Development of Studies on IUU Fishing Alleviation Policies and Discourse Network Analysis: A Literature Review

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Abstract. IUU Fishing has received increasing public attention in the last decade, due to various significant impacts, especially on the destruction of the marine environment. Meanwhile, the United Nations (UN) has established a global alleviation policy through the Sustainable Development Goals, which targets the practice of IUU fishing to be destroyed by 2020. In fact, the IUU Fishing index shows a slight increase, and 130 unit fishing vessels are still actively roaming. The success of existing IUU Fishing eradication policies is questionable, and one of the elements of success is the role of academics in supporting the policy process through scientific literature. This study aims to obtain an overview of the literature development to contribute to successfully implementing the IUU Fishing alleviation policy. By using two analytical techniques and elaborating on Discourse Network Analysis as the research focus being investigated, the authors review and map the development of their research. Bibliometric analysis and Content Analysis succeeded in answering the predetermined research questions. Opportunities for future studies are wide open to conduct studies focusing on implementing policies to eradicate IUU Fishing and DNA because these topics are dynamic, and the number of studies has tended to be low in the past 18 years.

1 Introduction

The topic of IUU Fishing, which stands for Illegal, Unreported, and Unregulated Fishing, for the past decade, has received worldwide public attention as indicated by the fluctuation of searches for this topic in the Google search engine from 2013 to 2022 [1], which is presented in Figure 1.

This attention is also supported by the trend of tweets on the social networking media Twitter from 2013 to 2022. The results show at least 44,146 tweets by netizens discussing the topic of IUU Fishing, with the keywords 'Illegal, Unreported and Unregulated Fishing' and 'IUU Fishing'. The trend of the number of tweets is presented in Figure 2.
The phenomenon of IUU fishing has not escaped the attention of the United Nations (UN), which sees it as a severe threat to the sustainability of the marine environment [2], through the dredging of fisheries resources [3], as well as the sustainability of one of the crucial sources supporting food availability throughout the world, namely seas and marine resources [4]. This condition prompted the UN to include this criticality as one of the seventeen targets of the Sustainable Development Goals (SDGs) and emphasized that by 2020, this practice must have been eradicated from all corners of the world. The existence of this decisive action has been a long journey that began since the existence of overfishing hundreds of years [5], the peak of which occurred in the 1980s [6]. Various policies were released at the global level to combat the practice of IUU Fishing, starting with The United Nations Convention on the Law of the Sea (UNCLOS) in 1982 [5-6], a prominent legal agreement that regulates behavior between countries that is universal [9], approved by 168 countries (including the European Union) and comprehensively regulates maritime issues, even non-convention countries must comply with the rules of law in it [10]. The FAO Compliance Agreement in 1993 [11], became an international agreement between countries on conservation and management actions aimed at increasing the role of flag states and strengthening their control over the compliance of their fishing vessels when fishing on the high seas. In 1995 following the emergence of an agreement that ensured the long-term conservation and sustainable use of balanced stocks of highly migratory fish, namely the UN Fish Stocks Agreement, which also outlined the obligations of flag states regarding registration and record keeping, authorization, compliance, and enforcement of fishing vessels [12]. In the same year, the Code of Conduct for Responsible Fisheries was presented to ensure effective conservation, management, and development of biological water.
resources, with respect for ecosystems and biodiversity, in the form of international regulations regarding standards of responsible fishing practice behavior [13].

However, what is the reality of IUU Fishing practices as of 2022? After more than two years since exceeding the target of the UN’s proclamation of alleviation of IUU Fishing, recorded as of January 27, 2023, there are still at least 335 fishing vessels included in this list, according to a recent investigation by TMT. This Norwegian non-profit organization provides fisheries intelligence, analysis, and capacity support to national authorities and related international institutions, was revealed that 184 fishing vessels were confirmed as perpetrators [14], 130 of them were detected with active status, and only 34% were supported by information from the flag country. This information can be observed in Figure 3.

![Image](image.png)

**Fig. 3.** Active Fishing Vessel Worldwide [12].

Indicators of the effectiveness of combating IUU Fishing are also supported by the existence of the IUU Fishing Index, which provides information on benchmarks and ranking of the vulnerability, prevalence, and response of 152 countries in the world that have maritime coastlines to IUU Fishing in the period 2019 to 2021 [13-14]. The report provides a measurement scale of 1 (best) to 5 (worst) as a benchmark. It revealed that the global total score of all countries experienced a slight increase from 2.29 in 2019 to 2.24 in 2021, where Estonia won the title of the best country in combating IUU Fishing with a score of 1.62, while the worst country is China with a value of 3.86.

