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D2.3 Report on the awareness actions

Technical report of the awareness actions delivered by project partners to members of the fisheries sector (e.g. small and large-scale fishers). Six awareness actions delivered to raise awareness on the adverse environmental and socio-economic effects of marine litter and ALDFG; and to co-create solutions to promote/implement best practices regarding waste management, including themes such as: what is considered litter; appropriate waste management practices on board and at land; which facilities are needed at ports to handle litter derived from fisheries, including ALDFG; how to implement more environmental-friendly fishing methods to avoid bycatch and reduce consumption of energy and raw materials; and fishers' perceptions to reduce ALDFG and marine litter.

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Summary NETTAG+ Project

NETTAG+ aims to provide a portfolio of three innovative smart and sustainable solutions to address the negative impacts of abandoned, lost or otherwise discarded fishing gear (ALDFG) on marine life and habitats. NETTAG+ will be based on synergistic activities between the fisheries industry, scientists and NGOs to develop three solutions to PREVENT, AVOID and MITIGATE the harmful impacts of ALDFG.

NETTAG+ will PREVENT marine litter derived from fisheries activities, AVOID loss of fishing gears, and MITIGATE harmful impact by removing existing ALDFG. These three solutions will jointly contribute to reduce ALDFG and marine pollution, namely by: reducing the introduction of hazardous chemicals and microplastics originating from ALDFG; reducing ghost fishing, bycatch and entanglements of sensitive or endangered species on ALDFG; and improving mapping, tracking and recovery technologies to retrieve ALDFG.

NETTAG+ aims to upgrade and upscale the integrative preventive approach that started in the previous NetTag project, and aims to replicate it in Mediterranean regions, providing the fisheries industry with three smart and environmentally-friendly solutions to reduce ALDFG and prevent the environmental impacts of fishing gears. The three solutions will be developed to maturity (TRL 7-8) by the end of the project, and will be tested, validated and demonstrated in real conditions in Atlantic and Mediterranean countries, namely Portugal (PT), United Kingdom (UK), Spain (ES), Italy (IT), Croatia (HR) and Malta (MT). NETTAG+'s ambition is to change the paradigm of the fisheries industry, aspiring to transform the societal perspectives about the role of fishers as Guardians and Cleaners of the Ocean. NETTAG+ will empower the sector to take effective actions to address marine pollution, promoting their role as key actors to tackle marine pollution.

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Executive Summary

The NETTAG+ project set out with a bold ambition: to transform the role of fishers from perceived contributors to marine pollution into empowered guardians of the sea. Through six participatory workshops conducted by five project partners in eight distinct locations across Portugal, Spain, Italy, Croatia, and Malta, the project engaged 259 participants, 238 of whom were fishers—both small- and large-scale—in a journey of awareness, dialogue, and co-creation.

Each workshop tackled a different facet of the marine litter challenge. From understanding the sources and impacts of pollution to exploring innovative technologies and sustainable practices, fishers were invited not just to listen, but to lead by providing feedback and suggestions on how best to prevent and reduce marine litter. Their feedback was insightful, and deeply rooted in lived experience.

Fishers voiced strong environmental awareness and a clear willingness to act. They shared frustrations over inadequate port infrastructures for litter management and unclear waste protocols. Yet they also showed interest in solutions. Technological innovations, such as acoustic tags and robotic tools to locate ALDFG, sparked curiosity but also concern. Cost, complexity, and the absence of clear operational frameworks were recurring themes. Still, many fishers expressed openness to testing these solutions, provided they are supported by public institutions and tailored to real-world conditions.

Bycatch reduction and emissions control emerged as critical areas where fishers saw both opportunity and challenge. They proposed practical measures—from gear modifications to cleaner fuels—but stressed that financial and regulatory support is essential to make these transitions viable.

Overall, the workshops revealed a sector ready to embrace sustainability, but constrained by systemic as well as structural barriers.

The insights gathered will inform future project phases and policy recommendations, ensuring that solutions are grounded in the realities of those who depend on the sea.

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1 Introduction

Marine litter — particularly plastic debris — is a pervasive and escalating threat to marine ecosystems, biodiversity, fisheries, and coastal communities. While an estimated 70–80% of marine litter originates from land-based sources — such as rivers, coastal runoff, mismanaged waste, and littering — at least 22% is believed to come from sea-based activities, including fishing, aquaculture, and shipping (Morales-Caselles et al., 2021). Among sea-based sources, *ghost gear* — fishing gear that is abandoned or lost at sea— accounts for approximately 10% of marine debris by volume (Macfadyen, G., Huntington, T. & Cappell, R., 2009). This gear continues to trap and kill marine life, damage habitats, and contribute to the broader plastic pollution crisis. Tackling marine pollution at a global level demands coordinated action across science, policy, and society—leveraging the expertise and collaboration of all stakeholders.

NETTAG+ works hand-in-hand with the fisheries sector, researchers, and NGOs to design and implement solutions that prevent, avoid, and mitigate the damaging effects of lost fishing gear and associated marine litter on marine life and habitats.

To PREVENT marine litter derived from fisheries activities, NETTAG+ prepared a package of six workshops targeting professional fishers (see D2.1 for detailed information) from the North-East Atlantic (Portugal, Spain) and the Mediterranean (Spain, Italy, Croatia, Malta):

- Workshop #1 - Seminar on marine litter
- Workshop #2 - Marine litter produced on board
- Workshop #3 - Marine litter collected by fishing gears
- Workshop #4 - Sustainable practices: bycatch reduction and marine conservation
- Workshop #5 - Reducing fisheries footprint
- Workshop #6 - NETTAG+ solutions

With the development of participatory workshops, NETTAG+ aims to enhance the comprehension of marine litter issues within fishing communities and empower fishers to adopt more sustainable practices and become 'guardians and cleaners' of the ocean.

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2 Methodology

Workshops were conducted by five project partners across five countries and eight distinct locations. Partners engaged a total of 259 participants, 238 of whom were fishers, both large-scale and small-scale (see Table 1) and 21 included Spanish representatives from marine conservation organizations, students and trainees from maritime training institutions.

To maximize participation, nearly all workshops were scheduled during the autumn and winter months, when fishing activity typically slows down. Although each workshop was designed as a stand-alone module, it was flexible enough to adapt to local specificities, needs and the availability of fishers. In Spain, Croatia and Malta, sessions were concentrated on single days to minimize disruption to the fishers' activities. In Portugal and Italy, the workshops were divided into two half-day sessions. In Spain, a large-scale session targeting industrial fishers was held online to further facilitate attendance and overcome logistical and availability challenges. Fishers were invited via email with follow-up calls. Table 1 presents a detailed list of workshops locations and attendance.

Table 1. Location, date, and attendance of the awareness actions with fishers.

