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Conservation Letters

DOI:
10.1111/conl.13015

Published: 28/03/2024

Publisher's PDF, also known as Version of record

Received: 14 December 2023 | Revised: 23 February 2024 | Accepted: 27 February 2024

DOI: 10.1111/conl.13015

Conservation Letters
A journal of the Society for Conservation Biology Open Access WILEY

LETTER

Destructive fishing: An expert-driven definition and exploration of this quasi-concept

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Funding information
Cambridge Conservation Initiative, Grant/Award Number: CCI-05-20-009; Helmholtz Institute for Functional Marine Biodiversity (HIFMB) at the University of Oldenburg; Brunel University London; Alfred-Wegener-Institute for Polar and Marine Research; Arcadia; Rothschild

Abstract

Numerous policy and international frameworks consider that "destructive fishing" hampers efforts to reach sustainability goals. Though ubiquitous, "destructive fishing" is undefined and therefore currently immeasurable. Here we propose a definition developed through expert consultation: "Destructive fishing is any fishing practice that causes irrecoverable habitat degradation, or which causes significant adverse environmental impacts, results in long-term declines in target or nontarget species beyond biologically safe limits and has negative livelihood impacts." We show strong stakeholder support for a definition, consensus on many biological and ecological dimensions, and no clustering of respondents from different sectors. Our consensus definition is a

Nibedita Mukherjee and Arlie Hannah McCarthy equal contribution

Foundation; A.G. Leventis Foundation; Isaac Newton Trust; Prince Albert II of Monaco Foundation

significant step toward defining sustainable fisheries goals and will help interpret and implement global political commitments which utilize the term "destructive fishing." Our definition and results will help reinforce the Food and Agricultural Organization's Code of Conduct and meaningfully support member countries to prohibit destructive fishing practices.

KEYWORDS
conservation, destructive fishing, fisheries, policy, sustainable development goals

1 | INTRODUCTION

Fisheries are fundamental to global food security (including nutrition security): approximately 22% of global animal meat production is extracted from the ocean each year (Costello & Ovando, 2019). In 2020, global capture fisheries produced 90.3 million tonnes, of which 78.8 million tonnes (87%) came from marine waters (Food and Agricultural Organization [FAO], 2022). Across fisheries and aquaculture, approximately 600 million livelihoods depend, at least partially, on fishery sectors and resources (Duke University & WorldFish, 2023), especially in coastal regions and on islands. Further, small-scale fisheries employ 60 million people and provide 40% of global catch (FAO, 2022). Addressing unsustainable aspects of fisheries would help secure livelihoods and economic stability, maintain good ecosystem functioning, and preserve cultural and spiritual values of the ocean (particularly for Indigenous Peoples, small-scale fishers, and local communities) (Nakamura et al., 2022; Singh et al., 2018; Strand et al., 2022, 2023). Sustainable fishing is promoted under multiple sustainable development goals (SDG) (Singh et al., 2018), particularly targets 14.4 (effectively regulate harvesting) and 14.6 (prohibit certain forms of fisheries subsidies), which refer to "overfishing," "illegal, unreported and unregulated fishing (IUU)" and "destructive fishing practices" (United Nations [UN], 2020).

Although established indicators enable managers to monitor progress toward ending "overfishing" and "IUU fishing" (Andriamahefazafy et al., 2022; Hosch & Macfadyen, 2022), no globally agreed definition or indicator exists for "destructive fishing" (Willer et al., 2022). The FAO (1995) Code of Conduct for Responsible Fisheries (CCRF) recommends: "States should prohibit dynamiting, poisoning and other comparable destructive fishing practices" (art. 8.4.2) (FAO, 1995). However, a review of academic literature, media articles, and policy documents (published 1976–2020) showed considerable vagueness in how and when the term is used, including within five multilateral policy frameworks which refer to destructive fishing (Willer et al., 2022).

The vagueness of the term in global treaties has rendered it a quasi-concept undermining consistent implementation (Brandi et al., 2019; Hoffman et al., 2022). A clear definition will enable managers to monitor change in the scale and prevalence of destructive practices; to determine if policies and management practices are effective and, ultimately, help restore and conserve biodiversity. Further, a definition will align with international legal instruments such as the United Nations Convention on Biological Diversity (CBD) (FAO, 1995) and the High-Seas Treaty which calls for "the need to address … biodiversity loss and degradation of ecosystems … due to … unsustainable use" (paragraph 3, Preamble) (UN, 2023).

By synthesizing expert knowledge from individuals in diverse fishing-related fields, we aimed to understand the utility of a definition, uncover consensus (or dissensus) on what constitutes "destructive fishing," and propose a starting definition.

2 | METHODS

We aimed to address the following objectives:

1. Explore whether a definition would be useful.
2. Explore the meaning of the term "destructive fishing" and co-create a new definition.
3. Identify the impacts (i.e., environmental, social, or economic changes) most associated with the term "destructive fishing".
4. Gather perceptions around how potentially destructive major fishing gear groups are (i.e., when not used responsibly).

2.1 | Expert survey and consultation

In this study, the Delphi technique was used to synthesize the opinions of fisheries experts (academics, practitioners in Non Governmental Organisations [NGOs], fishing industry, and associated fields) regarding the term "destructive fishing." We used the classical Delphi technique (an anonymous, iterative process of expert consultation) for this study because it is most suitable for finding consensus in complex issues where there are several contrasting views (Mukherjee et al., 2015). Due to its anonymous nature, the Delphi technique allows for the true opinion to emerge which is not impacted by psychological biases such as the Halo effect, Dominance effect and Groupthink (Mukherjee et al., 2015). The Delphi process went through three rounds (R1, R2, and R3) of consultations (SM1) delivered in English, French, and Spanish. The first round (R1) was mostly open-ended questions (Table S1). Based on thematic analysis of R1 responses, we developed agree/disagree statements which formed subsequent survey rounds (R2 and R3, see Tables S2 and S3). We set the consensus threshold at 70% of agreement or disagreement; the desired level is context-dependent (Mukherjee et al., 2015). Percentage agreement is the most commonly used definition of consensus in Delphi studies (Diamond et al., 2014).

