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Defining 'Destructive fishing': a lack of consensus inhibits effective global policy

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Abstract

Tackling the global problem of “destructive fishing” is central to the achievement of UN Sustainable Development Goal 14 ‘Life Below Water’, yet the term remains vague, making it difficult to track and quantify progress. Here we evaluate the frequency and range of uses of the term “destructive fishing” across the peer reviewed literature and media. Our research elucidated the clear lack of a consensus definition for “destructive fishing”, with only 6 academic articles to date providing a definition, and none of these matching. There is also a mismatch between regions where academia and policy identify fishing practices as “destructive” and the regions in which the media reports it. There are however clear trends in the types of fishing activity referred to as destructive in the academic literature, media and policy, and the term is used to refer to practices beyond those previously exemplified as "destructive" in an international policy context. We conclude that further exploration around the definition and scope of this term is warranted. By assembling a culturally and sectorally balanced pool of expert views, future research plans to use an iterative, anonymised approach to constructively address the conceptual vagueness and contention around this term.

Keywords

Destructive, fishing, marine, policy, sustainable, ocean

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Main Text

Sustainable fisheries require sound management of target species whilst safeguarding the social-ecological systems in which they occur. The need to consider sustainability in this wider context is reflected in sector specific guidelines, best practices [1,2] and international policy frameworks and assessments such as the Sustainable Development Goals (SDGs), the draft Global Biodiversity Framework (the post-2020 framework expected to be adopted by the Convention on Biological Diversity), and the draft Thematic Assessment of the Sustainable Use of Wild Species.

A range of terminology is used across these and other international frameworks to characterise the problematic dimensions of fisheries and the actions that may impede effective management. One of the most universal is SDG14.4, which requires that states "effectively regulate harvesting, and end overfishing, illegal, unreported and unregulated (IUU) fishing and destructive fishing practices" [3].

SDG indicators associated with these terms include accepted metrics to determine progress on overfishing ("Proportion of fish stocks within biologically sustainable levels") and IUU fishing ("Degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing"), but no equivalent is offered for the term "destructive fishing practices" [4]. An exploration of previous references to this term in international policy and guidance is instructive in revealing the conceptually non-specific nature of its use.

The terms "destructive fishing", "harmful impacts" and "significant adverse impacts" are routinely used in public discourses around fisheries as well as in a wide range of international policies [2,5,6]. In addition to the SDGs, perhaps the most important of these is the FAO's Code of Conduct for Responsible Fisheries (CCRF) which states that "states should prohibit dynamiting, poisoning and other comparable destructive fishing practices". As a set of voluntary principles and standards, regular monitoring is conducted by the FAO on how states apply the CCRF, documenting this specific provision through asking whether states have prohibitions on destructive fishing methods and practices, giving dynamiting and poisoning as examples [7].

In 2009 an FAO/UNEP report on fishery-related terminology in international policy provided a working definition of "destructive" - "the use of fishing gears in ways or in places such that one or more key components of an ecosystem are obliterated, devastated or ceases to be able to provide essential ecosystem functions" [8]. Crucially, this working definition also states that "only a very small number of fishing gears or fishing methods are recognized as inherently 'destructive' wherever and however they are used, the primary examples being explosives and synthetic toxins. In the absence of any formal agreement regarding the term, the classification of a gear or practice as destructive is a policy choice related to pre-set objectives and consistent with national and international law".

In line with this context-specific definition, there have been state-level attempts to define evidence-based thresholds of destructive risk aligned with different fishing practices and premised around how a given fishing gear and a given ecological entity interact, that have subsequently informed management of those practices, e.g. in the United States of America

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[9] and the United Kingdom [10]. While both cited examples principally consider ecological impact as the major destructive risk being assessed, they represent attempts to define the circumstances in which a given set of practices are "destructive" at a national level. Thus, while the term is subject to general use in international frameworks, national policy processes have begun to enhance specificity around which practices are destructive in which contexts.

Given the frequently polarised debate around the complementarity of sustainable fisheries and marine conservation objectives [11] – and the centrality of value-driven terms such as "destructive" in this debate – the authors propose a structured process by which to further explore consensus around this term. This article is in support of this future process and in it we review the frequency and use of the term "destructive fishing" across the peer-reviewed literature and media. Our intention is to assess 1. how and where the term "destructive fishing" is used and whether it is defined, 2. what broad categories of impacts or consequences – ecological, social and economic – are described in these examples and 3. Whether these examples refer to practices beyond those specifically exemplified as "destructive" in the CCRF.

