

**NWIFCA Authority meeting**  
**23<sup>rd</sup> of March 2023: 11:00 a.m.**

**Agenda  
Item  
8**

**SCIENCE REPORT FOR INFORMATION**  
**1<sup>ST</sup> OF DECEMBER – 23<sup>RD</sup> OF MARCH 2023**

**Purpose:** To provide an update on the work of the Science Team in the quarter.

**Recommendation:** Report for information, Receive the report

This quarter, the main priorities of the science team have been to complete the FISP project bid, assist with setting up a new returns database, draft a cockle fisheries management plan, organise training, undertake outstanding HRA's and start the mussel MLS work.

**Key achievements since the previous meeting:**

- 1) Completed Fisheries Industry Partnership Scheme proposal and submitted it to Defra
- 2) Drafted a HRA for the Foulney mussel bed fishery
- 3) Completed a first draft of the Cold Weather Protocol
- 4) Carried out the first stage of the mussel MLS study – mapping the extent of smaller mussel
- 5) Completed Byelaw 4 track record appeals review
- 6) Carried out one cockle inspection and four mussel inspections with reports
- 7) Presented our work at Cumbria University
- 8) Seven consultation requests and three dispensation requests provided

**ONGOING WORK STREAM UPDATES:**

**1. POTTING PERMIT BYELAW**

**a) Permit database**

The science team have been working to set up a database for the suitable logging and analysis of returns data. It is now agreed that a new database will be introduced in 2023, science officers will feed into the returns section to improve recording returns and new ways of analysing the data to help management.

**b) Whelk track record appeal**

The final outstanding application for the whelk potting permit has been finalised and will go to the Appeals Panel before the end of March 2023.

**2. COCKLE AND MUSSEL**

**a) Surveys and inspections**

Survey and inspection reports are provided in Annex 1 of this report.

<b>Surveys and inspections this quarter</b>	<b>Date</b>
<b>Mussels</b>	
Foulney mussel check	26-01-23
Mapping of Foulney mussel area	13-02-23
South America inspection	23-02-23
Heysham inspection	24-02-23
<b>Cockles</b>	
Flookburgh 2022 settlement inspection	17-01-23

### ***i) Mussel minimum landing size***

At the Technical Science and Byelaw meeting held on the 1<sup>st</sup> of November, the Authority agreed an approach to investigating the presence of 'stunted' mussel on the Foulney mussel bed and the impacts of reducing MLS in this area – as requested by industry members.

NWIFCA officers went out onto the Foulney mussel bed on the 26<sup>th</sup> of January to identify the area of smaller mussel reported by industry. On the bed, industry members showed officers the area and discussed the issues with pearling and slow growth. The smaller mussel were up the shoreline, with the contour of a 2.5m tide recommended as the line above which the smaller mussel was present. Officers returned on the following 2.5m (13-02-23) tide to map the contour.

Officers will return to carry out a Dutch Wand biomass survey of the area on the 13<sup>th</sup> and 14<sup>th</sup> of March.

### ***ii) South America inspection***

An inspection of South America was completed to assess if any mussel persisted from 2022 and to check the access to the bed after changes in the channels making it harder to access previously. Although tide and conditions were good, access remains limited to a short period over low water due to the depth and size of the channel needing to be crossed to access the bed. The area has received a 2023 mussel settlement across most of the bed. The east of the bed has been colonised by *Sabellaria*. More detail is provided in Annex 1.

### ***iii) Heysham TBC***

There was little mussel persisting from last year as most of the mussel has been washed away and scoured leaving areas of bare cobble and dead shell. There is significant *Sabellaria* extending from Conger Rock to Dallam Dyke though the majority of the reef is dead and has been exposed with the scouring of the mussel and mussel mud that was present at the end of 2022.

### ***ix) Flookburgh cockle inspection***

There have been several industry reports that Flookburgh had received a good 2022 cockle settlement and that the spat was persisting through the winter. Officers inspected Flookburgh and Leven cockle bed and targeted areas which have previously had cockle and areas which looked likely to contain cockle, lower areas and where birds, in particular oystercatchers were feeding.

The 2022 cockle was consistent across a large proportion of the bed, with a density between 30-100 m<sup>2</sup>. Most of the cockle was 15mm in size. There were low densities of size cockle across several of the sites inspected. A full survey will be completed in July to see if a commercial stock develops.

**b) Dee cockle fishery order**

No further update

**c) Cold Weather Protocol**

On the 16<sup>th</sup> of December 2022, the Penfold cockle fishery was temporarily suspended due to a period of severe cold weather.

During periods of severe cold weather, the NWIFCA must assess whether fishing activities taking place within a Special Protection Area (SPA) pose a risk to the designated bird species. This requirement arises from the legal obligation upon the NWIFCA to carry out a Habitats Regulation Assessment (HRA) for activities it regulates and to implement any mitigation measures identified as necessary.

Following the suspension of the Penfold Fishery, officers deemed it important that a cold weather protocol be drafted to set out the criteria that must be met and the steps that NWIFCA will follow. The protocol sets out a definition of severe cold and the threshold that would trigger a suspension, agreed weather stations and criteria for lifting the suspension. The document also details how NWIFCA officers will communicate with Natural England, Industry and Authority Members during such an event. Once finalised, the protocol will be circulated among Members and stakeholders and made available on the NWIFCA website.

**d) Foulney mussel bed TSB Member's visit**

Members of the Technical Science and Byelaw Committee will visit the Foulney mussel bed on the 20<sup>th</sup> of March. The purpose is to give members a first-hand experience of the size of the bed, see the work officers do in surveying and management, and possibly have the opportunity to hear from some of the fishers.

**e) Survey drone procurement**

Progress has been made in identifying a suitable drone for surveying and drone training has been confirmed. An overview document on the drone spec under consideration, and training being undertaken is provided in Annex 3.

**3. NWIFCA RESEARCH PROJECTS**

**a) Fisheries Industry Science Partnership Scheme (FISP)**

The Fisheries Industry Science Partnership (FISP) scheme is a £10 million government fund which seeks to: improve data collection, particularly for data limited species, enhance knowledge of technical measures including fishing gear selectivity, and/or build a better understanding of the ecosystem benefits and environmental impacts of aquaculture. Projects required collaboration between industry members and a research organisation and needed to fulfil a number of criteria such as improving our knowledge of data limited species, produce results that will inform

fisheries management plans, and support fishing opportunities. Members of the fishing industry were also to directly benefit from available funding. There were 4 lots available to apply to, these being: 1) Fisheries data collection, 2) mixed fisheries and selectivity, 3) environmental impacts of aquaculture and 4) other factors impacting fishing (such as offshore construction).

