

**ADAPTATION AND SHIFTING LIVELIHOODS IN THE SMALL-SCALE FISHERIES
OF THE GALÁPAGOS MARINE RESERVE, ECUADOR**

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ABSTRACT

Kim Engie: Adaptation and Shifting Livelihoods in the Small-Scale Fisheries of the Galápagos Marine Reserve, Ecuador
(Under the direction of Stephen J. Walsh)

In many areas, finding alternate livelihoods for fishers has been promoted to alleviate environmental strain but encountered difficulty because of often understudied, multiple roles that fishing fulfills, making job market dynamics easily misunderstood. I use the concept of social adaptation to study both individual adaptive capacities to find alternate work, and the social-structural creation of vulnerability to declining incomes and limited work options outside of fishing in the Galápagos Marine Reserve. Sub-analyses draw from (a) a formal household survey (N=167), (b) open-ended interviews (N=127), (c) participant observation, (d) government surveys and documents (e) and historical narratives.

A livelihoods-based analysis of labor mobility shows that those most able to move through fishing were a small minority with tertiary degrees, vertical social ties, or large family and social networks. For the vast majority of active fishers, the ability to leave fishing is weakly explained by individual differences and is more contingent on the changing nature of alternate opportunities. Although people have always transitioned from fishing to tourism, the highest-returning options have clearly constricted with privatization of tour operator rights over time. Combined with increasingly strict conservation governance regimes, today's fisher social vulnerability is situated in a particular Galápagos context of narrowing adaptive coping strategies and prospects for upward mobility, all the while remaining elevated in economic security above other Ecuadorian regions.

Regulatory changes have left a newly created alternate, recreational fishing, out of reach for most fishers. Analysis of these changes shows the intertwined influences between fishing and other industries as fishers negotiate with non-fishing actors for livelihood options. I suggest using regulatory debates to represent an explicitly social feedback loop to more strongly articulate the unclear ways that resilience and complexity frameworks, increasingly applied to Galápagos contexts, conceptualize the development of “alternate stable states”. While some scholars argue that despite tighter controls a more restricted “race for fish” among registered fishers continues to degrade resources, I argue that collectively, the desire and demonstrated multi-year efforts to find other jobs make a lack of alternate work the real culprit behind any race for fish – and its best cure.

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CHAPTER 1

Introduction

I.

“The term ‘fisheries management’ has been much in vogue in recent years, being taken to express a more subtle approach to the fisheries problem than the older terms “depletion” and “conservation”. Briefly, it focuses attention on the quantity of fish caught, taking as the human objective of commercial fishing the derivation of the largest sustainable catch.”

- H.S. Gordon 1954: 128

In 2008 a competition was held in the Galápagos Marine Reserve (GMR) to allow a limited number of fishermen and women (henceforth referred to as “fishers” and “fishermen” interchangeably) to convert their vessels into tour boats. Managers at the Galápagos National Park (GNP) received a flood of applications¹ but awarded only 16 permits, or “cupos”. Fitting long-term institutional goals to reduce the fishing footprint in the GMR, competition outcomes did not cleanly do so. A rule that did not allow more than one cupo in a family to the fourth degree of kinship was announced *after* many fishers had submitted applications that took up to \$8000USD to prepare, disqualifying them. Justified to promote equitable access to the wealthy tourism industry², certain families that were awarded several cupos also had relatives in government, raising ire. One fisher decided to annul a 17-year marriage so his brother-in-law’s tourism cupo would not disqualify him (El Universo 2009). In the end dozens of fishing families who had invested in embracing the “greener” tourism industry were told, in effect, to keep fishing.

¹ 77 applications were submitted (GNP 2009).

² Cupos are highly valuable; one is known to have sold for US\$320,000 in 2005 (Epler 2007).

This competition and its aftermath highlight the many tensions, political negotiations, and uneven outcomes connected to changing resource use trends within a society, even when trends are widely considered beneficial. The entirely small-scale fishing fleet of the Galápagos Islands exists within the fourth largest marine reserve in the world, a United Nations World Heritage Site renowned for its biological abundance and endemism. Shrinking the fishing footprint has widespread stakeholder support and aligns with both social and conservation goals.

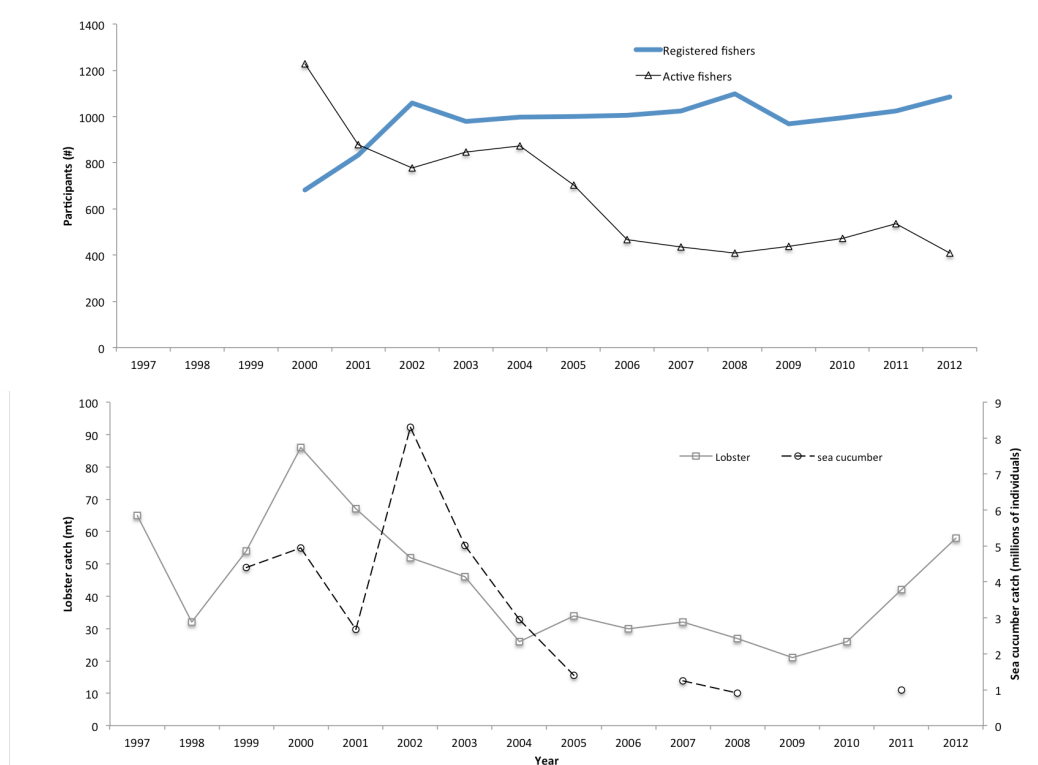


Figure 1.1 Catch, inactive and active participants in the two major fisheries of sea cucumber and lobster in the Galápagos Marine Reserve from 1997 – 2012.

After decades of erratic markets, declining abundance and increasingly stringent regulations, Galápagos fisheries have undergone a metamorphosis of remarkable proportions, declining in active participants and catch (Fig 1.1). However, not only the fact that people are leaving fishing but how and why they do so critically shapes future impacts on marine ecosystems and on social equity. Open debates around the expansion of sport fishing, land-based

and sea-based tourism, and niche marketing for Galápagos seafood all have diverse implications for conservation. Lack of data on this rapidly changing sector makes ecosystem impacts, social impediments and even transitional directions extremely difficult to assess, while future choices ahead for Galápagos society are “frightening, uncertain, and partially undesirable” (Ospina 2006) because individual and societal trade-offs in development for conservation are inevitable. In the end, Galápagos fishers and citizens find themselves at a crossroads.

This dissertation studies the decline and ongoing reorganization of fisheries in the Galápagos Marine Reserve – through its work force, politics, social connections, and most specifically, the occupational change of registered fishers. The analyses presented here study the politics and the socioeconomic realities of finding alternate livelihoods as inextricably intertwined and co-produced.

This project is centered around two themes. The first is one of *outwardness* regarding the social dimensions of fishing. In 1954 Gordon noted that the term “fisheries management” was focused heavily on the quantity of fish caught, influenced by managers who were trained predominantly in biology and concerned with the human effects on the production side of a fishing system, or its fish stocks – an observation that is largely still applicable today. This focus on optimizing harvests has slowly driven conventional governance to an ever-more detailed accounting of gear types, vessels and humans and led to a narrow sector-based perspective that disengages potentially important relationships outside the fisheries sector (Holling and Meffe 1996; St. Martin 2001). The literature on fisher behavior in the quantitative social sciences, although calling for branching out beyond the historically biological focus of fisheries management (e.g., Hilborn 1989; Salas and Gaertner 2004), remains sector-based by focusing predominantly on the proximal dynamics of catching fish. Hilborn (1989) for instance, called for

analyzing the "dynamic behavior of fishing fleets" through fleet investment, movement, catching power, and discarding.

Acknowledging the dynamic nature of the label, “fisherman” is part of the outward orientation of these analyses. There are two elements of understanding “fisherman” as dynamic. First, because many former fishers are now working in tourism and others have second or third jobs, econometrically understanding the ‘fishing sector’ beyond active fishermen more realistically incorporates how changing environmental impacts relate to how people move through fishing over time. Secondly, St. Martin (2001) notes that conventional bioeconomic approaches to fisheries management, described above, treat fishers as points of degradation that behave atomistically to maximize profit. Instead, social scientists have shown that fishers are also knowing, active, participants, holding the key to solutions and not just potential degraders of ecosystems, and embedded in broader communal spaces (Berkes 2003; Mansfield 2004; St. Martin 2007).

How can one study fishing while not obscuring its tight connections to the broader economy and society? My approach is to trace material benefits to individual fishers from other sectors through the main avenue of work. In the Galápagos as elsewhere, the effect of the tourism industry on fishing via alternate jobs is of enormous importance (e.g., Young 2003; Fabinyi 2010), yet remains almost entirely unstudied. The following chapters show that the distribution of tourism benefits via work is highly differentiated among registered fishers since the demand for job opportunities is higher than the supply. Documenting these relationships analyzes how other sectors affect fishing activity rather than analyzing fishing activity itself, in this way going beyond traditional sector analyses.

The second theme of this project is that of social *adaptation*. I take as a starting point the

fallacy of controllability of fisheries systems (Wilson 2006; Mahon et al. 2008), in other words agreeing that perfect knowledge of fishing resources and their fluctuations is unattainable.

Fisheries science has long been focused on determining the “optimal” amount of fish to harvest and on gathering more information with which to perfect quantification. Given this fallacy of controllability however, some fisheries social scientists have noted that efforts are better served by asking how people adapt to changing circumstances in fishing rather than seeking to quantify the components of variability in fisheries change (Garcia and Charles 2008; Mahon et al. 2008).

The overarching question of this project is, **In what ways can we understand how Galápagos fishers are “adapting” to social-ecological change?** By asking how people adapt rather than seeking objective “causes” of ecological change, this project recognizes that people occupying different social, economic, and political positions in society experience change differently.

Various chapters ask after the motives for how Galápagos fishers are adapting to change, how adaptation manifests for different individuals, and about the role of inequality in shaping the adaptive capacity of individuals and households to direct their livelihoods and decisions. Three sub-questions are central to this study:

1. In conditions of declining profitability and resource abundance, how have some individuals been able to (a) reduce their dependence on the local marine resource base while (b) maintaining their material standard of living?

I investigate the role of inequality in shaping the adaptive capacity of individuals and households to direct their livelihoods and decisions. I analyze adaptation and vulnerability to changing circumstances from multiple social positions.

2. How does job switching through fishing interface with conservation management policies?

Living and working within spaces officially set aside for environmental conservation sets

apart fishers within the Galápagos Marine Reserve from many modern industrial fisheries. I analyze how conservation policies interact with occupational change and occupational pluralism, a long-observed trait of many fishermen in the Galápagos, as well as changing harvest abundances and markets.

3. What is the political economy of diversification from fishing?

I pair fine-scale individual level analysis of fisheries change with a broader analysis of the Galápagos coastal tourism economy, asking, what are Galápagos fishers adapting *to*? The actions and options of fishermen must be understood as reactions to not only changes in marine resource abundance, but the structures of economic opportunity open to them – namely from tourism, the cash cow of the Galápagos economy.

II. Project Approach & Conceptual Framework

Scholarship on entry and exit from fishing is scattered across anthropology, labor economics, natural resource management, marine policy, fisheries science and resilience and complexity work. I apply a sustainable livelihoods interpretation to this broad and scattered literature to help synergize insights into a cohesive manner, interpreting entry and exit from fishing as livelihood change.

Sustainable livelihoods, the specific area in which this project is framed, is part of broader political ecology scholarship. Political ecology studies ecological change as intertwined with its political, economic and social contexts, a basic tenet being that environmental governance actions “hold implications for the distribution and control of resources” (Robbins 2004: 9), and are therefore political. There is always more than one option to react to environmental change, and studying decision-making processes and the (often) uneven effects of

policies is therefore vital.

Like other strands of political ecology, a major emphasis of the sustainable rural livelihoods approach (SRL) has been to analyze social difference and how differences affect poverty and social outcomes and connect to governance. SRL uses as a central analytic focus a ‘livelihood’, or the ways and means through which people go about making a living.

I put livelihoods in conversation with other frameworks in this project for various reasons. First, broader political ecological scholarship on adaptation and vulnerability is incorporated to study the contexts of vulnerability with greater definition and robustness. This helps to address livelihood critiques over the years that include an undertheorization of various elements such as the “vulnerability” context where shocks, trends, and seasonality are broadly noted as affecting wellbeing (leftmost box in Fig 1.2; Prowse 2008). Second, I use livelihoods concepts to engage with and question resilience and complex adaptive systems framings of social-ecological adaptation, important given its rising influence on how change over time is understood and acted upon in governance, including in the Galápagos (e.g., Watkins 2008; Gonzalez et al. 2008; Denkinger and Vinueza 2014). The following sections first review the sustainable livelihoods framework, and then the intersections made between SRL and other bodies of knowledge in this project.

A. A Sustainable Livelihoods Approach to Fishing

A1. Sustainable Rural Livelihoods

The “livelihoods approach” has roots in rural development work where it evolved as a framework for poverty alleviation, and draws from a simple premise that misunderstanding how rural peoples get by has underlain many development failures (Bebbington 1999; Ellis 2000;

Angelsen et al. 2011). Prowse (2008) notes that until the 1970s conventional macroeconomic narratives of agrarian change considered informal, non-wage work as backwards and its reallocation to “modern” capitalist sectors a key to economic growth. Ellis (2000) and Bebbington (1999) point to an overarching focus on raising small farm productivity in rural development policies until the 1990s, thought to improve economic growth in all sectors. In short the ways that farmers made a living in informal, non-waged work were misunderstood, with a focus on different spheres of the economy (e.g., formal/informal, capitalist/non-capitalist, rural/urban) far greater than that placed on the connections and overlaps between them. Policy interventions could be out of touch with local goals and clashing with peoples’ abilities to earn a living. A prime example are policies that treated job diversity as a temporary phase between two stages and encouraged specialization, when many rural peoples use job diversity as long-term, permanent strategies for various monetary and non-monetary reasons (Ellis 2000; Carswell 2002).

While much livelihoods work has focused more on social rather than ecological dynamics, I also keep attention placed on how these dynamics connect to ecosystem impacts by noting that the “sustainability” in question in sustainable livelihoods is understood as the maintenance or improvement of people’s ability to make a living *while not degrading the resource base* (Scoones 1998; DfID 2000).

Households and individuals often have differential access to resources and activities that enable some people to benefit more from government policies and market contexts over time and to better weather political and personal uncertainties. These markers of social difference have included land tenure (Adams and He 1995) and cattle ownership and off-farm skills (Dercon and Krishnan 1996), and often vary with gender (Carney 2004). Differential ownership of and access

to resources in turn intersects with different abilities “to be and to act” in the manner of one’s choosing (Bebbington 1999).

Both micro- and macro-scale approaches have been taken to study social differences. On a micro-scale has been the prominent “assets-mediating processes-activities” framework (Fig 1.2), which begins with a focus on household asset bases, the portfolio of work activities they engage in, and the mediating processes that enable people to actually translate their assets into activities. Such accounting stems from the definition of a livelihood as:

“...the *assets* (natural, physical, human, financial and social capital), the *activities*, and the *access* to these (mediated by institutions and social relations) that together determine the living gained by the individual or household.” (Ellis 2000: 10)

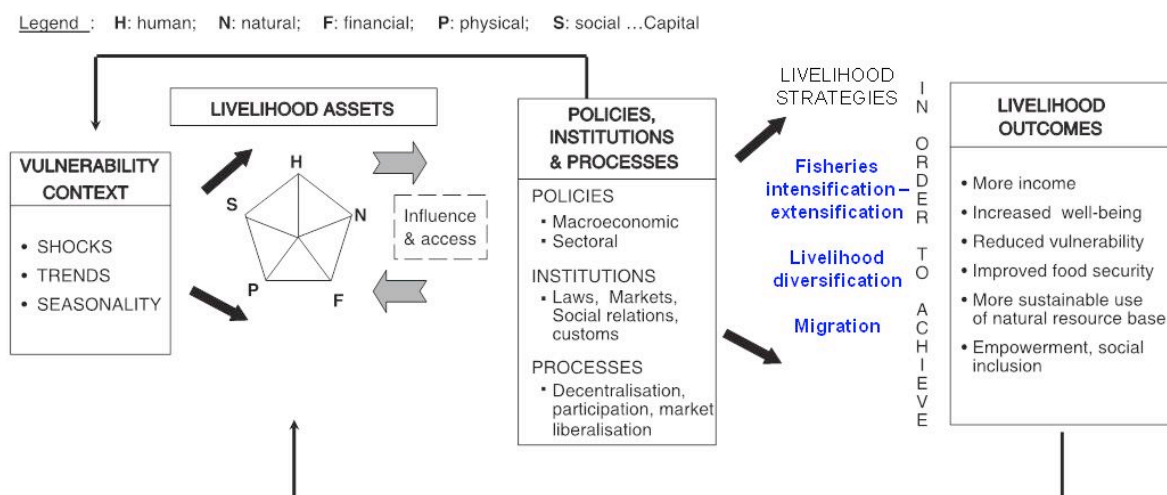


Figure 1.2. The sustainable livelihoods framework of understanding a livelihood as composed of assets, activities, and mediating processes. This project places focus on livelihood strategies, highlighted in blue. Adapted from the UK Department for international Development and Allison and Horemans 2006.

