

Best Practice Guidance for Assessing the Financial Effectiveness of Fishing Gear: Scientist-led Trials



UKFEN



Best Practice Guidance for Assessing the Financial Effectiveness of Fishing Gear: Scientist-led Trials

This document has been prepared for UKFEN by Seafish

Study team:

Ana Witteveen

Hazel Curtis

Dr Andrew F. Johnson (AFJMarine)

Struan Noble

Acknowledgements

This *Best Practice Guidance* and accompanying *Financial Assessment Spreadsheet* were informed by a technical workshop run by Seafish on 4th May 2017 in Edinburgh. At the workshop, industry experts reviewed the information and approaches needed to assess the financial implications of fishing gear trials. A complete list of contributors can be found in Appendix 1. Thanks to the attendees of the UKFEN workshop, those who have expressed an interest in and commented on the text and Alfredo Giron-Nava for comments on previous drafts of this document.

December 2017

ISBN No. 978-1-911073-21-5

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Seafish Economics
Seafish Industry Authority
18 Logie Mill
Logie Green Road
Edinburgh, EH7 4HS

Table of Contents

1. Background and Introduction	2
1.1 Bycatch, Gear Selectivity and the Landing Obligation	2
1.2 Assessing the Financial Viability of Gear Modifications.....	3
1.3 This Best Practice Guidance	4
2. Financial Assessment of Gear Trials.....	5
2.1 Data Collection	7
2.2 Data Entry	7
2.2.1 Costs.....	7
2.2.2 Revenue	8
2.2.2.1 Species	8
2.2.2.2 Fish Size Grade	8
2.2.2.3 Sales Value	9
2.2.2.4 Catch Quality.....	9
2.2.3 Trial Details	9
2.3 Short-term versus Long-term Data Collection and Evaluation	9
3. Data Sharing.....	11
4. The Financial Assessment Spreadsheet	12
4.1 Using the Excel Spreadsheet.....	12
4.1.1 The Trip Profile.....	13
4.1.2 The Catch Profile	17
4.1.3 The Revenue Profiles	17
4.1.4 The Cost Profile	18
4.1.5 Trip Summary and Excel Spreadsheet Outputs.....	18
4.2 Sharing Results.....	18
Appendix 1.	19
Appendix 2.	20

1. Background and Introduction

1.1 Bycatch, Gear Selectivity and the Landing Obligation

Bycatch, or incidental catch of non-target species, can be difficult to avoid due to the poor selectivity of many commercial fishing gears and a lack of economically-viable gear alternatives. Bycatch is discarded for a number of reasons, including high-grading¹, landing quota limits, limited onboard storage space, low value of species, and minimum landing size regulations.

The landing obligation, which bans at-sea discarding of quota species in EU waters, will significantly change the way many EU vessels operate once it is fully implemented in 2019. The landing obligation aims to incentivise vessel operators to minimise unwanted bycatch while minimising the trade-offs between rebuilding stocks and ensuring that fishing businesses remain financially viable under the landing obligation. Modifying or redesigning gear² is a practical and common way for vessel owners to increase fishing selectivity (Table 1).

Table 1. Main reasons vessel owners may seek to increase the selectivity of their fishing gears and reduce discards.

Reason	Description
Avoid choke points	Eliminating or reducing catches of certain stocks could help fishermen avoid encountering choke ³ situations, which can restrict vessel activity and profitability.
Demonstrate fishing sustainability	Demonstrating that landed catch is caught using sustainable fishing practices is becoming more important to consumers. Successful labelling as environmentally-friendly, eco-friendly or sustainable can lead to increased market demand and value. ⁴
Increase fishing efficiency	Gear modification can increase fishing efficiency, by increasing the amount of marketable catch, by reducing on-board sorting time, or by reducing fuel use per unit of catch.
Increase catch quality	Gear modification may reduce damage to fish during capture, increasing the market value of catch.
Give the industry a stronger voice	Provide evidence to government to inform future management decisions related to gear use and sustainable fishing.
Improve stock health	Boost stock replenishment and ecosystem productivity by reducing bycatch of non-target and undersize fish.

¹ High-grading is when fishermen discard smaller, less valuable fish, in order to use their quota for larger, more valuable fish.

² Browne, D. et al. A general catch comparison method for multi-gear trials: application to a quad-rig trawling fishery for Nephrops. ICES Journal of Marine Science fsw236–11 (2017). doi:10.1093/icesjms/fsw236.

³ Choke situations can arise in mixed fisheries. A species acts as a choke to further fishing when its quota is filled or taken before the quotas of other species caught in the same area by the same vessels, forcing vessels to stop operating because they cannot avoid catching the “choke” species.

⁴ Ponte, S. The Marine Stewardship Council (MSC) and the Making of a Market for ‘Sustainable Fish’. Journal of Agrarian Change 12, 300–315 (2012).

1.2 Assessing the Financial Viability of Gear Modifications

Before a new gear or gear modification is adopted by vessel owners, the gear must be trialed to compare its performance against the standard or existing gear in terms of:

1. The financial consequences of its use: How does the new gear affect the financial outcomes of the fishing businesses using it?
2. The operational and practical implications of changing gears: How, when and where should the new gear be used to achieve the best results? Will crew requirements change if gear modifications are adopted?
3. The environmental impacts of its use: Does the new gear reduce the proportion and quantity of bycatch and subsequent discards from the fishing activity?

