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I DO NOT KNOW MUCH ABOUT HISTORY: OCEANOGRAPHERS, ANTHROPOLOGISTS, HISTORIANS AND THE VANISHING FISH

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Abstract: This paper presents a critical analysis of the fundamental tenets of Daniel Pauly's book *Vanishing Fish: Shifting Baselines and the Future of Global Fisheries* (2019). The book covers a long history of research and hypotheses on the development of global fisheries, paying attention to what he calls the "toxic triad,"—the process of geographical, bathymetric, and taxonomic expansion of fishers' firms, from small-scale to industrial fleets. At the core of the analysis is a plea for the engagement of oceanographers in historical ecology as the key methodological tool to understand present-day fisheries. Pauly argues that social sciences are an important ally in fisheries sciences, but the effort of these disciplines falls short by avoiding certain important topics, emphasizing in community (ethnographic) studies and not providing information on the fishers' catch, which is critical for management and conservation. This paper refutes his argument and contextualizes the role of ecological history and the social sciences in fisheries sciences, without minimizing the importance of Pauly's contribution to the field.

Keywords: Fisheries; Ecological History; Toxic Triad; Shifting Baselines; World-Ecology; Ecosystem-Based Fisheries Management

AN EPISTEMOLOGICAL BASELINE

Vanishing Fish: Shifting Baselines and the Future of Global Fisheries is the most recent book by fisheries scientist Daniel Pauly (2019), one that synthesizes most of his scientific and management concerns. The book also presents most of his qualms related to the status of the global fisheries and the myriad of institutional and epistemological hurdles that fishery science has faced over the last 40 years. *Vanishing Fish* is well documented with 702 endnotes. Armed with references to papers and books on the sciences and disciplines involved in the analysis of ecosystems, fisheries, and biodiversity, Pauly engages in a succinct but precise critique of hypotheses, theories, research, and management practices on a global scale, due to his long-standing relation with international agencies and programs looking at the ocean as a source of foodstuffs and commodities.

My interest, as an anthropologist, in reading Pauly comes from my long-standing relationship with the study of the Puerto Rican fisheries and the relationship between humans, the landscape, the seascape, and coastal and marine ecosystems. Over the years I built a research agenda based on the social and historical analysis of the human-marine ecosystem interface, based on my initial readings of French historian Ferdinand Braudel's *The Mediterranean* (1972) and *On History* (1980). Braudel's work also led me to read—with great enthusiasm—

Immanuel Wallerstein's work on the concepts of **Center-Periphery** and the **World Economy** (Wallerstein 1979), in which the industrial nations (whether capitalist or socialist) dominate the extraction of cheap labor and resources from "less-developed" countries at the periphery of this system based on the production and circulation of commodities.

In recent months, I started to read the work of Jason W. Moore and his analysis of the **World Ecology** (a variation of the **World Economy** theme) as well as his analysis of capital accumulation on a global scale (Moore 2003, 2011, 2017), research that is germane to some of Pauly's critique of fisheries development. To my knowledge, the work of Wallerstein and those of Moore have not been applied to fishery science by oceanographers.

Elsewhere I have argued that, despite the advancement and interest of fisheries science in the social processes of coastal societies, the work of anthropologists, sociologists, and historians is often pushed aside in favor of biological and physical research (deemed as real scientific work), paying lip service to the much-touted strategy of *Ecosystem-Based Fisheries Management* (EBFM) that requires the incorporation of social issues (Valdés Pizzini et al 2012: 99-100). EBFM calls for "the appropriate understanding of fisheries (namely, stocks, populations and the extractive activities)," which requires the incorporation of an ecosystem-oriented reasoning, incorporating humans—their history, culture and complex social institutions—into the assessment of habitats and stocks. In fact, according to Food and Agriculture Organization of the United Nations (FAO), the ecosystem approach to fisheries must address "the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by marine ecosystems" (FAO 2003:14). As we stated in an article:

> One of the goals is to achieve sustainability, balancing societal objectives and incorporating in the analysis the biotic, abiotic, and human processes, as well as their uncertainties. Simply stated, fishing must satisfy human (market, community, firm, and individual) needs with a minimal impact to the ecosystem's functions, such as altering the food web, trophic, or species relationships, thus assuring the renewability of the stocks and the conservation of the ecosystem's components (Valdés Pizzini et al 2012: 100).

However, social processes are often used in EBFM as an interesting and exotic backdrop that usually do not answer important questions, such as how many fishes people catch and where to find them (Johnsen et al 2014).

