

Illegal Fishing in Vernacular Maritime Settlements: A Bibliometric Analysis

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Abstract

Many people living in maritime vernacular settlements engage in medium and small-scale fishing activities as their livelihood. However, there is a legal way of fishing as well as illegal ways. Recently, it has been noted that there exists a lot of illegal fishing in Indonesia. Although this issue affects fishing as an industry as well as the coastal areas and their fish, academic literature related to illegal fishing is somewhat lacking.

The purpose of this paper is to present a bibliometric analysis of the current literature on illegal fishing in the vernacular maritime settlements to explore the evolution of the concept. This research applies a bibliometric methodology to analyze 107 articles extracted from the Scopus database between 1995 and 2021. They involve citations, co-citations, and co-occurrences of author keywords.

The goal of this review is to ascertain the direction of research undertaken on the issue of illegal fishing in the vernacular maritime settlements during the last few decades. It identifies the most influential authors, publications, organizations, and nations associated with illegal fishing research. However, the study's reliance on a single database source may be a disadvantage, and hence other methodologies will likely be required for future research. This research seeks to provide academics and practitioners with in-depth insights into illegal fishing in maritime settlements, which may subsequently be utilized as a reference for future studies.

Keywords: Illegal fishing, Bibliometric analysis, Citation analysis.

Introduction

Criminal activities involving the environment and natural resources include poaching, illegal logging, and illegal fishing, among other things. As Gore et al. (2019) point out, criminality against the environment and natural resources threatens the long-term viability of economies throughout the world (Conroy & Litvinoff, 2013). It deprives governments of urgently needed royalties and tax payments; it lowers the pricing of legal commodities when legal markets exist; it encourages corruption and undermines good governance; and, at its most severe, it even feeds instability and promotes violence (Sander et al., 2014). Environmental and natural resource law enforcement has received more attention recently (Lindley et al., 2019), especially in the context of environmental and natural resource law enforcement, which has guided the conversation and supported the development and implementation of better response mechanisms at the local, state, national, and global levels. However, Sander et.al, (2014)

suggest that illegal fishing is more than just a regulatory and economic issue; it's also a problem that needs investments in law enforcement to ensure that it's applied effectively.

Therefore, practitioners and academics might anticipate some beneficial insights given the significance of this theme. These insights are necessary for a thorough understanding of the progress of subjects, and they may have further applicability in other fields. The recent dramatic increase in illegal fishing and the United Nations Convention on the Law of the Sea (UNCLOS) literature, as well as the limitations of the methodological approaches, confirm that the conservation and effective management of fisheries resources is unlikely (Bose, 2021; Sumaila, et., 2020; Chapsos, et al., 2019; Sander, 2014). As a result, a careful analysis of the concept of illegal fishing over the past 26 years, starting in 1995, utilizing a bibliometric analysis would be useful.

Thus, the objectives of this research are to identify the most eminent contributions to a given area, the most influential articles and journals, and subsequent development in the subject.

Research Methods

A bibliometric analysis is a meta-analytical research technique that summarizes a collection of bibliographic papers to demonstrate the interconnections among the articles based on multiple measures. This is accomplished by analyzing citations and co-citations using quantitative methods and identifying key research themes related to a given topic such as illegal fishing. A bibliometric analysis aims to address all the pre-defined research questions. Bibliometric analysis manifests interconnections among the articles concerning the frequency with which an article is cited and co-cited by other articles as seen in below Table 1.

This study gathered a comprehensive database that has been used extensively by various researchers for carrying out bibliometric analysis in multiple domains. The primary reason for choosing the Scopus database is its availability which is nearly 60 percent larger than the Web of Science (WOS) database (Zhao & Strotmann, 2015). Articles relevant to this study were searched from the Scopus database using the following titles: "Illegal fishing," "Illegal fisheries" and "Law". The study was limited to the analysis only within the discipline of "social sciences" which focuses on law. The publication dates of the articles range from 1995 to 2021. Articles and reviews published only in journals have been considered, and the conference papers have been excluded. The articles published only in the English language were considered (see Table 1). The search query yielded 107 to the search that employed the keywords included in journal titles. The review was conducted using 107 articles.