2.1.1 | Participant selection

A 2-page flyer explaining the project was distributed to 84 representative entities from marine or fisheries-focused organizations (including alliances, associations, and multilateral governmental fora) with a multitude of members or signatories; these entities represented 1054 individual organizations. Represented organizations included: 185 national governments represented by 72 inter-government secretariats (of Regional Fisheries Management Organizations and Regional Seas Conventions and Action Plans); 150 small-scale fishery groups; 426 civil society organizations, 83 academic institutions; 138 seafood sector corporates (various parts of supply chains). The 84 representative entities put forward experts for the survey or directed us to member organizations or individuals who they judged would be most suitable. The demographic spread of the initial contacts were analyzed to ensure that a wide range of nationalities, countries of work, and industries were included. We actively sought further participants in regions that were underrepresented in our initial expert pool (see SM2 and SM3 for ethics clearance, participant information sheets, and consent forms).

2.1.2 | Drivers of differences in quantitative responses

Given that the divergence of opinion could be driven by a range of factors, we collected the following information from the respondents: sector, nationality, countries, and organizations where they have worked, academic and/or professional qualifications relevant to fisheries, years of experience in marine fisheries or wider marine issues, familiarity with major ocean regions and experience with fishing gears (Tables S1 and S2). To assess whether these factors influenced the results we conducted a Principal Components Analysis (Dray & Josse, 2015; Josse & Husson, 2016) and tested for clusters (Hopkins statistic, Silverman-PCA, Dip-PCA, and Dip-dist) (Adolfsson et al., 2019) within the results of the quantitative questions in R1 (classification of different fishing gears on degree of destructiveness), and the responses to statements in R2 and R3.

2.1.3 | Workshop

The Delphi survey was complemented by an online workshop held online on 20 October 2022. The 25 participants included a mixture of experts who had previously taken part in one or more rounds of the Delphi process and those new to the project who were invited to increase geographic and sectoral representation. The project team and a professional facilitator guided discussion in three sessions with prior grouping of participants into break out rooms to reduce "Dominance effect" as best as possible.

3 | RESULTS

3.1 | Demographic and sector-wide information

We received 80 responses to the first round (R1) (74 in English, 6 in Spanish). Respondents came from 32 nationalities (Table 1) and had worked across 36 countries. Experts had, on average, 21 years of experience in their field, ranging from 6–50. The dominant groups were civil society/environmental NGOs (20%), academia (15%), government fisheries management (13%), and the commercial fishing industry (12%) (Table 2). Experts had worked in all listed ocean regions, and 48% of respondents had worked in multiple regions (Figure S1). Respondents noted experience in fishing gears or categories, most frequently trawls (54%), longlines (33%), and gillnets (29%). Most had experience in small-scale fisheries followed by industrial or commercial and some mentioned recreational or deep-sea fisheries. One fifth indicated a fishery target species (tuna most frequently, followed by shellfish and crustaceans).

Of the 80 respondents in R1, 54 completed R2 (51 in English, 3 in Spanish) and 42 completed R3 (40 in English, 2 in Spanish). The spread of responses from different sectors was similar in R2 and R3. A Principal Compo-

TABLE 1 Number of respondents working in and from different countries from each survey round.

Region	Country	Income	# Respondents working in R1	R2	R3	# Respondents from R1	R2	R3
Europe and Central Asia	United Kingdom	High	27	16	10	27	18	11
	Portugal	High	3	3	3	3	2	2
	Austria	High	1	0	0	0	0	0
	Belgium	High	1	1	0	0	0	0
	Denmark	High	1	0	0	1	0	0
	France	High	1	2	2	1	2	2
	The Netherlands	High	1	1	1	3	3	3
	Germany	High	0	0	0	1	0	0
	Italy	High	0	0	0	1	1	1
	Luxembourg	High	0	0	0	1	1	1
	Spain	High	0	0	0	3	3	2
East Asia and Pacific	New Zealand	High	5	4	3	4	4	3
	Hong Kong	High	3	2	2	0	0	0
	Thailand	Upper middle	2	1	1	2	1	1
	Australia	High	1	1	1	4	3	2
	Cambodia	Low	1	1	1	1	1	1
	Fiji	Upper middle	1	1	1	1	1	1
	Indonesia	Lower middle	1	0	0	1	0	0
	Malaysia	Upper middle	1	1	1	0	0	0
	Marshall Islands	Lower middle	1	1	0	0	0	0
	Papua New Guinea	Lower middle	1	1	0	0	0	0
	Philippines	Lower middle	1	1	1	0	0	0
	Taiwan	High	1	0	0	1	0	0
	Timor-Leste	Lower middle	1	1	0	0	0	0
North America	United States	High	6	3	3	4	2	2
	Canada	High	1	1	0	3	2	0
Latin America and Caribbean	Argentina	Upper middle	2	1	1	2	1	1
	Chile	High	1	1	1	1	1	1
	Colombia	Upper middle	1	1	1	1	1	1
	Ecuador	Upper middle	1	0	0	1	0	0
	Mexico	Upper middle	1	0	0	1	0	0
	Peru	Upper middle	1	0	0	1	0	0
	Uruguay	High	1	1	1	1	1	1
	Paraguay	Upper middle	0	0	0	1	1	0
Sub-Saharan Africa	Mozambique	Low	2	1	1	1	1	1
	Cameroon	Lower middle	1	1	1	1	1	1
	Kenya	Low	1	1	1	0	0	0
	Seychelles	Upper middle	1	1	0	0	0	0
	South Africa	Upper middle	1	0	0	3	1	1
	Namibia	Upper middle	0	0	0	1	0	0
South Asia	Bangladesh	Lower middle	1	0	0	1	0	0
	India	Lower middle	1	1	1	1	1	1
No answer	No answer	No answer	2	2	3	1	1	2

Note: Countries are grouped by region and assigned World Bank income classification (https://blogs.worldbank.org/opendata/new-world-bank-country-classifications-income-level-2022-2023).

TABLE 2 Number of respondents working in various sectors associated with fishing.

Sector	# Responses R1	R2	R3
Civil society (environmental NGO)	36	22	15
Academia	24	5	5
Government (fisheries management)	18	6	6
Industry (commercial fishing)	17	5	5
Civil society (other NGO)	12	2	1
Government (environment)	12	0	0
Industry (other)	10	5	7
Intergovernmental body	10	6	2
Civil society (small-scale fisheries/rights holder institution)	6	3	1

Note: In R1, respondents were able to select as many sectors as they felt were relevant; hence, the total number of responses is greater than the number of respondents. In R2 and R3, respondents selected a single sector that best represented their career.

nent Analyses and cluster analysis found no differences between sectors (Figures S2–S4).