Our study reveals a large increase in the use of the term "destructive fishing" in peer-reviewed literature, media, and policy over the past three decades (Figure 1). Prior to 1990 the term was rarely used in article titles or abstracts, before increasing in the mid-90s, coinciding with the development of the FAO CCRF (Figure 1a, b). A further increase was seen from the early 2000's, coinciding with the UN Fish Stocks and FAO Compliance Agreements (Figure 1a, b, c) and the term has been referred to with an increasing frequency year on year. Between 2018-2020 the term was used 96 times in the academic literature (title, abstract, or keywords) and 387 times in the media (title).

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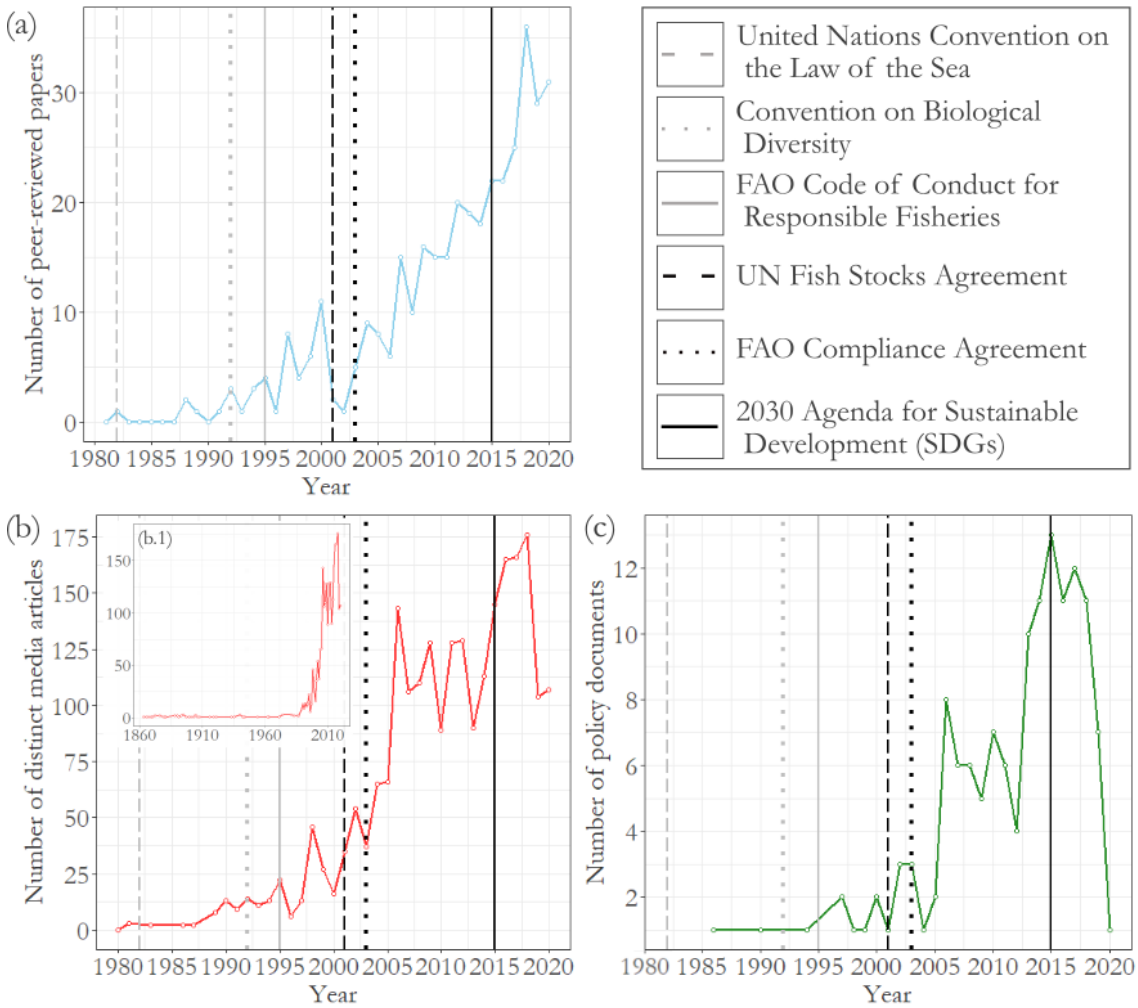

Figure 1: Change in frequency of articles focusing on destructive fishing over time in (a) peer-reviewed literature; (b) and (b.1) printed and online newspaper articles; and (c) national policy documents (including national laws, regulations and policies on fisheries). Vertical lines in (a), (b) and (c) indicate significant global policy mechanisms that impact fisheries management and conservation. Note the United Nations Convention on the Law of the Sea concluded in 1982, but only came into force in 1994. The authors highlight that academic publication rates in all fields of science have increased over the period, with the number of academic journals growing at around 4.7% since 1980 [12].

