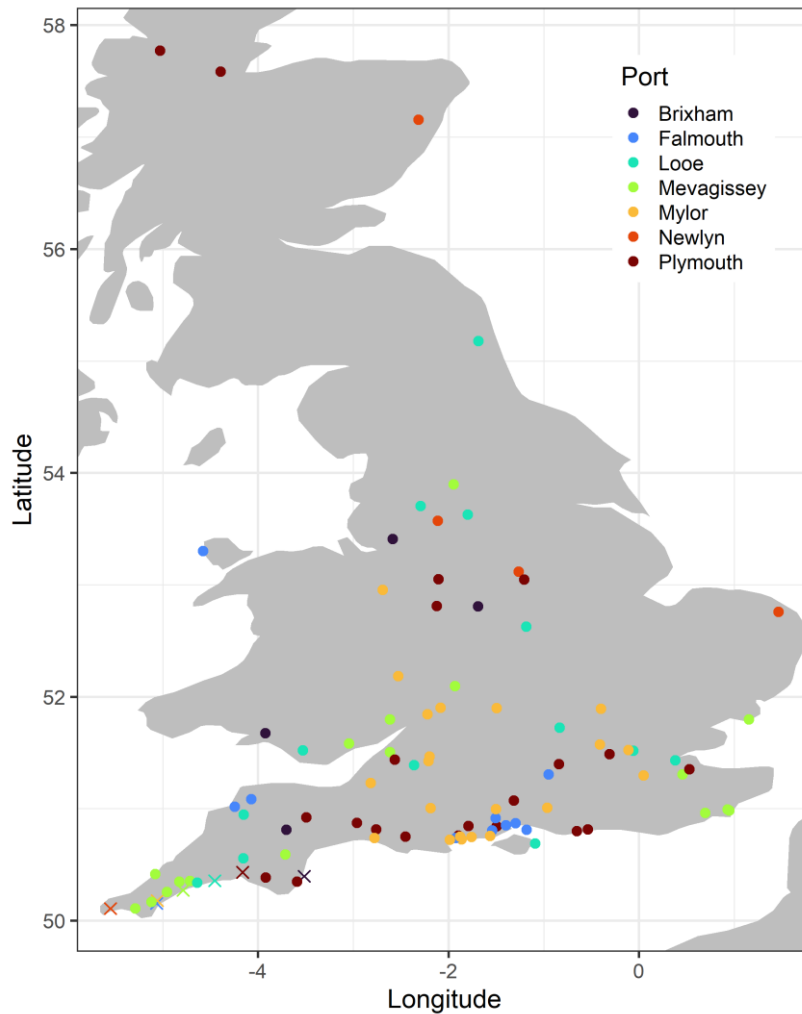


Figure 3: General location of anglers that took part in CHART, coloured by the port they travelled to. Port locations are indicated by an x.

Nearly three quarters of anglers were above 45 years old with the majority aged between 50 and 60 years (Figure 4A). Household income among anglers was generally high, with approximately 10% in each middle to upper-level incomes with 20% earning over £100,000 per annum (Figure 4B).

CHART anglers had fished for 21 days in the past 12 months, which was high compared to the 7-11 days fished each year general population of sea anglers (Hyder et al., 2021). In their normal fishing, anglers mainly focussed on sea bass (54%), cod (33%), and pollock (20%), with many generalists specifying targeting any species available (22%). Only 6 anglers responding stated that they regularly target tuna, while approximately half of anglers responding had never fished for tuna before.

When asked their top three reasons for taking part in CHART most anglers indicated their top two reasons were to catch tuna and to have a new experience. The third reason was much more diverse with a mix between gaining “skills” and “experience” and environmental benefits such as “wildlife watching”, “socialisation”, “relaxation” and “to be outdoors”. All those that took part said they experienced at least one form

of benefit from CHART from improved “social” interactions, “mental” or “physical” health. Nearly 90% of respondents said they felt the experience was good for their mental health with nearly two thirds agreeing it benefited their physical health.

