



Biodegradable materials for fishing gear and equipment

How can this brief support you

As a direct replacement of traditional plastic components used in fishing gear, **natural and biodegradable alternatives have the potential to significantly reduce plastic pollution produced by fisheries.**

SEARCULAR has tested two solutions using alternative materials: BIOFADs (biodegradable fish aggregating devices) from natural materials and marine biodegradable demersal seine ropes. Both support the target of **50% reduction of plastic pollution from fisheries** as set out in the [Zero Pollution Action Plan, European Green Deal](#) by replacing the plastic used within these gears with biodegradable alternatives ^{1,2}.

The implementation of marine biodegradable demersal seine ropes would ensure that microplastic pollution caused by rope abrasion in this fishery would biodegrade into carbon dioxide, water and biomass, supporting targets for a 30% reduction in microplastic release ([Zero Pollution Action Plan, European Green Deal](#)). SEARCULAR's novel design of dFADs, constructed entirely using natural materials, eliminates plastic from this essential fishing device for the tropical tuna purse seine fishery.

In support of these targets to reduce marine plastic pollution as part of the [European Green Deal](#), this brief outlines SEARCULAR's policy recommendations for the use of alternative materials to traditional plastic.

Key Recommendations

1

Increasing uptake of alternative materials in the manufacture of fishing gear and equipment would significantly reduce marine plastic pollution generated by European fisheries ^{1,2}. SEARCULAR's novel fishing gears and equipment manufactured using alternative materials (biodegradable and natural) perform comparatively to conventional plastic gears in our trial fisheries, contributing to the reduction of plastic waste without compromising on catch efficiency or gear performance ^{3,4,5}.

2

Policy should continue moving from a predominantly waste-management approach to place greater emphasis on gear design and material use ^{6,7}. There are several policy mechanisms for collecting and managing waste at the products end-of-life. Moving to a prevention-based focus for material use and gear design would reduce the amount of plastic produced by the industry requiring subsequent management ⁶.

3

Guidance on the use of new materials needs to be swift and adaptive, to keep pace with technological development, and consider environmental impacts along the entire value chain. The technological development of new materials, particularly biodegradable polymers, is fast paced and often protected by industry secrets. International standards for biodegradable materials should be developed to ensure any new materials and products meet circularity and sustainability requirements.



Background Research

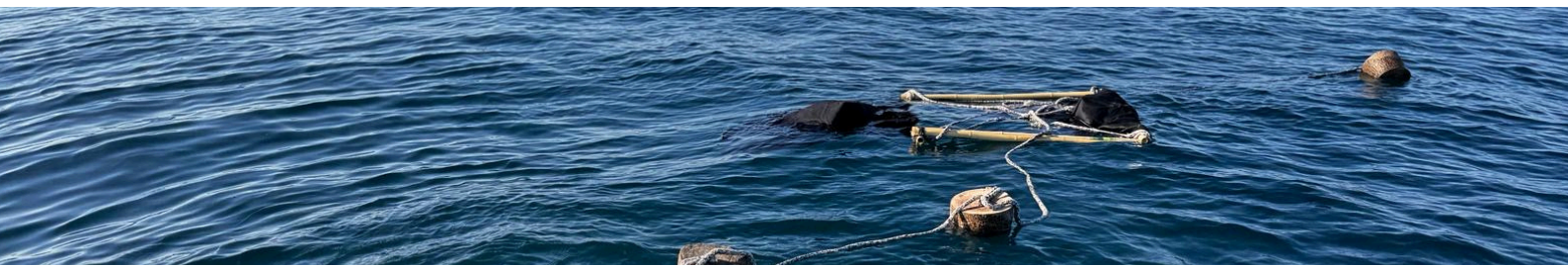
SEARCULAR has worked with manufacturers and the fishing industry to develop and test alternative materials for the production of low-impact, biodegradable fishing gear. In particular, we have explored the use of **natural materials** for drifting Fish Aggregating Devices (dFADs) used in tuna purse seine fisheries^{1,3}, and innovative **marine biodegradable polymers** for demersal seine ropes².

In both fisheries, our biodegradable designs **perform comparatively to traditional plastic alternatives**, with similar target catch performance, behaviour at sea and lifespan^{3,4,5}. By replacing plastics with natural biodegradable alternatives, SEARCULAR BIOFADs eliminate plastic pollution from these devices⁸. Our marine biodegradable seine ropes ensure that any particles worn from abrasion are quickly degraded,

preventing accumulation of microplastics in the marine environment.