Assets are distilled into various “capitals” and analyzed either conceptually or quantified with various survey procedures. Assets “owned, controlled, claimed, or in some other means accessed by the household” (Ibid., 31) are regarded as a foundation of understanding peoples’ options for adaptation and thus also their vulnerability to changes. Households are a common unit of analysis, since they are “a site in which particularly intense social and economic

interdependencies occur between a group of individuals” (Ellis 2000: 18). Ellis’ (2000) definition above inherited from Chambers and Conway’s (1992) earlier one, but added stress on access to resources and their mediation by institutions and social relations (see also Bebbington 1999).

While there is a danger of placing undue emphasis on econometric accounting in livelihood surveys, awareness of what resources people have available to them provides insight into how some may maneuver change in a more beneficial way than others (Scoones 1998; Scoones 2009). Sustainable livelihood frameworks, while abandoned by some NGOs for the difficulty and time-consuming nature of operationalizing an entire livelihood framework (Prowse 2008; Scoones 2009), remains a valuable tool for micro-level research of understanding how people make a living in particular times and places, when research is focused and goals prioritized.

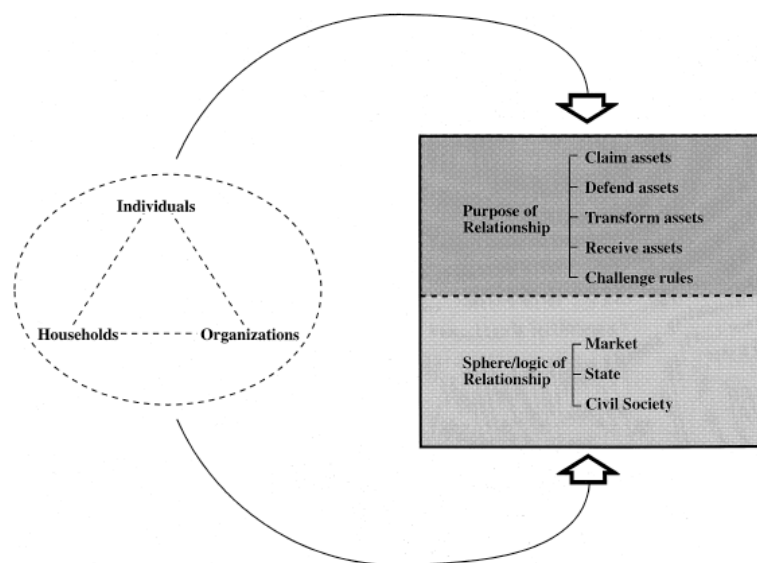


Figure 1.3. Bebbington’s conceptualization of livelihood asset use and transformation, stressing their interactions within the market, state, and civil society, and change from the specific nature of household relationships with other actors. From Bebbington 1999.³

³ This figure is reprinted with permission from Pergamon.

On a more macro-scale of analysis, Bebbington (1999) suggested joining such accounting to multiple scales in a similar framework that emphasized and visualized how rural people intersect with regional and global state, market, and civil society forces. The ways households interact with such forces shape the nature of their opportunities and constraints in using, transforming, and defending their assets, and therefore hold the key to understanding how livelihood pathways shift over time (Fig 1.3).

Livelihood studies can also emphasize broader political economic structures and foreground “mediating processes” over measuring household assets, an umbrella term for the myriad processes that sit between a set of concrete assets on the one hand and the portfolio of activities that households ultimately engage in (e.g., Bebbington 2001). Conditions such as social relationships, household dynamics, and market dynamics, and relations with institutions, organizations, and the state mediate differential outcomes between human societies and ecosystem processes (Frank et al. 2007). Livelihoods work also explicitly recognizes that work and compensation have multiple forms, monetary and non-monetary, formal and informal (e.g., Allison and Ellis 2001)⁴.

I note that livelihood scholarship crosses disciplines, epistemologies and ontologies to produce vastly different types of studies ranging from work that emphasizes struggles over meaning and identity or the co-production and interpretation of space (e.g., Batterbury 2001; Bebbington 2001; Perramond 2010; King 2011) to more positivist and post-positivist work that also measures asset bases and seeks to test various hypotheses about factors that affect livelihood changes (e.g., Lindenberg 2002; McSweeney 2004; Pender et al. 2004; Angelsen 2011), with many bleeding aspects of these elements together. This project is more based in the latter, and

⁴ For the sake of simplicity, I use “occupation” and “job” interchangeably with “livelihoods” in this analysis.

this review reflects that basis.

A2. The Sustainable Livelihoods Approach to Fishing

Allison and Ellis (2000) were one of the first proponents of bringing livelihoods insights to the study of small-scale fisheries, which until then had made little use of it despite its decades old existence. They argued for the potential of many SRL insights to inform how the social dynamics of fisheries are understood, including occupational diversity and seasonality, linking household and individual activities to broader economies beyond fishing, considering fishing's non-economic roles in people's lives, foregrounding local and community perspectives, and introducing methodologies for studying differential abilities or desires to leave fishing.

Fisheries policies arguably suffer from similar myopic views of the micro-scale ways that fishers earn a living and the large role job diversity often plays that spurred terrestrial livelihoods insights. Guiding much fisheries management, classic economic theory is merged with biomass production models in "bioeconomics" (Gordon 1954). Fishers are simplified to rational actors that always act to maximize their economic profit (St Martin 2001) and are not trusted to self-regulate under open access conditions, viewpoints still commonly circulated (May et al. 2008). Labor movements into and out of fishing are regarded as a matter of weighing opportunity costs of alternate jobs when fishing is no longer profitable (Gordon 1954; Smith 1981). However in the Galápagos as elsewhere, weighing socioeconomic alternates does not occur within a vacuum but involves negotiations with other stakeholders in broader political processes, the availability of alternate jobs, and uneven access to various types of work. As a result, leaving fishing is an inherently political process.

With mounting dissatisfaction with the bioeconomic paradigm, arguably there has been a

similar movement in marine and fisheries policy paralleling that which took place in the 1990s in rural development, of a “major shift in the scope and nature ... from the general to the particular, from seeking single solutions with widespread application to addressing specific problems in a limited context, from implementing solutions from above to permitting solutions to be generated from below” (Ellis 2000: 27). In the marine realm this has included calls for community-based management, ecosystem-based management, co-management and participatory governance (e.g., Christie et al. 1994; Pollnac et al. 2001; IUCN 2007; St. Martin et al. 2007; Charles and Wilson 2009).

I engage with livelihoods work and methods to study fisheries change as embodied. By this I mean that instead of studying how fishing is changing, I study how fishermen are changing and move away from the characterization of “fishing” change through anonymised, aggregate catch levels alone. Livelihoods framings allow for a clearer delineation of how marine resource use practices fit into the lives of Galápagos residents, who is leaving, and who is not. I look to both Ellis’ (2000) and Bebbington’s (1999) framings of livelihoods to analyze how individual social difference as well as broader state, market, and civic society forces have affected Galápagos fishers, respectively.

Speaking to the narrowly sector-based character of much of fisheries research, insight that rural livelihoods may be cyclically complex and diverse leads to views that any one employment option should not be overly emphasized without study of the role it plays in the greater coastal economy (Allison and Ellis 2000). I consider fisheries jobs in terms of exchangeability with others in the greater economy in the Galápagos, rather than in isolation, just one part of a portfolio of assets that fishermen may draw from, and bottom-up job changes through micro-scale capital transformation and substitution capabilities (Scoones 1998; Ellis

2000). I ask how different individual livelihood strategies intersect with job diversification, understood as part of a larger process through which people seek to secure desired life strategies (Owusu 2009). While many livelihoods scholars in anthropology and geography argue that livelihood struggles over meaning are underemphasized in relation to the economic earning potential of various occupations, in the Galápagos the socioeconomic element of fisheries livelihoods are less studied, and emphasized here.

B. The Political Ecology and Economy of Adaptation

Sustainable rural livelihoods approaches were taken up enthusiastically in the rural development field in the 1990s, including Britain's Department for International Development (DfID) where it was a popular policy and planning tool (DfID 2000; Prowse 2008; Scoones 2009). Rural development is not a discipline but "an organizing principle for anti-poverty policies in rural areas of low income countries" (Ellis 2000: 25). While SRL "provided a common language for different sectors and academic disciplines" (Prowse 2008: 17) and a firm dedication to poverty alleviation, the focus on application may have contributed to critiques of an undertheorization of various element such as the "vulnerability context". The broader literature on the political ecology of adaptation brings in greater precision here.

Political ecological insights into social change and adaptation are inherited from the major intellectual roots of both cultural ecology and political economy (Robbins 2004). Cultural ecologists analyze societies' relations to nature through their material needs (i.e., food, shelter), and consider changes in natural resource use as dictated by cultural preferences and practices (i.e., Nietschmann 1973; Denevan 1983). Denevan (1983) importantly linked adaptation to the question of *why* an idea gets adopted. He argued that resource practices and technology do not

evolve in any inevitable way, and are not simply contingent upon the availability or invention of new options and their diffusion. Rather a range of options, in agricultural or fishing practices for instance, likely exist in any given time, and their uptake is a negotiated process couched within needs, culture, and politics. In early Mesoamerica for example, domesticated crops appeared 6000 years before agriculture provided even 50% of the diet (Denevan 1983).

Political ecology scholars have also placed intense focus on the broader political economy of adaptation, emphasizing the social-structural creation of vulnerability. Rather than conceptualizing risk as external to human societies and lodged within a biophysical hazard such as a hurricane or drought, scholars such as Watts (1983) “highlighted the social nature of so-called ‘natural disasters’ ” (Bassett and Fogelman 2013: 44). In studying Nigerian famines, Watts concluded that rural Hausa communities were “conceptually prepared” to cope with drought, but undermined in their ability to do so by a colonial system that had transformed the structure of their society and traditional systems of food production and coping. Therefore, their weak adaptive capacity was shaped not by poor individual decision-making but structurally by broader political economic dynamics (Watts 1983). Although risk lies within biophysical (lack of rain) as well as social (introduction of a colonial capitalist system) phenomena, exclusive focus on the biophysical leads to a lack of attention on the (at least) equally influential social, economic, and political processes that create uneven exposure to risk.

Adaptive capacity is therefore a social process, determined by “...political-economic dynamics and social relations” (Bassett and Fogelman 2013: 45). Adaptation studies that focus exclusively on only individual actions reveal only proximate factors of risk and vulnerability, and tend to characterize adaptation as the need for small, “purposeful” adjustments, downplaying actions that are transformative, socially and politically. Bassett and Fogelman (2013) contrast the

different conceptualizations of risk and question framing in a political economic and a classic hazards analysis of adaptation and risk:

“The hazards school asks, How do people choose the degree of risk they will bear and the adjustment they will make? In contrast, political economists ask, How is vulnerability shaped by political economic processes and the social relations of production in which constraint rather than choice limits adaptive capabilities? (45)”

Vulnerability, or one’s exposure to a risk or susceptibility to harm (Leach et al. 2008) is a key concept with important contrasts with resilience. Scholars such as Adger (2006) have noted that resilience can be either desirable or undesirable; it has been described as having “...no normative element in theory since it is based on the observation of SES’s [social-ecological systems] – observing that some are stable and persistent and others are not” (Leach et al. 2008: 5). In contrast vulnerability is explicitly normative; its minimization is regarded as a social benefit where “some risks are *unacceptable* and should be avoided at all costs” (Leach et al. 2008:5, italics in original). A vulnerability approach to social adaptation therefore includes explicit analysis of political decisions.

In short, scholarship across cultural ecology and the political economy of adaptation note that exposure to disasters and one’s ability to cope with them is often uneven, and help an SRL analysis foreground how vulnerability and coping must be studied within the context of not only ecological or biophysical dynamics, but also the broader societal structures in which people live.

I look to these geographical concepts of adaptation to sharpen and at the same time broaden the scope of how fisheries livelihood changes are conceptualized. First, I emphasize the indeterminacy of adaptive pathways and retaining a sense of openness to development options from this literature to avoid “...directionality and ideas of ‘progress’ in development” in livelihoods framings (Scoones 2009: 184). Scoones (2009) notes that questions around how livelihoods analyses frame “good” or “bad” options and the question of “what needs

transformation through the disciplining practice of ‘development’?” is often unquestioned in livelihood analyses, even though many have an explicitly normative policy purpose (184). It is easy to assume that fewer active fishermen is always better than more for environmental robustness for instance, and therefore moving as many people out of fishing as possible is beneficial. However, the analyses in this project do not presuppose any occupational change as “better” than others in particular directions. In the Galápagos the choice to diversify out of fishing and remain in it may both be acceptable “goals” within a wide envelope of environmental sustainability. Arguably and propitiously, the choices that fishers face are exceptionally open compared to other areas where there is often little option but to leave stagnating industries or suffer both environmental degradation and worsening incomes (Allison and Ellis 2001; Cinner et al. 2009; Fulanda et al. 2009). The GMR therefore provides an important vantage point from which to theorize social adaptation outside of these crisis-driven situations, thanks to marine ecosystems’ *relative* health compared to many other places from what is discernible from sparse data accounts.

By maintaining this openness this project seeks to help sharpen the definition of adaptive capacity as empirically applied to all fishing communities. Nelson et al.’s (2007) definition of adaptive capacity⁵ importantly encompasses “maintaining the option to develop” as well as maintaining the functions and structural identity of a system in the face of change and shocks (397). The adaptive capacity of a fishing community as conceptualized here is not only the ability to maintain fishing livelihoods, but the capacity to change in the manner of one’s choosing, whether that be leaving or remaining in fishing. This analytic stance encapsulates the theme of *outwardness* that runs throughout the project.

⁵ Adaptive capacity as defined by Nelson et al. (2007) in the climate change literature is “the preconditions necessary to enable adaptation, including social and physical elements, and the ability to mobilize these elements” (397).

Countering directionality comes into play in terms of not only a normative judgment of livelihood choices as described above, but in terms of refuting an assumption of a simple relationship between availability and uptake of adaptive strategies, as cultural ecologists like William Denevan noted:

“A simplistic example of such [neo-environmental-deterministic] reasoning is as follows: the climate became drier, migration occurred to a wetter climate; ergo, the drought caused the migration. The reasoning instead should be: the climate became drier, a new adaptation became necessary; the option chosen was migration to a wetter climate” (1983: 405).

In observing the transitioning Galápagos fishing industry, one causal chain might go: there was a fish stock collapse, fishermen expanded into previously unexploited species that are now also declining, therefore the stock collapse caused environmental degradation to spread. Reasoning should instead proceed as: there was a fish stock collapse, what were the options for adapting to a stock collapse, and why did expansion into new species occur?

Finally, I stress the policy implications of adaptive strategies as social processes on multiple scales, adopting a “reformist” adaptation approach that asks after both small, incremental adjustments and larger, systemic transformation (Bassett and Fogelman 2013).

C. Sustainable Livelihoods Perspectives on Complex Social-Ecological Systems

The contemporary momentum, academic and political currency of the overlapping and connected concepts of resilience and complex adaptive systems (CAS) makes them an important and highly influential aspect of fisheries governance and one of the rising frameworks to stress dynamic change, albeit in very different ways from livelihoods and political ecology. While resilience and complex systems concepts of change have drawn strong reactions across academic spheres, of uptake and embrace but also alarm (e.g., Folke 2006, Walker and Salt 2006; Walker and Cooper 2013), political ecologists have begun asking how more fruitful engagements

between resilience, political ecology, and other traditions like development studies can develop (e.g., Leach et al. 2008). As Thrift put it, “[complexity] does have interesting and even important things to say. But ... in an increasingly mediatized world, complexity theory is, to an extent, just another business opportunity. It is up for sale and it is being sold” (1999:33).

Heeding these calls, I engage with complex systems scholarship in this project to ask how livelihoods scholarship can contribute to making fisheries applications of complex systems more sensitive to issues of social equity, fairness, and the political dynamics of governance decisions and structures, issues it currently lacks – particularly given its rising use in Galápagos contexts (e.g., Watkins 2008; Gonzalez et al. 2008; Denkinger and Vinueza 2014). Nelson et al. (2007) note that equity is historically not treated deeply in the adaptation and resilience literature. Mahon et al. (2008: 106) point out that, “the capacity to self-organize and adapt does not necessarily result in sustainable or fair resource use systems”, which “...will depend on the balance of power among stakeholders and their appreciation for these issues”.