Table 1. Search syntax in the Scopus database

Source: 2021 Scopus Indexing

Data Source	Search syntax
Search syntax in the Scopus database	TITLE-ABS-KEY ("Illegal fishing" OR "illegal fisheries") AND ("LAW") AND (LIMIT-TO (SUBJAREA, "SOC")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English"))

Illegal Fishing: The Conceptual Framework Traditional Fishermen and Illegal Fishing in Indonesia

The history of regular offshore fishing voyages to Sand Island since the beginning of the 17th century is attested by the Agreement between the Indonesian and Australian Governments signed first in 1974 (Memorandum of Understanding Between the Government of Australia and the Government of the Republic of Indonesia Regarding the Operations of

Indonesian Traditional Fisheries in Areas of the Australian Exclusive Fishing Zone and Continental Shelf, 1974). So therefore, the rights of traditional fishermen from the settlements on both sides to go fishing in the transboundary waters have been affirmed by both Governments (Benu et al, 2018). This is proof that not all the fishing done by these traditional fishermen is illegal. Sadly this condition is often overlooked in legal arguments. Because it is done traditionally does not necessarily mean it is illegal or against the law as discussed below.

There have been many studies conducted on livelihood strategies in marginalized fishing villages. Most of these studies were conducted in developing countries and were driven by the fact that most fishermen are living in poverty in villages located in rural, remote areas, with very few alternative employment opportunities (Allison and Ellis, 2001; Anderson and Obeng, 2017). This situation sometimes puts these fishermen on the wrong side of the law due to a lack of education.

Fishermen have been labeled as "the poorest of the poor" (Bene, 2003). Bene reviewed the perceptions embraced by academics, international agencies, and practitioners about the relationship between fisheries and poverty in developing countries. He identified two perspectives with which to perceive poverty in fisheries, which are "They are poor because they are fishermen" and "They are fishermen because they are poor". These statements describe the poverty in fisheries in the sense that whatever they try to do, they will remain poor, and being a fisherman is an economic activity of last resort for the poor (Allison and Horemans, 2006; Béné, 2006)

As a subset of illegal, unreported, and unregulated (IUU) fishing, illegal fishing "takes place where the fishery is against the law", while "unreported fishing takes place where legal instruments are in place to control the fishery, but no requirements for reporting, or penalties for non-reporting, exist; and unregulated fishing also occurs where legal instruments are not required, or adequate" (Varkey, et al., 2010; Nøstbakken, 2008; FAO, 2001). A primary study by Sander et al. (2014) has been concerned with the illegal part of IUU fishing, although many measures proposed in the typology also have positive spillovers into the other two components of IUU fishing. Illegal fishing exemplifies the real-world effects of environmental and natural resource criminality on development in terms of economic development (Mirrasooli, et al., 2019; Young, 2016; Telesetsky, 2014). The environmental ramifications are immediate and severe: According to Agnew et al. (2009), illegal and unreported fishing alone is responsible for the removal of between 11 and 26 million tons of fish from the oceans annually. Global fish supplies are rapidly depleting, with 30% of evaluated ocean fisheries overexploited and another 57% completely depleted (FAO, 2012).

