

Incorporating Social Science Theory and Methods into Ecosystem Assessment

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Social Sciences' Contributions to Integrated Fisheries Management

- With more emphasis on **integrated** approaches to fishery management, it has become ever more important to incorporate a wide range of methods and theory from multiple social sciences and, where appropriate, the humanities: anthropology, economics, geography, history, political science, psychology, and sociology.
- Over the past few SSC meetings, we have been introduced to approaches that place fish and habitats into larger socioeconomic and biological contexts:
 - Ecosystem analysis (Sagarese, et al. 2017) that emphasize trophic relationships/food web networks.
 - Agent based modeling (Saul, Brooks, and Die 2020) that showed, among other things, how fisher behavior can influence fishery-dependent data and potentially skew stock assessments.
 - Management Strategy Evaluation (Walter, et al. 2023) which considers relations among multiple management alternatives relative to management objectives, either empirically or via simulations.
- Social scientists have been representing human behavior as embedded in wider social and cultural contexts for several decades, embracing theoretical and methodological approaches such as systems theory, multi-scalar analysis, social network analysis, behavioral economics, and cultural ecology.

Scientific Modeling

- “One of the most insidious and nefarious characteristics of scientific models is their tendency to take over, and sometimes supplant, reality.” --Erwin Chargaff
- Rodney Dangerfield comments on this in this clip from Back to School:
 - <https://www.youtube.com/watch?v=uSLscJ2cY04>
- In many cases, models are based on assumptions that are, in turn, based on political positions, myths, or exaggerations. A case in fisheries management is the Tragedy of the Commons, which tends to dismiss community-based management in favor of resource privatization.
- Many scientific models about the natural world, such as ecosystems, are based on systems theory, or the idea that systems transmit energy across different trophic levels and respond to energy levels and shocks with feedback loops that serve to regulate the system. Systems, however, are rarely as closed as they are represented in most systems theory models.

Integrating social science into scientific modeling

- Scientific models are often necessary to represent trends, interactions, conditions, etc. because of limited, imperfect data. In some cases (e.g., SSC discussion of Spanish mackerel during the July 2023 meeting), changes in stock may be due to social factors that are not normally included in stock assessments.
- Social scientists often rely on data from the census and other government sources, but many of us develop our own data sets as well, viewing standard data sets as unreliable.
 - For example, Tropical Forest Fisheries, important in Puerto Rico, are not captured in landings data in the Caribbean (Garcia-Quijano, et al. 2018).
 - Part-time fishing—mixing fishing with other livelihoods—in the South Atlantic and Gulf States is often underreported (Griffith 2021).
- In as much as human behavior influences ecological dynamics, a variety of natural environments and processes, including fish populations, understanding it can be useful in ecosystem assessments.
- With the notable exception of our reliance on economic data, method, and theory, we have not taken advantage of the full range of social scientific data, methods, and theory in stock assessments and other fishery management activities.

Social Scientific Data & Methods

- Most of this talk will be devoted to data we collect and the methods we use to collect and analyze it as social scientists. This will include:
 - Assessing the lay of the land: overview methods.
 - Conventional methods: interviews, surveys & focus groups.
 - Less conventional methods.
 - Converting qualitative data into quantitative data.
 - Modeling.
- I mention social scientific theories at the end, but only briefly, as they are extensive.

Assessing the Lay of the Land

- One early task in many research projects is developing an overview of a port, a community, a region, etc. This can aid intercepting people familiar with the region's fisheries and streamline interviewing. Methods include, for example:
 - Windshield surveys (first-hand and virtual): observing through windshields while driving around; with mapping technologies available today, some of this can be done virtually. They usually locate fishing-relevant infrastructure: marinas, fish landing/processing centers, etc.
 - Cultural Mapping protocols: brief, single-page form that collects information about fishing-related businesses & locations and allows researchers to tell community members about their study.
 - Inventories/ check lists: used to assess fishing engaged and fishing dependent communities (Griffith, Stoffle, and Jepson 2015)
- These methods can aid in developing survey instruments/ interview protocols, sampling for more structured phases of the research, and achieving an early understanding of the levels of fishing taking place in the community. They can also supplement existing data sets such as the census.

