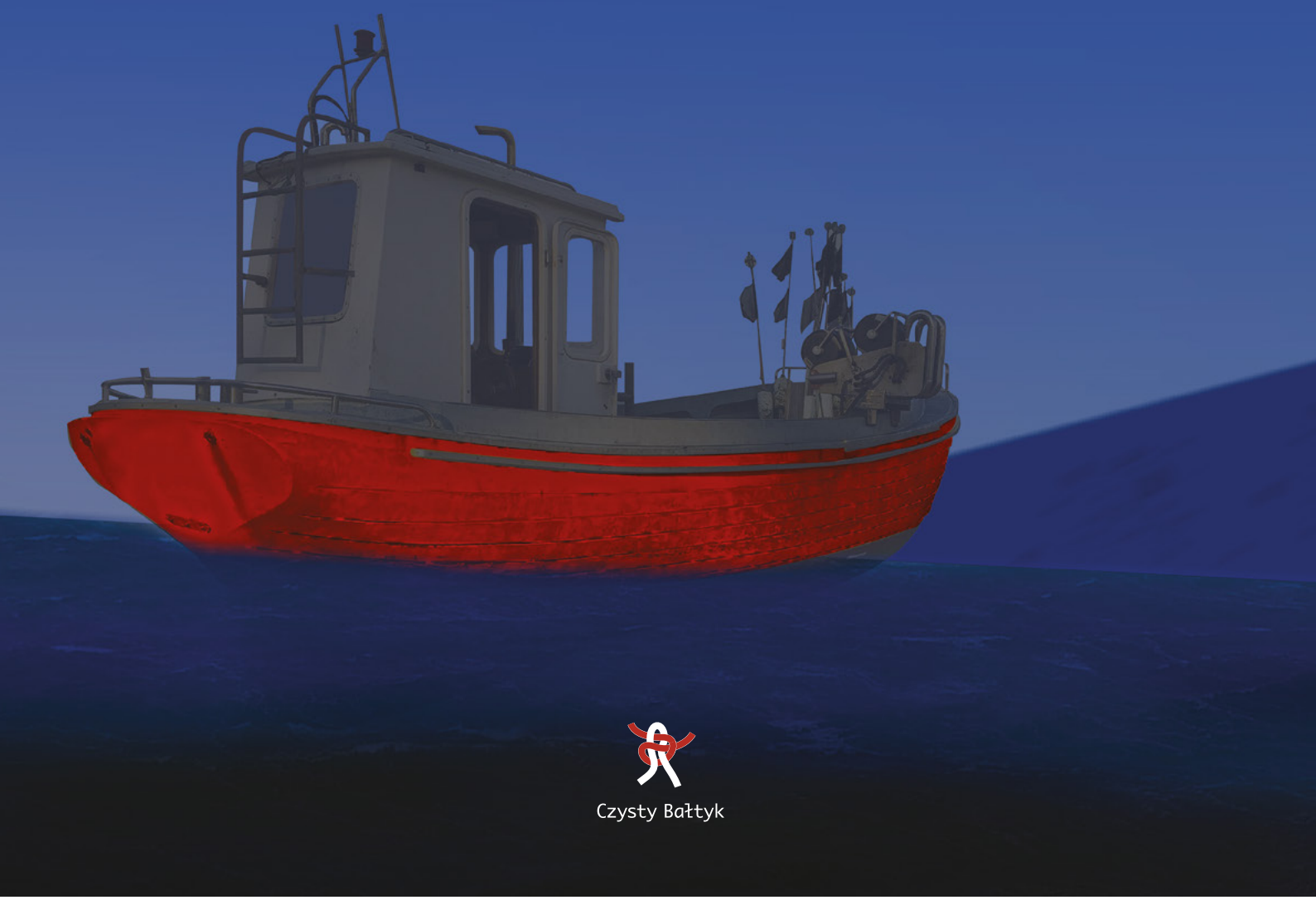
Zrzeszenie Rybaków Morskich – Organizacja Producentów

Association of Marine Fishermen – Producer Organisation

Conservation and restoration of marine biodiversity and ecosystems in the framework of sustainable fishing operations, consisting of retrieval of derelict fishing gear and marine litter



Czysty Bałtyk

RYBACTWO I MORZE

MGMiŻŚ Ministerstwo Gospodarki Morskiej i Żeglugi Śródlądowej

ARiMR

Unia Europejska
Europejski Fundusz Morski i Rybacki

Piotr Prędki

Conservation and restoration of marine biodiversity and ecosystems in the framework of sustainable fishing operations, consisting of retrieval of derelict fishing gear and marine litter

[Project: Clean Baltic]

FINAL REPORT

from activities carried out in 2017

Władysławowo, december 2017

Czysty Bałtyk

Final Report from a project carried out by
**Association of Marine Fishermen –
Producer Organisation]**

Publication prepared in the framework of the project
„Conservation and restoration of marine biodiversity and ecosystems in the framework of sustainable fishing operations, consisting of retrieval of derelict fishing gear and marine litter"

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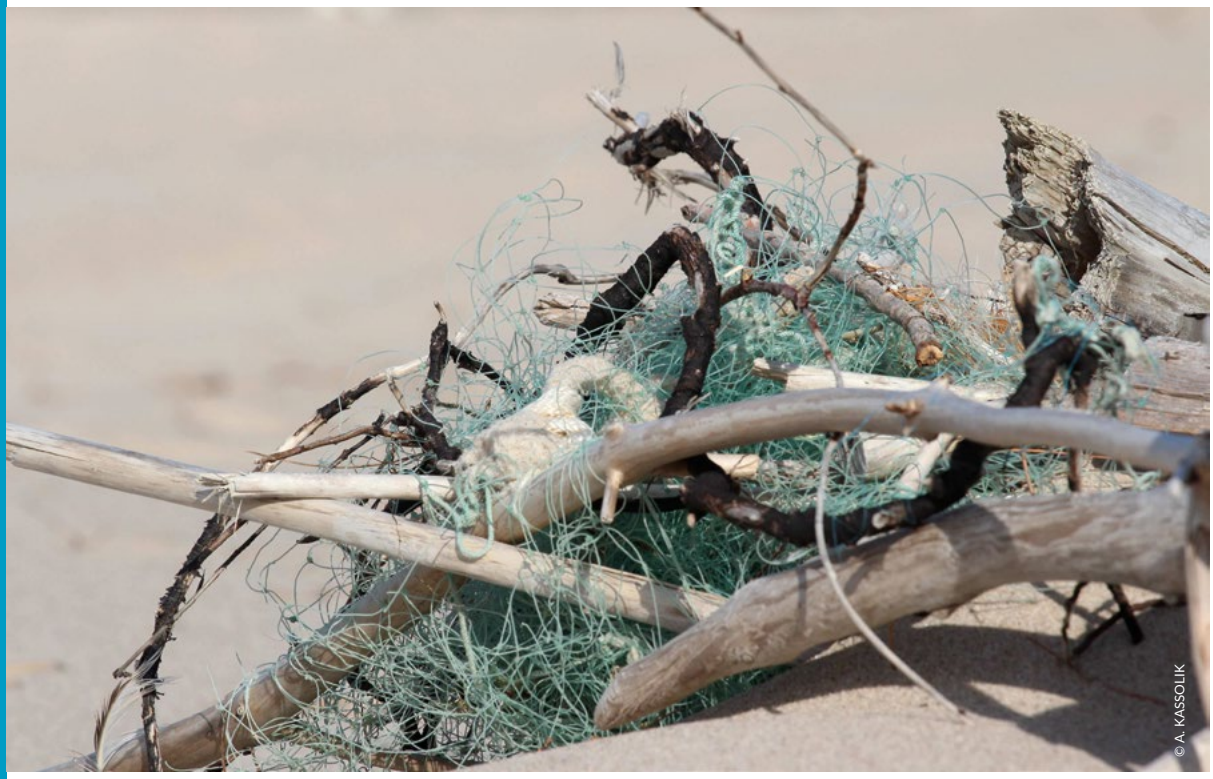
Chapter 1 Marine litter

Despite recent research and studies, the impact of marine litter on the living and non-living elements of marine ecosystem is still not fully explored. This is reflected by the lack of a single, globally existing definition of marine litter. To this day, the main characteristics of marine litter, such as their source or physical and chemical proprieties, are not clearly defined. The most common definition is that adopted by the United Nations Environment Programme, which defines marine litter as any persistent, manufactured or processed solid material deliberately discarded or accidentally lost in the marine and coastal environment.[1] In the European Union, the definition developed by the MSFD Task Group is also in common usage. Similarly to the UNEP definition, it defines marine litter as persistent, disposed or abandoned litter in the marine and coastal environment. In addition, this definition precisely states, that marine litter consists of components that were made or used by humans and deliberately or unintentionally disposed in the marine or coastal environment. According to this definition, marine litter also includes materials that are transported from land to the sea, through river systems, sewage and air currents. Marine litter consists of plastic, wood, metal, glass, fishing

[1] Jeftic L., Sheavly S., Adler E. 2009: Marine Litter: A Global Challenge. UNEP.



gears, clothing, paper etc. The above-mentioned definition covers only solid materials. Semi-solid residues, such as mineral and vegetable oils, paraffins and chemicals are not classified as marine litter.[2]

The above-mentioned extended definition is also reflected in the Regional Acton Plan for Marine Litter in the Baltic Sea, adopted in 2015 by the Contracting Parties of HELCOM.[3] This plan is described in detail in the following chapters of this report.

Qualitative and quantitative data on marine litter is also limited. However, monitoring activities, more intensive in recent years, have allowed the first attempts to identify the predominant types of litter found in the seas and oceans, their quantity and source. The main sources of marine litter include diffused and point land sources. Approximately 80% of marine litter comes from human activity on land. Other 20% of litter, such as lost fishing gears, enters the marine ecosystems as a result of human activities at sea.[4] **The main sources of marine litter include**:

- Diffused and point sources of litter from tourism (including the debris left on the beaches, cigarette butts, disposable packages);
- Point sources connected with municipal sewage systems (including microplastics, hygiene products);
- Point sources connected with waste water systems (all kinds of municipal waste);
- Diffused and point sources connected with fishing activities (including fishing gear);
- Diffused and point sources connected with maritime transport activities (including waste deliberately disposed in the sea);
- Diffused and point sources connected with natural disasters (including waste carried out by the wind and entering the sea as a result of flooding).

In global terms, plastic debris is undoubtedly the predominant part of marine litter. It is estimated that different types of plastics constitute from 60 to 80% of all waste deposited in the seas.[5] New data indicates that single-use plastic items constitute approximately 49% of litter found on the beaches[6]. This also applies to the Baltic Sea. The above-mentioned HELCOM Marine Litter Action Plan refers to the fact that the majority of litter in the Baltic are plastic items. This is confirmed by the results of the monitoring programmes carried out in the Baltic region. On the basis of an analysis of litter collected on 23 beaches in 4 Baltic countries (Sweden, Finland, Estonia and Lithuania), conducted in 2011-2013 in the framework of the MARLIN project, it was concluded that plastics constitute up to 53% of all litter found on beaches, whereas glass and ceramics accounted for 11%, paper and cardboard for 9% and metal 7%).[7] German studies carried out in 2015 confirm the domination of plastic litter. Four beaches in the north-western part of the Rugen island were monitored. Plastic waste constituted as much as 83% of the litter identified on the beach, whereas the spatial distribution of this type of waste depended on natural factors, such as marine currents and wind, as well as anthropogenic factors, in particular the scale of tourism.[8]

Similar monitoring was carried out in Poland in 2008 in the framework of research aimed at conducting initial assessment of the environmental status of marine waters for the implementation of the Marine Strategy Framework Directive. The research included a representative number of sections, which allowed to determine the amount of bulky and small-size waste deposited on the beaches. Based on the research results, the status of the environment, with respect to the descriptor of the Marine Strategy Framework Directive related to the waste deposited on the coastline, was qualified as weak, i.e. second on a five level scale determining the amount of waste.[9]

Domination of all kinds of plastics in marine litter should not be surprising. The properties of plastics, such as their longevity, are highly desired by most industries, which have caused a boom in production in the second half of the 20th century. The global produc-

2 Interwies E. et al. 2013: Issue Paper to the „International Conference on Prevention and Management of Marine Litter in European Seas".

3 HELCOM 2015: Regional Acton Plan for Marine Liter in the Baltic Sea.

4 Sheavly S. B.; Register K. M. 2007: Marine Debris & Plastics: Environmental Concerns, Sources, Impacts and Solutions. Journal of Polymers and the Environment. 15(4): 301–305. doi:10.1007/s10924-007-0074-3.

5 Derraik J. G. B. 2002: The pollution of the marine environment by plastic debris: a review. Marine Pollution Bulletin 44: 842–852.

6 Sherrington Ch., Darrah Ch., Watson S., Winter J. 2017: Leverage Points for Reducing Single-use Plastics. Seas at Risk.

7 Marilin Project 2013: Final report of Baltic marine litter project MARLIN – litter monitoring and raising awareness.

8 Hengstmann E. et al. 2017: Marine litter abundance and distribution on beaches on the Isle of Rügen considering the influence of exposition, morphology and recreational activities, Marine Pollution Bulletin, Volume 115, Issues 1–2, 15 February 2017, Pages 297–306.

9 Krzymiński W. et al.: Wstępna Ocena Stanu Środowiska Word Morskich Polskiej Strefy Morza Bałtyckiego. Główny Inspektorat Ochrony Środowiska.

tion of plastics is steadily increasing. In 1950, it amounted to 1.7 million tonnes. In 2013, it reached 299 million tonnes. This means a more than 200 times increase in the years 1950 – 2013. In Poland, every year 2.4 million plastic bottles, 8.4 disposable cups, 1.2 billion straws, 130 million of single-use packages and 45 billion cigarettes are used. In Europe, these figures are much higher and every year amount to 46 billion plastic bottles, 16 billion disposable cups, 36.4 billion straws, 2.5 billion single-use packages and 580 billion cigarettes.[10] The observed increase in plastic production results, among others, from low production costs and the properties of these items that allow their use in various industries and sectors, including those where the use of single-use packages is obligatory. This is confirmed by the report "Plastic waste in the environment"[11], prepared in 2010 for the European Commission. This report indicates that as much as 63% of plastic waste consists of single-use packages, followed by furniture (13%) and construction waste (6%). This division is also reflected at sea, where, as indicated above, the predominant group is composed of different types of packaging).

Unfortunately, in the absence of an adequate waste management strategy, the industries' and consumers' preference of plastics led to a sharp increase in the amount of plastic waste in the environment, including the marine environment. The report prepared by Jenne Jambeck from the University of Georgia[12] indicates, that in 2010, 192 coastal countries produced in total 275 million tonnes of plastic waste, of which, according to different estimates, 5-12 million tonnes landed in the seas. Moreover, the report prepared by Ellen MacArthur Foundation[13] points out, that if the current rate of development and the growth of generated waste is maintained, in 2050 the mass of plastic waste will be higher than the biomass of all fish stocks. Already at present, in the Atlantic, Indian and Pacific Oceans the accumulation of waste at the verge of marine currents can be observed. The surface of those so called 'waste spots' is constantly increasing. It can be assumed that in the Baltic, which is characterised by a limited water exchange with the North Sea, the problem of waste accumulation, in particular microplastics, can be even more intensive.