Of 52 academic articles where “destructive fishing” is a primary focus, only 6 provide a definition. These were typically broad in nature and lacked specifics, such as the “indiscriminate killing, stunning and/or waste of marine life” [13] and “operations that destroy benthic habitats and result in indiscriminate fishing mortality” [14]. There was no overlap in the definitions. However, there were similarities in the types of practices referred to as "destructive" including blast/dynamite and poison fishing, the two activities specifically referred to in the CCRF. Other practices, or more specifically gear types, were referred to as destructive, including beach seines, trawling, bottom trawling and gill nets (Figure 2a), with some gears described as “destructive” in all circumstances, whilst others were considered to be destructive under specific spatial, temporal, behavioural or social contexts. Indeed, overall these impacts are defined as context-specific, and a key area of

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further exploration is whether a more graduated scale of comparatively "destructive" practices is feasible.

The literature characterised destructive fishing across ecological, economic, and social impacts, with considerably more attention given to the ecological impacts. Ecologically, a significant reduction in population size or species abundance, habitat destruction, and decreased habitat quality were the most prevalent impacts, featuring in 67%, 48% and 42% of studies (Figure 2c). The economic and societal impacts tended to be conflated, highlighting aspects such as reduced yield or economic losses for fishers following short term gains, diminished livelihood opportunities and the association with criminality/illegality.

Geographically, academic publications and policy documents relating to destructive fishing predominately focus on the Indo-Pacific or coastal Africa (Figure 2b, S1), where already-defined “destructive” practices, especially dynamiting and poisoning, may occur within subsistence and/or small-scale fisheries. In contrast, the English-language media use of the term is dominated by European and North American countries (Figure S2). This demonstrates a mismatch in the discourse on destructive fishing between where such practices are thought to occur and the locus of corresponding media narratives, which has a major role in determining how such practices are discussed. This trend is likely to be driven also by our sampling of only English language media and requires further investigation - in multiple languages - to better understand these dynamics.

