Staying with the Trouble of Defining Small-Scale Fisheries

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Abstract

Small-scale fishing is one of the oldest and enduring human livelihood activities. Yet, small-scale fisheries persist not as a historical anachronism, but an important part of global food production and human well-being: the sector continues to land nearly half of the world's seafood while employing the majority of the labor in fisheries. While small-scale fisheries are both a traditional and enduring livelihood of global importance, their diversity makes them difficult to define. Yet, a volume of scientific research on small-scale fisheries exists, producing authoritative knowledge about what they are and how they should be managed that in turn shapes policies and access to resources. This research explores the dominant discursive patterns present in the scientific literature on small-scale fisheries drawing on a database of over 2,600 peer reviewed articles published between 1960-2016. Through a narrative analysis of over 250 articles, this preliminary research reveals a relatively stable and shared scientific definition of small-scale fisheries that focuses on certain elements of fishing technology. This research aims to reveal the myths and assumptions embedded in the dominant or hegemonic definition of small-scale fisheries and their problematic effects. Specifically, we highlight how the emphasis on technology reduces the complexity of small-scale fisheries to a few a knowable elements—boats, engines, and fishing gear—rendering small-scale fisheries legible and amenable to scientific study. The emphasis on technology occludes the intersectional forces of other land-based technologies, labor, and nature that co-constitute small-scale fisheries. Notably, this limited emphasis on technologies predominantly used for fishing at sea excludes processes and labor that occur on land, imparting a gendered bias in the definition and reifying the land-sea divide. The stability of the technological definition creates a narrative of small-scale fisheries as a particular technological-environmental problem to be solved while dis-embedding these practices from their entanglements with the social, political-economic, and environmental assemblages which relationally shape them.

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1. Introduction: Small-scale fisheries matter and so do the stories we tell about what they are

"It matters which stories tell stories, which concepts think concepts. Mathematically, visually, and narratively, it matters which figures figure figures, which systems systematize systems" Haraway (2015)

Small-scale fisheries mean many things to many people. They can define vital and persistent livelihoods, shape connections to place, form identities, and nurture means of production that span across space and time. Small-scale fisheries matter, and they have for a very long time. In fact, fishing is widely considered one of the oldest means of human subsistence (Pálsson 1989). Despite longstanding debates about the archaeological evidence for early fishing (Pálsson 1989), recent findings suggest modern humans were exploiting nearshore resources 165,000 years ago and deep sea fishing 45,000 years ago (Balter 2012, O'Connor, Ono, and Clarkson 2011, Henshilwood et al. 2002).

As a traditional and enduring livelihood, small-scale fisheries have been forged through a combination of adaptation and resistance to changing environmental, social and political conditions. Access to resources held in common—such as fisheries, pasture and forests—have long been challenged by ongoing state and elite efforts to enclose the commons for specific management objectives, including state or elite accumulation and profit (McCay 1987, Scott 1998, Linebaugh 2014). In addition to centuries of enclosure through feudalism, state-making and colonialism, small-scale fisheries also face the more recent trouble of existing in an increasingly industrial and global world. Prices, terms of trade, and competition in local markets for small-scale products are increasingly affected by aquaculture production, imported seafood and foreign preferences (Allison 2001). However, even in the context of an increasingly industrialized and globalized world economy, small-scale fisheries continue to land a significant portion of the world's seafood while employing 90% of the labor in capture fisheries (Béné, Macfadyen, and Allison 2007). Despite the label 'small-scale' they provide an important source of global food production, employment and subsistence up to present; therefore, while small-scale fisheries are among the oldest means of human subsistence, they persist not as an anachronism but as a set of malleable and diverse livelihood practices.

Scientific discourse shapes both policy objectives and popular perceptions about what small-scale fisheries are—and therefore how they should be managed. In this sense, Haraway's words remind us that the stories we tell *matter* because they are repeated, beget other stories, shape influential concepts, and naturalize certain systems over others (Haraway 2015). How environmental, social and political issues related to small-scale fisheries are framed within the scientific discourse reverberates across knowledge realms—influencing natural resource management policies, institutions, and public perceptions. Yet, for centuries scientists have struggled to describe exactly what small-scale fisheries *are* and their broader role in human evolution, survival, and society. Nineteenth and twentieth-century archaeologists and cultural anthropologists produced competing theories regarding the role of fishing in human evolution and prosperity (Pálsson 1989). Carl Sauer reinvented the "man the hunter" hypothesis, instead

speaking of "man the fisher" where, "the hypothesis…is that the path of our evolution turned aside from the common primate by going to sea" (Sauer 1962, 309). Some even proposed that fishing created the stable surplus and conditions for language and the flourishing of human society itself: the 'aquatic (hu)man' hypothesis (Sauer 1962, Hardy 1960). Scientific attention to small-scale fisheries emphasizes not only its evolutionary and historical significance but also its ongoing unfolding; coverage is only increasing in recent decades within 'natural' and 'social' sciences with many new disciplines and voices joining the conversation (Basurto et al. 2017). In the twentieth century, new hybrid disciplines emerged—including environmental economics and fisheries science—joining the dialogue on small-scale fisheries categorization and management (Pálsson 1989). Recent identification of the impending 'crisis' of global environmental change generally (Haraway 2014), and fisheries management specifically (Allison 2001), has only increased attention to the 'problems' and 'solutions' of resource use and management in small-scale fisheries (Basurto et al. 2017), whether or not these crises are 'real' (Forsyth 2004). It is from these few premises that we establish my project for this paper: *small-scale fisheries matter as an enduring component of human life and so do the scientific narratives that shape the conversations around what they are, how they should be managed, and what they can become.*

Despite their continued presence as a livelihood strategy and subject of study, small-scale fisheries remain challenging to define (Chuenpagdee et al. 2006). Undoubtedly, the plurality of small-scale fisheries is what makes them both salient and elusive; no one definition seems sufficiently pliable or encompassing. It is difficult to succinctly articulate such a wide array of practices: women pole-fishing for octopus on shallow reefs in Tanzania (Porter and Mbezi 2010); incorporated groundfish trawlers of New England and the active Fishermen's Wives Association (St Martin 2001); and urban fishers of São Paulo plying municipal reservoirs (Minte-Vera and Petrere Jr 2000). These examples all carry the label "small-scale fishery," yet each is constituted through unique social, political and ecological forces yielding different outcomes. Each technique is shaped by specific assemblages of human and more-than-human nature (Whatmore 2002)—the outcome of which, in these cases, yields seafood for human consumption. In addition to seafood, small-scale fisheries produce a variety of material goods which may be consumed, redistributed, sold locally, and exported globally, including baitfish, live fish for aquariums, fish meal for livestock consumption, medicine, building materials, and other marine products (Berkes 2015). In addition to consumable goods small-scale fisheries are productive of a range of immaterial forces: connections to place, community, cosmology, identity, and subjectivity. Importantly, the diverse practices, meanings, and material goods constitutive of small-scale fisheries are not merely part of the past but present, ongoing and becoming (Haraway 2015). Therefore, struggles to define small-scale fisheries also have a history, force, and meaningful trajectory of their own. Yet the story of the story of small-scale fisheries, the metadiscourse, has been largely overlooked.