NWIFCA science officers developed a proposal looking at the long-term sustainability of the intertidal shrimp fisheries in the NWIFCA District. This project fell into Lot 1. This project was based on reports from industry members that there has been a long-term decline in both the number and size of shrimp across the District. Shrimp are a data poor species with no stock assessment and little information available other than that provided by industry. The project, therefore, aimed to 1) establish a baseline dataset by conducting trawl surveys carried out by industry members, and 2) identify reasons for decline by undertaking water sampling and micro-cosm experiments in collaboration with Salford University. A summary of our proposal and methodology submitted to the bid is provided in Annex 2.

A total of 5 fishers agreed to take part, one from the Solway, two from Morecambe Bay and two from Southport. The results of the application will be announced before April 2023.

**b) Whelk Fisheries in the North West**

A new sampling schedule for the summer of 2023 has been developed. The aim is to identify the size-at-maturity for whelks in the NWIFCA District. Previous work has not provided a consistent dataset from which to make accurate calculations on the size-at-maturity of whelks. Therefore, a 2023 summer sampling schedule has been developed. The plan is for whelk samples to be provided by fishers once per month from May to September from the main fishing grounds.

Work is currently underway to engage fishers for sample procurement, obtain the relevant dispensations, and contact relevant partner bodies such as cefas who may be interested in contributing to the work. Once a size-at-maturity estimate has been identified, we can assess the appropriateness of the MLS flexible permit conditions. The project aims to be completed by winter 2023.

**4. MARINE PROTECTED AREAS IN THE NWIFCA DISTRICT:**

**a) Highly Protected Marine Areas (HPMAs)**

On the 28<sup>th</sup> of February Defra announced that Allonby Bay had been designated as a HPMa. They also published a summary of their responses to the consultation. Communications regarding the next steps of the process are ongoing with the CEO.

The Science department has been in communication with a student from the University of Bath who has requested our assistance with gathering information on the impacts of HPMa's on local communities. The research looks to identify people's perceptions of HPMa's and gather people opinions on the consultation process. Officers have encouraged local stakeholders to make contact with Charlotte and sent out details of the research work on available media platforms. The results of this work will be shared with NWIFCA at the end of the project.

**b) Marine Natural Capital**

NWIFCA officers have been engaging with local Natural England intertidal surveys in the Solway and Morecambe Bay. The surveys look to gather information on prey availability for protected bird species and will help to contribute to our understanding of bird food requirements. The Senior Scientist attended surveys in the Solway on the 7<sup>th</sup> of March, and officers will assist with further surveys in Morecambe Bay in April. Assisting with surveys provides a good opportunity for partnership working and contributing to the dataset that will be used for future management advice.

## **5. FISHERIES MANAGEMENT**

### **a) Fisheries Management Plans**

The purpose of the fisheries management plans is to define the fisheries, assess and account for their possible socio-economic and environmental effects and give a framework for their sustainable management.

FMPs are required at a national level under the Fisheries Act 2020. Following Brexit, the UK Fisheries Act 2020 placed FMPs as the main tool for reforming UK fisheries management.

The release of FMP's is being conducted in tranches – with the front runners consisting of whelk, scallop, crab and lobster, and bass. NWIFCA officers have had recent engagement through Defra's Shellfish Front runners webinar on the 3<sup>rd</sup> of March, which outlined the details of the forth coming management plans.

### **b) Cockle management plan**

At the TSB meeting on 7<sup>th</sup> of February it was agreed that a first draft of the NWIFCA cockle fisheries management plan should be completed by the following meeting (dated 9<sup>th</sup> of May) to provide a framework for future decision making and management. It is also necessary in the light of the upcoming national FMP's to have a clear framework which we can put forward during the data collection phase.

## **6. MMO MARINE LICENCE AND OTHER CONSULTATIONS FOR THE QUARTER**

### **a) Offshore Wind Leasing Round 4**

No further update

### **b) Mersey Tidal Power Project**

NWIFCA officers have a meeting with consultants on the 27<sup>th</sup> of March to get an update on the project, and provide information necessary to the Impact Assessment.

### **c) Geological Disposal Facility (GDF)**

No further update

### **Consultations this quarter:**

- Jubilee Bridge Painting Works
- Burbo Bank Extension Offshore Windfarm - Maintenance Works
- Cottage Lane SPS Emergency Overflow

- Geotechnical Investigations Mona Offshore Wind Farm - 75 Boreholes
- Conway Bat Native Oyster Restoration
- Mostyn Energy park Extension
- Area 457 EIA Scoping Opinion

**Dispensations this quarter:**

- EDF sampling
- Springfield Fuels Ltd sampling
- Wyre Rivers Trust

**7. WORKING GROUPS AND MEETINGS**

**a) Technical Advisory Group**

The next TAG meeting will be held in April/May.

**c) Whelk Working Group**

NWIFCA attend, and contribute to, the biannual Whelk working group (WWG). The group brings together members of all IFCA's, NE, relevant stakeholders, researchers and government bodies (Welsh government, cefas etc.) from across the UK to share research and current management strategies in order to learn from one another. Next meeting TBC.

**d) Cumbria University**

On the 13<sup>th</sup> of December the SS presented our work in Morecambe Bay to the post-graduate students at Cumbria University as part of their module on marine management.

**8<sup>th</sup> of March 2023**

# Annex 1

## South America Mussel Inspection (Quad) 23-02-23

LW: 07:50 0.8m (Liverpool tides)

An inspection of South America was completed to assess if any mussel persisted from 2022 and to check the access to the bed after changes in the channels making it harder to access. Although tide and conditions were good, access remains limited to a short period over low water due to the depth and size of the channel needing to be crossed to access the bed.

NWIFCA Track data has been provided in Figure 1 with the bed area mapped for reference from 2022. The area consisted of exposed hard substrate (mix of pebbles and small cobbles), sand and shell debris and areas of mussel which has persisted from 2022 (Figure 2). Where mussel persisted, it was 30-40mm in length. There was the occasional larger mussel 50-60mm (Figure 3).

The area has received a 2023 mussel settlement across a larger proportion of the bed (Figure 4). To the North of the bed a small area has been colonised by *Sabellaria alveolata* (Figure 5).

Across the channel a large area has been scoured back to hard substrate by the movement of the channel. No mussel settlement was observed although there was a large area being colonised by *Sabellaria alveolata* (Figure 6).