Although there has been significant investment in new gear design, and research and analyses of gear effectiveness, very few studies have addressed the economic impacts of the landing obligation for vessel operators.⁵

Increasing gear selectivity is one way for vessel owners to increase operating profit and help improve stock sustainability. Changing gear selectivity can alter operating costs and fishing income. Uncertainty surrounding the costs and benefits of gear modifications may make vessel owners reluctant to make gear changes, due to potential losses in time and revenues during trial periods.

Modified gear must be financially viable and meet legislative requirements for vessel owners to change their gear. If new gears or gear modifications meet the legislative requirements of the landing obligation but are not financially viable, they won't be adopted. Before gear modifications are adopted, it is necessary to assess the financial consequences of gear modifications to make sure fishing operations remain profitable with the new gear.

The financial performance of fishing gear may have an impact on wellbeing and retention of crew as well as the quality of work on board. If gear modifications result in increased revenue and crew share increases, crew retention and the standard to which catch is handled, sorted and stored are likely to increase which could further improve the value of catch and revenues generated by the vessel.

The EU parliament has acknowledged the need to account for the economic considerations of using more selective fishing methods, yet little progress has been made in terms of formal published literature on how to perform financial assessments of a gear trial. A literature review⁶ undertaken as part of this project and conversations with industry experts also highlighted the lack of formal documentation related with economic evaluations of fishing gear modifications.

⁵ Graham, N. & H, D. Different Principles for defining selectivity under the future TM regulation (STECF-13-04). Scientific, Technical and Economic Committee for Fisheries STECF 1–41 (2013). doi:10.2788/90188.

⁶ Johnson, A. F. Estimating the economic implications of marine fishery gear trials - a literature review. *Seafish - AFJMarine* (2017).

1.3 This Best Practice Guidance

This *Best Practice Guidance* for scientist-led gear trials advises readers on what data to collect and how to analyse it to assess the financial implications of using standard gears versus modified gears.⁷

Specific aims of this Guidance are:

1. Make vessel operators and trial supervisors aware of what data to collect and when to collect it so that they can plan ahead of gear trials and make sure the correct information is collected for the financial assessment;
2. Make it easier and faster for those involved in fishing gear trials to compare the costs and revenues from using old versus new gears or from changing tactical decisions of when and where to fish;
3. Provide a standardised approach for assessing and reporting the financial effectiveness of experimental gear so results can be accurately compared between gear trials;
4. Facilitate collaboration between fishermen, managers and scientists involved in experimental gear trials.

This document does not advise on how to evaluate the costs of undertaking a gear trial nor is it meant to instruct readers on how to run a gear trial. Readers can refer to the ICES “Manual of methods of measuring the selectivity of towed fishing gears”⁸ for such guidance on trial design and general trial assessment.

Seafish also produced a shorter, *Best Practice Guidance* for vessel operators conducting industry-led gear trials. This abridged *Best Practice Guidance* can act as a quick reference during a gear trial and is available for [download](#).

⁷ In this document “gear modifications” refers to both complete gear switches and alterations made to existing fishing gears.

⁸ Wileman, D. A. Manual of methods of measuring the selectivity of towed fishing gears. ICES cooperative research report 215, 38-99 (1996).

2. Financial Assessment of Gear Trials

The financial assessment of experimental fishing gear is only as reliable as the data collected. Data standardisation and variability are important to consider before conducting a financial assessment of fishing gear modifications. In the financial assessment of a gear modification, standardisation refers to the uniform collection, analysis and reporting of trial data.

When considering the financial implications of different fishing gears, data standardisation allows for more accurate financial comparisons between trials of standard and modified gears, and of the same gears trialled by different vessels, allowing more robust conclusions to be drawn about the financial implications of changes in gear use. Robust results are important for vessel owners considering changes in gear use and for legislators who require data on the practicality of writing new or modified gear into fisheries policy.

It is also important to consider variability in external factors. Weather conditions, fish abundance, time of year and many other external factors can influence the financial performance of fishing gear (Table 2). Standardising as many variables as possible across trials (e.g. fishing grounds, weather conditions) to reduce variability in results is important for the financial assessment of a trial gear to ensure the comparability of results across gear trials. The list of factors in Table 2 is not exhaustive and many of these factors are strongly auto-correlated. Some factors can be controlled for in the design of a trial or accounted for in post-trial data analyses.

Table 2. Factors to consider in the financial assessment of a gear trial which may affect the variability of gear performance.