In many ways complex systems science is an ecological corollary to livelihoods work, the former contrasting itself against reductionist science, and the latter against neoclassical economics. In parallel with this project’s application of livelihoods, complexity also stresses the indeterminacy of adaptive pathways and refutes claims to any linear or ‘natural’ stage of progression in development. Both can be considered network analytic approaches, placing greater focus on studying *relations* between entities (or entities as relations) than on the static properties of entities (both human and non-human) themselves. And while seemingly disparate, Holling’s (2001) “Adaptive Renewal Cycles” (ARCs), Denevan’s (1983) adaptive strategies and the political economy of adaptation are all ways of conceptualizing both incremental and transformative changes within a system. They dovetail in criticisms of “top-down” governance,

although conclusions differ: rethinking how stability is characterized and managed in ecosystems (Holling and Meffe 1996), and the reworking rather than diminishment of quantitative methods around social dynamics (Manson 2001).

These frameworks have gained strong resonance among the fisheries science community (e.g., Allen and McGlade 1987; Holling and Meffe 1996; Wilson 2006; Garcia and Charles 2008) and are compelling because they explain the loss of global marine ecosystem variability, encompassing both economic structures that incentivize producing fish as commodities, and mechanistic logic from mathematical explanations of increasing ecosystem brittleness (Levin 1998; Levin 2005). They have done so by spurring a reconceptualization of marine ecosystems, considering them inherently uncertain and lacking any inevitable “average” or “normal” stable equilibrial state (Wilson 2006). Although ecological, this reconceptualization has been a critical aspect of building support among fisheries scientists for governance reform because it indicts the conventional approach to fisheries management as becoming locked into controlling variability above all else to produce fish as commodities (Holling and Meffe 1996). Complex dynamics form from the bottom up, and historical events influence which pathways emerge among a multiplicity of possibilities. The most important implication of CAS is that there is no “grand plan” for change, recovery, and disturbance – all are instead driven by bottom-up processes. In short, a CAS is a highly abstract, mathematical concept that describes a particular set of processes in terms of organization and behavior.

At the same time however, because the influence of power imbalances on governance reforms (including in fisheries) are rarely outlined empirically, its detractors have argued that complexity and resilience may frame issues apolitically and privilege technocratic solutions (e.g.,

Leach et al. 2008; Walker and Cooper 2011)⁶. In terms of global risk management, examples put forth include the contention that those most vulnerable to hurricanes and natural disasters must become more “resilient” (Walker and Cooper 2011). While the theory is more expansive, scholarship on managing for ecosystem resilience (i.e., adaptive management) remains weakly able to legitimize knowledge falling outside of a narrow scientific definition, recognize politics, address dynamic behavior in social science via mathematical models, and recognize the multiple ways that people and institutions could potentially, and actually do, adapt to change (Leach et al. 2008).

III. Methods

My approach is akin to what Prowse (2008) calls “reflexive inductive livelihoods research” or an extended livelihoods approach, adopting an explicitly critical realist epistemology that foregrounds dialogue and reflexivity, is interdisciplinary, and extends out from positivist social science in various ways including triangulation of qualitative and quantitative work iterated and integrated over time. I did not conduct long-term ethnography as is part of Prowse’s (2008) advocated method; however I spent an intense amount of time in the field in one small community and stressed dialogue, reflexivity, and sensitivity in ongoing interactions between myself and participants. Prowse (2008) also notes that analyzing mediating processes such as market logic and institutional processes “in context” of their observed practices and operations rather than from a priori assumptions of their purposes and goals helps to expand

⁶ Walker and Cooper (2011) note that in complexity’s rise in global risk management, it’s “naturalizing metaphors” such as the unavoidability of surprise and the evolutionary selection of individuals in nature are an “intuitive ideological fit” with a neoliberal governance strategy that sees state intervention as more “unnatural” than private enterprise and a free market. Attitudes to natural disasters like Hurricane Katrina can include an absence of questioning of unequal social impacts under a contention that the most vulnerable must become more resilient, basically “neutraliz[ing] critical inquiry into the disastrous consequences of neoliberal approaches to financial regulation, urban planning and crisis response, [and] environmental policy and development” (144).

livelihood work as reflexive and inductive (see details in Chapter 4).

The epistemological viewpoint of critical realism is part of a “post-positivist paradigm”, which asserts that objects in the world exist and can be known apart from human perceptions and knowledge of them (in contrast to pure social constructivism). Guba and Lincoln (1994) characterize post-positivism as claiming to be value-free and mainly trying to ameliorate the “context stripping” that positivism is susceptible to (197); others characterize it however as acknowledging that human subjectivities are central to shaping action and understandings of the world (in contrast to Popper-esque positivism) (Collier 2005; Poon 2005; Prowse 2008). In the sense of using quantitative methods to study uneven development, I engage with broader post-positivist movements in Geography (Barnes 2009; Wyly 2009). Wyly (2009) notes that “...radical geographies has generally not encouraged an acceptance of the tools, languages, or analytical strategies of spatial science as legitimate part of the emancipatory critical enterprise” due to historical alignments of “mathematical/statistical/quantitative epistemology, and elite conservative politics”, particularly with spatial science in post-WWII America (314). While such stances have softened, the application of statistics toward a progressive politics of equity and inclusion is a still thin area in geography that has been coined “critical quantitative geographies” and “strategic positivism” (Barnes 2009; Wyly 2009).

The basic outlines of the declining Galápagos fishing industry, like others elsewhere, are easy to identify from statistics on employment, yearly fleet catches and active participants, and profit and loss calculations. Beyond aggregate economic data however, social equity has subtle interactions with employment and place, which demand empirical study of community perspectives and their complexities. Qualitative analysis of interviews and participant observation is thus critical to this study. Ideally, going a step further and quantitatively linking

surveys, participant observation, and interviews to resource use patterns helps translate the degree to which different aspects of social change affect resource use, and thus environmental change. Quantitative analysis is thus a critical other half to my project. I argue this scholarship is understandable to fisheries managers and scientists and acknowledges the importance of ecological change.

I therefore conduct a field-based and historical study with a concurrent, parallel mixed methods design where qualitative and quantitative data was gathered concurrently, and analyzed in parallel (Creswell and Plano Clark 2007). There is a long tradition of mixed methods in livelihood work that have combined detailed surveys with historical narratives of change to produce multi-scalar, compelling narratives of how livelihoods have unfolded and intersected with global forces in various places (e.g., Adams and Mortimore 1997; Batterbury 2001). The foundations for the three empirical analyses in Chapters 3, 4, and 5 stem from mixed methods that include (1) a formal household survey and descriptive statistics, (2) open-ended interviews and participant observation, and (3) historical document and database analysis of demographic and employment trends in the Galápagos Islands.

Although transitions are occurring all through the Galápagos archipelago, I focus on one island, San Cristobal, in order to more rigorously detail fisheries dynamics over a snapshot of time. San Cristobal is the birthplace of commercial fishing in the Galápagos, and still the port home of its *seco salado* or salted cod fleet, although cod vessels traverse the entire archipelago on their two-week trips. I focus on the island of San Cristobal because of known variety in multi-species harvest strategies and livelihood transitions occurring there, and because accuracy is aided by minimal illegal fishing compared to other islands.

A. Data Collection

I first generate empirical data on fine-scale social and occupational changes in San Cristobal fisheries. This analysis is a preliminary attempt to improve spotty documentation of the recent changes in the socioeconomic dimensions of Galápagos fishing.

A1. The 2012 Galápagos Livelihood Survey

The sustainable livelihoods “assets-mediating processes-activities” framework is central to my data collection on the differential ability of households to cope with change. I focus on household asset bases, the portfolio of work activities they engage in, and the mediating processes that enable people to actually translate their assets into activities in two ways: quantitatively through a household livelihood survey, and qualitatively through interviews, participant observation, and document analysis.

Analyses in this project follow Ellis’s (2000) categorization of five types of capital assets. These are physical capital, or things “brought into existence by economic production processes” (e.g., homes, boats), natural capital or the natural resource base (e.g., land, water, fish stocks), financial capital or stocks (e.g., cash, credit, income), human capital (e.g., education, health), and social capital (e.g., personalized networks, ties, and mutual obligations).

I conducted an original structured survey (N=167) from March – August 2012 in San Cristobal among individuals within the fishing community. Deliberately administered to individuals who were engaged in fishing to different degrees (49 full-time, 57 part-time, 12 occasional, and 46 inactive)⁷, I measured household assets, activities, and their changeover the

⁷ I categorize fishing participation into four levels following the Food and Agricultural Organization (FAO) of the United Nations. Those who derive $\geq 90\%$ of their income from fishing are full-time fishers, 30-90% are part-time, and $\leq 30\%$ are occasional. Those not fishing but holding a valid license that allows them to fish at any time, are non-

past three years (Scoones 1998). Aims were to assess how marine resource use practices fit into the lives of Galápagos residents – in terms of economic importance (absolutely and relative to other economic sectors), attachment, and changing practices. In addition rather than trying to perfectly capture household asset bases, the goal was to get some sense of differentiation among them. Since the survey was conducted once, most represent a window in time (spanning three years) rather than change over time, although it included retrospective questions.

Questions fall into five major categories: (i) occupational portfolios, (ii) financial and physical capital, (iii) economic security and relative poverty, (iv) job satisfaction and industry preferences, and (v) demographics, social and human capital (Table 1.1).⁸ I distinguish category (ii) from category (iii) because the latter speaks to how people are able to leverage their capital assets in life, and not simply their ownership of assets. An example is the decision to send one's children abroad for schooling, which many better-off families do for a higher quality of education.

Sensitivity to respondent unwillingness to answer certain questions (most commonly around income), or an expressed preference to be interviewed rather than surveyed resulted in not all fishers being asked all of the same questions. While the sample size of different questions may therefore differ, the data gathered gives various understandings of fishing as individually practiced. I personally administered all surveys in Spanish and taped the majority to help with posterior review. Respondents were found by “man-on-the-street” style connections and subsequent snowball sampling. There were 8 refusals, giving a 95% response rate. I surveyed and interviewed many people in their homes and also on park benches, aboard cruise boats, at cargo docks, in tourism agencies, and restaurants. When possible public places were avoided for

active. In the non-active category, I lump together people who may return to fishing but simply did not participate in the 2011-12 season, and those that have retired and do not want to return to commercial fishing.

⁸ The entire survey can be found in Appendices A and B.

Table 1.1 Major survey metrics of household assets, activities, and their change over the past three years

Category		Variable values
<i>Occupational portfolio & changes</i>		
	Changes in fishing participation, or “livelihood strategy” from 2009-11	intensify, diminish, maintain
	Changes in any jobs	# increased, # diminished, equal # same, equal # different
	Fishing preferences	fish more, fish less, continue, ambivalent
	Level of fishing engagement	Full-time, Part-time, Occasional & Inactive
<i>Financial & Physical Capital</i>		
	Household Income bracket	
	Fishing Income bracket	
	Boat ownership	Y/N
	*Home ownership	Y/N
<i>Economic Security & Relative Poverty</i>		
	Credit constraints: Ability to raise \$1000 in one week	borrow from friends/family, borrow from bank, sell something, go fishing, use savings, unable
	*Have children that attend primary, secondary or tertiary school outside of the Galápagos	Y/N
	*Chronic disability or illness	Y/N
	self-assessed health comparison	better, same, worse
	*Self-assessed material standard of living (2012)	good, more or less good, bad
	Self-assessed material standard of living (2009-2012)	better, the same, worse
<i>Job Satisfaction & Preferences</i>		
	Liked being a fisher	Y/N
	Would still go into fishing, in retrospect	Y/N
	Would recommend fishing to their children	Y/N
<i>Demographics, Human, and Social Capital</i>		
	*Highest individual- and household-level formal education	
	No. of dependents	
	involvement in the local fishing cooperative	1=member, 2=also held a post, 3=also has been president or member of UCOOPEPGAL ^a
	Family in politics or government	0=none, 1=public sector employees, 2= nuclear family or sibling in a local political position, 3= family or close friend as head of an organization, or self was in a political position

*These questions are duplicated from the 2009 Galápagos Living Standards Survey.

a: UCOOPEPGAL is the provincial-level umbrella fishing cooperative that represents all Galápagos fishers and participates in regional and national-level political discussions. All four island-level fishing cooperatives coordinate with UCOOPEPGAL.

more private locales. Group settings also varied (alone, among one to several friends), all of which were recorded to note the positioning of speakers and listeners. All respondents but one were men, and surveys ranged from 34 minutes (shortest) to 3 hours (longest).

A2. Participant Observation & Interviews

I relied heavily on interviews and participant observation for information on how peoples' livelihoods and careers had changed over time, accompanying survey point-in-time information. Approximately 77% of surveys (N = 127) were also interviews, accompanied by commentary on themes around general change in the industry, conservation in the Galápagos, and respondent-directed concerns. Participant observation greatly helped to deepen my exposure to local perspectives through casual conversations. This method is defined as "...experiencing the lives of the people you are studying as much as you can" (Bernard 2002), with a goal of building experiential knowledge about a research place and situation. I learned of the everyday practice of being a fisher outside of an interviewer-interviewee divide, in which unspoken power relationships can manifest in unobserved ways (Becker and Geer 1957; Bernard 2002). I had myriad interactions with fishers in town, and accompanied fishers on their daily routines over three fishing trips using different gear types and target species, each lasting one day.

A3. Documentation and Databases

I utilize two independent databases. A broader socioeconomic context is provided by the 2010 Ecuadorian Census, noted above, a household-level census with coverage in the Galápagos archipelago (N = 25,124). Questions covered household income, demographics, educational and occupational patterns, and indicators of economic, social, and health status (INEC 2010) and

provide a source of information independent from surveys and interviews for understanding occupational movement between various activities.

I use the GNP fisheries monitoring database to obtain such as aggregate harvests in the Galápagos from 2009-11, and the number of active vessels and participants. Although coverage is complete only for the two most valuable species of fish caught, it is the only dataset of harvest activity in the GMR. The GNP fisheries database provides general background on fishing trends during the study period only, because it is not possible to map out catches onto individuals or even boat owners, without falsely assuming that boat owners are responsible for their entire boat's catch. This database is a monitoring and data collection effort documenting harvest at the vessel level since 1994 (H. Reyes, pers. communication). Possession and permission for use was obtained in August of 2012.

B. Data Analysis

All quantitative analyzes and characterizations rest on the delineation of distinct fishing strategies over time. I use survey data to find the people who are fishing less, fishing more, and maintaining constant fishing levels by tracking their movement between full-time, part-time, occasional, and inactive engagements. I call these changes an individual's "fishing strategy", with the values of intensification, diminishment, or steady maintenance, assessed in the three-year period from 2009-11 (Fig 1.4).

This categorization is made possible by capturing individual occupational portfolios from 2009-11 and broadly since respondents began fishing. These fishing livelihood strategies parallel livelihood strategies conceptualized in rural terrestrial contexts, where strategies of diversification have been contrasted with those of intensification or extensification of agriculture, where households deepen their reliance on natural resources for survival (Hussein and Nelson

1998; Scoones 1998; Ellis 2000).

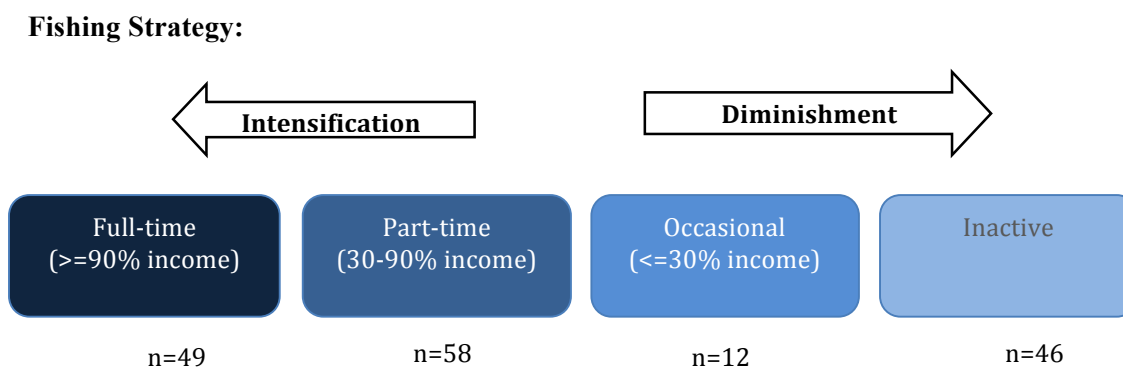


Figure 1.4. “Fishing strategies” of intensification, diminishment, or no change are based on how individuals transition between different levels of fishing engagement, from full-time to inactive.

I synthesize current job portfolios, what work people are taking up as they leave fishing, and their labor preferences, which are not always synonymous. Overall, analyses identify various social conditions and employment changes from 2009-2011 in Galápagos fisheries. Side-by-side comparisons of quantitative and qualitative data are aggregated around thematic lines in each chapter. Quantitative and qualitative data were analyzed independently and compared, often resulting in “meta-inferences” drawn around livelihood themes and research questions. Quantitative analysis consisted of statistical inferences from categorical survey questions, and qualitative analysis of gathering emergent themes from open-ended interview questions and document analysis. While retrospective survey questions are asked, I rely more heavily on qualitative analysis to interpret change over time.

