2026

Lost Fishing Gear:

Retrieval, recycling, and preventive actions for abandoned recreational fishing gear in the central Baltic Sea

A popular science report on the application of citizen science to map hotspots of abandoned, lost, or discarded fishing gear (ALDFG) along Estonia's marine shoreline

Interreg

Co-funded by the European Union

Central Baltic Programme

Re:Fish

Lost fishing gear is found in all seas, lakes, and waterways where recreational fishing takes place. It causes unnecessary suffering for fish, birds, and marine mammals. In the EU project Re:Fish, we are working towards a cleaner and healthier Baltic Sea.

Project period: 2023–2026
Funded by Interreg, Central Baltic Programme
Project partners: Keep Sweden Tidy (SE, lead partner), Keep the Archipelago Tidy (FI), University of Tartu (EE), Finland Environmental Institute (FI)

Read more at **centralbaltic.eu/project/refish/**

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Finnish Environment Institute

Interreg Co-funded by the European Union

Central Baltic Programme

Re:Fish

Project information

Funded by the EU's Interreg Central Baltic Programme under its "Improved Coastal and Marine Environment" priority, the Re:Fish project "Retrieval, recycling, and preventive actions for abandoned recreational fishing gear in the central Baltic Sea" (project period from March 2023 to February 2026) was coordinated by the Keep Sweden Tidy Foundation in cooperation with partners from Finland, Keep the Archipelago Tidy Association and the Finnish Environment Institute, and from Estonia, the University of Tartu.

The Re:Fish project addressed the problem of ghost fishing and plastic pollution caused by lost recreational fishing gear in Sweden, Finland, and Estonia. Through activities such as gear retrieval operations, end-of-life gear collections, citizen-based science initiatives, educational training and awareness campaigns, the project engaged anglers and fishers using passive gears, manufacturers, NGOs, research institutions, and authorities to prevent gear loss and advance practical measures for gear recovery and material recycling.

More information, project materials, and results can be found on the project webpage.

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Contents

1 Introduction 4
2. Development and testing of mobile application in Estonia 6
3. Overview of beach clean-up events in Estonia 9
References 15

1 Introduction

Abandoned, lost, and discarded fishing gear (ALDFG) is widely recognised as a significant global concern for fisheries and for the broader aquatic environment (Unsbo et al., 2023). It is stated in the literature that the consequences of ALDFG are substantial, as ghost fishing contributes to mortality among commercial, recreational, and protected species while degrading benthic habitats and disrupting ecosystem processes. These impacts extend beyond direct ecological damage, since gear that drifts ashore reduce the recreational value of beaches and shorelines and simultaneously poses risks to safe navigation. In broader environmental assessments, the presence of ALDFG in aquatic environments is associated with socio-economic consequences, as it contributes to pollution from macro- and microplastics and harmful chemicals while continuing to degrade habitats.

Gear loss may occur either intentionally or unintentionally, with the underlying drivers differing across gear types and geographic regions (Gilman et al., 2022). It is added that the commonly identified causes at sea include severe weather conditions, interactions with other fishing gear and marine traffic, poor quality, and theft. In definitional terms, "abandoned fishing gear" refers to gear over which the owner or operator retains control, and which could be retrieved, but which is deliberately left at sea because of force majeure or other unforeseen circumstances (Einarsson, H., He & Lansley, 2023). By contrast, "lost fishing gear" denotes gear over which control has been accidentally relinquished, and which cannot be located and/or recovered, whereas "discarded fishing gear" describes gear that is released at sea without any subsequent attempt at control or recovery by the owner or operator.

Within the CB Interreg project Re:Fish (started in 2023 and ended in 2026), several activities were carried out to map the current situation of the ALDFG problems in Sweden, Finland, and Estonia. Within the project, retrieval operations and clean-up activities were carried out,

end-of-life (EOL) fishing gear was collected, citizen science methodologies were applied, deposit systems were tested, and awareness-raising campaigns were implemented. In parallel, results, recommendations, and experiences generated through Re:Fish were communicated not only to recreational fishers and the wider public but also to relevant actors and stakeholders, including fishing gear producers and retailers. In contrast to earlier initiatives, Re:Fish worked to extend beyond the removal of marine litter by linking several previously disconnected elements, activating key actors — such as recreational fishers, non-governmental organisations, universities, and authorities — to strengthen the prevention and monitoring of ALDFG in leisure fishing, with citizen science serving as one of the primary data sources. Combined with these measures, the cooperation model developed within the project was designed to be replicable across other geographical contexts and scalable to the wider Baltic Sea region. Re: Fish therefore represented a distinctive opportunity to address transboundary ALDFG challenges in marine environmental protection and management through a holistic, cross-border approach.