Additional information on the scale of the problem in different regions of the world can be found on the Online Portal for Marine Litter: http://litterbase.awi.de established in 2017. An interactive map of marine litter in terms of amount and types in different seas was created on the basis of approximately 1.500 scientific publications.

10 Sherrington Ch., Darrah Ch., Watson S., Winter J. 2017: Leverage Points for Reducing Single-use Plastics. Seas at Risk.

11 Bio Intelligence Service 2011: Plastic waste in the environment – Final Report. European Commission.

12 Jambeck J. R. et al. 2015: Plastic waste inputs from land into the ocean, Science 347, 768 (2015); DOI: 10.1126/science.1260352.

13 World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company 2016: The New Plastics Economy – Rethinking the future of plastics.

The impact of plastic litter on marine ecosystems as well the economy and society are also the subject of large-scale studies. The litter has a negative impact on:

- **biodiversity** (1. entanglement of marine organisms, including protected seabird species and marine mammals in lost fishing gears, 2. accumulation of plastic particles and microplastics in stomachs, 3. transfer of invasive species to new habitats, 4. transport of hazardous, toxic substances, 5. destruction of valuable habitats, e.g. due to the reduction of water transparency);
- **water quality** (1. release of toxic and hazardous substances, 2. release of microplastics);
- **human health** (ingestion of microplastics from water and food);
- **economy** (1. decrease of tourist attractiveness, 2. costs of beach cleaning, 3. damages to ships, fish farms and equipment, 4. damages to water power plants, 5. waste of materials which could be recycled);
- **social aspects** (1. environmental degradation and decrease in quality of life of local communities, 2. direct threat to life and health of people in water, e.g. divers).[14]

There is no evident data indicating which risks occur in the Baltic Sea. However, on the basis of information from other regions of the world, it is possible to identify the main risks associated with the occurrence of plastic waste in the Baltic. The HELCOM Marine Litter Action Plan identifies several risks for the Baltic ecosystem on the basis of these information. Main impacts include cases of entanglement of protected species (such as harbour porpoise), ingestion of litter by marine organisms and birds, which negatively affects their condition, as well as degradation of marine demersal ecosystems. The HELCOM Plan refers to the fact, that plastic waste, in particular microplastics, accumulate toxic substances and pathogens at their surface, and therefore become disease carriers, dangerous for the living organisms or even the entire Baltic ecosystem. Many scientific publications refer to the bioaccumulation of plastic particles at different levels of the trophic food chain, which may negatively impact the immune and reproductive systems.[15]

[14] GESAMP 2016: Sources, fate and effects of microplastics in the marine environment: part two of a global assessment (Kershaw, P.J., and Rochman, C.M., Eds). IMO/FAO/UNESCO-IOC/UNIDO/WMO/IAEA /UN/UNEP/UNDP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection. Rep. Stud. GESAMP No. 93, 220 p.; UNEP 2015: Biodegradable Plastics & Marine Litter. Misconceptions, concerns and impacts on marine environments. United Nations Environment Programme (UNEP), Nairobi.

[15] Hammer Ch., VanBrocklin H. 2016: „Microplastic Bioaccumulation in invertebrates, Fish, and cormorants in Lake Champlain". Center for Earth and Environmental Science Student Posters. Book 25. http://digitalcommons.plasburgh.edu/cees_student_posters/25

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Chapter 2 Derelict fishing gears

Derelict fishing gears are classified as waste arising out of direct human activity in the marine environment. The problem of derelict fishing gears in the seas is as old as fishing itself. However, the problem had not been so important until the mid-1960s, when fishing gears made of synthetic fibres appeared on the market. Apart from evident advantages such as increased resistance to physical and biological factors, these fibres decompose very slowly in the marine environment. The fishing gear left in the sea may remain unchanged for decades or even longer and act in a negative and uncontrolled way on the ecosystem. This problem was recognised by the International Maritime Organization (IMO) and included in the International Convention for the Prevention of Pollution from Ships, signed in 1973 and ratified by Poland in 1987.[16] This Convention prohibits, with certain exceptions, the disposal of solid waste, including fishing gears into the sea. This issue is specifically mentioned in Annex 5 of

16 International Convention for the Prevention of Pollution from Ships, 1973, International Maritime Organisation (IMO).

the Convention, revised in 2011. Regulation 3 included in this Annex imposes a complete ban on the disposal of all forms of plastics into the sea, including fishing gears.

The challenges posed by the fishing gears lost by fishermen are also recognised by the Food and Agriculture Organization of the United Nations (FAO), which is reflected in the Code of Conduct for Responsible Fisheries signed in 1995.[17] With reference to lost fishing gears, the Code recommends the following: "*States should cooperate to develop and apply technologies, materials and operational methods that minimize the loss of fishing gear and the ghost fishing effects of lost or abandoned fishing gear*".

It should be noted that the above mentioned recommendation makes a distinction between lost and abandoned fishing gears. This distinction is also applied in the most common definition of this phenomenon, also used in the HELCOM Baltic Marine Litter Plan. The document mentions „abandoned, lost or otherwise discarded fishing gear or parts thereof (ALFDG)" or "derelict fishing gears". The definition of both phenomena is the same and specifies as follows: "*collective terms for commercial and recreational fishing gear that has been abandoned, lost or otherwise discarded into the marine environment and causes negative biological impacts through, e.g. unintentional catches of fish (a process which is often referred to as "ghost fishing"), coverage of sensitive habitats and/or fragmentation into micro-particles that could enter the food chain*".

The above mentioned distinction between abandoned, lost or otherwise discarded is directly connected with the factors contributing to this phenomenon, which are well identified and described in many documents and scientific publications.[18]

Over the years, as a result of the development of technology and industry, the factors contributing to the loss of fishing gears by fishermen have changed. In the past, the main factors were identified as low precision of navigation methods and systems. At present, the main factors contribution to this phenomenon are:

- the loss of gears, in particular static gears, caused by weather conditions (suddenchange of weather conditions with no possibility of retrieving the gears, e.g. storms);
- dumping new objects, causing additional gear loss (e.g. large-scale debris thrown overboard), especially during trawling;
- dumping damaged fishing gear and litter during repairs carried out at sea;
- the use of low quality material for the production of fishing gears, thus reducing the strength of particular elements and increasing the risk of their loss;
- illegal fishing and poaching leading to the abandonment of unmarked fishing gears at sea;
- the lack of accessible storage and disposal facilities for old end-of-life fishing gears;
- high costs of search and retrieval of lost fishing gears.

The lack of specific and clear legal regulation is undoubtedly behind the phenomenon of lost or abandoned fishing gears. The legal provisions that regulate the problem of lost or abandoned fishing gears and the measures to be undertaken by a vessel owner or skipper in the event of gear loss are included in the existing legislation, both at national and the EU level, in a very general way. In addition, the legal provisions, which regulate how to handle derelict fishing gears retrieved from the sea, in particular pertaining to the so-called no one's property and related to the recycling, are so complex that they discourage fishermen and other sea users from bringing the fishing gears retrieved during the fishing operations to the shore. These issues are described in detail in Chapter 5.

As mentioned above, the phenomenon of derelict fishing gears in the marine environment is directly related to the introduction of new, more resistant materials in the fishery. Until mid-20th century the fishing gears used in the Baltic Sea were made up mostly of natural fibres. Nets were made of linen, cotton, hemp, sisal and coco. These fibres were characterised by their limited strength. The increasing demand for fish products and an increasing volume of catches forced the net producers to use stronger materials, which permitted to fish with higher efficiency. A limited strength of natural fibre nets was caused, among others, by vulnerability to bacterial decomposition in water.

[17] Code of Conduct for Responsible Fisheries Food and Agriculture Organization of the United Nations, Rome, 1995 © FAO 1995.

[18] NOAA Marine Debris Program 2015: Report on the impacts of "ghost fishing" via derelict fishing gear. Silver Spring, MD. 25 pp.

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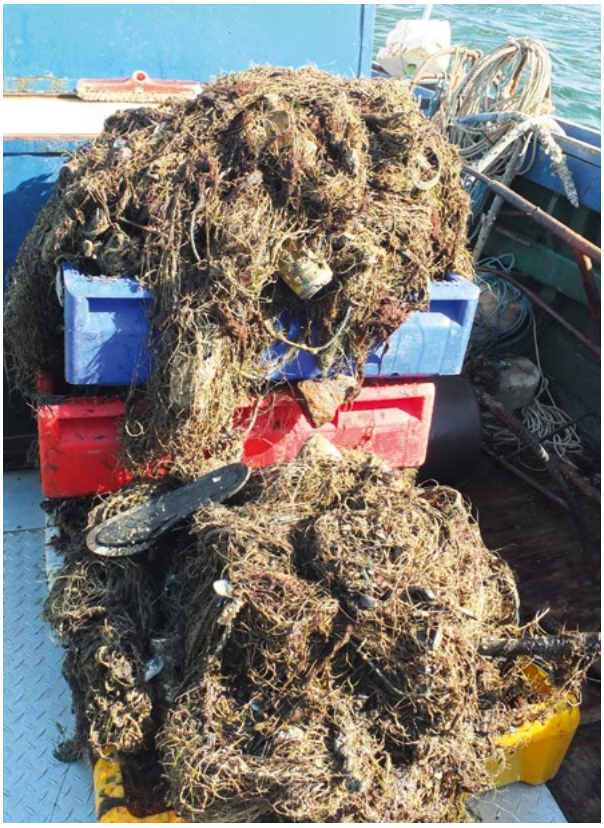
Synthetic fibres guaranteed the above-mentioned characteristics. Therefore, during the 1960s, these fibres have been introduced to the production of fishing gears. The names of synthetic fibres derive from the chemical composition of polymers. These are, among others:

- Polyamide fibres (e.g. Stylon, Nylon, Capron, Perlon, Dederon)
- Polyester fibres (e.g. Terylen, Dacron, Teteron, Torlen)
- Polypropylene fibres (e.g. Pylen, Ulstron, Proplon)
- Polyethylene fibres (e.g. Kuralon, Polyethylene)

Synthetic fibres are characterised by higher resistance, due to which the volume of catches in fishing operations is significantly increased. This feature of synthetic materials also allows to reduce the diameter of individual elements of the fishing gear, in particular the mesh sizes in gill nets, making the nets less visible for fish and permitting to increase the fishing efficiency as compared to the nets made of natural fibres in the past. The resistance of synthetic fibres to biological factors is of great importance. This is one of the main differences between the synthetic and organic fibres. Undoubtedly this is an advantage for fishermen. However, as a result of that, lost nets remain in the sea for dozens or even hundreds of years, exerting negative impact on the living and non-living elements of the ecosystem, resulting in economic, environmental and social losses.

The susceptibility of the above-mentioned polymers to degradation in the marine environment is a subject of many scientific studies. Synthetic materials are known for their high resistance and long degradation time, counted in hundreds of years. On land, the process of degradation of polymers is mainly caused by the following factors:

- effects of UV radiation;
- thermal reactions, including thermal oxidation;
- hydrolysis of polymers;
- microbiological decomposition.



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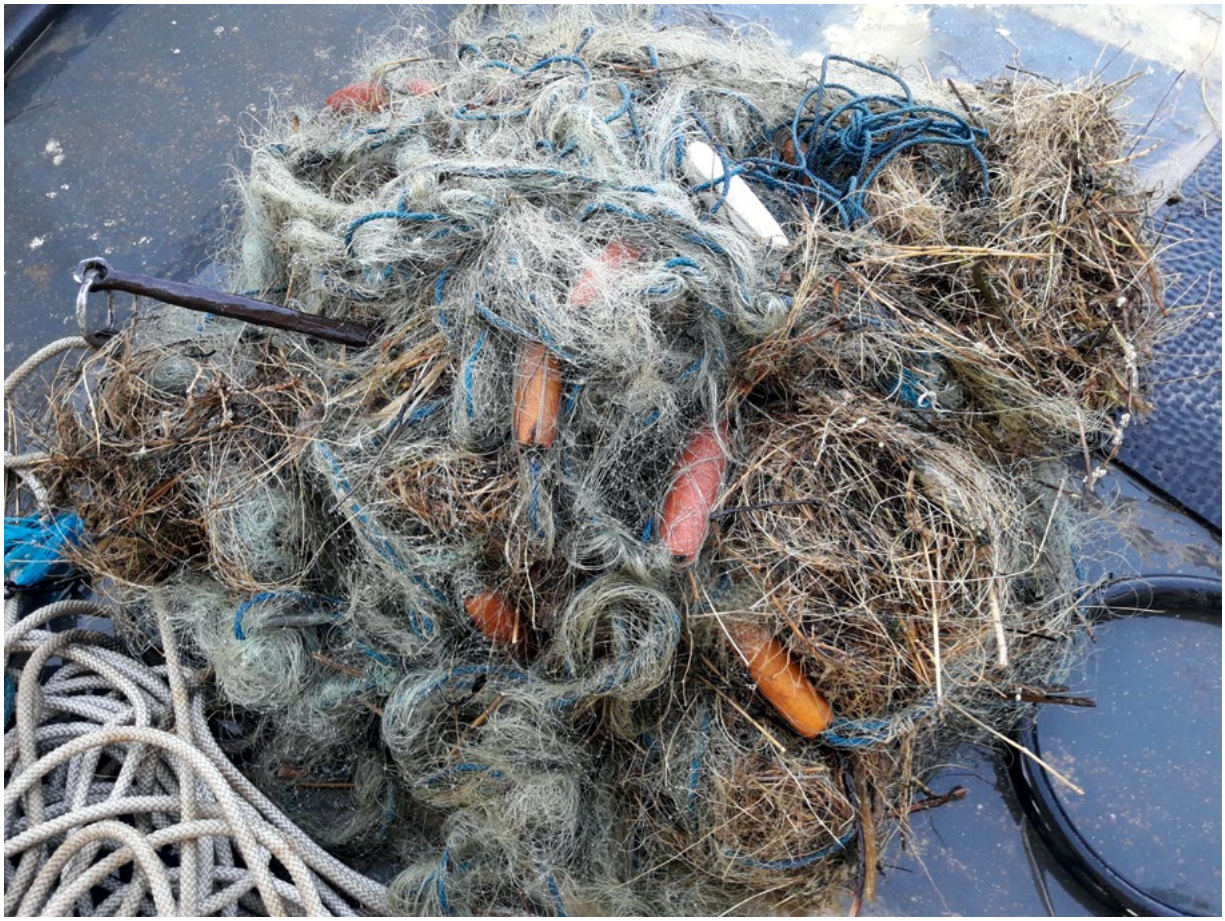

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In the seas and oceans, the list of factors, which cause the degradation of plastics is much shorter. Their degradation occurs primarily through solar UV-radiation or induced photo oxidation reactions.[19] These factors mainly affect the waste deposited on the beaches, floating at water surface or drifting in the upper, pelagic layers, to which the sun reaches.[20] The effectiveness of these factors decreases with the depth, hence their impact on the degradation of derelict fishing gears is very small.

Apart from chemical degradation to single compounds, plastic waste, including fishing gears, may be subject to physical fragmentation into smaller elements, including the fractions of the so-called microplastics. This process results from e.g. abrasion, which releases microgranules of plastics, with size not exceeding 1 mm, into the sea. Such microgranules have a significant impact on the marine environment and the living organisms.[21]

19 Andrady A. L. 2015: Persistence of Plastic Litter in the Oceans. In: Bergmann M., Gutow L., Klages M. (eds) Marine Anthropogenic Litter. Springer, Cham.