Country	Organising Partner	Location	Date	No. of Participants	Large-Scale (LSF) or Small-Scale Fleet (SSF)
Portugal	APMSHM	Matosinhos	04/10/2024 09/10/2024	24	22 LSF + 2 SSF
Portugal	APMSHM	Peniche	27/12/2024 30/12/2024	39	LSF
Spain	ARVI	Online	28/11/2024	78 (57 fishers + other stakeholders)	57 LSF
Spain	ARVI	Santa Pola, Alicante	10/09/2024	21	SSF
Italy	WWF Italia	Patti, Sicily	28/01/2025 25/05/2025 17/07/2025	30	SSF
Croatia	WWF Adria	Tribunj port	21/01/2025	8	8 LSF
Croatia	WWF Adria	Brižine port - Kaštel Sućurac	22/01/2025	14	13 LSF + 1 SSF
Croatia	WWF Adria	Gaženica port - Zadar	04/06/2025	11	11 LSF
Malta	ARM/MAFA	Zejtun	02/04/2025	34	SSF

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The sessions were structured to begin with a seminar on marine litter, followed by group exercises and interactive discussions. These activities provided participants with opportunities to share their experiences, practices, and challenges related to marine pollution and sustainable fishing.

All materials used for the workshops have been translated in all project languages and are available here. For detailed information, please refer to document D2.1.

The first workshop served as an introductory seminar focusing on the environmental impacts of ocean pollution. It emphasized the fishing sector's role in addressing marine litter, detailing pollution sources, its effects on ecosystems and fisheries, and relevant regulatory frameworks.

In the second workshop, fishers engaged in hands-on group exercises. They identified types of marine litter generated on board, classified how these items were disposed of (either at sea or onshore), and proposed measures to reduce litter. A SWOT analysis helped assess the feasibility of these measures, considering internal and external factors.

The third workshop explored the full waste management chain. Participants categorized litter types found in nets and tracked their disposal routes. They also suggested further actions and ideas for broader dissemination.

Workshop four focused on bycatch—unintentional capture of non-target species—and its impact on marine biodiversity. Through interactive sessions, fishers identified frequently caught species, discussed reduction strategies, analysed current protocols, and explored ways to promote best practices and leadership in conservation.

The fifth aimed to raise awareness about reducing the environmental footprint of fishing, particularly greenhouse gas emissions and plastic use. The sixth workshop provided the opportunity for collaborative discussions on innovative solutions from the NETTAG+ project, including technologies to prevent gear loss and mitigate the effects of abandoned fishing gear.

At the end of the workshops, participants were asked to fill a short evaluation form aimed to collect both quantitative and qualitative feedback to improve future sessions. It employed a 1-to-4 Likert scale to assess aspects such as venue comfort, content relevance and clarity, workshop pacing, and instructor performance. Additionally, open-ended questions invited participants to share what they liked most and least about the workshop, allowing for more personalized insights. Participants had the option to submit the form anonymously or include their name.

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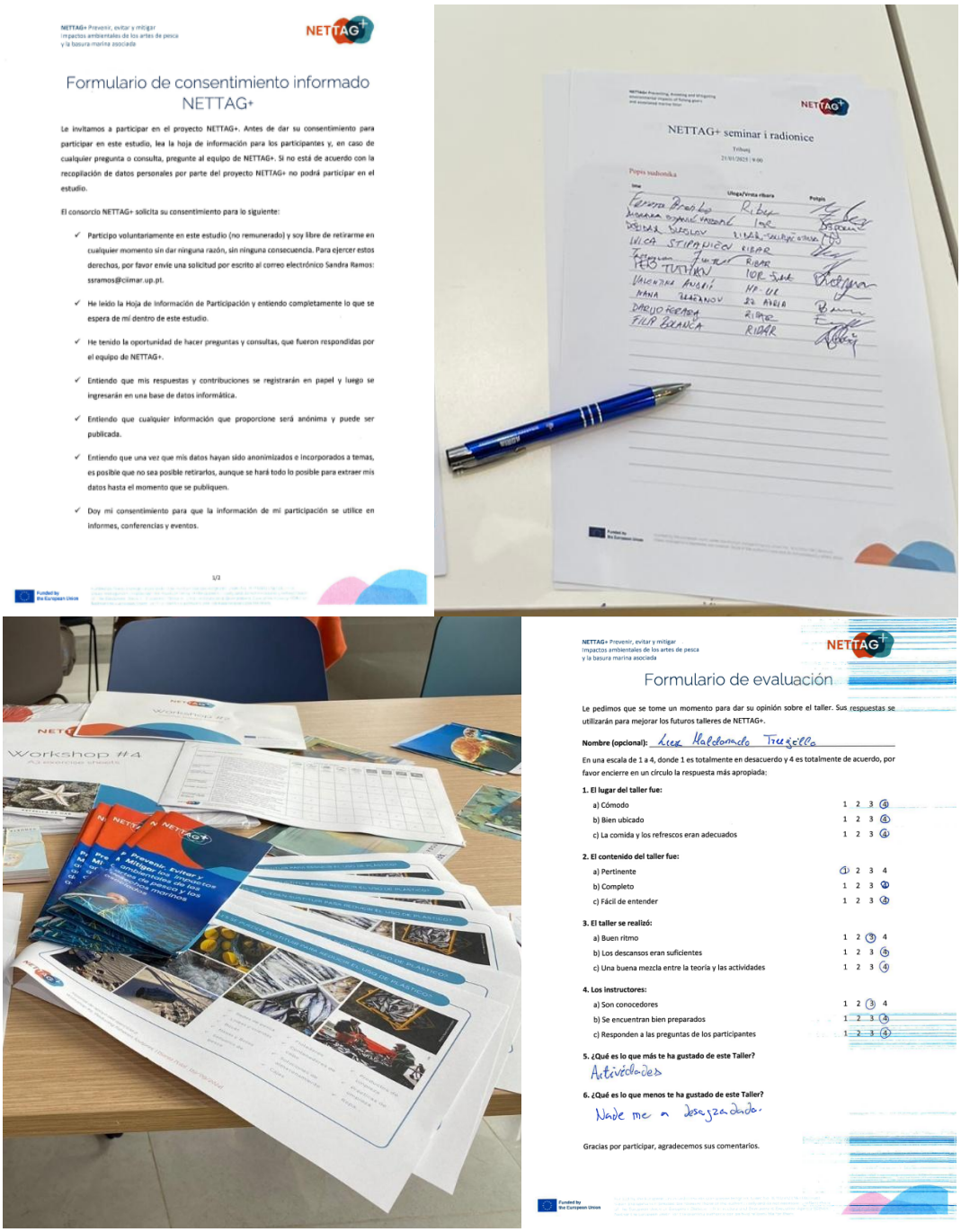
In accordance with ethical approval obtained through the USC Bioethics Committee, Code 77/2023, participants were asked to sign a consent form confirming their voluntary attendance at the workshops and authorising the capture and use of photographs, as well as the use of workshop outcomes by the project partners. They also received printed copies of the workshop materials and the NETTAG+ informational leaflet.