3.2 | Support for a new definition

Over half (59%) of the respondents supported a new definition of "destructive fishing" (Table S4). Most respondents (86%) identified at least one potential consequence: 12 benefits and 9 risks. The most common potential benefits were "improve[d] consistency, clarity and standardization of use" (21%) and "contribut[ion] to more meaningful implementation of global goals" (16%). The most common potential risks were that a definition could "fail to accommodate context dependency" (14%) and "oversimplify complexity of term and related concepts" (11%). "Destructive fishing" was most consistently classified as an activity that causes "irrecoverable habitat degradation" (combination of: habitat degradation as the most common impact category [54%] and "irrecoverability," or transformative ecological change, as the most prevalent concept [23%]).

3.3 | Meaning of "destructive fishing" and associated impacts

Participant-provided meanings of "destructive fishing" included a range of conceptualizations and examples of environmental, social, and economic impacts; 92.5% or definitions included environmental impacts (Figure 1a).

In R1, respondents most associated ecological impacts (91% of responses) with "destructive fishing," but economic (52%) and social (48%) impacts were also acknowledged (Figure 1b). Negative impacts to benthic habitats/vulnerable marine ecosystems (VMEs, 46%), nontarget species (43%), and target species decline (41%) were commonly described (Figure 1c). Overall, we identified 16 impact categories (6 environment, 6 social, and 4 economic), with 47 specific impacts (Table S5). These were categorized into statements which were scored in R2 and R3.

Participants scored 13 concept statements; 12 reached consensus by R3 (Figure 2). The statement "describes changes/impacts that are reversible over any time scale" was the only concept statement without consensus at the end of R3.

Participants scored 16 statements relating to impacts of "destructive fishing" (environmental: 9 statements, social and economic impacts: 7 statements). Seven of the nine environmental statements reached consensus by R3 (Figure 3). In contrast, none of the social and economic statements reached consensus by R3 (Figure 4). There was no significant difference among the different sectors (Figures S3 and S4).

3.3.1 | Scope of "destructive fishing"

Of the 16 scope statements, 12 reached consensus by R3 (Figure 5). Respondents agreed that behavior and management play critical roles in the destructiveness of a practice (recognizing that some are almost universally considered destructive), and that "destructive fishing" could be avoided (Figure 5). While overlapping conceptually with "IUU fishing" and "overfishing," respondents disagreed that "destructive fishing" is the same as these terms. Respondents agreed that "destructive fishing" is the same as fishing that causes "serious or irreversible harm" and "significant adverse impact" (Figure 5).

Participants who answered "Strongly Agree" or "Strongly Disagree" to any statement in R2 were invited to justify their answer, which provided further detail about impacts, concepts and scope of "destructive fishing" (Table S9).

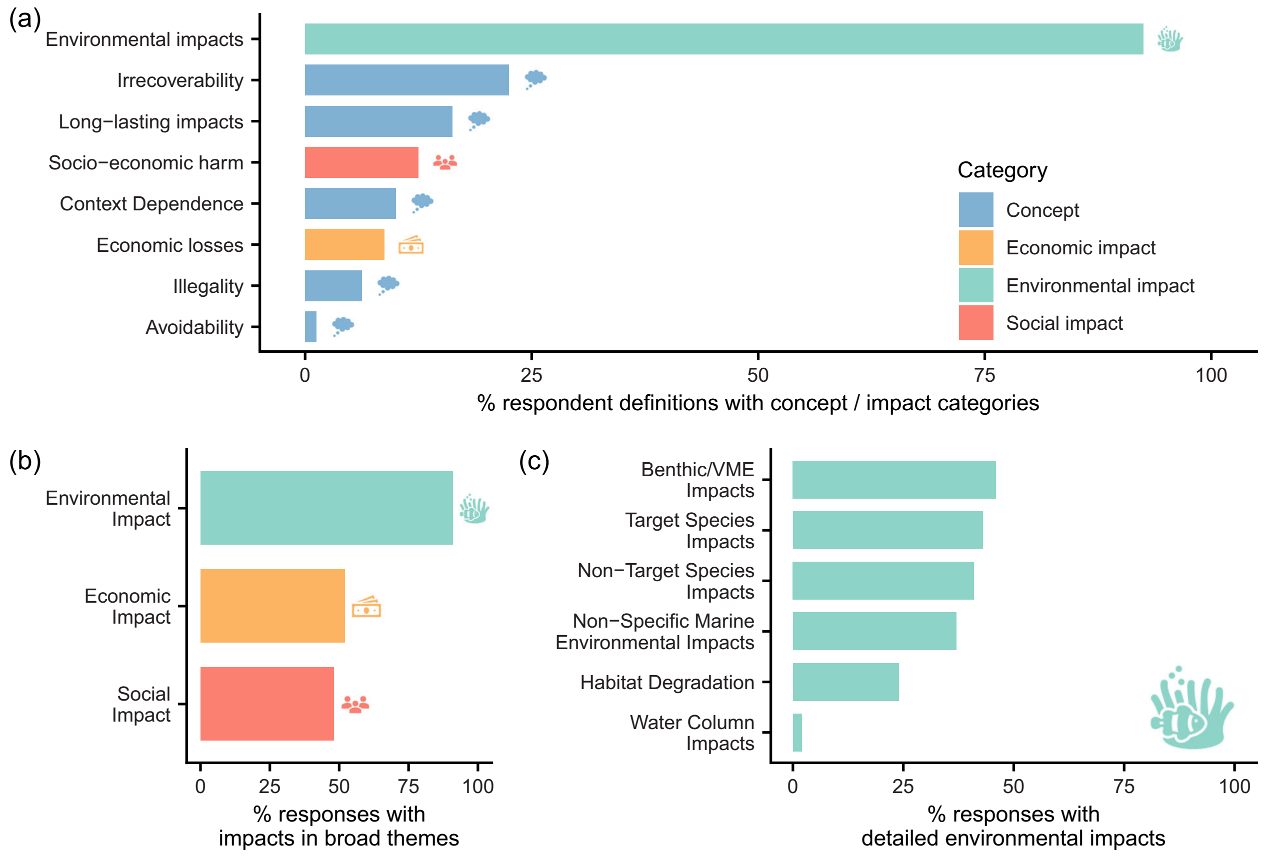

FIGURE 1 (a) The meaning of "destructive fishing" in R1 was illustrated by examples of impacts as well as a range of concepts linked to the term, including irrecoverability and transformative scale of the ecosystem (23% of answers), long-lasting impacts (16%), context dependence (10%), illegality (6%), avoidability/unnecessary damage (1%). (b) When asked to detail potential impacts (Table S5), almost all included an environmental impact (91%), followed by economic impacts (52%) and social impacts (48%). (c) The environmental impacts fell into a range of broad categories, based on specific impacts experts highlighted, for example, specific benthic or sensitive habitats such as coral reefs. VME, vulnerable marine ecosystem.