This brief piece analyzes Daniel Pauly's perspective on these issues and underscores the way in which social sciences (economy, history, sociology, and anthropology, among others) contribute to our understanding of ecosystems and biodiversity. I argue that those topics, and variations on the theme, should be part of the curriculum of academic programs in ocean sciences, a condition that is lacking at the Department of Marine Sciences at the University of Puerto Rico. Oceanographers involved in the science and practice of conservation of biodiversity and "resources" must be knowledgeable of the human dimension. After all, managing fisheries is managing people (Hillborn 2007).

YOU SHOULD KNOW ABOUT HISTORY

That seems to be the main concern and advice formulated by Daniel Pauly: the need for the application of a historical perspective in the analysis of fisheries. The understanding of the trajectory of small scale and industrial fisheries depend on our knowledge of the historical transformations of the local, regional, and global fisheries. It is an argument brought by many researchers, including Jeremy Jackson and his colleagues who wrote a seminal article on the subject: "Historical Overfishing and the Recent Collapse of Coastal Ecosystems" (Jackson et al 2001). Both Jackson and Pauly are on record asking for the full understanding of the historical status and conditions of species and habitats, to

manage them appropriately, avoiding the "shifting baseline syndrome". For Pauly the "syndrome" appears "when members of each generation of fisheries scientists accept as a baseline the population size and species composition that occurred at the beginning of their careers and use this to evaluate changes" (2019:95). The impact of such a syndrome is devastating for the species and the ecosystems, as those baselines keep shifting and there is a loss of collective memory of the composition of the marine and coastal ecosystems on a historical scale.

Jeremy Jackson and Daniel Pauly made the case for the need of a comprehensive historical approach exploring the disciplines and sources of data that document the human activities that developed piscatorial practices in wetlands and coastal areas, that continued into the seas and the oceans in the period known as the Anthropocene (Fagan 2017, Rivera 2015).

For a new generation of oceanographers, it is not a matter of reading history books but to integrate the knowledge produced by paleoecologists, archaeologists, and historians into their own work or, better yet, by the process of integrating the historical agenda into their own work. That agenda includes interdisciplinary research, data mining, a holistic approach, the examination (and analysis) of the following documents: journals, ship and harbor logbooks, letters, chronicles, travel reports, newspapers, and early assessment of the fisheries by government officials and scientists in different types of archives (see Fagan 2006, Bolster 2012). For some, it may require the use of oral histories, life history interviews, which require the valuation of anecdotes (see Pauly 2019: 100), something that was, until recently, considered irrelevant to scientific research in ecology and fisheries (see Ames 2005, 2011).

For example, the recent book *The Last Turtlemen of the Caribbean*, written by Sharika Crawford (2020), presents a detailed account of the history of turtling in the Western Caribbean by islanders from a number of archipelagos in the region, from the Cayman Islands to Cuba, Honduras, and San Andrés in Colombia. Crawford explored secondary sources (books, magazine articles, newspapers), documents from the 19th and 20th century from several archives in the region, and oral histories of the turtlemen collected several years ago by specialists in cultural history from the Cayman Islands to present a cogent portrait of the changes in the populations of marine turtles in the Caribbean. The detailed account is weaved with the work (and data collected) written by Archie Carr (for example, 1979) that resulted in a conservation program to protect the nesting sites and species. Crawford's work also provides an analysis of the diplomatic conflicts among the different nations and territories involved in the crossing of jurisdictions to capture the turtles. In other words, fisheries, ecosystems, and species are embedded in regional and global political economies that require the attention of social scientists and oceanographers to fully gauge the conditions of the system (Campling and Colas 2021).

In 2003 Daniel Pauly and Jay MacLean published the book *In a Perfect Ocean: The State of Fisheries and Ecosystems in the North Atlantic Ocean*. The examination of the North Atlantic Large Marine Ecosystem (LME) is a required reading for all those interested in the keystone species of the ecosystem (in my case, *Gadus morhua*) and as an example of a comprehensive analysis that incorporates management science, ecology, fisheries science, climate science, and history. *In a Perfect Ocean* starts with an assessment of past abundances (to establish a clear baseline) using paleoecology, archaeology, and history to reconstruct the key components of this LME, and to assess the present-day status of the health of the ecosystem.

