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Article

The Sinking of Fishing Vessels from an Environmental Perspective

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ABSTRACT

Illegal, unreported, and unregulated (IUU) fishing is a challenge for coastal states which, despite various international instruments, are still unable to enforce the sovereign rights established by UNCLOS in relation to fish stocks in their Exclusive Economic Zones (EEZs). In an attempt to implement effective deterrent measures, some coastal states resort to sinking fishing vessels identified as engaging in IUU fishing in their EEZs. However, the sinking of these vessels has implications that go beyond the desired deterrent effect, as it reflects an ingrained view that the seas and oceans can be used as a dumping ground, without any further analysis of the impacts of this choice. This study sought to assess the main environmental impacts of this practice, highlighting how significant sinking is for marine pollution. To this end, a sinking action was characterized and an environmental assessment of its main impacts was carried out by adapting Leopold's matrix, in addition to estimating a potential fine for the main impact observed. The conclusion is that the environmental impact of dumping is not negligible and that, due to the potential cumulative effects, global action to regulate or ban this practice is necessary, lest the international community once again impose regulations only when the environmental damage caused by this activity has already had significant deleterious effects on humanity.
Keywords: IUU fishing; sinking; marine pollution.

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Illegal, unreported, and unregulated (IUU) fishing is a challenge for coastal states which, despite various international instruments, are still unable to enforce the sovereign rights established by UNCLOS in relation to fish stocks in their Exclusive Economic Zones (EEZs). In an attempt to implement effective deterrent measures, some coastal states resort to sinking fishing vessels identified as engaging in IUU fishing in their EEZs. However, the sinking of these vessels has implications that go beyond the desired deterrent effect, as it reflects an ingrained view that the seas and oceans can be used as a dumping ground, without any further analysis of the impacts of this choice. This study sought to assess the main environmental impacts of this practice, highlighting how significant sinking is for marine pollution. To this end, a sinking action was characterized and an environmental assessment of its main impacts was carried out by adapting Leopold's matrix, in addition to estimating a potential fine for the main impact observed. The conclusion is that the environmental impact of dumping is not negligible and that, due to the potential cumulative effects, global action to regulate or ban this practice is necessary, lest the international community once again impose regulations only when the environmental damage caused by this activity has already had significant deleterious effects on humanity.
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Introduction

The exploitation of living natural resources in the exclusive economic zone (EEZ) was granted to coastal states by the 1982 United Nations Conference on the Law of the Sea (UNCLOS)[1] . However, the exercise of this exclusivity has not been without conflict, especially between nations seeking to meet the protein demands of their populations. This demand puts pressure, if not on increasing, then on maintaining fishing activity, which can be seen both in global fishing levels and in the evolution of the motorized fishing fleet, as shown in the report *The State of World Fisheries and Aquaculture (*FAO, 2024)[2] .

However, when this activity is carried out in the EEZ without the proper authorization from the coastal state, it generates conflicts that are not new, as shown by some classic cases such as the lobster wars between Brazil and France (December 1960), the cod wars between the United Kingdom and Iceland (December 1970) and the sole war between Canada and Spain (December 1990). Despite advances in the search for good global governance of the seas and oceans, these conflicts remain present, as shown by recent records such as the sinking of fishing vessels by Argentina[3] and Indonesia[4] in 2016 and by French Guiana in 2024[5] , among others.

This paper addresses the practice of sinking vessels involved in illegal fishing in the EEZ from an environmental perspective, questioning the extent to which this practice of using the ocean as a dumping ground is harmful from an environmental standpoint. To achieve this broader objective, the following specific objectives were established: (i) To survey the main social and environmental impacts of sinking fishing vessels involved in IUU fishing; (ii) To assess the significance of the greatest environmental impact observed.

To this end, this paper is divided into five sections, in addition to this introduction. The first section presents the methodology adopted to achieve the specific objectives. The second section presents the triggering event of these conflicts, which is illegal fishing, conceptualizing it for the purposes of this paper and showing the impact of this activity and its implications. Next, the third section discusses the practice of sinking vessels found by coastal states engaged in illegal fishing activities within their EEZs, addressing the case of Indonesia, which has adopted the practice as state policy, and the position (or lack thereof) of other coastal states. The fourth section presents the results and discussions, addressing the significance of the socio-environmental

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1 Article 56(1)(a) of UNCLOS establishes that the coastal state has "sovereign rights for the purpose of exploring, exploiting, conserving, and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed, as well as the seabed and its subsoil, and with respect to other activities for the exploitation and economic use of the zone, such as the production of energy from water, currents, and winds" (UN, 1982, own translation).

2 See figures 13 (page 28) and 23 (page 55) of the original report, available at https://openknowledge.fao.org/handle/20.500.14283/cd0683en. Accessed on 1/25/2024.

3 https://www.defesaaereanaval.com.br/naval/prefectura-naval-argentina-afunda-barco-de-pesca-chines-com-video. Accessed on 11/28/2024.

4 https://e-global.pt/noticias/mundo/asia/indonesia-afunda-mais-de-100-embarcacoes-de-pesca-ilegais-estrangeiras/. Accessed on 11/28/2024.

5 https://www.naval.com.br/blog/2024/06/25/franca-anuncia-destruicao-de-quatro-barcos-brasileiros-por-pesca-ilegal/. Accessed on 11/28/2024.

impacts of the practice and discussing this practice in relation to the responsibility of coastal states under UNCLOS. The fifth and final section presents the final considerations of the study with a call to the global community .