3.4 | New definition

Expert-suggested definitions (R2) were categorized into themes using thematic analysis. Habitat degradation was the most common theme (62%) (Table S8). Other common themes were as follows: (1) scale of damage, with significant/extensive damage being a key factor of destructiveness (24%); (2) activities that are beyond acceptable thresholds of management/mitigation (12%); and (3) the consequences of poor management (8%), although this concept remained ambiguous.

The themes were presented to the workshop participants to create a consensus definition. Participants agreed that a definition should include spatio-temporal and intensity components (e.g., "long-lasting impacts" or "significant adverse effects"), which could be defined at a local level or using existing frameworks. Based on results from the Delphi process, the workshop, and subsequent discussions amongst experts (SR4), the proposed new definition is as follows:

> Destructive fishing is any fishing practice that causes irrecoverable habitat degradation, or which causes significant adverse environmental impacts, results in long-term declines in target and non-target species beyond biologically safe limits, and has negative livelihood impacts.

We acknowledge that our proposed definition requires further qualification or refinement to create a usable definition. Specifically, under all "and"/"or" combinations, we foresaw scenarios that either should be considered "destructive" but would not be under this definition (e.g., because a practice is bioecologically but not socioeconomically destructive), or vice versa. Perhaps final users of

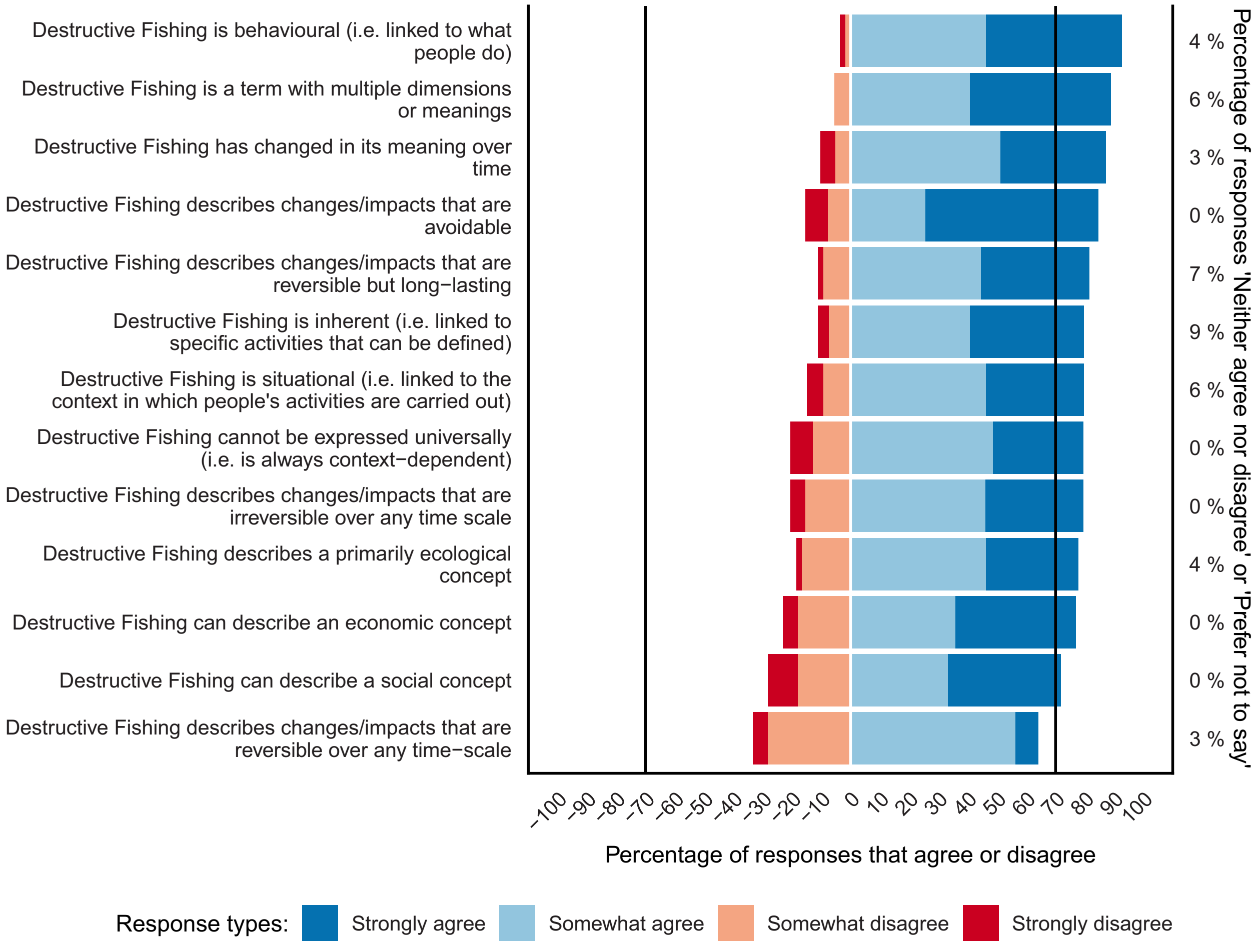

FIGURE 2 Percentage of survey respondents that agreed or disagreed with statements related to "destructive fishing" as an overarching concept. Line indicates the 70% consensus threshold. Middle options of "neither agree nor disagree" (R2) and "prefer not to say" (R3) are displayed on the right side of the figure.

the definition may specify whether they use "and" or "or" and if a practice is bioecologically or socioeconomically destructive or both.