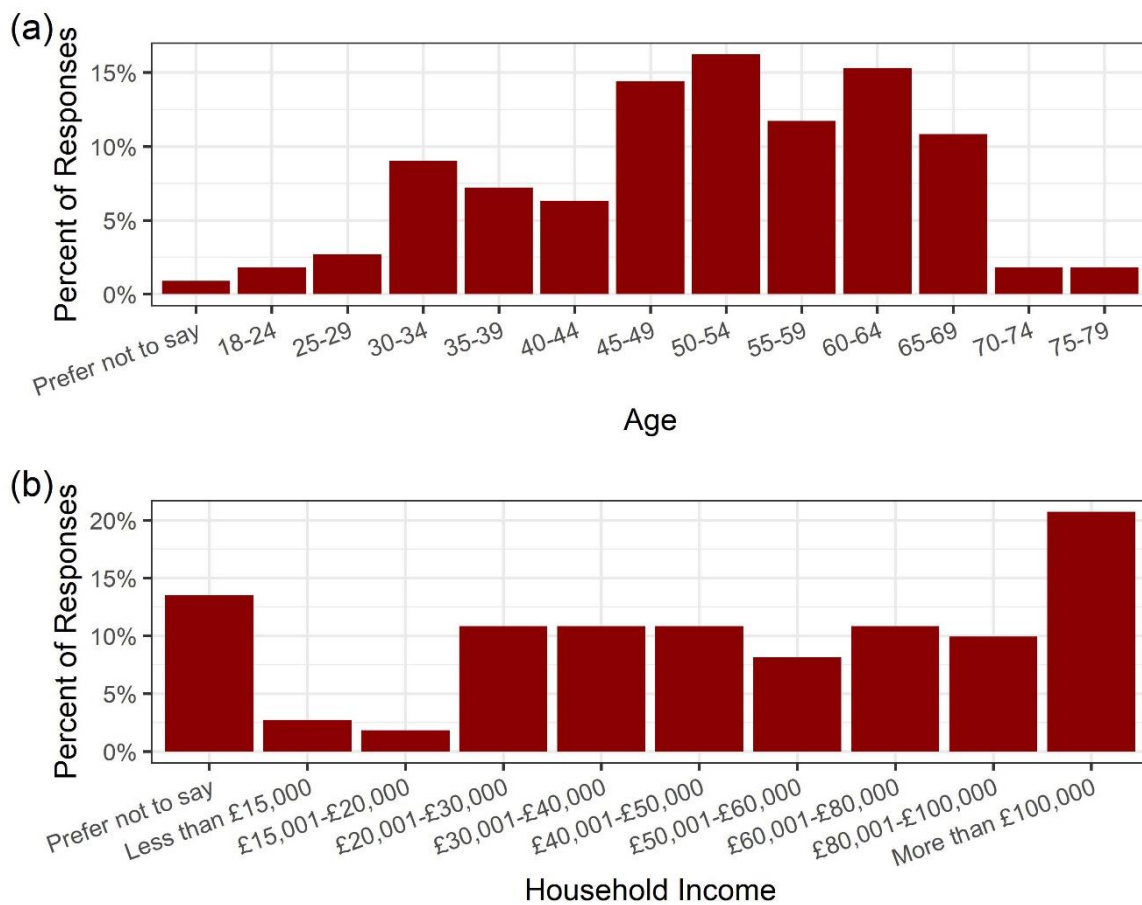


Figure 4: Percentage of responses from anglers for each of the different categories relating to: (a) age; and (b) household income.

Spending

The average angler spend for one CHART day trip was £493±25, approximately five-times greater than the average trip spend for all UK sea angler in 2017 of £86 adjusted for inflation to 2021 (Hyder et al., 2020). Charter fees, at £333±21, accounted for the majority of the spend (67%) followed by accommodation at £61±6 (12%) (

Table 2). Food was purchased mainly spent in restaurants, followed by shops. Spending on transport was the next highest spend with fuel as the highest transport expense with an average of £23±2 per person per day of their trip. Accessory spend was low given skippers often provided equipment to anglers.