The existence of these factual discrepancies raises the question, what is the level of success in implementing IUU Fishing eradication policies that are present at the international level (perhaps also at the regional level) in resolving this troubling practice? The successful implementation of a public policy is, indeed, supported by several elements, one of which is the role of the actor or stakeholder [15–17]. Of the many actors, some have quite a strong influence but have moderate or low interest, namely academics or scholars. Scholars have an essential role in influencing the policy process, one of which is through their published studies, which can describe the dynamics of IUU Fishing alleviation policies through research developments or scientific literature that reviews the policy themes. Of course, quite a lot of studies like this have been carried out by researchers. However, the next question arises, is there research with this focus that is elaborated with discourse network analysis techniques, and how is the scientific development? The benefits that can be obtained from the use of Discourse Network Analysis (DNA) in policy implementation include being able to photograph social facts from all negotiations, intrigues, calculations, records of persuasion, and violence committed by actors or authorities on behalf of other actors or powers [20], can explore the role of the key actors involved and the socio-political context that influences the determination, negotiation, and implementation of public policies in Vietnam [21], which is strengthened by the importance of the involvement of actor networks in the form of solid
interactions, joint actions, and high collaboration in order to achieve the effectiveness of public policy implementation [22]. This then prompted the author to conduct a review of studies and research that reviews IUU Fishing alleviation policies from the perspective of discourse network analysis to obtain an overview of conceptual developments so that they can contribute input to increasing the successful implementation of IUU Fishing alleviation policies in achieving marine environment and fisheries resources sustainability.

2 Methods

This study is a type of document study research, where in achieving the writing objectives, four research questions are determined: (a) what terms emerged in research developments related to IUU Fishing alleviation policies from the perspective of discourse network analysis? (b) what research objectives were formulated? (c) what research methods were used? (d) what research recommendations were carried out in the relevant literature?

Collection of materials or research materials is carried out using the advanced search feature on the ScienceDirect database, where the material sought is an article that has the theme Policy Implementation OR Policies Implementation and contains specific keywords in the title, abstract or author-specified keywords, namely; 'discourse network analysis' AND 'IUU Fishing' OR 'Illegal Unreported and Unregulated Fishing'.

As an effort to maximize the achievement of writing objectives and answer the research questions above, this study uses two analytical techniques, namely Bibliometric Analysis and Content Analysis. Bibliometric Analysis is the first stage of analysis used in this study to demonstrate answering the first research question by mapping the interconnections of research topics in the literature [23], where the VOSviewer application is used as an analytical support tool.

Content Analysis was chosen as the second analysis stage, used to overcome the weaknesses of Bibliometric Analysis, which allows the significance of some topics or research streams than others because they are more frequently cited [24], as well as to answer the second, third, and fourth research questions. The next step in this analysis phase, starting with the re-selection of previous research materials with the provisions of the literature, which is; (a) the manuscript of the article in English, (b) the abstract contains studies that explicitly or implicitly examine the interconnection of the IUU Fishing discourse and the interconnection of several actors involved in the discourse. Studies that explicitly examine the interconnection of discourse and actors can be identified by the words ‘Policy’ OR ‘Policies’ AND ‘IUU’ OR ‘Illegal Unreported and Unregulated Fishing’ AND ‘discourse network analysis’ in the abstract or body text of the article. This is based on the principles of DNA analysis techniques that seek to map the structure, connections, and dynamics between policy discourses [23-24], and the interconnections between actors [27]. This document selection was carried out to ensure that a discourse network analysis was carried out in related studies with identification in the form of an analysis of the relationship between discourse and actors in the IUU Fishing alleviation policy process.

After getting the results in the form of related studies, the authors conduct a content search and interpret the appropriate text, which can answer the research questions mentioned at the beginning of this section. Research objectives can be identified from statements explicitly written in research materials. Research methods are identified and categorized in two ways: the study method, the type of research, and the data collection technique. Research recommendations that are expected to be traced can be in the form of recommendations for future research, IUU Fishing alleviation policies, or both.
3 Result and Discussion

The collection of research materials on the ScienceDirect database resulted in 89 articles related to the keywords that have been determined. These results are stored in a reference manager format, and text data will be further processed with Bibliometric Analysis and Content Analysis. A general overview of the research material search will be presented according to the year of publication and the type of study of this research object.