Qualitatively, data collection and analysis were at times simultaneous. I took extensive field notes and synthesized emergent themes, then iteratively collected further data based on analysis of earlier observations (Becker and Geer 1957; Kleinman et al. 1997). My qualitative methods also iteratively influenced my quantitative data via the livelihood survey, which was conceived as a conversation piece more than a one-time assessment of individuals and their

households. As participant observation reshaped or introduced new aspects of livelihood change, in several instances I developed additional survey questions where counting frequencies was possible: for example, as I saw that fishers had little savings despite yearly incomes that sometimes approximated Galápagos averages, I added a question concerning the ability to cope with sudden cash needs. I then found earlier survey respondents around town to ask what were now follow-up questions. I also used member checking across various respondents to triangulate the accuracy of qualitative data implications over time (Creswell and Plano Clark 2011).

The main methodological challenge in applying a livelihoods approach to these dynamics was the effort needed to canvas the fishing community, broadly defined, in terms of their asset bases and occupational portfolios at such a fine scale. I argue that the truthfulness of respondent-reported survey results improved over time as trust and rapport was built with the fishing community, and I had the opportunity for iterative questioning to clarify answers unclear to me when conversational opportunities arose. I lived in San Cristobal for six months, from March – August 2012, and visited the islands several times in 2009 and 2010 as well.

IV. Chapter Outline

Understanding the varied effects of the decade-long downturn in Galápagos fisheries, and its multiple and complex meanings, is the overall project of this dissertation. To set the stage, Chapter 2 introduces the recent history of fishing in the Galápagos Islands, major actors, historical governance regimes, and existing knowledge on the state of both social and ecological change. The second half of the chapter presents general results of this project's livelihood survey and major trends in the different ways that fishing livelihoods have been changing since the last in-depth study of fishing livelihoods was conducted in 2004 (Ospina 2006). These results reflect

my practical goal to assist Galápagos managers by answering basic questions such as how various elements of the fisheries occupation (i.e., production for consumption, identity; Ellis 2000), are used by households and to outline trends in change.

Chapters 3, 4, and 5 then present three empirical analyses that study different themes within social adaptation and conservation, in the transitioning Galápagos fishing industry on San Cristobal. Analyses span individual decision-making around occupational change as well as the broad economic structures that Galápagos fishermen operate within. Quantitative data from the 2012 Galápagos Livelihood Survey is analyzed in two parts presented in Chapters 3 and 4.

Chapter 3 uses survey data to analyze labor mobility through fishing. I analyze differences in asset bases to assess the degree to which individual adaptive strategies emanate from potentially variable abilities to leave, paired with analysis of preferences and attachment to fishing. Comparing various hypotheses from the economic theory of labor, the livelihood approach to small-scale fishing, and fisheries anthropology, I show that social considerations beyond profit seeking, a conventional assumption of fisher behavior, shape labor mobility through fishing as revealed through peoples' acceptance of alternate labor choices that do not completely replace fishing incomes.

While Chapter 3 analyzes why people move through fishing, Chapter 4 places focus on survey variables related to proxies of economic security and relative poverty to present an analysis of the social outcomes of present-day fishing strategies and degrees of participation. I place particular focus on two broader dynamics: how the tourism and fishing industries intersect through their overlapping local labor pool, and the double-edged sword of conservation governance on fisher wellbeing. While the fishing industry has undergone a decade-long stagnation, the tourism industry has also been changing, continuing a rapid period of growth.

These changes are changing the calculus of job switching away from fishing, and opening up non-fishing laboring opportunities that are highly uneven in terms of economic return, skill level, and independence. Visible differences in socioeconomic status among registered fishers show that a spectrum of marginalization and precarity is emerging in the fishing community.

Chapter 5 uses the new Galápagos recreational fishing industry, *pesca vivencial*, as a case study in how resilience and complex adaptive systems (CAS) frameworks are beginning to be applied in the Galápagos. I contrast resilience and livelihoods interpretations of emerging resource use patterns, such as recreational fishing, and argue that livelihood work can help to better articulate the weak ways that “alternate stable states” and social feedback loops are analyzed in fisheries resilience scholarship thus far, which may shape the formation of different policy implications. Documenting the diversity of fishing practices that have arisen around recreational fishing, one strong dynamic emerging from community perspectives is the glossing over of how to maintain a self-restrained lifestyle of respecting the environment’s fragile limits (Gonzalez et al. 2008) amidst a loss of community control of the tourism industry. This analysis shows that *pesca vivencial* should be understood as a logical response by local residents to break into a wealthy tourism market that many perceived as captured by local and outside elites, rather than a pursuit of more extractive lifestyles for profit.

V. Contributions from the Galápagos

Nash (2009) argues that despite intense conflicts, the elements of a sustainable society are in the Galápagos due to international attention and commitment, strong local political pushback, and relatively healthy ecosystems. In a global context of continuing degradation of other ocean archipelagos, a sense of urgency has become associated with conservation outcomes in the

Galápagos: “We have one last chance to keep an oceanic archipelago ecosystem intact. Hawaii, the Pacific Islands, the Mascarenes, and other island groups have become an absolute mess” (Nash 2009: 107). Combined with the luxury of relatively well-funded conservation efforts, strong local control of government and progressive adaptive management policies, the Galápagos Islands offer a fascinating laboratory to tackle emergent issues in environmental protection and continuing social adaptation, given the rapid evolution of ongoing searches for more sustainable ways to support their population and environment. Registered fishers in the GMR who have been able to reduce their fishing engagements over time and boost their socioeconomic capital are rare examples of positive social and ecological outcomes of conservation policies in Protected Areas. Understanding the processes that enabled them to do so may help the conservation movement pursue needed goals while being a more benign force of globalization (Zimmerer 2000; Zimmerer 2005).

In the Galápagos and beyond, this project’s intensive analysis of social adaptation is performed in the service of strengthening environmental conservation in both theory and practice. Since Allison and Ellis’ (2001) article, the term sustainable livelihoods and its tenets have become integrated in fisheries development work (i.e., Allison et al. 2002; IMM 2008). However, besides a large-scale development project in Africa (Allison and Horemans 2006), empirical studies of what sustainable livelihoods insights can contribute to understanding transitional or declining fishing industries have been sparse (but see Bene et al. 2003; Smith et al. 2005). This project uses SRL to delve into the dynamics of renewal and reinvention in transforming natural resource industries, far less understood than, and a necessary counterbalance to major work on the demise of fish stocks in ecology (Pauly et al. 1998; Daskalov 2002), fisheries (Allen and McGlade 1987; Levin 1993) and social science (Acheson

2006; Wilson 2006).

Theoretically, I speak to current debates in several geographic subfields. Within political ecology, I participate in a long-running debate around how to conduct serious research on social dynamics that is attentive to political and broader economic context without losing a connection to ecological outcomes (e.g., Vayda and Walters 1999; Peterson 2000). Although research within the context of sustainable livelihoods has linked different livelihood strategies to ecological impact, particularly in farming (e.g., Adams and Mortimore 1997; Batterbury 2001), such work is thin in fishing.

I also take sustainable livelihood methods in unusual directions by expanding beyond studying the extremely poor or marginalized (Ellis 2000). It has been said that the Galápagos has “exiled extreme poverty” (Ospina 2006), but the insight remains that the *relatively* poor may have different needs and thus constraints on behavior that is more conservation-friendly.

Within complexity scholarship, I participate in debates around the potential for more serious applicability to social dynamics, which necessarily includes explicit treatment of power and everyday processes. If complexity theory is to become more reflexive and applicable to on-the-ground governance, serious application to social dynamics must be conducted at a fine, household level, compared to the broad, sweeping conceptualizations that have thus far marked engagement of post-structural scholars (Thrift 1999; Manson 2001), natural resource management (Seixas and Berkes 2003; Gonzalez et al. 2008), and environmental change research (Nelson et al. 2007).

CHAPTER 2

Setting: The Changing Seas of the Galápagos Islands

First considered a barren and harsh site for human settlement when encountered in the 16th century, the natural bounties of the Galápagos archipelago slowly underwrote fishing, tourism, and scientific industries that coexist and share much overlap in territory and labor networks. This chapter provides necessary background on the fishing and tourism industries of the Galápagos, setting the stage for the in-depth analyses in the rest of the dissertation. In the first sections I present the main actors, institutions, and a short history of their interactions that has produced the conditions in which the fishing industry has been operating.

Socioeconomic change is at least as fast paced and dynamic as biophysical changes in the ocean. It is unknown how the recent decade-long downturn in fishing has affected the demographics and socioeconomic character of the fishing sector. The latter part of the chapter provides an update on some broad socioeconomic characteristics of the fishing industry up until 2012.

I. The Biophysical environment

The Galápagos Islands remain among the most ecologically intact oceanic archipelagos in the world, with an estimated 95% of its original biodiversity still extant (Watkins and Cruz 2007; Nash 2009). Isolation from human predation until the 17th century, an absence of large mammals, a position at the juncture of three major ocean currents, and large altitudinal gradients has yielded a high level of microclimates and endemism with about one-fifth of all species there

found nowhere else. Flora and fauna are a distinct mixture of tropical, Indo-Pacific, and South and Central American species (MacFarland and Cifuentes 1996; Edgar et al. 2004).

The archipelago consists of four large and hundreds of small islands and islets. The four largest and inhabited islands are San Cristobal, Santa Cruz, Floreana, and Isabela, from East to West. They sit on the Galápagos platform, an underwater shelf built from volcanic accretions over time and shallower than the surrounding Pacific Ocean at 200 – 1000 m depths (Banks 2002). The Galápagos platform is home to many seamounts, underwater volcanoes that sit roughly 200 m below the surface and often have aggregations of various fish and shark species around them. The biophysical environment of the archipelago is very dynamic, with the coastal oceans undergoing large swings in water temperatures and nutrient loads given natural shifts in current patterns. These rich nutrients contribute to making the Galápagos Marine Reserve

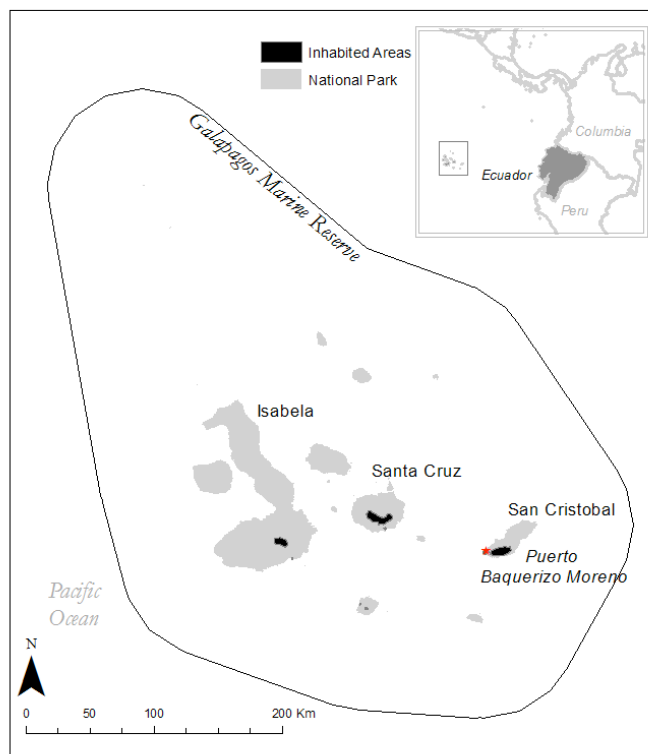


Figure 2.1. The Galápagos archipelago, major islands, and capitol, Puerto Baquerizo Moreno. The Galápagos Marine Reserve extends 40 nm beyond the coastlines.

(GMR) a rich aggregation of both local and migratory marine life in the Pacific Ocean.

Populations are susceptible to catastrophic El Nino-Southern Oscillation (ENSO) events from across the Pacific, which are also linked to heavy rains and droughts, making this a fragile as well as unique environment (Snell and Rea 1999; Reidinger et al. 2002). Underscoring its fragility, although very few species extinctions have occurred many have

declined in recent decades; in 2007 two species of Galápagos corals and 10 species of seaweed were put on the IUCN Red List, none of which are exploited by humans.

Waters are also rich in fish species. Small pelagics such as mackerel and sardines occur mainly in the cooler waters of the slope, shelf, and seamounts on southern and western coasts, serving as food for many animals like sea lions, large pelagics, sharks and penguins. They are also used for baitfish. Large pelagics and tuna species are found throughout the GMR, migrating through as well as spawning in waters 24° C or warmer. Species include billfishes, dorado (dolphinfish), sierra (Pacific King's mackerel), yellowfin tuna, bigeye tuna, and skipjack tuna (Ben-Yami 2001). In addition there are myriad sharks, and the majority of rocky coastline in Ecuador is found in the Galápagos, explaining why it also holds the majority of habitat ideal for spiny lobsters (Bustamante et al. 2000; details in Section II below). Many of these species make up the backbone of contemporary Galápagos fishing industries.

II. Fish and Fishermen

The human dimensions of settlement and resource use are equally rich in history and dynamic in change. In the 1800s the islands were a sleepy outpost of penal colonies and private plantations, made part of Ecuador, and had a sprinkling of Ecuadorian and European settlers. Beginning in the twentieth century, the enormous natural wealth of the Galápagos archipelago underwrote the creation of both a local commercial fishing fleet and a nature-based tourism industry.

A. Fishing Resources

Fishing has a long history in the Galápagos reaching back to the times of the first

attempted settlements in the 1830s, and has filled multiple subsistence, leisure, and commercial needs. For local residents, fishing remains much engaged in for home consumption. Commercial activities began in the 1940s for salted grouper, the 1960s for lobster, and the 1990s for sea cucumbers, still the three dominant fisheries (MacFarland and Cifuentes 1996; Wilen et al. 2000).

The fishing fleet consists of three types of vessels. The largest is the *bote*, a wooden boat up to 18 m in length, with a small cabin for sleeping and a hold. Restrooms are uncommon. Small fiberglass dinghies called *fibras* can be up to 9.5 m long, and *pangas* are small wooden boats up to 6.5 m long, with approximately the same shape (Fig 2.2). Fibras are the most versatile as they are more easily convertible for other uses such as operating day tours, and some in fact have been converted into recreational fishing boats with the addition of a cabin and other features (more details in Chapter 5). They are also faster than pangas; Ospina (2006) notes their use in illegal fishing. In 2006 there were 446 total vessels (67 botes, 145 fibras, and 234 pangas; Zapata 2006). By 2013 vessels had dropped to 371 total, and 261 regularly sailing (GNP 2013).

All information collected by the Galápagos National Park (GNP), as managing authority, and mentioned below is stored in a Fisheries Monitoring Database maintained jointly by the GNP and the affiliated Charles Darwin Research Station (CDRS), documenting harvest at the vessel level since 1994 (H. Reyes, pers. communication). Documentation is spotty and records before 1994 are extremely difficult to find. At present, the salted cod, lobster, and sea cucumber fisheries run on regular seasons agreed upon in a Fisheries Management calendar, which largely mimics export demands and avoids spawning times. The salted cod season begins around September and runs until Catholic Holy Week in April. Lobster fishing opens in September and ends December. Sea cucumber fishing is unique in being contingent upon an acceptable

measured density, and if opens occurs in June and July. The first fishing calendar was created shortly after the establishment of the GMR (c. 2000), and is reviewed and renewed approximately every five years.



Figure 2.2. Various vessel types in the Galápagos fishing fleet. A larger wooden *bote* on the left in construction. Botes are given a coat of paint before going to sea. A line of *fibras* and *pangas* on the right, which are similar in shape but differ in material and length. The boat with a cabin in the foreground is a *fibra*. Photos by author.

A1. Salted cod

The *seco salado* is the traditional fishery of the Galápagos. It targets mixed demersal finfish, the most important of which are serranid groupers, focused on the bacalao (*Myctoperca olfax*) (Ben-Yami 2001). The vast majority of salted cod fishermen are still found on San Cristobal, the birthplace of this fishery. A few boats on San Cristobal, less than five, specialize in not groupers but salted mullet, locally known as *lisa*, to fill a smaller market niche. The predominant practice has remained fishing by hand with a baited hook attached to weights, called an *empate*. Lines are fed across that boat's rail until they reach the bottom and then jigged until a fish is caught, whereby each fish is hauled hand over hand to the surface. Salted cod trips

are typically 15-18 days long and carried out from large wooden *botes* that travel throughout the peninsula. Fish are split and salted in the air before sale. Almost the entire catch is exported to mainland Ecuador, where it serves a culturally important role as food during the Holy Week before Easter. The season revolves largely around Holy week, beginning when mainland merchants start stocking up on bacalao in September although the height of the season begins in December, and continues until Easter (Molina et al. 2005).

Information of seco salado harvests comes from two main sources: export records and fishing trip records, which captains are required to fill out after each trip, and include the fishing grounds visited and total trip catch amount. There is no other monitoring. Population trends are ambiguous, although many scientists think that abundance has decreased in the seco salado. Burbano et al. (2014) found that older generations of seco salado fishermen reported a greater past abundance of groupers than younger fishermen.

A2. Lobster

The spiny lobster fishery is made up of two species, red (*Panulirus penicillatus*) and blue/green (*P. gracilis*). Red lobsters are more abundant and found throughout the archipelago in coastal waters. Both are reported as being littoral and found at depths < 10 m. A third lobster, the slippery lobster (*S. astori*) also known locally as Chinese lobster, is also fished solely for local consumption. All three species prefer rocky substrate, caves, and reefs. *P. penicillatus* is a nocturnal feeder (Bustamante et al. 2000; Ben-Yami 2001).