This research focuses on the dominant scientific narratives that have been advanced to make sense of small-scale fisheries. As these stories are repeated they often become taken-for-granted explanations amounting to environmental orthodoxies or common-sense explanations (Forsyth 2004). Often, they become popular not because they necessarily provide an accurate, empirically grounded or complete picture of the practices they claim to represent but because they make for 'good stories' (Walker 2006). Drawing on existing scientific literature on small-scale fisheries, we identify the dominant—even taken-for-granted—stories used to define them. We

begin by first differentiating among the most commons elements used to define small-scale fisheries before turning to their productive effects. Despite the complexity and situated geographies of small-scale fishing practices, relatively stable patterns of understanding are evoked within the scientific literature. Across decades, geographies, paradigms and sub-disciplines, the scientific literature consistently focuses on *technology* to define small-scale fisheries. This narrow and consistent focus on technology reduces the inherent complexity of small-scale fisheries, rendering them legible and amenable to scientific study, categorization, measurement, and modeling. While focusing on technology obscures many other salient aspects and dynamics, it aligns small-scale fisheries with existing discursive framings: reductionism and modernization. Drawing on James C. Scott's (1998) concept of legibility, we explore how, why, and to what effect small-scale fisheries are made legible through reduction and simplification. We place our analysis and findings in the context of ongoing and ubiquitous struggles over property rights, access, and self-determination in fisheries.

While our analysis focuses on the dominant definition of small-scale fisheries, this is not the only lens through which to view and understand them. Alternative definitions of small-scale fisheries are being advanced by a range of actors and social movements operating at different scales. We raise alternative paradigms as counterpoints in the discussion, offering insights into other ways of seeing small-scale fisheries. However, within the scientific discourse, alternatives to the technological definition emerged relatively recently. Hence, my paper builds on Donna Haraway's (2016) notion of "staying with the trouble" precisely because we have much to learn from reflecting on the fraught history of studying small-scale fisheries and the troubled definitions that exist and persist despite more inclusive alternatives. Recent progress towards re-articulation and self-determination in small-scale fisheries needs to be understood in relation to the hegemonic definition: deconstructing the apparent naturalness of hegemonic concepts is a strategy to make space for resignification (Gibson-Graham 1997). We conclude with a view toward present and future possibilities for reframing how we envision these entangled practices, opening discursive space for other stories about what small-scale fisheries are and can become. Arriving at future possibilities through an analysis of past optics is intentional here—small-scale fisheries are not merely past or present but *pastpresent*, ongoing and always becoming (Haraway 2008, Haraway 2014).

2. Data and Methods

Drawing on inductive research from a database of over 2,600 peer-reviewed articles published on small-scale fisheries we differentiate among the key features used to define them. The database includes articles published from 1960 to 2016 and retrieved from the Web of Science database. Relevant articles were identified using the search terms "small-scale fisher*" or "artisanal fisher*" or "fisherfolk" or "fishing communit*". This research is ongoing, and initial coding has been conducted on approximately 250 articles from 1960-2000[1]. Further coding will add additional insights and temporal depth to this analysis. The findings presented here are preliminary and attend to the broad themes we discovered through initial reading and coding of this subset of articles. While an in-depth discourse analysis designed to trace inter-textual discursive patterns is

[1] All articles were read and coded from 1960-1980. Beginning in 1990, due to the volume of articles, a random sample of 25% of articles were read and coded for each decade.

one possible project, there is "breadth as well as depth in analyzing environmental discourse, looking for the big picture rather than details" (Dryzek 2013, 11). Therefore, in connection with the present project, we read and coded articles seeking out the broad discursive patterns used to define and problematize small-scale fisheries. In this sense, we cover a wider swath of the scientific literature, and paint it in broad strokes (Dryzek 2013, 11). Given this objective, this research is limited to uncovering general trends but does not parse the definition by geography, discipline, or any other possible sub-grouping within the scientific literature.

Within the 250 articles reviewed for this paper we noted any portion of text which explicitly defined small-scale fisheries and recorded how the author(s) articulated the concept. We used a basic grounded theory approach, coding language inductively rather than analyzing the texts with a preexisting set of theoretical codes (Walsh et al. 2015). This method allowed me to identify patterns emerging from the data through selective coding, focused on definitions as the core category. We reviewed all notes and first inductively grouped them around emergent, core concepts used to define small-scale fisheries. These included distinct themes such as capital, labor, time, spatial zones and technology. We further focused our analysis on the most common theme: what we call the dominant or hegemonic definition of small-scale fisheries, which relies on technology. These results are presented in the following section.

3. Key characteristics and dominant definitions of small-scale fisheries

Missing definitions; a substantive absence

First, it is worth noting that many articles on small-scale fisheries simply fail to define what they are. Small-scale fisheries are a self-evident starting point or integral component of many analyses, without any space or specificity devoted to defining the term. We interpret these absences as powerful and substantive rather than as irrelevant. Thus, the *lack* of a substantive definition is the first dominant characteristic, or ironically, definition of small-scale fisheries we identified.

Technology; boats, engines and fishing gear

The most consistent pattern we observed across the definitions was the reliance on technology to describe small-scale fisheries. Technological definitions included both qualitative and quantitative accounts of boats, engines, and fishing gear. Descriptive characteristics stressed included small-scale fisheries low level of technical capacity, inefficiency, and their traditional or ancient nature. Additionally, fixed thresholds were placed on the geometry, power, and capacity of such technologies.