20 Cooper D. A., Corcoran P. L. 2010: Effects of mechanical and chemical processes on the degradation of plastic beach debris on the island of Kauai, Hawaii. Marine Pollution Bulletin, 60, 650–654.

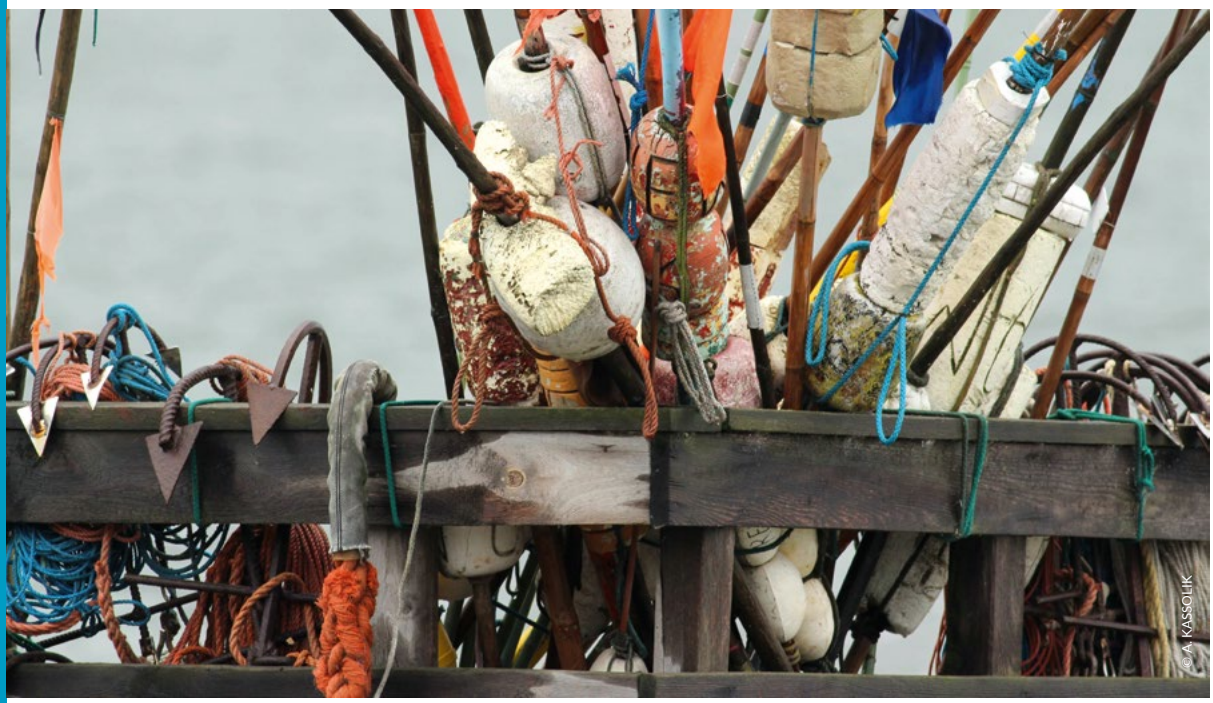
21 Löder M. G. J., Gerdts G. 2015: Methodology used for the detection and identification of microplastics – A critical appraisal. In: M. Bergmann, L. Gutow & M. Klages (eds), Marine anthropogenic litter (pp. 201–227). Berlin: Springer.

Chapter 3 The scale of the problem

Although the impact of derelict fishing gears on marine ecosystems is well recognised, the information on the scale of the problem, expressed in terms of the estimated quantitative data on derelict gears, is limited. This fact results from: the loopholes in the legislation (the lack of obligation to report all cases of gear loss), low public awareness of the impact of derelict fishing gears on the ecosystem, including the state of the commercially exploited fish stocks, as well as from illegal, unreported and unregulated catches, which contribute to the occurrence of this phenomenon.

The analysis of available, fragmented data indicates that the quantity of lost or discarded fishing gears depends on the type of gear used, as well as the region, in which the fishing operations are carried out. The data from the FAO[22] report shows that 0.02 to 3.2% of gillnets per vessel are lost every year. The analysis of available information does not permit to identify the factors, which are behind such a big difference

[22] Macfadyen G., Huntington T., Cappell R. 2009: Abandoned, lost or otherwise discarded fishing gear. UNEP Regional Seas Reports and Studies No. 185; FAO Fisheries and Aquaculture Technical Paper, No. 523. Rome, UNEP/FAO. 2009. 115p.



in the percentage of gears lost in this segment. The percentage of lost longlines amounts on average to 2% of all used gears. The scale of the problem in the case of traps is significantly higher. Available reports indicate that in some regions, due to unfavourable weather conditions, fishermen lose up to 30% of all traps. The highest percentage of lost gears was noted in the waters surrounding the Caribbean Islands. Data from this region indicates the loss of 79% of all used fishing gears.[23]

Attempts to determine the scale of the problem were also undertaken in the European Union. The analysis indicates that the rates of gear loss in the EU waters were found to be low and did not exceed 1% of all gears. This is due to the fact, that most of the gears are used in coastal waters, where they can easily be recovered in the event of loss. At the same time, taking into account the scale of fisheries in the EU waters, even such small percentage of lost nets can account for a substantial increase of derelict fishing gears in the marine environment. Deepwater fisheries were a noted exception to the above, as the number of lost gears is much higher due to unfavourable conditions in open and deep waters. It should be noted, that the recovery rates of lost gears are close to zero due to the high costs of the recovery operations carried out in deep waters, as well as large distances between the fishing grounds and land.[24]

It should be noted that the data presented above is merely an attempt to determine the scale of the problem and is largely uncertain. Most of the presented information comes from the last century and had been collected as a result of non-standardised surveys and questionnaires among fishermen or derived from a small-scale monitoring operations. Taking into account the constant development of technologies, including more and more accurate navigation systems, one should presume that the current scale of the problem may be lower.

Some attempts were made to estimate the amount of derelict fishing gears in the Baltic Sea. The FANTARED 2 project, financed by the EU, estimated the number of lost gill nets in the Swedish fishery. Each fishing vessel lost on average 3.9 gill nets per year. For the entire Swedish fleet fishing in this area, the total of lost nets amounted to approximately 165 km per year,

23 Matthews T. R., Glazer R. A. 2010: Assessing opinions on abandoned, lost, or discarded fishing gear in the Caribbean, In Proceedings of the Gulf and Caribbean Fisheries Institute pp. 12–22, Gulf and Caribbean Fisheries Institute, c/o Harbor Branch Oceanographic Institution, Inc. Fort Pierce FL 34946 United States.

24 Brown J., Macfadyen G., Huntington T., Magnus J., Tumilty J. 2005: Ghost fishing by lost fishing gear. Final report to DG, Fisheries and Maritime Affairs of the European Commission, Fish/2004/20. Institute for European Environmental Policy/Poseidon. Aquatic Resource Management Ltd Joint Report. pp. 132.

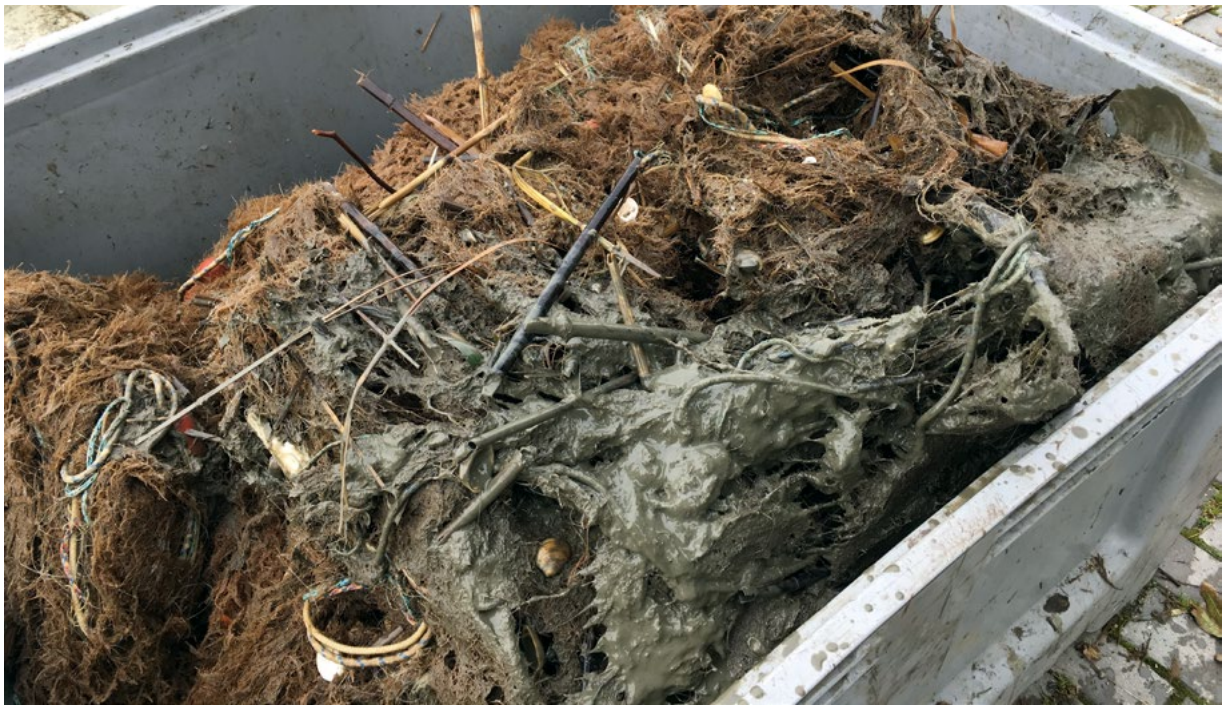


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Table 1. **Summary of available data on gear loss**
(own elaboration on the basis of literature sources)

Region	Fishing gear	Gear loss indicator	Date of publication
North Sea and North-eastern Atlantic	Bottom gillnets	0.02–0.09% of gears used by one vessel per year	2003
The English Channel French waters of the North Sea	Gillnets	0.2% (sole and turbot fishery) 2.11% (sea bass fishery) of gears used by one vessel per year	2003
Mediterranean	Gillnets	0.05% (hake coastal fishery) 3.2% (sea bream fishery) of gears used by one vessel per year	2003
Aden Bay	Traps	Approx. 20% of traps per vessel per year	2002
Persian and Oman Gulf	Traps	260,000 of traps lost in 2002	2007
Indian Ocean	Longlines	3% of longlines	1998
Coast of Australia	Traps	35 of traps used by one vessel per year	Not specified
North-eastern Pacific	Traps	7,000–31,000 of traps lost by the entire fleet per year	1993
Newfoundland	Cod gillnets	5,000 of gears lost by the entire fleet per year	1996
Coast of Canada	Gillnets	2% of gears used by one vessel per year	1995
Gulf of St Lawrence	Traps	792 of traps lost by the entire fleet per year	Not specified
New England	Traps	20–30% of traps used by one vessel per year	1978
Chesapeake Bay	Traps	Do 30% of traps used by one vessel per year	2007
Caribbean	Traps	20,000 of traps lost by the entire fleet per year	2004
Mexican Bay	Traps	250,000 of traps lost by the entire fleet per year	2001
Baltic Sea	gillnets (Polish fleet)	1,500 of gears lost by the entire fleet per year	2013
	gillnets (Lithuanian fleet)	150 of gears lost by the entire fleet per year	2013
	gillnets (Swedish fleet)	0.1% of all gears	2002

i.e. less than 0.1% of all nets.[25] During the research it was also noted that the percentage of lost nets increases with distance from the shore and the biggest losses occur in demersal fishery. Importantly, the questionnaires carried out among fishermen indicated that conflicts between gillnet and trawl fisheries were one of the most important causes of gear loss, since gill nets are often damaged by trawlers.

Attempts to estimate the amount of derelict fishing gears in the Baltic were also undertaken by WWF Poland, in the framework of projects carried out by the Foundation. In 2011, as part of the pilot project "Collecting ghost nets from the Baltic Sea"[26] a thorough analysis of the problem was carried out, using the data on the fishing efforts of the EU fleet operating in the Baltic. It was assumed that in 2005–2008 the number of gillnets lost by the EU fleet operating in the Baltic amounted to approx. 5.500–10.000 nets annually. In the framework of a similar project carried out in 2013, it was estimated that the Polish gillnet fleet had lost approx. 1.500 gears in 2009, and the Lithuanian fleet approx. 150 gears. In the course of the research a downward trend in the amount of lost nets has been noted due to a decrease of the number of fishing vessels operating in the Baltic, as well as to a number of adopted measures aimed at rebuilding the stocks of commercially exploited fish species, which directly resulted in a decrease of the fishing effort.[27]

In the framework of the above-mentioned research, a preliminary attempt to estimate the number of trawl nets deposited on shipwrecks in the Polish and Lithuanian waters was also made. The estimates were based on the data on trawl nets retrieved from shipwrecks, as well as on the estimated number of shipwrecks in the Polish and Lithuanian waters. Since the exact number of wrecks is not known and the available data refers to a wide range of 1,000-3,000 wrecks only in the Polish waters, precautionary minimum values were used. Given the above assumptions, the amount of nets deposited on shipwrecks in the Polish waters may amount up to 810 tonnes of trawl nets, and in Lithuanian waters to 100 tonnes. At the same time, the authors underlined that due to different concentrations of wrecks in different parts of the Baltic, it is not possible to extrapolate the estimates to the entire sea. It should also be emphasised that the shipwrecks have not been thoroughly investigated in terms of the deposited nets and the results of this assessment should be considered as preliminary.

At present, the MARELITT Baltic project, carried out jointly by Poland, Germany, Sweden and Estonia, is expected to provide a more accurate estimates regarding the scale of the problem of derelict fishing gears in the Baltic Sea.[28]

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[25] Seafish: FANTARED 2: A study to identify, quantify and ameliorate the impacts of static gear lost at sea. Final report.

[26] Kasperek S., Prędki P. 2011: Ecological effects of ghost net retrieval in the Baltic Sea. Final report. WWF Poland.

[27] Szulc M. 2013: Collecting ghost nets in the Baltic. Final Report on the activities conducted in 2012. WWF Poland.

[28] Marelit Baltic web site, about the project: https://www.marelittbaltic.eu/about-the-project/

Chapter 4

The impact of derelict fishing gear

Despite the lack of detailed data on the amount of fishing gears in the seas, the scientific literature contains many information on the impact of lost nets on the environment, as well as on the economy and local communities. Uncontrolled catches of fish and marine organisms are among the most frequently mentioned negative impacts. It should be noted, however, that this is only one out of many negative environmental effects of lost or abandoned fishing gears, which in consequence lead to measurable economic and social losses.