3.4.1 | Gear types

Respondents scored 48 gears and practices in 11 categories (Figure 6 and Table S6) on their potential destructiveness. Across the 0 (not at all potentially destructive) to 5 (highly potentially destructive) scale, the mean score across all gear types was 2.76. The four highest scores were blast/dynamite fishing (4.83), chemicals/poisons (4.79), mechanized dredges (4.37), and towed dredges (4.33); and the three lowest scores were harpoons (1.41), diving (1.46), and handlines (1.47). Overall, the negative impacts of gear types on environmental factors (mean 3.01) were considered worse than impacts on social (2.62) or economic (2.72) factors. Nearly 50% of respondents answered "Don't know" for the impacts of gear types on social and economic factors, in contrast to just 30% for environmental factors (Table S6). Further results on drivers are in Supplementary Results SR2, Table S7, and Figure S5.

4 | DISCUSSION

4.1 | Policy implications

Several international treaties and policy frameworks refer to "reducing" or "ending" destructive fishing. In this context, defining and measuring "destructive fishing" in both biological and human dimensions will be critical for future action. We show that experts in this study considered "destructive fishing" to be distinct from "overfishing" and "IUU fishing." For example, managing a fishery at maximum sustainable yield for one target stock could still be destructive for by-catch species or have destructive social impacts. Further, our respondents felt "destructive fishing" may be avoidable through improved

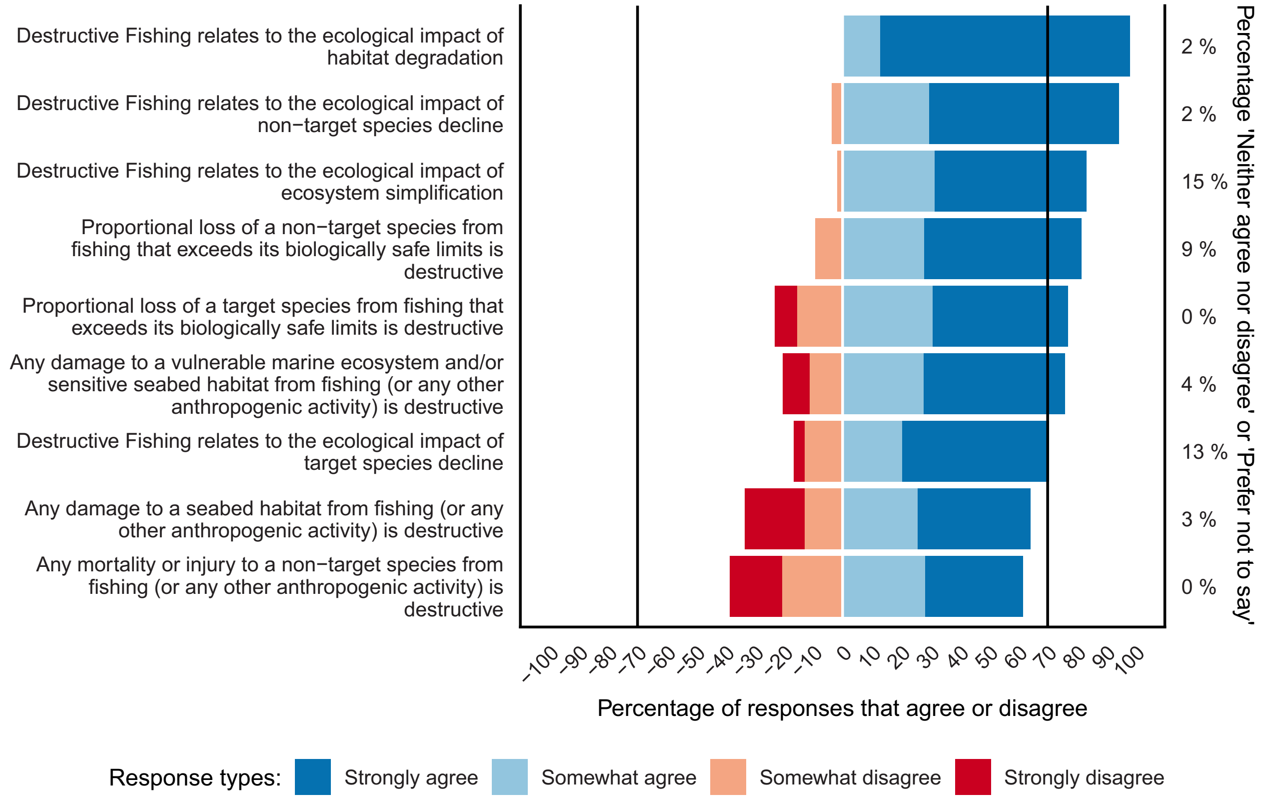

FIGURE 3 Percentage of survey respondents that agreed or disagreed with statements related to the environmental impacts of "destructive fishing." Line indicates the 70% consensus threshold. Middle options of "neither agree nor disagree" (R2) and "prefer not to say" (R3) are displayed on the right side of the figure.