Methodology

Boundary conditions

[6]For the purposes of this study, we considered the deliberate sinking of a vessel involved in IUU fishing in an EEZ with a depth of 2,000 m, without the existence of corals, but with high fish stocks. The hypothetically sunk fishing vessel was considered suitable for industrial fishing with the capacity to access the EEZ of a coastal state other than its state of origin. A trawler was chosen[7] as described below, the image of which can be seen in Figure 1.

Vessel: Professional fishing vessel
Type: Trawler
Length: 60.4 m
Width: 12.6 m
Number of crew members: 12
Fuel oil tank capacity: 280m^3 trawler

Another condition established was that the coastal state in question has no resource restrictions for the proper final disposal of the vessel, and that the flag state has not expressed interest in releasing the vessel on bail.

[6] By deliberate, we mean conducted by the coastal state through drilling holes in the hull, without the use of explosives. It should be noted that the use of explosives is one of the techniques used by Indonesia, as illustrated in Figure 5 of this paper.

[7] Initially, we searched for vessel records in Brazil's General Fishing Activity Registration System (SisRGP) to select a vessel with real characteristics in use in Brazil, but the SisRGP was inoperative. In the search for international references, the report *The State of World Fisheries and Aquaculture (*FAO, 2024) was evaluated, but it did not include vessel types and only classified them into groups by size and motorization. Therefore, we opted to choose a fishing vessel by consulting the website: https://www.nauticexpo.com/pt/prod/remontowa/product-31521-512052.html. Accessed on 12/03/2024.

Figure1 - Professional trawler fishing vessel. Source: https://www.nauticexpo.com/pt/prod/remontowa/product-31521-512052.html. Accessed on 12/03/2024.

Tools

There are several methodologies for conducting an environmental impact assessment, such as spontaneous (*ad hoc*) methods, checklists, map overlay, interaction matrices, interaction networks (*Networks)*, and simulation models. There is no single method that applies to all cases, and the choice of method must be evaluated on a case-by-case basis (Jesus et al., 2021; De Moraes and DAquino, [n.d.] and IBAMA, 2017).

In order to assess the environmental impact of the sinking, the adapted Leopold environmental impact assessment matrix[8] was used. The justification for choosing the Leopold matrix is due to its widespread use in assessments of the impacts of underwater activities by IBAMA, due to the simplicity and objectivity of the instrument.

The disadvantage would be its subjectivity, which was mitigated by the use of part of the methodological guidelines of Technical Note (NT) No. 03/2017 – COEXP/GMAC/DILIC/IBAMA (IBAMA, 2017), one of whose objectives is to minimize subjectivity in these assessments. The methodological guidance of the aforementioned NT presents a series of components required for environmental licensing purposes, but for the purposes of this work, it is understood that the description of the components would exceed its

[8] Created by Luna B. Leopold and colleagues in 1971, the matrix was a response to a gap left by the US Environmental Policy Act of 1969, which was unclear about conducting environmental impact assessments. The classic matrix method consists of three basic elements:

a) a list of effects on the environment;

b) an assessment of the importance of each of the effects;

c) a combination of estimates of magnitude and importance.

For further details, see https://www.iaia.org/pdf/south-eastern-europe/Vol1_EIA_Manual.pdf. Accessed on 12/05/2024.

objectives[9] . Thus, the components considered for the characterization of the impact of the sinking that is the subject of this work were consolidated as follows.

- Occurrence: Only actual impacts are considered.
- Nature: Only negative impacts were considered, not considering any claims of artificial reef creation as positive.
- Form of incidence: Only direct impacts were considered.
- Spatial scope and duration: The impact was considered to be supra-regional due to its impact on fishing shoals and long-lasting due to fuel oil contamination.

With the above components established as a premise, it is now worth highlighting those that were considered in the matrix that was used.

- Magnitude: this is the intensity of the change caused by the aspect on the marine environment, which should be assessed qualitatively as "low," "medium," or "high."
- Sensitivity: this should also be assessed qualitatively as "low," "medium," or "high," according to the specific characteristics of the environment.
- Importance: importance should be interpreted by combining the magnitude of the impact and the sensitivity of the affected environmental factor. The result of this combination can be seen in Table 1 below:

1 Table - Table for assessing the importance of the impact

Environmental Sensitivity	**Magnitude of Impact**		
	Low	**Medium**	**High**
Low	Small	Medium	Average
Medium	Medium	Medium	Large
High	Medium	Large	Large

Source: Technical Note No. 3/2017/COEXP/CGMAC/DILIC (IBAMA).

Considering the above guidelines and assumptions, we arrive at the impact assessment matrix model that was used in this study, which is presented in Table 2 below.

The triggering event adopted was the sinking of the vessel, as already described. The environmental aspect column considered the type of *output* (energy, effluent, noise, etc.) generated by the sinking of the vessel. The following column (environmental impact) listed the impacts generated from the aspect considered and its interaction with the environment. The combination of sensitivity and magnitude generates the importance that, according to NT No. 03/2017, is the crucial stage in the assessment of environmental impacts.