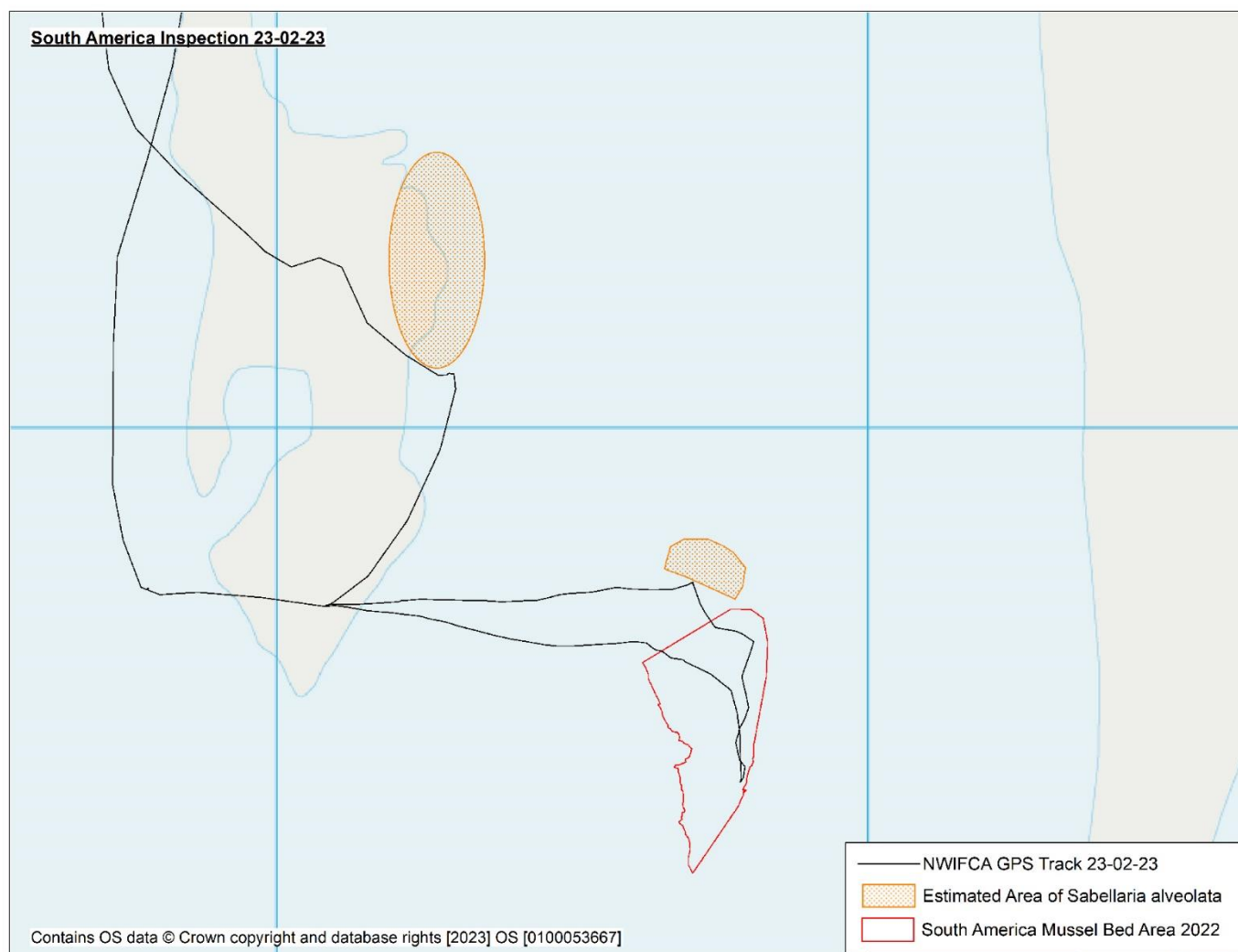


Fig 1. Map of South America including area of mussel suitable for fishing

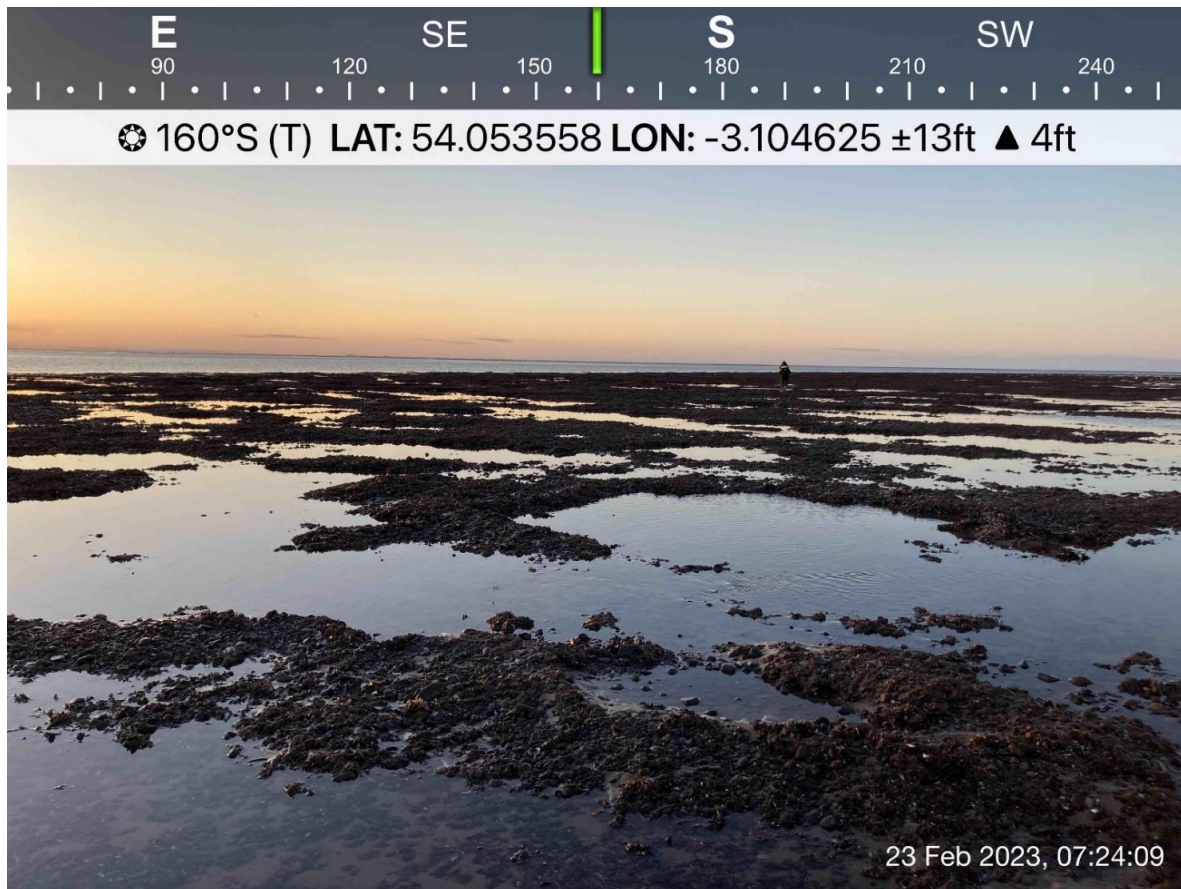


Fig 2. Overview of South America 23-02-23





Fig 3. Mussel 30-40mm in length with the occasional larger mussel 23-02-23

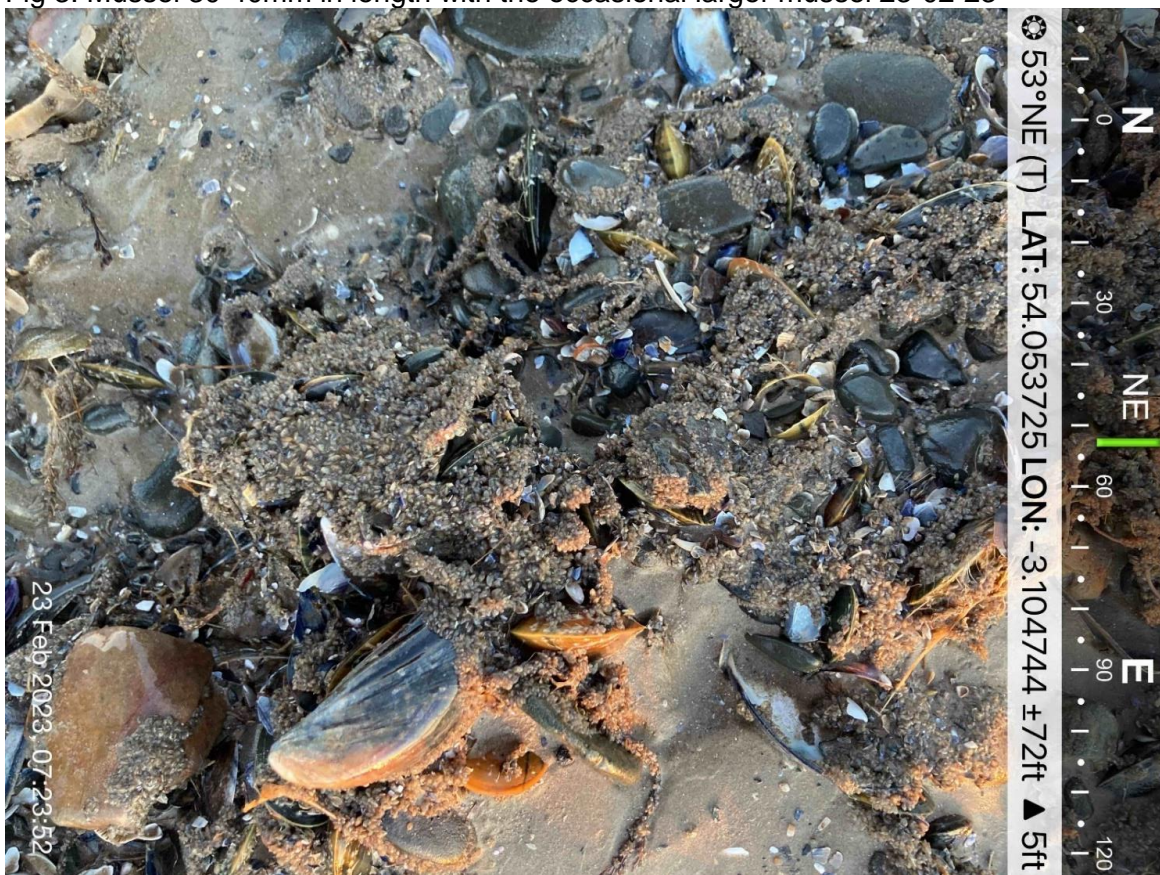


Fig 4. 2023 mussel settlement 23-02-23



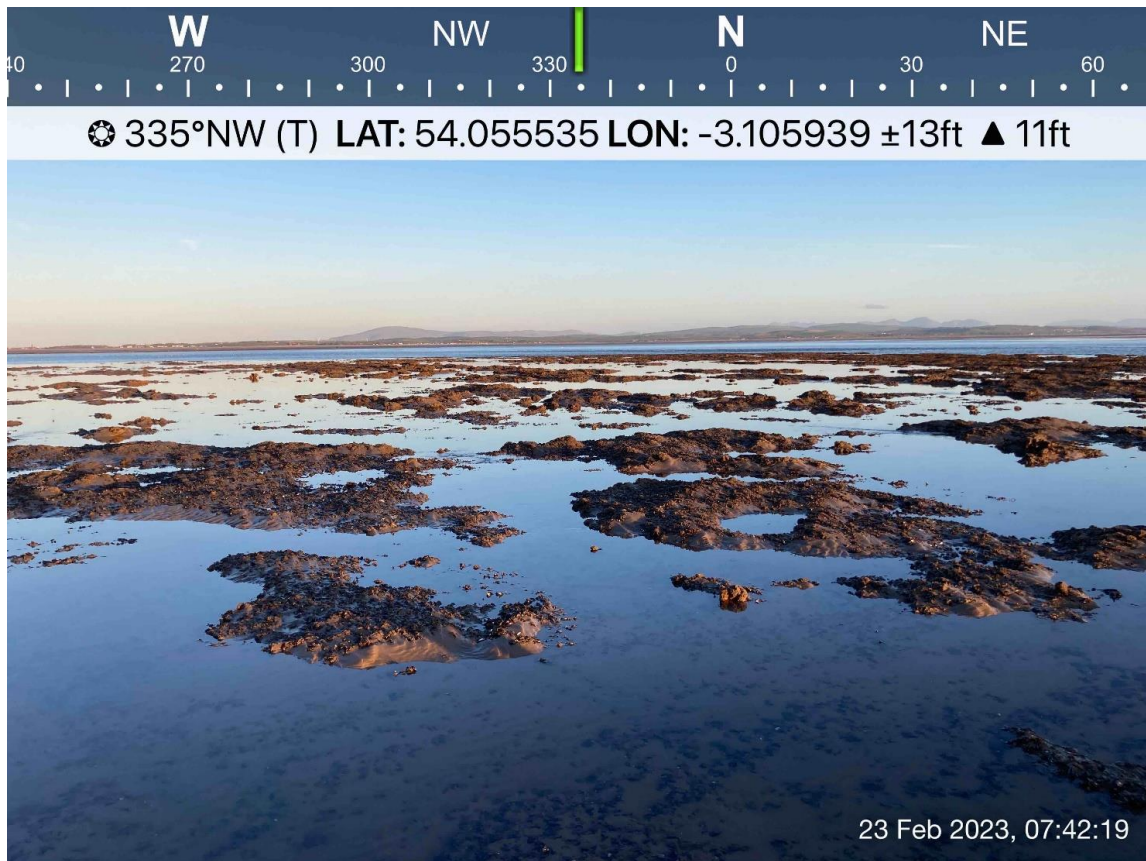


Fig 5. Area of *Sabellaria alveolata* near the mussel bed 23-02-23



Fig 6. Area of *Sabellaria alveolata* North of the mussel bed further up the channel 23-02-23

## Heysham Flat Mussel Inspection 24-02-23

Officers present: GG, MC, JH  
Tides LW 08:27 1.1m (Liverpool tides)

Officers inspected the mussel on Heysham Flat to assess if mussel had persisted from 2022 (Figure 1.) Access to the outer skears was not possible across Dallam Dyke due to depth of water and timings.