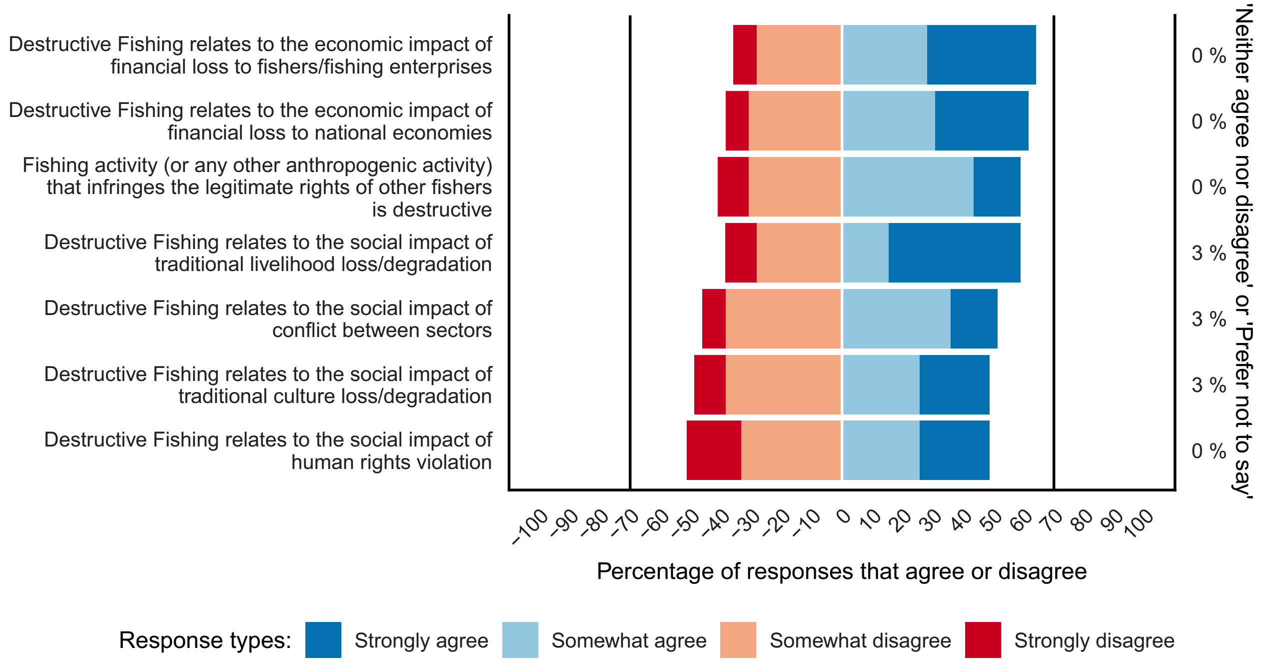

FIGURE 4 Percentage of survey respondents that agreed or disagreed with statements related to the economic and social impacts of "destructive fishing." Line indicates the 70% consensus threshold. Responses here are from R3. Middle options of "neither agree nor disagree" (R2) and "prefer not to say" (R3) are displayed on the right side of the figure.

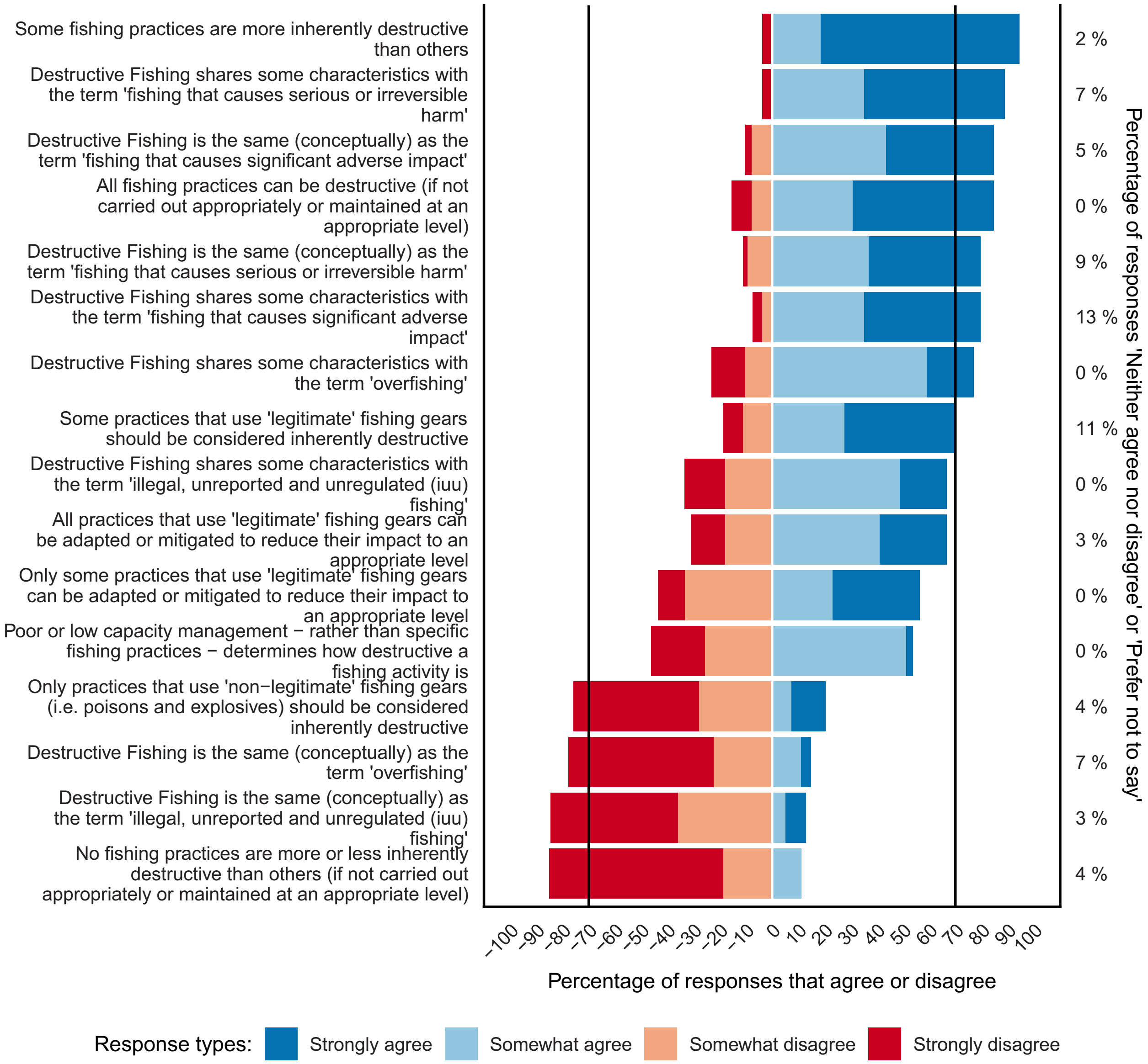

FIGURE 5 Percentage of survey respondents that agreed or disagreed with statements related to the scope of the term "destructive." Line indicates the 70% consensus threshold. Middle options of "neither agree nor disagree" (R2) and "prefer not to say" (R3) are displayed on the right side of the figure.

fisheries management. Therefore, delivering global goals to "end" or "reduce" "destructive fishing" requires dedicated policy targets rather than relying entirely on existing ones.