Small-scale boats were often defined by their material construction, features, capacity and length. Traditional craft made from natural materials and local, longstanding techniques were frequently referenced. In a case study of Chilean waters, small-scale fisheries were contrasted with industrial activities based on the material and features of the boats: "small-scale coastal fishermen use a variety of wooden vessels with or without a deck" (Bernal et al. 1999). In this case the material construction of the boat, described as locally sourced and crafted, separated small-scale fishing from industrial activities. The author proceeded to describe small-scale fishing, along with other artisanal activities including mining and agriculture, as, "ancient social and economic practices," thereby placing these activities as temporally distant from the present. Implicitly, such

traditional practices are contrasted against the benchmark of modern, industrial practices. In many cases, small-scale boats were not explicitly limited to traditional materials or techniques. In Yemen small-scale boats include wooden boats but also boats that "are increasingly made of fiberglass…with a length of 6-15 meters and small outboard motors, carry a crew of 2-4 people and embark on single-day fishing trips" (Wagenaar and D'Haese 2007). As this example demonstrates, where modern boats are included in the definition, additional limits are often placed on small-scale fisheries' technical capacity, including boat length, crew capacity, engines, and trip duration.

Most small-scale fishing vessels, regardless of material construction, were defined by their size, capacity and length. In several cases boats were simply defined as 'small' without any indication of what that meant, why it was meaningful, or relative to what they were 'small'. In some cases, small-scale fisheries were defined through vague, relational terms. For example, in Brazil, "the small-scale or artisanal fishermen are distinguished from commercial or big-scale fishermen" (Santos and Rabanal 1988). Where the descriptor 'small' was elaborated upon it was usually coupled with fixed metrics, thus defining small-scale boats by specific, static thresholds (typically ranging from 5-30 meters). Higher thresholds on boat length (from 20-30 meters) were associated with more developed contexts. For example, in Scotland's 800-person community of Burra Isle, small-scale fishing is a "native industry on the island, the boats of 20 to 25 meters in length" (Byron 1988). Wherever the threshold was located, vessel length was usually portrayed as definitive and static in time and space rather than potentially arbitrary, error-prone, conditional or momentary. Additional fixed limits were commonly placed on boats' spatial or temporal range. In Brazil's shark fishery, "the distinction of industrial fisheries from artisanal is not clearly defined but it generally relates to the capacity of the vessels to operate at sea for extended periods" (Walker 1998). In the shark fishery of Trinidad and Tobago, "the artisanal fishery is characterized by the vessel being <10 m in length and tending to operate within 1 day's travelling distance form port" (Anon 1990). These examples demonstrates how temporal and spatial limits were often coupled and linked to technology. When spatial limits were discussed in isolation, the distinction was usually made between inshore zones—the terrain of small-scale fisheries—and offshore areas.

Typically, the defining characteristics of small-scale boats were discussed in combination with mobility. In many parts of the world, small-scale fisheries were depicted as having limited mobility and being reliant on traditional, non-mechanized methods. In Kerala, India, small-scale fisheries were defined as, "oar or wind-propelled craft made entirely of wood" (Platteau 1984). But, increasingly, outboard or built-in engines are available and incorporated in small-scale fisheries, and this dichotomy between non-mechanized and mechanized boats is a less useful defining trait. In a broad characterization of African small-scale fisheries, this shift was observed in the comment that "sail or oar-powered vessels are commonly used in the artisanal fishery yet recently, fishers have been investing in outboard engines and larger vessels even in the poorest countries" (Kroese and Sauer 1998). Beyond the mechanized/non-mechanized dichotomy, other aspects of engine capacity were differentiated, such as fuel-type, inboard vs. outboard engines, and horsepower. Overall, small-scale fisheries were often defined by fixed upper limits on engine type and horsepower and their limited mobility.

Finally, technological definitions focused on the fishing gear itself, identifying low-technology 'traditional' gear as decisively small-scale. These definitions encompass a range of passive, hand-operated gear types including hand lines, set nets, and benthic traps. Again, small-

scale fishing gear was coded as traditional, in contradistinction to highly efficient, technologically advanced or introduced gear types, including trawlers and gill nets. Small-scale fishing technologies were consistently labeled as 'low-yield', 'simple', 'unchanging', and 'inefficient'. Definitions based on gear were usually coupled with other technological limits, such as in the Pacific coast of Panama, where "traditionally the small-scale fisheries of the region have been based on relatively simple fishing technologies. Dugout canoes ranging from 15 to 30 feet in length are still used. Cast nets, beach seines, hooks and lines and weirs are the traditional capture equipment" (Bort 1987).

Whether leveraged in combination or isolation, definitions that rely on technological criteria consistently stressed small-scale fisheries' low-technological capacity and fixed limits through the use of descriptive tropes. Defining small-scale fisheries through the lens of technology locates small-scale fisheries in the past. This temporal distancing produced two different images: small-scale fisheries as backwards and inefficient, or romanticized as ecologically and socially harmonious. Either way, technological definitions produced a limited optic through which these complex practices are viewed.

Other defining criteria and indirect connections to technology

In addition to technology, we identified several other common characteristics used to define small-scale fisheries, including restrictions on capital, on labor, and on where fish are landed and sold. While some definitions used these traits independent from technology, in most cases these criteria are used either in combination with technological traits or are indirectly related to technological limits. Without reviewing all the 'other' traits here, we touch on a few examples.

Capital restrictions were used to separate small-scale fisheries from enterprises with greater capital investments. Capital limits were often linked to technological limits, where the "level of investment in each fishing unit is small with a correspondingly low level of technology" (Berkes and Kislalioglu 1989). Small-scale fisheries were also defined as methods with low labor demands and capacity. Several studies defined small-scale fisheries as solitary endeavors, or as collaborations of only a few people (typically 2-5), limited by either the demands of the particular fishing method and or the capacity of the boat. Fishing methods with low labor demands were consistency stressed as 'low-yield' and 'inefficient'. Third, small-scale fisheries were occasionally defined by the immediate landing and processing destination of the catch. In some cases, small-scale fisheries were coded as boats that landed fish in local ports and sold fish to local markets, patrons or processors. Additionally, small-scale catch is often destined in whole or in part for subsistence consumption or redistribution rather than for sale (Walker 1998).