Category	Factor	Reason for potential impact on variability in gear trial financial assessment results
VESSEL	Vessel specifications	A combination of vessel length and overall vessel efficiency will help determine fuel use and the size of the gear being trialled.
	Engine power	Larger engine sizes will use more fuel but also make it easier to handle larger gears and easier to use towed gears over difficult sea bottom-types.
	Price of fuel	Higher fuel costs per weight of catch will lower overall profits.
CATCH	Catch composition	More marketable catch will mean more profit. A higher proportion of non-marketable catch will likely reduce the proportion of marketable catch and increase on-board handling and sorting time by the crew, reducing overall profits.
	Size grade of catch	Larger size grades are typically worth more per kg. ⁹
	Quality of catch	Catch that is damaged during fishing typically has a lower market value than undamaged catch.
FISHING	Season	Season can influence the economic variability of gear trials for two main reasons: 1) the average sea-state during different seasons will affect both fuel consumption and fishing efficiency of the vessel and 2) the probable abundance, size structure and size composition of stocks vary seasonally based on the biological cycles of fish.
	Location	The choice of fishing grounds determines many factors related to the economics of a fishing trip. Fishing in low stock areas or on difficult bottom types will reduce the profitability and effectiveness of fishing operations. Choosing to fish at sites a long way from home or landing port will increase fuel costs and time spent steaming, thereby impacting the economics of a fishing trip.
	Time spent steaming versus time spent fishing	A higher proportion of time spent steaming means more fuel costs per haul and an increased likelihood of reduced overall profits.
	Number of gear deployments	More gear deployments (e.g. hauls for towed gear or number of pots, nets or traps for static gears) generally increases the probability of increased catches. If gear is used more per fishing trip length, then the profitability of a trip could be higher.
CREW	Skipper experience	More experienced skippers will be more versed in handling gear and knowing where to fish, which should increase the effectiveness of fishing operations.
	Crew experience	More experienced crew should work more efficiently, increase effective fishing time and reduce damage to catch, helping to increase overall profits.
	Crew costs	Crew cost can vary across vessels and depends on how crew are paid (salary or crew share), impacting fishing costs and overall vessel profit.

⁹ Sjöberg, E. Pricing on the Fish Market—Does Size Matter? MARE 30, 277–296 (2015).

2.1 Data Collection

It is important for the trial supervisor to plan ahead and make sure that the necessary information for the financial assessment is collected before, during and after the gear trial. Table 3 provides a general data collection timeframe.

Table 3. Financial assessment data collection timeframe.

When to collect and /or record data	What data to collect
Before departure	Fuel price per litre, vessel identification, vessel length, engine power, gear type, gear modification, list of top target species, trial goals
During the trip	Catch composition (weight of each species and fish size grade of catch)
After landing	Sales value of catch (either actual or estimated) by species and fish size grade, estimated amount of fuel used (litres), crew share, fixed crew wages, other estimated fishing costs (e.g. ice, bait), number of valid gear deployments, overall time spent fishing, average fishing distance, average fishing speed, average depth of gear use, date of departure, date of landing, port of departure, port of landing, fishing grounds, sea state, bottom type

2.2 Data Entry

It is important to consider as many of the factors that could impact the costs, revenues and characteristics of the trial as possible in the financial assessment of the trial gear. The more information that is included in the assessment, the more accurate and comparable the results are likely to be.

2.2.1 Costs

Fishing costs could increase or decrease depending on the operation of the gear itself and the catch profile from fishing with the trial gear. For example, if the trial gear catches more fish overall, more ice and boxes may be needed to store the fish, increasing fishing costs. Fishing costs to consider include, but are not limited to:

- ✓ Fuel
- ✓ Crew share
- ✓ Quota leasing
- ✓ Ice
- ✓ Bait
- ✓ Boxes

If a vessel has a fuel flow metre, the average fuel flow per hour multiplied by the number of hours spent towing will return the amount of fuel used for towing. If a fuel flow metre is not installed on-board it will be difficult for vessel operators to distinguish between fuel used for towing and fuel used for steaming. Without a fuel flow metre the best way to estimate fuel use is by calculating the difference between the total amount of fuel in the tank before and after the trip, which will return total fuel used for both steaming and towing, as opposed to just towing.

It is also difficult to estimate fuel use per hour of towing if both trial gear and existing gear are towed at the same time. Under these conditions, it may not be possible to estimate the difference in fuel use between the two gears during a gear trial. If this is the case, estimates of fuel use should be made based on expectations of the fuel use that arise from detailed discussions with net makers or gear technicians, until actual fuel consumption data can be included in the financial assessment.

2.2.2 Revenue

Fishing revenues could be higher or lower with trial gear compared to existing gear, depending on the catch composition (species and fish size grade) from the gear, the method of sale and the market value. Gear modification can impact prices achieved at market by changing the catch composition and the quality of catch. If a gear modification increases catch quality, fish size or the amount of valuable species caught, fishing revenues may increase. If revenues increase as a result of gear modifications, crew share, crew retention and the standard of on-board handling could also increase, further increasing the value of catch.

The financial assessment should include information about:

- ✓ Which species were caught
- ✓ The amount of catch by species and fish size grade
- ✓ The average market price or total sales value of each species and fish size grade
- ✓ The overall quality of the catch

For fish sold at market, the ideal situation for comparing revenues from trial gear to revenues from existing gear is to keep fish caught by each gear separate on board and to sell it all at the same market on the same day. In this way, all external factors will be constant for the sales of trial gear landings and existing gear landings. If fish from both gears are not sold in this way and there are differences in external factors affecting price between the two sales, it is necessary to make some adjustments to account for those potential sources of difference in price. If there are no observable differences in fish quality, then it would be acceptable to use average prices per species per size grade to estimate overall fishing income from a trip.