Lobster was the earliest commercial fishery to successfully target an international export market for a sustained period of time. According to interviews, Japanese and other foreign vessels first came for lobster and began teaching local fishermen how to dive for them, first free

diving with gloves and spear, and now with hookah diving gear. In hookah diving, a diver is connected to the surface by a tube that continually feeds him air, compressed at the surface and sent down by an accompanying machine. Only the tails are exported, with catch usually reported in pounds. Lobster fishing is done by either small teams of 2-3 people in *pangas* who go out for one night, or with a larger *bote* and several *pangas* who go out together for longer trips of several days, during which the *botes* serve as mothership to the *pangas*, who are diving and bringing catch in to the *bote*. Fishermen sleep and eat communally on the *bote*.

Management consists of seasonal closures. In the beginning, lobsters were harvested year round, although since at least the beginning of the Fisheries Management Calendar, harvest is only allowed from September to December. Population health is estimated by trends in catch per unit of effort over time; no independent abundance estimates are made. There is 100% monitoring coverage of catches brought in to the docks of Isabela, Santa Cruz and San Cristobal by Park guards. The Galápagos catch makes up the majority of lobster exports from Ecuador, since national export data and Galápagos catch data closely track each other (Bustamante et al. 2000).

This fishery has undergone the most dramatic fluctuations in catch and market price that is clearly related to conditions outside of fishing alone (Bustamante et al. 2000). In the 1990s the fishery was depressed with market prices below \$10/lb and low catches per unit effort. The fishery has recovered in abundance and profitability however, beginning in the mid-2000s due to boosted market prices and stronger enforcement by the GNP of seasonal closures and sanctions. This period saw a continued drift of fishers into tourism as well, so that overall from 2005-08 active participants dropped by half (Murillo 2010 unpublished). One indication of a long-term decline in lobster over the decades however is the transition to a completely nocturnal fishery

from a previously diurnal one, where animals are caught on the open sandy bottom when they come out of the rocks to feed and are more easily captured. The time of this transition is unclear, although it occurred before 2001 (Ben-Yami 2001). Night diving is more uncomfortable with colder water and more sharks, and so indicates something that would only be done as abundances decline. It is the second most economically valuable fishery after sea cucumbers.

A3. Sea cucumber

The sea cucumber (*Stichopus fucus*) is the last marine resource to have been discovered to have economic value. Fishing began in the 1990s in the Galápagos Islands (Ben-Yami 2001; Bremner and Perez 2002), coinciding with the largest economic crisis of the century in Ecuador from 1995 – 2000, and the realization that highly valuable sea cucumber stocks were still in great abundance in Galápagos after they had been fished out of the Ecuadorian coast (Ospina 2006; Hearn 2008). Fishers cook and dry the animals before selling them to merchants, who usually quote a price per pound (c. 3-4 animals). Harvests are usually reported in terms of number of animals, referred to as units.

This resource is managed in the same way as lobsters, with 100% coverage of catches brought to the docks. Sea cucumbers are the only marine resources that are counted yearly by scientists for abundance estimates. Seasons are 2 months, and if densities are lower than $2/100\text{m}^2$, then a season is not opened. Fishermen commonly take issue with abundance counts and claim underestimates. It is noted that the GMR's no-take zones are "evidently hardly useful" in protecting this stock because sea cucumber grounds are largely outside of them (Ben-Yami 2001). Illegal fishing was rampant in the 1990s by all sectors of society – fishing, tourism crew, and Navy and government officials, depending on who recounts the story (interviews 2010 and

2012). What is clear is that enforcement was extremely spotty. Illegal fishing and enforcement has improved over time, to an ambiguous degree.

This resource is exhausted to a great degree. At first easily harvested at depths no more than 3-4 meters, Ben-Yami (2001) reported that cucumbers were harvested down to 20 m in 2001; in 2012 fishers reported commonly diving past 35 m. The fishery has thus shifted from one characterized by easy profit and low skill, to one of hard-earned profit with mounting physical risk. Yearly dive accidents occur, and long-term or permanent paralysis is not infrequent. Prices paid to fishers by exporters have risen but not maintained overall compensation levels. Although the 2011 price of sea cucumber was up to \$4/unit (Reyes et al. 2012) from the 2000 price of \$0.73/unit (Bremner and Perez 2002), gone are the days of phenomenal profits and bountiful daily harvests.

A4. Whitefish

Finally, multiple marine species are caught and sold fresh for bait or consumption to the local market. Smaller pelagics are caught for bait with beach seines, including clupeids and anchovies, and offshore with hook and line, including mackerel and small arangids. Recently Heel (2012) found that fishermen were catching not only smaller pelagics but top predators like yellowfin for bait, indicating possible overly high pressure on bait fish stocks.

A fishery for tuna and other midwater finfish also exists and appears to have grown since 2001. These fish are largely consumed locally and caught by trolling, or dragging a hook and line called an *arrastre* through the water behind a moving boat. Rod and reel are used, although less commonly. Fish are sold directly from the docks, through seafood shops called *marisquerias* and

often combined with butcher shops, and from fishermen themselves driving around the streets and proclaiming their catch.

In management terms, all of these fishing practices are referred to with the catch-all term *pescas blancas* or whitefish. No information on their population abundance or trends exist or is collected, and their degree of exploitation is ambiguous. Improving fishing techniques and the rise of trolling may be some cause for concern (Heel 2012).

A5. Sharks and Illegal Fishing

Shark fishing has been practiced for decades, and before the establishment of a marine reserve was not illegal. The lucrative market for shark fins fuels a continuing illicit trade, rumored to be more prevalent on Isabela than other islands given the distance from government offices and a weaker economy outside of fishing. Even on San Cristobal in 2012, several fishers admitted to me having finned sharks recently, and one indicated the willingness to do so if he needed to raise quick cash, noting how their numbers have risen dramatically from previous densities before the Marine Reserve was established. Aided by conservation establishment, the archipelago is renown for having schools of sharks in densities found in only a handful of places on Earth.

Industrial fishing fleets from the Ecuadorian fishing center of Manta and from other countries fished the rich Galápagos waters for many years, coming very near to the coastlines to take tuna and lobster before the Marine Reserve was established. After 2001 industrial ships still entered the GMR zone to fish illegally, to the consternation of local fishers. The situation was so common that in 2001 Ben-Yami noted, “Obviously, mainland-based seiners catch small pelagics within [the] GMR. Since this is illegal fishing, no information is available” (np). A common

description related to me was being able to see so many vessels at night in certain areas that the scene resembled a city on the water. Only in the last few years has a satellite vessel monitoring system been implemented, which according to officials has greatly reduced illegal entry by industrial ships into the Marine Reserve to virtually zero (interviews 2012).

B. Political Organization and Interests

The artisanal fishing sector is made up of heterogeneous actors with different roles, patterns of harvest and profit making, and political interests at times. Each of the three major islands has a local cooperative which represents fishing interests: COPREPAG on Santa Cruz, COPAHISA on Isabela, and COPESAN and COPESPROMAR on San Cristobal, the only island with not one but two. These organize under the provincial level cooperative UCOOPEPGAL. One man, Marco Escarabay, was UCOOPEPGAL's president in 2012. Many on San Cristobal have cited Escarabay, who also lives on that island, as the real political head of the fishing sector regardless of who contemporary presidents are of the island-level cooperatives for many years.

The local cooperatives are the official conduit through which the fishing community communicates with the GNP, state and provincial institutions on relevant issues. Delegates to meetings are typically the presidents. Cooperative presidents are nominated and voted upon, and serve with little or no compensation. The president and board members manage affairs, and board members similarly volunteer for 2-3 year unpaid terms. Initially, cooperative membership was mandatory for obtaining a fishing permit, agreed upon by governing institutions with the fishing community. With the new Ecuadoran constitution in 2008, membership was dropped as a prerequisite as part of a broader national movement of freedom to choose associations.

Cooperative membership extends past active fishermen. Many registered but inactive fishermen are members, as well their children, wives, and sometimes relatives, and also seafood merchants.

On San Cristobal the existence of two cooperatives is indicative of the fractious nature of fisheries politics on the island, because no practical difference but internal strife caused the split among fishers several decades ago. When asked why they were part of one or the other cooperative, local fishermen all indicated choosing solely based on the membership of family and friends, or that they were the same. Fieldwork showed that on San Cristobal in the past, local fishers have disagreed on the decisions and agreements made by their presidents with the GNP on various issues. For this reason, frustration and disenchantment with the San Cristobal cooperatives is common.

Notwithstanding the fractious nature of fishing politics today, in the past there have been several notable acts of solidarity by the fishing community. The most often cited sector-wide political action taken by fishermen are the dramatic 3-day protests in 2001, where local fishermen made international headlines for boldly storming the offices of the Galápagos National Park en masse, demanding a relaxation of sea cucumber fishing quotas (de Roy 2001). The takeover of GNP headquarters and threats to harm endangered tortoises caused fishermen to be characterized as chaotic exploiters, "...interested only in profit in the short run..." (TRAFFIC cited in Ospina 2006).

However, fishermen have played key conservation roles as well. The Galápagos fishing lobby's stance against industrial fishing and insistence on extending the Marine Reserve out to 40 nautical miles past the archipelago's coastline was critical. Ben-Yami notes that the scientific community, National Park and CDRS were "...ready to meet the industrial fishing interests halfway and, in fact, to agree to [a] 15 sea miles zone." He goes on:

"...the fact remains, however that the width of the 40-mile zone is less dictated by

protection needs of the Galápagos marine habitats, than by the resolution to allocate to local fishermen extensive offshore fishing grounds. This exclusivity can be used in the future as compensation for the much-needed reduction of inshore fishing effort” (2001: np)

Therefore, the stances that the fishing sector has advanced over the years on management issues cannot be cleanly characterized as either anti- or pro-conservation, but reflect more complex local politics and a sector that is highly heterogeneous in political views.

C. Institutions and Governance Regimes

Both marine and terrestrial governance can be characterized by various historical governance regimes. Arguably, in the beginning resource use was open access given the absence of state oversight. Low human population densities were joined with narratives that describe bounty and a lack of the need for restrictions or closed zones (e.g., Ospina 2005; Engie unpub. data). The fishing and tourism sectors grew organically and informally; local residents and fishermen often took visitors out on their small boats for day trips. As tourism and industrial fishing in the coastal areas of the Islands both grew and attracted actors from the mainland and abroad, conflicts between local fishermen, industrial fishermen, and tourism groups grew as well. With the establishment of the Galápagos National Park (GNP) in 1959 and the affiliated CDRS in 1960, conservation interests came to the archipelago, with great international networks of participants and interests. By the 1990s, these sectoral conflicts had grown to extraordinary levels.

The writings of MacDonald (1997), Grenier (2000), and Ospina (2006) have dissected this period. MacDonald (1997) argues that the intense conflicts of the 1990s have at their heart a disagreement between local residents and institutions over the nature of resource use and rights. Locals have always considered Galápagos resources common-property due to their longstanding

use of the landscape. In reality, resources are public property and the Ecuadorian State rather than the community has always owned them. Such divergent viewpoints lay dormant until hands-on governance intensified in 1959, when the State decided to enclose 97% of all land inside the newly created Galápagos National Park, introducing tensions with island residents. MacDonald advocated for managing resources *as if* they were communal property, putting community-based management in action with participatory processes that would give local people more inclusion and say in policies.

Grenier (2000) also argued for the necessity of local control of resources, and believed the Galápagos faced a choice between further connections to outside, global networks of capitalist development, or local use of resources that compromised some development and amenities for the sake of the fragile environment. The former would continue to erode ecosystem and cultural diversity. Both works had great influence over the structure of the landmark legal reforms implemented in 1998, called the Organic Law for the Special Regimen for the Conservation and Sustainable Development of Galápagos (LOREG) or simply, the Special Law. Formed with intense effort put into consensual and participatory processes and incorporation of known ecosystem science, the Special Law represented a paradigmatic shift for local governance (Baine et al. 2007; Heylings and Bravo 2007). It gave significant power to the province, making the Galápagos the most autonomous of all Ecuador's provinces. Part of this autonomy stems from a dedicated source of income, since 45% of income from entrance fees to into the archipelago⁹ go directly to the GNP, 25% to municipalities, and 20% to the provincial-level Governing Council, formerly known as INGALA (GNP 2013). Making up over \$21 million from 2010-11 (GNP 2013), these funds enable the National Park and local governments to plan and

⁹ In 2012 these entrance fees were \$100 per adult of foreign descent, \$50 per child under age 12 of foreign descent, and \$6 per adult for tourists and foreign nationals residing in Ecuador (GNP 2013).

execute their mission with significant flexibility. Ospina (2006) argues for an “optimistic” interpretation of what the Special Law represents, which is a mutual limitation of economic self-interests by conservation, tourism and fishing actors, each of whom agreed to previously unheard of limits in territory and practices.

The Galápagos Marine Reserve was established in 2000, modifying the prior-existing Galápagos Marine Resources Reserve, so that its borders extended offshore to 40 nautical miles beyond the outer edges of the islands, enforceably excluding industrial fishing for the first time (Heylings and Bravo 2007). This space encompasses 133,000 km² and represents over one-third of all waters protected in Latin America for conservation (Guarderas et al. 2008).

Out of this era was born the constellation of documents, institutions, agencies and boards that currently govern resource management and fishing in the Galápagos Islands. Major documents are a Fisheries Management Plan that lays out the major rules of catch, gear, timing, and commercial access by permit registration to be renewed every two years. This Plan was revisited in 2009 and updated. While subsistence fishing was previously entirely unregulated, anyone can still obtain a subsistence fishing day permit to do so. Entry into commercial fishing has hardened, and only children of currently registered fishermen may now apply for a license (Wilen et al. 2000). The 5-year fishing calendar mentioned above was also begun. As new laws or modifications are created over time, they are put into effect largely by the publication of Resolutions (by the GNP) and Executive decrees (by the national government). All governing decisions are formally funneled through the GNP, which has final authority on actions (Fig 2.3). The Participatory Management Board (JMP in Spanish) hears issues and proposals and votes on resolutions, with each member organization carrying one vote. By consensus, resolutions are passed to the Inter-institutional Management Board (AIM in Spanish), where again, each

member group casts one vote. The AIM commonly takes recommendations given to it by the JMP and approves them. The JMP and AIM represent official channeling of the community's participation in management issues.

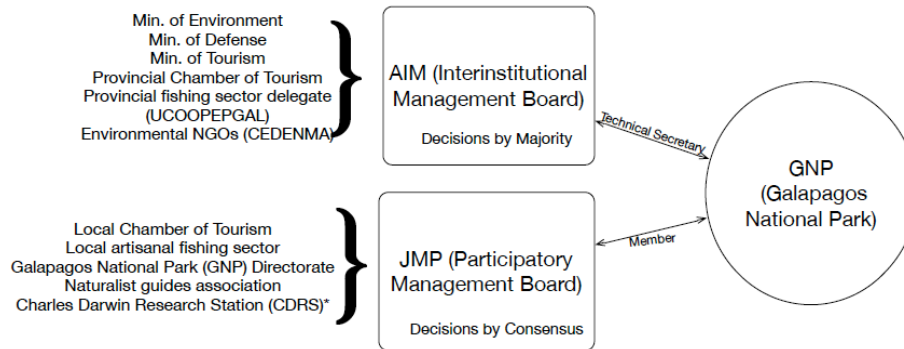


Figure 2.3. The participatory management structure within the Galápagos Marine Reserve. Spanish acronyms are used for the AIM, JMP, CEDENMA, and UCOOPEPGAL. Modified from Heylings and Bravo 2007.

*The CDRS serves an advisory role to the GNP and no longer has voting power.

The constellation of institutions in the Galápagos is prone to fighting amongst themselves and exerts relatively weak control over law enforcement. Further, “the Ecuadorian State transfers to the Galápagos its structural weaknesses: regional disputes, budgetary and technical shortages, the inability to apply its orders and politics, and the lack of confidence of the citizens in the integrity of its decisions” (Ospina 2006: 124). In many ways, policies are designed to contain contradictions and competing uses, and there are many inherent tensions.

International non-governmental organizations (NGOs) have also played key roles in Galápagos governance, drawn to the archipelago by high levels of endemism and role in the science of natural history. NGOs serve as environmental advocates and partners in finance, research, and development with local and state institutions. Major environmental NGOs with offices in the Galápagos (mostly Santa Cruz) are Conservation International, WildAid, the World Wildlife Fund, and Sea Shepherd. Others more oriented toward local social issues as well as the

environment include Fundacion Natura and the University San Francisco de Quito. The US, Spain and Japan have also funded major initiatives through their development agencies. In fishing, NGOs have funded major initiatives to develop the processing capacity of the sector and foster ties between the fishing and tourism sectors around sustainable seafood. Prominent ventures include building processing plants on both Santa Cruz and San Cristobal, the latter by the Spanish Aid Agency ARAUCARIA. Other projects have included strategy and financial support for local value-added seafood initiatives, pilot projects for recreational sport fishing ventures, and periodic assessments of the Marine Reserve. WildAid and Sea Shepherd specialize in giving the GNP vessels and mechanical support for monitoring, and have significantly funded the recent satellite vessel monitoring system.