The dominant definition

These recurring characteristics are not exhaustive, but they characterize the most common traits used to define small-scale fisheries. While in some cases single characteristics (like boat length) were used to classify small-scale fisheries, in most cases multiple criteria were deployed. Drawing on multiple characteristics allows for greater specificity in defining what a small-scale fishery is. This analysis does not consider the specific combinations that are possible but instead focuses on technological definitions because they dominated throughout the literature. While the subsequent analysis focuses on technological definitions, we argue that most of the assumptions

and effects we discuss in the following sections apply to the other defining characteristics (e.g. limits on capital, labor, markets), including possible combinations among them.

4. Seeing like a scientist: small-scale fisheries and power/knowledge

"There is nothing determined or automatic about the process [of hegemony]. Even when successful, it does not impose an all-embracing view of life: rather it imposes blinkers, which inhibit vision in certain directions while leaving it clear in others." Thompson (1978)

Scientific observation, like centralized management, relies on reduction, abstraction and simplification so that certain features of reality are brought into sharp focus. Human social and ecological systems are interrelated and inherently complex, characterized by a great number and variety of elements, interactions and relatings (Dryzek 2013, 8). In contrast to their complexity, our knowledge about these systems is always limited to some extent by our own perceptive capacity (Rose 1994). While perception is always reductive to some degree, Scott describes how "certain forms of knowledge and control *require* just such a narrowing of vision" (Scott 1998, 11). In *Seeing like a State* (1998), Scott uses the examples of scientific forest management and land tenure reform (among others) to describe how the state's desire for a high degree of schematic knowledge and control over these systems required a reductive and selective filter. Focusing on a few elements of these systems—such as single species monocultures and standing wood biomass—eased measurement, control and manipulation of complex socio-natural landscapes that were illegible to outsiders. Leveraging Scott's metaphor of vision, we explore how the focus on technology in the dominant definition of small-scale fisheries similarly reduces their complexity to a few legible elements: boats, engines and fishing gear.

Understanding small-scale fisheries exclusively through the optic of technology creates a shared means of comprehension in the scientific literature; a stable discourse. Discourses are bound up with power as they construct meaning and define what constitutes "common sense" or "legitimate knowledge" (Dryzek 2013, 9). While multiple, competing discourses co-exist at any time, some predominate as they are endorsed and evoked across knowledge realms. The ability of a discourse and its proponents to advance one perception and its value, over another, is an expression of power (Foucault 1980, Dryzek 2013). For Foucault, these are so inextricably linked that he proposed the term 'power/knowledge' to signify that power is constituted, performed and diffused through accepted forms of knowledge (and vice versa) (Foucault 1980). We argue that the construction, repetition and stabilization of the technological definition of small-scale fisheries is also an expression of power/knowledge. The stable and narrow emphasis on technology is advanced at the expense of an expansive view of the complex interrelationships and elements which co-produce small-scale fisheries.

Ideas about what small-scale fisheries are do not exist merely as ideas of the mind. Scientific beliefs and ideas become accepted stories that "have material forces that have a direct impact on the world in which we live and which we struggle to change" (Goldman 2005, 33). The reductive emphasis on technology tells a certain story about what small-scale fisheries are, at the exclusion of others. Returning to Haraway's words—it matters which stories tell stories—I explore how the discourse of technological limits in the dominant definition encodes multiple productive

assumptions and reductions, positioning the narrative of small-scale fisheries within broader discourses of modernization. In doing so, we discuss a combination of political-economic and ecological forces at work in small-scale fisheries which are excluded from the dominant narrative of technological limits. With the technological terms of reference set, the dominant definition does not invite analysis or acknowledgement of the intricate, variable and shifting relations which co-constitute small-scale fisheries; they are out of view. "In this way knowledges are selectively isolated into a larger truth regime," and as they are repeated through authoritative channels of science, policy and the media, they become more 'true' (Foucault, Rabinov, and Hurley 1994). We argue that the selective focus on technology and repetition across the scientific literature achieves a stable truth regime, or hegemony, that controls and dominates the scientific narrative of small-scale fisheries. The hegemonic definition performs an ontological reduction, shrinking the existence, constitution and practice of small-scale fisheries to certain knowable traits. These omissions are not inconsequential because authoritative definitions of small-scale fisheries produce "knowledge [that can] change the world, not merely represent it" (Castree and Gregory 2008). Yet, "rather than ask whether these categories are true or false we must ask what it is that produces them and what they serve to produce" (Harvey 2010).

Rather than abandoning problematic concepts, we can "start where we are", opening up common-sense categories and revealing their limits in order to transform them (Gibson-Graham 1997, xxi). It is in this spirit that we lay out the conceptual difficulties and productive effects of the dominant technological definition of small-scale fisheries in the following sections.

4.1 Reduction of 'other' technologies

Even within the realm of technology, multiple axes of reduction are performed by the dominant definition's emphasis on boats, engines and fishing gear. In Marxist political economy, such technologies constitute the *instruments of production*, mobilized in a specific labor-process; they are the tools and machinery which enable production (Marx 1967). Yet fishing as a productive process is constituted through a combination of material forces, including: human labor, the means of labor (including technology), and the subject of labor (the resource base) (Marx 1967). These intersectional forces, which co-produce small-scale fisheries, are excluded from the story.

First, the role of infrastructure and supporting technologies that enable fishing are left out of the dominant definition. Boats, engines and fishing gear constitute the machinery and tools directly implicated in catching a fish. Yet the technological means of production in any productive process includes other supporting technologies and infrastructure (Marx 1967). Aside from boats, engines and fishing gear—the instruments of production—many other forms of infrastructure and technology support fishing and post-harvest processing. Hard infrastructure and technologies such as ports, markets, roads, transportation, fish storage and processing technologies are vital to fishing. The multiple technologies enrolled in small-scale fishing are reduced to capture technologies at the expense of even an inclusive technological definition; both pre- and post-harvest technologies and infrastructure are excluded. These 'other' technologies are largely land-based whereas the dominant definition signifies the technologies predominantly used to capture fish at sea.

