# Can the construction of Oarweed, *Laminaria Digitata* and Marram grass, *Ammophila* into an organic fishing net, provide a natural sustainable alternative to the unsustainable traditional fishing nets made from plastics?

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## Abstract

Ghost fishing accounts for 10% to 30% of the total debris in the ocean. Ghost fishing gear is the most deadly kind of plastic, killing the most marine life of all pollution. This research aims to look at natural alternative materials such as seaweed and sea grasses to replace synthesised plastic materials. Oarweed, *Laminaria Digitata* was braided together with three green strands of Marram Grass, *Ammophila* at varied widths, providing the base for the prototype of a fishing net material. Two strands of similarly sized *Laminaria Digitata* were plaited around a dried Marram base and then dried again. Tactile strength and flexibility were tested using a clamp and weights. The strongest sample was B, with the largest width of all the materials and the most weight held. When compared, samples B and D demonstrated that when you double the width of the braid it resulted in doubling the strength. The findings of this project suggest that this could be used as an alternative for local small-scale fishing where a smaller species and quantity of fish are captured. Further research could look at the combination of natural alternatives, to withstand greater strength in order to successfully replace plastic fishing nets for the sustainable future.

## Introduction

We aim to find a fishing net that would not cause major harm to sea life and aquatic organisms. So we decided to find a way to solve it. We realised that if we braid seaweeds and seagrasses tight enough to make ropes then we would also be able to make fishing nets. Then you also do not have to worry about them trapping animals if they accidentally fall in the ocean as they are organic and will decompose within a short period of time.

In this study we used 3 types of seaweeds and sea grasses. These included Oarweed, *laminaria digitata* and Marram grass, *Ammophila*. These were all braided together and then left to dry for 24 hours and the 3 of those strands were left for a further 2 weeks to further dry out. *Laminaria digitata* seemed like it was a good choice for its length and branch structures and it would be easier to braid as it wouldn't have to be cut. It also grows quickly so it could be sustainably farmed without the fear of exploitation. Seaweed has a long life span and recovers quickly. We selected marram grass due to the characteristic of being flexible when freshly picked and also thin so it can be very easily woven.

Our hypotheses are to explain if "local fishing net materials can be adapted to be more environmentally friendly and sustainable" and we aim to work this out by testing different prototypes of nets.

## Methodology

3 strands of Marram Grass were braided together at various widths, this provided the base for the prototype of the fishing tool material. The braids were dried overnight. Two wet strands of similarly sized *Laminaria Digitata* were plaited round the Marram base. Samples were dried for 2 weeks.

The prototypes were measured and labelled A, B, C and D. The marram grass base on its own would act as Control of the experiment. Each prototype was placed in a clamp, with 2 hooks placed in the middle of the braid.

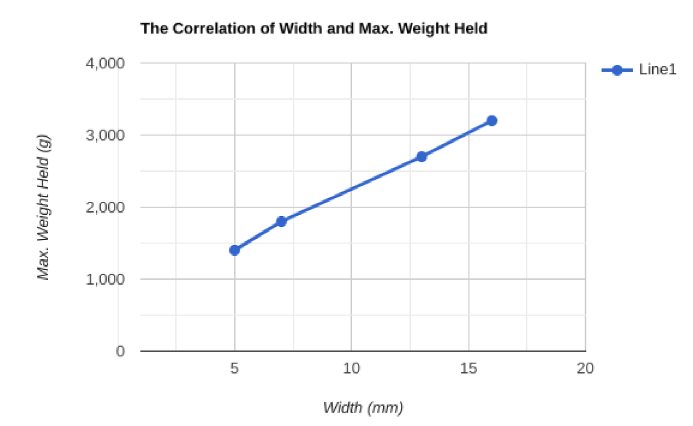
Masses were gradually increased at 100g intervals. Weights were added on either side of the prototype until it had broken or showed signs of extreme destruction. The level of destruction was assessed through sight and observation.

## Results

**Table 1. Table showing the width of biological braid with the total weight held.** This table illustrates the difference in the width of the braids and the amount of weight held by each variable.

| Braid type | Width (mm) | Max. weight held (g) |
|---|---|---|
| A | 13 | 2700 |
| B | 16 | 3200 |
| C | 5 | (Marram grass base alone) 1400 |
| D | 7 | 1800 |

**Image 1. Graph to show correlation of braid type and weight held.** This graph shows a positive correlation; that as the width of the braid type increased, the weight held also increased.




The strongest sample proved to be B, with the largest width of all the materials (16mm) and the most weight held (3200g). Whilst the weight it was able to hold was underestimated, the ratio of its size to width made it unsurprising that it was the strongest of the materials. Furthermore, an interesting pattern, particularly between sample B and D, was observed amongst the results obtained. D had a width of 7mm and B had a width of 16mm. D held 1800g and B held 3200g (Table 1).
From this we found doubling the width doubled the force that the sample was able to withstand. C, although was the lowest width, still held a substantial amount of weight (1400G). It's lower width was due to the braid only being composed of three strands of Marram Grass. Additionally, the range of weight held between the prototypes (1800g) was less than had been expected, but the samples held greater amounts of weight than originally thought (Image 1).

## Conclusion

"Can local fishing net material be adapted to be environmentally friendly?". As expected, the greater the width of the braid, the greater the mass that it could hold. The mass that could be held by the prototypes was limited, which wouldn't make this style of net suitable for a trawler or other large fishing vessel. It could, however, have applications for fishing on a smaller scale as some of the prototypes could hold enough mass to be used for smaller fish.

If repeated in the future, this experiment could be improved by testing a range of materials such as other species of seagrass or alternative organic materials, as there was a clear difference in the strength of the materials used in this experiment. During testing, the *Laminaria Digitata* consistently snapped before the Marram Grass and so making nets from Marram Grass only would probably lead to a more robust net, though there may be other materials that were not tested in this experiment which could provide even better performance.

In addition, only one style of braiding was tested so it could be interesting to explore whether different braids could have an effect on strength.

## Discussion

Though this project did not, ultimately, lead to the creation of a sustainable replacement for commercial fishing nets, it does represent that there are alternatives to plastic nets and, if developed further, it could provide a solution to smaller fishing communities around the globe as nets made from seagrass are inexpensive and could possibly be made strong enough for catching small numbers of fish.

Overall, this project was a part of a wider effort amongst the scientific community to eradicate ghost nets from our oceans and create a sustainable future for the fishing industry.

## Future Research

This experiment used materials found along Cornish coastlines, but this wouldn't be appropriate for use in fishing nets in other parts of the world. As much as possible, locally sourced materials should be used in order to prevent introducing new species or pathogens found on these species from being introduced into other ecosystems.

This would also make the nets more sustainable as sourcing materials locally, reduces their carbon footprint. It would also be advisable to consider the abundance of materials and avoid the use of endangered species such as giant kelp.