Our proposed definition could facilitate the development of metrics to assess implementation progress of associated goals, including SDG target 14.4, and aligns with research suggesting that a unified definition would foster more meaningful and consistent management of destructive fishing in line with global ambitions and would address the consequences of its vagueness (Willer et al., 2022). We suggest operationalizing our definition, first through refinement in policy fora, and second using an indicator framework that captures greater nuance from our results. We further suggest that such efforts capitalize on existing, readily usable indicators, and targets wherever possible.

4.2 | Operationalizing the definition

To be operationalized, our proposed definition requires strengthening and refinement in policy fora and connection to metrics or indicators that could measure progress toward eliminating "destructive fishing." Our proposed definition may promote the development of technical

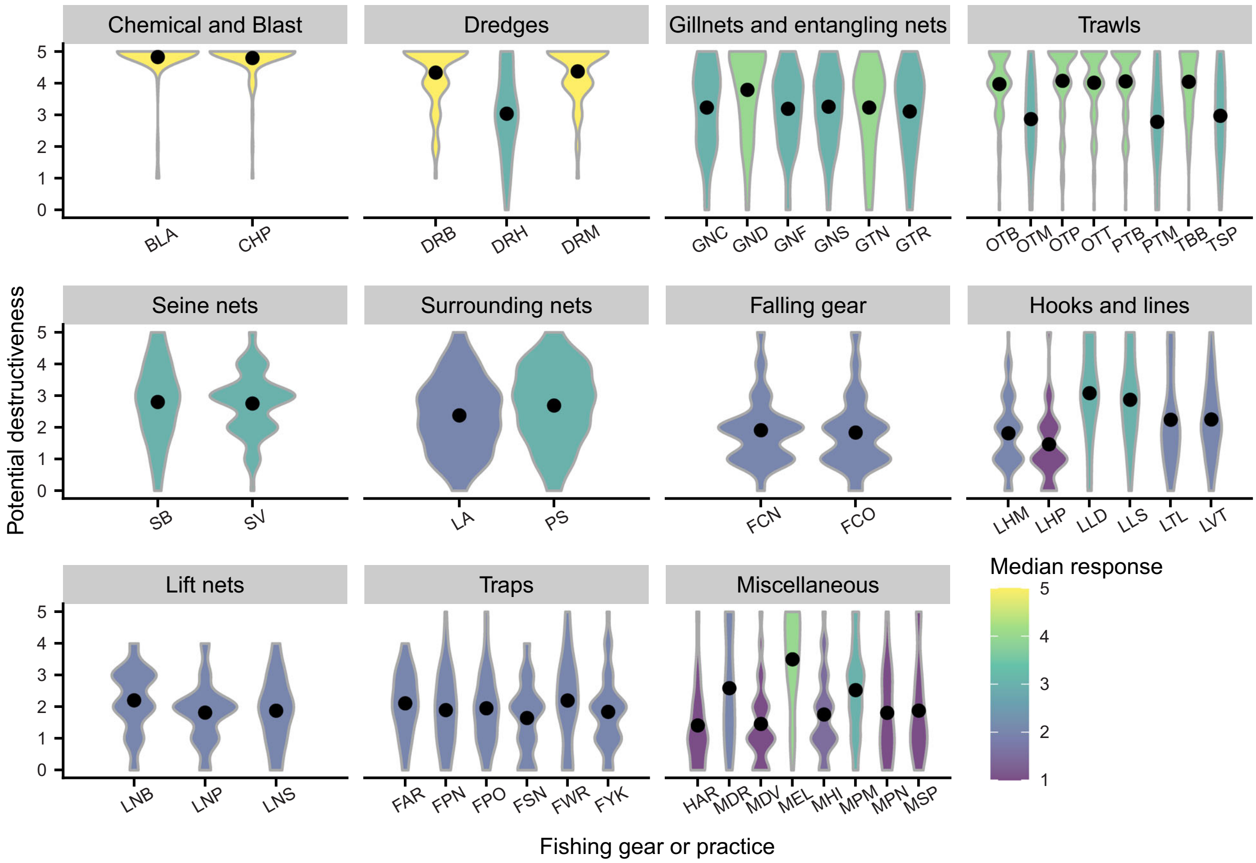

FIGURE 6 The extent to which fishing gears and practices can be considered "potentially destructive" according to survey respondents, 0 is least destructive and 5 is most destructive. Each gear or practice is represented by a violin plot, grouped by the broader category (as per Food and Agricultural Organization [FAO] gear classification (He et al., 2021), plus blast and chemical fishing, see Table S6 for full description). Black dots and color reflect the mean and median scores, respectively. BLA = blast/explosives/dynamite, CHP = chemicals/poisons/synthetic toxins, DRB = towed dredges, DRH = hand dredges, DRM = mechanized dredges, GNC = encircling gillnets, GND = drift gillnets, GNF = fixed gillnets, GNS = set gillnets, GTN = combined gillnets-trammel nets, GTR = trammel nets, OTB = single boat bottom otter trawls, OTM = single boat midwater otter trawls, OTP = multiple bottom otter trawls, OTT = twin bottom otter trawls, PTB = bottom pair trawls, PTM = midwater pair trawls, TBB = beam trawls, TSP = semipelagic trawls, SB = beach seines, SV = boat seines, LA = surrounding nets without purse lines, PS = purse seines, FCN = cast nets, FCO = cover pots/lantern nets, LHM = mechanized lines and pole-and-lines, LHP = handlines and hand-operated pole-and-lines, LLD = drifting longlines, LLS = set longlines, LTL = trolling lines, LVT = vertical lines, LNB = boat-operated lift nets, LNP = portable lift nets, LNS = shore-operated stationary lift nets, FAR = aerial traps, FPN = stationary uncovered pound nets, FPO = pots, FSN = stow nets, FWR = barriers, fences, weirs, etc., FYK = Fyke nets, HAR = harpoons, MDR = drive-in nets, MDV = diving, MEL = electric fishing, MHI = hand implements (wrenching gear, clamps, tongs, rakes, spears), MPM = pumps, MPN = pushnets, MSP = scoopnets.

guidelines on measuring "destructive fishing" under the FAO which would help to raise this issue on an international scale, reinforce the FAO Code of Conduct, and meaningfully support member countries to prohibit these practices. The recently formed FAO Sub-committee on Fisheries Management (23) may present a forum to evaluate how the goal of ending destructive fishing is reported, perhaps supporting the Committee on Fisheries (COFI) in its role as the FAO decision-making body responsible for the CCRF. In addition, in 2025, a comprehensive review (24) of the SDG indicators is being conducted, and the current definition could be fed into this review to help support development of a new indicator to address the critical issue of destructive fishing.