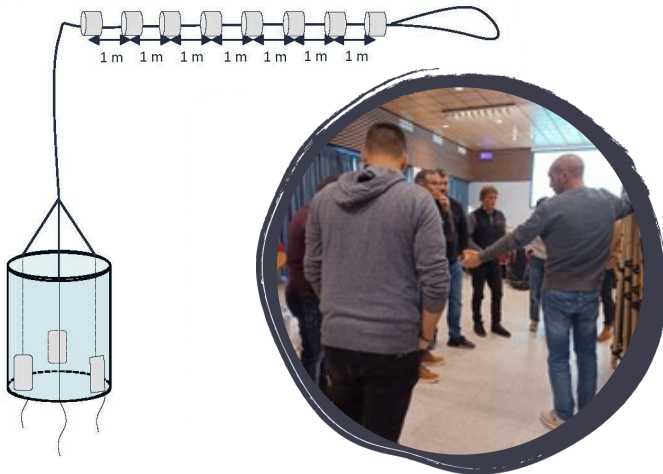
We know that uptake of new materials by manufacturers will be limited if there is no market demand⁹. Currently the cost of alternative materials and designs are prohibitive for fishers. We ask that funding mechanisms are put in place to support manufacturers and fisheries that develop and adopt alternative materials, helping to reduce the environmental impact of the industry.

In this brief we highlight our main policy recommendations to help reduce fisheries-based marine plastic pollution and to overcome challenges and barriers to adopting alternative materials in the manufacture of fishing gear and equipment.



Utilizing natural materials for dFADs completely eliminates plastic pollutions from these devices.

Through a series of co-creation workshops with fishermen, SEARCULAR has developed three innovative new models of drifting Fish Aggregating Devices (dFADs). These biodegradable FADs (BIOFADs) are constructed entirely of natural materials such as bamboo, paulownia, pine and recycled cotton¹. Trials in the Mediterranean Sea have yielded promising results, with the BIOFADs remaining active after 6.5 months - the expected lifespan of a traditional plastic dFAD³. **With an estimated 120,000 FADs deployed worldwide each year³, the reduction in plastic pollution and entanglement risk through the roll-out of biodegradable alternatives is significant**, however there are barriers to wide-scale adoption of these materials.



Above: Diagram showing the structure of a new cylindrical BIOFAD model. Co-designed with fishers and made with natural materials.
Inset: A co-creation workshop held as part of the design process.

There is no structured process for certifying and validating the use of alternative materials. **Policy should recognize and support the adoption of scientifically validated biodegradable materials**, such as those demonstrated by SEARCULAR. This would ensure that alternative natural and renewable components are **formally acknowledged as credible, safe, and effective** options for reducing the environmental footprint of fishing gears. Formal approval and regulation mandating the use of biodegradable, non-entangling FADs would ensure uptake and enable fishermen to showcase their efforts to move towards lower-impact fishing methods⁹. Such approval and certification schemes should include mandatory life cycle assessment to ensure that the new solutions do not shift burdens from marine pollution to other impact categories.



Developing seine ropes using a marine biodegradable polymer prevents accumulation of microplastics in the marine environment.

Working closely with manufacturers, SEARCULAR has developed innovative biodegradable seine ropes using marine biodegradable polymers². When tested aboard a commercial fishing vessel, we found the **biodegradable ropes perform comparably to traditional plastic ropes**, with similar behaviour and longevity⁵. Anecdotal feedback from the skipper shows a positive response to the ropes and confidence in the continued use of the alternative ropes. **Using biodegradable polymers for demersal seine ropes has the potential to remove 77-97 tonnes of microplastic pollution per year from Norwegian fisheries alone**¹⁰.

Despite positive results in the performance of biodegradable seine ropes, and the role they can play in significantly reducing marine microplastic pollution from fisheries, **wide-scale uptake remains a challenge**. The cost of implementing biodegradable ropes is prohibitive for fishermen. Thus, **funding mechanisms should support fisheries that adopt alternative materials**, helping reduce cost gaps and accelerating market uptake⁹.