Referring to the EU Maritime Forum, citizen science is described as having evolved into a pivotal resource whose added value for science, research, and policy supports the alignment of interventions with community needs (https://maritime-forum.ec.europa.eu/contents/citizen-science-importance-and-benefits_en). In this context, citizen science is understood as the involvement of volunteers who are not professional researchers in different stages of the scientific process. While data collection constitutes a central component, such participation may also encompass quality assurance, analysis and interpretation, problem definition, and the dissemination of results. Owing to its capacity to connect local engagement with knowledge production, the approach is particularly prominent within environmental fields, where it both expands the evidential base and enhances public awareness and involvement. The literature indicates that citizen science delivers benefits to society, science, policymaking, and participants themselves, including by mitigating ALDFG-related pressures on fisheries and aquatic ecosystems. By engaging

citizens in research activities and in the co-design of measures, the approach primarily supports awareness, a sense of ownership, and motivation, which in turn often leads participants to identify solutions that are straightforward to implement, cost-efficient, and effective.

The development of mobile applications and web-based platforms enables non-specialist citizen science observers, including walkers, divers, and sailors, to document ALDFG sightings (Morfin et al., 2025). Referring to the same body of work, the widespread adoption and user-friendly design of dedicated smartphone applications are highlighted as key factors that enable researchers to engage a broad audience, thereby facilitating both the collection and transmission of ALDFG-related data.

2. Development and testing of mobile application in Estonia

To fulfil the aims of Re:Fish project, a web application "Mapping of found fishing gear" was developed and implemented within the project framework (accessible at https://gis.sea.ee/refish/; in Estonian). Using geospatial analysis, ALDFG hotspots along Estonia's marine coastline were mapped, and each report was archived in a unified repository that supports sustainable fisheries management. The system enables both reporting and verification, allowing fishers, non-governmental organisations, and state authorities to submit observations in real time. For each recorded find, users can enter optional data into the web application. The recorded information may include the categorisation of the item (e.g. net, rope, hook), quantity, estimated weight, and an accompanying photograph. Additional contextual information can also be provided, such as whether the item was visible or hidden, whether it was removed from the site or left in place, and the activity being undertaken at the time the item was discovered. Once verified, reports are visualised via Google Maps, providing an integrated overview that identifies critical

hotspots and supports the targeting of response measures (Figure 1).

Figure 1. Screenshot of the results view in the Re:Fish web application "Mapping of found fishing gear", showing the locations where fishing equipment was found in Pärnu Bay region, Estonia, during the application test period from 2023 to 2025.

So far, the application has been tested by the University of Tartu Re:Fish team and volunteers from the Estonian Fund of Nature. The first results showed that the most frequently recorded fishing equipment in the web application was a gillnet, followed by ropes and flags (Figure 2).