IUU fishing is particularly damaging not only because it contributes to ongoing overfishing of targeted, marketable fish (Chapsos, & Hamilton, 2019; Belhabib & Le Billon, 2020). By its very nature, illegal fishing disrespects regulations designed to reduce the environmental impact of fishing. Illegally operating fishing involves vessels frequently older and more polluting ships sailing under flags of convenience. They tend to take more bycatch and use more destructive fishing techniques than other vessels (Desai & Shambaugh, 2021; Belhabib, et al., 2014; Davies, et al., 2009). Moreover, the unreported nature of illegal fishing further complicates the already difficult task of making fish stock assessments, biasing them towards allowing more fishing than would otherwise be considered sustainable (Agnew et al., 2009). Moreover, the economic and social impacts are equally significant. It was reported that the global fish trade was worth \$109 billion in 2010, and fisheries and aquaculture provide direct livelihoods for as many as 55 million people and indirect livelihoods to at least double that (FAO, 2012; World Bank, FAO, 2009). Economic losses to society from illegal and unreported fishing alone are estimated to range between \$4.9 billion (Haken, 2011) and \$23.5 billion annually (Agnew et al., 2009). The majority of this damage occurs in developing countries, in whose exclusive economic zones (EEZs) most IUU fishing takes place (FAO, 2012).

As much as criminals are attracted to illegal fishing, development practitioners cannot afford to ignore it. The perverse association between crime and development has been well established (Page & Ortiz, 2019; Vrancken, et al., 2019; Satria et al., 2018; De Coning, 2016;

Heinemann and Verner, 2006; Ayres, 1998; World Bank, 2011a, 2011b). Illegal fishing undermines livelihoods by depriving the legitimate users of a resource from capturing their rightful rents because it significantly affects fish supply. Its spillover effects can even negatively affect terrestrial biodiversity (Sumaila, et al., 2020;2010; Shaffril, et al., 2019; Valdmanis and Akam, 2012; Worm et al., 2009; Agnew et al., 2009; Brashares et al., 2004). This underlines that illegal fishing is not a victimless crime and that its impact must not be underestimated. It has negative impacts on the resource base and on communities that rely on it for their livelihoods, and further, it often ties into broader networks of crime. As a result, the low level of attention it has been receiving from law enforcement and development agencies compared to other forms of crime is unjustified. Similar to terrestrial ecosystems, illegal fishing requires the application of a structured approach to prioritize and sequence interventions and investments rather than randomly mixing and matching activities with unknown impacts on reducing and eliminating illegal fishing.

Criminal Dimensions of Illegal Fishing

People engage in criminal activities such as illegal fishing because it is lucrative to do so. The opportunity to conduct illegal fishing is perhaps larger than in any other form of environmental and natural resource crime: fish stocks are frequently poorly guarded and need protection due to their geographically dispersed nature far from human habitation and infrastructure. Prior studies have found a significant correlation between weak governance and the level of illegal fishing (Helyar et al., 2014; Agnew et al., 2009), and have confirmed the weakness of ecosystem-based fishery management in developing countries (Pitcher et al., 2009). To make matters worse, it is generally difficult to distinguish legally from illegally caught fish on the market, and the drive to do so diminishes as demand for all fish accelerates. The combination makes illegal fishing among the most difficult form of environmental crime to detect (Brack and Hayman, 2002). Clarke (1980) suggests that crime flourishes where people have the means, motive, and opportunity to commit it. Opportunity is rife, the motive is readily achievable, and the means for illegal fishing – boats, nets, fuel, navigational instruments, crews, etc. – are readily available in the open market.

It is important to understand the types of illegal fishing to which our framework would apply. A uniform definition of environmental and natural resource crime is elusive and there are variations in the way countries apply their laws against environmentally destructive practices. As such, it is argued that not all crimes are equal and that illegal fishing is not simply an act in contravention of laws or regulations. This is important not only because national legal frameworks for fisheries are often unclear, under-developed, or non-existent, but because subsistence fishing, even where illegal, does not constitute criminal behavior for the current frameworks. Beirne and South (2012) and White (2009) in conceiving of environmental and natural resource crime as causing environmental harm, argue that subsistence behavior can also lead to negative environmental outcomes, especially when it is illegal. However, to secure sustainable natural resource management and poverty reduction regimes, the distinction between need-based subsistence illegal fishing and large-scale, organized greed-based illegal fishing is crucial (Sander et al., 2014).