2.2.2.1 Species

The names of species recorded for the financial assessment should be standardised to make results comparable across trials and vessels. It is advised that trial supervisors record species by the names listed on the sales slip, to ensure compatibility with sales price data.

2.2.2.2 Fish Size Grade

The number of fish size grades varies depending on the species. Based on EU market regulations¹⁰ there are a maximum of five official fish size grades for each species.

The fish size grades of each species caught should be recorded in the financial assessment to allow for comparisons between catches from different hauls and gears. The fish size grade can also

¹⁰ European Commission (EC), 1996. Regulation (EC) No 2406/96 of 26 November 1996 laying down common marketing standards for certain fishery products, Brussels. Available at: <http://eurlex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A31996R2406>.

provide useful information for fisheries biologists and ecologists as it can be converted to total length measures of catch and length-weight relationships.¹¹

2.2.2.3 Sales Value

Quantifying differences in the value of the catch from trial gear and from existing gear can be challenging and labour intensive if there is a diverse catch. Trial supervisors can record price data either at the time of catch or at the time of sale. It may be easier for the trial supervisor to estimate the value of catch prior to the sale based on average market prices rather than waiting to record the actual sales value; however, this estimation will reduce the accuracy of the financial assessment results. Waiting to record the actual sales value requires follow up action by the trial supervisor and may take more time; however, it will likely yield more accurate financial assessment results.

Trial supervisors should take into account a number of other considerations when entering sales data. If a portion of the catch is not marketable, the trial supervisor should assign it a sales value of £0. If a vessel operator splits the catch of one fishing trip between different markets then the trial supervisor should make note of this in their financial assessment worksheet and ensure that the sales of all catch is accounted for. If catch is landed outside of the UK and sold in a different currency, the trial supervisor should assume that all values are in the foreign currency and make note of the foreign currency of sale in their financial assessment.

2.2.2.4 Catch Quality

Along with the species and the fish size grade of catch, sales prices can be affected by the quality of catch. If a gear modification increases catch quality, sales values may increase, as higher quality catch generally lasts longer and achieves a higher sales value.

Trial supervisors should consider a qualitative assessment of catch quality from the trial gear in the financial assessment, as catch quality is a useful indicator of the effectiveness of the gear. If a new gear modification selects only target catch of the best size grade, it may still not be economically viable if the fish are damaged and achieve a low sales price at market.

2.2.3 Trial Details

Trial details, including vessel length, gear type, fishing grounds and sea state are important to consider in the financial assessment of a gear modification because they can impact the effectiveness of the gear. For example, sea state can affect both fuel use and fishing efficiency of the vessel, which can impact the financial effectiveness of the gear. Tables 2 and 5 include trial profile variables that could be considered in a financial assessment.

2.3 Short-term versus Long-term Data Collection and Evaluation

The time scale over which data are collected is an important consideration in the financial assessment of gear trials. Estimating the financial consequences of gear modifications involves a trade-off between the speed of getting results and the certainty of the results (Table 4).

¹¹ Bedford, B. C., Woolner, L. E. & Jones, B. W. Length-Weight relationships for commercial fish species and conversion factors for various presentations. MAFF Direct Fisheries research 1–41 (1986).

Table 4. Potential trade-offs when comparing gear use over different timescales.

Time Scale	Comparisons made between...	Replication	Ease of standardisation	Uncertainty associated with results	Likelihood of variability
Short-term (snap-shot)	Gear deployments (e.g. gear changes within the same day)	Low	High	High	Low
Medium-term	Trial periods (e.g. a one week gear trial)	Medium	Medium	Medium	Medium
Long-term	Multiple trial periods (e.g. five individual one week gear trials)	High	Low	Low	High

The more a gear is tested under standardised conditions, the more confident a trial supervisor can be in their conclusions when comparing gear types; however, understanding the consequences of gear modifications over longer time scales under more variable conditions is also important to consider as vessels come under the EU's landing obligation. Trial supervisors can begin to get an idea of whether a gear modification is more or less profitable than a standard gear as soon as they see the catch from gear deployments. Running and completing gear trials within short time frames, however, runs the risk of producing highly uncertain results, as the short time frame may not be representative of "normal" fishing over a more realistic, longer time scale. If the change is substantial in the short-term however, it may be enough for a vessel owner to decide to start using and further refining the set-up of the trialed gear. On the other hand, trial supervisors may gain a more realistic, though less standardised, understanding of the financial effectiveness of a gear modification if more trials are run with the same gear in different conditions over longer time scales (e.g. fishing at different times of year or on different fishing grounds).

Quota requirements and leasing costs are additional considerations affecting the long-term (months to years) financial implications of using different gears or gear modifications. If comparisons between different fishing gears are made over short time scales, quota requirements may not be a necessary consideration when evaluating costs versus profits. Over longer time scales, however, quota considerations will become important as some quotas might be used up sooner with trial gear than with existing gear, particularly in mixed-species fisheries where 'choke' situations may occur.¹² Evaluations over longer time scales also mean that issues of gear wear and maintenance are important in the financial evaluation of gear use.