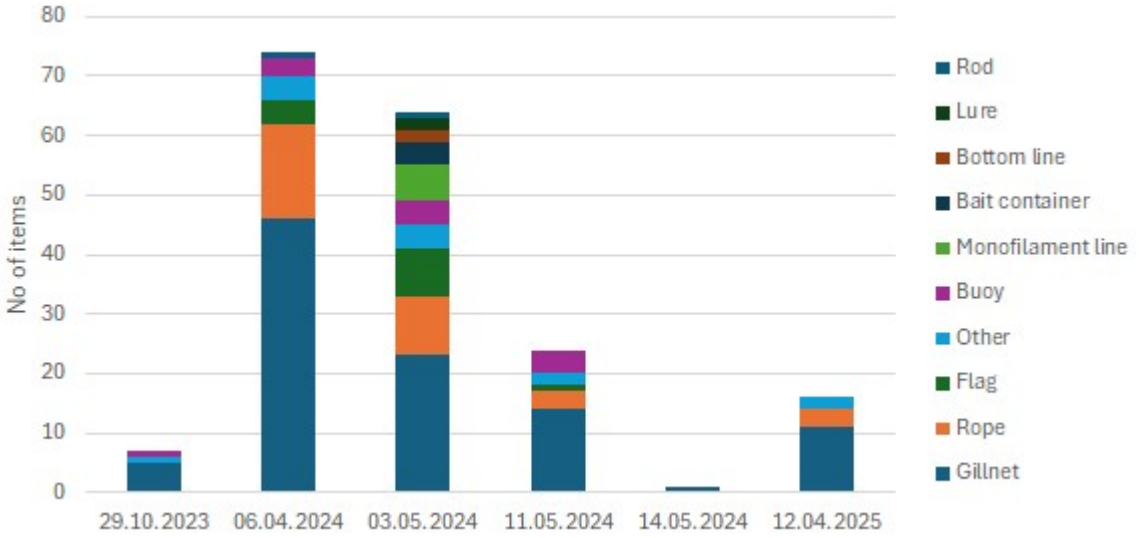

Figure 2. The results of testing the Re:Fish web application "Mapping of found fishing gear", by date and number of registered items.

As all data are hosted on a single, open Re:Fish app platform, transparency and accessibility in reporting are maintained, stakeholder collaboration is enhanced, and contributions to the Sustainable Development Goals are supported through reductions in the ecological burden associated with marine debris. In line with global initiatives to protect marine biodiversity and improve fisheries governance, the Re:Fish App provides a practical mechanism to reduce ALDFG and safeguard marine resources, as applications designed to identify ALDFG hotspots are regarded as central to the effectiveness of gear-recovery programmes.

3. Overview of beach clean-up events in Estonia

Project activities consisted of coastal clean-up actions carried out along the shoreline of Pärnu Bay. A total of seven beaches were visited (Figure 3). Coastal clean-ups were carried out in cooperation with the Estonian Fund for Nature (Photo 1). The Re:Fish web application, "Mapping of Found Fishing Gear," was used to record the locations and other relevant information for the found fishing equipment.

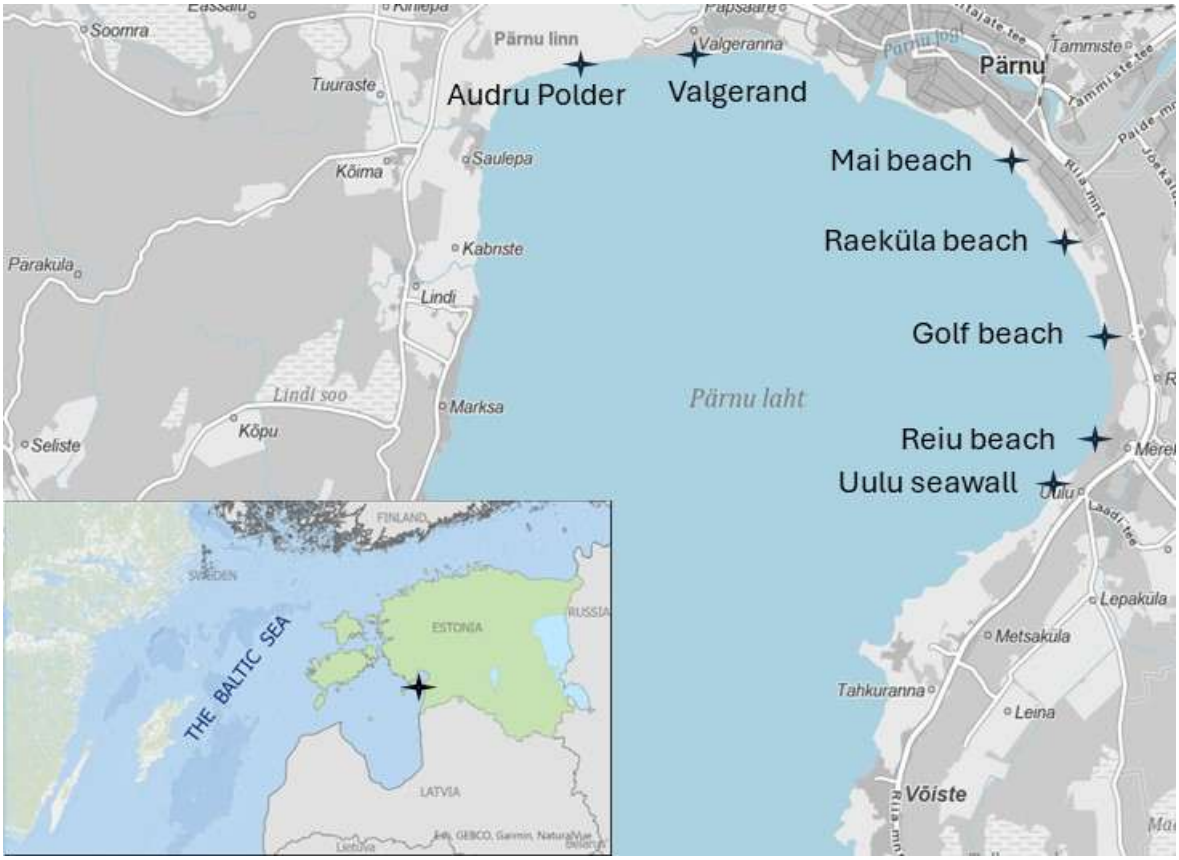

Figure 3. Location of cleaning sites along the shoreline of Pärnu Bay, Estonia.