Even within the instruments of production, emphasis on technologies associated with particular types of fishing activity can be reductive. Defining small-scale fisheries through boats,

engines and certain fishing gear embeds a bias towards fishing at sea. This reduction largely ignores the wide range of fishing that occurs from shore, in riverine systems, in intertidal zones, in mangroves and estuaries, on sandbars, and on reef-tops. These activities are often referred to as gleaning, gathering or collecting—activities other than 'fishing' (Pálsson 1989, Kleiber, Harris, and Vincent 2015). Simultaneously, these 'other' activities comprise a large proportion of seafood produced through small-scale fisheries, yet their technologies (as well as labor and resource base as described in the following sections) are largely excluded by the dominant definition. Therefore, even within the technological emphasis on the instruments of production, the dominant definition advantages *certain* kinds of fishing technologies and practices over others, at the expense of an inclusive depiction of small-scale fisheries.

4.2 Reduction of labor (and nature)

Technological definitions of small-scale fisheries further exclude the intersectional forces of labor and the natural resource base that together constitute the means of production in small-scale fisheries. This imbalance reduces the juncture of these forces to technology, obscuring the intersectional roles of labor and material nature that relationally produce small-scale fisheries. The technologies of capture—boats, engines, fishing gear—are inert objects without being worked upon and mobilized through labor.

Fishing entails highly taxing and variable physical labor, inscribed with rhythm and flux, performed within the contours of diverse and often unpredictable environments (Pálsson 1989, Smith 1988). The physical demands of fishing are often cited as a source of pride among fishers, who express satisfaction and dignity in the "hard work" of fishing (Kaplan 1988). While the labor of fishing is often demanding, it is also diverse. Small-scale fishing practices are so varied and contextual that no succinct description of the requisite kinds of physical labor can be attempted in full here. However, returning to the three examples we offered in the introduction—octopus fishing, groundfish trawling, and reservoir fishing—one can envision the diverse corporeal intimacies and dexterity required. Each of these fisheries relies on specialized labor and embodied knowledge to draw a corralled octopus from a den, to trawl groundfish from the seafloor, or to net tilapia from a man-made lake. The specific physical labor required by each are inherently shaped by the structure, visibility and flow of the natural environment and the agency of the species. The technologies of capture in each case—a hooked pole, a bottom trawler, and a cast net, respectively—are selected, produced, and worked upon in response to the intersectional forces of human and more-than-human nature. In each case the technology is not useful without the specific, tacit knowledge—the knowledge which cannot be fully codified—and the labor performed (Polanyi 1966). Telling the story of each of these small-scale fisheries solely through the lens of capture technologies creates a passive and incomplete view of the relational forces that co-produce these fisheries. Yet this is exactly the effect produced through the dominant definition: a highly selective picture of fishing-as-technology, isolated from any relational forces, movement or performativity.

In addition to the direct labor of catching fish, small-scale fisheries require a range of labor in preparation and post-harvest processing. In this way, fishing is hardly a solitary effort; a plurality of interdependent labor is required. Pálsson (2015) metaphorically describes the interconnectivity of labor as an ongoing conversation, "involving a whole community of actors—both at sea and ashore—in which the agency of each is continually constituted in relation to the others". Isolating

the labor of fishing from these interconnections reifies the individual over the collective. This may appear justified since human labor:

> "–in fishing or doing fieldwork (or anything else, for that matter)—are indeed individual in the sense that they are properties of the body, dispositions of the habitus. However, to isolate their acquisition and application from everything outside the boundaries of their soma is to subscribe to a normative theory of learning and a natural conception of the individual. An alternative approach recognizes the sociality of the individual being and the situated nature of human activities. If, as Bakhtin has argued, every word in conversation is half someone else's, every fish that gets caught is partly that of others" (Pálsson 2015).

Drawing on Bakhtin's notion of dialogism—fishing is not a one-way conversation but an ongoing dialogue of mutually constituted effort already embedded in a cultural, political and corporeal history (Bakhtin 2010, Pálsson 2015). Therefore, isolating any one moment of labor from the interconnected work of fishing—such as the direct labor of catching fish—is to hear (or see) only *part* of the corporeal story of small-scale fisheries. Yet this isolated, individualistic story is the most common one communicated by the dominant definition: the discrete fisher at sea, disconnected from the efforts of others. The individualization of labor and skill in fishing—with particular emphasis on labor at sea—fits within the broader discourse of the competitive fisher as the rational actor engaged in the race to fish, trapped in the tragedy of the commons (St Martin 2001, Dryzek 2013).

This partial story further encodes a gendered bias in the definition of small-scale fisheries: while "fishing is not solely undertaken by men, and cannot simply be defined in terms of people on boats"(Reed and Christie 2008, Shannon 2006), this is precisely the story that is communicated through the technological definition. Small-scale "fisheries" are reduced to "fishing" at sea (FAO 2016), occluding the range of fishing activities and labor that occur on land or near-shore areas and are often performed by women. The role of women in fishing and the gendered divisions of labor, environmental knowledge, access and control over resources are not well understood in small-scale fisheries, as in many realms of the environment (Reed and Christie 2008). Yet feminist development studies have consistently demonstrated that "human-environmental interactions and processes are *gendered*, meaning men and women experience the environment differently and often have different access to and control over ecological systems" (Robbins 2011, 63). What research exists indicates that women constitute a large share of the labor force in small-scale fishing globally, but predominantly work in shore-side efforts such as preparation, accounting, managing, financing, fish processing, trading, and marketing (Weeratunge, Snyder, and Sze 2010, Thorpe et al. 2014, Odotei 1992). Others assert that nearly half the world's small-scale fishers are actually women (Béné et al. 2009), but because their efforts are often concentrated in the intertidal and shallow water zones, they are labeled as collection and gleaning: activities 'other' than fishing (Pálsson 1989). Unchallenged definitions and embedded assumptions of whose labor counts in small-scale fisheries shape data collection and sampling procedures, resulting in a gendered data deficiency (Kleiber, Harris, and Vincent 2015). If women perform much of the labor in support of fishing—and perhaps even half of the direct labor of fishing—why aren't their efforts measured,

accounted for, and represented in the production of scientific data and knowledge? The dominant definition offers insight; men's labor in fishing is more likely to be 'read' as relevant and internal to small-scale fishing, whereas women's labor is coded as external 'help' (Kleiber, Harris, and Vincent 2015). Together the gendered data-deficiency and the very definition of small-scale fisheries are shaped by the structural hierarchy that so often centers the efforts, priorities and vision of more powerful groups while marginalizing others.