¹² Baudron, A. R. & Fernandes, P. G. Adverse consequences of stock recovery: European hake, a new 'choke' species under a discard ban? *Fish and Fisheries* 16, 563–575 (2014).

3. Data Sharing

Sharing information on gear designs and modifications and on the financial performance of different gears could help reduce uncertainty for other vessel operators looking to trial new selective gears aboard their vessels. Efforts are being made to help fishermen, net makers and fisheries managers find practical ways to reduce bycatch in commercial fisheries through data sharing initiatives. The [GearingUp](#) project, which was launched in November 2017, for example aims to bring together data from science and industry-led gear trials and make it available to fishermen searching for guidance on how to adapt their own fishing practises to reduce unwanted catches and eliminate discards.

Sharing financial assessments of new gear or gear modifications could also help the fishing industry as well as scientists and managers better understand how gear modifications might affect the profitability of fishing operations. Understanding whether a gear change is more economically viable for a vessel operator than a standard gear could put the fisheries sector in a better position to voice their own concerns relating to any new management proposals or decisions that do not appear to align with the economic needs of the industry.

There are numerous benefits of open communication between those involved with gear technology development, gear trials and the integration of new gears into management and legislation:

1. Increased communication on the economic evaluation of gear trials will help increase momentum towards funding and support from management and government sectors through initiatives such as the Gear Innovation and Technology Advisory Group (GITAG).
2. Increased communication between vessel operators trialling gears may help reduce costs of future gear trials, particularly if data are widely shared, reducing the need for the repetition of gear trials.
3. If gear modifications are found to be financially effective, the uptake of selective fishing gear over time may increase, improving the health of fish stocks while supporting the compliance of the fishing industry under the landing obligation.
4. Information gathered and reported from gear trials could highlight the environmental benefits of more selective gear. This information could help advocate for greater support of gear trials and, where appropriate, encourage policy makers to find ways to share information about effective technologies with the rest of the industry.
5. Evidence gathered through the voluntary submission of catch data from gear trials could feed into bio-economic models of fisheries to help assess their future economic and environmental outcomes.
6. Regular feedback on gear use to fisheries managers and policy-makers could lead to increased responsiveness and flexibility in policy adaptations. More communication and collaboration between government and industry could help lead to policy implementation which is designed, evaluated and supported by all.

4. The Financial Assessment Spreadsheet

Seafish has developed a *Financial Assessment Spreadsheet* for trial supervisors to use alongside this *Best Practice Guidance*. The *Financial Assessment Spreadsheet* provides a straightforward, standardised way for trial supervisors to collect, analyse and compare gear trial results and assess the financial effectiveness of fishing modifications (gears and tactics).

The Excel spreadsheet calculates trip-level fishing revenue based on catch composition and market prices, and considers fishing costs, such as fuel and crew costs, when calculating crew share and vessel share. The spreadsheet generates a trip-level financial assessment of the standard and trial gears, which can be compared across trials and scaled up by the user to estimate longer term financial impacts of gear modifications, such as annual financial gains or losses from using modified gear. Though the first iteration of the *Financial Assessment Spreadsheet* is designed for towed gears only, it can easily be modified¹³ to suit any fishing methods or gears. The Excel spreadsheet can be downloaded [here](#).

4.1 Using the Excel Spreadsheet

The *Financial Assessment Spreadsheet* is designed for trip-level data. Catch data from each haul should be entered into a separate haul sheet. If two gears are towed at the same time, catch and revenue data from each gear should be recorded separately if possible. Even if catch from different gears must be combined before sale, vessel operators are encouraged to record the species and size composition of catches from each gear separately before catches are combined for sale.

Twenty individual haul sheets are provided in the Excel spreadsheet along with a *Trip Summary* sheet which pulls together key summary calculations from the trip. If more than 20 haul sheets are needed, users can copy the Excel spreadsheet within the same Excel document or start a whole new Excel document for the additional gear trial data.

The Excel spreadsheet is split into five main sections:

- ✓ **Trip Profile:** basic information about the vessel, fishing gear and the gear trial;
- ✓ **Catch Profiles:** breakdown of the quantity of catch from each haul by species and fish size grade;
- ✓ **Revenue Profiles:** total sales value by species and fish size grade for marketable catch from the standard gear and for marketable catch from the trial gear;
- ✓ **Cost Profile:** estimated trip expenses for the standard gear and the trial gear;
- ✓ **Trip Summary:** financial assessment of the standard gear and trial gear based on the *Cost and Revenue Profiles*, catch assessment for the standard gear and trial gear based on the *Catch Profiles*, and an overall trip assessment of the gear and gear trial.

To minimise variability and issues of comparability between gear trials, the spreadsheet includes drop-down list options, where appropriate, to help standardise inputs. For example, the spreadsheet has been designed with a dropdown menu of a list of species commonly caught within UK waters to help standardise the user's inputs. In situations where a list of possible options is not practical, open data cells are provided but units for entry are advised in parentheses (e.g. Engine power (kW)).