The product of this matrix qualified the impacts identified, allowing them to be identified by their importance. This analysis met the first objective by identifying the main social and environmental impacts of the sinking of the vessel and supported the achievement of the second specific objective.

[9] For more details on the methodological guidelines, see TECHNICAL NOTE No. 3/2017/COEXP/CGMAC/DILIC (SEI 0274753).

To assess the significance of the greatest impact identified, the matrix product was first used to identify the most important one. Then, as a metric to assess how significant this impact is, a fine estimate was adopted. For this, the Oil Manual[10] was used, as it is the protocol adopted by IBAMA in cases of oil spills in jurisdictional waters.

2 Table Impact assessment matrix model

FATO GERADOR	ASPECTO AMBIENTAL	IMPACTO AMBIENTAL	SENSIBILIDADE	MAGNITUDE	IMPORTÂNCIA
			baixa	baixa	Pequena
			média	baixa	Média
			média	média	Média
			média	alta	Grande

Source: Prepared by the author

Illegal Fishing

Fishing in the EEZ of a coastal state without proper authorization is known as illegal fishing (IUU[11]) according to the concept established in *the International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing* - IPOA-IUU (FAO, 2001)[12] .

Regarding the concept of IUU fishing, it is worth highlighting the work of Piñon(2024) when he discusses the need to clarify that this is not a single fact, but rather three separate types of conduct that need to be understood for better characterization[13] . However, for the scope of this work, we are interested in the conduct characterized as illegal that appears in the IPOA-IUU (FAO, 2001) .

Thus, for the purposes of this study, illegal fishing is considered to be that carried out by vessels, whether national or foreign, in waters under the jurisdiction of a state without its permission, or in violation of existing regulations[14] .

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[10] Document prepared by IBAMA entitled "Protocol for Responding to Accidents Involving Oil and Hazardous or Harmful Substances in Waters under National Jurisdiction," known institutionally as the "Oil Manual" (Information No. 2/2022/SECOATE/COATE/CGEMA/DIPRO-IBAMA. SEI/IBAMA 13312386).

[11] In English, *Illegal, unreported, and unregulated* (IUU).

[12] The history and full text of the action plan can be accessed at: https://www.fao.org/iuu-fishing/international-framework/ipoa-iuu/en/ . Accessed on 11/29/2024.

[13] For a more in-depth reading of the concept of IUU fishing, we recommend the thesis "Confronting illegal, unreported, and unregulated fishing in maritime areas beyond the jurisdiction of states: the effectiveness of conservation and management measures for living natural resources in the southwestern Atlantic" by Charles Piñon (2024), available at: https://www.marinha.mil.br/ppgem/sites/www.marinha.mil.br.ppgem/files/tese_pinon_final_deposito.pdf . Accessed on 11/29/2024.

[14] See Item 3.1.1 of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing, available at: https://openknowledge.fao.org/server/api/core/bitstreams/a80c3bfb-1d5b-4ee6-9c85-54b7e83986a2/content. Accessed on 12/19/2024.

The impacts of this activity go beyond those recorded by local fishing communities, such as the reduction of fish stocks and social and environmental imbalance, and also affect the economies of coastal states. Although it is difficult to measure this impact due to the very nature of the activity, these losses are estimated to be in the billions of dollars.

Agnew *et al.* (2009) refer to an estimated annual value of between US$10 billion and US$23.5 billion due to illegal and unreported fishing globally. Pauly and Zeller (2015), cited by Temple *et al.* (2022), estimate losses of US$41 billion due to unreported catches in 2016. According to Khan *et al.* (2024), citing data from *the United Nations Office on Drugs and Crime* (UNODC), they estimate that, for 2016, the entire IUU fishing value chain caused global losses of around US$ 15 to 36 billion.

One of the major challenges in combating IUU fishing is the difficulty of monitoring the vessels involved. A survey based on data from the period 2017-2021 found that 75% of the mapped industrial fleet did not appear in the available tracking systems, evidencing the practice of disconnecting the location systems of these vessels to enable IUU fishing (Paolo *et al.,* 2024).

Figures 2 and 3 below, diagrammed by the website www.smithsonianmag.com[15] based on the study by Paolo *et al.* (2024), present the results of the monitoring carried out and show, respectively, the concentration of publicly traceable fishing vessels and those that are not publicly traceable.

Figure2 - Concentration of publicly traceable fishing vessels. Source: https://www.smithsonianmag.com/smart-news/satellite-maps-reveal-rampant-fishing-untracked-dark-vessels-oceans-180983539/, citing a study by Paolo *et al.*, 2024).

15 Full address: https://www.smithsonianmag.com/smart-news/satellite-maps-reveal-rampant-fishing-untracked-dark-vessels-oceans-180983539/. Accessed on: 12/09/2024.

Figure3 - Concentration of publicly untraceable fishing vessels. Source: https://www.smithsonianmag.com/smart-news/satellite-maps-reveal-rampant-fishing-untracked-dark-vessels-oceans-180983539/, citing a study by Paolo et al. (2024).

This practice, combined with the possibility of transporting goods between coastal regions of different nations and insufficient enforcement in EEZs, allows for other crimes that have also brought IUU fishing under the scope of the UNODC due to its capacity for involvement in a series of transnational crimes, which may or may not be directly related to fishing itself, such as money laundering, forced labor[16] , bribery of authorities, human trafficking, and firearms trafficking (UNODC, 2024).