Table 2: Average spend by category per angler for one CHART fishing day trip.

Categories	Mean	Standard Error
Accommodation	£61	£6
Charter Fee	£333	£21
Trip Accessories	£3	£0.35
Transport	£38	£3
Food	£46	£3
Other	£12	£2
Total	£493	£25

Total Economic Impact of CHART

The average spend for each spending category calculated per trip gave an estimate for the total expenditure of £1,311 per trip. Spending distributions across the categories remained the same as spending by individual anglers. Charter fees accounted for 65% of this spend with an average £856 per trip, approximately £200 above average for other charter fees.

The direct impact of CHART in 2021 was £410,000, generating a total economic impact of £889,000, GVA of £189,000 and supporting 11 FTEs (Table 3). However, this is from a small sample size considering only angler spend on the pilot study of this programme.

Table 3: Economic Impact of spending directly attributed to CHART and Total Economic Impact of the CHART programme generated from Angler spending. Spending is given as the mean with 95% confidence intervals in [].

Total Expenditure (thousands)	£443 [£381, £505]	£534 [£458, £609]
Total Economic Impact:		
<ul style="list-style-type: none"> • Expenditure (thousands) • Jobs 	<ul style="list-style-type: none"> • £742 [£640, £845] • 9 [8, 11] 	<ul style="list-style-type: none"> • £889 [£765, £1012] 11 [10, 13]

Additional impact generated by CHART

Spending per trip was adjusted to calculate the economic impact of CHART using the counterfactuals assumptions for each group of anglers (Table 1). These were combined to generate trip spending attributed to CHART, giving an estimate for the total expenditure of £1,088 for a single CHART Bluefin tuna trip.

Overall, 83% of the spending was found to be directly attributed to CHART. This generated a total direct expenditure estimate of £343,000 in 2021. This resulted in a total economic impact from CHART anglers of £742,000, providing £157,000 of Gross Value Added (GVA) and supporting approximately 9 jobs (Table 3). This was generated across the pilot study of the programme from only 15 vessels with 407 trips across a 4-month period

Conclusions

The wider socioeconomic impacts of the CHART programme associated with anglers were generally positive, providing considerable social benefits with improvements in mental and physical health as well as increased social interactions amongst anglers. Spending from anglers generated a total direct expenditure of approximately £343,000 directly from CHART with a total economic impact from CHART anglers of £742,000, providing £157,000 of Gross Value Added (GVA) and supporting approximately 9 FTEs. This spend is considerably higher than would be generated without the CHART programme, as the counterfactual showed that 83% of spend was directly attributed to CHART. However, this assumed the 10% of anglers which responded to the programme were representative of those that ordinarily fish as part of CHART. While this provides a generally positive effect of potential future CHART, the economic impact calculated was generated only from the first year of the pilot study programme. As such this may not be directly representative of potential economic impacts of CHART in future years. The spending by anglers may change in future should more trips become available as more available trips may decrease the cost of charter fees, which as the major spend for anglers would considerably affect overall spending. Future years may generate a change in the angler profile with increased numbers of anglers from different areas which may in turn impact spending generated by the programme. As such, while generally positive, caution should be taken when extrapolating results to the whole CHART programme, further socio-economic analysis of future CHART programmes will be needed to accurately assess the economic impact of this CHART programme.

Skipper Socioeconomic Survey

15 skippers participated in the 2021 CHART programme. 14 skippers returned completed surveys with the final skipper returning information on revenue generated in this report and not investments and costs. Total investment and cost statistics only accounted for 14 of the 15 skippers. Investment and cost varied dramatically between skippers, so estimating the investment and cost of the 15th skipper would have been inaccurate. Therefore, actual total investment and cost in CHART in 2021 would have been higher than stated in this report. Average cost and investment were taken from the responses of 14 skippers but still represents an approximate average spend per skipper across the programme.