4.1.
Uncontrolled catches and their impact on marine ecosystems

Uncontrolled catches of marine organisms are undoubtedly one of the best-known and described impacts of derelict fishing gears. This phenomenon refers in particular to gillnets and traps, which retain their catchability and continue to fish. It should be noted, that the fishing capacity of lost nets is much smaller than regular nets controlled by fishermen. This has been demonstrated during the research on the fishing capacity of gillnets in cod fishery, carried out in the Baltic. Experiments have shown, that the fishing capacity of these gears amounts to 20% of the normal efficiency of the gears used by fishermen. According to experiments, the fishing capacity of lost gillnets decreases with time, to reach approximately 6% after 27 months.[29] No research has been conducted in the Baltic for longer than the 27 month period. Research carried out in other regions indicates that a limited, but constant fishing capacity of derelict fishing gears can last even 20 years.[30]

Experimental data obtained in the Baltic confirm the observations made in other regions. In 1990s, research was carried out in the UK waters to estimate the catching ability of lost gears. A net, imitating a derelict gear, was used in the experiment. During 9 months, this gear caught 226 fish and over 800 shellfish. The tested gear continued to fish even after storm damage.[31] Similar experiments were carried out in the west coast of the United States (close to Seattle). Fish and other organisms were found in over 870 gillnets.[32]

A decrease in the fishing capacity of derelict fishing gear is caused by several physical and biological factors. The observations indicate that derelict fishing gears twist and tangle due to water currents. This results in a significant decrease in the catching ability due to changes in the mesh geometry. In addition, biofouling (the attachment and growth of other living organisms, such as algae) makes these nets more visible and thus easier to avoid with time. Moreover, the attachment of other organisms to fishing gears increases their weight and thus makes the gear sink to the sea bottom and loose the catching ability. This phenomenon is often limited in time, since due to degradation and strong currents the derelict gears may raise again in the water column and regain their catching ability. In addition, the location of derelict gears also impacts the rate of loss of their catching ability. The literature indicates that gears lost in deep water can continue to fish for much longer than gears lost in shallower waters.[33] This is related to the differences in the intensity of physical and biological impacts in shallow and deep waters.

High, uncontrolled catching ability is also observed in derelict trap gears. Research on the scale of uncontrolled fishing for this type of gear has not been carried out in the Baltic. Due to the increasing popularity of these gears, particularly in the Eastern Baltic, it could be assumed that research will be necessary to estimate the scale of the problem.

Experiments have shown, that the fishing capacity of these gears amounts to 20% of the normal efficiency of the gears used by fishermen. According to experiments, the fishing capacity of lost gillnets decreases with time, to reach approximately 6% after 27 months.

29 Tschernij V., Larsson P.-O. 2003: Ghost fishing by lost cod gill nets in the Baltic Sea. Fisheries Research, 64(2–3): 151–162.

30 Good T. P., June J. A., Etnier M. A., Broadhurst G. 2010: Derelict fishing nets in Puget Sound and the Northwest Straits: Patterns and threats to marine fauna. Marine Pollution Bulletin 60, 39–50.

31 Kaiser M. J., Bullimore B., Newman P., Lock K., and Gilbert S. 1996: Catches in 'ghost fishing'' set nets. Marine Ecology Progress Series 145, 11–16.

32 NOAA Marine Debris Program 2015: Report on the impacts of "ghost fishing" via derelict fishing gear. Silver Spring, MD. 25 pp.

33 NOAA Marine Debris Program 2015: Report on the impacts of "ghost fishing" via derelict fishing gear. Silver Spring, MD. 25 pp.

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Research carried out in different parts of the world shows clearly that derelict traps continue to fish target species, as well as other species. It is estimated that a single trap, used originally in crab fishery, is able to catch up to 50 crabs after being lost.[34] Canadian research confirms this fact and allows to conclude that the catching ability of derelict traps persists for over 7 years. This is related directly to the continuous supply of a new bait (in the form of trapped organisms) to the derelict trap.[35]

Derelict trawls, due to their construction, have undoubtedly the lowest fishing capacity. They are active gears with a massive construction and after loss they sink to the bottom and loose their ability to catch fish. According to the observations made in the Baltic region, derelict trawls continue to catch fish only if they are hooked on underwater objects and thus remain stretched in water. Limited catching ability of lost trawls results also from economic aspects. Fishermen usually undertake efforts to recover trawls, which are much more expensive than gillnets.

Lost or abandoned fishing gears have also a negative impact on other elements of marine ecosystems. A well-known and described phenomenon is the by-catch of marine mammals and birds. The studies of gillnets carried out in the western coast of the United States have shown a by-catch of 14 bird species (total of 509 individuals) and 4 species of marine mammals (23 individuals).[36] By-catch of protected species draws particular attention. In the Hawaiian Archipelago by-catch of critically endangered Hawaiian monk seal has been noted. Estimates made in Australian waters indicate that 25% of all cases of entanglement of marine mammals refer to derelict fishing gear. Also in the Baltic cases of by-catch of marine mammals, such as harbour porpoise and grey seal, caused by elements of derelict gillnets have been reported. The analysis of the reports from derelict gear retrieval actions carried out in 2011–2015 in the Baltic, indicates a high percentage of dead birds found in these nets. It is not known whether these birds entangled into derelict gears or were caught in the nets during fishing opera-

34 Havens K. J., Bilkovic, D. M., Stanhope, D., Angstadt K., Hershner C. 2008: The effects of derelict blue crab traps on marine organisms in the lower York River, Virginia. North American Journal of Fisheries Management 28, 1194–1200.

35 Maselko J., Bishop G., Murphy P. 2013: Ghost Fishing in the Southeast Alaska Commercial Dungeness Crab Fishery. North American Journal of Fisheries Management 33, 422–431.

36 NOAA Marine Debris Program 2015: Report on the impacts of "ghost fishing" via derelict fishing gear. Silver Spring, MD. 25 pp.

tions. Data presented in the report indicates that trawls stretched on shipwrecks may kill marine mammals.

Derelict fishing gears also have a negative impact on valuable, protected habitats. This applies in particular to heavy gears, such as trawls or traps, which can cause a physical destruction of reefs and other habitats. This process in particularly intensive during strong currents, which move derelict gears into valuable fauna and flora habitats, causing their damage. Negative impact of lost gillnets can be observed in the areas of coral reefs. These nets cover large areas of reefs and have a negative impact on the structure and development of reefs.[37]

The physical phenomena described above also contribute to a slow release of microplastics from derelict fishing gears. Their impact on marine ecosystems is described in the previous chapter.

4.2. Economic and social losses due to derelict fishing gears

The impact of derelict fishing gears also covers potential economic losses resulting from uncontrolled catches of marine organisms, including valuable, commercially exploited species. An assessment can be made of the losses resulting from uncontrolled catches of Baltic cod on the basis of available data[38], The analysis conducted in 2011, using a standard revaluation risk value applied in cases of uncertain conditions, indicates that average cod catches by derelict gillnets in 2009 amounted to approximately 9 tonnes per year. Taking into account an average price for one kilogram of cod (ca. PLN 6 per kg), one can assume that in 2009 the economic losses caused only by uncontrolled catches by derelict gillnets amounted to approximately PLN 54.000. The above calculation does not include the losses caused by derelict gears in other periods. Assuming that the same amount of gears was lost in the following years, the economic losses caused by this phenomenon are much higher.

It is worth noting that the fishing mortality caused by derelict fishing gears is not included in the assessment of the fishing pressure and the state of the fish stocks, carried out, among others, by the International Council for the Exploration of the Sea (ICES). In the case of species exploited at maximum sustainable yield (MSY), which allows the population to continue to be productive, any additional fishing mortality not included in the assessment, may threaten the stability of a fish stock and in consequence contribute to the reduction of fishing quota, which will incur subsequent economic losses for the fishing sector.

Economic losses caused by derelict fishing gears also include the expenses incurred for the purchase of new gears. This is particularly significant in the case of trawls, which cost much more than gillnets. Therefore, fishermen put an increased effort to recover lost trawls. Losses in the case of gillnets are much lower. However, in Polish fisheries, these nets are mainly used by small scale fishermen, whose revenues have been signifi-

37 Donohue M. J., Schorr G. 2004: Derelict Fishing Gear & Related Debris: A Hawaii Case Study. In Derelict Fishing Gear and Related Marine Debris: An Educational Outreach Seminar among APEC Partners. APEC Seminar on Derelict Fishing Gear and Related Marine Debris, 13–16 January 2004, Honolulu, Hawaii, USA.

38 Kasperek S., Prędki P. 2011: Ecological effects of ghost net retrieval in the Baltic Sea. Final report. WWF Poland; Szulc M. 2013: Collecting ghost nets in the Baltic. Final Report on the activities conducted in 2012. WWF Poland.

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cantly reduced, also due to the poor condition of some of the Baltic fish stocks. Therefore, all additional costs are a big challenge for small scale fishermen.

Taking into account the average annual loss of gillnets at the level of 5.500 units and the average cost of one cod fishery gillnet unit with the necessary equipment at a level of PLN 300, it can be assumed that the economic losses incurred due to the loss of cod gillnets amount to approximately PLN 1.650.000. These are additional costs, which need to be covered by fishermen.

Besides the economic costs associated with uncontrolled catches and the need to replace lost gear and buy new equipment, there are several other factors which have a negative impact on the economic situation of the fishing fleet and the fishing industry. Those factors include, among others:

- The costs of suspension of fishing due to damages to engines or rudders caused by entanglement in derelict nets drifting in the water column;
- The costs of search of derelict fishing gear, including fuel costs and loss of potential income due to shortening of the fishing operations.

Furthermore, the social costs of derelict gears include the following negative effects:

- building up and preserving a negative image of fishermen as sea users who do not care about the environment;
- reduction of tourism benefits in coastal areas due to lost gear on beaches and at sea;
- reduction of the so called "shipwreck tourism", resulting from a limited access to wrecks for divers caused by derelict trawls;
- safety risks for people including divers and people engaged in active recreation on the coast and at sea.[39]

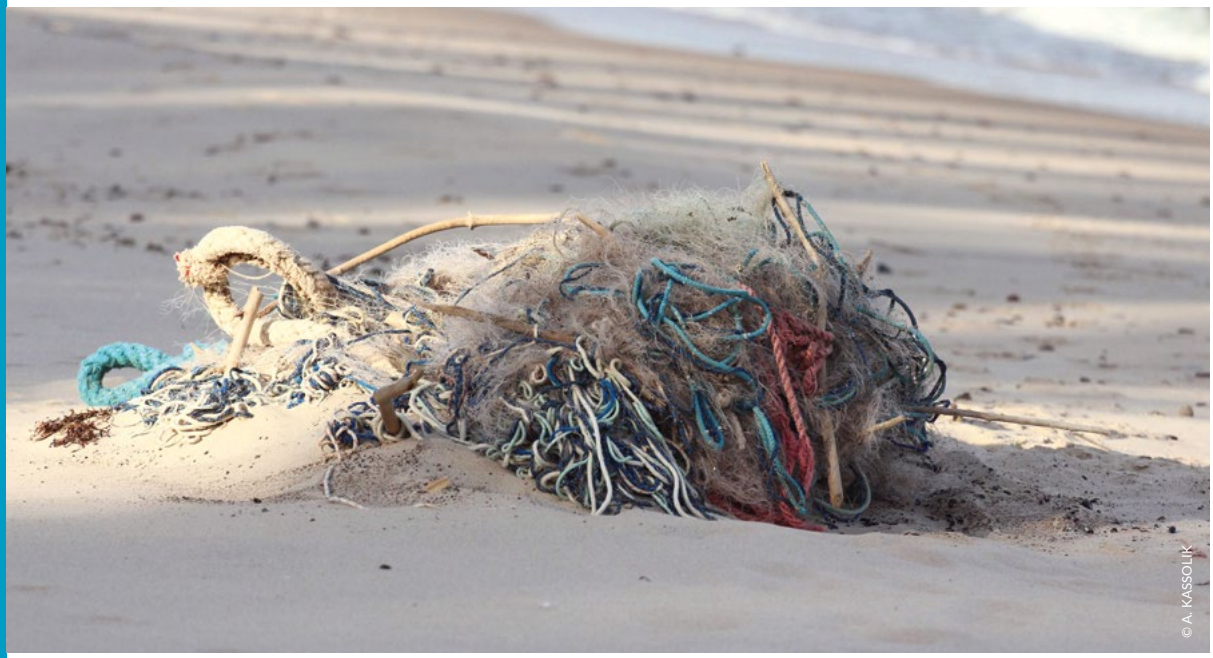
Undoubtedly, the above-mentioned costs, both direct and indirect, are significant. It is necessary to undertake actions aimed at precise identification and estimation of the losses caused by derelict fishing gears and compare the results with the estimated costs of preventative and mitigation measures. This action is necessary to elaborate and implement an effective and economically justified strategy aimed at mitigating the impact of derelict fishing gears on marine ecosystems as well as reducing the economic and social losses.

[39] Macfadyen G., Huntington T., Cappell R. 2009: Abandoned, lost or otherwise discarded fishing gear. UNEP Regional Seas Reports and Studies No.185; FAO Fisheries and Aquaculture Technical Paper, No. 523. Rome, UNEP/FAO. 2009. 115 p.

Chapter 5

Legal provisions and other documents referring to derelict fishing gears

As mentioned in Chapter 1, the impact of marine litter, including derelict fishing gear, has been identified and included in the legislation following the introduction of mass production of plastics. This was directly related to the properties of products, which, unlike the natural materials used in the past, are subject to a very slow degradation almost invisible if considered on a scale of one generation. Slow degradation and the associated accumulation of waste, including derelict fishing gear in the marine environment, necessitated the need to seek systemic solutions, aimed primarily at reducing the amount of litter released to the environment.



The most important legal acts, which contain the regulations aimed at reducing the amount of derelict fishing gear, as well as at mitigating the negative impact of these gears are listed below in chronological order.

5.1. Akty prawa oraz dokumenty o charakterze międzynarodowym

1987 International Convention for the Prevention of Pollution from Ships[40]

International Maritime Organisation (IMO)

The Convention is one of the first regulatory acts covering prevention of pollution by litter in the marine environment. The provisions of Annex V adopted in 1988 and revised in 2011 pertain to solid waste and impose a complete ban on the disposal into the sea of all forms of plastics, including the fishing gears, except for security reasons. The Convention was adopted in 1973 and ratified by Poland in 1987.

1995 Code of Conduct for Responsible Fisheries[41]

Food and Agriculture Organization of the United Nations (FAO)

The Code of Conduct for Responsible Fisheries (FAO) was adopted in 1995 in Rome and was the first such document setting the principles for responsible standards in fisheries. The Code sets out further measures with an aim to reduce to a minimum the negative impact of fisheries on the environment. In the context of derelict fishing gear, the Code states in point 8.4.6. that *"States should cooperate to develop and apply technologies, materials and operational methods that minimize the loss of fishing gear and the ghost fishing effects of lost or abandoned fishing gear." Furthermore, point 7.6.9 states that "States should take appropriate measures to minimize waste, discards, catch by lost or abandoned gear, catch of non-target species, both fish and non-fish species, and negative impacts on associated or dependent species, in particular endangered species"*.

2005 Resolution adopted by the General Assembly on 29 November 2005 No 60/31[42]

United Nations

This Resolution is devoted to sustainable fisheries. In points 77-81 it contains provisions calling the national governments, international organisations, non-governmental organisations and the fisheries sector to undertake intensive measures to reduce the negative impact of derelict fishing gears on the environment, including, in particular: collection of data on gear loss locations, analysis of economic costs incurred by the fisheries sector, collection of data on the derelict gears impact on the marine environment, setting up a platform to exchange information and implement measures to raise awareness on the negative impact of derelict fishing gears within the fisheries sector.