Conventional Methods

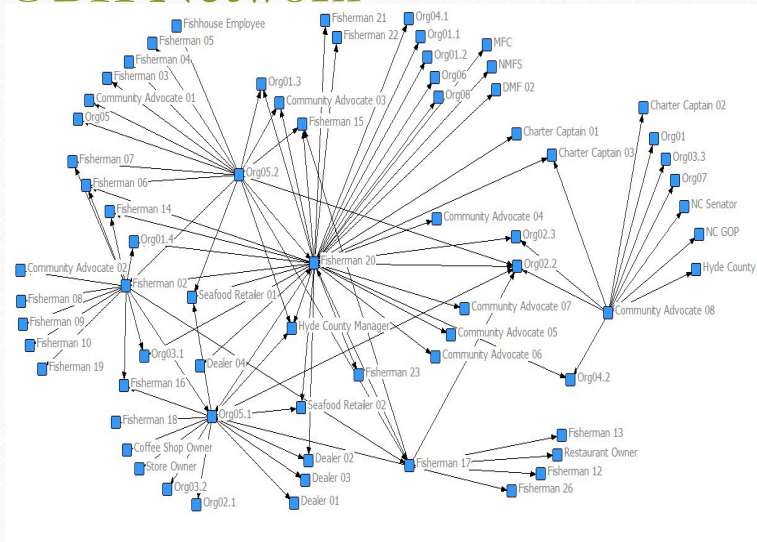
- Surveys and focus groups are probably the most common methods used to elicit data about landings, gear, territories fished, etc. when logbook and other data aren't available or relevant.
 - Surveys need to be constructed thoughtfully, pretested, and well-distributed with representative sampling schemes.
 - Focus groups need to be kept small and constructed with attention to class, gender, ethnic, and other differences and power imbalances (in some cases, participants who are more empowered will dominate conversation, marginalizing minority views).
- In-person, open-ended interviewing tends to yield the most wide-ranging and helpful information, often introducing issues you hadn't considered relevant but that influence fishing behaviors.

Less Conventional Methods

- **Social network elicitation:** Determining connections among social actors based on specific activities, such as information about regulations (IBX vs. OBX networks—next slide).
- **Photo voice:** Handing out cameras to fishermen, seafood dealers, etc. or asking them to take photos of a specific activity (e.g., handling of discards, by-catch, vessels on the water). Interviewing photographers about the photographs (often reveals aspects of human-ecosystem interactions that researchers had not considered before hand).
- **Cultural consensus analysis:** Developing agree-disagree statements from open-ended interviews or written sources to add to surveys. For example, “Red snapper have migrated east in the Gulf of Mexico” (agree or disagree)
- **Reconstructing cultural biographies and the social lives of things** (Griffith, Garcia Quijano, and Valdez Pizzini 2013). This involves understanding the history or biography of things in terms of human interactions with those things; these things can include natural resources like fish or places like fishing ports.

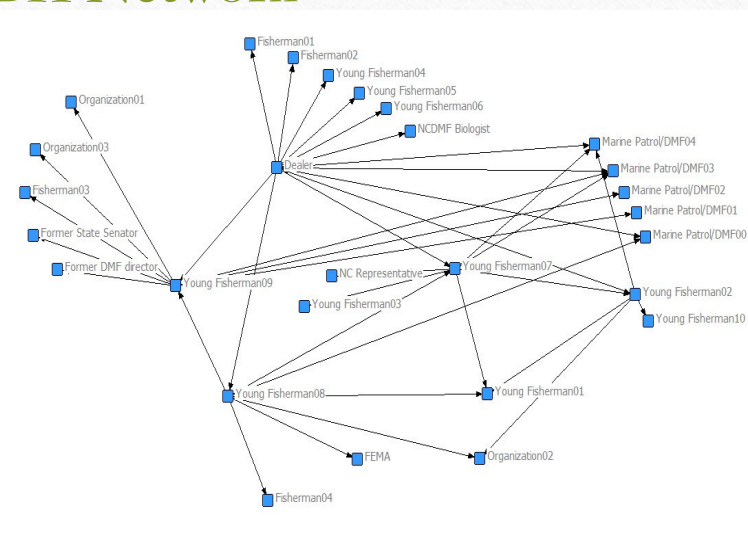
Variations in Networks: Both small NC coastal communities