There is a significant historic *Sabellaria alveolata* reef extending across the skewer from Conger Rock to Dallam Dyke (Figure 2 and 3). The majority of the reef is dead and has been exposed with the scouring of the mussel and mussel mud that was present at the end of 2022. The reef is in the same location as last year, data from 01-03-22 was used to show the extent of the *Sabellaria alveolata*.

There was very little mussel persisting from last year as most of the mussel has been washed away and scoured leaving areas of bare cobble (Figure 4.), dead shell (Figure 5 and 6.) and historic *Sabellaria alveolata* present on the skewer. Knott End skewer looked bare, with cobble and no stock (Figure 7.)

Numerous bird species were present feeding in the area including oystercatchers and eiders.

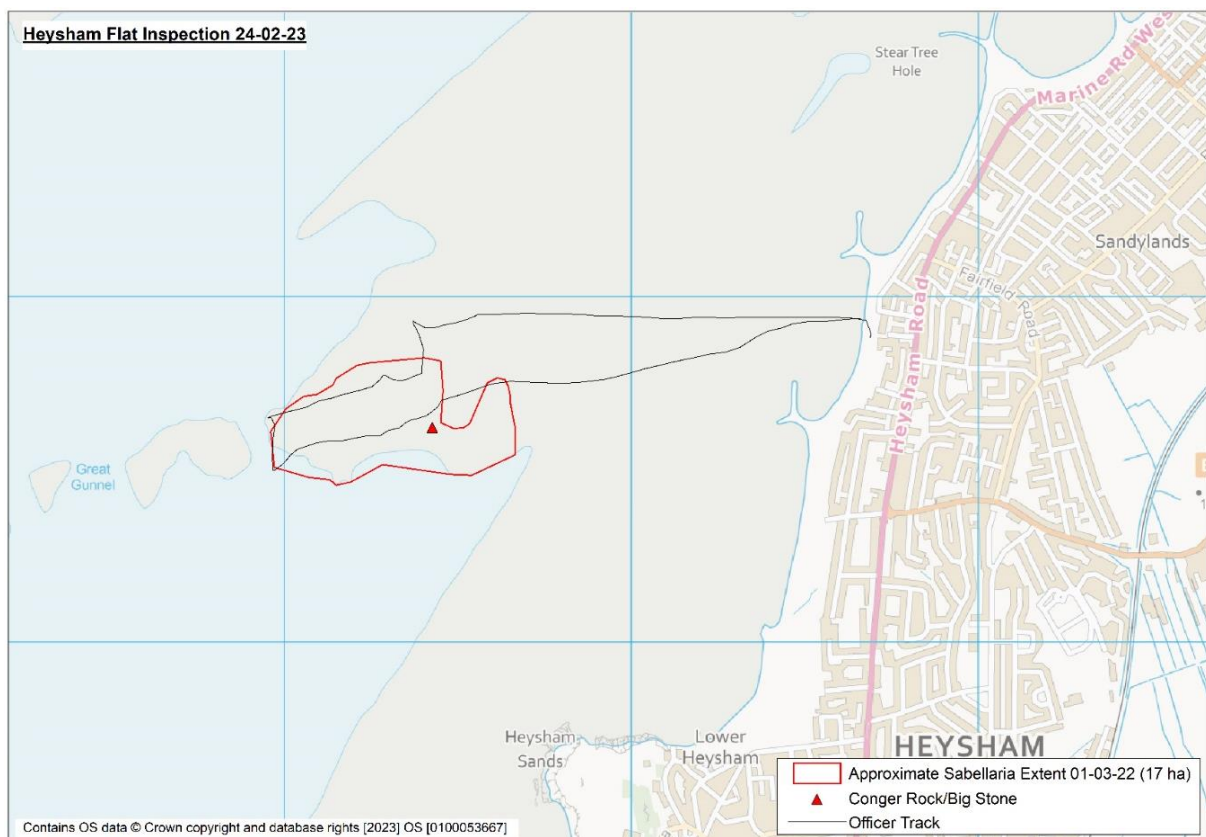


Figure 1. Map showing the extent of *Sabellaria sp.* and the officer track on Heysham Flat survey 24-02-23.





Figure 2. Extensive *Sabellaria* sp. reefs 23-02-24.



Figure 3. *Sabellaria* sp. Heysham 23-02-24.





Figure 4. Bare Cobble 24-02-23.



Figure 5. Dead mussel shell 24-02-23.





Figure 6. Dead mussel shell and wash out 24-02-23.



Figure 7. Knott end skear 24-02-23.

### **Flookburgh Cockle Survey 17-01-23**

Officers present: ID, JH, GG

Tides: LW 12:56 3.3m (Liverpool Tides)

Inspection method - Jumbo and 0.5m<sup>2</sup> quadrat

There have been several industry reports that Flookburgh had received a good 2022 cockle settlement and that the spat was persisting through the winter. Officers inspected Flookburgh and Leven cockle bed and targeted areas which have previously had cockle and areas which looked likely to contain cockle, lower areas and where birds, in particular oystercatchers were feeding.