NETTAG+ Prevenir, evitar y mitigar impactos ambientales de los artes de pesca y la basura marina asociada

Formulario de consentimiento informado NETTAG+

Le invitamos a participar en el proyecto NETTAG+. Antes de dar su consentimiento para participar en este estudio, lea la hoja de información para los participantes y, en caso de cualquier pregunta o consulta, pregunte al equipo de NETTAG+. Si no está de acuerdo con la recopilación de datos personales por parte del proyecto NETTAG+ no podrá participar en el estudio.

El consorcio NETTAG+ solicita su consentimiento para lo siguiente:

- ✓ Participo voluntariamente en este estudio (no remunerado) y soy libre de retirarme en cualquier momento sin dar ninguna razón, sin ninguna consecuencia. Para ejercer estos derechos, por favor envíe una solicitud por escrito al correo electrónico Sandra Ramos: ssramos@ciimar.up.pt.
- ✓ He leído la Hoja de Información de Participación y entiendo completamente lo que se espera de mí dentro de este estudio.
- ✓ He tenido la oportunidad de hacer preguntas y consultas, que fueron respondidas por el equipo de NETTAG+.
- ✓ Entiendo que mis respuestas y contribuciones se registrarán en papel y luego se ingresarán en una base de datos informática.
- ✓ Entiendo que cualquier información que proporcione será anónima y puede ser publicada.
- ✓ Entiendo que una vez que mis datos hayan sido anonimizados e incorporados a temas, es posible que no sea posible retirarlos, aunque se hará todo lo posible para extraer mis datos hasta el momento que se publiquen.
- ✓ Doy mi consentimiento para que la información de mi participación se utilice en informes, conferencias y eventos.

1/2

NETTAG+ seminar i radionice

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Workshop #4

NETTAG+ Prevenir, evitar y mitigar impactos ambientales de los artes de pesca y la basura marina asociada

Formulario de evaluación

Le pedimos que se tome un momento para dar su opinión sobre el taller. Sus respuestas se utilizarán para mejorar los futuros talleres de NETTAG+.

Nombre (opcional): Luis Maldonado Trujillo

En una escala de 1 a 4, donde 1 es totalmente en desacuerdo y 4 es totalmente de acuerdo, por favor encierre en un círculo la respuesta más apropiada:

1. El lugar del taller fue:
- a) Cómodo 1 2 3 4
- b) Bien ubicado 1 2 3 4
- c) La comida y los refrescos eran adecuados 1 2 3 4

2. El contenido del taller fue:
- a) Pertinente 1 2 3 4
- b) Completo 1 2 3 4
- c) Fácil de entender 1 2 3 4

3. El taller se realizó:
- a) Buen ritmo 1 2 3 4
- b) Los descansos eran suficientes 1 2 3 4
- c) Una buena mezcla entre la teoría y las actividades 1 2 3 4

4. Los instructores:
- a) Son conocedores 1 2 3 4
- b) Se encuentran bien preparados 1 2 3 4
- c) Responden a las preguntas de los participantes 1 2 3 4

5. ¿Qué es lo que más te ha gustado de este Taller?
Actividades

6. ¿Qué es lo que menos te ha gustado de este Taller?
Nada me ha desagradado.

Gracias por participar, agradecemos sus comentarios.

Figure 1. From top left: consent and attendance forms; bottom: workshop materials and evaluation form ©APMSHM, ©WWF Adria, ©ARVI

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3 Workshop results

3.1 Workshop 1 - Seminar on marine litter

Figure 2. Fishers from Matoshinos (PT) attending the 1st workshops, 4 October 2024 ©APMSHM

Fishers from **Portugal** actively participated in the discussion, sharing insights into their current waste management practices and proposing suggestions to improve the implementation of best practices to prevent and reduce marine litter derived from fisheries. In Peniche, participants noted that, while efforts are made to retrieve lost nets, the recovery of traps and pots remains challenging due to the lack of effective tracking systems. Marine litter entangled in fishing gear was identified as a recurring issue, with many fishers already collecting such waste and bringing it back to port. However, they highlighted that port waste management infrastructure is insufficient to support these efforts.

In **Spain**, participants demonstrated a high level of motivation and awareness regarding the issue of marine litter. They expressed strong support for the NETTAG+ project and showed particular interest in its proposed solutions—especially the innovative technologies aimed at detecting and recovering ghost nets.

In **Croatia**, the workshops revealed a nuanced understanding of the challenges and opportunities within different fishing communities. In Tribunj, fishers were already familiar with many of the topics discussed, but the recycling of end-of-life (EOL) gear sparked particular interest. Their engagement was notably supported by the Fishers Cooperative Adria, which plays a vital role in promoting sustainable practices. Fishers expressed a strong desire for recognition of their sustainable efforts and voiced support for ongoing End-Of-Life (EOL) gear recycling at Gaženica port. They also highlighted the

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uniqueness of their local challenges, advocating for tailored solutions rather than one-size-fits-all approaches.

Figure 3. Fishers from Brižine (Kaštel Sućurac) (HR) attending the 1st workshops, 22 October 2024 ©WWF Adria

Meanwhile, in Brižine (Kaštel Sućurac), fishers pointed to the lack of public awareness about the land-based origins of much marine litter. The local Fishing Cooperative Friška Riba was praised for its support, and the workshop provided a valuable space for fishers to voice not only their environmental concerns but also broader issues affecting their daily work.

In **Malta**, the workshop prompted critical reflection among fishers, particularly regarding the data presented. Some questioned the accuracy of degradation timelines for longline hooks, noting that non-stainless steel hooks corrode much faster than suggested. There was a sense among some participants that the seminar content was overly critical of fishing practices, rather than being framed in a supportive or collaborative tone. This feedback underscored the importance of framing environmental discussions in a way that acknowledges and respects the lived experiences of fishers.

In **Italy**, the workshop resonated deeply with fishers who are acutely aware of the impacts of marine pollution. Their daily work is directly affected by floating debris and the broader consequences of climate change, including damage to gear and declining fish populations. These firsthand experiences have cultivated a strong environmental consciousness and a genuine commitment to protecting the marine ecosystem. The workshop served not only as an educational session but also as a space for fishers to share their stories and reaffirm their dedication to sustainable fishing.