The Resolution calls upon the States to undertake actions to elaborate measures aimed in the first place at preventing the loss or discarding of fishing gears. With regard to derelict fishing gears, it recommends conducting joint recovery programmes.

A very interesting provision, which unfortunately has not been implemented until now, is a proposal to establish in each country a register of fishing gears to improve their management system, including recycling and exchange. The call to implement the abovementioned measures by the governments is repeated in the Resolution of the United Nations No. 65/38 of 2010 (point 126).[43]

40 International Convention for the Prevention of Pollution from Ships, 1973, International Maritime Organisation (IMO).

41 Code of Conduct for Responsible Fisheries Food and Agriculture Organization of the United Nations, Rome, 1995 © FAO 1995.

42 Resolution adopted by the General Assembly on 29 November 2005. 60/31. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments.

43 Resolution adopted by the General Assembly on 7 December 2010 65/38. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10

2008 Marine Strategy Framework Directive[44]

European Union

The main aim of this Directive is to achieve a good status of the marine environment by 2020. Good environmental status (GES) is determined in relation to 11 descriptors. Descriptor 10 refers to marine litter and states that GES will be achieved only when properties and quantities of marine litter do not cause harm to the coastal and marine environment.

One of the elements needed to implement Descriptor 10 of the Directive is the implementation of an action plan on circular economy by the European Commission. As a part of its Circular Economy strategy, the Commission will propose in 2017 a strategy on plastics, addressing marine litter in addition to issues such as recyclability and biodegradability. The strategy is aimed at reducing the amount of waste on the beaches as well as derelict fishing gear by at least 30% by 2020. The Commission will address sea-based sources of marine litter, including from shipping and fishing activities, through the revision of the Port Reception Facilities Directive to reduce the amount of waste in the sea. The Commission will provide financial support, notably from the European Maritime and Fisheries Fund, to improve capacity to collect marine litter and the availability of data on litter.[45]

2009 Council Regulation (EC) No 1224/2009 of 20 November 2009 establishing a Community control system for ensuring compliance with the rules of the common fisheries policy[46]

European Union

This Regulation is the only legal act of Community interest, which imposes specific requirements for the recovery of derelict fishing gears on shipowners. These requirements are laid down in Article 48: "Recovery of lost gear:

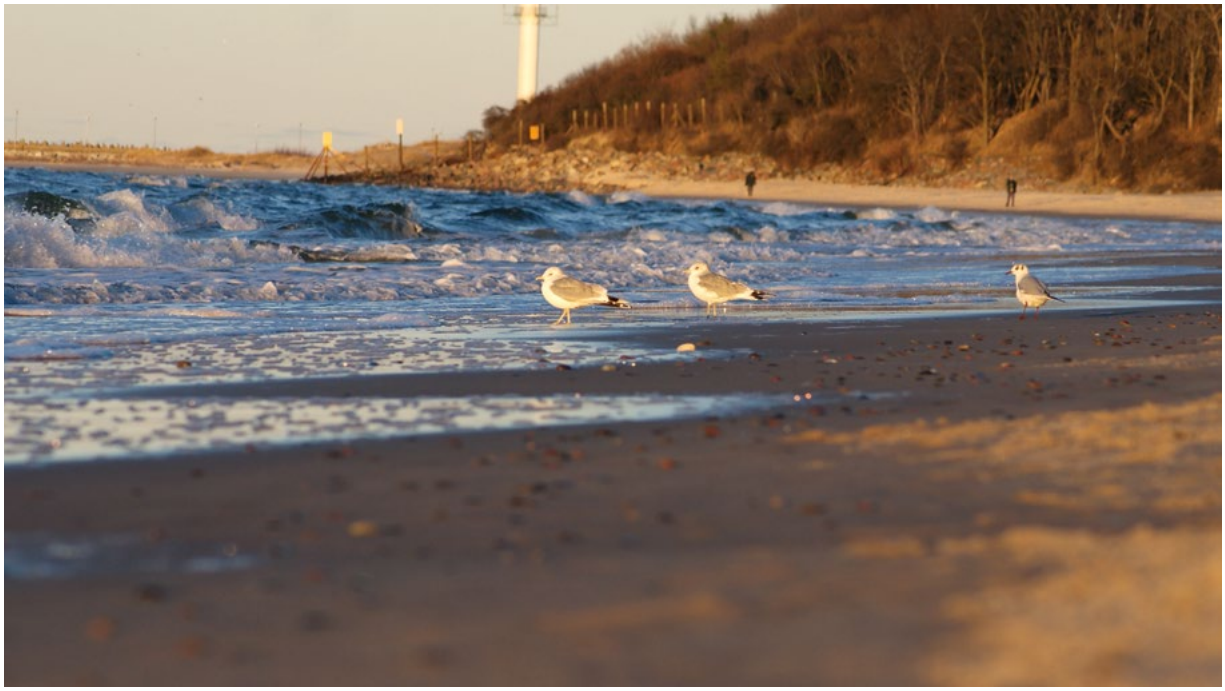
1. A Community fishing vessel shall have the equipment on board to retrieve lost gear.
2. The master of a Community fishing vessel that has lost gear or part of it shall attempt to retrieve it as soon as possible.
3. If the lost gear cannot be retrieved, the master of the vessel shall inform the competent authority of its flag Member State, which shall then inform the competent authority of the coastal Member State, within 24 hours of the following:
   a) the external identification number and the name of the fishing vessel;
   b) the type of lost gear;
   c) the time when the gear was lost;
   d) the position where the gear was lost;
   e) he measures undertaken to retrieve the gear.
4. If the gear that is retrieved by the competent authorities of the Member States has not been reported as lost, these authorities may recover the cost from the master of the fishing vessel that lost the gear.
5. A Member State may exempt Community fishing vessels of less than 12 metres' length overall flying its flag from the requirement set out in paragraph 1 if they:
   a) operate exclusively within the territorial seas of the flag Member State; or
   b) never spend more than 24 hours at sea from the time of departure to the return to port".

December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments.

44 Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).

45 Joint Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. International ocean governance: an agenda for the future of our oceans. JOIN/2016/049 final.

46 Council Regulation (EC) No 1224/2009 of 20 November 2009 establishing a Community control system for ensuring compliance with the rules of the common fisheries policy, amending Regulations (EC) No 847/96, (EC) No 2371/2002, (EC) No 811/2004, (EC) No 768/2005, (EC) No 2115/2005, (EC) No 2166/2005, (EC) No 388/2006, (EC) No 509/2007, (EC) No 676/2007, (EC) No 1098/2007, (EC) No 1300/2008, (EC) No 1342/2008 and repealing Regulations (EEC) No 2847/93, (EC) No 1627/94 and (EC) No 1966/2006.



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2011

International Guidelines on Bycatch Management and Reduction of Discards[47]

Food and Agriculture Organisation – FAO

The international guidelines on by-catch management and reduction of discards identify derelict fishing gears as one of the factors causing by-catch of marine organisms, including commercially exploited fish and shellfish.

Chapter 8 recommends a number of measures, which should be implemented by Regional Fisheries Management Organisations (RFMO), in order to reduce the scale of this phenomenon. These measures include adopting objectives in fisheries management policies and plans to minimize fishing mortalities as a result of pre-catch losses and ghost fishing, improve data collection systems on the impact of derelict gears, as well as developing technologies and measures that quantify and reduce the negative impact.

2011

The Honolulu Strategy[48]

United Nations Environment Programme
National Oceanic and Atmospheric Administration (NOAA)

The Honolulu Strategy prepared during the 5th International Marine Debris Conference is a framework for a comprehensive and global effort to reduce the ecological, human health, and economic impacts of marine debris.

The strategy describes measures aimed at limiting the input of waste resulting directly from human activity at sea. It describes several activities, which contribute to decreasing the amount of lost or abandoned fishing gears and their negative impact. These measures cover: the necessity to develop best practices in fisheries, the use of alternative technologies and modified fishing gears, improvement of the waste collection systems (including fishing gears), and implementation of effective strategies to retrieve derelict fishing gears.

Undoubtedly, the Honolulu Strategy has opened up a new chapter of in the history of measures to solve the problem of marine debris, including derelict fishing gears. The publication of this strategy resulted in elab-

47 FAO, International Guidelines on Bycatch Management and Reduction of Discards. Rome, FAO. 2011. 73 pp.

48 UNEP, NOAA, 2011: The Honolulu Strategy, A global framework for prevention and management of marine debris.

oration and implementation of several regional marine litter plans, including the Baltic Marine Litter Plan described below.

2014 European Maritime and Fisheries Fund[49]

European Union

The European Marine and Fisheries Fund (EMFF) is a tool for achieving the aims and objectives of the Common Fisheries Policy. It sets out the main directions to support the measures, which contribute to the achievement of the CFP goals, in particular the recovery of fish stocks above sustainable levels.

Among the measures, which the fund may support, EMFF includes measures aimed at protecting and restoring biodiversity and marine ecosystems (Article 40), and mentions in particular: "the collection of waste by fishermen from the sea such as the removal of lost fishing gear and marine litter". Polish fishermen have benefited from this fund to carry out the project covered by this report.

2015 2030 Agenda for Sustainable Development[50]

the United Nations

Among the sustainable development goals adopted in 2015 by the leaders of over 100 countries, there is a goal pertaining to the protection of the seas and their resources. Marine litter is included in one of the targets, which states: "By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution". This target should certainly cover the measures aimed at reducing the amount of lost and derelict fishing gears.

2015 HELCOM Regional Action Plan for Marine Litter in the Baltic Sea[51]

The Helsinki Commission

HELCOM Regional Action Plan for Marine Litter sets the standards to put the commitments agreed by the European Union into action, namely 2030 Agenda for Sustainable Development and the Marine Strategy Framework Directive. The Plan was adopted in 2015 by all nine Baltic coastal states. Its content was subject to consultations started in 2013, with the stakeholders, directly or indirectly related to the sea. This wide stakeholders involvement in establishing the objectives of the Plan, as well as the ways of achieving them, constitutes the Plan's greatest value and strength.

The plan aims to significantly reduce marine litter by 2025, compared to 2015, and to prevent harm to the coastal and marine environment. The most important measures to reduce the amount and the impact of derelict fishing gears are:

- to promote and disseminate best practices in relation to all relevant aspects of waste management within the fishing sector, including ports, in order to limit the quantities of derelict fishing gears;
- to develop and implement best fishing practices in relation to derelict fishing gears, as well as best practices in their retrieval from the sea;
- to identify the locations with the highest risk of nets being snagged and the places, where derelict gears accumulate;
- to carry out activities aimed at removing derelict fishing gears;
- to carry out education activities to increase the awareness of sea users in relation to the impact of derelict fishing gears on the environment.

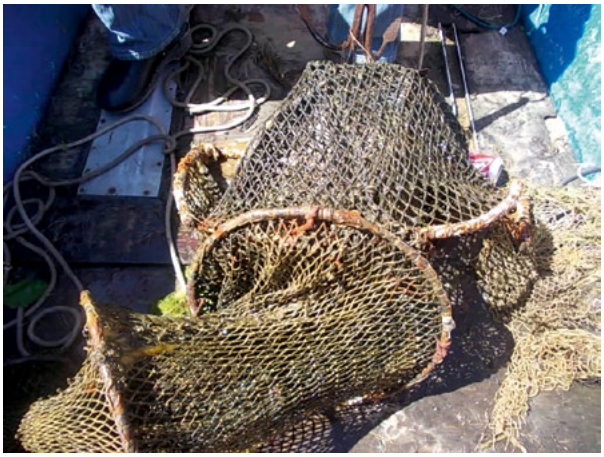
The adoption of the Baltic Action Plan for Marine Litter has undoubtedly contributed to a significant increase of interest in derelict fishing gears in the Baltic. One of the main successes resulting from the implementation of this plan is the MARELITT Baltic project, which has been initiated by Sweden, Germany, Poland and Estonia. The aim of the project is, among others, to find methods to minimise the number of lost gears, to retrieve derelict fishing gears, as well as to introduce new waste management systems, which would permit to recover and re-use valuable netting material in compliance with the concept of circular economy.

49 Regulation (EU) No 508/2014 of the European Parliament and of the Council of 15 May 2014 on the European Maritime and Fisheries Fund.

50 2030 Agenda for Sustainable Development, the United Nations, 2015.

51 HELCOM 2015: Regional Acton Plan for Marine Liter in the Baltic Sea. The Helsinki Commission.

5.2.
National legal acts and documents



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2001 Act of 18 September 2001, The Maritime Code[52]

The Maritime Code does not include any direct reference to derelict fishing gears, but nevertheless it should be mentioned, as it is an important act regulating the issue of no one's property retrieved from the sea, including unmarked lost or abandoned gears.

The recommendations on how to deal with no one's property are described in detail in Chapter IV of the Maritime Code. The provisions included in this chapter state, among others, that in the case of retrieval of no one's property from the sea and inability to indicate its owner, this fact must be reported immediately to the relevant maritime authority, which is obliged to start a procedure to search for the owner of this property. If the owner is identified, then s/he should cover the costs of the gears' retrieval. In other cases, the relevant maritime authority may sell the property in question and the costs of the retrieval shall be covered by the obtained funds.

The question remains whether unmarked lost gears retrieved from the sea should be treated as no one's property in accordance with the provisions of the Maritime Code. In the context of gear retrieval actions carried out in the Polish territorial waters, two interpretations of the rules had been applied by the maritime authorities. In recent years, the prevailing interpretation of the regulations with respect to derelict fishing gears was to exclude the gears from the category of no one's property and to classify them as marine litter. This significantly simplified the recycling procedure by avoiding long procedure related to the search for a potential owner of retrieved fishing gears.

2011 The Polish Code of Conduct for Responsible Fisheries[53]

The Code was signed by four Polish fisheries organisations in 2011 to confirm the will and determination of Polish fishermen to comply with the fishery law, to care for the resources and the environment, to reduce the adverse impact of fishing on the environment, to encourage co-operation with other stakeholders in introducing optimal management measures in fisheries, to enhance the knowledge on the resources and to secure best quality fish to the processors and consumers. Among several provisions, the Code includes one directly related to marine litter, including fishing gear. In the part referring to the reduction of adverse impact of fishery on the environment, the representatives of four fisheries organisations commit themselves to "bring litter to the port, including retrieved fishing gears".

2015 Act on Marine Fisheries[54]

Due to the character of this document, the Act refers to the issue of derelict fishing gear in rather general terms. Article 6 states that unmarked fishing gears exposed in the maritime areas of the Republic of Poland and used to conduct commercial fisheries, should be treated as deliberately abandoned. This Article obliges the shipowners to expose the gears in such a way as to

[52] Act of 18 September 2001, The Maritime Code (Journal of Laws 2001 No.138 item 1545).

[53] The Polish Code of Conduct for Responsible Fisheries, 2011.

[54] The Act of 19 December 2014 on marine fisheries.

avoid any damage to other gears and to mark the gears, among others, to guarantee their visibility.