Some international instruments have been developed by the FAO[17] to tackle IUU fishing, such as the 1995 *Compliance Agreement*[18] , the 2016 *Agreement on Port State Measures*[19] , the 1995 *Code of Conduct for Responsible*

[16] In Brazil, it would be considered work analogous to slavery according to Article 149 of Decree-Law No. 2,848/1940, amended by Law No. 10,803/2003.

[17] Food and Agriculture Organization of the United Nations.

[18] Aims to strengthen the role of flag States and ensure that a State intensifies control over its vessels. For more details, see: https://www.fao.org/iuu-fishing/international-framework/fao-compliance-agreement/en/. Accessed on: 11/26/2024.

[19] Aims to prevent, deter, and eliminate IUU fishing by preventing vessels engaged in such activities from using ports and landing their catches. For further details, see: https://www.fao.org/port-state-measures/en/ Accessed on: 11/26/2024.

Fisheries[20] , and the aforementioned 2001 *International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing* (IPOA-IUU)[21] .

Despite these initiatives seeking global fisheries governance, others have taken shape in response to the challenge. Examples include the work carried out by *Global Fishing Watch*[22] and *Dark vessel detection missions*[23] , which have generated useful information not only for understanding the phenomenon of IUU fishing but also for combating and consequently reducing these activities[24] .

Despite all these instruments and initiatives, IUU fishing not only remains active but also continues to be a source of conflict, as shown by records made by OCEANA in the Argentine EEZ, where situations involving the country's coast guard and foreign vessels engaged in IUU fishing range from seizures to conflicts that resemble a literal war with deliberate collisions and sinkings (Valentine, 2021).

With the above, this section has presented IUU fishing, the economic impact of this activity, and the challenge that the global community faces in trying to establish good fisheries governance. It has also shed light on the conflict generated by this activity, which is not new and remains active in the EEZs of coastal states. Based on this scenario, the next section will address one of the practices adopted by coastal states under pressure from IUU fishing.

The Sinking of Vessels

The practice of sinking vessels involved in IUU fishing activities in the EEZ is implemented by coastal states as a deterrent to protect their fish stocks.

Although this practice has been reported in the press, in informal conversations with professionals in the field, and even in some literature, no database has been found with figures and details on the scale of these sinkings[25] , nor has any survey been conducted among coastal states on the extent to which this practice is institutionalized.

In Brazil, despite reports[26] that the sinking of vessels is an activity that is part of the Brazilian Navy's (MB) options, in a consultation with the MB[27] regarding possible sunken vessels involved in illegal activities

[20] It aims to establish international standards of behavior for responsible practices, with the aim of ensuring the effective conservation, management, and development of living aquatic resources. For more details, see: https://www.fao.org/iuu-fishing/international-framework/code-of-conduct-for-responsible-fisheries/en/ Accessed on: 11/26/2024.

[21] It aims to combat IUU fishing by providing technical support to States, including through regional fisheries organizations, in accordance with international law. For more details, see: https://www.fao.org/iuu-fishing/international-framework/ipoa-iuu/en/ . Accessed on: 11/26/2024.

[22] For further details, visit: https://globalfishingwatch.org/. Accessed on: 12/13/24.

[23] For more details, visit: https://mda.space/dark-vessel. Accessed on 12/13/24.

[24] Action taken by the Costa Rican government in partnership with *Global Fishing Watch* reduced IUU fishing activity in a marine conservation unit. For details, visit: https://ticotimes.net/2024/07/09/cocos-island-national-park-sees-drop-in-illegal-fishing-activity . Accessed on: 12/13/24

[25] There are initiatives to map vessel sinkings due to other causes, but not specifically sinkings resulting from IUU fishing activities in the EEZ. Some examples can be accessed at: https://wrecks.nauticalcharts.noaa.gov/viewer/ or https://www.environment.gov.au/shipwreck/public/maps/shipwreck-map-search-load.do. Accessed on 09/26/24

[26] Information obtained in informal conversations with active and reserve members of the Brazilian Navy.

in the EEZ, the MB responded that there are no records of this activity and that it is guided by Decree No. 5,129/04, which determines the seizure of vessels in this situation[28] .

The choice of this practice would be a more severe and efficient form of punishment because, according to Khan *et al.* (2024), although IUU fishing has ramifications with other transnational crimes, it is treated as a fish stock management problem, resulting in lenient penalties, which would constitute a low-risk and high-profit activity for those involved.

This combination of low risk and high profit is conferred by the provision of Article 73 of UNCLOS, which provides for the release of vessels and crews after payment of reasonable bail when apprehended for IUU fishing, which would allow these criminals to reoffend.

An example of recidivism is presented by Liliansa (2020) when she discusses the vessel Camuoco, which, under the Panamanian flag, was arrested by France in 1999 for illegal fishing in the French EEZ and was released after posting bail. However, after its release, the vessel, now flying the Uruguayan flag and renamed Arvisa I, and operating under a different name, was arrested again by France for IUU fishing in another French EEZ.

Faced with this type of situation and in search of a more effective deterrent, Indonesia has instituted the sinking of vessels involved in IUU fishing activities as state policy since 2009 (Tarigan, 2018). The effectiveness of this measure is based on two premises: (a) once the means (vessels) are destroyed, the possibility of recidivism is eliminated; (b) the possibility of having the means destroyed would unbalance the risk analysis of illegal activity, reducing the appetite for risk in the activity.