In the absence of sustainable management, natural capital suffers efficiency losses and produces below its optimum level (World Bank, FAO, 2009), is often rendered unusable, or becomes extinct. The immediate losers in this scenario are those living on the periphery who depend on natural capital for their income. Their acts directly undermine their long-term subsistence. Sander et al., (2014) point out that crimes of need require broader development interventions, and crimes born of greed merit the application of law and order, especially given the frequent spatial disconnection between the criminals and the negative consequences of their crime.

Currently, the fishery sector's fight against crime is underperforming. The fight against illegal fishing is typically ranked low on the list of criminal justice priorities, is underfunded and under-resourced, reactionary and regressive, corrupt, and of poor quality. As a consequence, it is ineffective as a deterrent. The lack of an organized strategy to evaluate

fishing-related crimes and devise effective and efficient response mechanisms is impeding the fight against illegal fishing.

Findings

In this part, the results of the bibliometric analysis are elaborated. Firstly, the results of the citation analysis are presented, which is followed by analyses of co-citation and co-occurrence of author keywords. The citation analysis reviews the number of publications per year; most cited documents; most dominant authors; most dominant journals; most dominant institutions, and most dominant countries. Table 2 shows a total of 107 articles from 55 journals, written by 265 authors affiliated with 216 institutions from 52 countries, with a total number of references cited as 1333. These general results provide a portrait of all the articles being reviewed about illegal fishing.

Table 2: General Results
Source: Scimago Journal Ranking (2021)

Summary of General Results	
Criteria	Quantity
Articles	107
Journals	55
Authors	265
Institutions	216
Countries	52
Cited references	1333

Number of Publications per Year

The trend in the number of publications on illegal fishing from 1995 to 2021 shows two interesting stages. First, from 1995 to 2008 as the beginning of the concept of Illegal fishing or illegal fisheries in the context of law sciences. Publications in those years were at their highest point in 2007. During the 2013-2021 period, there was an increase in the number of publications that were more than four times the initial stage. The year 2019 presents the highest number of publications compared to 2013, with a slight decrease in 2020. However, looking at the trend in the number of publications that have been received up to the initial stage of 2007, it can be assumed that the following years tend to be more constant compared to the year 2019.

Most Cited Documents

Table 3 below shows the 38 most cited documents that have at least ten citations on the subject of Illegal fishing and Illegal fisheries. The documents are ranked in descending order of the number of citations received. Thirty-eight articles received at least ten citations for 81,47 percent of the total cited documents or more.

Table 3: Most cited documents in Illegal Fishing Literature
Source: Scimago Journal Ranking (2021)

Rank	Titles	Authors	Cited by
1	Global scope and economics of illegal fishing	(Sumaila, Alder & Keith, 2006)	160
2	Estimates of illegal and unreported fish in seafood imports to the USA	(Pramod et al., 2014)	125
3	Illegal and unregulated fishing of toothfish in the Southern Ocean, and the CCAMLR catch documentation scheme.	(Agnew, 2000)	72
4	The economics of illegal fishing: A behavioral model	(Charles, Mazany & Cross, 1999)	57
5	Rational noncompliance and the liquidation of Northeast groundfish resources	(King & Sutinen, 2010)	51