OBX Network



Multi-Centered Network

IBX Network

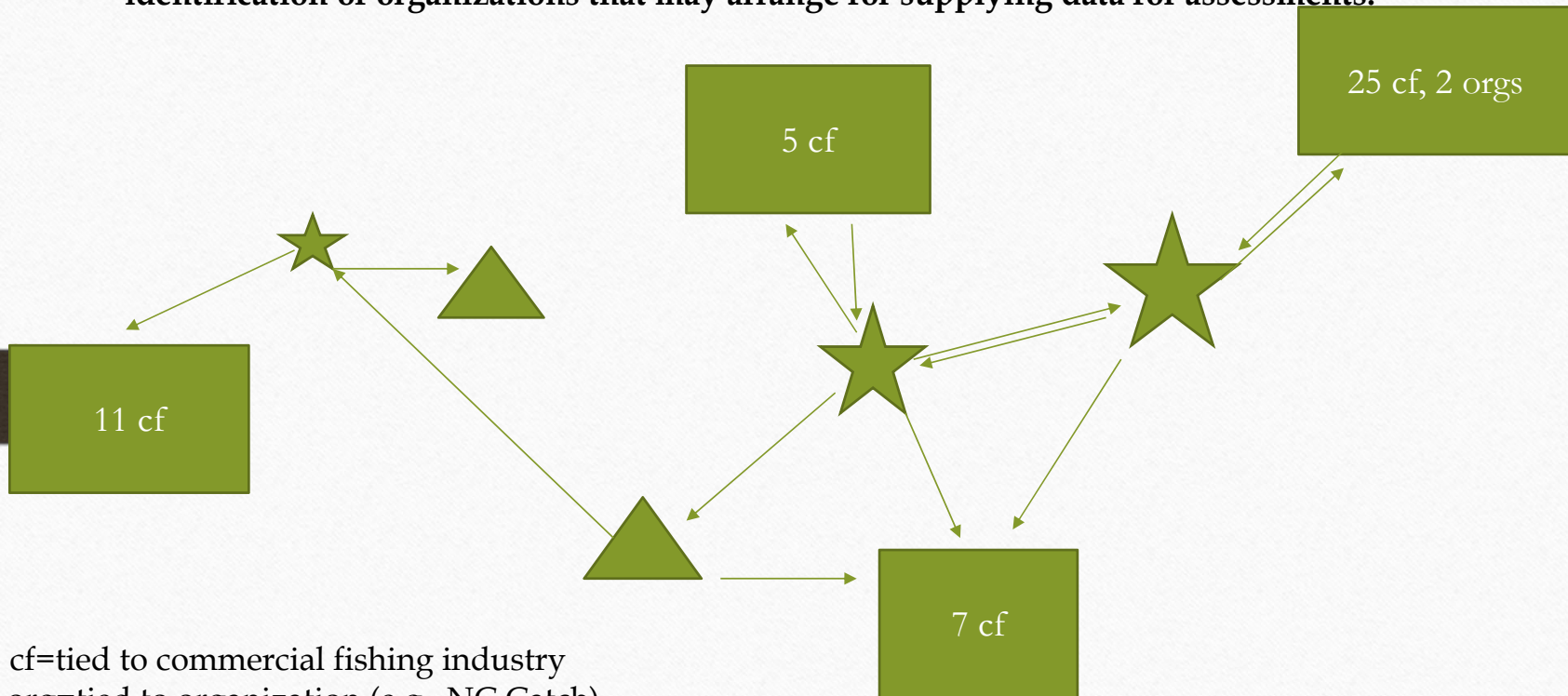


Fish Dealer-Centric Network

OBX vs. IBX Networks

- Outer Banks group is far denser than the Inner Banks network, increasing the sources of information and social positions for advocacy, action, etc.
- The fish dealer at the core of the Inner Banks network has a good deal of control over the network, given that he buys the fishers' crabs, and can make decisions about what information, causes, etc. he considers important enough to encourage.
- Eliciting social networks can lead to an appreciation of the people considered leaders formally (e.g., commissioners, mayors, marine advisory service agents) vs. those whom others rely on for leadership when important matters come before fishing families and communities.
- Network information can be gathered specifically to address whatever you are interested in; in our study, it was the flow of regulatory information, but network data could be gathered on the conditions of fish stocks by asking fishers to name fishermen who have advanced Traditional or Local Ecological Knowledge and then targeting those fishermen for in-depth interviewing.