A range of metrics could be used to quantify progress toward ending "destructive fishing". Although the specific metrics selected will need to be adapted to reflect local priorities and context, some of the metrics that could be considered include existing indicators and methodologies. An indicator framework could include metrics measuring: (1) impacts on habitat structure (e.g., swept area seabed impact, extent of physical damage, and fishing activities within VMEs); (2) impacts on nontarget species (e.g., stock assessments of bycatch species, bycatch as a proportion of total catch); and (3) impacts on ecosystem function (e.g., trait-based measures, size-based indicators, and marine trophic index) (UNEP-WCMC, 2023).

4.3 | Consensus across sectors

We found majority support for a consensus definition for the term "destructive fishing", irrespective of the varied background of the experts. Cross-sector consensus reflects broad understanding that fishing practices can have destructive impacts not only on habitats and ecosystems, but also on the well-being and economic prosperity of people (including fishers), particularly in vulnerable coastal communities and small-scale operations (Arthur et al., 2019; Muallil et al., 2014; Stacey et al., 2021). Several initiatives from the FAO (FAO, 2015, 2019) and the UN Human Rights Council (UN Human Rights Council, 2018) seek to bring together the ecological and societal aspects of fishing.

4.4 | Impact of gears or practices

Broadly, we found consensus that (1) there is a hierarchy of "destructiveness" in gears and practices (Chuenpagdee et al., 2003) and (2) inherently destructive practices can include "legitimate" gears and or practices. According to this study, the most potentially destructive gears or practices are blast/dynamite, chemicals/poisons, and various forms of "legitimate" towed demersal gear, specifically mechanized, and towed dredges. We considered "legitimate" gears/practices to be those listed within the FAO defined taxonomy of fishing gears (He et al., 2021), as opposed to explosives, and poisons, which fall outside. Our results suggest the scope of "destructive fishing" lies beyond the practices specifically mentioned as requiring "prohibiting" in the FAO CCRF.

Nonetheless, the notion that all fishing practices could be equally destructive (given management and ecological context) and, conversely, that only "illegitimate" practices can be considered inherently destructive were consistently rejected. Thus, although context matters, it is not everything: there are "legitimate" gears that could be considered inherently destructive. We found broad agreement across respondents, but nonetheless we acknowledge the ecologically-focused positionality of our expert group and the importance of nuance and context-specificity in comparing fishing practices.

4.5 | Limitations of the study

We note three main limitations of our expert pool, which should be addressed in any future work and before the definition is operationalized. First, we lacked experts from the consumer end of the fish and seafood value chain. These end-value-chain actors will, as demand stimulators, indirectly drive fishing activities and, through marketing and labeling (Willer et al., 2021), "may impact everyday consumers" perceptions of destructive fishing. Second, few experts were from low- and middle-income nations, and none from China or Russia (among the global top 5 largest fishing nations and where fishing plays a critical social and economic role) (Teh et al., 2020; Wang & Wang, 2021). Third, most respondents had backgrounds in biology and ecology (rather than social sciences, policy, governance etc.), even after additional participants with wider professional backgrounds were invited to the workshop to address this imbalance. Information on gender was not asked in the Delphi rounds.

4.6 | Conclusion

To ensure healthy oceans that support sustainable fisheries, destructive and harmful practices must be addressed and clearly defined. The consensus definition presented here is a considerable step toward that goal. Significant and irreversible damage caused to the wider marine ecosystem, threatens not only biodiversity but also the ability of marine systems to contribute to the well-being, livelihoods, and food security for millions around the world. Our results provide a basis for corporate, intergovernmental, and national discussions on the topic of destructive fishing.

AUTHOR CONTRIBUTIONS

Daniel Steadman and Chris McOwen conceived the project. Arlie Hannah McCarthy, Nibedita Mukherjee, David Willer, and Joshua I. Brian contributed to the analysis. Nibedita Mukherjee, Arlie Hannah McCarthy, Daniel Steadman, and Hannah Richardson drafted the paper. Authors who were also expert participants contributed critically to writing the manuscript. All authors have read and edited the manuscript.

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ACKNOWLEDGMENTS

We sincerely thank contributors to this project in the Delphi process who chose not to contribute further as authors on the manuscript. The topic raises significant challenges and we are enormously grateful for their time, insights and generosity in participating. We also thank Oli Yates at RSPB, part of the larger project team, for his insights. We were funded by the Cambridge Conservation Initiative [CCI] collaborative research grant CCI-05-20-009. The CCI collaborative fund is sponsored by Arcadia a charitable fund of Lisbet Rausing and Peter Baldwin, the Rothschild Foundation, the A.G. Leventis Foundation, the Issac Newton Trust and the Prince Albert II of Monaco Foundation. NM was funded by Brunel University London. AHM was partially funded by the Helmholtz Institute for Functional Marine Biodiversity (HIFMB) at the University of Oldenburg and the Alfred-Wegener-Institute for Polar and Marine Research.

CONFLICT OF INTEREST STATEMENT

Authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data that breaches the anonymity of responses in this study cannot be made available. Some anonymized and summary data can be found in the Supplementary Information.

ADDITIONAL INFORMATION

This manuscript has Supplementary Information.

CODE AVAILABILITY STATEMENT

Code for the figures and certain analyses used in this manuscript can be found at https://github.com/arlie-m/destructive_fishing_defintion_delphi.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: McCarthy, A. H., Steadman, D., Richardson, H., Murphy, J., Benbow, S., Brian, J. I., Brooks, H., Costa-Domingo, G., Hazin, C., McOwen, C., Walker, J., Willer, D. F., Abdi, M., Auster, P. J., Bealey, R., Bensted-Smith, R., Broadburn, K., Carvalho, G., Collinson, T., … Mukherjee, N. (2024). Destructive fishing: An expert-driven definition and exploration of this quasi-concept. *Conservation Letters*, *17*, e13015. https://doi.org/10.1111/conl.13015