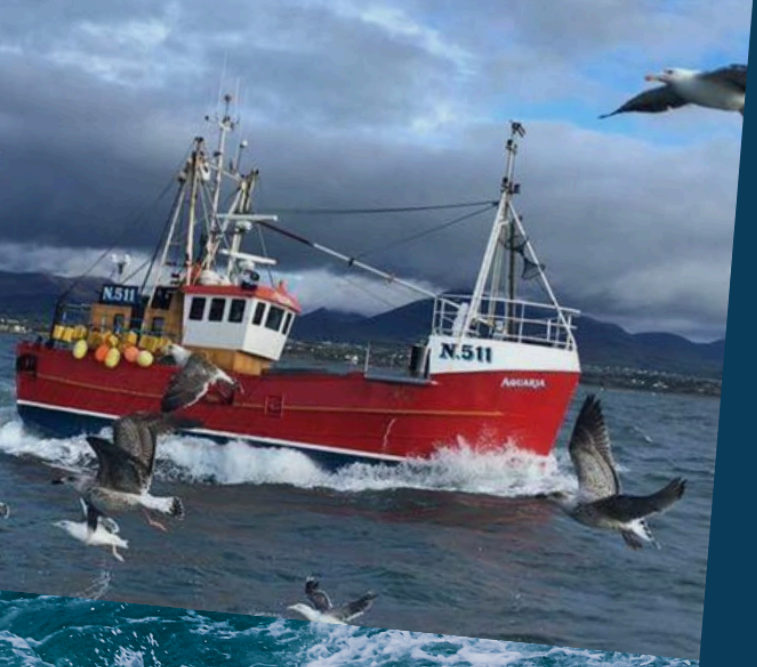

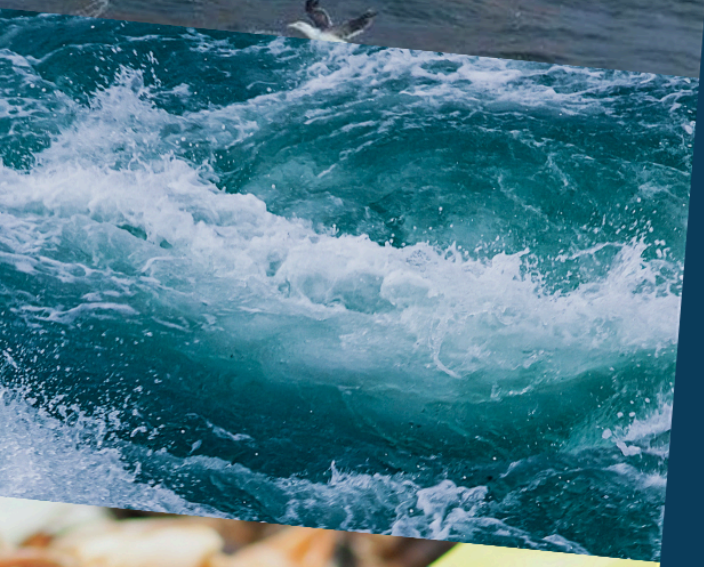

A Cost-Benefit Analysis of the Nephrops Stun and Tail Machine

Summary Report

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Published by: Fisheries Innovation & Sustainability (FIS)

This report is available at: https://www.fisorg.uk

Suggested Citation:

Title: A Cost-Benefit Analysis of the Nephrops Stun and Tail Machine – Summary Report

First published: 2026

Fisheries Innovation & Sustainability

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Summary Report

Executive Summary

Fisheries Innovation & Sustainability (FIS) recently commissioned independent fisheries economists to evaluate the potential financial and operational benefits for fishing businesses adopting the Nephrops Stun and Tail system. The assessment compared the balance between anticipated economic gains, including reduced crew requirements and increased catch efficiency through more efficient use of available labour, against the costs associated with purchasing and fitting the system. The likely investment payback period was also calculated.

While some uncertainties remain regarding the final purchase costs of the system, estimates indicate that total costs, including fitting, are likely to range between approximately £126,000 and £284,000, depending on the number of tailing lanes required. Based on this, the analysis indicates that for Irish Sea and West of Scotland vessels targeting Nephrops, investment in the system could be recouped in approximately three years. For North Sea vessels landing a more mixed catch composition, including significant non-Nephrops species, the projected financial gains from labour savings and increased catch efficiency are expected to be more limited. However, the study highlights that the technology would still deliver important wider benefits, particularly in relation to improved onboard working conditions and enhanced animal welfare outcomes.