The survey concluded with six open-ended questions, where skippers were invited to provide their thoughts and opinions on their motivations to sign up to the programme, the benefits, and opportunities they experienced, and any changes in their fishing and

business behaviour. 13 of the 15 skippers provided answers to these questions. Due to the qualitative nature of these responses, a thematic analysis was conducted. This approach identified meaningful themes as it reflects upon all responses gained from stakeholders. Commonalities between skipper responses were identified to present overall thoughts and opinions regarding the subject matter. Multiple analysts explored the data to control for researcher bias.

Economic Benefits to Skippers

Investment by category (GBP, from 14 skippers)

Category	
Clothes	4,980
Terminal tackle	50,850
Engines	70,550
Other major spend	33,980
Total investment without boats and engines	267,860

The majority of investment was in boats and engines, with a small group of **skippers** investing large amounts in boats and engines. In the context of this evaluation these investments cannot be directly attributed to CHART, as, although skippers may have decided to invest in the vessels due to CHART, they might have invested in them for their non-tuna charter boat business in the absence of CHART. The largest investment directly relating to CHART was in rods, reels and mainlines. As catching tuna recreationally requires specific, high-quality rods, reels and mainlines, this investment was a direct result of participating in the CHART programme. Significantly, skippers on average reported they would only require **19% of their initial investment** to complete the CHART programme for another year. This demonstrated the high start-up costs associated with entering the CHART programme but lower costs to continue in the programme over future years.

Investment by Region

Region	Investment (From 14 skippers) (£)
Local	71,280
UK	538,430
International	240,700
Local – without boats and engines	59,080
UK – without boats and engines	128,080
International – without boats and engines	80,700

The majority of investment was made across the UK, with a large proportion of this being in boats and engines. Not all equipment required for the recreational targeting of bluefin tuna can be purchased in the UK, hence some international investment, with one skipper buying a boat internationally. In the survey, the difference between the UK and local wasn't clearly defined but left to the discretion of skippers, so may not be consistent across all responses. The 2021 programme generated significant revenue both locally and across the UK.

Operating Profits

Category	Amount (£)
Average cost to skippers per trip	£379
Total variable costs to skippers	£154,234
Average revenue per trip	£704
Estimated average operating profit per trip	£325
Estimated total revenue from CHART 2021	£286,558
Estimated total operating profits from CHART 2021	£132,324
Estimated average operating profit per skipper from CHART 2021	£8,822

Average cost to skippers per trip is taken as the mean of the variable costs reported by 14 skippers, then multiplied by **407, the number of paying trips completed**, to find the total variable costs. The variable costs include fuel, staff, food, tackle (not including terminal tackle) and other costs on a per trip basis. The definition of revenue in the skipper survey was unclear and as a result not all of the responses aligned. 2 responses were not included in this report, so the average revenue per trip is an estimation based on the 13 other responses, as is the total revenue generated from CHART.

Operating profit per trip is average revenue per trip minus average cost to skippers per trip. Average operating profit per skipper for CHART 2021 was the average operating profit per trip multiplied by the average number of trips (27.1) per skipper. Analysis of the angler survey suggested that average charter fees were £856 per trip, meaning the total revenue generated by CHART was £348,392. This suggests CHART generated £194,139 operating profit in total. The angler survey also showed that further money was spent in the local economy by anglers, alongside charter fees. A final key statistic to draw from the skipper survey is that **100% of skippers** said they would participate in the programme if it were to be offered again, suggesting that skippers found their participation in CHART worthwhile.

Social benefits to Skippers

To gain a better understanding of potential social benefits that skippers reported, the survey investigated the motivations behind signing up to the CHART programme. Most respondents directly referenced the opportunity of catching bluefin tuna as the main reason why they signed up to the programme. Some commented on the opportunity to contribute to scientific data collection as well as a method of preventing commercial exploitation of the species. Only two skippers specifically stated that they were financially motivated to take part. Analysis of the data found four main themes/social

benefits: building relationships, enhancing knowledge, new opportunities, and changes in fishing behaviours.