The provisions of this Act regulating the scope of data that should be collected by masters of vessels of less than 10 meters as part of their monthly catch reports (Article 70) do not cover the need to include the cases of gear loss. The introduction of provisions with respect to lost gears would certainly help to improve the knowledge of the location and causes of such loss and would allow to plan effective operations aimed at retrieving these gears.

2016

Regulation on minimum conservation sizes and closed seasons of marine organisms and detailed conditions for conducting commercial fisheries[55], with later amendments

Ministry of Maritime Economy and Inland Navigation

The Regulation does not directly refer to derelict fishing gear. However, several provisions describe the detailed conditions of conducting commercial fisheries, which should contribute to reducing the number of conflicts and adverse situations at sea, including potentially the loss of fishing gear:

- **§ 9** lays down restrictions on the use of towed gears in coastal areas, where fishing operations are usually carried out with gillnets;
- **§ 10** imposes the obligation to take out gillnets and entangling nets, traps and longlines at least once every 48 hours;
- **§ 12** imposes the obligation to use towed gears at least 150 m from gillnets;
- **§ 15** states that no part of the fishing gear or markings of the gear shall be left on the fishing grounds.

A number of paragraphs describe the marking of passive fishing gear to ensure their visibility and to limit the cases of snagging by other vessels.

2014 2020

Operational Programme "Fisheries and Sea"[56]

The Operational Programme "Fisheries and Sea" (OP FISH) for the years 2014–2020 is consistent with the provisions of the European Maritime and Fisheries Fund in relation to the retrieval of derelict fishing gears. OP FISH together with a number of specific implementing acts foresee the possibility to finance these kind of operations, on the condition that they are carried out in co-operation with non-governmental organisations actively engaged in environmental protection. This provision is to maximise the positive environmental impact of these operations.

The analysis of the above-mentioned documents shows that most of them include very general provisions and goals for reducing the impact of derelict fishing gears on the marine environment. Undoubtedly, programme documents, including all sorts of strategies, action plans and conventions are essential to establish global, regional and local measures. However, given the fact that first documents in this field date back to the 1980s, one would expect a greater progress in elaborating specific and effective solutions in the field of prevention and mitigation of the negative impact of derelict fishing gears.

Article 48 of the Council Regulation 1224/2009 of 20 November 2009 establishing a Community control system for ensuring compliance with the rules of the common fisheries policy, quoted above, describes the measures, which would undoubtedly contribute to the reduction of the amount of derelict fishing gears in the seas. These measures have not been effectively implemented. Cases of gear loss have not been reported by fishermen. Information on the precise location and time of loss of the gear would allow to undertake effective actions to retrieve them. One could presume, that the lack of this information is caused by a low confidence of fishermen towards the fisheries administration and low awareness with regard to these requirements described in the regulation, which in turn results from the complexity of fishery rules. Education in this field should be foreseen, in particular taking into account Article 48, point 4, which states that if the retrieved gear is not reported as lost, competent authorities may recover the cost from the master of the fishing vessel that lost the gear. However, in the case

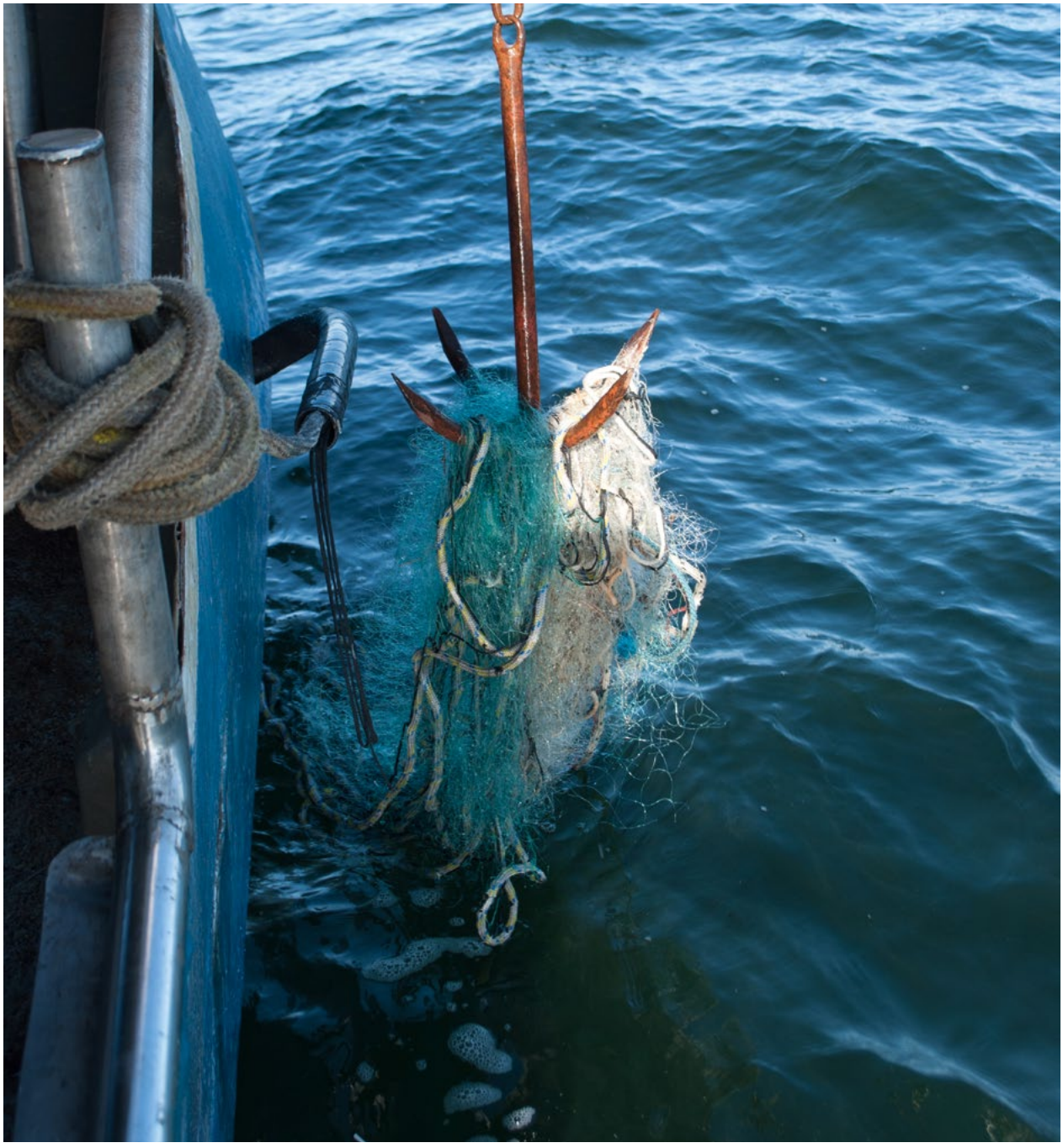
[55] Regulation on minimum conservation sizes and closed seasons of marine organisms and detailed conditions for conducting commercial fisheries, 17 September 2016.

[56] Act of 10th July 2015 on the support of sustainable development of the fisheries sector with the support of the European Maritime and Fisheries Fund.

when the gear loss is reported, this provision does not apply and therefore the fisherman does not bear additional costs.

The requirement to report gear loss in logbooks should also be considered. Logbooks are currently missing such column, which can also be the reason for non-reporting from vessel masters.

It is also worth considering introducing an amendment to the rules regarding marking of the fishing gears, so that the use of electronic marking, which would also functions as transmitters to locate lost gears, is obligatory. However, it is necessary to conduct in-depth studies of such devices to develop a system for net marking with signal of a strength and parameters appropriate for the marine environment. Possible solutions should not cause a significant increase of the costs incurred by fishermen.



Chapter 6

Review of the initiatives aimed at eliminating the impact of derelict fishing gears and other marine litter

As mentioned in the previous chapter, various international documents, among them conventions and regional action plans, as well as increasing public awareness of the impact of marine litter, including derelict fishing gears on the marine environment and the health and life of humans, have become a driving force of activities aimed at solving this problem. These activities can be divided into educational, preventative and mitigation initiatives. Selected global, regional and national initiatives, aimed at mitigating the scale of the phenomenon of derelict fishing gear and other marine litter and its negative impact on the marine environment are presented below.

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6.1. Global and regional initiatives

Global Partnership on Marine Litter (GPML)

https://www.unep.org/gpa/what-we-do/global--partnership-marine-litter

The Global Partnership on Marine Litter was established in 2012 during Rio+ Conference. One of its main goals is the implementation of the provisions of the Honolulu Strategy, described in the previous chapter. This initiative gathers the representatives of all interested parties: international agencies, governments, private sector, civil society, scientists and non-governmental organisations. The Partnership focuses on activities aimed at decreasing the impact of marine litter on the economy, environment and human health, as well as activities enhancing international co-operation and promoting information sharing between local and regional initiatives.

Global Ghost Gear Initiative (GGGI)

http://www.ghostgear.org/

The Ghost Gear Initiative was launched in 2015. It is the first global initiative dedicated to tackling the problem of derelict fishing gear at a global scale. The initiative gathers representatives of the fisheries sector, private sector, scientists, governments, as well as international and non-governmental organisations. The initiative contributes and builds on the Honolulu Strategy.

The two main areas of activity of GGGI is promotion and information exchange between initiatives committed to driving solutions to the problem of derelict fishing gears, carried out worldwide. The website, under "Projects" shows an interactive map of projects carried out by the members of the group.

Ghost Fishing Foundation

http://www.ghostfishing.org

The Ghost Fishing Foundation was established in 2009. It was founded by divers from all over the world, who are concerned by the state of the marine environment. The Foundation initiates and promotes lost fishing gear removal initiatives worldwide and shows the problem to a wide audience.

Healty Seas

http://healthyseas.org/about/

Healthy Seas brings together non-governmental organisations and the industry with the aim to clean the seas and oceans from marine litter, such as derelict fishing gear, and to recycle the retrieved material. This is the main element that distinguishes this initiative from the ones mentioned above. This organisation produces a wide range of products from the retrieved fishing nets, among others socks and carpets.

Marelitt Baltic

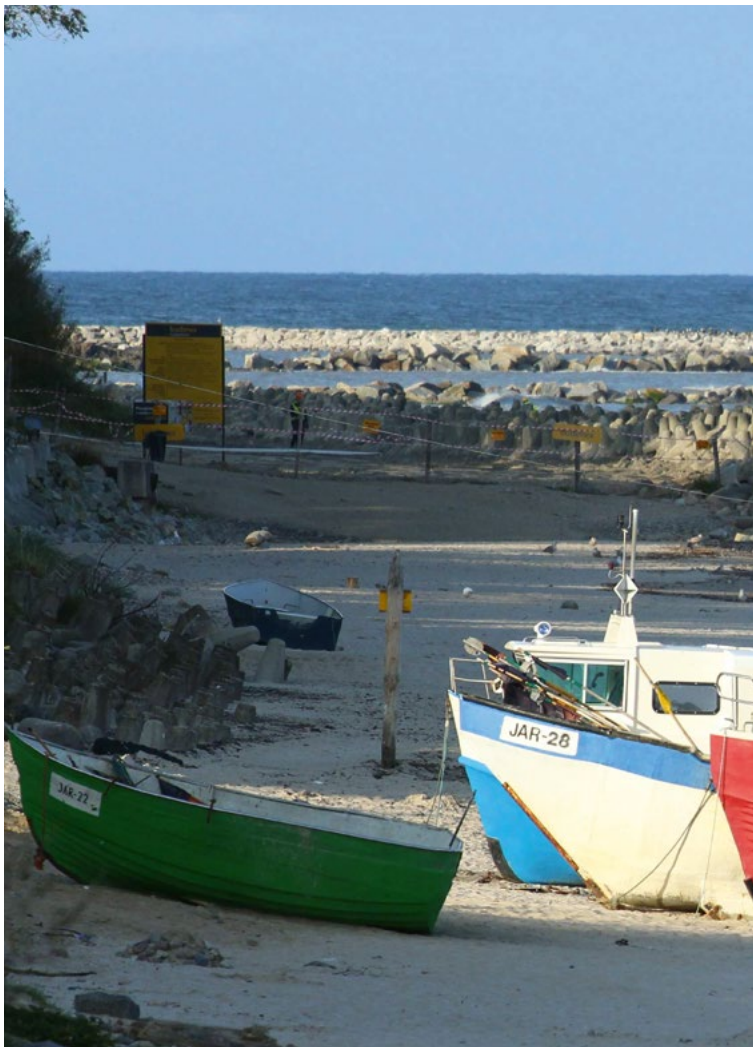
https://www.marelittbaltic.eu

The MARELITT Baltic Project derives directly from the Baltic Marine Litter Action Plan, adopted in 2015. Its objectives are in line with the activities described in the Plan, aimed at mitigating the problem of derelict fishing gear. Project partners include non-governmental organisations (Keep the Estonian Sea Tidy, WWF Poland, WWF Germany, Keep Sweden Tidy), universities (Maritime Academy in Szczecin, Institute of Logistics and Warehousing), fisheries organisations (Kołobrzeg Fish Producers Group), divers (Estonian Divers Association) and local governments (Municipality of Simrishamn).

The aim of the MARELITT project is to develop simple, cost-efficient and environmentally safe methods to retrieve derelict fishing gears from the Baltic, adapting to the different geographical conditions of the Baltic, and to find a systemic solution to the environmental impacts caused by the derelict fishing gears.

The project is carried out by WWF Poland, together with partners from Estonia, Germany and Sweden.

6.2.
National initiatives



Without any exaggeration, Poland is the leader in the initiatives carried out to mitigate the problem of derelict fishing gears in the Baltic.

2004 The first attempts to search for gillnets were carried out by the Sea Fisheries Institute in 2004 (now the National Marine Fisheries Research Institute), using a research vessel *Baltica*. Two types of fishing gears were used during research cruises: otter trawls and small anchors towed on a rope. As a result of hauls parts of gillnets were retrieved. It was concluded that after some modifications the device with small anchors could be successfully used in the search for lost fishing gears. A similar device was used in the projects carried out a few years later.[57]

2007 In 2007, joint actions aimed at retrieving derelict fishing gear were undertaken by Our Earth Foundation and the Maritime Academy in Szczecin. The Memel shipwreck was cleaned in the framework of International Baltic Clean-up Campaign. During the action conducted from the ship of the Maritime Academy, the Navigator XXI, the divers retrieved over 1.5 tonnes of derelict gears, mostly broken trawls. They had worked out several best practices, which were used during the projects carried out later.

2011 In 2011, WWF Poland carried out a pilot project "Collecting ghost nets from the Baltic Sea" aimed at retrieving derelict gears. During 15 days at sea, fishermen took out 4.288 kg of lost nets. In addition, during the wreck cleaning actions carried out on two wrecks, 1.807 kg of unmarked fishing gears were retrieved. Apart from having positive ecological effects, the project also contributed to increasing trust between fishermen and non-governmental organisations, which resulted in the continuation of joint actions in the following years.

57 Wiadomości rybackie, nr 7–8 (139), 2004. Morsk Instytut Badawczy, Gdynia.

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2012 In 2012–2013, WWF Poland continued the retrieval actions in co-operation with the Polish and Lithuanian fishermen. During 67 days at sea, fishing vessels involved in the project retrieved over 14.000 kg of nets. In addition, almost 3.000 kg of nets were removed from 8 shipwrecks. An interactive map of underwater objects on which fishing nets entangle ("hooks") was created with the aim to permit an exchange of information between fishermen on underwater obstacles, which pose a threat during trawling. Unfortunately, fishermen have had little interest in filling in the map with new objects and thus it contains only the information obtained from the Hydrography Office of the Navy.