Madjid, Widodo, and Samudro (2019) and Liliansa (2020) report that Indonesia adopted this policy due to high economic losses and damage caused by IUU fishing in its EEZ, which was causing suffering to the fishing community. It should be noted that fishing accounts for 50% of the animal protein in the country's population's diet and supports more than 7 million jobs (Guerreo, 2023).

Nainggolan *et al.* (2018), cited by Khan *et al.* (2024), reported that 315 vessels were sunk by Indonesia between 2015 and 2017 due to IUU fishing practices. These 315 vessels sunk by Indonesia in three years are part of a broader scenario in which the ocean is considered a convenient destination for the disposal of unusable items, that is, a type of destination that resembles a landfill, but not an open one, as it is covered by the ocean waters.

In Brazil, an example of this type of use of the ocean for the disposal of unusable equipment occurred with the aircraft carrier "São Paulo," which, after a tortuous attempt at environmentally appropriate disposal, was sunk 350 km off the coast (at the edge of the EEZ)[29] . The potential environmental assessments of the impacts of this disposal are treated as confidential by the responsible environmental agency, as can be seen

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[27] Consultation carried out through the Access to Information Act (LAI). Identifier NUP: 60000.003280/2024-15. Date of registration 09/22/22024.

[28] Response from the Brazilian Navy: In response to your inquiry, this Service informs you that there is no record of sinking by the Brazilian Navy due to illegal practices by vessels. As provided for in Decree 5.129/04, which regulates the Naval Patrol, vessels engaged in unauthorized activities in Brazilian Jurisdictional Waters will be seized and referred to the competent authorities for administrative and criminal purposes.

[29] Press reports on the sinking of the “São Paulo”: https://g1.globo.com/pe/pernambuco/noticia/2023/10/05/marinha-gastou-r-372-milhoes-para-afundar-porta-avioes-desativado-sao-paulo-que-havia-sido-vendido-por-r-10-milhoes.ghtml. Accessed on: 1/26/2024.

from the agency's response when consulted[30] about the possibility of accessing the assessment carried out by the Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA[31]) on the environmental impacts of the sinking of the aircraft carrier:

> The document in question is part of case 00405.004527/2023-55, which aims to establish the environmental agency's legal action strategies. Therefore, the aforementioned case is restricted to attorneys from the Federal Attorney General's Office who are conducting Ibama's legal defense, as well as Ibama employees who are required by the PGF/AGU to provide technical statements regarding the defense. Thus, according to Legal Note No. 2/2024/CPGEST/PFE-IBAMA-SEDE/PGF (18159178), external access to the dossier established for Ibama's legal defense **is not authorized** (IBAMA, 2024, emphasis added).

The stance of coastal states in using the seas and the ocean as a repository is contrary to Chapter XII of UNCLOS, which deals with the Protection and Preservation of the Marine Environment, where Article 192 stipulates the general obligation of states to protect and preserve this environment. This protection is not a matter of mere altruism, but rather the need to preserve the health of the seas and oceans, which ultimately enable the conditions for human life as we know it today.

This section presented the practice of dumping as a deterrent alternative for states that claim it to be the most effective among the other instruments available, a practice that perceives the seas and oceans as usable as a repository for the disposal of waste, without considering impacts other than the most immediate ones, that is, getting rid of a visible problem. The next section will present the methodology that was used to determine how significant the social and environmental impact of this practice and its implications are.

Results and Discussions

The main social and environmental impacts of the sinking of the vessel, according to the methodology adopted, can be seen in Table 3. This table highlights the impacts resulting from the diesel oil spill and the wreckage remaining on the seabed as being of great importance. Both received this classification due to the impacts generated on fish stocks. One is due to contamination by hydrocarbons (diesel oil) leaked from the sinking vessel, and the other is due to the impact on trawling activity.

Hydrocarbon contamination is highlighted because it is directly related to socioeconomic aspects associated with both consumer health and fishermen's income (Araújo *et al.*, 2020). The impact on health is due to the potential bioaccumulative effects of contamination of fish stocks, which in turn has a negative impact on income because contaminated fish are avoided in commercial transactions. It should be noted for further discussion that this contamination is not restricted to the EEZ of the coastal state, since fish stocks do not respect the jurisdictional boundaries established by humans.

[30] Consultation carried out through LAI. No. 02303.017893/2024-29. Order No. 20705527/2024-Diqua.

[31] Brazilian Institute of the Environment and Renewable Natural Resources: federal agency with legal personality under public law, administrative and financial autonomy, linked to the Ministry of the Environment (MMA), responsible for environmental licensing and inspection processes at the federal level.

The permanence of the wreckage could be mitigated by the creation of artificial reefs, which is not part of the analysis of this study. This permanence does not present a risk of contamination of fish stocks or cross-border pollution per se, but rather a more specific, physical, and permanent impact. It is important to note the potential future damage to mineral exploration, whether of the seabed or oil and gas reserves, since the permanent presence of wreckage would require the diversion of any underwater installations.

Having identified the main impacts and determined that the diesel oil spill was the most significant, we proceeded to calculate the potential fine for this sinking. For incidents involving the discharge of fuel oil[32] , the Oil Manual, in item 7.4 - Procedures for the discharge of oil or oily mixtures into waters under national jurisdiction from vessels not associated with offshore platforms - assigns responsibility for investigation to the Brazilian Navy (MB).