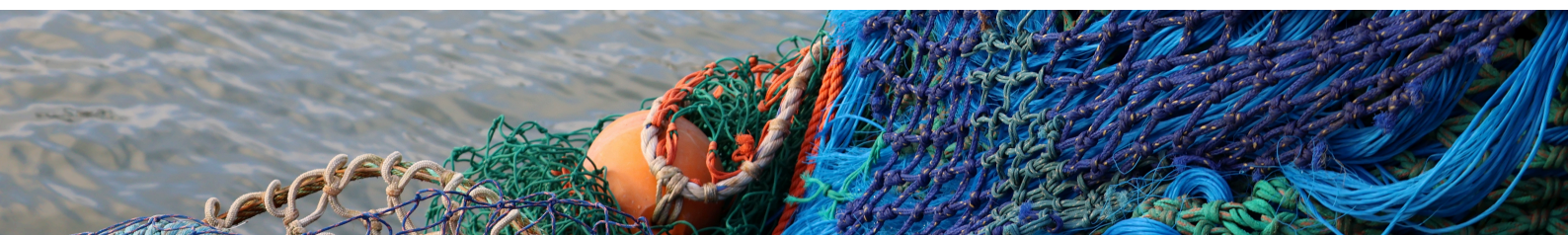
At the same time, our Cost Benefit Analysis suggests that policy to **facilitate scale up of alternative material manufacturing** would lower the price premium currently associated with alternative fishing gear materials⁸. Producer responsibility schemes that reward fishing gear manufacturing with reduced environmental impacts across the entire value chain, would support a more competitive market between biodegradable alternatives and conventional plastic gears.

Policy should focus on gear design and manufacture to reduce the amount of plastic waste produced by the fishing industry at source.

While the current focus on collection and recycling determined by the [Zero Pollution Action Plan](#), [European Green Deal](#) supports the reduction of end-of-life gear being incinerated or placed in landfill, SEARCULAR has demonstrated that shifting to **biodegradable alternatives reduces the amount of plastic waste produced**⁸.

However, it is important to consider certification of any alternative materials to ensure they are environmentally sustainable and suitable for marine conditions. The development of mandatory **standards**⁷ and **certification of scientifically-proven materials** would prevent the adoption of non-recyclable or environmentally more harmful substitutions and supports a long-term reduction in marine plastic.

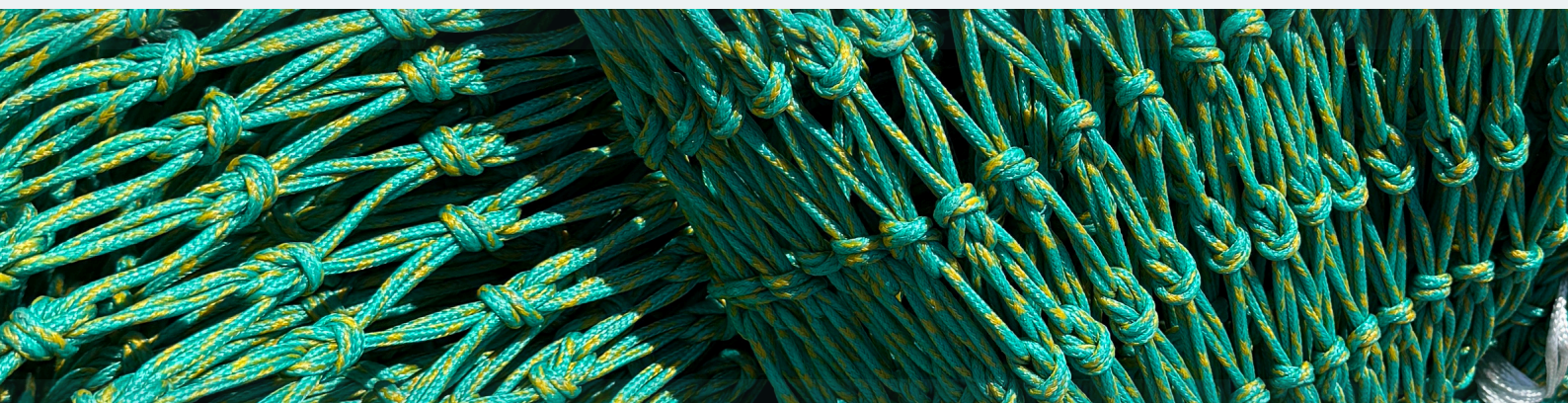
We note that while our results show the potential benefits of alternative, biodegradable materials, these materials are tailored to specific fisheries and regions. For inclusion across different fisheries or geographic areas, further research and development would be required.



About SEARCULAR

SEARCULAR is a European Horizon-funded research and innovation project under Mission Protect our Oceans and Waters. SEARCULAR has 13 partners, from across Europe and is working with the fishing industry to co-develop solutions that reduce marine litter and microplastic generated by fishing gear.

Tailored to the requirements of diverse fisheries, SEARCULAR has developed and tested **4 innovative solutions** to tackle marine plastics from fishing gears at source, and ultimately, support sustainable fisheries and healthy marine environments for generations to come.



References and Resources

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