D. Fluctuating Social Conditions: Socio-demographics and Livelihood Diversity

Perhaps because the *seco salado* began there, San Cristobal is home to over half of all Galápagos fishermen, followed by Santa Cruz. The oldest fishing families began doing so in the early days of Ecuadorian colonialism in the mid-1830's, and by now are on their fourth generation, making the Galápagos fishing tradition relatively young compared to many fishing communities around the world.

By all accounts up until the 1980s, Galápagos fishermen numbered less than 200 (120 in 1981; Ben-Yami 2001) and focused on finfish and the *seco salado*. Some call these old-timers the “authentic” fishermen, contrasted to the relative newcomers and “opportunists” who came into the fishery from 1992 onwards with the beginning of sea cucumber fishing (Ben-Yami 2001; Ospina 2006). The sea cucumber boom attracted a flood of new entrants: locals, immigrants from mainland Ecuador, and many first-time fishers (Bremner and Perez 2002). Daily profits were enormous; they exceeded Ecuador's per capita *yearly* gross income for several years (Table 2.1).

Table 2.1. Gross and per capita income estimates for the sea cucumber and lobster fisheries over time. All figures are in U.S. dollars.

*Sea Cucumber			**Lobster		
Year	Gross income	Per capita gross income	Gross income	Per capita gross income	~Avg Ecuadorian Per capita gross income
1994	4.0 million	10,204	517,176	1,296 (1997)	2,050
1999	3.5 million	4,428	933,504	1,369	1,599
2000	3.6 million	2,929	1,701,700	1,438	1,462
2005	-	-	`820,000	1,244	3,013
2008	-	-	687,940	1,792	4,256

* Source: Ospina 2006

**Source: Murillo 2010 (unpublished data)

`Source: Ramirez et al. 2012

~ Source: World Bank 2014

In 2001 the fleet was characterized as having more newcomers than old-timers by Ben-Yami (2001), who however were establishing larger roots in the islands by establishing families, building houses, and investing more in fishing equipment. These newcomers were largely from Manabí and Ecuador's other coastal provinces (Ospina 2006). Several years later Ospina (2006) categorized the "social origins" of fishermen into three groups, the first two as described above and a third group attracted by a more recent "commercial boom", dealing in the commerce as well as harvesting side of fishing, and whose primary economic support was other work in the public sector and commerce (39). This third group includes people from old colonial families as well as newer migrants.

Besides these three "waves" of various social origins, a second axis on which to categorize the fishing sector is via the functions that individuals carry out, which also relates to their share of profits and to some degree, gender and age. Zapata (2006) and Ospina (2006) have both outlined the major subgroups according to their specialization in specific activities, summarized again here:

Armadores: are the owners of fishing vessels, who may or may not always fish with their boat, and often captain if so. Most women in fishing are involved as armadores. Boat owners outfit vessels with gasoline and supplies and shoulder all upkeep. To compensate for this responsibility the boat commonly earns an equal “share” of the catch, which is split evenly among fishers, so that an armador/pescador (fisherman) earns two shares, one for him/herself and one for the boat. They shoulder more responsibility, but earn more profits. They often maintain contacts with seafood merchants as well; other fishermen less so.

Buzos: are the divers. Diving is done for lobster and sea cucumber, and a smaller number also dive for octopus, conch, and fish for local consumption. Diving carries the greatest personal danger among fishing practices, and is commonly a job for younger men. Divers earn more compared to fishermen who do not dive, given the higher profit margins in sea cucumber and lobster fisheries. They are rarely the *armador*.

Fishing assistants: Several types of fishing assistant roles also exist, the most prominent being the *panguero*. The *panguero* is a trusted assistant to a diver, often a close friend or family member, operating the hookah’s air compressor machine and maneuvering the panga or fibra on the surface with the moving diver to avoid rocky ledges. This job is very important since he can save a diver from death or conversely cause him great harm. Many are paid a set dollar amount per day (\$50 in 2012) that can be far lower than a diver’s earnings, although some (usually family members) are given an equal share of the catch. The other major fishing assistant role is the *cocinero* or cook, who typically gets a small (c. \$50) set rate per day on top of his share of the catch for providing the cooking services on *botes*.

Comerciantes: are seafood merchants, who buy catch from fishing boats and ship them to mainland Ecuador or abroad.

Although many people have entered fishing in times of lucrative profits, Ospina (2006) notes that entry into fishing is also driven by family needs and circumstances. I myself have also interviewed fishermen of this stripe. One man in his mid-thirties recounted being the oldest of four children, and beginning to fish to help support the family. Fishing has always served as a source of income when other jobs were not available. Interviewing fishermen of all ages in 2012, a common reply to the question of why someone started fishing in decades past was “there were no other jobs”. Like other fishing communities, kinship ties play major roles in choosing fishing partners (e.g., Lofgren 1972, Terkla et al. 1988); I observed many fishing crews of relatives such as brothers and brothers-in-law, sometimes responsible for involving each other in fishing.

There is much overlap in the labor pools between fishing and other sectors. It is often true that a fisherman is a tour operator is a public servant, or some combination. This livelihood diversity stretches across *comerciantes*, *armadores*, and fishermen on the ocean. Job switching into and out of fishing is also a long-standing dynamic. Of all the original fishing families on San Cristobal, perhaps half left decades ago and turned toward tourism (Ospina 2006, Reck pers. comm, Engie unpublished data).

Despite various attempts at developing more productive linkages between the fisheries and tourism sectors, these linkages remain weak, with locally caught fish largely serving the consumption needs of local residents and export markets, and the tourism food sector using significant portions of imported seafood, even while buying some local catch. In terms of the local market, many fishermen on San Cristobal have noted that a handful of full-time fishermen could easily satisfy island demand. These indications highlight the utmost importance of the external market to the maintenance of local fisher livelihoods.

E. Changing Seas

Tourism is the economic engine of the Galápagos archipelago. The strength of the industry lifts not only the provincial but the national Ecuadorian economy, with gross revenues estimated at around 175 million in 2003 (130 going to the national economy; Ospina 2006) and 300 million in 2007 (Dixon 2007). Deliberate alignment between tourism and conservation interests several decades ago helped to spawn the “floating hotel” model of high-end tourism that the Galápagos market is known for, with the reasoning of keeping its human footprint relatively low and economic benefits relatively high (Ben-Yami 2001; Grenier 2007).

The archipelago experienced exponential growth between 1999 and 2005, with a GDP on par with the fastest growing economies in the world (9.6% annually). Tourism contributed $\frac{3}{4}$ of this GDP growth (Taylor et al. 2006). Despite this growth, per capita income increased only 1.8% annually between 1995 and 2005, pointing to growing social inequality and raising questions around of the official goal of channeling economic benefits to the population of around 26,000 residents to create conservation incentives.

While fishing briefly rivaled tourism in value at the height of the sea cucumber boom of the 1990s, it has since been eclipsed and is likely shrinking in contributions to island gross domestic product (GPD). Gross revenues for all fisheries likely remained below 5 million in the mid-2000s or < 4% of total Galápagos income, to contrast the value of tourism given above (Hearn et al. 2007; Watkins and Cruz 2002).

From the 1980s to 2001, the fishing sector was characterized by continuous growth in both participants and vessels. However (coincidentally) since the enactment of the Special Law, catch rates have been generally declining in the Marine Reserve in terms of both abundance and size in the primary fisheries of sea cucumber, lobster, and salted fish, as outlined above (Hearn et

al. 2007). This decrease in catches intersects with several processes: (a) improving economic prospects in local tourism and commerce, (b) gradual improvement in monitoring and enforcement, and (c) shrinking populations of resources in the sea.

III. Galápagos Fishing Livelihoods In 2012

In many ways Galápagos fishermen are still being characterized by their past growth and seen as potentially degrading forces on the environment – and because they are ever changing, being mischaracterized. Histories of past conflicts, demands for greater harvesting privileges, and undeniable overfishing from the 1990s often leads to the characterization of the fishing community as politically volatile and potentially dangerous to conservation because of their potential to fish down marine resources. In reality much has changed: the sector has been on an extended decline that began in 2001.

Preliminary interviews in the archipelago in 2009 and 2010 revealed that social dimensions of the rapidly changing fisheries sector were not being studied at length. To some, reorganization of the fisheries sector is welcome, but managers now see a larger “issue” with the pollution and safety of fisher-led initiatives to work in loosely regulated taxi and ferry transport, although they rarely discuss the lack of resolution on the impediments to labor movement in more preferred channels (i.e., tourism).

What are fishing livelihoods like now? Below I present broad trends in the directions that fishermen see their industry and themselves going, condensed into broad fishing livelihood strategies. Subsequently, the effects on species fished, the direction of labor flows, and who in the community is leaving are discussed.

A. Livelihood portfolios among Registered Fishers

The pool of those fishing regularly seems relatively stable on a yearly timestep, with little movement into and out of fishing in San Cristobal from 2009-11. Of 167 surveyed, 15 people had diminished and 7 intensified fishing (as a measure of their total income), while 145 maintained their fishing levels¹⁰ (Table 2.2).

Table 2.2. Survey respondents who are intensifying or diminishing their fishing engagements from 2009-12 (left), and through the course of their working career (right).

2009 - 2011		Career-wide	
FISHING STRATEGIES	N (%)	FISHING STRATEGIES	N (%)
Diminishment	15	Diminishment	117
FT – PT	7 (47%)	FT – PT	57 (49%)
FT – Occasional	1 (7%)	FT – Occasional	9 (8%)
FT – Inactive	4 (27%)	FT – Inactive	38 (32%)
PT – Inactive	2 (13%)	PT – Occasional/Inactive	12 (10%)
Occasional - Inactive	1 (7%)	Occasional - Inactive	1 (1%)
Intensification	7	Intensification	10
PT – FT	3 (43%)	PT – FT	7 (70%)
Inactive – FT	2 (29%)	Inactive – FT	2 (20%)
Occasional - PT	2 (29%)	Inactive - PT	1 (10%)
Steady Maintenance	145	Steady Maintenance	70
Full-time	44 (30%)	Full-time	40 (57%)
Part-Time	47 (32%)	Part-Time	16 (23%)
Occasional	11 (8%)	Occasional	6 (9%)
Inactive	41 (28%)	Inactive	8 (11%)

On longer timescales, of the 58 occasional and inactive fishers interviewed, most had once been full-time (n=47, 81%). The other 13 had fished since childhood in occasional and part-time capacities, sometimes during school holidays or weekends or with family members who fished. In total of the 167 surveyed, 117 (70%) have diminished their fishing engagements over time.

Consider entry into fishing in three eras: waves 1, 2, and 3, as characterized by Ospina (2006): (1) the older fishermen who were involved before sea cucumbers began, which Ben-

¹⁰ In light of the relatively few people that fished occasionally (12 of 167), where fishing accounts for $\leq 30\%$ of their income, I lumped this group of fishers in with the 46 inactive survey respondents for statistical and graphical analyses.

Yami (2001) pegs at 1992, (2) those who entered in the sea cucumber era, and (3) those who came in later with a renewed interest in commercialization of fishing. Survey respondents entering during these three eras span the gamut of fishing participation levels (Fig 2.4). Those from “wave 1” are now shrinking in full-time participation, with age and the rise of non-fishing work opportunities over time, although many are still fishing actively. Notably, no one in Wave 3 is full-time, indicating that those entering fishing now view it as part of a diversified livelihood portfolio, and not an exclusive occupation.

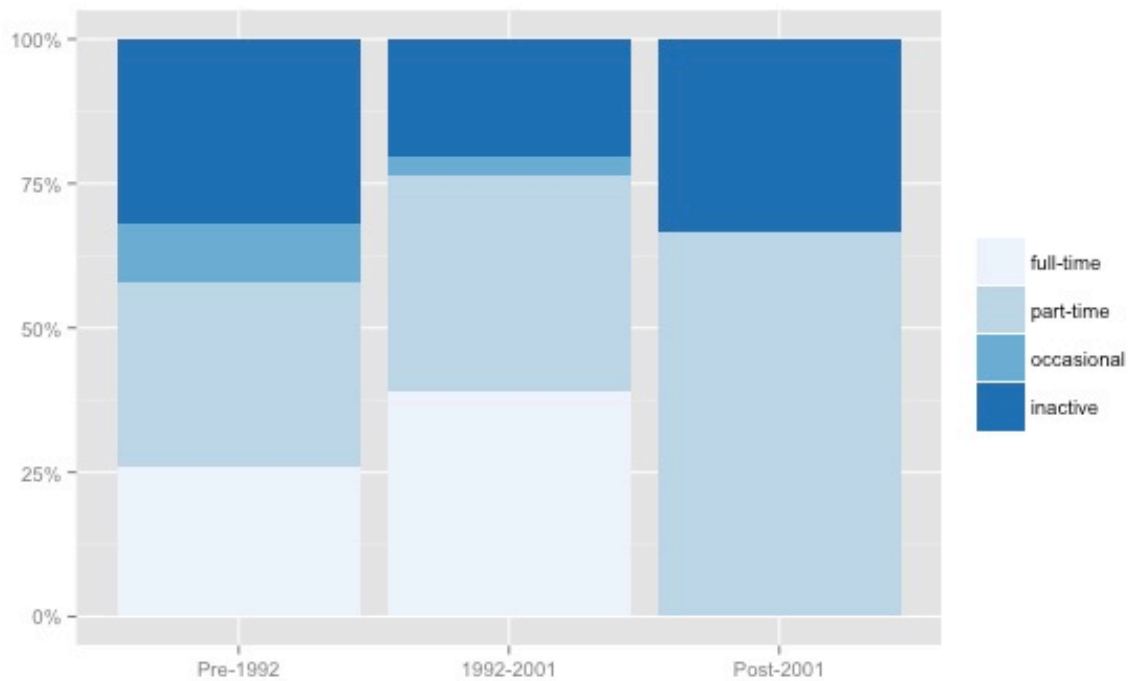


Figure 2.4. The fishing status of individuals according to the time they entered fishing.

The 2012 livelihood survey confirms and sharpens past observations of how people participate in fishing in different ways. Part-time fishing was found to be very common, in line with past observations. The livelihood diversity found among registered fishers shows that they

were highly connected to other economic sectors in San Cristobal (Fig. 2.5). The median number of income-generating activities held was two per person, and ranged from one to six. Eighty-eight percent of survey respondents also prefer to have more than one job in the household. Of people that were not full-time fishers, the majority (81.4%) reported having more than one job. Eighteen (36.8%) full-time fishers also reported more than one job, which while representing a very small portion of their total income, shows that a third of even full-time fishers worked in other economic sectors from 2009-11 in fishing off-seasons.

Job switching in general occurred more frequently than job switching in fishing, with slightly less than a third of all individuals (28.4%, $N=48$) reporting that they or someone in their household changed jobs from 2009-2011. This is a much higher frequency than individuals reported moving in and out of fishing. From 2009-2011, 72% ($N=121$) of active fisher households reported the same occupations with no changes. Registered fishers were involved in various types of non-fishing work, the most by far ($n=62$) being in tourism, most commonly as a tour boat captain followed by a *marinero*, or deckhand or sailor (Fig 2.5, Table 2.3).

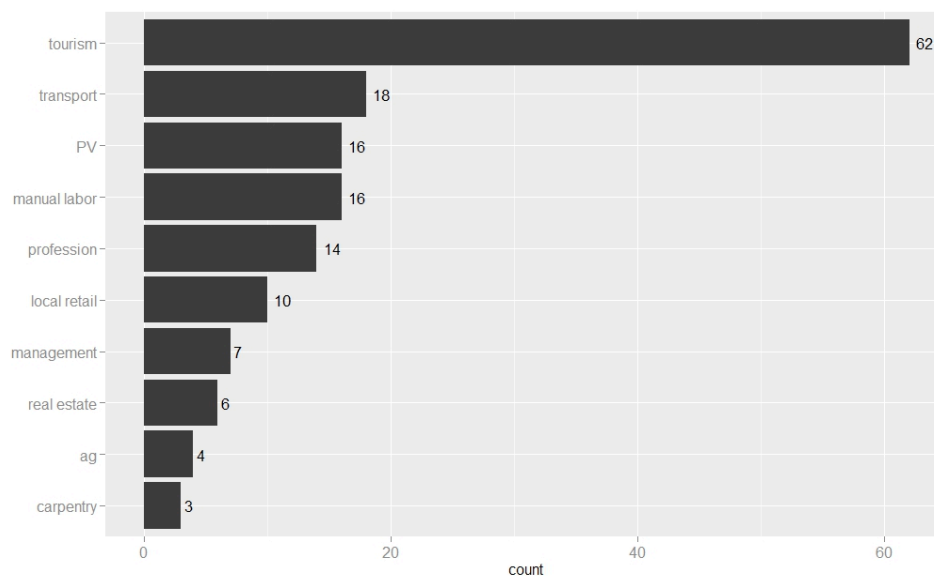


Figure 2.5. Work that survey respondents reported having worked in, besides fishing. Frequency counts are overlapping, so that one person could be counted in several categories depending on the number of jobs they hold.

Table 2.3. Specific jobs held by survey respondents that are contained in the loose categories graphed in Figure 2.5.