The MB establishes the standardization for the assessment of administrative fines for water pollution in NORMAM-401/DPC[33,34] , which in its item 1.5 indicates a potential range from R$ 1,000.00 to R$ 50 million, according to Decree 4.136/2002[35] . To define values, an Environmental Technical Report (LTA) issued by the MB is required, but the aforementioned NORMAM does not provide sufficient information for this valuation, and the reports already issued, which could be used as a source, although public, are not available *online*.

In the absence of further information from NORMAM and the LTAs, it was decided to apply item 7.3.10.2 of the same Oil Manual, which contains a table with the ranges of fines per volume spilled, referring to oil discharges from vessels associated with the oil & gas (O&G) industry[36] . This table shows fine ranges proportional to the spill and indicates that, for a spilled volume greater than 100 and less than 200 m^3[37] , the fine would be R$ 20 million.

[32] The concepts of incident, discharge, and oil comply with the provisions of item 6.1.1 of the "Oil Manual."

[33] NORMAM are the Maritime Authority Standards that regulate activities carried out at sea.

[34] Available at: https://www.marinha.mil.br/sites/default/files/atos-normativos/dpc/normam/normam-401.pdf. Accessed on 12/15/24.

[35] Provides for the specification of penalties applicable to violations of the rules for the prevention, control, and inspection of pollution caused by the discharge of oil and other harmful or hazardous substances into waters under national jurisdiction, as provided for in Law No. 9,966 of April 28, 2000, and makes other provisions.

[36] The use of the item applicable to the discharge of oil from vessels associated with the O&G industry was not considered excessive, since the executor of the practice, in this case the coastal state, can be equated in terms of financial and technical capacity to the O&G industry.

[37] For characterization purposes, a volume smaller than the total capacity of the tanks (280m^3) was considered.

Table3 - Survey of the main environmental impacts of the sinking of the vessel involved in IUU fishing

FATO GERADOR	ASPECTO AMBIENTAL	IMPACTO AMBIENTAL	Meio Fisico (F) ou Biótico(B)	Sócioeconômico (S ou N)	SENSIBILIDADE	MAGNITUDE	IMPORTÂNCIA
Afundamento de Embarcação de Pesca	Liberação de resíduos sólidos classe IIA e IIB	Alteração temporária das características físico-químicas da água	F	N	baixa	baixa	Pequena
		Contaminação biota/estoque pesqueiro	B	N	baixa	baixa	Pequena
	Liberação de resíduos sólidos classe I	Alteração temporária das características físico-químicas da água	F	N	média	baixa	Média
		Contaminação biota/estoque pesqueiro	B	N	média	média	Média
	Liberação de produto quimico (p. ex. fluido hidraulico)	Alteração temporária das características físico-químicas da água	F	N	baixa	baixa	Pequena
		Contaminação biota/estoque pesqueiro	B	N	média	média	Média
		Deslocamento dos estoque pesqueiro	B	S	média	baixa	Média
	Vazamento de água oleosa	Alteração temporária das características físico-químicas da água	F	N	baixa	baixa	Pequena
		Contaminação biota/estoque pesqueiro	B	N	média	média	Média
		Deslocamento dos estoque pesqueiro	B	S	média	baixa	Média
	Geração de ruídos	Deslocamento dos estoque pesqueiro	B	S	média	baixa	Média
	Descarte de efluentes sanitários	Interferência na cadeia alimentar do estoque pesqueiro	B	N	baixa	média	Média
		Alteração temporária das características físico-químicas da água	F	N	baixa	baixa	Pequena
	Permanência definitiva de destroços no assoalho marinho	Ocupação do leito com modificação da topografia	F	N	baixa	baixa	Pequena
		Alteração da composição do estoque pesqueiro	B	S	média	média	Média
		Impaco na atividade pesqueira (pesca de arrasto)	NA	S	média	alta	Grande
		Restrições a futura exploração do assoalho e subsolo submarinos	NA	S	baixa	média	Média
	Vazamento de óleo diesel combustível devido a ruptura dos tanques	Redução temporária da área de pesca	NA	S	média	alta	Grande
		Contaminação da biota/estoque pesqueiro	B	S	média	alta	Grande
		Poluição da costa	F	S	média	média	Média
		Alteração temporária das características físico-químicas da água	S	N	média	média	Média

Source: Prepared by the author.

Considering the most important environmental aspect found in the survey and the estimated fine, it can be concluded that the environmental impact of the sinking of this type of vessel is not negligible. When assessing the position of the coastal state as the executor of the sinking, it could be argued that it is exercising its sovereign right to apply its judicial measures, as provided for in Article 73 of UNCLOS, legitimizing its actions, which is corroborated by Liliansa (2020) when analyzing Indonesia's vessel sinking measures.

As evidenced by the environmental assessment and the estimated potential fine, by sinking vessels found engaged in illegal activities in its EEZ, the coastal state would be promoting marine pollution that is not negligible and potentially harmful to other states, since there are no physical limits to marine contamination. This scenario of deliberate pollution by the coastal state would also conflict with Principle 21 of the 1972 Stockholm Declaration on the Human Environment, which states that:

> States have the sovereign right to exploit their own resources pursuant to their own environmental policies, and the obligation to ensure that activities within their jurisdiction or control **do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction** (UN, 1972, my emphasis).