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Purpose

This study provides an economic analysis of a novel automated Nephrops stunning and tailing machine for use on vessels, at sea. It has been funded through Fisheries Innovation & Sustainability (FIS) as part of a project that has brought together UK fisheries producer organisations, processors and retailers together with the Norwegian manufacturer of automated fish processing systems, Optimar.

Background

Approach

To better understand the economics of the UK's Nephrops fisheries and provide a cost-benefit analysis of automated stunning and tailing, a series of confidential, one-to-one stakeholder discussions were held with fishers, fisheries producer organisations, processors and others involved in the development of the automated system. Alongside these discussions, data was drawn from the UK Sea Fisheries Annual Statistics Report, which provides a dataset of UK landings by rectangle, stock, port and EEZ, as well as from the Seafish Multi Annual UK Fishing Fleet Estimates which for 2024 data are preliminary and are based on 2023 accounts and 2024 activity data received from the Marine Management Organisation (MMO).

Tailing Nephrops

The UK trawled Nephrops fishery produces two distinct products, based mostly on the size of the Nephrops that are landed onto vessels. Larger Nephrops are kept whole and are sold as langoustine, both within the UK and within a considerable export market. Smaller Nephrops (although above the minimum size) are tailed, the head and thorax are discarded, and the tails are sold as scampi, mostly to the UK market. Tailing has, to date, been done by hand using a twisting motion, with a skilled operator tailing as many as 42 animals per minute.

Automated stunning and tailing

Automated stunning and tailing first of all stuns Nephrops using an electric current, allowing for automated tailing to take place using a twisting process similar to that used in manual tailing. Stunning is necessary in order for tailing to be automated but it also has other advantages in relation to the welfare of Nephrops through the tailing process. Although the stunning and tailing elements of the process can be automated, there is still

some requirement for manual sorting e.g. to remove Nephrops that are either too large or too small and non-Nephrops species.

Market drivers

There are three distinct market drivers that could lead to the uptake of automated stunning and tailing of Nephrops. The first of these relates to crew availability and affordability, the second to the welfare of decapod crustaceans, and the third to product quality. Crew availability and affordability have a direct bearing on the economics of the fleet; the welfare of decapod crustaceans creates certain challenges but also opportunities for product differentiation; and where improving product quality benefits processors it should be hoped that this would also lead to more sustainable returns to the fleet.

Crew availability and affordability

The UK's >12m Nephrops trawling fleet is dependent to a large extent on migrant labour. Fisheries targeting Nephrops require manual labour to sort and tail their catches. As primary producers these fisheries are very often price-takers rather than price-makers, and with relatively low prices paid for tailed Nephrops this in turn has limited the opportunities to increase the remuneration of crew. These economic conditions have created a significant challenge to recruitment from the domestic labour force. To address this challenge, fishing businesses have recruited from overseas, targeting countries in which the remuneration from a UK fishing vessel is comparatively high.

Migrant labour working on UK vessels and in UK waters requires either a Transit visa or a Skilled Worker visa. A Transit visa only provides for crew to come through the UK to join a fishing vessel; it does not allow for those crew to participate in fishing activities whilst they are within the territory, i.e. when they are on land or within the UK's territorial waters, which extend 12 nautical miles from the coast. Off the west coast of Scotland, for example, the UK territorial waters extend to 12 nm west of the Outer Hebrides. By definition, crew employed on a Transit visa cannot work on board a fishing vessel (other than work that is in line with their role aboard the vessel and incidental to their employment) either on the quayside or whilst steaming through territorial waters to or from a fishing ground. Whilst there is no set wage for workers on a Transit visa, crew are thought to be paid an average of £18,000 per year (plus a bonus) and vessel owners are subject to the requirements of ILO c188.[1]

[1] https://www.gov.uk/government/collections/ilo-work-in-fishing-convention

The alternative to a Transit visa has been the Skilled Worker visa, which was first introduced in 2023. Fishing has to date been eligible for a Skilled Worker visa[2] and included on the immigration salary list.[3] A Skilled Worker visa allows for crew to work on board a fishing vessel anywhere within the UK, including at the quayside and whilst steaming through territorial waters to or from a fishing ground. The immigration salary list also sets the minimum remuneration that a worker must receive and the minimum qualifications and experience they must bring, including the minimal standards of English.