Building relationships

Many skippers reported that they had created new business partnerships during the scheme, including connections with marine tourism businesses and working relationships with other skippers on the programme. Several skippers reported that these relationships extended beyond work, and friendships were formed, with plans to continue communication after the scheme. A few instances of negative interactions between skippers on the CHART programme, and those running private vessels were reported, with feelings of jealousy being expressed as certain vessels missed out on the opportunity to participate in the programme.

New client bases were frequently established, with a noticeable increase in bookings. Many clients indicated their desire to return next year if the programme was running again, or to engage with other types of angling in the area.

Enhancing knowledge

Analysis of qualitative responses found that skippers thoroughly enjoyed having the opportunity to contribute to scientific data collection, using their skills to provide valuable data which they hope can be used to help build knowledge of the species as it reappears in our waters. The respondents also illustrated how CHART allowed them to develop their knowledge and skills, learning a new style of fishing and fish handling as well as understanding more about tuna behaviour specifically. One skipper explained that the knowledge they gained in the short time taking part is of huge personal satisfaction, and another reported the enjoyment of being able to teach anglers new skills.

New opportunities

Throughout the data, skippers continuously reiterated their enjoyment of catching this specific species of fish, with many respondents directly referencing the opportunity to catch bluefin tuna as being a motivation for taking part in the CHART scheme. As CHART was the first time that vessels were authorised to recreationally target bluefin tuna, one skipper noted that if the programme were to continue, the opportunity of manufacturing and selling big game fishing gear locally could be considered.

Our feedback also suggests that bluefin tuna have attracted more corporate and wealthier clients, and a significant number of out-of-county and international clients. The opportunity to catch this species has thus attracted an array of new customers which has subsequently created a financial incentive for the skippers by extending their client base. It is also important to highlight that the skippers acknowledged that establishing a sustainable method of sport fishery to prevent exploitation of the species is imperative, with many respondents expressing frustration at high levels of commercial exploitation. Respondents encourage the protection of not just bluefin tuna, but all fish from illegal fishing.

Changing of fishing behaviours

Skippers reported that their fishing behaviours changed in several ways. Firstly, and expectedly, they targeted different species than usual, blue fin tuna; secondly, around half travelled to a different location to fish than normal; thirdly, most skippers extended their fishing season; and finally, around half changed their effort profile by fishing at different times than usual. Several commented that they had more opportunities to go out to sea compared to a normal fishing year, as BFT were found closer to shore and so poor weather had less impact on their ability to fish given reduced distances to fishing grounds. Overall, the skippers reported that they could fish for bluefin tuna for longer compared to their previous activities.

Other comments surrounding fishing behaviour again related to the enjoyment of catching bluefin tuna. One respondent claimed to have drastically reduced all other fishing activity as it does not compare to the opportunity to catch this species. Another respondent also explained how they thoroughly enjoy fishing for sport so love the idea of a catch and release scheme, allowing and promoting a sustainable method of sport fishery.

Conclusion

The total investment by skippers was £850,410, reduced to £267,860 once larger investments such as boats and engines were removed (given that the majority of skippers only purchased tackle and equipment). Most of this spend was on a national basis, although skippers also purchased goods both internationally and locally. Profit was generally limited, with an average profit of ~ £9,000 per skipper across CHART 2021. It is likely that this profit will increase in subsequent years given that skippers will require less initial investment and will have an additional year of BFT fishing experience, meaning they can charge more to customers. To that point, all skippers unanimously agreed that they would participate in a future project.

There were a variety of social benefits to skippers, including enhanced fishing knowledge and business relationships within their local economies and with a new clientele base. CHART 2021 enabled skippers to fish outside of regular seasons, bringing new opportunities for fishing for a differing species, in new areas and at differing times. Skippers were positive about being able to take part in a scientific fishery and about BFT angling in general, citing that CHART represented a sustainable method of utilising BFT quota over commercial and illegal/unauthorised targeting of the species.