¹³ If users require advice or assistance on how to adapt the Excel spreadsheet to assess a specific gear type or how to account for cost variables outside the scope of the current spreadsheet, please contact Seafish at geartrialeconomics@seafish.co.uk.

Should a user be unable to fill a cell with the required data or units, it is advised that the user input as much detail as possible to facilitate the possible integration of results into larger databases for the comparison of gear types or gear modifications.

4.1.1 The Trip Profile

The *Trip Profile* section should be completed to provide information about the vessel, gear type, trial objectives, gear operation, time and location of the trip and fishing conditions at the time of the trip. This information is useful to the user when comparing trial results across vessels, gears, and trips undertaken at different times of year, in different fishing locations, and under different fishing conditions. Some of the *Trip Profile* data, such as “Top target species”, should be collected before the start of the trip and some data, such as “Average tow distance”, won’t be possible to collect until the trip is underway, or after the trip is over. Users can refer to Tables 3 and 5 for further information about when to collect the *Trip Profile* data and the details requested in the *Trip Profile* section.

Table 5. Descriptions of each variable in the *Trip Profile* section of the *Financial Assessment Spreadsheet*. The colour of the section corresponds to the sub-section of the *Trip Profile* in the Excel spreadsheet. The most important variables are marked with an asterisk.

Variable	Instructions	Description	Relevance
Vessel Information			
Vessel ID (name and PLN)	Enter the name and PLN of the vessel in the trial	Name of vessel and port letter and number (PLN) as shown on vessel	Vessel identification allows for comparison of vessel performance across trials and provides a history of which vessels have trialled which gears
Fleet Segment	Select from the list of Seafish fleet segments provided; see “Seafish Fleet Segments” sheet for segmentation criteria	Seafish fleet segments are based on fishing location, vessel length, engine power, fishing gear and main species landed	Allows for data standardisation and comparability against existing Seafish datasets
Vessel Length (m)	Enter vessel length	Overall length of the vessel	Vessel length will often influence the size of gear trialled
Engine Power (kW)	Enter the power of the main engine of the vessel trialling the gear	If necessary to convert from horsepower, use 1hp = 0.7457 kW	Larger engine sizes will use more fuel but also make it easier to handle larger gears and easier to handle gears over difficult sea bottom-types
Gear Information			
Gear Type*	Select from list provided – if the gear is not in the list, please provide the name of the gear in the yellow cell below	The list of gear types provided is adapted from the full list of gear types in the Seafish gear database – these gears are specific to the UK fleet	Gear type is critical to compare vessel performance across gears and trials
Further Gear Description	Provide more details about the gear being used	This could include any additional details related to the gear being used, for example headline height or length, mesh size, trawl door weight etc. Anything deemed relevant by the user is useful	Further refines information about the specifics of the gear being trialled
Gear Modification*	Select from list provided – if the gear modification is not in the list, please provide the name of the modification in the yellow cell below	Gear modification refers to both full gear switches and alterations to standard gear; the list provided is adapted from the list of selectivity devices in the Seafish gear database	Gear modification information is critical to compare vessel performance across gears and trials
Further Description of Gear Modification	Provide more details about the gear modification being trialled	More detailed information about the gear modification being trialled (e.g. size and placement of square mesh panels, escape panels etc.), its stage of development and any other information deemed relevant by the user	Any additional information about the gear modification is helpful when comparing financial assessment results across gear trials

Best Practice Guidance for Assessing the Financial Effectiveness of Fishing Gear: Scientist-led Trials

Variable	Instructions	Description	Relevance
Trial Objectives			
Top 3 Target Species	List the top 3 target species for the trip	Name the top target species before fishing operation begins (e.g. do not only record what was actually caught)	This information provides context for the trial, an idea of the goals of the vessel owner in conducting the trial and some criteria for the success of the gear trial
Goals of Trial	Select all general “goals” that apply; describe any other goals for the trial that are not listed in the specified cell below	These goals are the major objectives for each gear trial (e.g. reduce bycatch of undersize species)	Provides context of the purpose of the trial, the goals of the vessel owner in conducting the trial and some criteria against which the “success” of the gear can be measured
Further Description of Trial Objectives	Provide more detailed information about the objectives of the gear trial	Secondary objectives of the trial or additional information related to the objectives of the trial	Gives more information about the purpose of the trial
Gear Operation			
Number of Valid Hauls (#)*	Enter the number of hauls that are classed as successful; do not include any unsuccessful deployments	A haul could be considered unsuccessful if the gear gets tangled or does not deploy properly, etc. - any unsuccessful hauls and potential reasons why they were considered “unsuccessful” should be noted in the trial assessment section of the <i>Trip Summary</i> sheet	This can be used to estimate the fishing effectiveness per haul
Overall Towing Time During Trip (hours)*	Enter the total time spent towing during the trip	This is the time that gear is actively fishing during a fishing trip and therefore does NOT include steaming time to and from fishing grounds	Overall towing time can be used to estimate the average revenue per hour of active fishing (£/hour)
Average Tow Distance (km)*	Enter an estimate of average distance towed per haul	The average distance towed per haul	Average tow distance can be used to estimate the average fishing effectiveness over the average distance towed
Average Tow Speed (knots)	Enter an estimate of the average speed whilst towing gear (actively fishing) during the trip	The average speed whilst towing	Average tow speed can be used to estimate distance if the overall fishing time during a trip is known and can then be used to calculate the average revenue per km of towed distance
Average Tow Depth (m)	Enter an estimate of the average depth at which gear is towed	The average tow depth; ideally standard and trial gears will be used in similar areas during each trip and this value will be the same for both standard and trial gears for each trip	Average tow depth can provide additional information that may be useful in evaluating the overall economic performance of fishing gear (for example, if a trial gear is used more effectively in shallower water than the standard gear, it will likely have a shorter deployment and retrieval time which may affect other variables (e.g. fuel usage, number of gear deployments) during the trial)