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Figure 4. Fishers from Santa Pola (ES) attending the 1st workshops on 19 September 2024 ©ARVI

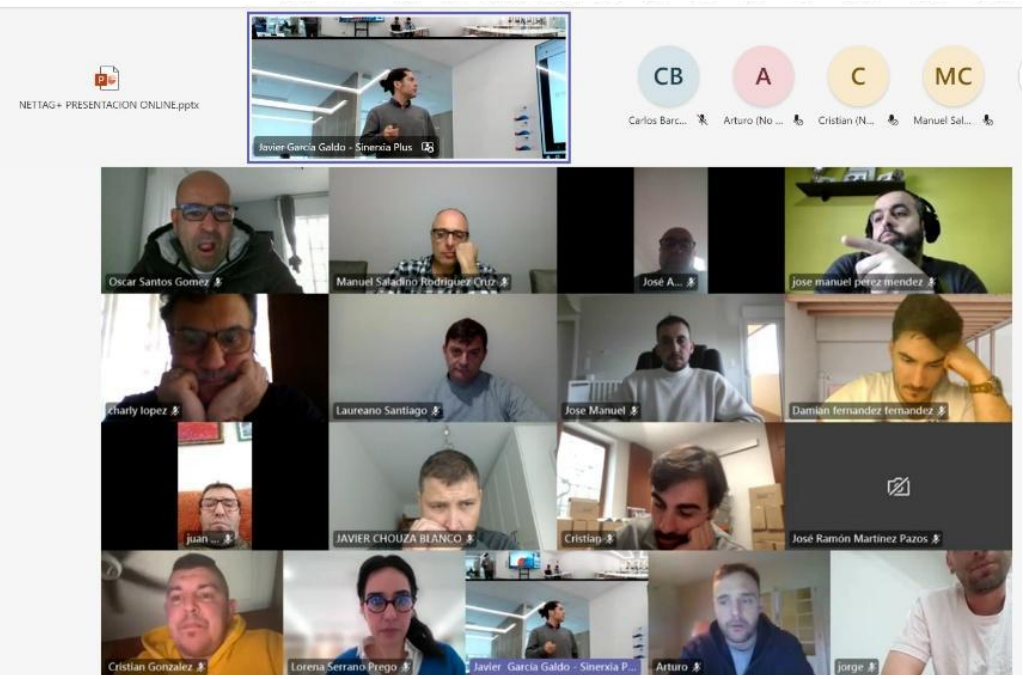

Figure 5. Spanish representatives of industrial fisheries attending the online workshop on 26 November 2024 ©ARVI

Overall, participants from all countries showed high environmental awareness and a willingness to adopt sustainable practices. They appreciated the opportunity to share experiences and collaborate, but some raised concerns about the framing of discussions, with some feeling unfairly portrayed as polluters. In particular, fishers expressed readiness to contribute to marine conservation if supported with practical tools, fair policies, and institutional backing.

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3.2 Workshop 2 - Marine litter produced onboard

Figure 6. Fishers from Peniche (PT) working on the 2nd workshop, 27 December 2024 ©APMSHM

Portuguese fishers from Matosinhos and Peniche categorized marine litter into organic, recyclable, and hazardous types, revealing varied definitions of what constitutes waste. While most avoided discarding litter at sea, items like food scraps and paper were often not considered litter and were routinely thrown overboard. Cigarette butts were widely recognized as litter, but still occasionally discarded. Fishers frequently retrieved debris caught in their gear and brought it ashore, though recycling was not practiced.

In **Spain**, online participants identified common litter types such as plastic bags, aluminium cans, fishing gear, and biodegradable materials. There was broad recognition of the importance of reducing marine litter to protect marine ecosystems. Small-scale fishers from Santa Pola largely agreed on what constitutes litter, though some items like fishing materials and food packaging were classified differently, reflecting diverse perceptions.

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Figure 7. Fishers from Santa Pola (ES) working on the 2nd workshop, 22 October 2024 ©ARVI

In **Italy**, fishers actively participated in group discussions but generally did not see themselves as major contributors to marine pollution. Waste was mostly generated during long fishing trips, with disposable items used for convenience. Although they acknowledged the volume of waste produced, switching to reusable materials was considered impractical. Waste management practices varied: some fishers recycled at home, while others disposed of mixed waste without sorting. The lack of designated waste collection areas and organized systems at ports made onboard waste separation difficult. Environmental conditions, such as strong southern winds and urban runoff, were also seen as contributing to marine litter. Fishers expressed a willingness to improve practices but emphasized the need for better infrastructure and clearer guidelines.

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Figure 8. Fishers from Patti, Sicily (IT) working on the 2nd workshop, 3 February 2025 ©WWF Italia

In **Malta**, exercises revealed a strong consensus on litter classification, with synthetic items like plastic bags, bottles, and cigarette butts unanimously marked as litter. Natural items such as fruit waste, wood, and marine species were generally not considered litter. Confusion around items like gloves and boots indicated a need for clearer guidelines distinguishing waste from usable equipment. Most litter was brought ashore, though organic waste was often discarded at sea. Final disposal typically involved general garbage containers, with some recyclable items sent for recycling. Fishers proposed several improvements, including more secure waste containers at ports, better access to waste services, distribution of free garbage bags, and incentive-based systems. Education and outreach were also emphasized as key to fostering better waste management practices.

In **Croatia**, fishers from Brižine, Gaženica, and Tribunj ports showed a good understanding of responsible versus irresponsible behaviour regarding marine litter, like the need to collect litter that is clearly not supposed to be in the sea like plastic items, but also electronic items or tyres that are often found. However, disagreements over what should be brought back to port versus discarded at sea (e.g. how to dispose of non-biodegradable waste like cigarette butts and paper tissues) highlighted the need for continued awareness efforts. Participants voiced concerns about weak enforcement and the absence of consequences for littering, which undermines responsible practices. Many felt their voices

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were not adequately heard by local and national authorities. Support from cooperatives like Friška Riba was seen as crucial, and fishers called for stronger international cooperation, especially between Croatia and Italy, to address shared marine litter challenges.

Figure 9. Fishers from Tribunj (HR) working on the 2nd workshop, 21 January 2025 ©WWF Adria

Overall, the exercises highlighted common challenges across regions, including inconsistent litter classification, limited port infrastructure for litter management, weak enforcement, and logistical barriers to proper waste disposal. Despite these challenges, fishers in all countries expressed a willingness to engage in solutions, provided they are supported by practical measures, clear guidelines, and stronger institutional backing.

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3.3 Workshop 3 - Marine litter collected by fishing gears

Table 2. Reported items most often caught in nets in Spain, Portugal and Italy

	Spain	Portugal	Italy
Domestic litter	-Plastic bags -Plastic bottles -Cans -Yogurt container -Food scraps -Aluminium foil	-Shipping bags -Plastic bottles -Food containers -Scrap metals -Organic waste -Toilet paper -Cigarette butts -Glass bottles -Plastic containers -Mobile phones	-Plastic bags -Plastic bottles -Yogurt cups -Aluminum food containers -Cans -Glass bottles -Face towels -Aluminium foil -Sanitary napkins -Soaps -Flip flops -Shoes
Fisheries debris	-Fragments of nets -Ropes -Hooks -Traps and pots -Fishing floats	-Fragments of nets -Ropes -Hooks -Rubber boots -Plastic gloves -Fishing gear -Fish traps and pots -Styrofoam boxes	-Styrofoam boxes -Old fishing nets -Buoys -Traps and pots -Boat motors -Longlines -Recreational fishing nets -Artificial lines -FAD wire -Plastic boots -Plastic gloves
Other	-Tyres -Umbrellas -Broken smartphones -Cigarette butts -Oils -Paint cans -Straw bale (for livestock) -Washing machines -Bicycles	-Starfish -Sea turtles -Microalgae -Bicycles -Pine trees -Fridges -Wood -Baby seats -Chairs	-Car tyres -Animal carcasses -Algae -Wood logs

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In **Portugal**, discussions in Matosinhos and Peniche revealed that fishers frequently find domestic and plastic waste—such as food containers, plastic bags, bottles, and remnants of fishing gear—entangled in their nets. While most dispose of this waste at port facilities, they expressed frustration with the lack of dedicated collection points and the absence of incentive systems.