Pauly and MacLean argue that the past "often holds the key to understanding the present problems of ecosystems and, therefore, perhaps the key to their recovery" (2003: 15). Moreover, they argue that: "Without this historical

viewpoint [on the long duration of overfishing and its impact] often from archaeological evidence, ecologist have come to different conclusions about marine ecosystems changes, often blaming them on changes in water currents, other environmental change, or increase pollution" (2003: 21).

WHAT IS IN THE CATCH?

That seems to be a central question in fisheries. Ecology and fisheries science depend on the assessment and accounting of the number of fish and shellfish (and mammals as well) caught by fishers, hunters, and gatherers with different types of technologies, at different coordinates and times. Estimating the total catch is a nightmare due to a number of constraints: distorted information, lack of information for certain species consumed at the fishers households, the discarded catch, the "invisible" subsistence fishing practices that evade the government (the scientists and agencies) radar, the lack of reporting by sport and recreational fishers and anglers (Puerto Rico, for example), the intentional low reporting by industrial fleets, the tacit fraud of some fishing firms, the lack of systematic data gathering practices, and the overreporting of catches to the FAO by the Chinese (Pauly 2019). In sum catch underreporting, over-reporting, and catch underestimation are a problem.

Pauly seems to support the idea that the social sciences are an important ally to the cause of fishery management but makes a poor effort at demonstrating that. In his analysis of catch underestimation, he authoritatively indicates the following:

> Social scientists are well placed to contribute estimates of these small-scale fisheries catches, because of their local contacts and because they are often embedded in the very institutions that take the pulse of small-scale fisheries. And social scientists should know the importance of catch levels, which are what make people go fishing (Pauly 2019: 38).

After that universal non sequitur (no, catch levels are not what make people go fishing in many societies, see Robben 1989), Pauly wields a critique to Johannes' classic *Words of the Lagoon* (1981), and to his admirers in anthropology, for the lack of information on total catch data, and the fishers' catch. First, Johannes, whose contribution to anthropology and ecology is enormous, was not an anthropologist but a marine ecologist who understood the complexity and richness of human culture as it relates to the biodiversity of the coral reef ecosystem. This is an understanding that goes beyond the bean counting of the catches and contributes to our knowledge of the complex ways in which fishers visualize and construct cognitive models of species and ecosystems to operate an extremely useful line of research for fisheries management (Hind 2014, Johnsen et al 2014, García-Quijano and Valdés-Pizzini 2015). Second, anthropologists and other social scientists involved in the fisheries are interested in an array of social, cultural, and economic processes that impact their livelihood. Figure 1 shows a conceptual map of several areas germane to the lives of fishers that must be also understood. The "map" coincides with a recent assessment of the intersection between fisheries science and the social sciences and the need to engage in an innovative research agenda (Banvick et al 2018). But do not take me wrong, I believe that catch data is important, as well as the complexities of the process by which the data is produced, obtained, and interpreted by government officials and fishery scientists (Valdés-Pizzini 2000). At the Interdisciplinary Center for Coastal Studies (CIEL, for its initials in Spanish, UPR-Mayagüez) we had taken that into consideration in the past, both as a critique and as part of the analysis of the local fisheries (Valdés-Pizzini et al 2012, Valdés-Pizzini and Schärer-Umpierre 2014).

THE TOXIC TRIAD

Pauly is aware of the problem of the fisheries at a global scale due to his lengthy experience of fieldwork and scientific work in Africa, America, Asia, and Europe. His experience with conservation NGOs, fisheries development programs (banks and agencies), the International Center for Living Aquatic Resource Management

(ICLARM) in Manila, the FAO, and universities provided him with a global perspective and a firsthand look at the problem of the fisheries. There are many intellectual, educational, and scientific outcomes of that lengthy experience, but here I will underscore one: the parsimonious explanation of the status of the global fisheries by what he labels the toxic triad.

In summary, the fate of the world's fisheries has been in the hand of a threefold expansion lead by the development in fisheries technologies over the past four hundred years and accelerated in the 19th and 20th centuries. Those are the geographical expansion, the bathymetric expansion and the taxonomic expansion. That is, global fisheries expanded their productive activities to new production frontiers hitherto explored or utilized. These processes match Jason W. Moore's (2020) concepts of frontiers of appropriation of commodities and resources, the horizontal frontier (geographical), the vertical frontier (bathymetric), and the search for new commodities (for example, new species). In more detail, the components of the toxic triad are as follows:

(1) An expansion of the geographical coverage of fishing banks and sites: As catches diminished, fishing boats moved to other areas where there was abundance, and the economic return was higher. According to Pauly, "[f]rom 1950 to 1980, industrial fisheries expanded their reach by about 0.4 million square miles per year." In the 1980s, it increased from 1.1 to 1.5 million square miles per year, then it declined but started going southward in other latitudes (2019:5, 165).