Rank	Titles	Authors	Cited by
6	Status, trends, and challenges in the sustainability of small-scale fisheries in the Philippines: Insights from FISHDA (Fishing Industries' Support in Handling Decisions Application) model	(Muallil et al., 2014)	41
7	Positioning fisheries in a changing world	(Grafton et al., 2008)	39
8	Territorial Use Rights for Fisheries (TURFs): State of the art and the road ahead	(Nguyen Thi Quynh, 2017)	35
9	Under the shadow: Forced labor among sea fishers in Thailand.	(Chantavanich, Laodumrongchai & Stringer, 2016)	34
10	Multilateral hot pursuit and illegal fishing in the southern ocean: The pursuits of the Viarsa 1 and the South Tomi	(Molenaar, 2004)	34
11	The veil over the Nets (unraveling corporate liability for IUU fishing offenses)	(Griggs & Lugten, 2007)	28
12	Fisheries catch under-reporting in The Gambia, Liberia, and Namibia, and the three large marine ecosystems which they represent	(Belhabib et., 2016)	25
13	Pushing the limits of the Law of the sea convention: Australian and French cooperative surveillance and Enforcement in the Southern Ocean	(Gullett & Schofield, 2007)	25
14	Global patterns of fisheries conflict: Forty years of data	(Spijkers et al., 2019)	23
15	The Fisheries of Africa: Exploitation, policy, and maritime security trends	(Belhabib, Sumaila & Le Billon, 2019)	20
16	The Moves of a Bajau Middlewoman: Understanding the Disparity between Trade Networks and Marine Conservation	(Pauwelussen, 2015)	20
17	From advocacy to confrontation: Direct enforcement by environmental NGOs	(Eilstrup-Sangiovanni & Bondaroff, 2014)	20
18	Estimates of illegal and unreported seafood imports to Japan	(Pramod, Pitcher & Mantha, 2017)	18
19	Towards a new fisheries crime' paradigm: South Africa as an illustrative example	(de Coning & Witbooi, 2015)	18
20	Community as a Network: exploring a relational approach to social resilience in Coastal Indonesia	(Pauwelussen, 2015)	17
21	Maritime corporate terrorism and its consequences in the western Indian Ocean: Illegal fishing, waste dumping and piracy in twenty-first-century Somalia	(Weldemichael, 2012)	17
22	Will new multilateral arrangements help the Southeast Asian States solve illegal fishing?	(Williams, 2013)	15
23	Interdicting vessels to enforce the common interest: Maritime countermeasures and the use of force	(Guilfoyle, 2007)	15
24	War, fish, and foreign fleets: The marine fisheries catches of Sierra Leone 1950–2015	(Seto et al., 2017)	14
25	Justifying non-compliance: The morality of illegalities in small-scale fisheries of Lake Victoria, East Africa	(Cepić & Nunan, 2017)	13
26	International trade law compatibility of market-related measures to combat illegal, unreported, and unregulated (IUU) fishing	(Young, 2016)	13
27	Conceptualizing maritime environmental and natural resources law enforcement - The case of illegal fishing	(Sander et al., 2014)	13
28	Managing the offshore and coastal fisheries in Taiwan to achieve sustainable development using policy indicators	(Liu W, 2013)	13
29	Sino-Vietnamese rapprochement and the South China Sea irritant	(Tønnesson, 2003)	13
30	On super fishers and black capture: Images of illegal fishing in artisanal fisheries of southern Chile	(Nahuelhual et al., 2018)	12
31	Illegal fishing and Fisheries law enforcement in small Island developing states: The Pacific Islands experience	(Aqorau, 2000)	12
32	Illegal fishing and fisheries crime as a transnational organized crime in Indonesia	(Chapsos & Hamilton, 2019)	11

Rank	Titles	Authors	Cited by
33	Compliance, corruption, and co-management: How corruption fuels illegalities and undermines the legitimacy of fisheries co-management	(Nunan et al., 2018)	11
34	Illegal Chinese Fishing in the yellow sea: A Korean Officer's Perspective	(Kim S.K., 2012)	11
35	ITQs under illegal fishing: An application to the red shrimp fishery in Chile	(Chávez, González & Salgado, 2008)	11
36	Risky facilities: Analysis of illegal recreational fishing in the Great Barrier Reef Marine Park, Australia	(Weekers & Zahnaw, 2018)	10
37	What's in a name? The illegality of illegal, unreported, and unregulated fishing	(Theilen, 2013)	10
38	The Robin Hood Narrative: A Discussion of Empirical and Ethical Legitimizations of Somali Pirates	(Schneider & Winkler, 2013)	10

Most Dominant Authors

Table 4 below shows the most dominant authors on the subject of illegal fishing. The influence of the authors is measured by the number of articles they have published on illegal fishing vis-a-vis the citations received by each of them. In terms of the total number of citations received, Sumaila, Alder, and Keith are the most dominant authors with 180, 160, and 160 citations respectively. Table 5, on the other hand, indicates the average of citations per document led by Alder and Keith as the most dominant authors with 160 and 160 citations per document respectively.