Tourism	62	Profession/Office Administration	14
Tour captain	12	accountant, govt	3
marinero	11	teacher/professor	3
tour guide	10	executive	3
tour agency owner	9	Assistant	3
tour boat owner	4	public works	1
tour boat cook	4	welder	1
hotel owner	3	Local retail	10
timonel ^a	3	local shop owner	3
dive guide & timonel	1	restaurant owner	3
patron costanero/armador	1	local shopkeeper	3
aceitero	1	laundromat	1
tour boat manager	1	sundries & internet stores	1
Transport	18	Management	7
taxi driver	8	GNP guard	3
driver, govt	3	*GNP monitor	1
bus driver	3	GNP guard to fisher	1
water taxi	3	fish plant operator	1
Cabotaje driver ^b	1	Real Estate	6
GNP boat capt'n	1	rental apts	6
PV	16	Agriculture	4
Manual labor	16	Owns cattle ranch	2
security guard	5	Owns farm	2
construction	7	farm worker, wood carver	1
cargo	4	Carpentry	3
		Naval carpenter	2
		Carpenter	1

*contract work

^ahelmsman or mate

^binter-island ferry

Survey respondents roughly follow one of three broad livelihood strategies at present, apparent from both their work patterns and stated preferences: (a) individuals seeking to completely transition away from fishing, (b) strategies of long-term livelihood diversity, and (c) strategies of fishing exclusively.

4.1. Strategies of Transitioning Away From Fishing

Many active fishers were seeking to leave the industry. Overall half of surveyed full-time fishers would like to find work outside of the fishing sector and 45% of part-time fishers would like to reduce their fishing levels further (Table 2.4). These long-term strategies were not in

perfect alignment with the categories of “intensifying”, “diminishing”, or “steadily maintaining” fishing levels from 2009-2011.

Table 2.4. Fishing preferences of survey respondents, according to their fishing status in the 2011-12 season.¹¹

	Full-time	Part-time	Occasional	Inactive	Overall
Fish more	-	1 (2%)	-	1 (2%)	2 (1.2%)
Remain as-is	15 (31%)	19 (33%)	8 (67%)	40 (87%)	62 (37.1%)
Fish less	31 (51%)	26 (45%)	1	-	37 (22.2%)
Go into recreational fishing	0	4 (7%)	1(8%)	3 (7%)	7 (4.2%)

¹4 out of 12 occasional fishers were asked this question

Transitioning out however of fishing is often a multi-year process. Twenty-three individuals who did not change occupations from 2009-11 have nevertheless applied for some type of tourism permit before; many continue to actively fish while seeking other opportunities. These applications show long-term efforts to transition away from fishing or diversify, even among those still actively fishing.

Table 2.5. Survey respondents who have ever applied for a permit for any tourism-related operation (e.g., operating tour boats for day tours or cruises, recreational fishing).

	Yes	No
<i>Fishing Strategy</i>		
Intensify	0	7
Diminish ¹	7	7
Same	23	115
<i>Fishing status*</i>		
full-time	8	40
part-time	11	43
Occasional/Inactive	11	44

¹14 out of 15 diminishers were asked this question

Many now-active fishers implied plans to leave in coming years. Some fishers are planning transitions with the aid of their spouses or family members, and some are simply seeking an

¹¹ Individuals were asked if they preferred to continue with their current labor activities or not, and then what they would prefer to do. Open-ended responses were categorized into four levels of preference around future fishing levels: to fish more than at present, less, continue with their activities, or some ambivalent response.

opportunity with no current plans, ambiguously saying they would like to, “renounce fishing and work in tourism” or, “if there were an opportunity, I’d take it”. A non-significant portion of all individuals seeking other work indicated a desire to work outside of any positions requiring customer service, although this did not preclude them from looking for (and finding) crew-based work on tour ships.

A2. Strategies of Long-Term Livelihood Diversity

In general, part-time fishing represents a deliberate move away from full-time fishing but not necessarily a desire to leave fishing entirely. Among one-quarter of part-time fishers surveyed, there is a strong desire to retain fishing as a source of employment in diversified livelihoods. Nineteen of the 35 part-time fishers asked intend to remain in fishing part-time. An additional 12 expressed a desire to stay for another 5-10 years before switching to non-fishing work entirely (Table 2.4; lumped into “fish less” category). Twenty percent of these individuals have been part-time fishers¹² for their entire careers, 80% were formerly full-time. In terms of the social origins discussed by Ospina and Ben-Yami above, those pursuing strategies of permanent diversification span all three “waves” of fishermen – old-timers who began before 1992, those who began between 1992-8, and a third wave who entered fishing in the 2000s. The two youngest fishermen interviewed (ages 20 and 21 in 2012), who entered in 2010 have always been part-time, pursuing work in tourism and commerce as well. Joining their ranks, five of the 15 “diminishers” were moving towards part-time fishing as preferred long-term work. One was becoming more involved in the new recreational fishing industry, and one always fluctuates between occasional and part-time fishing.

¹² “Current” refers to the time of survey, in spring 2012.

While the reasons for livelihood diversity are complex, interviews revealed both a significant informal economy and uncertain job stability. In non-fishing work, respondents repeatedly noted the lack of job security, even for government positions, because new political regimes triggered job turnovers in potentially any position. Fishing is thus continuing to provide a security net in times of job loss or low non-fishing work.

Declining and erratic incomes were noted as a major reason for part-time involvement. Diversifying across fishing and other work spreads risk throughout diverse labor markets and seasons, in what Ellis (2000) calls “covariate risk”. As one put it,

Fisher 13752: When I can go, I like the life of the sea. When I get the chance I go, even if just to catch a little bit. What we catch doesn’t cover fuel. Since we have our other activities, I use the pay from those and spend the day well. If we fish well, good. If we go badly, it’s just as good. We always go fishing as a family. I have another cousin who is also a fisherman, my brother also. The three of us go. We all have other activities apart from fishing. We don’t depend exclusively on fishing.

It is notable that even those individuals pursuing livelihood strategies of permanent diversification appear constrained in the non-fishing work they can find. Fifty-five percent of part-time fishers would like more non-fishing work, and 53% of full-time fishers would also prefer some non-fishing work if it were available (Table C2 in Appendix C).

A3. Strategies of Fishing Exclusively

Finally, a third and relatively small group of interviewees, 17 total, reported that they would remain in fishing full-time or wanted to fish more. One out of seven individuals who intensified fishing did so because “fishing is more fun. In tourism one is more enslaved”, returning after 1.5 years of work as a sailor in tourism. Some echoed these sentiments, having the assets and capabilities to work in tourism, but in some cases choosing not to. One interviewee noted that he wouldn’t work in tourism as an employee, but only as an owner of an operation if

he had the chance. Why do so, when “fishing is adventure. Each day is a new day to know something.” Another reported that fishing was more “tranquil” than working in institutions, which were political. Other individuals however believe they have no other options, because of age or education:

Interviewer: what do you want to do besides fishing?

Fisher 63392: At my age! I don’t know because at my age I’m already old. (laughing, 40 years of age)

After reporting that he did not want to continue fishing for the rest of his life, one fisher related,

Fisher 65620: You know it’s difficult. If you don’t have for example, higher education, you are not able to get work in an institution, and then sometimes fish on the weekends. But with an incomplete level of studies, it’s difficult to enter an institution.

Interviewer: Do you have some type of preferred work outside of fishing?

Fisher 65620: Ah no, because I can’t work in anything else. Nothing. When I have no work [in fishing], I just help my wife in her workshop [sewing clothes].

However, those fishers who mentioned staying in fishing along with an inability to leave due to age or lack of opportunities with their low education levels show a belief in an inability to leave the profession.

B. Conclusion: Continuing Fluctuations in Social Conditions

B1. Changing Species Impact

How then, have fishing livelihoods changed with the downturn of the recent decade? In terms of the species fished, although the decline in fishing participants has been fairly steep, none of the major Galápagos fisheries appear to be disappearing. Many full-time fishermen are generalists and participate in every major season. Part-time fishermen mostly participate in lobster and sea cucumber and also the whitefish day-trip fishery, but rarely the *seco salado*,

whose 2-week trips are more difficult to balance with other work. As one scientist put it, sea cucumber fishing is the last one that people give up since it is the most profitable. To a certain degree this is true; after people get into the mid-thirties or 40 years of age, they largely stop diving because of its dangers, and then participate very little in either sea cucumbers or lobster. Some act as *pangueros* occasionally, but the majority interviewed expressed a dislike for going out if they were no longer diving. At this stage, those still part-time are participating in the *seco salado* and then working seasonal jobs during the rest of the year. There are thus various patterns of where part-time fishing effort is placed: mostly in lobster and sea cucumber, mostly in whitefish for those who dislike diving and long trips, and mostly *seco salado* and whitefish for others.

B2. Socio-demographics of Exiting and Recent Labor Flows Between Sectors

Both older and newer entrants, “opportunists” and longtime fishers, are leaving the profession, looking to leave, or would like to leave. Those remaining full-time are increasingly the minority. Active participants have declined from a high point of over 1100 in 2000 to 536 in 2011, archipelago-wide. This gives an overall rate of 49% of active fishers and 50% inactive (GNP 2013). The family networks of fishers from older island families provide assistance in several ways: as potential sources of financial support and partnership in entrepreneurial ventures, and as a source of general connections since they also tend to have family members with decades of experience and connections in either public service or owning businesses. However, the “second wave” of migrants into fisheries in the 1990s now have considerable roots as well, and any differences in social networks don’t always make a big difference. In addition such support often extends only to one’s nuclear and very close extended family, and conflict

within family trees is also common. Illustrating this, the sizeable element of the fishing population that are pursuing long-term, diversified livelihoods in fishing (i.e., part-time fishing) cut across the three “waves” of fishermen characterized by Ospina (2006) according to the time they entered fishing (Fig 2.4).

The direction of labor flows between fishing and the other economic sectors of the Galápagos economy has switched entirely from 2001. Registered fishers seem to be drawing on the same type of livelihood diversity that they always have: seasonal handiwork such as construction, painting, and carpentry, and more steady work in the public sector, tourism, and from family businesses. Movement into tourism, and interest in more tourism work, is notably larger than in 2001. Ben-Yami (2001) reported strong socioeconomic pressures to move into fishing because of higher wages compared to the sea-based tourism industry and stagnation of local land-based tourism.

The directions out of fishing have changed alongside the evolution of structures and opportunities in tourism and the public sector. Sea-based crew jobs onboard tourism boats have grown since 2001, when scholars noted that it did not pay as well as fishing (Ospina 2006). In 2012, field observations showed that the base for local tourism was higher than in 2001, although still a far cry from Santa Cruz. The number of hotels, restaurants, and bars on San Cristobal has slowly risen, and attract a steady stream of land-based travelers, although tour agencies reported a consistent under-capacity. Wages are also higher for sea-based crew, although a full-time fisherman can still earn more than semi-skilled positions such as sailors and deckhands (Details in Chapters 3 & 4 below).

The following chapters investigate more detailed aspects of the livelihood strategies found in fishing presented here, on the various motives besides profit maximization that drive

fishing pressure (Chapter 3), the various interpretations of shifting social vulnerabilities in Galápagos society and the political economy of job creation in the tourism economy (Chapter 4), and regulatory debates and political dynamics in recreational fishing (Chapter 5).

CHAPTER 3

A Livelihoods Approach to Declining Participation in Galápagos Fisheries: Community Perspectives

I. Introduction

This chapter represents the first of a two-part analysis of the 2012 Livelihood Survey described in Chapter 1, investigating labor mobility through fishing. Chapter 4 will present a second and highly intertwined analysis of what survey data reveals about the social outcomes of socioeconomic change; here is presented the analysis of why and how people leave fishing, as they themselves tell it. Specifically I ask why it is that some are better able than others to leave fishing. Analysis investigates occupational change through fishing in San Cristobal in a recent three-year period (2009 – 2011) as well as over long-term career trajectories. Results bring out more detail from the broad overview of trends presented on changing livelihoods in Chapter 2.

The simple question of why people move through fishing is key to a prominent issue in fisheries management in the Galápagos and elsewhere, namely the long-term concern for many marine stocks declining due to human exploitation (e.g., Pauley 1998; Hearn and Murillo 2007). Many “alternate livelihood” programs and governance policies have deliberately aimed at shrinking fishing sectors worldwide, but their ambiguous outcomes have given rise to the question of whether some people are less able or willing to leave fishing than others. Factors often cited include understudied and easily misunderstood local job market dynamics, and reluctance or inability to exit by some individuals that is attributed to high job satisfaction (e.g., Pollnac et al. 2001; IMM 2008) or poverty (e.g., Cinner et al 2009). Even as reserves show

compelling benefits to degraded ecosystems over time (Côté et al. 2001; García-Charton et al. 2008), the difficulties alternate livelihood programs have had add to the trenchant critiques of their “social failures” that are now a major threat to stakeholder buy-in (Christie 2004; West et al. 2006).

A second aim of this chapter is to connect the focused study on community-based perspectives conducted here with ongoing econometric analyses of seasonal fishing patterns, a potentially fruitful interdisciplinary area. Past work on fishermen’s perspectives, discourses, relationships with nature, histories and socioeconomic conditions (e.g., Finchum n.d.; Reck 1986; Ben-Yami 2000; Wilen et al. 2001; Ospina 2005, Ospina 2006) have left unremarked the potential contributions to the short-term, quantitative analyses conducted around Galápagos fishing, which are often richer in biological and spatial detail than social studies (e.g., Viteri et al. 2005; Castrejon 2011; Bucaram et al. 2014). Quantitative modeling of fisher behavior is highly influential to management decisions, but heavily weighted toward short-term seasonal and monetary factors. This runs the risk of simplifying the broader influence of coastal economies that fisheries are embedded within, perhaps given the sparseness of reliable long-term economic data on many fleet activities. The focus here on occupational transitions rather than seasonal participation translates cross-sector ties into broader and often quantifiable metrics of employment and economic security and foregrounds social dynamics longer than a fishing season.

From the collective weight of evidence I conclude that in terms of transitions out of fishing in San Cristobal, (a) strengthening human capital is of major importance, (b) socioeconomic inequality produces constraints on household actions highly analogous to those of concern due to poverty, and (c) job satisfaction has very weak retentive effects on fishing

employment in the Galápagos.

What follows is a background section (Section II) and an empirical livelihoods analysis of individual change and differential abilities to leave fishing in San Cristobal (Section III). Discussion and implications for quantitative bioeconomic characterization of fisher behavior follow in Sections IV and V, and concluding remarks in Section VI.

II. Background

“There is nothing more enticing, disenchanting, and enslaving than the life at sea.”
Joseph Conrad

A. To Fish Or Not To Fish: What are the Questions?

Fisheries scholars have long acknowledged that a tendency to misunderstand fisher behavior is often a more critical factor in the collapse of fisheries around the world than any lack of knowledge of resources themselves (Hilborn 1985; Salas and Gaertner 2004). The dynamics under which people leave fishing has taken on particular significance in scholarship on “fisher behavior”. Hilborn’s (1989) call for analyzing the “dynamic behavior of fishing fleets” outlines four areas that reflect the prominence of economics in fisheries social science: investment, movement, catching power, and discarding. Gordon (1954), advocating a “bioeconomic” framework which combined biological theories of how fish stocks grow with neoclassical economic assumptions of human behavior, hypothesized that the socially optimum allocation of labor must take into account industry profit, but did not consider social benefits and therefore labor decisions beyond profits. Even while these calls expand out beyond biological analyses they look outward from the fishing sector only slightly in terms of productive activities that individuals engage in.

Allison and Ellis (2001) advocate an outward facing approach to understanding how fishing industries change via the “sustainable livelihoods approach” to fisheries management, which interprets peoples’ actions as part of long-term livelihood “strategies” that are embedded in economic needs but also social responsibilities and relationships, and particular to spatial, temporal and cultural contexts. Like everyone, fishers are people living in particular societies and times that also influence their occupational and harvest choices. To meaningfully understand the breadth of influences on peoples’ actions, attending to the resource user perspective on the role that fishing fulfills for an individual and household is critical (Allison and Ellis 2001).

Livelihood scholarship has commonly utilized a conceptual framework of investigating the “assets-mediating processes-activities” framework, which begins with a focus on household asset bases, the portfolio of work activities they engage in, and the mediating processes that enable people to actually translate their assets into activities, previously described in Chapter 1. Ellis (2000) notes that assets are “the basic building blocks upon which households are able to undertake production, engage in labour markets, and participate in reciprocal exchanges with other households” (31). Differential access to resources, activities, and asset bases (including income) is thought to produce a differential ability of individuals and household to adapt to livelihood change and uncertainty, including via job switching.