The 2022 cockle was consistent across a large proportion of the bed, with a density between 30-100 m<sup>2</sup>. Most of the cockle was 15mm in size. There were low densities of size cockle across several of the sites inspected.

A full survey will be completed in July to see if a commercial stock develops.

## Annex 2

### E02 Summary Description For information only

Please provide a brief (plain English) summary of your proposal. If successful, this will be used in future communications and promotional material (including spending announcements) on the scheme.

**This question is not scored.**

Please use the following sub-headings to structure the summary:

- Project Aims
- Action (what you will do and the methodologies you will use)
- Expected Outcome (benefits of project)

Responses should be no more than 250 words with a font size of 11.

Do not include any links in your response.

### Response

#### Project Aims

The project aims to understand the potential causes for the decline in brown shrimp (*Crangon crangon*) in the Northwest and develop the first baseline dataset for future stock assessments and monitoring in the region. Brown shrimp is of significant importance to the local fishers, offering seasonal fishing opportunities and supporting well established traditional potted shrimp businesses. In 2021 national landings were valued at £1.2 million. Over the past five years, fishing industry representatives have reported declines in the number and size of shrimp across the Northwest, but the lack of data on the fishery has hindered management decisions. It is therefore important to establish a baseline stock assessment to further monitor the state of the fishery and investigate the potential causes of decline.

#### Actions:

- 1) The projects industry partners will undertake trawl surveys to collect size frequency, and weight data across the main areas of the North West District. Data will be collected across two years to establish an initial dataset
- 2) Samples will be analysed to see how factors including (but not limited to) fishing practices, water quality, temperature, predator-prey relationship, and food availability impact the shrimp life cycle, and stock levels.
- 3) Collation of CPUE data where available
- 4) Fishers interviewed to gather concerns and input into management recommendations.

#### Expected outcome:

- 1) First baseline dataset on brown shrimp from which to monitor future stock changes, from which to measure sustainable exploitation
- 2) Increased engagement with commercial shrimp fishers and knowledge of stock variables



## E05 Approach and Methodology

Weighting: 25%

The questions being assessed under this section are in bold.

We would expect to see the following detailed under this section:

- **Project approach and methodology**
- **Details of how you plan to deliver your project, this should include a project plan, highlighting milestones and the processes in place to ensure outputs are achieved, (for example, this can be expressed as a Gantt chart). This should take into account the required regular reporting to Defra.**
- **Details of project outputs, including datasets and analysis that will be undertaken**
- **MEDIN data standard that will be used and, where there isn't one for the data being collected, sufficient detail and timeframes within the project for developing one with MEDIN**
- **Completion of risk log and identification of strategies for managing the risks**

Responses should be **no more than 3 A4 pages** with a font size of 11.

Any annexes included within the response can be provided in addition to the page limit.

Figures (e.g. graphs and charts) can be provided in addition to the page limit

## Response

Methodology for aim: **1) to develop a baseline dataset for the stock in the District**

Research has shown that brown shrimp lack a clear age structure and reproduce almost year-round, therefore, an age-based stock assessment is not possible. An alternative approach is to survey during peak occurrence in late summer/autumn when mature shrimp migrate inshore. Depth and area-stratified samples can be obtained to estimate the total biomass and size frequency of shrimp. This can then be compared with total annual landings to identify if fishing levels are sustainable. Collating this evidence will establish the first baseline biomass-stock assessment for shrimp in the district.

To establish the baseline dataset, local fishers and industry partners will undertake monthly surveys in their respective areas (Solway, Morecambe, Ribble, Dee) from September to December 2023 and 2024. All data will be recorded according to MEDIN data standards, and participants will attend MEDIN workshops. This part of the project will be predominantly lead by NWIFCA and the fishing industry.

### **Survey methodology:**

- The survey will be conducted with shrimp trawl (sampling areas to be determined in collaboration with industry members) once per month from September to December 2023 and 2024 by industry in partnership with NWIFCA. (these will be standardized)

- Number and location of sample hauls will be based on stratified random sampling strategy and dependent on the conditions of each location. Similar methodology set out in *Bourges et al 2021*.
- For each haul the position, date, time of day and depth will be recorded. Including total catch by weight of shrimp.
- Mesh size, tow speed and gear spec used will be the same and determined with industry.
- 200 animals from each haul will be separated from fish and other epibenthos (also recorded) and be frozen for later measurement of length, weight and sex (following similar methodology as set out in Tulp *et al* 2016) in the lab.
- Collate landings data from industry over the same time period, with detail on number of hours fishing, total weight caught (if possible) and total retained (size).
- Additional water samples to also be collected for salinity, dissolved oxygen and nutrient levels.

#### **Key outputs:**

- Survey dataset 1 completed by spring 2024, and survey dataset 2 completed winter 2024
- Landings dataset collated by spring 2024.

#### **Data analysis:**

- Density, mean number and weight per haul will be calculated from the trawled distance and samples.
- Length frequency distributions, size and undersize comparisons.
- Mean abundance per area will be calculated for all areas using the estimated total area of the ground and the total area covered by the trawl.
- Statistical analysis will be conducted in R following methodology outlined in Bourdages *et al* 2021
- To calculate the CPUE, landings datasets over the same time period will be collated from fishers (this will be by voluntary agreement as there is no legal obligation for them to do so). Landings will then be compared with the results of the monthly surveys to identify the levels of stock removal.

Key milestones are noted in Figure 1. A copy of the potential risks to the projects success and strategies for management are provided in Figure 2.

#### **References**

Tulp *et al.*, 2016. Annual brown shrimp (*Crangon crangon*) biomass production in Northwestern Europe contrasted to annual landings, *ICES Journal of Marine Science*, Volume 73, Issue 10, November 2016, Pages 2539–2551, <https://doi.org/10.1093/icesjms/fsw141>

*Bourdages et al., 2021. Preliminary results from the ecosystemic survey in August 2021 in Estuary and northern Gulf of St. Laurence.*

<https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/41072224.pdf>

Methodology for aim: **2) Determining the reason for decline in the regions shrimp (both size of individuals and overall biomass of catch)**

A key concern for industry has been the decline in both the abundance and size of shrimp across the district. Establishing a baseline dataset in aim 1 will provide a measure against which to monitor future decline, however, there is a need to investigate the cause of this decline in order to predict future changes and develop stock management approaches. A number of abiotic and biotic factors will be explored using shrimp and water samples collected from survey trawls to identify how these variables may be influencing shrimp behaviour and life history characteristics such as growth and survivability.