Table 4: Most Dominant Authors (in terms of total citations received)
Source: Scimago Journal Ranking (2021)

Rank	Authors	Documents	Citations
1	Sumaila U.R.	2	180
2	Alder J.	1	160
3	Keith H.	1	160
4	Agnew D.J.	1	72
5	Belhabib D.	3	59
6	Charles A.T.	1	57
7	Cross M.L.	1	57
8	Mazany R.L.	1	57
9	Le Billon P.	2	43
10	Stringer C.	2	42

Table 5. Most dominant authors (in terms of average citation per document)
Source: Scimago Journal Ranking

Rank	Authors	Documents	Citations	Average citation per document
1	Alder J.	1	160	160
2	Keith H.	1	160	160
3	Sumaila U.R.	2	180	90
4	Agnew D.J.	1	72	72
5	Charles A.T.	1	57	57
6	Cross M.L.	1	57	57
7	Mazany R.L.	1	57	57
8	Le Billon P.	2	43	21.5
9	Stringer C.	2	42	21
10	Belhabib D.	3	59	19.6667

Most Dominant Journals

Table 6 illustrates the most dominant journals that have narrated the concept of illegal fishing. The Journal of Marine Policy has the highest rank with 34 publications followed by the International Journal of Marine and Coastal Law with only 6 articles. On the total number of citations received, the 'Marine Policy' attests as the most dominant journal with a total of

citations of 793, followed by the International Journal of Marine and Coastal Law with a total citation of 94. Table 7 shows the average citations received per article, whereby 'Marine Resource Economics' attests as the most dominant journal with 31 average citations per article; followed by 'Marine Policy' with average citations per article at 23.3824.

Table 6: Most dominant journals (in terms of the total articles published)

Source: Scimago Journal Ranking (2021)

Rank	Journals	Articles	Citations
1	Marine Policy	34	795
2	International Journal of Marine and Coastal Law	6	94
3	Marine Resource Economics	2	62
4	Environmental Development	2	38
5	Global Environmental Change	1	23
6	Anthropological Forum	1	20
7	Maritime Studies	2	17
8	International And Comparative Law Quarterly	2	16
9	Contemporary Southeast Asia	1	15
10	Trends In Organized Crime	1	11

Table 7: Most dominant journals (in terms of average citation per document)

Source: Scimago Journal Ranking (2021)

Rank	Journals	Articles	Citations	Average citation per document
1	Marine Resource Economics	2	62	31
2	Marine Policy	34	795	23.3824
3	Global Environmental Change	1	23	23
4	Anthropological Forum	1	20	20
5	Environmental Development	2	38	19
6	International Journal of Marine and Coastal Law	6	94	15.6667
7	Contemporary Southeast Asia	1	15	15
8	Trends In Organized Crime	1	11	11
9	Maritime Studies	2	17	8.5
10	International And Comparative Law Quarterly	2	16	8

Most Dominant Institutions

Table 8 shows the most dominant institutions that have published articles on illegal fishing. The institutions are plotted based on the authors who have published articles and received citations and affiliations with those institutions. On the total number of published articles, the University of British Columbia and the Imperial College are at the top of the list, while for the total citations received, the University of British Columbia is the highest in rank with a total citation of 389, followed by the Imperial College with a count of 72. Based on the average citations received per article, the Imperial College is the most dominant institution with 72 average citations per document, followed by Saint Mary's University with an average citation per document of 57 (See Table 9).