Year of Publication. The data findings show that the first study appeared in 2005, an article concerned with the impact of indiscriminate fishing on the risk of damage to marine ecosystems and that there has been a trend of increasing unreported fishing since the 1950s with an estimate of more than 10,000 tonnes of the BC salmon and groundfish fisheries, which peak occurred in 1990 with data close to 30,000 tons [28]. This first article shows that the focus under study began to develop, starting with concerns over fishing trends and believed to be at risk of damage to marine ecosystems. Even though there are not too many, the data on the number of study publications shows that there are articles published yearly, and their presence can be seen in Figure 4. It is observed that efforts of studies related to our research focus have increased since 2018, and the peak occurred in 2022, in which as many as 16 published studies.

![Fig. 4. Published scientific studies related to research focus (Source: Processed by Author, 2023).](image)

Type of Study. Eighty-nine literature data were collected, consisting of 4 types or types of studies, namely review articles, research articles, book chapters, and short communications. The type of literature as research articles is the most popular study. The trend of publication types each year is presented in Figure 5, and which can be seen that since 2019, researchers have begun to pay attention to the direction of publication in the form of
short communication. However, this still does not shake the existence of research articles that are still far beyond other types of publications.

![Published scientific studies types related to research focus](image)

**Fig. 5.** Published scientific studies types related to research focus (Source: Processed by Author, 2023).

### 3.1 Bibliometric Analysis

The processing stage of reference manager (RIS) data in the VOSviewer application is carried out to photograph the interconnection between research topics so that results can be obtained in the form of a map based on bibliographic data. The type of co-occurrence analysis and the analytical method with full counting of the analysis units in keywords were chosen as the analysis technique. The next step is to select a minimum number of occurrences of keywords, as much as 3, so that 24 terms are produced, with only 23 terms connected in this analysis process. The 23 terms consist of IUU Fishing, Climate Change, Fisheries Management, Fisheries, Illegal Fishing, Marine Protected Areas, Sustainability, Bycatch, IUU, Tuna, EU, European Union, Indonesia, Overfishing, Small-scale Fisheries, WTO, Common Fisheries Policy, Fisheries Governance, High Seas, Food Security, Maritime Security, Traceability, Illegal and Illegal, Unreported and Unregulated Fishing. Details of the number of occurrences of the top five keywords as well as the total link strength between keywords, are presented in Table 1.

<table>
<thead>
<tr>
<th>Keywords</th>
<th>Occurrences</th>
<th>Total link strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>IUU Fishing</td>
<td>26</td>
<td>25</td>
</tr>
<tr>
<td>Climate Change</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Fisheries Management</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Fisheries</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Illegal Fishing</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>
As previously stated, this analysis can show the interconnections of topics reviewed in related literature, and with VOSviewer, a visualization of these interconnections can be obtained, as seen in Figure 6. The largest node is IUU Fishing, followed by Fisheries Management and Illegal Fishing which signifies that these three things are the term that most often appears in the focus of the research object. It was also observed that five color classifications appeared, indicating that the more similar the colors, the term could be classified into one cluster or studies stream, for example, the blue cluster, illustrating that the discussion on IUU Fishing has a stronger connection with Common Fisheries Policy, WTO, European Unions, and Traceability. In comparison, the red cluster tends to focus on IUU and its connections with Fisheries, Climate Change, Food Security, Highseas and Overfishing. Likewise, in the yellow cluster, Sustainability is more connected to EU, Fisheries Governance, and Tuna. In contrast, the green cluster is dominated by interconnections between Illegal Fishing, often associated with Maritime Security, Small Scale Fisheries, Bycatch, Marine Protected Areas, and Indonesia.