In **Spain**, participants stressed the need for better port infrastructure for litter management and awareness-raising campaigns.

In **Italy,** fishers reported that much of the waste passively caught in their nets or floating nearby consists of lightweight plastics, sanitary napkins, and absorbent materials. They traced much of this pollution to rivers and streams that carry untreated or poorly filtered waste into coastal waters, highlighting insufficient sewage treatment as a major factor. The most common items encountered were plastic bags, bottles, fragmented plastic debris, as well as styrofoam boxes used for storing fish. Each vessel carries between 70 and 200 of these boxes, and many are lost or discarded at sea, significantly contributing to marine litter. Alongside plastics, fishers also noted urban waste such as shoes, flip-flops, and packaging materials, particularly after rainfall when runoff washes debris into the sea. Entanglement of fishing lines and nets with plastic waste not only damages gear but forces fishers to dispose of it as mixed waste on land, increasing operational costs and complicating recycling. To address these problems, participants recommended reducing styrofoam use, introducing biodegradable or recyclable alternatives, and improving waste management along rivers and coastal zones.

In **Malta**, fishers described a wide variety of waste passively caught in nets, ranging from plastics, ropes, and containers to unusual items such as deck chairs, tyres, and even World War II artifacts. They also distinguished between items thrown back into the sea, such as organic matter and bycatch, and those brought to shore, recycled, or discarded in general garbage containers. Many pointed to the lack of disposal facilities in ports, particularly skips large enough for ropes, wood, and bulky plastics. Suggestions for further action included creating special waste permits, improving access to disposal facilities, coordinating clean-ups, and developing mobile apps to report litter. On dissemination, fishers proposed spreading awareness through social media, education, and fisher-to-fisher communication, while also expressing willingness to share data if authorities respond promptly and meaningfully.

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Table 3. Reported items most often caught in nets in Malta and Croatia

	Malta	Croatia
Domestic litter	-Garbage bags -Ropes boiler suits -Plastic -Clothes -Sunglasses	-Bottles -Tetrapack containers -Sponges -Food wrappings -Plastic cutlery -Cigarette butts -Plastic bottles -Rubber
Fisheries debris	-Ropes -Fishing lines -Hooks -Fishing braid -Dead tuna -Broken pots	-Aquaculture gear -Fishing nets -Hooks -Plastic boxes -Styrofoam boxes -Plastic boots -Plastic gloves
Other	-Cargo containers -Abandoned boats -Dead livestock -Balloons -Hose pipes -Oil barrels -Metal -Reeds -Trees -World War II artifacts	-Starfish -Sea turtles -Microalgae -Bicycles -Pine trees -Fridges -Wood -Baby seats -Chairs

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Figure 10. Fishers from Malta working on the 3rd workshop, 08 April 2025 ©ARM

In **Croatia**, the situation varied across different ports. Fishers from Gaženica port Zada, highlighted that while waste management in major ports is generally under control, smaller ports still struggle with limited or overflowing container access, hindering proper disposal. Despite these obstacles, the fishers participating in the workshop remain engaged and open to solutions, particularly the recycling of end-of-life fishing gear. Participants emphasized the importance of clearer communication from institutions and more consistent regulation to build trust and ensure sustainable practices. In Brizine, a recurring concern was the lack of facilities for disposing of either passively collected waste or litter generated on board, with many pointing to unsustainable tourism as a major source of marine debris. While fishers welcomed the idea of financial compensation for recycling old gear, they were concerned about possible additional costs.

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Figure 11. Fishers from Gaženica Zadar (HR) working on the 3rd workshop, 4 June 2025 ©WWF Adria

Taken together, the workshops paint a picture of fishing communities deeply aware of the environmental and operational challenges caused by marine litter. Participants indicate being willing to be part of the solution, but face obstacles ranging from inadequate port infrastructure for litter management and inconsistent regulation to high operational costs. The proposals that resonated most strongly across all locations revolved around better waste collection systems and stronger collaboration between fishers, authorities, and local communities. The insights underscore the need for both upstream interventions, such as improved river and urban waste management, and downstream measures, including port infrastructure upgrades.

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3.4 Workshop 4 - Sustainable practices: bycatch reduction and marine conservation

Table 4. Reported bycatch species most commonly caught and the associated fishing gear across all workshops

	Species	Fishing gear
Bycatch species most frequently captured and associated fishing gear	-Marine mammals	-Purse seine, trammel nets, gillnets
	-Seabirds	-Trammel nets, longlines, set lines, gillnets
	-Sharks	-Trammel nets, trawl nets
	-Pelagic sharks (esp.blue shark, shortfin mako, porbeagle)	-Long lines, set lines
	-Small spotted catsharks	-Trawl nets, trammel nets
	-Corals	-Trawl nets, Trammel nets
	-Sea sponges	-Trawl nets
	-Turtles	-Trawl nets
	-Rays	-Purse seine
	-Electric rays	-Trawl nets, trammel nets

In **Portugal**, many fishers expressed the view that their practices did not pose a significant threat to non-target species. Since most were engaged in multi-species fishing, they reported that it was rare for species other than their intended catch to appear. Nonetheless, participants from Peniche identified small pelagic fish and sea turtles as the most frequent bycatch, typically released alive but rarely reported. The discussion highlighted bottom trawl and purse seine fishing, particularly targeting sardines, as the method most prone to higher levels of bycatch. Fishers explained that because this method targets dense schools of fish, dolphins and other species feeding in the same areas often become entangled. This underscored both the ecological risks and the limitations of current fishing technologies. Participants emphasized the need for better education, spatial restrictions to protect vulnerable areas, and standardised reporting protocols.

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Figure 12. Fishers from Matoshinos (PT) working on the 4th workshop, 9 October 2024 ©APMSHM

The **Spanish** workshop held in Santa Pola revealed a clear commitment among fishers to reducing bycatch, but it also showed that practices vary across regions and fishing methods. Participants agreed that measures such as pingers and escape hatches could be highly effective, but they also stressed that widespread adoption would require financial support. Many fishers expressed hesitation about reporting bycatch, citing concerns about penalties. Instead, they advocated for incentive-based approaches to encourage transparency and compliance, rather than punitive measures. Fishers participating in the online session broadened the conversation by introducing a range of suggestions drawn from international perspectives. Participants proposed the use of bird-scaring devices such as Tori lines, the adoption of selective fishing gear with larger mesh sizes and escape panels, and the integration of technological innovations like GPS for recovering lost gear and real-time monitoring systems. Participants also emphasized the role of marine protected areas as a long-term measure to safeguard vulnerable species.