Table 8: Most dominant institutions (in total citations received)

Source: Scimago Journal Ranking (2021)

Rank	Institutions	Country	Documents	Citations
1	University of British Columbia	Canada	8	389
2	Imperial College	United Kingdom	1	72
3	Dalhousie University	Canada	2	66
4	University of Maryland	United Kingdom	2	59
5	Saint Mary's University	Canada	1	57
6	University of California	United States	2	53
7	University of Rhode Island	United States	1	51
8	The University of Auckland	New Zealand	2	42
9	University of the Philippines Diliman	Philippines	1	41

10	The Australian National University	Australia	1	39
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Table 9: Most Dominant Institutions (in average citation per document)

Source: ?

Rank	Institutions	Countries	Documents	Citations	Average citation per document
1	Imperial College	United Kingdom	1	72	72
2	Saint Mary's University	Canada	1	57	57
3	University of Rhode Island	United States	1	51	51
4	Univ. of the Philippines Diliman	Philippines	1	41	41
5	Mindanao State University	Philippines	1	41	41
6	The Australian National University	Australia	1	39	39
7	University of Washington	United States	1	39	39
8	University of Iceland	Iceland	1	39	39
9	The University of Western Australia	Australia	1	35	35
10	Chulalongkorn University	Thailand	1	34	34

Most Dominant Countries

Table 10 indicates the most dominant countries with highly cited papers related to illegal fishing. Based on the total citations received, Canada attests to be the most dominant country with a citation count of 510; followed by the United States with a count of 311. Based on the average citations per document, interestingly, Canada is at the top list as seen in Table 11. Thus, the publication of highly cited articles belongs to the authors from Canada. Other dominant countries in the list are Thailand, Japan, and the Netherlands with a total of 23.666 articles with an average of 34 and 31 citations per article.

Table 10: Most dominant countries (in total citations received)

Source: Scimago Journal Ranking (2021)

Rank	Country	Document	Citation
1	Canada	13	510
2	United States	17	311
3	Australia	17	209
4	United Kingdom	15	178
5	Netherlands	3	71
6	Chile	4	67
7	Japan	2	62
8	Philippines	3	59
9	Norway	5	57
10	France	4	56

Table 11: Most Dominant Countries (in average citation per document)

Source: Scimago Journal Ranking (2021)

Rank	Countries	Documents	Citations	Average citation per document
1	Canada	13	510	39.2308
2	Thailand	1	34	34
3	Japan	2	62	31
4	Netherlands	3	71	23.6667
5	Argentina	2	42	21
6	New Zealand	2	42	21
7	Philippines	3	59	19.6667
8	United States	17	311	18.2941

9	Chile	4	67	17
10	France	4	56	14

Most Frequently Cited Authors and Journals

This analysis describes the results of author co-citation with cited authors. Based on the analysis of the cited references of the 107 articles, a total of 1333 have been identified. Then this set was narrowed down to authors with at least 13 citations resulting in a total of 32 articles. A co-citation analysis was conducted to search the most frequently cited journals. Of the 107 articles, 46 specially cited journals were identified with at least 8 citations each. The most frequently cited journal is *Marine Policy Journal*. This list of frequently cited journals means the significance of these journals for researchers who have an interest in the issues related to illegal fishing.

Discussion and Implications

The trend in the number of publications on illegal fishing from 1995 to 2021 shows two interesting stages. First, from 1995 to 2008 as the beginning of the concept of illegal fishing or illegal fisheries in the context of law sciences. Publications in those years were at their highest point in 2007. During the 2013-2021 period, there was an increase in the number of publications amounting to more than four times the initial stage. The year 2019 presents the highest number of publications compared to 2013, with a slight decrease in 2020. However, looking at the trend in the number of publications that were received up to the initial stage of 2007, it can be assumed that the following years tend to be more constant compared to the year 2019.

This analysis reveals that the number of publications associated with illegal fishing has significantly increased over the years since its conceptualization. This trend in the publication is broken down into two parts. The first part is from the period of 1995–2008 as the initial years of illegal fishing with a very minimal number of publications. Nevertheless, post-2013, in the second part, literature on illegal fishing initiates a significant increase in the number of publications every year. The most cited article on illegal fishing is entitled "Global scope and economies of illegal fishing" by Sumaila, Alder & Keith (2006) with 160 citations.