2015 Undoubtedly the largest project targeting derelict fishing gear, also on a global scale, was carried out in 2015 by the Kołobrzeg Fish Producers Group and WWF Poland. The project was entitled "Removal of derelict fishing gear, lost or discarded by fishermen in the Baltic Sea". Over 100 Polish fishing vessels took part in this project. They spent in total over 14.000 hours at sea. Over 215.295 kg of nets were retrieved during the retrieval operations. In addition, over 500 kg of nets were removed from three shipwrecks. The project was co-financed under the European Maritime and Fisheries Fund.

Chapter 7

Description of the project „Conservation and restoration of marine biodiversity and ecosystems in the framework of sustainable fishing operations, consisting of retrieval of derelict fishing gear and marine litter”

[Project: Clean Baltic]

Background

The problem of derelict fishing gears and their impact on the marine environment is dealt with by many projects and studies worldwide. A detailed review of global initiatives aimed at retrieving fishing gears, as well as at elaborating effective and economically efficient recycling systems can be found, among others, on the website of the MARE Foundation. These initiatives should be followed and the best practices resulting from them should be further applied. Poland, the unquestionable leader in this matter, should actively participate in the discussions held at international level. The measures worked out during the projects carried out in Poland could be implemented in other regions of the world and contribute to minimising the impact of derelict fishing gear on the environment.

First documented activities focused on the retrieval of derelict fishing gears were carried out in the Polish waters of the Baltic in 2004 by the Sea Fisheries Institute (now the National Marine Fisheries Research Institute), using a research vessel Baltica[58]. First activities aimed at cleaning the shipwrecks in the Polish waters were undertaken by Our Earth Foundation and the Maritime Academy in Szczecin. In 2007, during the action conducted from the ship of the Maritime Academy, the Navigator XXI, the divers retrieved derelict gears from the Memel shipwreck.

The above-mentioned activities were the basis for further, large-scale projects related to this problem. In the framework of projects carried out in 2011–2013 in co-operation with fishermen and non-governmental organisations, methodology for effective retrieval of derelict fishing gears was elaborated. The projects have contributed significantly to changing the fishermen's perception of effective protection of the Baltic ecosystem. The co-operation between fishermen and non-governmental organisations active in the area of environmental protection clearly demonstrated that the so-far applied policy with regard to compensations for temporary cessation of fishing activities to protect commercially exploited species requires a revision. The decision-makers, as well as the fishermen decided that during the closed seasons, instead of cessation of fishery, the potential of fishermen, both technical, practical and intellectual, should be used to improve the state of the marine environment. It was also concluded that such solution will help to reduce the exodus of qualified personnel from the fisheries sector and will contribute to diversifying the sources of income. Consequently, following this proposed amendment from passive to active protection of the environment, several provisions were included in the Operational Programme "Fisheries and Sea" for the years 2014–2020 with a view to implement activities aimed at improving the state of the marine environment, jointly by fishermen's organisations and NGOs.

The first such activities were carried out in 2015. Thanks to the financing from the Operational Programme "Sustainable development of the fisheries sector and coastal fishing areas 2007-2013", more than 100 Polish fishing vessels spent over 14.000 hours at sea and retrieved approximately 215.000 kilograms of fishing gears. The project "Conservation and restoration of marine biodiversity and ecosystems in the framework of sustainable fishing operations, consisting of retrieval of derelict fishing gear and marine litter" ("Clean Baltic") is a natural continuation of the project carried out in 2015, however it is focused on coastal areas with the highest risk of losing or discarding gillnets, i.e. the nets with the highest uncontrolled fishing capacity after their loss.

The scale of the current project is also much larger than in 2015. The project is carried out by 5 fishermen's organisations, namely:

1. Association of Marine Fishermen – Producer Organisation (Zrzeszenie Rybaków Morskich – Organizacja Producentów)
2. Boat Fishermen Association "Mierzeja" (Stowarzyszenie Rybaków Łodziowych „Mierzeja")
3. Fishermen Association Wolin (Wolińskie Stowarzyszenie Rybaków)
4. Boat Fishermen's Organisation – Producer Organisation (Organizacja Rybaków Łodziowych - Producentów Rybnych sp. z o.o.)
5. Darłowo Group of Fish Producers and Shipowners (Darłowska Grupa Producentów Ryb i Armatorów Łodzi Rybackich Sp. z o.o.).

Each organisation is responsible for conducting activities in areas, where they operate on daily basis. This approach is of highest importance, because, as proved by the previous projects, the success of such project depends on the knowledge and experience of fishermen with regard to the sea and potential locations of derelict fishing gear. In addition, the location of activities conducted by particular organisations were divided in such a way as to avoid any overlapping.

58 Wiadomości rybackie, nr 7-8 (139), 2004. Morsk Instytut Badawczy, Gdynia.

Activities

As mentioned in the previous chapter, the actions devoted to searching derelict gears were carried out in 2017 by vessels of 5 fishermen's organisations. Therefore, almost the entire Polish coastal area was covered by these activities, including the Vistula Lagoon, the Szczecin Lagoon, the Kamieński Lagoon and the Dąbie lake, where such activities have not been carried out before. The co-ordination of actions carried out by particular organisations permitted to avoid any overlapping in search areas and make the actions the most effective.

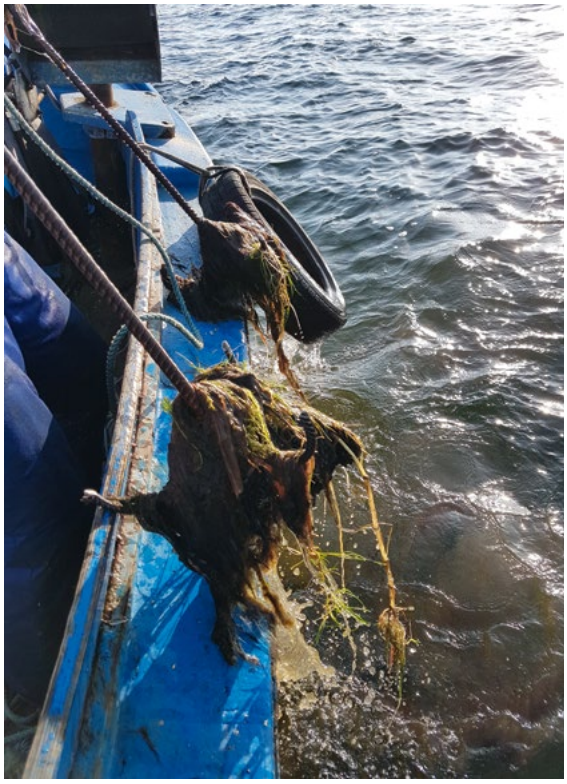
The search for derelict fishing gear was carried out in coastal waters extending up to 12 nautical miles from the coast. This limitation was caused by several factors:

1. **Economic factors** – areas close to the coast were chosen in order to maximise the effectiveness of search time, by shortening the time needed to reach a particular area.
2. **Technical factors** – vessels participating in the project, with a length of up to 12 meters, have a limited ability to reach more distant areas.
3. **Methodological factors** – according to the current knowledge, it was assumed that coastal areas are characterised by the highest probability of finding derelict gillnets, which preserve the highest uncontrolled fishing capacity.

The search activities involved over 500 fishing boats with a length of up to 12 metres from 5 fishermen's organisations. All of the boats participating in the project, with the exclusion of the vessels operating on the lagoons, had an allocated quota for Baltic cod.. This assumption originates from the above-mentioned change in the perception of how fishermen should be involved in environmental protection. Past experience has shown that the involvement of fishermen in additional activities during the closed seasons contributes both to the improvement of the marine ecosystem and to the reduction of the exodus of qualified personnel from the fisheries sector, thanks to the extra income from these activities. An additional argument for the involvement of vessels of up to 12 metres in length was the need to undertake additional measures to reduce the fishing pressure on Baltic cod, which stocks are currently in a poor condition. The involvement of vessels in the search activities outside of the closed season for cod fishery, had permitted to reach this goal, since these vessels did not conduct fishing operations and instead concentrated on search and retrieval of derelict fishing gears.

Each vessel was obliged to conduct fifteen, 8 hours long search actions in an area defined by the project co-ordinator, in consultation with the shipowners and scientists. Taking into account the technical parameters of the vessels that took part in the project, including the cruising speed during the search activities of approx. 1–1.2 Mm/h, each vessel was obliged to search an area of 3-6 square nautical miles. In addition, in order to effectively manage the time of actions and to limit the time needed to reach the fishing grounds, the search areas were allocated with respect to the home port of particular vessels.

In view of the fact that the activities were carried out in the protected Natura 2000 sites, the search was conducted using modified search devices, called creepers. They were lighter than those used in previous projects. This permitted to reduce the negative impact of dragging on the sea bottom. Two types of creepers were mainly used during the project:
1. Creeper of 6 kg for boats up to 10 m,
2. Creeper of 8 kg for boats 10-12 m.



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A complete search device for boats up to 10 metres was composed of:

- a rope: 12 mm thick and 100 metres long,
- a chain: 8 mm thick and 1 meter long,
- a creeper weighing 6 kg,
- floaters.

A complete search device for boats 10-12 m was composed of:

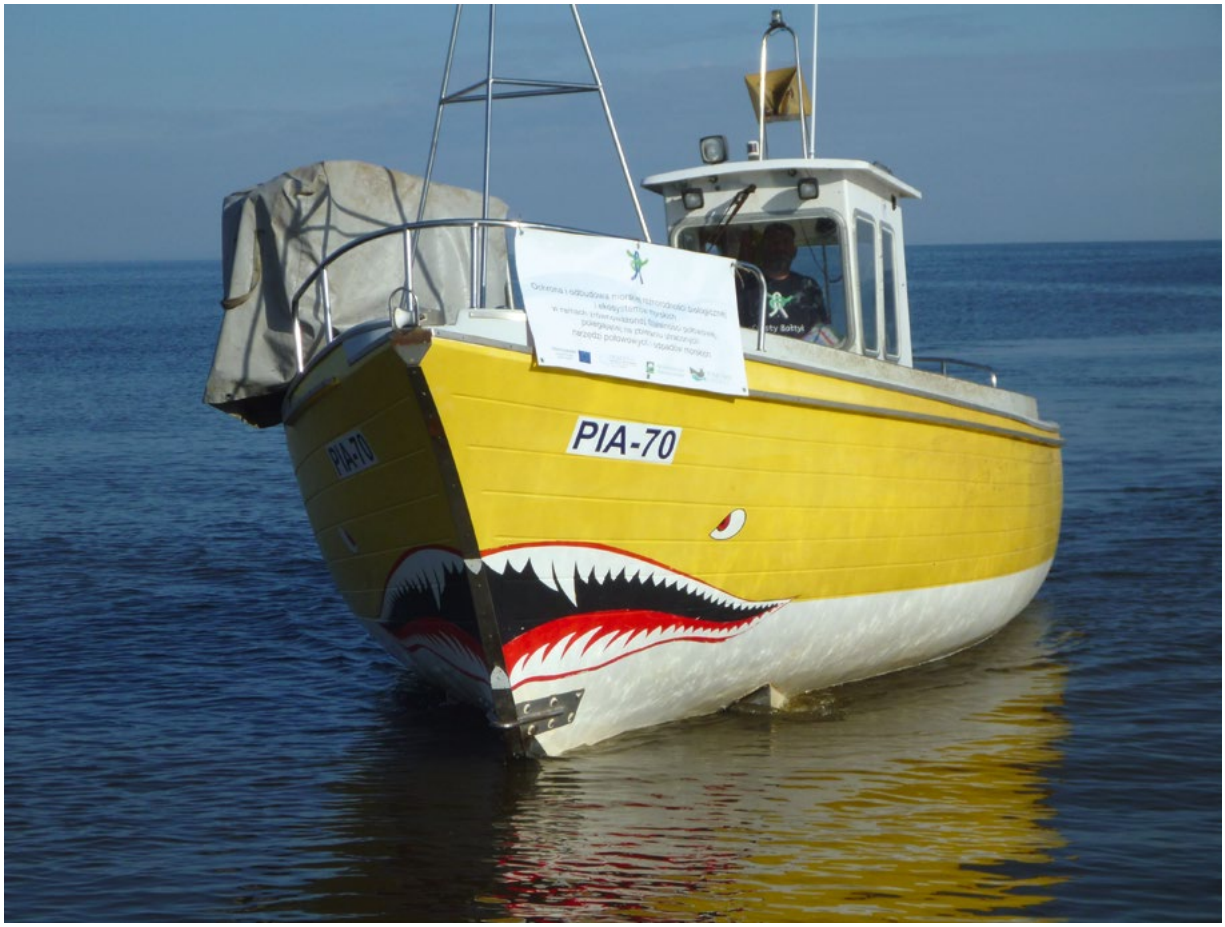
- a rope: 14 mm thick and 133 metres long,
- a chain: 8 mm thick and 1 meter long,
- a steel creeper weighing 8 kg,
- floaters.

It should be noted that much lighter devices were used in particularly sensitive areas, that is a creeper weighing 0.7 kg built of galvanised iron. The size of the device was 180 mm and 165 mm. The creeper was dragged using a steel rope 20-30 m long, depending on water depth. This device was only used to localise derelict fishing gears. The retrieval actions were carried out using the devices described above.

In the framework of the project, the fishing vessels were obliged to retrieve derelict fishing gears, as well as other waste found in the sea. In the case a fishing vessel was not able to take out an object due to its weight, it was obliged to mark it with a buoy, so another vessel, with adequate technical parameters and equipment could attempt to retrieve it.

The retrieved fishing gears and other waste were deposited in special "big bag" containers. Before the removal of the waste by the external, recycling company, fishermen were obliged to fill in the reports of the activities and provide photographic documentation. Data collected in the reports covered:

- locations of search actions,
- co-ordinates of the position, where derelict nets or other waste were recovered,
- date and hour of departure from the port,
- date and hour of return to the port,
- port of departure and return,
- type of retrieved fishing gear,
- fishing gear material,
- mesh size,
- fish species found in the nets,
- weight of fish found in the nets,
- other organisms found in the nets,
- other retrieved waste.



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In the framework of the project carried out by the Association of Marine Fishermen – Producer Organisation (Zrzeszenie Rybaków Morskich – Organizacja Producentów) the operations were carried out in areas up to 30 metres in depth. The search area covered the waters east of Jarosławiec. The vessels departed from 20 ports and covered the following fishing rectangles, located in the vicinity of these ports:

1. **Ustka**, fishing rectangles: KL 5-6, L5,
2. **Rowy**, fishing rectangles: L5, LM5, M5-6, M5, M6, L6
3. **Władysławowo**, fishing rectangles: R6, R7, P7, R5
4. **Dębki**, fishing rectangle P7
5. **Swarzewo**, fishing rectangle R6
6. **Puck**, fishing rectangles: R6, R5, S5
7. **Chłapowo**, fishing rectangles: R6, R5
8. **Chałupy**, fishing rectangles: R6, R5
9. **Hel**, fishing rectangles: S5, R6
10. **Jastarnia**, fishing rectangles: R5, R6, S5
11. **Kuźnica**, fishing rectangles: R6, S5, R5
12. **Rewa**, fishing rectangle R5
13. **Mechelinki**, fishing rectangles: R5, S4
14. **Oksywie**, fishing rectangles: R4, S5
15. **Obłuże**, fishing rectangle R5
16. **Sopot**, fishing rectangle S4
17. **Świbno**, fishing rectangles: S4, ST4
18. **Krynica morska**, fishing rectangles: U4, T4
19. **Krynica morska**, fishing rectangle U4
20. **Piaski**, fishing rectangles: U7, U8, U9, U10, U12, U13, U14, U17.