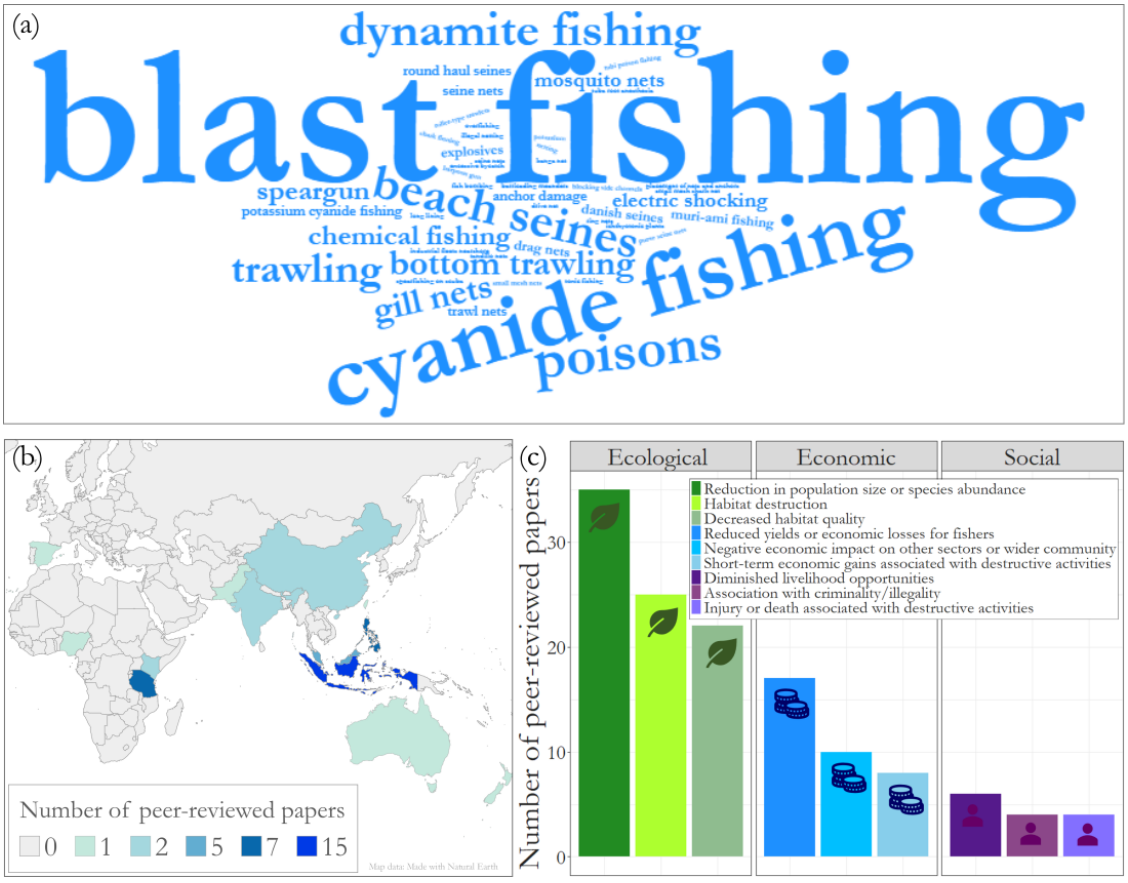

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Figure 2. Peer-reviewed literature content analysis. (a) Word cloud showing the most commonly cited destructive fishing practices, words scale with frequency; (b) Graduated map indicating all study locations cited at the country level; (c) Bar charts showing the top three most commonly cited ecological, economic and social impacts of destructive fishing.

Having established through a brief review of academic literature that the term "destructive fishing" is 1. widely used but not widely defined, 2. linked to a diverse array of (predominantly ecological) impacts and 3. used to refer to practices beyond those previously exemplified as "destructive" in an international policy context, we conclude that further exploration around the definition and scope of this term is warranted. This further exploration should aim to make the use of this term more meaningful in public discourse and more actionable in policy development, building on recent attempts to characterise "destructive fishing" risk and informed by a wider array of scientific evidence, expert input, and policy commitment than previous definition-setting processes.

Clearly, applying the term “destructive” to an activity, a livelihood or a commercial practice is not only context-specific but politically and socially sensitive. We therefore propose a process that focuses on exploring consensus and is conducted in a consultative and participatory manner. To that end, we plan to conduct a multi-stage expert review process using the Delphi technique – a structured, iterative and anonymised process of gathering expert knowledge whose main strength is in creating “clarity about vague concepts” [15,16]. From this brief review, we have generated the following broad questions to explore with an expert pool:

1. What is the diversity of perceptions around the term “destructive fishing”?
2. Which ecological, social and economic impacts are most associated with the term?
3. Where a destructive fishing practice refers to how a fishing gear is used in a specific context, which practices can be considered more or less potentially destructive?
4. How generalizable are local definitions of destructive fishing practices across different regions?

By ensuring a culturally and sectorally balanced pool of expert views (i.e. that includes fisheries managers, policymakers, civil society, small-scale rights holders, industry and academia), we hope to use an iterative, anonymised approach to constructively address the conceptual vagueness and contention around this term by “transform(ing) diverse individual knowledge to create a collective wisdom” [17].

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Methods

The frequency over time of the use of the term “destructive fishing” in the academic literature was assessed using Scopus database [18]. We counted the number of scientific articles published each year that contained both “destructive” and “fishing” in the title, keywords, or abstract, yielding a total of 522 publications since 1974 when records begin (Supplementary Data 1, data obtained 12/02/2021). These papers were then filtered down to a total of 375, with the 147 removed not explicitly referring to destructive fishing practices and simply containing the corresponding words.

The frequency of use of “destructive fishing” in the media was assessed using the ProQuest database [19]. We counted the number of 'Newspapers', 'Historical Newspapers', 'Wire Feeds', 'Magazines', 'Historical Periodicals' and 'Blogs, Podcasts & Websites' that contained “destructive fishing” in the title, yielding a total of 2500 articles (Supplementary Data 2, data obtained 16/03/2021). Seventy-five of these articles were published in multiple locations (e.g. the same news article appearing on different websites). We removed these repeated publications from the total number of articles published per year (Figure 1), but maintained them when considering the distribution of articles across countries, to fairly capture the geographic scope of media attention to “destructive fishing”. The frequency data for the media analysis was combined with that from the research analysis to produce Figure 1.