(2) A systematic exploration and search for fishes (populations, fishing banks) outside the inshore traditional areas (for example, the cod fishery in Newfoundland after the 1950s), to the deep offshore areas: That expansion required new technologies and of the most important (and detrimental to the species and habitats) was the beam trawl that evolved from the otter trawl (Pauly 2019:6, see also Roberts 2007, Bolster 2012).

(3) The fishing process also moved towards other species that remained underutilized or were not attractive to the consumers. That meant that the fishers expanded their productive activities shifting to other species (and gears), engaging in the taxonomic expansion of their activities, thus disrupting the trophic chain in the ecosystem (Bolster 2012). Anthropologist Reade Davis (2014) has described how the "collapse" of northern cod (a large predator) in 1992 had a cascading effect in the food web and opened the door for a dramatic increase in snow crab (*Chionoecetes opilio*) and shrimp (*Pandalus borealis*), both underutilized species that became the most important source of income for inshore fishers, who started to invest in large vessels to capture those species offshore. The taxonomic expansion occurs (as in this case) when there is a crisis of underproduction "caused by resource depletion" and "capital has the tendency to move to new commodity frontiers" (Davis 2014: 711).

This triad is a clear-cut model that guide us into the historical analysis of the fisheries elsewhere, and guide the anthropological, ecological, and historical research aiming at the interdisciplinary exploration and analysis of the trajectory of the fisheries on a local, regional, or global scale. As such, it is a useful framework to describe and analyze a number of fishing (and processing) activities in Puerto Rico and the United States Virgin Islands (USVI), for example: (a) the shift from handlines in the shelf drop-off to the use to large vessels to fish deep water groupers and snappers with electric reels in the fishing banks throughout the Caribbean and (b) the fishing incursions of longliners from Florida in pursuit of swordfish (*Xiphias gladius*) and other pelagic species.

WHO IS TO BLAME FOR THE TOXIC TRIAD?

We are. All those who are or have been involved, in one way or another, with

the fisheries are to blame for the sad state of the species, including scientists with their failed assessment of the stocks (see Finnlayson 1994, for the case of northern cod). It is as simple as that. Many of us have fallen into the trap of economic development and growth that requires an increment in landings every year and the incorporation of new technologies to improve the catch per unit effort (CPUE), and thus contribute to the yearly increment of the Gross National (or Domestic) Product. Social formations (i.e., States, societies) since the 19th century have provided an array of incentives to fishing firms and fishers to provide them with the means for an expanded accumulation of capital and an increased production. The history of Canadian and United States fisheries are examples of that, societies in which the state provided fishers and firms with loans, monetary incentives for the construction of powerful fishing vessels, sustenance to fishers' families in difficult times (the Dole), and bounties for landing certain species. That seems to be the pattern worldwide.

We tend to criticize and demonize fishers' firms for the expansion of their activities, the pursue of new fishing banks, depths, and species, but government agencies, international development banks, and organizations and academics involved in information and technology transfer have our share of blame. Some have contributed enormously to the dramatic alteration of the food web by encouraging fishers to go after top predators or herbivores, formerly classified as underutilized (unfished) species (Valdés Pizzini 2007). Many of us (including Pauly) are involved in reversing those trends, fighting against market pressures, contradictory government policies, and supporting marine protected areas and management plans for those species and habitats in dire straits.

I DON'T KNOW ABOUT ANTHROPOLOGY...

Pauly makes the case for the need of social sciences research for the development effective strategies for the management of the fisheries. EBFM requires the incorporation of the stakeholders and therefore the understanding of social and ethnic groups is essential, as well as the understanding of their worldview. However, through many pages, Pauly seems to be missing the boat by failing to understand that the job of social scientists is not to count fish but to assess the social, economic, political, and cultural processes that shape fishing as an important socioeconomic endeavor in societies.

The core of Pauly's critique to the social sciences may be summarized as the following: (1) "neglect key quantitative variables" (such as catches), (2) "social scientists seldom proposed generalizable models of fishing communities", they focus on "descriptions of localized situations" that could lead to hypothesis and are usually expressed in non-quantitative terms, and (3) therefore "fail to propose and test models of social behaviors of sufficient generality to be useful for policy making" (2019:37-39). Pauly seems obsessed with the handful of sociological and anthropological works he read that focused on the "culture of a village," studies that underscored the local adaptations and uniqueness of coastal communities, studies that, presumably, did not provide usable information for fishery managers (2019: 45-46).