Photo 1. Photo of volunteers from Estonian Fund for Nature at the end of a coastal clean-up event (06.04.2024).

Pärnu Bay is a shallow coastal area in the northeastern part of the Baltic Sea, along the southwestern coast of Estonia. The bay has an average depth of around 5 meters and is known for its productive fishing grounds. Fishing activity is intense and takes place year-round, involving both recreational and commercial fisheries. Nets and other passive fishing gears are commonly used. During winter, shifting ice conditions increase the risk of gear loss, adding an extra challenge for local fishers.

In 2024, a total of 186 kg of marine litter was removed from a 3 km stretch of shoreline in the Audru Polder conservation area, followed by an additional 120 kg removed in 2025 (Figure 4). In 2024, most of the litter removed in the Audru Polder area consisted of fishing-related items and glass, each accounting for 60 kg, followed by other litter and plastic. In 2025, the total amount of litter decreased, with other litter being the largest category with 55 kg, while fishing-related litter dropped significantly to 24 kg, and both plastic and glass amounts also declined.

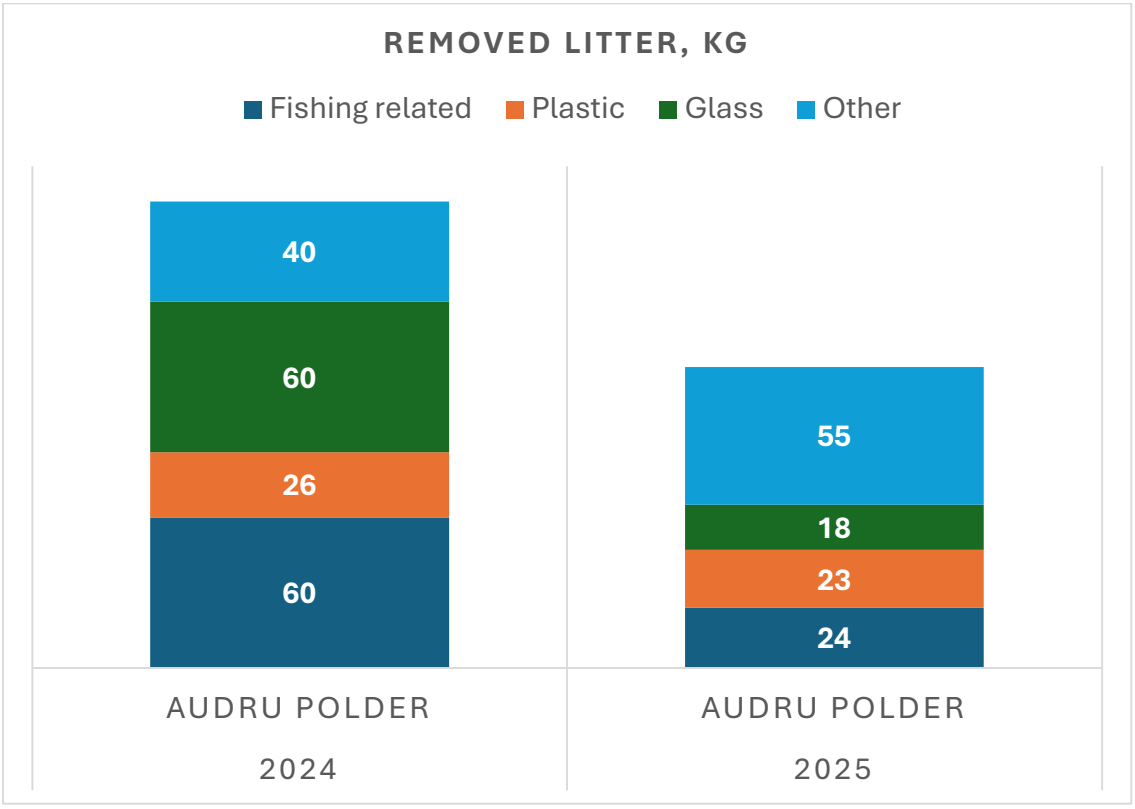

Figure 4. Amount and composition of marine litter (kg) removed during coastal clean-up activities in the Audru Polder conservation area in 2024 and 2025, categorized by fishing-related litter, plastic, glass, and other litter.