The search areas coincided with the fishing grounds exploited by vessels stationed in the above-mentioned ports.

The actions were divided into two phases:

- Phase I conducted in April – August 2017. 81 vessels up to 10 metres and 19 vessels above 10 metres were engaged in the actions,
- Phase II conducted from 26th August – 31st October 2017. 56 vessels up to 10 metres and 33 vessels above 10 metres were engaged in the actions.

The actions were also carried out in the following Natura 2000 sites:

- PLB220005 the Puck Bay
- PLH220032 the Puck Bay and the Hel Peninsula
- PLB220004 the Vistula river mouth
- PLH220044 Refuge at the Vistula river mouth
- PLB990002 Baltic Sea coastal waters.

15% of all search actions were covered by observers onboard the vessels in order to control, whether search actions were conducted according to the procedures set up in the project, as well as to collect additional information, which would permit to improve the methodology and effectiveness of search actions in the future.

Results

On the basis of the analysis of data provided by fishermen, it can be concluded that as part of the activities carried out by the Association of Marine Fishermen – Producer Organisation:

1. **During 2 775 8-hour actions** conducted by 185 fishing vessels **80.457 kg** of marine litter was removed from the sea.

2. Gillnets (GNS) dominated among the retrieved fishing gears. Trawls, longlines and traps were also found. The types of gears correspond to the types of gears used in these areas.

3. **The weight of fish (mostly flounder) found in the derelict gear was low**. It should be underlined that fish were found only in 19 derelict fishing gears.

4. Other marine organisms, **including birds and mussels were also found in the derelict gear**. One dead grey seal was found.

5. **Other litter retrieved by fishermen** consisted of buoys, styrofoam, boxes, ropes and other items such as gloves or rubbish bags. As compared to other areas, where the project had been conducted, a lot of lines, both used in fishing gears as well as ropes were found among the retrieved gear.

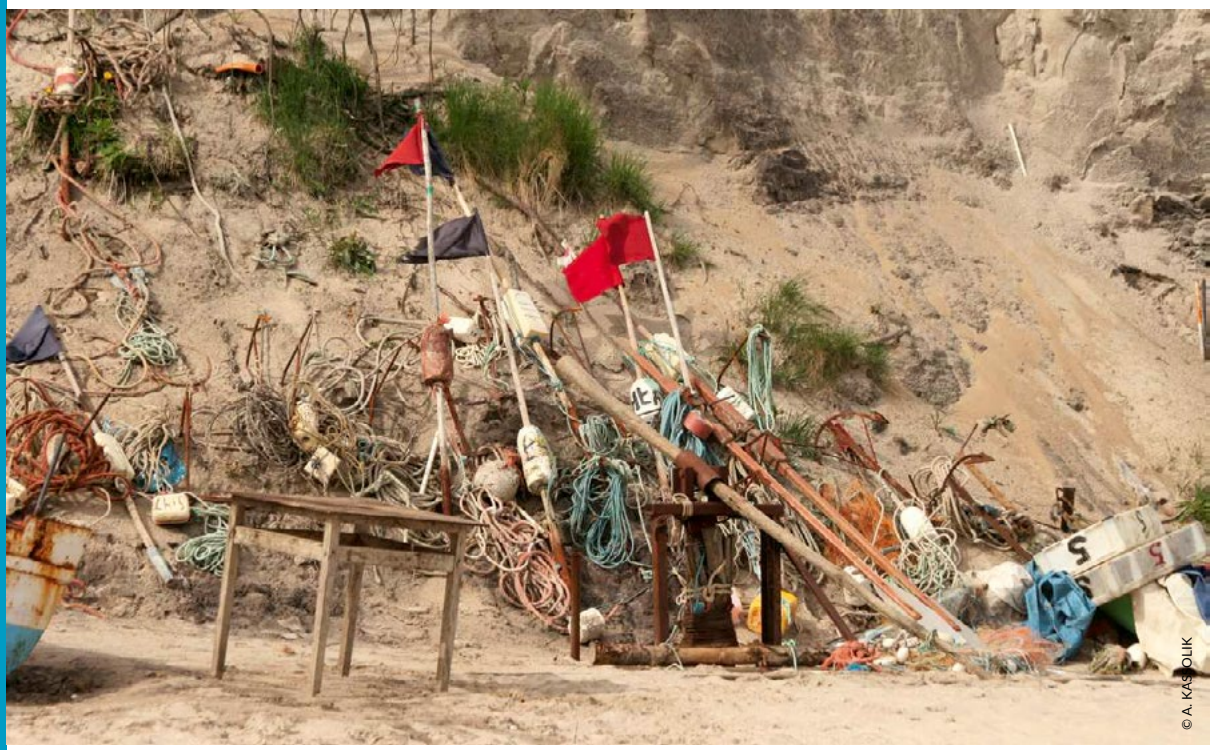
6. **The average effectiveness** of conducted operations was **3.62 kg of litter per hour**.

Chapter 8 Recommendations

The research carried out in recent years on the scale and impact of derelict fishing gear, together with the activities aimed at retrieving the gears from the sea, have undoubtedly helped to extend and systemise the knowledge of this phenomenon. Consequently, a number of strategies and plans, described in this report, have been created, indicating the main lines of action needed to limit the amount of derelict fishing gears and their negative impacts.

However, it is necessary to undertake further intensive measures to accurately identify and estimate the losses caused by derelict fishing gears. The results of these estimates should be confronted with the costs of prevention and reduction of the scale of this phenomenon. It is necessary to elaborate and implement an effective and economically justified strategy for reducing the impact of derelict fishing gear on marine ecosystems and limit social and economic losses.

Considering the above, on the basis of available data, the recommendations mentioned below have been identified as those that need to be implemented in the first place:



1
Full implementation of Article 48 of the Council Regulation (EC) No 1224/2009 of 20 November 2009 establishing a Community control system for ensuring compliance with the rules of the Common Fisheries Policy:

Article 48 describes in detail the measures, which should be undertaken in the case of gear loss. Undoubtedly, full implementation of these provisions, both in relation to the vessels above and below 12 meters, would allow to plan and more effectively conduct actions aimed at retrieving lost gears from the sea.

2
Creation of national registers of fishing gears and introduction of a promissory system of purchase:

Such a system would have two functions. First of all, it would support full implementation of Article 48. Taking into account the limits of fishing gear per vessel, imposed by the law, the implementation of such system and inclusion of all gears in a national register would force the vessel owners to report the cases of gear loss, because the purchase of new gears would only be possible in two cases:

- reporting of a lost gear or
- recycling of an old gear. In addition, the system should cover a promissory component.

If a fisherman gives back his old gear, he should receive a discount on the purchase of new gear. The introduction of such system would contribute to limiting the cases of discarding of fishing gears to the sea. Such system, would also guarantee a full recycling of end-of-life gears, is in full conformity with the principles of circular economy.

3
Introduction of modern localisation technologies to mark the fishing gears:

The use of modern transmitters to mark the fishing gears would allow to effectively locate and retrieve derelict fishing gears. Research on such systems should be continued in order to develop a transmitter with a technical parameters appropriate for the marine environment. The research should cover the economic aspects of the implementation of such system. Possible solutions should not cause a significant increase of the costs incurred by fishermen.

4
Elaboration and implementation of a spatial management plan for marine waters, including spatial and/or temporary management of the fishing areas, using active and passive gears:

One of the main reasons of gear loss is the conflict between the fisheries with passive and active gears. It is therefore recommended to implement a spatial management plan at sea. In co-operation with fishermen, fishing areas and periods for both categories of gears should be determined.

5
Creation of an information exchange system on underwater “hooks”:

The loss of active gear after snagging on underwater “hooks” is undoubtedly on of the main reasons for derelict trawls. It is therefore recommended to create a system of information exchange on the obstacles, which will also be reflected in the legislation. The existing systems do not function well.

6
Improvement of the waste management system in the fishing ports:

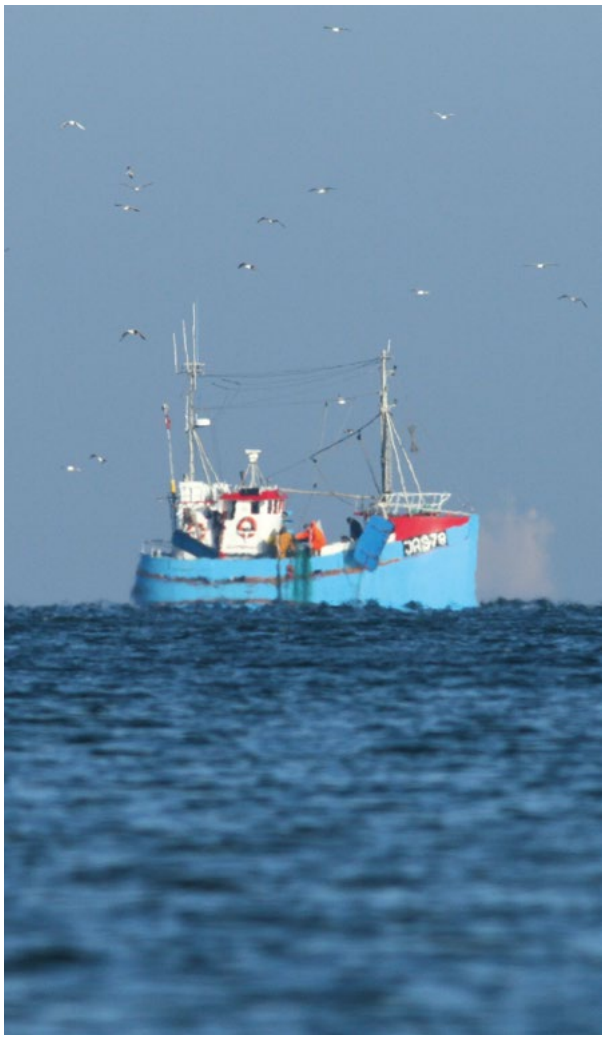
The creation of a national system for collecting end-of--life fishing gears in the ports, through the installation of dedicated waste containers. The netting material, suitably cleaned, can be recycled and therefore should not be deposited in municipal waste landfills. In addition, the creation of a national system for collecting end-of-life gears would contribute to limiting the cases of fishing gears being discarded to the sea.

7
Development and implementation of biodegradable netting material:

Taking into account that the material used for fishing gear takes decades to decompose, research on new materials that would be biodegradable in the marine environment and characterised by the same strength should be undertaken. The use of biodegradable materials for fishing gears would allow to avoid uncontrolled by-catch performed by derelict fishing gears.

8
Continuation of the removal of derelict fishing gears from the sea:

Undoubtedly, prevention should be the key measure to solve the problem of derelict gears. However, cases of gear loss are unavoidable. Therefore, it is recommended to continue the activities aimed at removing derelict fishing gears from the sea. These activities should be co-ordinated and based on reliable information received from fishermen. This can be enhanced by the implementation of recommendations 1, 2 and 3.



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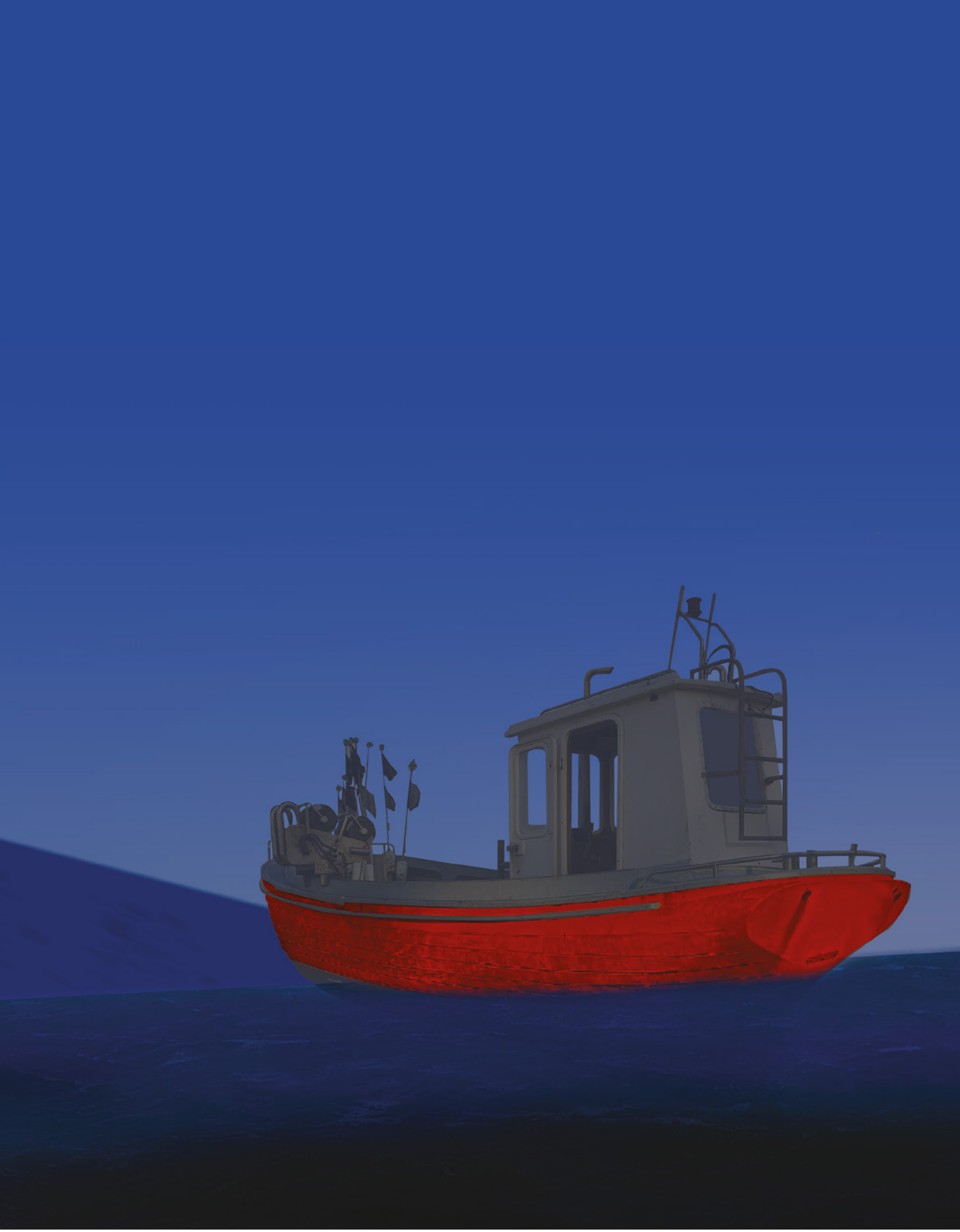

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