Beyond how or whether the gendered data gap weakens fisheries science, this knowledge feeds into policy, with material effects for women's lives as "the policy implications of such [gender biased] studies lead to persistent misunderstandings of the way in which women are located in multiple social, economic, and cultural structures" (Porter 2012). Therefore, the point is not merely to count women, but to fundamentally change how we see small-scale fisheries through a gender lens (Williams 2008). The discursive invisibility of women's labor in the sector contributes to tenure insecurity and marginalization where policy and regulatory environments fail to secure women's access to fisheries resources (Weeratunge, Snyder, and Sze 2010, Sharma 2003). Scientific efforts need to move beyond merely 'tacking on' gender—the 'add women and stir' formula (Porter 2012, Ann 1972, Williams 2008). But by adding a 'gender lens' we can change much more than the way we collect data on small-scale fisheries: "recognizing that if we change the perspective, we change what we look at, how we interpret it and how we address the issues it raises" (Porter 2012).

4.3 Reduction of nature (and agency)

In contrast to labor, Marx's third productive force—the material resource base—is often included in definitions of small-scale fisheries. However, the variety of more-than-human natures encountered in and constitutive of small-scale fisheries are often reduced to a few 'target species'. The language of target species and taxa reduces nature to natural resources; products to be harvested and transformed into commodities for human use rather than active subjects with agency (Callicott 2003, 245). Target species are typically presented as an external object and objective of a small-scale fishery rather than as internal forces relationally shaping the fishing process through their entanglements with labor, technology, and the wider environment.

Yet, many small-scale fisheries are not selective and catch a range of fish species which are often sold, redistributed, kept for bait, or consumed rather than discarded. While some small-scale fisheries are highly selective and able to effectively target desired species, many are ultimately multi-species operations. Even when small-scale fisheries may be more accurately described as multi-species (and many are described this way), evading the problem of fixing the target species, these definitions typically still fall short of an intersectional, dialectic understanding of small-scale fisheries as entangled processes co-constituted through human and more-than human natures. Yet, outside of our social constructions and categorizations of these practices, "there is no set stock of 'natural' resources on one side and a community of human, economic agents on the other, but a dynamic, widely distributed mesh of social and natural, material and immaterial resources that are co-produced and circulate among those who participate in the making of the commons" (Bresnihan 2016, 22-23). The active role of nature in the more-than-human commons that constitute small-scale fisheries is left outside the field of view, ignored by the dominant definition that fixes upon stable categories of target species. Focusing on targets species makes small-scale fisheries amenable to the tools of fisheries science; bioeconomic modelling, stock assessments and

management. Yet, even as we attempt to 'fix' these material natures as knowable, measurable objects of study—like technology—they simultaneously elude these representations. Marine animals are mobile, difficult to detect, and actively evade both human capture and simple definition.

4.4 Reduction of social relations (and alternative economies)

As an entangled, more-than-human-commons with productive force, small-scale fishing is an inherently social and economic process. Small-scale fishing is constituted through the active, varied and joint forces of labor, technologies, and nature that shape and are shaped by social relations. Any analysis of a productive activity—whether small-scale extraction from a commons or from a factory—should consider the constellation of social processes entailed and their broader social context (Massey 1995, 15). Small-scale fisheries are actualized through the inherently social and political dynamics of organizing labor, maintaining access to resources, managing use, and distributing surplus—all of which require forms of collective action (Gibson-Graham, Roelvink, and St. Martin 2015). Yet the technological definition does not include meaningful representation of the dynamic and situated social relations that constitute small-scale fisheries.

Rather than inclusion, the dominant definition's emphasis on technology disembeds small-scale fishing from all social relations (Giddens 2013). Yet, social relations are interwoven with how we "govern how objects, food, and goods are made, harvested and assembled" (Robbins 2011, 54). Small-scale fisheries necessitate multiple, organized relationships, whether among fishers, processors, marketers, households, kin-groups, gender, class, religions, communities, or local economies. These relationships form the basis of collective action in small-scale fisheries along multiple dimensions, including negotiations of self-governance and economic practices which shape the production, appropriation and distribution of surplus value to a variety of ends (Gibson-Graham 1997). Yet, when social relations in small-scale fisheries are represented, they are often portrayed as 'traditional' or fixed in structural forms; either marginalized and exterior to capital relations or interior and subsumed by capitalist hegemony. These social relationships cannot be conceptualized as a predetermined organic whole (e.g. the individual or fisher or the community) with a fixed and stable identity (e.g. capitalist or noncapitalist producers). Social relations in small-scale fisheries do not adhere to or fit neatly within any strict binary of capitalist or non-capitalist economic space, as "the economy is not fixed, bounded and unified in space and time with a capitalist identity" (Gibson-Graham 1997). The social-economic space of small-scale fisheries differs through space and time, yet the social diversity of small-scale fisheries are largely invisible within the realm of fisheries science (St Martin 2001).

The technological precision of the dominant definition cuts through the connective fabric of social relations—disembedding small-scale fishing from its social, political-economic context. Disembedding achieves a useful separation of selected elements and practices from their complexity and context, which in turn enables greater abstraction, alienation and fragmentation (Giddens 2013, 12). Freed from the embedded restraints of social particularities, the observation, measurement and management of small-scale fisheries appear asocial, apolitical and unproblematic. These productive effects fit within the broader pattern and trajectory of globalization, where the increasingly abstract character of communication and objects obscures their origins (Eriksen 2014). This obstruction—or disembedding—eases the translation, transferability and widespread applicability of abstract definitions of small-scale fisheries,

unencumbered by their particular social relations. Reducing small-scale fisheries to technology creates a legible and tractable point of contact, connecting the story of small-scale fishing to wider discourses of modernization.

5. Performative effects of reduction; Small-scale fisheries as not-quite modern

Modernism marks both a time period—the modern era—and a set of beliefs in scientific rationality and linear technical progress (Giddens 2013, Marshall 2012, 21). Modernism brought uneven but widespread changes in social institutions, cultural norms, attitudes, and practice—including the ontological embrace of objectivism rooted in the certainty of systematic observation and its ability to describe the world from the outside (Marshall 2012). Through isolating parts of a wider system, the essential elements could be accurately defined through uniform modes of observation and measurement. The unity and dominance of these ontological and epistemological beliefs—the scientific method—still dominate natural and social sciences as well as the administration and practices of many institutions (Marshall 2012, Scott 1998, Giddens 2013).