In Patti (**Italy**), fishers recognized the ecological value of reducing bycatch and understood the link to healthier marine ecosystems. However, they pointed to the practical challenges of implementing changes, particularly the costs of gear adaptation and the fear that such modifications could reduce catch efficiency. The session highlighted a strong need for more technical support and targeted training, as well as financial mechanisms to offset the burden on fishers.

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Table 5. Summary of the measures proposed by participants in Spain and Portugal, along with potential implementation approaches and obstacles.

	Spain	Portugal
Measures to reduce bycatch	-Windows in net, pingers, tori lines. -Placing signals to deter unwanted species, install escape hatches or windows in trawl nets. -Acoustic devices to scare away species. -New fishing gear designs. -Extra weights on hooks. -Scarecrows. -Banning more destructive fishing gear.	-Acoustic device, parrot, tori lines. -Cast the net without sharks and dolphins. -Do not drag in areas with corals & ban casting nets for more than one night in this type of seabed. -Avoid throwing fish remains when casting into the sea.
How to implement the selected measures	-Subsidies. -Sanctions. -Tighten the regulatory framework. -Controls. -Informing the sector and fishing school students.	-EU financing program for all vessels. -Provide information on this type of measures. -Appeal to the awareness of fishermen (masters).
Strengths		-Identify easy to implement measures that have no costs.
Weaknesses		-Increased marine populations.
Opportunities		-Greater species diversity.
Threats		-Unfunded programs.

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Figure 13. Fishers from Malta working on the 4th workshop, 8 April 2025 ©ARM

In **Malta**, participants identified sea turtles, seabirds, sharks, corals, sponges, and marine mammals as the most frequently caught as bycatch. Longlines, trawls and trammel nets emerged as the gears most associated with these incidental captures. While turtles and seabirds were cited as the most frequently caught, participants also noted encounters with endangered corals and sharks, underscoring the conservation stakes involved. In discussions about best practices, participants suggested measures such as deploying longlines at night to avoid seabirds, using deterrents to keep birds away, modifying hooks and bait, and observing seasonal closures. Some groups admitted that they had not implemented any measures so far, largely because they perceived bycatch as relatively low in their operations. Protocols for handling bycatch varied. Many fishers described releasing animals quickly and with minimal harm, often cutting lines to free entangled species. However, formal reporting was inconsistent. Some fishers informed the Maltese conservation NGO Nature Trust, while others avoided reporting altogether, citing fear of penalties or a lack of clarity about procedures. Participants suggested developing clear protocols, including systems that would avoid punishing fishers for transparent reporting. Proposals also emerged for distributing discarded bycatch to organizations such as Fondazzjoni San Pietru for food aid. The final exercise on dissemination highlighted the importance of peer-to-peer communication. Many participants saw leadership emerging from within fishing communities, with individual fishers acting as champions for sustainable practices.

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Across all three ports of **Croatia** - Gaženica, Brižine, and Tribunj - a common theme emerged: fishers recognized the value of reducing bycatch for the health of marine ecosystems, yet they emphasized the need for more education, clearer guidance, and supportive policies. In Gaženica, discussions revealed apprehension about the economic burden that bycatch reduction measures could impose. Many feared that modifying gear to reduce bycatch would come with high upfront costs and might compromise the capture of target species. Similar concerns were raised in Brižine, where fishers highlighted the importance of receiving reliable information from the Institute of Oceanography and Fisheries (IOR) and other relevant authorities. They felt strongly that fishers should not be punished for bycatch when they operate within legal limits; rather, supportive mechanisms such as subsidies or compensation schemes would be more effective. The session in Tribunj reinforced these points. Fishers there reiterated their openness to learning about bycatch reduction and their recognition of its benefits for biodiversity. At the same time, they echoed worries about gear modifications and potential losses to their primary catch. The workshops across Croatia demonstrated a widespread interest in knowledge-sharing and a desire for solutions that balance ecological responsibility with economic viability.

Table 6. Summary of the measures proposed by participants in Italy, Malta and Croatia along with potential implementation approaches and obstacles.

	Italy	Malta	Croatia
Measures to reduce bycatch	-Temporal and spatial closures. -Modification of fishing gear. -Testing excluder devices.	-Deploying the longlines from the side of the boat instead of the back. This allows the baited hooks to submerge more quickly, preventing seabirds from reaching them. -Deploying the longlines during the night to minimize the risk of seabird bycatch. -Close season. -Tying a ball and dragging it behind the boat to deter seabirds. -Using artificial bait, such as plastic bait. -Using different hooks.	-Fishing net modifications. -Closing migratory routes for a specific period.

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	Italy	Malta	Croatia
How to implement the selected measures	-Development of management plans. -Support from local associations. -Fisheries funds.	-Good compensation programs for fishers.	-Sharing information through Fishing Cooperative. -Collaboration with scientists.
Strengths	-Receiving sustainability certifications. -Improved ecosystems.	-Reducing bycatch.	-Enhancing sustainability certification. -Economic Benefits – -Reducing bycatch means higher efficiency and less wasted effort in sorting catches.
Weaknesses	-Lower income and time costs in testing new practices. -Risk of reducing catches.	-Awareness is needed.	-Time consuming. -Difficulties in monitoring compliance. -Some measures may work better in certain areas or seasons than others. -Resistance from older fishers.
Opportunities	-Recovering fish stocks and ecosystems. -Higher price for fish.	-Compensation for fishers to reduce their fishing time. -Providing financial support for adopting fishing gear designed to avoid bycatch.	-Consumer Demand for Sustainable Seafood. -Collaboration with NGOs. -EU Funding and Support projects.
Threats	-Financial losses.	These measures can have a negative impact on fishers by reducing income.	

Across all workshops, there was consensus on the importance of addressing bycatch as a critical issue for marine biodiversity, but the financial and operational burdens of implementing measures and fear of penalties were identified as significant obstacles, pointing to the need for clearer protocols, supportive regulations, and incentive schemes. Overall, the workshops revealed both challenges and opportunities. Fishers demonstrated willingness to engage with conservation goals but consistently asked for financial support, technical training, and fair policies to help them transition towards more sustainable practices.

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3.5 Workshop 5 - Reducing fisheries footprint

Table 7. Measures proposed by participants to reduce GHG emissions along with potential implementation approaches.

	Spain	Portugal
Measures to reduce GHG emissions	-Solar panels onboard with storage batteries. -Electric windmills. -Hybrid boats. -Hybrid engines. -Particle filters. -Optimized boat hulls to reduce drag force. -Flying drag doors. -Flying doors. -New boats. -Transition from oil or gas-powered boats to cleaner alternatives. -Improve selectivity to reduce fishing effort.	-Replace current engines with more efficient ones. -Use cleaner diesel. -Build new vessels with better conditions to implement solar panels and electric motors. -Authorise the use of more powerful engines so that we can sail slowly, or at the same speed and pollute less.
How to implement the selected measures	-Aid to help fishers carry out necessary changes. -Combine grants with knowledge-sharing and new constructions to support implementation. -Invest in research to reduce the cost of new motors.	-Financial support programs. -Change our fishing fleet, as our fleet is very outdated. -Projects supported by community funds.