Field and lab methodology:

- Measure abiotic factors from water samples (some parameters in the field, other bringing water samples in the lab).
- Examine whether nutrient levels, pollution and sewage, temperature, salinity, heavy metal presence are potentially causing stress. Refer to bibliographic references and historical data for comparison of methodology. Use Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) to conduct trace-level elemental analysis.
- Conduct micro-cosm experiments to see how temperature and salinity may be affecting life history traits and their life cycle, early or late molting etc. preliminary data have been collected on colour change in natural conditions– this may be considered beyond the life of the initial project.
- Biotic factors: Interaction with other fisheries – monitor the presence / abundance of juvenile flat fish in trawls. Correlation with predator species abundance; Investigation into changes in other species
- Comparison on trends in other areas, including Netherlands and Germany, where declines have been reported as well

**Key outputs:**

- Dataset of abiotic factors completed by spring 2025
- Pilot data from lab experiments to be potentially expanded with a PhD work (two PhD thesis already produced at the University of Salford; Althomali 2019; Siegenthaler 2017).

**Data analysis:**

- Seasonal variation in abiotic factor compared to historical trends
- Comparison of number decline in other populations

**References:**

*Althomali A. W. 2019. Behavioural ecotoxicology of the brown shrimp, Crangon crangon: changing colour in polluted environments PHD thesis The University of Salford*

*Siegenthaler A. 2017. Hide and seek: a multidisciplinary study on the ecological success of an estuarine dweller PHD thesis The University of Salford*

## **Drone Procurement and Training Report 2023**

### **Purpose of this report**

This report aims to outline the rationale behind the need for a drone at NWIFCA. The report will also outline the research conducted by staff and the procurement process to date, including drone specifications, training and additional requirements. The report will make a recommendation for the drone NWIFCA will look to procure, along with training and additional software.

### **Background**

Drones are Unmanned Aerial Systems (UAS), typically small aircraft controlled by a pilot on the ground. Drones can have a multitude of camera and surveying attachments, making them a piece of equipment used widely by organisations for a variety of purposes. A number of regional IFCAs utilise drones in day-to-day activity, and they have proved invaluable for surveying, enforcement, management and research. At NWIFCA we would like to utilise a drone to increase survey capacity, collect data to add to existing and novel research, and improve enforcement efforts.

### **Current survey practises and limitations**

Currently, surveys for mussel are undertaken across the district by the science team with support from IFCOs. The surveys are labour intensive, limited by daylight and tides, and rely heavily on the availability of officers, vehicles and quad bikes.

Many areas such as Heysham Flat, South America, Falkland's, and mussel beds in the Dee, are not accessible by quad. Officers have to cross channels on foot often over long distances and are limited by tides and currents. Once on these beds, the assessment is limited by the tide and bed perimeters and stock estimates are therefore restricted. Previously, aerial extents of the bed were provided by industry on helicopter flights, but difficulties with licences and insurance cover meant that last year this was not possible.

### **Drone Benefits**

There are numerous ways in which having drone capability can benefit the NWIFCA. These include:

- Increased survey capacity.
- Reduced survey time.
- Increased officer safety.
- Increased resilience of survey methods.
- Ability to undertake and contribute to novel research.
- Improved data accuracy.
- Improved data for GIS mapping.
- Improved evidence collection for monitoring of MPAs and closed areas, including the newly designated HPMA at Allonby Bay.
- Improved evidence collection for enforcement duties.
- Comparison of drone data with available LIDAR data to assess historic changes in mussel beds in the district.

A drone would offer the ability to give NWIFCA autonomy for gathering its own data on the aerial extent of the bed, limit officer time in higher risk situations such as crossing long water channels by foot, and allow for a comparable, highly accurate level of monitoring which is useful for monitoring a highly dynamic resource. Drones would allow an optimum survey

approach, capturing mussel bed perimeter extent and percentage cover to utilise alongside ground-based sampling for size, weight and biomass calculations.

In addition, recent research conducted by Newcastle University and Northumberland IFCA demonstrates that the use of drone footage can be used to distinguish mussels from surrounding substrates using multispectral camera systems.

The NWIFCA district is now home to the pilot Highly Protected Marine Area (HPMA) at Allonby Bay. As one of the first of its kind, the protection and conservation of this area will be highly scrutinised. The addition of drone technology to the organisation will increase our ability to ensure the HPMA is protected from extractive activities and succeeds as a pilot site.

Introducing drones to the NWIFCA will also allow further collaborative working with other IFCAs. Sharing of technology and payloads such as different cameras will allow the NWIFCA and other regional IFCAs to increase survey and monitoring capacity without any additional costs. This will also lead to knowledge sharing, improving data collection and operations.

As well as the obvious benefits that the drone hardware will provide, it is likely that a new computer of higher spec will be needed to aid in data processing. This higher specification computer will also be useful for the processing of other survey data such as that produced by our Sidescan Sonar surveys in the Solway.

#### **Other IFCA use of Drones**

A number of regional IFCAs around the country use drones. There is also an IFCA drone taskforce, which is a technical group set up to share best practise amongst the IFCAs and assist IFCAs in building drone capability. Below is an overview of the IFCAs that have drone capability, the models used and brief description of the work completed using drones.

<b>IFCA</b>	<b>Drones</b>	<b>No of Pilots</b>	<b>Uses</b>
<b>Northumberland</b>	DJI Mavic 2	3	Environmental monitoring and monitoring fishing activity. Working with Newcastle Uni using multispectral cameras to map mussel beds.
<b>North Eastern</b>	DJI Phantom 4 Pro+ SplashDrone 3+ C1-XR	2	Survey work and enforcement work.
<b>Eastern</b>	2 x DJI Mini 2 DJI Mavic 2 Enterprise	2	Monitoring of fishing activities.
<b>Kent and Essex</b>	2 x DJI Mini 2	2	Monitoring of marine vessel activities and Marine Protected Areas (MPAs).
<b>Southern</b>	DJI Matrice 300 RTK with Zenmuse H20T camera DJI Mini 2	2	Long range visual recording for monitoring and evidence gathering of closed areas. Thermal imaging allows deployment at night.

## Drone Procurement Research

Following discussions and research into other IFCA drone specifications, 3 models were originally selected as possible options for the needs of NWIFCA. These models were:

- DJI Phantom 4 Multispectral,
- DJI Mavic 3 Multispectral (3M),
- DJI Matrice 300 RTK.