For fishing companies which received the certificate of sponsorship for their first Skilled Worker visa before 4th April 2024, and which have continually held one or more Skilled Worker visas since then, the lower rate for the minimum salary applies, which is £25,000 per year. For all other fishing companies the standard rate for the minimum salary applies, which is £33,400 per year. To these must be added the costs of Employer's National Insurance (15% for earnings above the £5,000 threshold) and the Immigration Skills Charge (£480). As such, the current costs for employing crew on a Skilled Worker visa is either £28,480 or £38,140, depending on when the company first received the certificate of sponsorship. For all migrant labour, whether on Transit visas or a Skilled Worker visa, there may be additional costs incurred by the vessel operator including, inter alia, recruitment fees, travel costs and food and accommodation.

From the end of 2026 fishing will be removed from the schedule of occupations that are eligible for a Skilled Worker visa. Crew that are already employed may be retained, for the time being, at current levels of remuneration; but any new recruitment to the sector will be through the domestic labour force.

Many fishing vessels working in the Nephrops sector have suffered poor economic performance since 2020. Crew costs are a major factor in determining vessel profitability. If automation can reduce the number of crew on a vessel, then this should lead towards improved economic performance. If automation can improve the working conditions on a vessel – both in terms of tasks to be done and hours to be worked – then this could lead to improved recruitment from the domestic labour force.

[2] https://www.gov.uk/government/publications/skilled-worker-visa-eligible-occupations/skilled-worker-visa-eligible-occupations-and-codes

[3] https://www.gov.uk/government/publications/skilled-worker-visa-immigration-salary-list/skilled-worker-visa-immigration-salary-list

The welfare of decapod crustaceans

Subsequent to the Animal Welfare (Sentience) Act 2022,[4] decapod crustaceans have been regarded in law as sentient beings. The seafood sector has responded to this through the development of detailed codes of practice for the welfare of decapod crustaceans,[5] although these omitted tailed-at-sea Nephrops. That decapod crustaceans are regarded in law as sentient does not have an immediate effect on what is regarded as allowable practice. However, it does present the 'risk' to the tailed-at-sea Nephrops sector that laws on the welfare of animals at the time of killing may in due course be made applicable to the operations of these vessels.

In tandem with the change in UK law that recognises Nephrops (as decapod crustaceans) as sentient, UK retailers have come under increasing pressure from animal welfare non-governmental organisations (NGOs) to address crustacean welfare concerns. The Snapshot[6] is an industry benchmark which ranks UK companies on their management and reporting of decapod crustacean welfare. These UK companies include all of the major retailers, together with processors and wholesalers. Looked at positively, these NGO actions present opportunities for product differentiation and an uplift in prices through "higher welfare practices." However, it should also be noted that the higher welfare practices addressed in the Snapshot are not limited to UK production, but rather they cover each of these businesses' global supply chains. These supply chains include competitor products to tailed-at-sea Nephrops, such as farmed warm water prawns, and these farmed products can also be produced using higher welfare practices. There is therefore a risk that UK retailers and processors will preferentially source competitor products on the basis of their higher-welfare attributes.

Protecting and enhancing the market for tailed at sea Nephrops therefore requires that vessels both minimise the impact of any legislative change following on from the Animal Welfare (Sentience) Act 2022, and address the market demands for higher-welfare products. The introduction of electrical stunning as a process-step prior to tailing would meet both of these objectives.

[4] https://www.legislation.gov.uk/ukpga/2022/22/contents

[5] https://www.seafish.org/media/bcnp5v41/codes-of-practice-for-crustaceans-crabs-and-nephrobs-july-2024.pdf

[6] https://www.crustaceancompassion.org/the-snapshot

Product quality

Manual tailing of Nephrops results in a product that can vary from tailer-to-tailer; and that can vary as tailers progress through the hours of their working day. More critically, manual tailing takes time and this is time when Nephrops have been landed onto the vessel but before they are chilled. The more rapidly that Nephrops can be tailed, the more rapidly they can be chilled, and the better the product quality should be. If automation can speed up the process of tailing then it should by default lead to improved product quality.