In Pauly's view, that is the reason why the social sciences have been relegated by fisheries biologists, scientists, and managers. Instead, he proposes that anthropologists and sociologists should look ("investigate and test") at an array of important processes that he has identified through his personal observations of the global fisheries. The abridged list of topics reads as follows: (a) changes in the agricultural sector and the migration of "excess labor" to coastal areas, and thus becoming fishers; (b) excessive fishing pressure; (c) development of inshore industrial fishing; (d) women labor in other sectors of the economy subsidizing fishers; and (e) deforestation and the impact of sedimentation and siltation in coastal areas and habitats. These processes are related to the economic development agenda,

something that Pauly tends to believe has been unattended by anthropologists (2019: 160).

It is true that the early efforts of social scientists in the realm of fisheries were devoted to localized community studies, but the trend in the last 30 years has been to explore several areas, using both qualitative and quantitative methodological in the analysis of local, regional, and global fisheries. The work of colleagues like Richard Pollnac and John Poggie in the 1970s, consisted of quantitative analyses of the patterns of labor and job satisfaction that were essential in the policies of economic development. Those authors have continued that line of research, joining forces with a new cadre of scholars that have expanded the possibilities of that analysis (Seara et al 2017, García-Quijano et al 2015). Labor processes and displacement (Griffith and Valdés-Pizzini 2002) and the process of modernization and economic development (Maiolo and Orbach 1982) have been a standard fare in social science research since the 1980s.

Moreover, the thorough analysis of property, territoriality, and ownership of coastal and fishery resources have been documented and analyzed by the social sciences (see, for example, McCay and Acheson 1987, edited volume). Also, many anthropologists, sociologists, and economists have studied, in a systematic manner, the role of government and international organizations in shaping fisheries' policies on a local, regional, and global scales. The works of Paul Durrenberger and Thomas King (2000), Bonnie McCay (2000), Pérez (2005), and Kooinman et al (2005) are, to name a few, examples of that bend. For the case of Newfoundland (closer to Pauly's interest), historians, anthropologists, and sociologists have documented the complex processes of fisheries management (Fynnlayson 1994, Bavington 2011), government policies, market and export development (Alexander 1977), fisheries development policies (Wright 2001, Davis 2014), and the integration and displacement of labor on a historical scale (Antler 1982, Sider 2003).

LAST BUT NOT LEAST

Vanishing Fish is an extraordinary book (and testimony) that should be required reading by all those involved in the study and conservation of fisheries. Pauly's lifetime achievements are worth reviewing, and his zeal emulated. Daniel Pauly has a prominent public persona, as he may be considered an activist for the conservation of fishes, and more importantly, the ecological processes that make biodiversity of the oceans possible. At public meetings, the media, the printed word (academic books, articles, and pieces for the public), management committees, and bodies at every planetary level, Pauly makes his presence felt, and his voice heard. His views on a number of issues (whaling, consumption of seafood, marine protected areas, EBFM, industrial fishing in inshore areas, and the trawling fishing technology) are based on his research and lifelong experience on a worldwide scale. Those in the field of fisheries know well his contributions in the dissemination and amplification of knowledge through the development of important databases such as **Fishbase** and **Sea Life Base**, both important tools for researchers and educators.

My interest in writing this review or reflection stems from the fact that Pauly is a staunch supporter of the use of history to understand present-day fisheries and ecosystems and is thus an advocate for the need of a "historical ecology" (2019:186). In my view, such an endeavor requires team effort, and an interdisciplinary approach in which historians (and social scientists with a historiographical bend) and oceanographers combine wits and cross each other's intellectual (and disciplinary) boundaries. Carole Crumley is one of the scholars that have delineated the road map of the field of historical ecology, defined as "a practical framework of concepts and methods for studying the past and future of the relationship between people and their environment" (Crumley 2015 p. 1). Historical ecology incorporates

the "physical and social history of ecosystems and landscapes" using a heterarchy of approaches. In other words, it requires a collaborative and transdisciplinary effort (2015 pp. 5-6), a research strategy sorely needed in fisheries, although there are many—scattered—examples of studies in that direction (Davis 2014, Schärer-Umpierre et al 2014).