In the Valgerand conservation area, 190 kg of marine litter was collected from a 3.2 km stretch of shoreline in 2024, with a further 95 kg removed in 2025 (Figure 5). In 2024, the most significant portion of litter removed in the Valgerand area was plastic (68 kg), followed by other litter and fishing-related items, with glass as the smallest category. In 2025, the total amount of litter decreased significantly, with fishing-related items becoming the largest category at 55 kg, while plastic, glass, and other litter all declined to much lower amounts. The decrease in other litter is mainly due to the removal of old, buried litter during the first year, which left less hidden debris to collect the following year, despite Valgerand being an important recreational and leisure area.

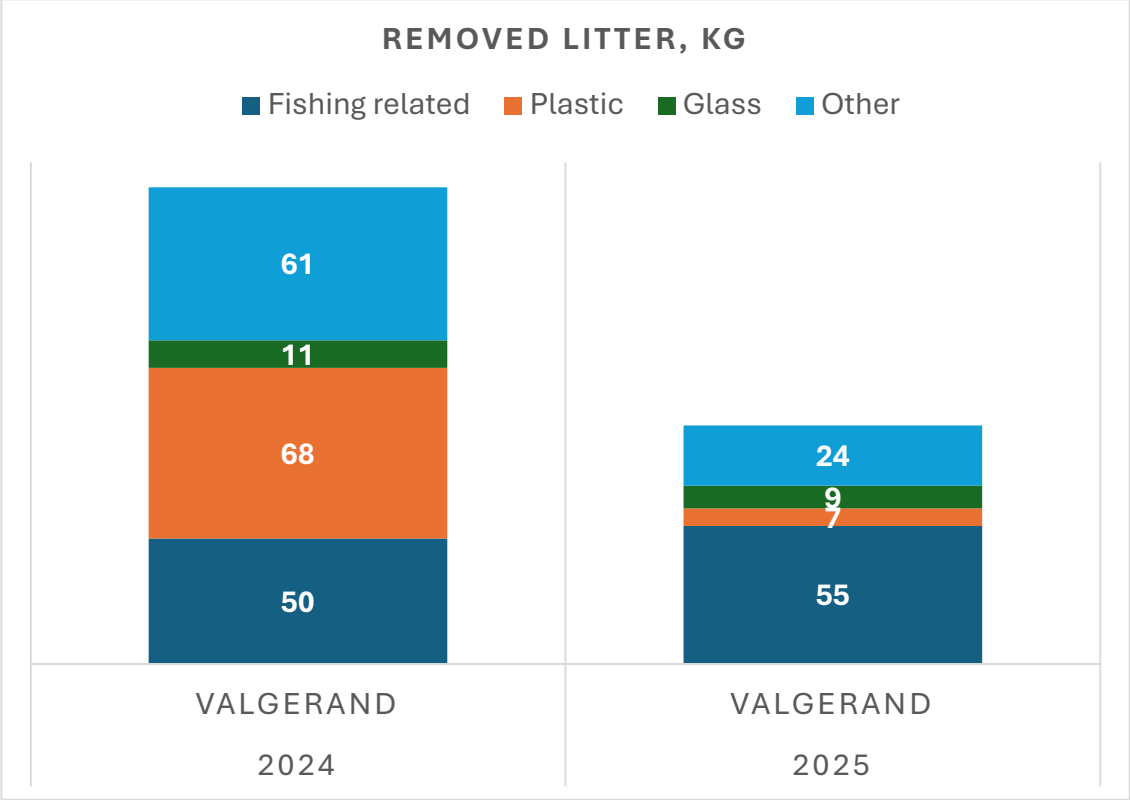

Figure 5. Amount and composition of marine litter (kg) removed during coastal clean-up activities in the Valgerand conservation area in 2024 and 2025, categorized by fishing-related litter, plastic, glass, and other litter.

The fishing-related litter found from Audru Polder and Valgerand areas mostly consisted of gillnets, net marker flags, floats, and various ropes and lines that had previously been used either in general shipping or specifically in fishing (Photo 2).