Best Practice Guidance for Assessing the Financial Effectiveness of Fishing Gear: Scientist-led Trials

Variable	Instructions	Description	Relevance
Spatial and Temporal Information (When and Where)			
Start Date of Trip (dd/mm/yyyy)	The date of departure on the fishing trip	Make sure the date is entered in the correct format (day/month/year) e.g. (21/04/2017)	The average sea state during different seasons will affect both the fuel and fishing efficiency of the vessel; the probable abundance, size structure and size composition of stocks in the area being fish are also likely to vary seasonally
End Date of Trip (dd/mm/yyyy)	The date of landing catch from the fishing trip	Make sure the date is entered in the correct format (day/month/year) e.g. (21/04/2017)	The length of the trip impacts fuel consumption, quantity and freshness of catch and can be used to estimate the fishing effectiveness over the length of the trip
Port of Departure	Enter name of place of departure	Use the full geographic name of the location (e.g. Peterhead, Scotland)	Distance to fishing grounds impacts steaming time and fuel consumption
Port of Landing	Enter name of place of landing catch	Use the full geographic name of the location (e.g. Peterhead, Scotland)	Distance back to shore from fishing grounds impacts steaming time and fuel consumption
ICES Area	Select the ICES area from the list provided where the majority of fishing activities took place	If fishing in more than one ICES area, list secondary ICES areas in the yellow cell below; see the ICES Map provided for reference in the Excel spreadsheet and in Appendix 2 of this document	Different fishing areas support different marine ecosystems which impacts species abundance and catch composition
Common Name of Fishing Grounds	Provide the common name(s) of the fishing grounds where fishing activities took place, if applicable	This name may be different between sectors or fishermen; please provide the most common or frequently used name for the fishing grounds (e.g. Dogger Bank)	The common name of fishing grounds provides additional information that may be useful in the assessment of the gear trial, particularly if gear trials are undertaken in different fishing grounds within the same ICES area, as species compositions on these grounds may be different
Fishing Conditions			
Average Sea State	Enter the number of days during the trip spent activity fishing (e.g. not including days spent steaming) with calm, moderate and rough sea conditions respectively	The sea state classifications (smooth-slightly wavy, moderate-choppy, very rough) are based on wind speed and wave height and were loosely informed by the Met office sea state classification system	The sea state affects both fuel consumption and fishing efficiency of the vessel
Bottom Type	Select the primary bottom type where the fishing activity took place – if not listed, add a description in the yellow cell below	The listed options are the broadest, standard sea bottom habitat classifications used in marine science	The bottom type can have an impact on gear efficiency (for bottom gears) and influence fuel consumption during the trial; fishing on difficult bottom types will reduce the effectiveness of fishing operations

4.1.2 The Catch Profile

The user should enter catch data from each haul into the *Catch Profile* section of a separate haul sheet. More species can be added to the *Catch Profiles* by clicking the “+ ADD Species” button to the right of the *Catch Profile* table. In the haul summary, the total amount of marketable and non-marketable catch is automatically calculated for each haul. All information in this section of the Excel spreadsheet is critical to calculations in the *Trip Summary* at the end of the Excel spreadsheet.

Step 1: Select whether the gear used for the haul was “standard” or “trial” gear.

Step 2: Select the species name from the drop-down list provided. The species list includes species commonly caught by the UK fleet. If a species does not appear on the list, please enter the name of the species in the yellow cell below marked “if other species*, please specify”.

Step 3: Enter the total quantity (kg) of each size grade of the species that is marketable and the total quantity (kg) of each size grade of the species that is non-marketable. Marketable catch refers to any catch that can be sold and includes both target species and marketable bycatch. Non-marketable catch refers to catch that has no market value and may include damaged catch, catch that is discarded (non-quota species) or catch that would have been discarded prior to the landing obligation (quota species). Fish size grades are based on official EU regulation¹⁴ as recorded on the market and have been limited to five categories in the *Financial Assessment Spreadsheet*.

Step 4: If more than one species is caught in the haul, users can click the “+ADD Species” button to add another set of rows. Steps 2-4 should be repeated until all the species caught in the haul have been recorded. Total catch quantity (kg) is automatically calculated at the bottom of the *Catch Profile* table for each haul.