Thus, considering that conflicts arising from IUU fishing occur in areas that have already been delimited and that the ocean still has 200 maritime boundaries pending definition (García and Gupta 2022, Acikgonul and Lucas 2020 *apud* MacKay and Collins, 2025) the possibility of coastal states adopting this practice in order to implement more effective deterrent measures is not reduced, which requires coordination through global fisheries governance that is not only more responsible but also more effective, lest, once again, rules and practices be imposed only after significant harmful effects on humanity have occurred.

Final Considerations

No, the ocean is not a wild west, as claimed by Paul Watson, one of the founders of *Greenpeace* who now leads *Sea Shepherd*[38] . The ocean is indeed a complex, multifaceted environment, with a kaleidoscope of actors, interests, factors, and dynamics still being discovered and not fully understood, which demands responsible and long-term actions.

Under the conditions raised, the study manages to show the magnitude of the environmental impact of the practice of sinking vessels on a case-by-case basis. A broader study with institutional support from coastal states could provide an analysis of the global situation of these practices and the extent to which the marine environment is affected.

In fact, maintaining the practice of sinking without global initiatives that seek best practices for the issue, or even its ban, is in line with maintaining the current ocean governance scenario, where conservation issues are considered important but addressed insufficiently to effectively achieve the goals of sustainable ocean use.

What has been presented here is a specific explanation of an isolated action where coastal states, in an attempt to protect their fish stocks, cause damage that is not adequately accounted for and that will

[38] Wanted by Interpol, Paul Watson sinks ships to save whales. Available at: https://www.uol.com.br/ecoa/reportagens-especiais/causadores-paul-watson/#cover. Accessed on: 12/13/24.

cumulatively have a negative impact not only on the state itself, but also on humanity, which depends on the good health of the ocean.

This situation reflects how society has long treated the seas and oceans as a final disposal area for its activities, from the simple disposal of domestic waste to the sinking of an aircraft carrier .

Bibliographic References

Agnew DJ, Pearce J, Pramod G, et al. 2009. Estimating the worldwide extent of illegal fishing. PLoS ONE 4(2):e4570. [cited 2024 Nov 26]. Available from: https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0004570&type=printable.

Araújo ME, Ramalho CWN, Melo PW. 2020. Artisanal fishers, consumers, and the environment: Immediate consequences of the oil spill in Pernambuco, Northeast Brazil. Cadernos de Saúde Pública 36(1). [cited 2025 Nov 26]. Available from: https://doi.org/10.1590/0102-311x00230319.

Cocos Island National Park sees drop in illegal fishing activity. The Tico Times [serial on the Internet]. 2024 Jul 9 [cited 2024 Dec 13]. Available from: https://ticotimes.net/2024/07/09/cocos-island-national-park-sees-drop-in-illegal-fishing-activity.

De Moraes CD, Daquino CA. Environmental impact assessment: a review of the literature on the main methodologies. [monograph on the Internet]. [s.l.]. [cited 2024 Dec 19]. Available from: https://labhidrogeo.paginas.ufsc.br/files/2016/08/AIA-UMA-REVIS%C3%83O-DA-LITERATURA-SOBRE-AS-PRINCIPAIS-METODOLOGIAS.pdf.

FAO (org.). 2001. International plan of action to prevent, deter and eliminate illegal, unreported and unregulated fishing. Rome: Food and Agriculture Organization of the United Nations. [cited 2024 Dec 19]. Available from: https://openknowledge.fao.org/server/api/core/bitstreams/a80c3bfb-1d5b-4ee6-9c85-54b7e83986a2/content.

FAO. 2024. The State of World Fisheries and Aquaculture 2024 – Blue Transformation in action. Rome: [n.p.]. [cited 2024 Nov 25]. Available from: https://openknowledge.fao.org/handle/20.500.14283/cd0683en.

France announces destruction of four Brazilian boats for illegal fishing. Poder Naval [serial on the Internet]. 2024 Jun 25 [cited 2024 Nov 28]. Available from: https://www.naval.com.br/blog/2024/06/25/franca-anuncia-destruicao-de-quatro-barcos-brasileiros-por-pesca-ilegal/.

Guerrero S. 2023. Between fishing nets and sovereign rights in the South China Sea: Illegal fishing in Indonesia's EEZ. [monograph on the Internet]. [s.l.]. [cited 2024 Dec 14]. Available from: https://cemeri.org/pt/art/a-conflicto-china-meridional-pesca-kt.

IBAMA, Brazilian Institute of the Environment. 2024. Dispatch: Response to Request for Access to Information LAI DIC 20619886. [homepage on the Internet]. [n.p.: n.p.]. [cited 2024 Dec 1]. Available from: https://drive.google.com/drive/folders/10Ee2aw1LUw3_pdfveK04nO_xKIDhqJOY.

IBAMA, Brazilian Institute of the Environment. 2017. Technical Note No. 3/2017/COEXP/CGMAC/DILIC. SEI/IBAMA - 0274753, NT no. 03/2017.

Indonesia sinks more than 100 illegal foreign fishing vessels. e-Global.pt [serial on the Internet]. 2018 Aug 22 [cited 2024 Nov 28]. Available from: https://e-global.pt/noticias/mundo/asia/indonesia-afunda-mais-de-100-embarcacoes-de-pesca-ilegais-estrangeiras/.

