

## METHOD STATEMENT

### Experiment Design - Overall Aim:

The aim of this project is to:

- investigate the sites for capability to wild seed seaweed species of commercial interest
- test sustainably sourced materials as suitable seeding and cultivation materials for sustainable intertidal aquaculture
- monitor the potential
- to optimise design to help enhance the biodiversity of the sites

This project will be testing different hard substrates (traditional plant-based rope, wood, metal and stone) for the purpose of determining the presence and settlement preferences of commercially (and intertidal ecosystem) important seaweed and invertebrate species. Some species may be present within the area in a low abundance due to the lack of suitable substrates. Most aquaculture relies on human-made material (e.g. polypropylene rope) and seaweed cultivation is no different with seeding material often of long lasting human-made material. This project will also test the durability of the different materials for potential suitability within an intertidal aquaculture setting.

This project will look at the survival of some locally collected seaweed species (*Chondrus crispus* and/or *Mastocarpus stellatus*) using nylon mussel socks, as no plant-based alternative is readily available to test this method of farming.

The project will monitor species diversity near the test structures and away from the test structures.

The structures will be placed at three tide heights within the designated 49m x 20m (980m<sup>2</sup>) area marked on each map and within the co-ordinates given.

These tests will be replicated across three sites on the Isle of Skye, Highlands:

- Loch na Dal (Kinloch )
- Loch Eishort (Heasta)
- Loch Harport (Carbost)

Within each area will contain at three relative tide heights:

- 2m x 5m of different line (rope) substrate
- 0.3m x 6.7m of rock hard substrate (nine 0.3m x 0.3m x 0.5m blocks spaced at 0.5m intervals )
- three willow woven panels (1m width)

The nylon mussel sock cultivation of the small red seaweeds will be at one tide height, replicated three times per site and 1.5m in length per replicate.

### **Rope Collector:**

Five different rope materials will be deployed to act as hard substrate collectors:

- Polypropylene or polyester (as man-made control)
- Hemp
- Sisal
- Manilla
- Jute

Each rope will be 3 strand weave and 12mm thick. Five replicates of 2.7m of each rope (a total of 13.5m per rope type) will be strung between support lines, 2m apart, to give 2m of suspended line with a minimum of 0.35m of excess line for sections to be removed for settlement analysis every two weeks throughout the trial. Below is the design of the set-up that will be deployed three times at each tide height and at each site.

The suspended rope will be analysed for species settling and the density (mass/m (seaweed) or number/m (invertebrates) ) of each species settling on the rope.

Support lines will be connected to a mix of wood posts and metal rods.

### **Rock Hard Substrate:**

The aim is to investigate the influence of geology and surface type (rough, smooth and grooved) on the settlement of different seaweed and invertebrate species. Each rock type that will be used is native to Skye and will be locally sourced.

Small limestone, sandstone and basalt blocks (0.3m w x 0.3m l x 0.5m h) will be placed at each tide height. Three replicate blocks of each rock type will be placed 0.5m apart in line and at the same tide height as the the rope trials. A total of 27 blocks will be placed at each site (a grand total of 81 blocks).

The blocks will be visually inspected as well as sample scrapings taken every two weeks for the duration of the project.

Woven willow screens low to the ground around 10cm-15cm in height, and a possible substrate.

The aim is to again test durability and settlement potential of this traditional method of construction, typically used in fish traps. Each 1m w x 1m l screen will be held in position by

supporting line and metal rebar poles. Visual analysis and sample scrapings will be taken every two weeks.

### **Mussel Sock Seaweed Survival Trial:**

Survival trial of locally collected wild *Chondrus crispus* / *Matocarpus stellatus* / *Gracilaria gracilis* will be tested at one tide height. Only one of the species will be cultivated at each site, based on which species is present at the site. The nylon mussel sock will be filled with locally collected specimens. The socks will be suspended between posts. The aim is to have three replicates of 1m of nylon mussel sock at the tide height closest to MLWS. Wooden posts will be used if possible to attach the socks to. The contents will be weighed every two weeks and visually inspected to assess condition.

### **Summary of Materials:**

*Rope:* 3 strand weave, 12mm, 122m total length used for each of the following type across three sites:

- Polypropylene or polyester (as man-made control) -
- Hemp
- Sisal
- Manilla
- Jute

The lines will be suspended between between two 5m (total length 10m per grid) supporting lines, held in place by a mix of wooden (oak) posts and metal rods. A total of 30m per site will be used with a total of 90m used across the three sites.

*Rock Hard Substrates:* The hard substrate will consist of limestone, sandstone and basalt rocks.

For each of the three rock types, 27 blocks with the following dimensions 0.3m x 0.3m x 0.5m will be used across the three sites.

*Woven willow screens:* At each site 9 woven willow screens with the dimensions of 1m w x 1m l will be erected at each site giving a total of 27 screens.

*Nylon mussell sock:* A maximum of 6m of nylon mussell sock will be attached to a maximum of 9 posts per site (total of 18m of nylon mussell sock).