In **Portugal**, discussions in Peniche and Matoshinos centered on how vessel operations and maintenance can significantly influence emissions. Participants recognized that simple adjustments to fuel use and engine management could deliver immediate benefits in reducing greenhouse gas emissions. Opinions were divided, however, on the replacement of fishing gear. Some participants argued that the current gear lacks viable alternatives, while others insisted that environmentally friendly options must be developed and adopted. Alongside these debates, there was consensus on the urgent need for more efficient vessel designs and low-emission engines. Many fishers stressed that

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financial support would be essential to replace outdated equipment and adopt greener technologies. They concluded that although knowledge of pollution prevention already exists, the gap lies in implementation, which can only be addressed through stronger and better-funded initiatives.

In **Spain**, small-scale fishers from Santa Pola expressed strong support for replacing traditional fishing gear with eco-friendly alternatives but raised concerns over costs and durability. Incentive programs were seen as important to accelerate adoption. Meanwhile, the online group discussion added a broader perspective, calling for stricter regulation, onboard waste management, and more awareness-raising campaigns. Many fishers stressed that EU regulations already demand high levels of sustainability, yet they face unfair competition from unregulated fleets, particularly from Asia, which were said to operate with subsidies, exploit labor, and disregard environmental standards. This discrepancy was seen as undermining the competitiveness of EU fishers who comply with sustainability rules.

In **Italy**, participants displayed enthusiasm for exploring innovative practices, provided these did not compromise efficiency and reliability. The discussion covered a wide range of potential solutions, from biodiesel fuels and vegetable-based hydraulic oils to more efficient propellers and hull designs. While practical challenges were raised—including the operational limitations of certain technologies—participants acknowledged the long-term potential of these innovations to lower fuel consumption and operating costs. They also highlighted reputational benefits, suggesting that positioning the sector as sustainable could improve access to green seafood markets. Financial concerns, however, remained a barrier. Participants pointed to delays and gaps in subsidy coverage and argued that collective organization would be essential to gain influence in funding negotiations. Despite these challenges, rising fuel costs, stricter regulations, and growing awareness of climate impacts were seen as strong motivators to change.

Table 8. Measures proposed by participants to reduce GHG emissions along with potential implementation approaches.

	Italy	Malta	Croatia
Measures to reduce GHG emissions	-Use of Biodiesel. -Use of vegetable hydraulic oil. -Sustainable hulling. -Efficient propellers. -Stern flaps.	-Upgrading to modern boat engines (e.g., Euro 5 models with injectors and ECU). -Enhancing boat engines for better performance and efficiency. -Using cleaner diesel and alternative cleaner fuel options.	-New hybrid vessels. -Adopt renewable energy. -Optimize engine performance.

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	Italy	Malta	Croatia
		-Introducing outboard motors for full-time and part-time fishers. -Reducing or optimizing cruising speed. -Meticulous planning of fishing trips to reduce fuel use and environmental impact. - Installing solar panels on vessels - Improving electrical systems on boats - Upgrading freezers to eco-friendly models - Replacing old fishing boats with modern ones - Transitioning from wooden boats to fiberglass vessels - Adopting advanced hull designs (e.g., catamarans) to enhance efficiency and sustainability.	
How to implement the selected measures	-EU Fisheries Funding opportunities. -More cooperation among fishers to be more influential.	-Provide simple and accessible incentives to support upgrades. -Implement government schemes to promote adoption of new technologies. -Develop programs that help fishers upgrade equipment and systems. -Ensure incentives are easy to use and apply.	-Buying new engines or whole vessels if needed. -Use of EU funds.

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Figure 14. Fishers from Malta working on the 5th workshop, 8 April 2025 ©ARM

Fishers in **Malta** expressed strong interest in reducing greenhouse gas emissions and adopting environmentally friendly practices, emphasizing solutions that are both practical and financially viable. Key approaches included upgrading engines, using cleaner fuels, optimizing cruising speeds, and integrating renewable energy, such as solar panels. Transitioning from wooden to fiberglass boats and using outboard engines were also seen as promising measures. Participants stressed that accessible government funding and support would be essential to implement these changes effectively. In terms of materials, fishers highlighted alternatives such as cork floaters instead of plastic, wooden boxes instead of styrofoam, and biodegradable nets, ropes, and lures, along with innovative options like clay pots for octopus traps. Communication and leadership were also emphasized, with fisher-to-fisher sharing, social media, and workshops identified as key tools for spreading sustainable practices. Supporting youth in the sector and leveraging NGOs, Aquatic Resources Malta, and fishing cooperatives were seen as essential to drive long-term change. Overall, fishers showed a clear willingness to transition to greener practices, provided they receive sufficient financial and technical support.

The workshops in **Croatia** showed that fishers are open to sustainable practices but remain cautious, with concerns largely centered on cost, durability, and regulatory complexity. At Gaženica port in Zadar, participants expressed interest in eco-friendly gear but insisted it must match current tools in efficiency and quality. They noted that examples from other EU fishers would help build confidence

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and reduce hesitation. While EU funds were seen as valuable, many argued that they do not fully cover transition costs and often require upfront investment. Fishers also asked for clearer guidance on how to deal with still-usable old nets when adopting eco-friendly replacements. At Brižine port, discussions focused on cost efficiency and the complexity of accessing EU subsidies. Concerns were also raised about the lack of skilled professionals to repair increasingly specialized vessels, which could make adopting new technologies more challenging. In Tribunj, participants repeated concerns about costs and durability while also highlighting the challenge of adapting to rapidly changing regulations. They felt the government should play a stronger role in supporting fishers through transitions, both financially and by ensuring regulatory changes are communicated clearly and in time.

Overall, the workshop showed that fishers are aware of and willing to adopt a variety of greener practices but face significant challenges in doing so. Financial barriers, questions of efficiency and durability, and bureaucratic hurdles in accessing subsidies were recurring concerns. Accessible funding, technical training, regulatory clarity, and fair market competition will therefore be essential to enable fishers to reduce their environmental footprint while ensuring the long-term viability of their livelihoods.

3.6 Workshop 6 - NETTAG+ solutions

In **Portugal**, the conversation around the Prevent objective was particularly encouraging: awareness-raising initiatives and improved port facilities were all received positively. Under the Avoid objective, however, the reception was more cautious in Matosinhos. Acoustic locators and autonomous vehicles were generally met with neutral assessments, suggesting that these technologies still face a trust or feasibility gap among stakeholders. In Peniche, fishers stressed the need for training, technical support, and pilot projects to test these tools in real fishing conditions. On the Mitigate solution, the detection of lost fishing gear stood out as a promising solution that earned widespread approval, while the robotic tools to locate ALDFG were viewed as unrealistic in the short term due to high costs and maintenance demands. Fishers from Peniche agreed that transitioning to sustainable materials and technologies is technically feasible but economically challenging.