![Fig. 6. Visualisation of terms interconnection (Source: Processed by Author, 2023)](image)

Apart from interconnecting topics reviewed in related studies, VOSviewer can also visualize the topic's developments or trends from year to year. Figure 7 reveals that the terms WTO, Tuna, and Illegal appeared earlier than the other terms, which can be concluded that the focus of the studies, according to the keywords specified in this study, started with these three terms. In 2016, articles began to discuss Fisheries Management and shifted focus the following year to the terms Climate Change, Food Security, Illegal Fishing, Overfishing, Illegal Fishing, IUU, and IUU Fishing in 2018. As for the past five years, the focus of study appears more frequently on the terms Indonesia, Maritime Security, Marine Protected Areas, European Union, and Sustainability.

### 3.2 Content Analysis

After carrying out additional procedures on the body text of 89 studies, which were determined in the Content Analysis, the results were obtained in English articles. However, only 2 (two) literature were obtained that met the requirements of the specified selection method. As stated in the previous section, the 89 literatures are dominated by research articles with the type of case studies. The focus of the studies found is not explicitly or implicitly aimed at mapping the policy discourse or the actors involved but related to the impacts of IUU Fishing practices in general [29], impacts on the marine environment [1, 29], and reductions in the number of certain species [31], or assessing the results of IUU Fishing [31, 32]. This shows that not all of the terms or keywords applied in the initial search for research
material are genuinely relevant to the keywords that are aligned with the objectives of this study, and it is essential to carry out further screening and identify the relevance of keywords so that this study can answer research questions.

![Fig. 7. Topic trend per year (Source: Processed by Author, 2023)](image)

Returning to the results of the advanced selection, which is known that these two works of literature have been published quite a distance apart. First, an article entitled “Toothfish crises, actor diversity and the emergence of compliance mechanisms in the Southern Ocean” was published in the Journal of Global Environmental Change in 2011 [34], while a second article appeared in the Marine Policy Journal in 2021 with the title “Sustainable Networks: Modes of governance in the EU's external fisheries policy relations under the IUU Regulation in Thailand and the SFPA with Senegal” [35].

### 3.2.1 Research Purposes Identification

Based on observations, setting objectives from the two literatures has almost the same goal, namely identifying the roles of actors involved in IUU Fishing alleviation policies. Both of these studies are concerned with how policymakers can maximize their role in achieving the success of IUU Fishing eradication policies.

The first article investigates and evaluates the actions taken by state and non-state actors in dealing with three waves of IUU fishing which have caused crises-like situations and affected the development of compliance mechanisms [34].

The second article examines how the EU exercises and translates the role of normative force in two core external fisheries policies: the IUU Fishing Act and the Sustainable Fisheries Partnership Agreement (SFPA), and focuses on exploring how and to what extent the EU has implemented the core environmental values of normative force, during dialogue and negotiations between the EU and partner developing countries (third countries) for policy mechanisms [35].

### 3.2.2 Research Methods Identification

The method used by both studies is qualitative but uses different analytical techniques. A crisis-response framework developed by Hermann (1969) was used by the first study by conducting interviews with Open-ended expert informants, selected by the first study through snow-ball sampling techniques, consisting of Civil servants, academia, environmental Non-
Governmental Organizations (NGOs), the fishing industry and other private enterprises [34]. The second study chose the case study approach using the normative power analysis combined with critical discourse analysis of several dozens of policy and legal documents from EU archival and current legislation [35]. The second study conducted semi-structured interviews in 2019 with informants consisting of government officers from the EU and Thai governments, international advocacy organizations, non-government organizations, donors, consultants, and fishing vessel owners, while data in the form of reports and policy documents were further analyzed with a literature review.

3.2.3 Research Recommendation Identification

Although the first article does not provide recommendations for future studies, it directs recommendations that may be useful to stakeholders in successfully implementing the IUU Fishing alleviation policy. The substance of the recommendation is the design of how to develop mechanisms in order to increase compliance with anti-IUU fishing policies requiring contributions from synergies of actors' interests in environmental conservation and sustainable use [34].

The second article provides more recommendations for future studies. Regarding the form of policy of one of the dominant actors (EU), which may have differences when applied to the other two actors, this article recommends conducting studies to investigate these differences. Second, the article suggests that future studies further deepen the analysis of aspects of the IUU Fishing and SFPA alleviation policies implemented by the EU to complement the studies that have been conducted and emphasize the importance of having further studies to examine the power asymmetries in fisheries by allowing the empirical to disclose the narrative of power relations in each context without resorting to “colonial power vs. colonized” dichotomies [35]. For stakeholders, the second article recommends emphasizing the importance of the EU and third countries opening up dialogue with external actors to achieve common goals and conducting public debate to avoid future power asymmetry [35].