Photo 2. Examples of items removed from beaches during the clean-up campaigns in Pärnu Bay, Estonia.

In addition to Audru Polder and Valgerand, five smaller beaches along the Pärnu Bay coast were cleaned in spring 2024: Mai Beach, Raeküla Beach, Golf Beach, Reiu Beach, and Uulu Seawall (3.61 km in total). These beaches are located near the city of Pärnu and its surrounding coastal area. Each of these sites was visited only once, as in spring 2025 water levels in the region were unusually high, preventing a second round of clean-up activities. The litter collected at these smaller beaches in 2024 was 66 kg in total and mainly consisted of fishing-related items (24 kg), plastics (19 kg), and other litter (23 kg) (Figure 6). Compared

to Audru Polder and Valgerand, the overall quantities were smaller, reflecting the different usage and exposure levels of these sites.

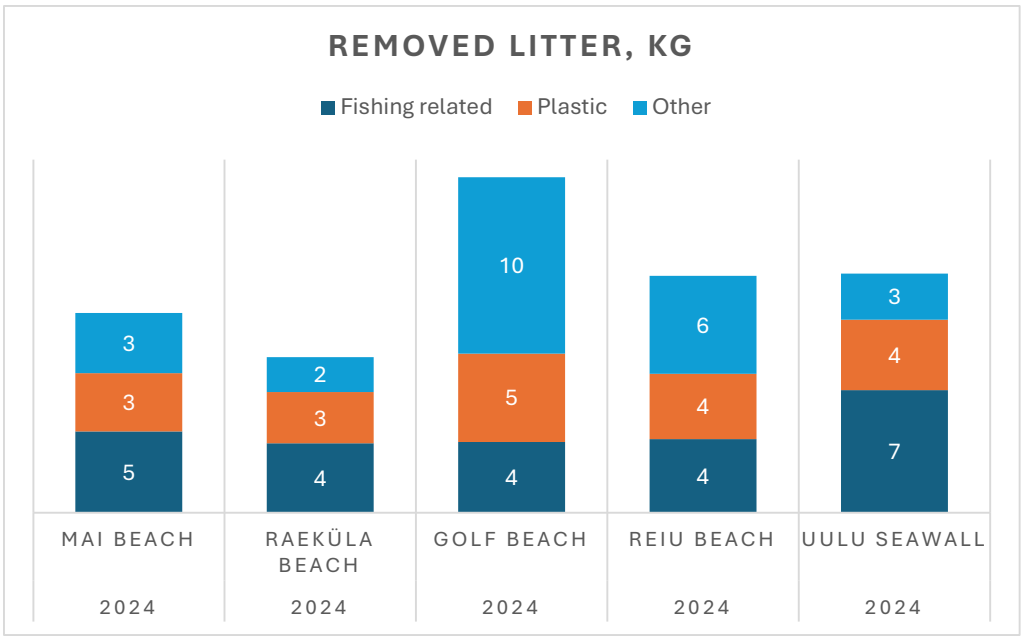

Figure 6. Amount and composition of marine litter (kg) removed in 2024 from five different beaches in the Pärnu Bay area, categorized by fishing-related litter, plastic, and other litter.

References

Einarsson, H., He, P. and Lansley, J. 2023. Voluntary Guidelines on the Marking of Fishing Gear – Manual for the marking of fishing gear. Suppl. 2. Rome, FAO. https://doi.org/10.4060/cc4251en

EU Maritime Forum (https://maritime-forum.ec.europa.eu/contents/citizen-science-importance-and-benefits_en)

Gilman, E., Humberstone, J., Wilson, JR., et al. 2022. Matching fishery-specific drivers of abandoned, lost, and discarded fishing gear to relevant interventions. Marine Policy 141: https://doi.org/10.1016/j.marpol.2022.105097

Morfin, M., Mehault, S., Miquerol, L. et al. 2025. Using citizen science to inventory and map abandoned, lost, or otherwise discarded fishing gear (ALDFG). Marine Pollution Bulletin 220:118418.https://www.researchgate.net/publication/393645403_Using_citizen_science_to_inventory_and_map_abandoned_lost_or_otherwise_discarded_fishing_gear_ALDFG

Unsbo, H., Boltenstern, M. and Olshamma, M. 2023. Quantification and environmental pollution aspects of lost fishing gear in the Baltic countries. Swedish Agency for Marine and Water Management. Report C 775. 1-78. https://ivl.diva-portal.org/smash/get/diva2:1790189/FULLTEXT01.pdf