In **Spain**, among the Prevent strategies, Port Facilities & Plans were well received, especially for their role in improving waste management, though limited space and high maintenance costs were noted as challenges. Awareness Actions were appreciated for promoting responsible fishing, but their impact was seen as limited without consistent outreach and broader engagement. In the Avoid category, Acoustic Tags were acknowledged for their role in reducing bycatch and protecting vulnerable species.

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Still, their cost and technical complexity were seen as barriers. Autonomous Vehicles were viewed as promising tools for data collection and reducing manual effort, though their dependence on technology and maintenance requirements raised concerns. Under Mitigate, the Detection of Lost Gears solution was valued for its affordability and potential to reduce ghost fishing, but issues such as underwater noise and limited detection range were highlighted. The robotic tools to locate ALDFG was seen as efficient and time-saving, yet its high cost and need for skilled personnel were considered limiting factors. Participants also stressed the need for local community engagement and awareness campaigns to ensure successful implementation. Insights from the online workshop further reinforced the relevance of acoustic deterrents and mapping tools, while highlighting the need for better regulation and training to support adoption.

In **Italy**, the gear-tagging system also drew interest tempered by apprehensions over affordability. Fishers emphasized that they would hesitate to invest in the technology without guaranteed support from public institutions. There were also reservations about the complexity of the equipment, with many underscoring the need for simple, practical tools that could be seamlessly integrated into everyday fishing practices. Nonetheless, Italian participants expressed their willingness to collaborate on reporting ghost gear and to engage in pilot testing of the NETTAG+ solutions, as long as adequate financial and technical backing is ensured.

In **Malta**, participants welcomed initiatives like awareness-raising actions for cleaner seas and better environmental knowledge among fishers, but challenges such as scheduling conflicts and limited communication reach were noted. Suggestions included using media, local events, and incentives to boost participation. Discussions on **port facilities** highlighted their role in improving cleanliness and safety, but issues like overflowing skips and lack of enforcement were raised. Participants recommended more infrastructure, better access to waste services, and dedicated areas for hazardous materials and oil collection. Technologies like acoustic tags, autonomous vehicles, and gear detection tools were explored. While promising, they were often seen as costly, complex, or impractical for daily use. Participants emphasized the need for further testing, financial support, and awareness to make these innovations accessible and effective.

The workshops in **Croatia** revealed both curiosity and cautious optimism among fishers. In Gaženica port in Zadar, many fishers expressed strong interest in the tagging system but were wary of its potential cost, stressing that financial support from the government would be crucial for adoption. Despite these concerns, there was notable readiness to assist in reporting ghost gear sightings to local

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authorities, provided that clear protocols were established to define roles and responsibilities once gear was located at sea. They also voiced hopes that the equipment would be straightforward to use in daily operations. In Brižine port, the discussions were lively and inquisitive. Fishers showed enthusiasm for learning about the NETTAG+ objectives and innovations, yet again raised questions about cost efficiency and the practicality of the devices in various conditions, including battery life and resilience in harsh weather. Many said they would prefer to see real-world demonstrations of the technology before committing to participation. A similar sentiment emerged in Tribunj port, where participants demonstrated openness to collaboration but underscored their concerns about the financial burden of tags without government subsidies. They echoed the call for a well-defined protocol to handle ghost gear once detected, highlighting that no such framework currently exists in Croatia. Across all Croatian workshops, a willingness to cooperate and test new solutions was evident, provided their concerns around costs and operational clarity were addressed.

This final workshop revealed a consistent interest across countries in the NETTAG+ solutions, particularly those aimed at improving sustainability and reducing ghost gear. While awareness programmes were generally well received, technological innovations such as tagging systems and robotic tools to locate ALDFG faced scrutiny regarding cost, usability, and implementation protocols. The feedback underscores the importance of financial support, clear operational guidelines, and user-friendly design in ensuring successful adoption.

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4 Workshops evaluation results

The NETTAG+ workshops were generally well received by participants, who appreciated the opportunity to engage in meaningful discussions and activities related to marine litter and sustainable fishing practices. Many highlighted the value of the theoretical explanations and the chance to share ideas with peers and facilitators. The organization of the workshops, including the venues and logistics, was frequently praised, contributing to a positive overall experience. Participants also noted the relevance of the topics covered and the quality of the information provided, which helped deepen their understanding of the challenges and solutions surrounding marine pollution.

Facilitators were commended for their knowledge and openness, with several participants expressing appreciation for their willingness to listen and respond to real-world concerns. The workshops fostered a collaborative atmosphere, encouraging dialogue among fishers and stakeholders like NGOs and scientists, and creating space for the exchange of practical insights.

Despite the overall positive feedback, some participants felt that the workshops were too long or included too many activities, which led to a sense of fatigue. Others mentioned that certain parts of the content were already familiar to them, suggesting a need for more tailored or advanced material in future sessions. A few attendees expressed concerns about the framing of the discussions, feeling that fishers were portrayed as the primary source of pollution, which they found discouraging.

The need for balance between information delivery and interactive engagement was a recurring theme, as was the importance of ensuring that materials are accessible and relevant to the local context.

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5 Conclusion

The NETTAG+ workshops have demonstrated that fishers across the Mediterranean and North-East Atlantic are aware of the environmental challenges posed by marine litter and ALDFG. More importantly, they are ready to be part of the solution to contribute to the reduction of the problem.

Participants consistently expressed a strong commitment to environmental stewardship, but also highlighted systemic barriers that hinder progress. These include inadequate port infrastructure, unclear waste management protocols and limited access to recycling facilities. Technological innovations introduced by NETTAG+, such as acoustic tags and robotic tools to locate ALDFG, were met with interest, but concerns around cost, usability, and operational integration were common.

Here are some recommendations to overcome these barriers:

- **Strengthen Infrastructure and Services at Ports:** Improve waste collection systems, provide dedicated facilities for recycling fishing gear, and ensure access to secure disposal containers—especially in smaller harbors.
- **Ensure Simplicity and Usability of Technologies:** Design tools that are easy to operate, resilient in harsh conditions, and compatible with daily fishing routines. Support their adoption through training and pilot testing.
- **Develop Clear Protocols and Guidelines:** Establish transparent procedures for reporting ALDFG and bycatch, and clarify roles and responsibilities among fishers, authorities, and port operators.
- **Promote Inclusive Communication and Recognition:** Frame fishers as allies in marine conservation. Foster trust through respectful dialogue, peer-to-peer learning, and public acknowledgment of their contributions.
- **Support Policy Alignment and Market Fairness:** Address regulatory gaps and ensure fair competition within the sector.

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8 Annexes

All NETTAG+ workshop materials from project countries are available HERE.

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