4.1.3 The Revenue Profiles

The user should enter the total sales value (£) of all marketable catch by species and fish size grade. If possible, catch from the standard gear and trial gear should be stored, sold and recorded separately in the “Standard Gear Revenues” sheet and the “Trial Gear Revenues” sheet. If catches cannot be kept separate, total sales values for combined catches can be recorded in either the “Standard Gear Revenues” sheet or the “Trial Gear Revenues” sheet; however, in this case, it will be harder to compare the financial effectiveness of the standard gear and the trial gear.

Sales values can either be estimated by the user before sale, based on their knowledge of the market, or can be the actual sales values that are achieved at market following the fishing trip. If recording actual sales values, the *Revenue Profiles* cannot be completed until the vessel owner has received the sales details from the trip. If catch is landed outside the UK and sold in a different currency, users should assume that all values are in the foreign currency and add a note of the currency in the space for “additional comments” in the *Trip Summary* sheet. Users should note that all non-marketable catch, by definition, has a sales value of £0 and all “undersize” catch is considered non-marketable. Total sales values of catch (£) are automatically calculated at the

¹⁴ European Commission (EC), 1996. Regulation (EC) No 2406/96 of 26 November 1996 laying down common marketing standards for certain fishery products, Brussels. Available at: <http://eurlex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A31996R2406>.

bottom of the *Revenue Profile* tables. All information in this section of the *Financial Assessment Spreadsheet* is critical to calculations in the *Trip Summary* at the end of the spreadsheet.

4.1.4 The Cost Profile

The trip expenses for the standard gear and trial gear should be estimated separately, including the cost of fuel, crew, quota leasing, ice and boxes. Total fuel cost (£) is automatically calculated based on the amount of fuel used (assuming the same price per litre for standard and trial gear).

The total estimated trip expenses for each gear are automatically calculated at the bottom of the *Cost Profile* table. All information in this section of the *Financial Assessment Spreadsheet* is critical to calculations in the *Trip Summary* at the end of the Excel spreadsheet.

4.1.5 Trip Summary and Excel Spreadsheet Outputs

The overall trip assessment section of the *Trip Summary* sheet should be completed by providing a qualitative assessment of the catch quality from the trial gear and the overall performance of the trial gear, as well as any additional thoughts on the gear trial overall. The qualitative assessment of catch quality from the gear trial is included as a subjective indicator of the effectiveness of the gear. Comments provided by the user about the success of the gear are important as they may capture information that has not otherwise been accounted for in the financial assessment of the gear. The additional comments section may be useful to long-term users of the worksheet as a reminder of the details of past trials that may otherwise be forgotten.

At the top of the *Trip Summary* sheet, the Excel spreadsheet produces a financial assessment of the trip, considering fishing income from target catch and marketable bycatch and estimated fishing expenses for both the standard and the trial gear. The financial assessment provides crew share and vessel share estimates from the trip. The spreadsheet also summarises the amount of marketable and non-marketable catch from the standard gear and trial gear for comparison.

Users can provide feedback on the *Financial Assessment Spreadsheet* at the bottom of the *Trip Summary* sheet. The comments provided in the feedback section will help improve future editions of this resource.

4.2 Sharing Results

The Seafish team welcomes feedback regarding this *Best Practice Guidance* and *Financial Assessment Spreadsheet* and will make suitable updates to both documents in later revised versions. Completed *Financial Assessment Spreadsheets* can be shared confidentially with the Seafish economics team to help inform other users and stakeholders. Shared data may be used anonymously for Seafish reports and in fisheries economics working groups in the UK and Europe. No individual vessel will be identified in any report and no vessel-level information will be supplied to third parties. Please contact Seafish with comments, queries and completed *Financial Assessment Spreadsheets* at geartrialeconomics@seafish.co.uk.

Appendix 1.

List of attendees at the UKFEN workshop “Methods to capture the economic and financial implications of experimental fishing gear” held in Edinburgh (May 4, 2017).

First name	Surname	Affiliation, company, organisation
Daragh	Browne	BIM
James	Buchan	Scottish Seafood Association
Stephen	Buchan	Jackson Trawls
Dr. Giulia	Cambie	Centre for Environment Fisheries and Aquaculture Science (CEFAS)
Richard	Caslake	Seafish
John	Coppock	Gannet Scientific Services Ltd
Hazel	Curtis	Seafish
Darren	Edwards	Brixham Trawl Makers Ltd
Martin	Esseen	Fisheries Consultant
Prof. Michel	Kaiser	Bangor University
Ian	Kinsey	Independent Skipper
Dr. Stephen	Mangi	Centre for Environment Fisheries and Aquaculture Science (CEFAS)
Mike	Montgomerie	Seafish
Malcolm	Morrison	Scottish Fishermen's Federation & GITAG
Jennifer	Mouat	The Aegir Consultancy & GITAG
Dr F.G. Barry	O'Neill	Marine Scotland Science
Alex	Olsen	Espersen
Jim	Portus	South Western Fish Producers Organisation (SWFPO)
Dale	Rodmell	National Federation of Fishermen's Organisations (NFFO)
Dr. Lillian	Sanderman	Marine Management Organisation (MMO)
Robert	Stevenson	Lunar FPO
Dan	Watson	SafetyNet Technologies Ltd

Appendix 2.

Map of ICES fishing areas in UK and adjacent waters. More detailed spatial information can be found [here](#).