The frequency of use of “destructive fishing” in policy documents was assessed using the FAOLEX database [20]. We counted the number of documents that the phrase "destructive fishing" in the body of the document, yielding 137 documents. We categorised documents by country of origin, and year of publication (Supplementary Data 3, data obtained 03/03/2021). For the academic literature, media, and policy searches, we note that the methodology will have been selective for English-language sources. Papers and policy documents where the abstract was in English as well as the main text language were also included in our analysis.

For the in-depth analysis of research, we narrowed down the 375 research publications to the 52 which had a primary focus on “destructive fishing”, defined by containing “destructive fishing” in the title or keywords only (Supplementary Data 4). Each publication was read in depth and the following were recorded: title, authors, abstract, date, city and country of research institutions, city and country and regions of field sites, the geographic scope of the study (one country, more than one country, global), study context, study aims, the type of research, whether a definition for “destructive fishing” was provided, any definition for “destructive fishing” used, the “destructive fishing” methods practiced, ecological impacts and target habitats, social impacts, economic impacts, and management measures (Tables S1, S2). Publications were divided evenly between D.F.W., J.I.B., and C.J.D. for assessment, and a double blinding process was performed on a random selection of two papers per researcher to confirm scoring was consistent between researchers. The data from this in-depth analysis was used to produce Figure 2. The authors identify a future need for an in depth analysis on the use of “destructive fishing” in the media.

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Competing Interests. None.

Data and materials availability. All data is available in the manuscript or supplementary materials.

List of Supplementary Materials:

- Supplementary Data 1: All academic articles extracted with 'Destructive fishing' in the title, abstract or key words.
- Supplementary Data 2: All media articles with 'Destructive fishing' in the title.
- Supplementary Data 3: Summary of policy documents with 'Destructive fishing' in the body of the document.
- Supplementary Data 4: List of academic articles chosen for in-depth analysis ('destructive fishing' in title or key words only).
- Figure S1: Geographic distribution of policy documents.
- Figure S2: Geographic distribution of media articles.
- Table S1: Full list of all destructive fishing practices listed in the academic articles analysed.
- Table S2: Full list of all ecological, social and economic impacts listed in the academic articles analysed.