Scientific observation and measurement of small-scale fisheries first requires a definition: highlighting some elements for further study while reducing others. The definition provides the perceptual guide to decode the messiness of a complex system, discerning essential from nonessential elements. In this way, the technological definition of small-scale fisheries serves as a metrological device—delineating which factors among their complexity merit observation and measurement (Campbell, Hagerman, and Gray 2014). Metrological practices set measurement standards, criteria, targets and thresholds (Campbell, Hagerman, and Gray 2014, Barry and Slater 2002, 181). Yet, defining what warrants measurement is not an impartial reflection of reality "as it is," but serves to "create new realities (calculable objects)" (Campbell, Hagerman, and Gray 2014). Boats, engines and fishing gear become the calculable objects of small-scale fisheries, serving as uniform, scalable dimensions that are "empty" of space and time (Giddens 2013). Attending to technology as the calculable objects of small-scale fisheries distances them from space and time by dismembedding them from social relations, connections to place and history (Giddens 2013). This separation allows for the unproblematic ordering and reordering of relationships by depoliticizing their measurement, management and policy prescriptions and simultaneously positions them as development subjects.

For example, Berkes and Kislalioglu (1989) define small-scale fisheries through this optic of development: "small-scale fisheries are those in which capital and energy inputs are relatively small, and both yield and incomes relatively low. This definition also serves to highlight those features of small-scale fisheries which have made them the subject of development focus" (Berkes and Kislalioglu 1989). In this instance, the authors directly align their definition of small-scale fisheries with the development agenda, explicitly spelling out what is more often subtly insinuated. They go on to describe how small-scale fisheries became increasingly attractive to development over time: "especially since the 1950s, much effort has gone into increasing capital and energy inputs to improve yields and income through such means as mechanization. However, it is probably accurate to say that many resource development planners have traditionally had disdain for small-scale fisheries, regarding them as too trifling to bother with for major development focus" (Berkes and Kislalioglu 1989).

This example elucidates how the reductive emphasis on technology in the dominant definition locates small-scale fisheries within the wider discourse of modernization; they are not quite modern—based on low-levels of technology—and hence amenable to modernization and development. Fixing small-scale fishing to static, low-levels of technology achieves not just a separation from industrial fishing but a temporal distancing; small-scale fishing *is* the past. Simultaneously, small-scale fisheries—as rudimentary, backward practices—are prime subjects for Western-style development. In this discursive state of underdevelopment, small-scale fisheries during this time period (pre 1990) were prime territory for development along an assumed unilinear hierarchy of progress (Gibson-Graham 1997). Several articles evoke the simultaneous "problem" and "opportunity" posed by small-scale fisheries in their titles: "Problems of fishing development in primitive communities" (Shetty 1965), and "New directions in developing small-scale fisheries" (Lawson 1977).

From the 1950s through the 1980s, the "problem" woven into the narrative of small-scale fisheries was their under-utilization (Basurto et al. 2017). As interest in and attention to small-scale fishing increased in the scientific literature in the 1980s and 1990s, it was frequently framed as an untapped opportunity for economic development (Basurto et al. 2017). Many articles in the database prior to 1990 describe programs—funded by governments or multi-lateral organizations—designed to develop small-scale fisheries through subsidies and programs providing better boats, engines and fishing gear (Basurto et al. 2017). These programs were often "imposed as a package of entirely alien innovations" with little consideration of their appropriateness within the existing local context (Lawson 1977). However, after several high-profile cases of fisheries' collapse in the 1990s raised concerns about the impending natural resource crisis fisheries faced, the narrative shifted to controlling, restricting and managing fishing technologies (Basurto et al. 2017). Therefore, while the arc of the narrative identifying the 'problems' and 'solutions' of small-scale fisheries pivoted, the focus on technology persisted.

Developing small-scale fisheries is not inherently a good or a bad thing; "we should not always assume it's [developments] success or failure without first looking at how hegemony gets constituted" (Goldman 2005, 24). The definition of small-scale fisheries is simply one discursive site where the hegemony of development finds traction; the story lines connected through a shared focus on technology and unilinear progress. The outcomes of these development efforts are surely mixed, with multiple, often complicated effects. In some cases, development can be beneficial to small-scale fishers, providing them with access to needed technology. Many don't see a problem with development *per se*, but in how these development initiatives integrate with local processes, incorporate fishers' perspectives, and interface with their environment and national context (Andrew et al. 2007).

Regardless of their outcome, definitions which read small-scale fisheries through the lens of technological limits deny the situated nature of these practices, their social and ecological significance, and their potential for change and adaptation. Western paradigms of science, centralized government, and development have repeatedly read the productive practices of local, indigenous or traditional peoples as part of the past—defined by static, low-levels of technology (Goldman 2005, Scott 1998). Rather than defining small-scale fishing and production practices by their technologies—fixed and unchanging without outside development intervention—we could see these practices as part of wider constructs of identity, connections to place, and social relations

performed and forged through local agency, and, often times, partially constrained by inequitable structural forces (Bebbington 1993). Instead, defining small-scale fisheries through the metrological optic of technology plays into modernist tropes about traditional, small-scale practices as 'other'.

6. Other Ways of Seeing Small-Scale Fisheries

While the hegemonic definition continues to shape the trajectory of small-scale fisheries' development, many alternative stories and possibilities exist. The act of defining is always an assertion of power/knowledge, but its effects cut both ways. Foucault reminds us that power is not inherently negative; it is merely productive, producing domains of knowledge and stories about what elements count (Gaventa 2003). In *Seeing like a State*, Scott acknowledges this space of possibility: "We must keep in mind not only the capacity of (state and scientific) simplifications to transform the world but also the capacity of society to modify, subvert, block, and even overturn the categories imposed upon it" (Scott 1998, 49). The apparent limits imposed by discursive and material hegemony can be encountered as challenges, positively charged, rather than structural limits (Gibson-Graham 1997). Countering the dominant representations of small-scale fisheries challenges the constitution and performance of hegemony; breaking open the bounded category and clearing discursive space for alternative visions. These alternatives can, "pry open the ossified views of economic subjects and sectors and allow for new conversations about sustainable resource use, rights and community economic development" (Gibson-Graham 2008). In this sense, there are other ways of seeing and defining small-scale fisheries, and therefore, also other stories to be told. One alternative view of small-scale fisheries gaining substantial international traction is the human-rights framework (Allison et al. 2012) encapsulated within the United Nation's Food and Agriculture Organization's (FAO) Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Reduction (SSF-Guidelines). The human-rights based framework calls attention to the wider structural, political-economic and social forces that shape the opportunities and experience of fisher folk around the world (Allison et al. 2012). Rather than focusing the discussion of the challenges and threats to fishing through the limited conception of economic incentives and narratives of ecological crisis, this framework attends to small-scale fishing as a complex issue that is centrally social. Drawing on the existing legal framework of the Universal Declaration of Human Rights, this approach sees small-scale fisheries as constituted through interwoven economic, social and political rights (Allison et al. 2012). As opposed to the 'rights-based' approaches promoted by the World Bank, which are concerned centrally with economic efficiency and property rights, the human-rights based approach provides a wider optic and a more inclusive representation of the complex forces and central issues that constitute and concern small-scale fishers. Including a broader conception of rights in the definition of small-scale fisheries opens avenues to address issues of "poverty and marginalization experienced in many small-scale fishing communities [which] amounts to a violation of people's social, economic and cultural rights and sometimes their civic and political rights" (Allison et al. 2012).