Simplified Fishing Community Sociogram: simplifying it in this way allows for easier identification of organizations that may arrange for supplying data for assessments.

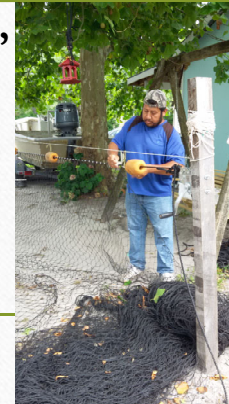


cf=tied to commercial fishing industry
 org=tied to organization (e.g., NC Catch)
 reg=tied to regulatory agency

Stars represent centrally placed individuals
 Triangles represent centrally placed organizations
 Boxes indicate clusters of individuals and organizations

Photos can show points in fishing-processing where value-adding occurs, bottlenecks develop, labor is needed, people depend on fishing, etc.

Photo Voice



Visual cues are often helpful in getting people talking about constraints on fishing, such as the ability to find locals to work in different branches of seafood.

Cultural Consensus Analysis

- Based on linguistic theory, cultural consensus analysis assesses consensus on specific issues. It assesses the extent to which opinions are shared across different populations.
- Just as you need only a few speakers to learn an entire language, you need only a few people who represent the views of many to understand the beliefs of a group (e.g., snapper-grouper commercial fishermen on the status of red snapper).
- The technique involves initial steps to: 1) identify the group; 2) conduct open-ended interviews with a few members of the group to obtain agree-disagree statements; and 3) determine (often through social network analysis) who are representative individuals in the group.
- Develop a cultural consensus “test”: essentially a series of agree-disagree statements about the resource you are studying. Administer the test to 20 to 25 individuals you have identified as knowledgeable about the subject at hand. Determine **consensus** on the subject; consensus is not necessarily “best available science,” but what the group believes.