Additionally, the most dominant authors are Sumaila (in total citations received); Alder, and Keith (in average citations per document). The highest number of publications associated with illegal fishing is in 'Marine Policy' with a total of 34 publications. *Marine Resource Economics* is the most dominant journal with 31 average citations per document; followed by *Marine Policy*. Furthermore, the University of British Columbia and Imperial College in the UK are the most dominant institutions with the total citations received and average citations per article. Finally, Canada is the most dominant country with the total citations received, and Canada also has the most dominant citations per article. The results provide an outline of the most dominant contributors who have contributed to examining the issues of illegal fishing. They also point out the increasing interest in the subject of illegal fishing by prominent scholars and institutions globally. Moreover, they reveal that Pauly and Belhabib are the two most frequently cited authors on illegal fishing. There are three most frequently cited journals as the top contributors to the subject of illegal fishing.

With regards to the co-occurrence of author keywords, there are 8 keywords (illegal fishing, fisheries, compliance, enforcement, IUU fishing, legitimacy, piracy, fisheries crime) that relate to illegal fishing. This means the concept of illegal fishing has wider aspects that could be explored by the researchers. There are 4 other (maritime security, fisheries management, law enforcement, transnational organized crime, environmental criminology) encouraging keywords that could shape future studies related to illegal fishing.

Conclusion

Environmental crime in the world's oceans is a significant threat to natural resources, livelihoods, countries' economies, and the world's biodiversity. Using illegal fishing as an example, this paper responded to the issue of ocean-based criminal activities that are shrinking prosperity and exacerbating a sustainable natural resource as well as the lives of communities

in the vernacular settlements. The use of law enforcement allows for sustainable subsistence resource use while targeting the crimes committed by criminal groups. The adoption of environmental and natural resource law enforcement along with prevention, detection, suppression, and recovery chain will facilitate a professionalization of combating. An effective response to environmental and natural resource crimes needs to involve non-traditional actors such as fisheries authorities, customs, coast guard, military, police, intelligence, finance, trade, environmental authorities, the judiciary, civil society, legal fisheries operators, foreign governments, and donors. The complexity of combatting environmental and natural resource crime requires multi-sector buy-in and oversight by top government authorities. In this regard, the structured conceptualization of environmental and natural resource law enforcement in the context of illegal fishing provides the foundation for advancing national, regional, and international work on this issue, with economic and environmental benefits.

The research has important ramifications, among other things, it provides considerable information about the major contributors to the issue of illegal fishing, as well as information about the most influential research, publications, and organizations that contribute to the subject of illegal fishing. Additionally, the study details the evolution and advancement of the issue of illegal fishing through time, as well as the important research themes that have arisen from the literature on illegal fishing. Further, it includes an in-depth examination of the concepts of illicit fishing, IUU fishing, and UNCLOS, which may be utilized as a guide for future strategic initiatives.

Limitations and Future Research Opportunities

This study complemented the existing work on illegal fishing tourism by providing insightful content that adopts a systematic review. Despite their contributions, each of these studies, including our study has limitations. One of the limitations is that this study adopted a single source or database for data collection and synthesis. Although other bibliometric studies have also used single databases, to avoid duplication, there are possibilities to include other methods in analyzing literature on illegal fishing. Another limitation is the inability to capture a wider and deeper context of the citation structure of the articles. However, this study has sufficiently explained some other citation structures for the literature on illegal fishing. In future research, the focus should be placed on analyzing the concept from other disciplines of studies and expanding more dominant papers. Moreover, it is suggested to continue such bibliometric studies on illegal fishing within intervals of every five years, which could contribute to theoretical development. Finally, the literature review using bibliometric analysis can be carried out through a wide array of techniques, of which more than three techniques have been adopted in this study.

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