The SSF-guidelines incorporates the language of human rights while widening the definition of small-scale fisheries beyond narrow technological limits. The SSF-guidelines define small-scale fisheries as encompassing inland and marine fisheries activities along the value-chain, "pre-harvest,

harvest and post-harvest—undertaken by men and women which play an important role in food security and nutrition, poverty eradication, equitable development and sustainable resource utilization" (FAO 2015, ix). This definition acknowledges the plural and gendered labor that constitutes the labor of small-scale fishing within a social, economic and political fabric. Inevitably, this framework still includes certain elements of small-scale fisheries at the exclusion of others. The environment is largely presented as a threat or crisis to be addressed (e.g. climate change and natural disasters) through the care and one-way agency of humans, rather than non-human natures as dynamically co-constituting small-scale fishing practices and dilemmas. Others have criticized the human rights framework as part of neoliberal discourse and unassailing faith in the liberatory power of individual and market freedoms (Ruddle and Davis 2013). However, as a counter-narrative to the technological definition, the human rights framework and the SSF-guidelines together offer one alternative view and understanding of small-scale fisheries with potentially radical possibilities.

7. Conclusion: Telling other stories makes other worlds possible in troubling times

In *The Politics of the Earth*, Dryzek lays out why environmental discourses matter: language shapes our perception of reality and therefore, also, "the way we construct, interpret, discuss and analyze environmental problems [which] has all kinds of consequences" (Dryzek 2013, 10). Social and environmental representations are performative in the sense that they are "implicated in making the worlds they ostensibly represent" (Gibson-Graham 1997, xxxix). Defining small-scale fisheries conditions how we perceive their existence, with real material and political effects. Scientists, governments, and development agencies draw on this authoritative knowledge, shaping policies which in turn shape access to resources (Ribot and Peluso 2003). Therefore, as definitions become stories, are repeated, and stabilize, they become environmental orthodoxies that contour the scope of possible solutions we imagine and implement to manage small-scale fisheries (Dryzek 2013).

While many different definitions of small-scale fisheries exist, this research demonstrates that throughout the last half-century, the scientific discourse reveals a stable pattern relying on certain elements of technology to define small-scale fisheries. The dominant definition focuses on certain elements of technology while reducing the intersectional forces of other land-based technologies, labor, and nature. Notably, this limited emphasis on technologies of fishing at sea excludes processes and labor on land, imparting a gendered bias in the definition and reifying the land-sea divide. The stability of the technological definition constructs small-scale fisheries as a particular technological-environmental problem, dis-embedding these practices from their entanglements with the social, political-economic, and environmental assemblages which shape them. This positions small-scale fisheries, both within and outside of the scientific realm, as a techno-environmental problem encountered by the established industrial political-economy, requiring action (Dryzek 2013). The direction of the narrative line drawn between the 'problem' and the 'solution' in small-scale fisheries has shifted over time but often revolves around property rights. Many interventions involve restructuring rights including access, management and control over fishing technology, effort, and resources. Within the focus on property rights the underlying logic has shifted over time from an emphasis on centralized management to market-based solutions in fisheries reform (Mansfield 2004). Despite these differences, both management approaches envision solutions to fisheries management through different forms of administrative

rationalization—whether top-down management or market-based restructuring—emphasizing the role of the outside expert in problem solving (Dryzek 2013). Operating from particular understandings of what small-scale fisheries are, "fisheries science and the management it informs propose solutions to fisheries crisis that are limited by their initial assumptions and are often dissonant with fishers' perceptions of the resource and their desires for management" (St Martin 2001).

In the various iterations of "the problem" and "the solution" in small-scale fisheries, little attention is paid to how these narratives are enabled or constrained by how the subject of study is first defined. In fact, many recommendations are espoused without even clearly defining what a small-scale fishery is, because their constitution is assumed to be a matter of common-sense. To the extent that the dominant definition is responsible, it is worth 'staying with the trouble' to reveal the technological definition's constitution as hegemony and its productive effects. Through the foregoing analysis, we attended to the many elements excluded by the technological definition—including other technologies, labor, and nature. We draw attention to these often "invisible" elements, not to add them to a wider list of disconnected mechanisms, but to draw attention to their "thick" interdependent relations (Bresnihan 2016, 23). This multiplicity and interdependency—so often read as chaotic, illegible, and problematic—is what constitutes small-scale fishing as a dynamic and performative practice, supporting diverse economies (Gibson-Graham, Roelvink, and St. Martin 2015). The often "invisible" and small-scale forms of commoning constitute different subjectivities, values and knowledge—to some extent always social and collective, even if not outside of the wider capitalist relations of production (Bresnihan 2016, 23).

Interwoven with the many elements reduced and excluded from the technological definition we have offered other possible ways of seeing small-scale fisheries: as relationally shaped assemblages, as more-than-human commons, as human-rights, as gendered, as a sector of interconnected labor spanning across land and sea. Within these alternative stories lies the power to reimagine what small-scale fisheries are, and therefore, the potential scope of problems and solutions. By drawing attention to the relational forces, connectivity, messiness, and interdependencies which co-produce small-scale fisheries, they may appear illegible—difficult to pin down. Yet, "illegibility remains a reliable resource for political economy" (Scott 1998, 54). The complexity of small-scale fisheries might better be read as a part of their resilience and historical persistence, rather than as a problem to be rationalized and fixed.

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