Cost-Benefit Analysis

This assessment provides a cost-benefit analysis of an automated stunning and tailing machine that has been developed for use in the UK's tailed-at-sea Nephrops fisheries. Contextual data has been gathered through one-to-one discussions with fishers, fish producer organisations, processors and retailers, together with the manufacturer of the automated system. Data has been drawn from the UK Sea Fisheries Annual Statistics Report alongside the Seafish Multi Annual UK Fishing Fleet Estimates.

Estimates of the volumes of Nephrops tailed at sea were made based on the difference in the live weight (i.e. when hauled onto the vessel) and landed weight (i.e. when unloaded from the vessel), assuming a landing weight for 'tails' of 0.3 x liveweight. Average daily catches were multiplied by 0.2 to model a 'poor day's catch' and by 1.8 to model a 'good day's catch'.

Benefits of using the automated stunning and tailing machine were based on savings in crew time, where these could lead to the reduction of a whole person, and on the additional fishing that could be possible in 'peak months' if crew-hours were not a limiting factor.

The costs of purchasing and fitting the automated stunning and tailing machine present a degree of uncertainty. The final purchase price will be a commercial decision based on estimated sales volumes and other factors. However, based on the experience of developing and fitting automated machinery it was possible to provide 'low', 'medium' and 'high' estimates which are thought to cover the range of possible outcomes, together with a fitting price estimated as a proportion of the purchase price.

Separate estimates were made for each of three areas: Area VIIA (the Irish Sea), Area IV (the North Sea) and Area VIA (West of Scotland). Each of these areas differs in (i) the proportion of the catch as a whole that is Nephrops, (ii) the proportion of those Nephrops which are

tailed, (iii) the accessibility of fishing grounds, including grounds that are outside UK territorial waters, and (iv) the underlying cost structure for vessel operations – in particular as these relate to crew costs.

For each of these areas the analyses compared the benefits in terms of crew savings and additional catch against the costs of purchasing and fitting the automated stunning and tailing machine, and a calculation was made for each price point of the time taken to pay back the investment.

Key Findings

In the Irish Sea and the West of Scotland fleets, both of which are predominantly Nephrops fisheries, the automated stunning and tailing machine should provide for a reduction in crew numbers (assuming, of course, that minimum crew numbers for safety and other fishing operations can be maintained). For Area VIIA (Irish Sea) Nephrops the payback time for an average 15-18m vessel was between 1.9 and 2.6 years; and for an 18-24m vessel it was between 2.3 and 3.4 years. For Area VIA (West of Scotland) Nephrops the payback time for an average 15-18m vessel was between 2.9 and 4.0 years; and for an 18-24m vessel it was between 2.7 and 3.7 years. The two key differences between these areas were the average crew costs (per FTE) reported in the Seafish data (West of Scotland reporting figures somewhat lower than the Irish Sea), together with the proportion of the Nephrops catch that is tailed (80% in the Irish Sea fleet vs. 60% in the West of Scotland fleet). For each of these reasons the payback time is longer in the West of Scotland fleet than it is in the Irish Sea fleet.

For Area IV (North Sea) the reduction in crew numbers is marginal – between 0.3 and 0.6 crew members. Whilst the machine would provide benefits in terms of improved crew welfare and animal welfare, it is difficult to see how it could reduce crew numbers in the North Sea fleet. Moreover, these vessels are reliant on a significant proportion of non-Nephrops catch, for which the automated stunning and tailing serves no purpose; and the peak landing months for Nephrops are not thought to create a bottleneck to overall landings in this fleet.

Conclusion

FIS commissioned an independent assessment of the Nephrops Stun and Tail system, which found that based on estimated installation costs of £126,000–£284,000, Irish Sea and West of Scotland vessels could recover the investment within around three years through labour savings and improved catch efficiency. Although financial returns are expected to be

lower for North Sea vessels with more mixed catches, the system is still expected to provide significant benefits through improved onboard working conditions and enhanced animal welfare.

Acknowledgements

The authors are indebted to the contributions of time, knowledge and understanding of the Fisheries Innovation and Sustainability panel and Seafish Economics team.

Whilst this study has benefited from the contributions of many industry experts, the views stated herein are entirely those of the authors.

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