4 Conclusion

Public attention to IUU fishing has increased over the last decade due to its significant impact on the sustainability of the marine environment through dredging activities for fisheries resources. Global policies have been present to eradicate IUU Fishing since 1982, which started with UNCLOS and was recently proclaimed by the United Nations (UN) through the establishment of Sustainable Development Goals, one of which targets this practice to be entirely eradicated by 2020. However, the index IUU Fishing has shown only modest improvement, and 130 fishing vessels are still active in the world's oceans. The gap raises questions regarding the successful implementation of the IUU Fishing alleviation policy in completing this practice. The success of public policy implementation must be distinct from the role of actors or stakeholders, where academics or scholars have strong influence but have moderate or even low interest in the policy process.

This study utilizes two analysis techniques, Bibliometric Analysis, and Content Analysis, to investigate the dynamics of IUU Fishing alleviation policy implementation through the development of scientific research or literature that reviews the policy themes and attempts to elaborate with DNA techniques so that it is hoped that an overview and conceptual development can be obtained and used as a reference for actors and stakeholders in achieving successful implementation of IUU Fishing alleviation policies.

The initial results of tracing research materials found 89 articles sourced from the ScienceDirect database, which are related to the focus of this study. Even though every year
there is published literature, the number of 89 is very scant compared to the existence of literature with the keywords "Illegal, Unreported, and Unregulated Fishing" in the same way resulting in 4,779 hits, or less than 2% of the study on the topic of IUU Fishing conducted related to policy implementation and DNA.

This affects the results obtained from the Bibliometric Analysis process, which, although able to answer the first research question of this study, the clusterization cannot be explored too much because the ties or interconnections between keywords are too weak. Some keywords are similar but are considered different by the Vosviewer system, indicating the need for language uniformity so that an overview of related studies can be appropriately structured, for example, the EU with the European Union with the EU, as well as Illegal, Unreported, and Unregulated Fishing with IUU. Through Bibliometric Analysis, it was also revealed that DNA had yet to emerge as a term that was raised as a research focus in the literature. The direction of terms development of the latest studies that have been captured from this analysis are Indonesia, Marine Protected Areas, Maritime Security, Sustainability, and the European Union.

The second process, with Content Analysis, revealed that there were only two articles that were identified discussing the term network analysis. However, they did not explicitly state that they were researching using DNA techniques. The analysis results reveal that the purpose of the detected literature is to investigate the roles of actors and stakeholders as well as policy discourse to achieve successful implementation. Both articles use a qualitative method approach and are of the type of case study, but they have different data collection techniques and analysis techniques and provide recommendations for future studies with various insights.

In line with the recommendations in the literature, and with the fact that the number of studies relevant to the research focus of this study is still relatively small, the results of the Bibliometric Analysis, in the absence of DNA keywords, also refer to essential facts in the form of dynamic roles of actors, informal trade sector and fisheries management activities [36], this shows that there are opportunities for future studies, to conduct research with a quantitative or mixed method approach which is elaborated using various analytical techniques, one of which is Discourse network analysis, which apparently, has not emerged as a widely discussed term, so that it can enrich literature related to policy implementation and IUU Fishing terms and contribute to the successful implementation of its policies.

References


fisheries in the Brazilian Amazon,” *Ecol. Econ.*

J. Christensen, “Illegal, Unreported and Unregulated Fishing in Historical Perspective,” in *Perspectives on Oceans Past*,

B. P. Galligan, “Fisheries extractivism and the right to subsistence: Conflicting governance models and the legal structures that enact them,” *Mar. Policy*.


F. Serena, “UN Fish Stocks Agreement,” *FAO-IUU Fishing*.


“COMBINED IUU VESSEL LIST,” *TM-Tracking*.


Poseidon_Aquatic_Resource_Management_Ltd. and Global_Initiative, “IUU Fishing,” *iufishingindex.net*.


B. A. Diaz, “Finding social (mis)alignment in older adult and opioid health policy implementation with corpus-assisted discourse analysis,” *Appl. Corpus Linguist.*.


P. To and W. Dressler, “Rethinking 'success': The politics of payment for forest services in Vietnam,” *Land use policy*.