Research and analysis of these models led to the removal of the DJI Phantom 4 multispectral as a viable option. Research revealed that the Mavic 3M provided a number of upgrades to the Phantom 4, including better portability, improved flight time and improvements to the camera and data capture specifications. An in-depth analysis of the two drones can be read here: [DJI Mavic 3 Multispectral vs DJI Phantom 4 Multispectral – heliguy™](#).

Further research and analysis was then undertaken on the two remaining models, the DJI Mavic 3M and the DJI Matrice 300 RTK. Heliguy has also written an article on this comparison: [DJI Mavic 3 Enterprise Series vs M30 vs M300 RTK – heliguy™](#). We have amalgamated some of the important specifications for these models in the table below.

	<b>Mavic 3 Multispectral</b>	<b>M300 RTK</b>
Dimensions (L x W x H)	Folded (without propellers): 223 x 96.3 x 122.2 mm;  Unfolded (without propellers): 347.5 x 283 x 139.6 mm	Folded: 430 x 420 x 430 mm;  Unfolded (propellers excluded): 810 x 670 x 430 mm
Weight	951g (with propellers and RTK module)	Approx. 6.3 kg (with two TB60 batteries, and single downward gimbal)
Max Take-off Weight	1050g	9 kg
Max Flight Time	43 minutes	55 minutes (no payload); With payload: Depends on payload. Examples include H20T: 43 min; P1: Up to 44 min; L1: Up to 42 min.
Camera/Payloads	Fixed, multi-sensor payload.  RGB Camera: 4/3 CMOS, Effective pixels: 20MP  Multispectral: 1/2.8-inch CMOS, Effective pixels 5MP	Interchangeable payloads, including third-party payloads. Can carry up to three at a time.  Payload options include H20T (Laser rangefinder + Wide + Zoom + Thermal); P1 full-frame photogrammetry camera; L1 LiDAR and photogrammetry sensor; gas detection modules; speakers/spotlights; and agricultural sensors.
IP Rating	No	IP45

Operating Temperature	-10°C to 40°C	-20°C to 50°C
Max Speed	15 m/s (Normal Mode); Forward: 21 m/s (Sport Mode)	S mode: 23 m/s P mode: 17 m/s
Max Wind Speed Resistance	12 m/s (during take-off and landing)	15 m/s; 12 m/s (during take-off and landing)
RTK	Supported (RTK Module comes with drone)	Supported (Dual RTK Built in)
Controller	DJI RC Pro Enterprise (No IP rating)	DJI Smart Controller Enterprise; No IP Rating *RC Plus compatibility is expected soon
Max Transmission Distance (CE)	8km	8 km
Dual RC Control Mode	Not supported	Supported
Safety Features	Includes omnidirectional binocular vision system; DJI AirSense; Smart Return To Home; APAS 5.0; Health Management System.	Includes omnidirectional sensing; DJI AirSense; Smart Return To Home; Three Propeller Landing; Health Management System.
Suggested Industries	Precision environmental monitoring and agriculture.	Depends on the payload, but M300 RTK has a solution for all industry verticals, including public safety, inspection, surveying, and agriculture.
Price Bracket	Low tier	High tier

### Mavic 3 Multispectral



This lightweight, highly portable drone is designed for environmental monitoring and land management. It has a 20MP RGB camera and four 5MP multispectral cameras, allowing high precision surveying. It also includes an RTK (real-time kinematics) module, allowing improved accuracy to 1cm. A flight time of 43 minutes allows data capture of up to 2km<sup>2</sup> per flight, with a max range of 8km. This is a lower price tier option but unfortunately it does not have an IP rating for working in wet conditions.



Image from Heliguy product brochure © Heliguy.

### Matrice 300 RTK

This highly versatile drone is a large commercial drone with numerous capabilities that can be tailored to suit. Although the price is higher, the drone has an IP45 rating for poor weather use and can carry a wide range of different payloads, including photogrammetry, LiDAR and thermal imaging cameras. As the name suggests, an RTK module is standard for accurate surveying, and this drone has long flight times similar to the Mavic 3M depending on payload options.



Image from [Matrice 300 RTK – Built Tough. Works Smart. – DJI](#).

## Training and software requirements

Drone operators and pilots will need to register with the UK Civil Aviation Authority (CAA), and get an operator ID and Flyer ID.

- **Operator ID** – if you are responsible for a drone you are required to register as a drone operator to get an operator ID. This is £10.
  - o The operator will be the person within the IFCA responsible for the drone. This includes maintenance and ensuring anyone who flies it has a valid flyer ID and correct training, qualifications and insurance. The same operator can be used for a number of drones within the organisation and does not need a flyer ID/intention of flying the drone.
- **Flyer ID** – Drone pilots must register and get a flyer ID. This includes a 40-question multiple choice exam and is free.

- **Training - General Visual Line of Sight Certificate**

Categories: Open/Specific.

The General Visual Line of Sight Certificate is a remote pilot competency certificate which provides a single qualification that is suitable for most VLOS (Visual Line of Sight) operations. This course comprises of theory training units and end-of-unit assessments, creation of an operations manual and a practical flight assessment. The operations manual, along with your GVC Certificate, can then be submitted to the CAA for your operational permissions.

- **Training – Aerial Surveying Course**

This course over 5 days provides training on utilising drones for surveying. It comprises theory, practical and scenario-based training. It includes surveying fundamentals, GNSS (Global Navigation Satellite Systems) data capture, aerial photogrammetry, 3D modelling, aerial LiDAR and data capture and processing.

## Total Costs

**Costs are approximate until final decision on drone model.**

Drone

- DJI Mavic 3M - £3926 inc VAT
- DJI Matrice 300 RTK - £10,450 inc VAT

Payloads

- Zenmuse P1 - £5595
- Zenmuse H20 – £4100
- Zenmuse H20T - £10200
- Zenmuse L1 - £9160

Additional batteries to allow extended survey times -

Software – DJI Terra 1 device perpetual licence - £3430

GVC Training – Approximately £5000 for up to 4 candidates. Includes online theoretical section, plus 3 days practical GVC and operations training at pre-defined client location.

Survey Training - £2000 per candidate.

Maintenance - £250 per annum.

Licences – Operator ID £10.

### **Next steps**

Timeline:

1. Two science officers will be going for demonstration of the 2 models by Heliguy on the 30/03/23
2. GVC training has been confirmed and officers will be undertaking this in the next few months (exact dates to be confirmed).
3. Once training starts and officers have had the opportunity to demo both drones, NWIFCA will purchase the model which best meets our survey and enforcement needs.