Jesus MS, Silva MG, Tavares MS, Silva LGO, Santos REM, Brandão TM, Costa IMNB, Amorim EOC. 2021. Methods for assessing environmental impacts: a literature review. Brazilian Journal of Development 7(4):38039–38070. [cited 2024 Dec 3]. Available from: https://doi.org/10.34117/bjdv7n4-321.

Khan AMA, Jiang MG, Yang XQ, Apriliani IM, Purba NP, Wiryawan B, Taurusman AA, Pasaribu B. 2024. Illegal fishing threatens the sustainability of future tuna commodities in Indonesia. Marine Policy 159:105936. [cited 2024 Nov 9]. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0308597X23004694.

Liliansa D. 2020. The necessity of Indonesia's measures to sink vessels for IUU fishing in the Exclusive Economic Zone. Asian Journal of International Law 10(1):125–157. [cited 2024 Dec 13]. Available from: https://www.cambridge.org/core/product/identifier/S2044251319000183/type/journal_article.

Mackay K, Collins R. 2025. Reorienting approaches to maritime boundary disputes: A case for hydro-diplomacy? Marine Policy 171:106442. [cited 2024 Nov 24]. Available from: https://www.sciencedirect.com/science/article/pii/S0308597X24004421.

Madjid MA, Widodo W, Samudro EG. 2019. The implementation of sinking illegal fishing vessels policy towards the bilateral relations between Indonesia and Malaysia. Politik Indonesia: Indonesian Political Science Review 4(2):191–207. [cited 2024 Dec 3]. Available from: https://journal.unnes.ac.id/nju/index.php/jpi/article/view/18767.

The Navy spent R$ 37.2 million to sink the decommissioned aircraft carrier São Paulo, which had been sold for R$ 10 million. G1 [serial on the Internet]. 2023 Oct 5 [cited 2024 Jan 26]. Available from: https://g1.globo.com/pe/pernambuco/noticia/2023/10/05/marinha-gastou-r-372-milhoes-para-afundar-porta-avioes-desativado-sao-paulo-que-havia-sido-vendido-por-r-10-milhoes.ghtml.

UN, United Nations. 1982. United Nations Convention on the Law of the Sea. [homepage on the Internet]. [s.l.: s.n.]. [cited 2024 Nov 28]. Available from: https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf.

UN, United Nations. 1972. Report of the United Nations Conference on the Human Environment (Stockholm Declaration). [homepage on the Internet]. Stockholm. [cited 2024 Dec 19]. Available from: https://documents.un.org/doc/undoc/gen/nl7/300/05/pdf/nl730005.pdf.

Paolo FS, Kroodsma D, Raynor J, Hochberg T, Davis P, Cleary J, Marsaglia L, Orofino S, Thomas C, Halpin P. 2024. Satellite mapping reveals extensive industrial activity at sea. Nature 625(7993):85–91. [cited 2024 Nov 30]. Available from: https://www.nature.com/articles/s41586-023-06825-8.

Piñon CP. 2024. Addressing illegal, unreported, and unregulated fishing in maritime areas beyond the jurisdiction of States: the effectiveness of conservation and management measures for living natural resources in the Western South Atlantic. Doctorate. Naval War College, Graduate Program in Maritime Studies (PPGEM), Rio de Janeiro, RJ. [cited 2024 Nov 14]. Available from: https://www.marinha.mil.br/ppgem/sites/www.marinha.mil.br.ppgem/files/upload/tese_pinon_final_deposito.pdf.

Argentine Naval Prefecture sinks Chinese fishing boat (with video). Air & Naval Defense [serial on the Internet]. [2016] [cited 2024 Nov 28]. Available from: https://www.defesaaereanaval.com.br/naval/prefectura-naval-argentina-afunda-barco-de-pesca-chines-com-video.

Wanted by Interpol, Paul Watson sinks ships to save whales. [serial on the Internet]. [cited 2024 Dec 13]. Available from: https://www.uol.com.br/ecoa/reportagens-especiais/causadores-paul-watson/#cover.

Tarigan MI. 2018. Implementation of countermeasures effort of illegal fishing in Indonesia (Case Study on Sinking the FV Viking Vessel). Journal of Indonesian Legal Studies 3(1):131–146. [cited 2024 Nov 9]. Available from: http://journal.unnes.ac.id/sju/jils/article/view/23213.

Temple AJ, Skerritt DJ, Howarth PEC, Pearce J, Mangi SC. 2022. Illegal, unregulated and unreported fishing impacts: A systematic review of evidence and proposed future agenda. Marine Policy 139. [cited 2024 Nov 11]. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0308597X2200080X.

UNODC, United Nations Office on Drugs and Crime. 2024. UNODC approach to crimes in the fisheries sector. [homepage on the Internet]. [s.l.: s.n.]. [cited 2024 Nov 13]. Available from: https://www.unodc.org/res/piracy/index_html/UNODC_Approach_to_Crimes_in_the_Fisheries_Sector.pdf.

Valentine M. 2021. Now you see me, now you don't: Vanishing vessels along Argentina's waters. [monograph on the Internet]. Zenodo. [cited 2024 Nov 26]. Available from: https://zenodo.org/record/4893397.