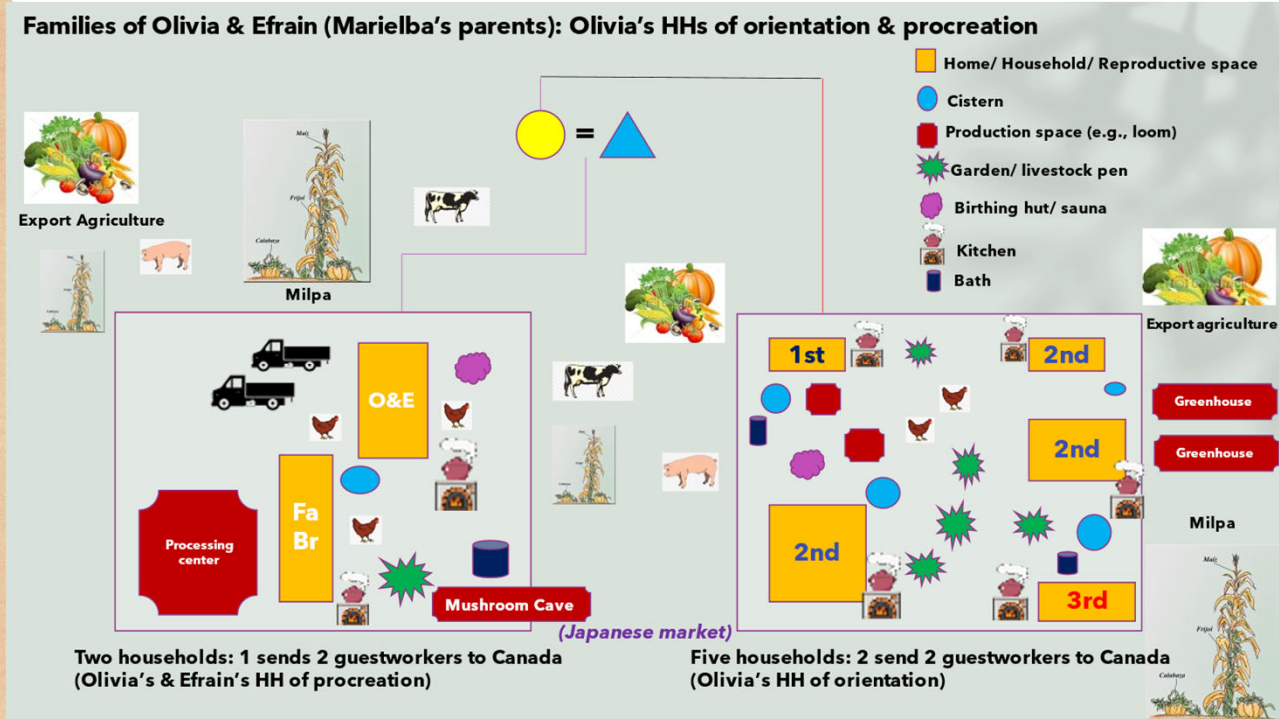
Cultural Biographies

- Cultural biographies are biographies of specific things, from an anthropocentric perspective, that locate the ways that they influence one another.
- Griffith, Garcia-Quijano, and Valdes-Pizzini (2013) traced the cultural biographies of spotted goatfish (*Pseudupeneus maculatus*) and *Sierra*, a local generic name for cero & king mackerel (*Scomberomorus regalis* & *Scomberomorus cavalla*).
- All three species were heavily targeted by Puerto Rican fishermen yet constituted small proportions of official landings. In some communities, fishermen said these were their most important species, yet they were under 3% of all landings.
- Reason: Puerto Rican fishermen valued quality of their catch over quantity, and these species were in such high demand that they were: 1) kept for family consumption; 2) given as gifts to members of their social networks; or 3) sold as specialty products in alternative markets (e.g., directly from vessels, used in fishing association restaurants, through networks during Lent).

Analyzing Livelihood Constellations

- Many fishing families today engage in multiple livelihoods.
- Understanding how different livelihoods influence one another can help predict movement in and out of fisheries, impacts on communities, etc.
- Figure at right represents two Guatemalan peasant extended households.

Families have multiple sources of income; can fall back on others as one or more constricts or disappears altogether.



Engagement in multiple livelihoods typical among people whose occupations have marked seasonal fluctuations, as in fishing or farming.

Quantifying Qualitative Data

- Much of the data social scientists collect is qualitative in nature: “dependence” (on fisheries); “gentrification” (of coastlines/ fisheries habitat); “precariousness” (of economic circumstances).
- We can describe these variables, but often we need to track them in relation to explicitly quantitative variables like landings, allocations, distance from centers of power, etc.
- Many social scientists accomplish this by creating indices.

Dependence on Fisheries in Puerto Rico: Index of 8 items, each with a score, derived from ethnographic work with the fisheries

1. Place-based (score = 2) vs. Network-Based (score = 1)

2. Ratio of full-time to part-time fishers (points based on formula).

3. Number of ties to tourism (e.g., provide charter services, fishing association has tourist restaurant, allow association pier for recreational fishing)

4. Involvement in coastal conflict (3 points for direct involvement; 1 for indirect involvement)

5. Number of ties to the state: (1 point for each tie that results in improved fishing capability)

6. Fishing infrastructure (e.g., association facilities, recreational fishing club, boat building on site)

7. Ceremonial activity/ infrastructure (e.g., host a Virgen del Carmen ceremony; statues to fishermen, on-site chapel)

8. Rank in the landings data (1 to 5 based on University of Massachusetts Work Environmental Index formula)

Other Measures Developed

- “Meeting National Standard 8: Ground Truthing Social Indicators of Fishing in South Atlantic Coastal Communities” (*Marine Fisheries Review*)
- Compared 20 Atlantic ports from Wanchese, NC to Palm Beach Shores, FL for **dependence** on fisheries and other dimensions, developing indices for each of them:
 - **Vulnerability:** Ability to withstand shocks of closures, limited entry, etc. that might disrupt fishing.
 - **Sustainability:** Ability to maintain and reproduce fishing practices over time.
 - **Gentrification:** Extent to which trends in economic development displaced fishing infrastructure/ populations, including working waterfronts.
- We ranked the ports and compared our rankings with those done only with readily available census data, finding that the ethnographic data were more reliable in large metropolitan areas whereas the census data were useful in smaller, rural ports.

Modeling & Social Scientific Theories

- Models in the social sciences are about as ubiquitous as theories, to which they are usually related.
- Some current modeling techniques were noted above (Ecosystem/ System Analysis, ABM, etc.) but too many others exist to cover them here.
- Like ecosystem-based management, the key aspect of our most helpful social scientific theories are those that place human behaviors in wider social and cultural contexts, just as ecologists place fish, trophic exchanges, HABS, etc. into their wider ecosystems.



Thank You

Questions?