Arguably, the work of Pauly followed, to some extent the pathway suggested by Crumley. Early in his career Pauly labelled it "multidisciplinary," and credits that approach in the study of multispecies fisheries in San Miguel Bay, the Philippines, for "an understanding of what makes fisheries tick" (2019:178-179). Stephen Jay Gould, in his last book, called for the need of "consilience", that he described as the process of the jumping together of humanists (social scientists, for example) and natural scientists to solve complex problems, with both camps contributing knowledge, experience, and the willingness to learn from each other (Gould 2011). The present and future of our scientific knowledge of fisheries and biodiversity conservation will require the combination of different scientific approaches, qualitative and quantitative methods, and more important, a historical analysis that goes beyond a chronology of events. What is needed is a historical ecology with the goal of explaining the complexities of the ecosystems with a grasp of the political economy and the cultural manifestations of those people (including scientists and managers) involved in the fisheries in the long duration of time (Campling and Colas 2021).

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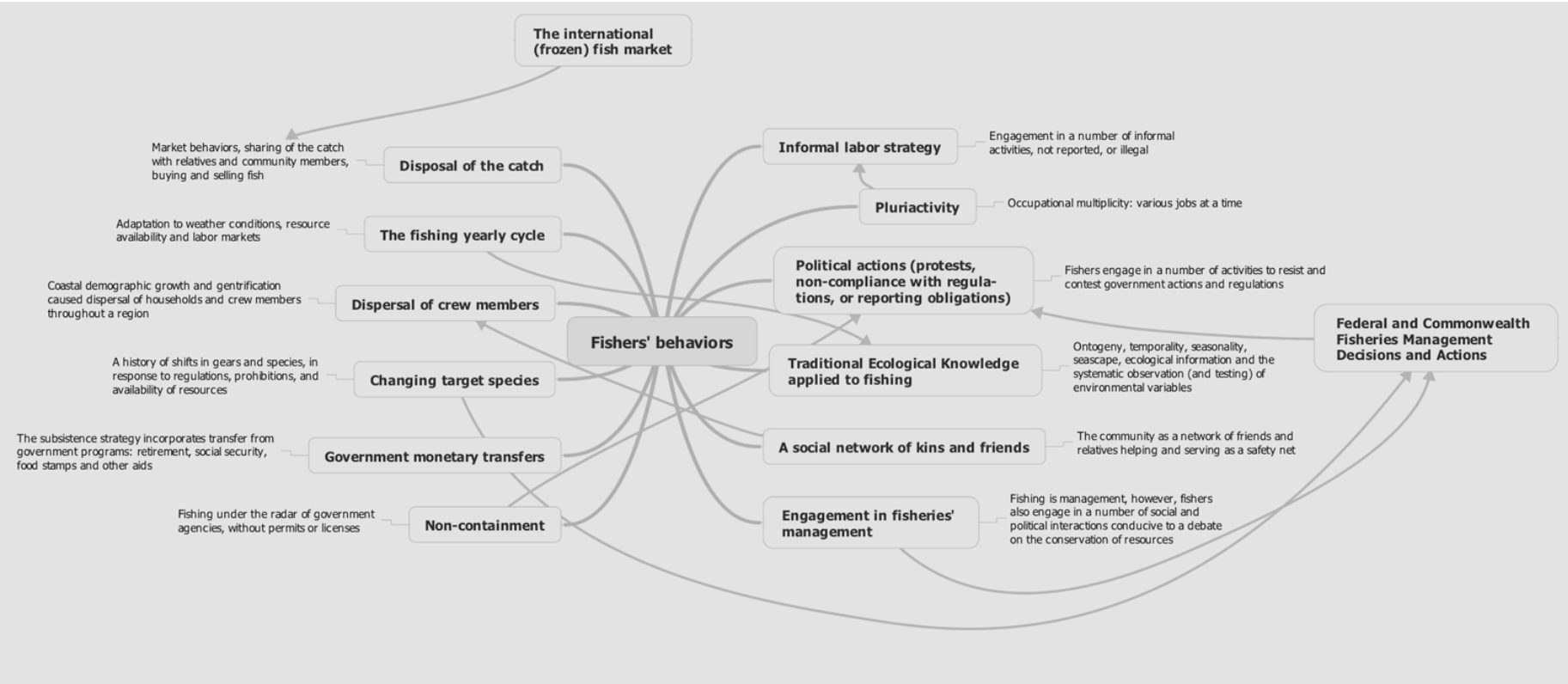

Figure 1 Conceptual map of fishers' behaviors