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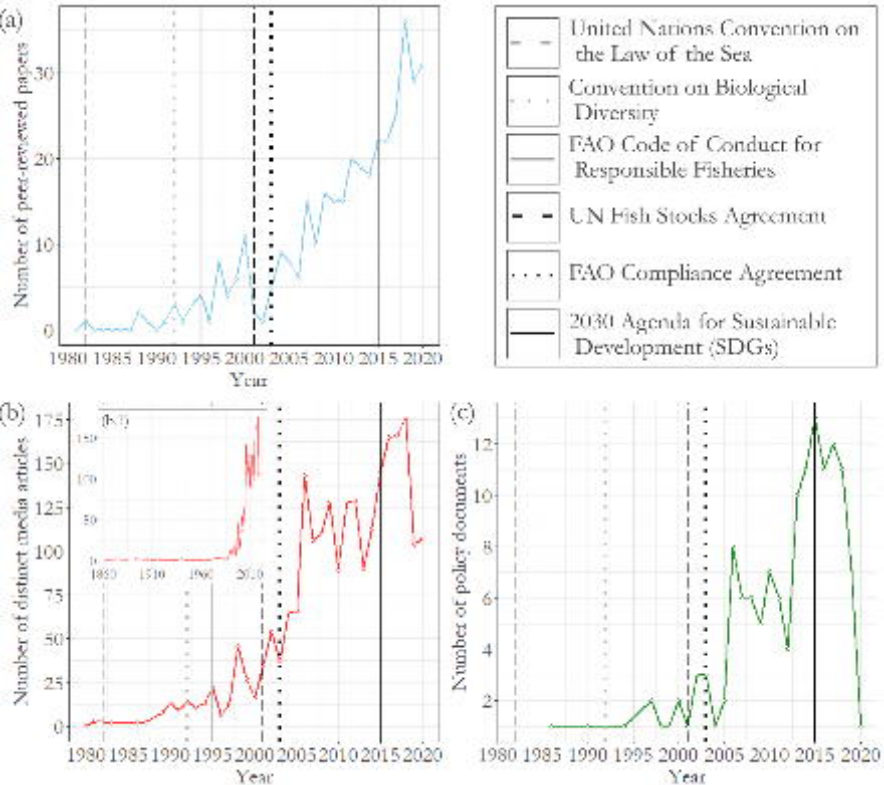
(a)
Number of peer-reviewed papers
0
10
20
30
1980 1985 1990 1995 2000 2005 2010 2015 2020
Year
United Nations Convention on the Law of the Sea
Convention on Biological Diversity
FAO Code of Conduct for Responsible Fisheries
UN Fish Stocks Agreement
FAO Compliance Agreement
2030 Agenda for Sustainable Development (SDGs)
(b)
Number of distinct media articles
0
25
50
75
100
125
150
175
1980 1985 1990 1995 2000 2005 2010 2015 2020
Year
(c)
Number of policy documents
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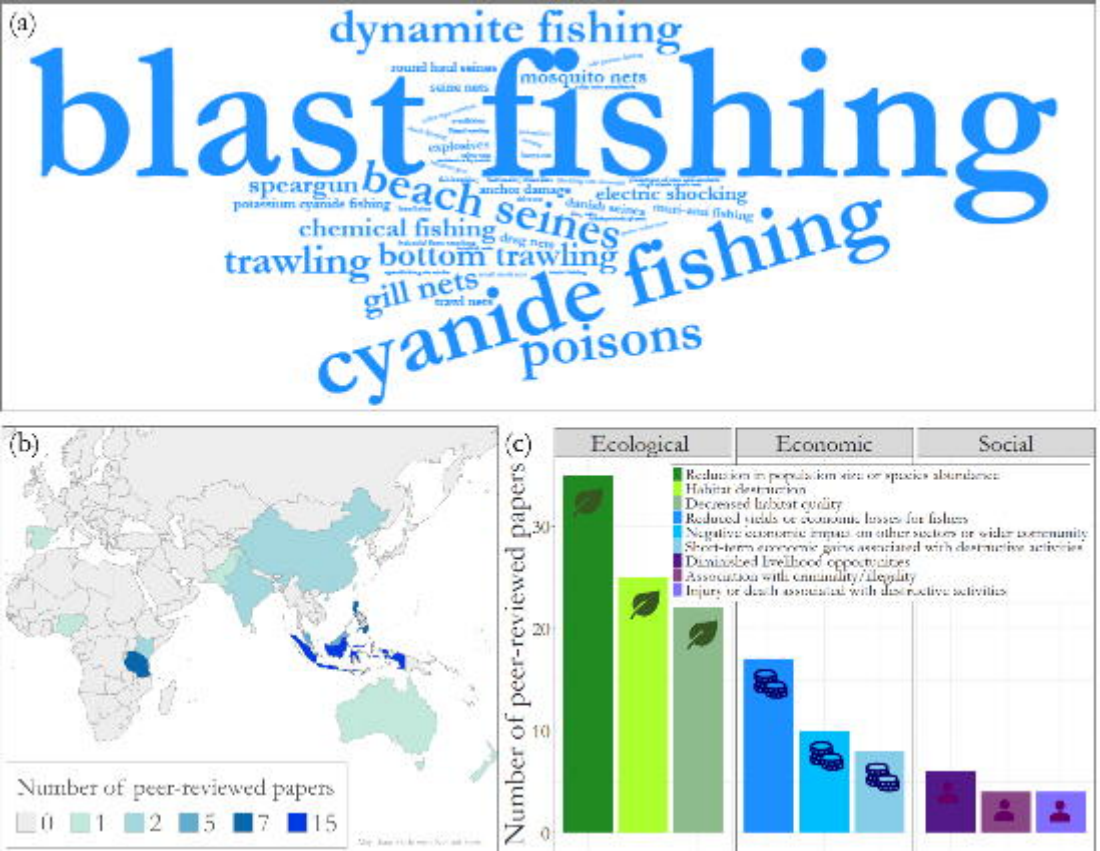
4
6
8
10
12
1980 1985 1990 1995 2000 2005 2010 2015 2020
Year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dynamite fishing
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round haul seines
mosquito nets
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explosives
speargun
beach seines
anchor damage
electric shocking
potassium cyanide fishing
chemical fishing
trawling
bottom trawling
gill nets
cyanide fishing
poisons
(b)
Number of peer-reviewed papers
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1
2
5
7
15
(c)
Ecological
Economic
Social
Number of peer-reviewed papers
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Habitat destruction
Decreased habitat quality
Reduced yields or economic losses for fishers
Negative economic impact on other sectors or wider community
Short-term economic gains associated with destructive activities
Diminished livelihood opportunities
Association with criminality/illegality
Injury or death associated with destructive activities