Beyond the general livelihoods approach, two prominent theories of individual differentiation in fishing exits have emerged from past work on livelihoods, fisheries migrations, and exits from fishing industries (Terkla et al. 1988; Scoones 1998; Ellis 2000; Pollnac et al. 2001; Cinner et al. 2009). One is what is termed here the “poverty trap hypothesis”, which posits that some individuals remain in fishing because they lack the means to leave. Fishing can have a relatively low cost to entry, particularly in artisanal fisheries that are relatively low-tech (Allison

and Ellis 2000) or open access. Cinner et al. (2009) found that “fishers from poorer households were less likely to exit a severely declining fishery”. Poverty can play into some peoples’ calculus to *become* fishers, *stay* in fishing, and their ability to *leave* fishing. Poverty represents not simply an absence of wealth but different responses to change; poorer people can be more risk averse, prioritizing less-risky strategies over profit maximization. They relate this behavior with literature on poverty traps in general,

“situations in which poor people are unable to mobilize the necessary resources to overcome either shocks or chronic low-income situations and consequently remain in poverty. Generally, the poor are excluded from higher-return livelihood strategies because of constraints on cash liquidity, a lack of access to credit, and social exclusion (Dasgupta 1997; Adato et al. 2006; Barrett et al. 2006). (Cinner 2009: 128)”

Others have summarized the plethora of non-economic motives driving occupational choice under the concept of job satisfaction. A “satisfaction bonus” has been hypothesized to have a retentive effect on labor in fishing but for reasons of choice, keeping fishing rates high even beyond what makes economic sense (e.g., Anderson 1980; Smith 1988; Pollnac and Poggie 1988). Pollnac et al. (2001) infer that higher than average job satisfaction among fishermen may contribute to the ambiguous outcomes of many policy interventions specifically designed to get people to leave fishing, asserting that a fundamental and erroneous assumption of alternate livelihood programs is that fishing is “a dirty, hard, undesirable occupation, hence employment of last resort and that fishers are amongst the poorest of the poor” (531). Surveys in Asia and Alaska raise doubt over the idea that people would leave for comparable income elsewhere, and note a “psycho-cultural” attachment to fishing by some personality types who have higher risk tolerance than non-fishers, generating resistance to exiting (Pollnac and Poggie 1988; Pollnac et al. 2001; Pollnac and Poggie 2006). In a comparative study of small-scale fishers in the Philippines, Vietnam and Indonesia, Pollnac et al. (2001) found that a minority of fishers (16, 25, and 36% respectively), would readily leave the occupation and many would recommend it to

their children. Because researchers specifically posed hypothetical choices involving equal or better pay, results indicated that people do not engage in fishing purely for economic incentives. The above studies however involved only active fishers and tested decisions to leave with hypothetical questions.

B. Study Contributions: The Dollars and Sense of Alternate Livelihoods in Galápagos

“We have been trying to get the fishermen to do things because it's technically correct, because we are thinking about, you know, sustainability and the future...but we haven't really appealed to them as people.”

- Conservation Scientist, Santa Cruz (2012)

Like many fished areas, Galápagos fisheries bear the mark of ecological strain; a “gold rush” style fishery for valuable sea cucumbers beginning in the early 1990s has effectively decimated sea cucumber stocks (Toral-Granda 2005; Hearn 2008). Institutional and scholarly reaction to this (selective) degradation in the Galápagos can be seen as forming two distinct currents. First, under limited resources governance efforts have been technically focused, as acknowledged by conservation managers (interviews 2012). In other words greatest effort has been put toward monitoring and enforcement, rule setting, permit requirements, and studying biological robustness. Secondly, the immense conflicts of the past several decades have sparked much scholarship on dimensions of power, politics, and conflict resolution in Galápagos (e.g., MacDonald 1997; Ospina 2005; Ospina 2006; Payne 2007; Stacey & Fuks 2007; Finchum n.d.). All together, circumstances have arisen so that at present the socioeconomic and temporal dimensions of fisheries are a thin area of understanding between (a) technical ecological understandings and (b) analyses of environmental politics.

As valuable nearshore marine stocks have declined over the years, fishers and managers have embarked on an extended search for alternatives, both within and outside of fishing, with

results that have been mixed at best and not closely examined. It is not actually known, for instance, how well non-fishing work substitutes and provides for fishing families, the different livelihood roles that fishing fulfills for households, or what former fishers are doing. Taylor et al. (2006) noted the need for better household-level data on distributional impacts of recent development. Murillo et al. (2007) reiterated the need to know more about fine-scale occupational changes,

“First, however, it is important to identify the various interest groups within the sector, as it is unlikely that any one solution will satisfy everyone... It is important to identify those fishers who are dedicated to artisanal fishing, that is, those who consider fishing more than just a source of employment but also a way of life, and who wish to find solutions within the fisheries. It is also important to identify those fishers who are open to employment away from fishing, either in tourism or in other areas. With this analysis completed, specific projects can be targeted to smaller interest groups. (18)”

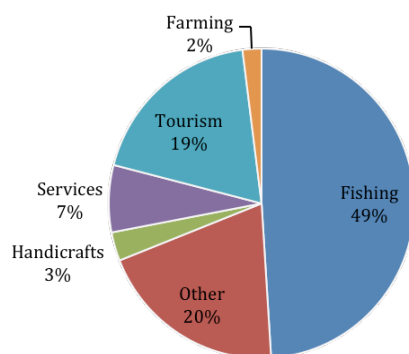


Figure 3.1. The diverse occupational activities of registered members of COPAHISA, the fishing cooperative on Isabela Island. Data from Gravez 2008.

A survey by Gravez et al. (2008) of the members of the fishing cooperative of Isabela Island (Fig 3.1, called COPAHISA for short in Spanish) lends support to the hypothesis that Galápagos fishers utilize a strategy of occupational diversity to hedge their vulnerability to

different adversities, like other small-scale fishers elsewhere (Allison and Ellis 2001). As far back as 1999, Wilen et al. (2000) noted that many

registered fishers harvested only occasionally or recreationally, and Murillo et al. (2007) found that fewer than 60% of registered fishers had participated in nearly every fishing season from 2002-07. Besides these sporadic observations however, not much has been formally outlined about occupational diversity in fishing in the Galápagos.

Four major Galápagos censuses conducted in 2001, 2006, 2009, and 2010 only lightly touched upon the fishing community. Because all censuses grouped workers in fishing,

agriculture and cattle into one category, none have connected household characteristics to fishing activity or yielded much detail on individual fishing practices and profits. Other short surveys have provided socioeconomic snapshots and smaller sample sizes than that proposed here. Hearn et al. (2007) carried out an extensive pilot study of profitability (i.e., net income change) in the lobster fishery from 2002 - 2005, but noted that the number of fishers carrying out other activities and income outside of fishing was unknown. Wilen et al. (2000) conducted detailed household surveys on costs and profits from fishing, but surveyed only 40 households across three islands. None included former fishers. With the benefit of over a decade of hindsight, I ask:

- (i) How and why have individuals left fishing, and why is it that some are better able than others to exit?
- (ii) What are the implications for modeling of a livelihoods approach in terms of long-term as well as short-term motives to fish in San Cristobal?

III. Results

I first review recent (2009-11) labor movements through fishing, and then analyze the relationships between occupational change and three broad hypotheses around how and why people move through fishing: (i) differential asset bases following a sustainable livelihoods framework, (ii) the related hypothesis about relative poverty traps, and (iii) job satisfaction.

As described in Chapter 1, the 2012 survey and accompanying interviews serve as the empirical basis for testing these hypotheses in a mixed methods analysis that compares (a) quantifiable and categorical survey data questions for the 2009-11 period with (b) open-ended qualitative interviews on change over time and participant observation. The former measures relative metrics of household assets while the latter asks individuals what helped them to leave,

or why they still fishing. While the survey included retrospective questions, in the end analysis relies more heavily on the qualitative data to draw implications on change over time based on local perspectives, career histories, and analysis of non-economic and cross-sector factors. For each hypothesis, quantitative and qualitative data are analyzed in parallel and their implications compared.

A. Industry Exits, Alternate Labor & Opportunity Costs

As laid out in Chapter 2, fishing livelihoods have changed significantly since the establishment of the GMR in 2000. Labor flows are now predominantly away fishing, with the majority of active fishers preferring to fish less and half seeking to transition away from fishing. While these tendencies have been observed in the community for many years (e.g., Zapata 2005; Ospina 2006), the question still remains as to what makes some better able to find alternate work.

As described in Chapter 1, survey data show the people who are fishing less (“diminishers”), fishing more (“intensifiers”), and maintaining constant fishing levels based on questions on their movement between full-time, part-time, occasional, and inactive engagements. These changes are called an individual’s “fishing strategy”, assessed (i) in the three-year period from 2009-11 and (ii) over the course of their fishing careers. Of the 167 registered fishers surveyed on San Cristobal in 2012, relatively few people had changed fishing levels from 2009-11. Fifteen diminished their fishing engagement, and 7 left fishing entirely. On the opposite side of the spectrum seven individuals intensified fishing. The remaining 145 maintained steady fishing levels¹³.

¹³ In light of the relatively few people that fished occasionally (12 of 167), where fishing accounts for $\leq 30\%$ of their income, I lumped this group of fishers in with the 46 inactive survey respondents for statistical and graphical analyses.

In terms of alternate labor, almost half of all individuals exiting from 2009-11 did so because of winning a permit to operate a tour boat in 2009 (3 of 7), therefore the most common way of leaving fishing (Table 3.1). Three others voluntarily retired with age (69, 61 and 65 in 2012) and did not time their decision with the acquisition of new work. The deciding factor for two out of three was to care for ailing spouses. Two continued to operate local shops and the other did odd jobs until he found steady work as a security guard two years later. These older fishers plan to continue working for the foreseeable future, illustrating the thin retirement options for fishers and Galápagos residents in general except for those with government pensions.

Three individuals diversified into non-fishing jobs specifically because of dive accidents that endangered their health and necessitated a recovery period, which was ongoing in 2012¹⁴. Two other individuals left after receiving temporary semi-skilled work contracts in government institutions. Other reasons given include decisions to begin work in tourism to work with family (in this case a newly awarded tour operator permit owner), fishing's general difficult life, and because of the growing effort needed to maintain catches in coastal fisheries. In all of these cases except for the tourism permit competition, individuals had the skills and certifications needed to work outside of fishing before they left, at times for decades, and simply decided to leave during the 2009-11 period.

One individual applied for a recreational pesca vivencial permit when given the opportunity, and might be considered to have diversified the least, since he still fishes most major seasons as well.

In the opposite direction, three of the seven individuals who intensified their fishing

¹⁴ Many others had experienced past dive accidents; 2012 was simply not in their recovery period.

levels from 2009-11 did so as a direct result of losing contract work in recent years¹⁵. Jobs lost spanned semi-skilled labor as building guards, work for the GNP (fisheries monitoring and goat hunting), and other odd jobs in construction and transport. Another intensifier reported returning to fishing (after several years away) despite preferring non-fishing work because salaries as crew on tour boats were lower than full-time fishing and difficult for supporting a family. In total, 4 of 7 who intensified fishing would rather work outside of fishing.

Table 3.1. Alternate labor taken up by those recently diminishing their fishing levels (2009-11)

Alternate Labor Accepted	Reason given, if any	# of people
<i>Became inactive</i>		
None, then night guard	Care for ailing spouse, age	1
Shop owner, then tour boat operator	Care for ailing spouse, age	1
None, continuing a local sundries shop	Age	1
Tour boat operator/won permit		3
Construction/cargo loading	None given	2
*government institution contract work	More family time	1
<i>Became part-time</i>		
Sailor (certified mariner)	Reduced fishing when father retired (from fishing), driven to work with family	1
Sailor (certified mariner)	Increasing time and effort needed in fishing	1
Construction/cargo	Broken boat, unable to crew (not owner)	1
Construction	Recovering from dive accident (taking one season off)	1
Water taxi owner/operator	Very hard work and low income	1
PAV boat	Took an opportunity as it arose	1
Cruise ship cook	Tough and intermittent work of fishing	1

*still fishes occasionally, on the weekends

More broadly, 96 (57%) survey respondents have diminished their fishing in some way over their careers (48 are still part-time) and 8 (5%) have intensified their fishing levels. While declining earnings were among the motivators for people diminishing their fishing levels, interestingly various reasons were given for these declines. Shrinking fishing abundance but also a belief in restrictive policies that keep the market small, prevent profitability, and generally provide little support to cultivating a fishing lifestyle were the two most prominent factors

¹⁵ A fourth person lost a job with the Galápagos National Park in 2012, and was also set to start fishing again with his family as a result.

named. One noted, “I tell you there is no help to have a permanent income (in fishing). What can we do? Prepare to work as professionals in other areas.” Several active fishers noted that while there was fish to catch all year, the (all local) fresh market was so small as to not support many outside of the major export seasons.

Interviews thus showed that beyond earnings, other factors such as health, age, individual or family illness, and commitment to family time contributed to decisions to diminish fishing, for some even during the profitable sea cucumber era. Health concerns were largest around diving, the most dangerous task in Galápagos fishing. As one noted about the period over ten years ago when he quit,

Fisher 69972: The idea [in leaving] was more for, for health. For life. Because, in this time, there was a lot of money. There was a lot of sea cucumber. But there were already many deaths. Certainly. Many fishermen died. Every day, two dead, one dead. ...Money was there, but - I could die in one day.

Jobs in both fishing and tourism were noted as being hard on families, if one was involved in particular temporal cycles. Some individuals served as crew on tourist cruise ships that are typically out at sea for eight-day stretches, with one day ashore between trips. Work best for families interestingly can span fishing, government, or tourism, based on the circumstances. One fisher chose a contract day job with the government to either fishing or tourism:

Fisher 68272: Look. I have my family. In tourism and fishing, you spend – 3 weeks, 4 weeks away from, from your home. Out to the other side of the islands. Damn! At the same time [now], well I have my job [here], it’s good, I’m here until 5 o’clock in the afternoon, and [then] I’m with my family. I’m with my children, I’m with my wife. Yes. I’ve given a lot of time to the sea. I worked on the sea a long time.

Another however, chose to leave land-based work as a night guard to return to recreational fishing, since working nights left him sleeping much of the day when his children were around. At times then the question of to fish or not to fish was trumped by a basic a desire for stability,

with fishing taken up if it provided more family time than other work. The theme of stability was commonly expressed in conjunction with becoming married.

Fisher 50521: My mentality started to change when I was married. Yes... married, I felt that the money was not enough. They offered me the opportunity to work at INGALA, as captain of one of those little boats, but even then it was not as much. One needs [more], the salary was very little, I earned 60 sucres a month at that time. ... Fishing was much more profitable.

Interviewer: But you wanted a job more....secure? Or...?

Fisher 50521: More....I wanted more stability.

For many former fishermen, an opportunity that presented itself was reason to leave, commonly cited by college degree holders. Fisher 77962 explained, “First, apart from fishing we [my family] had to study to be professionals. I am an engineer. So then, with this title, one can already convert your job. Without a title, there’s little work.”

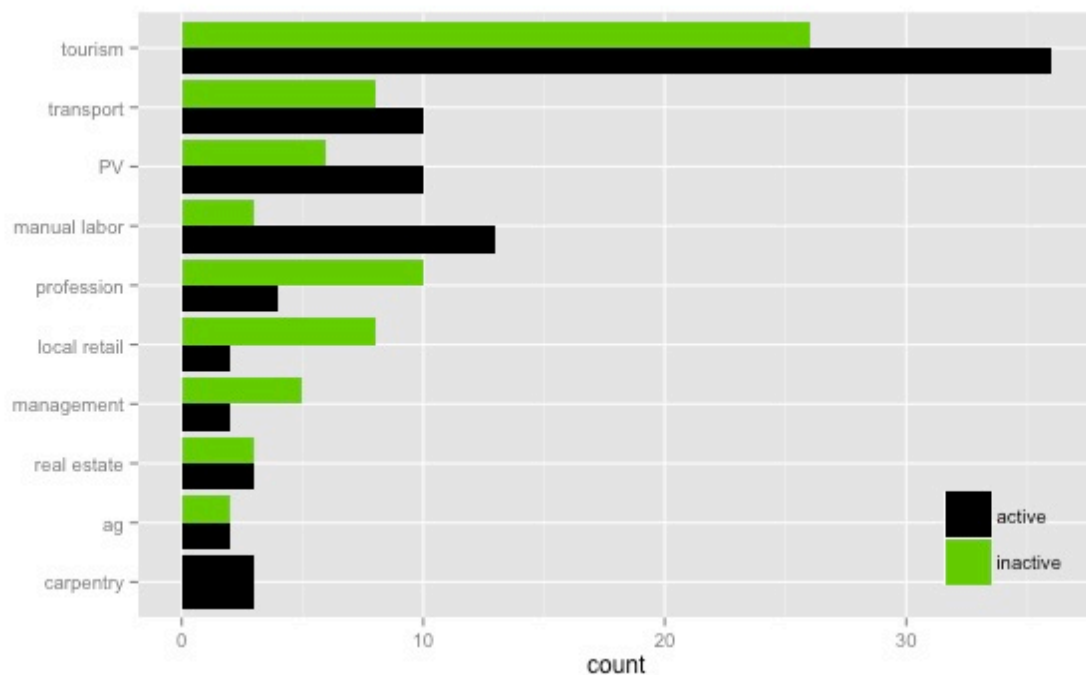


Figure 3.2. Categories of non-fishing work that survey respondents are engaged in, broken down by their active or inactive status. Occasional fishermen, whose income from fishing is <10% of their annual income, are grouped in the inactive category here. Active fishermen include those who own boats but do not go to sea themselves.

In all, inactive former fishers were found working in a broad range of activities from tourism to the public sector (Fig 3.2), and made up the majority of those working in professions,

local retail, and management, while active fishermen made up the majority of those working in manual labor, transport, pesca vivencial, and carpentry (Fig 3.2).

As is also evident from the above excerpts, the alternate labor taken up by those leaving fishing does not and has not necessarily offered higher wages – in fact in a non-trivial portion of cases, lower wages have been accepted. Most survey respondents have gradually earned more money outside of fishing over time, although there are a few who have never achieved this parity. Of the 43 diminishers who were asked if their incomes now were greater than the last year they fished full-time, 6 reported that they were not, and three of these had left recently.

B. Hypotheses Around Labor Mobility Through Fishing

Original plans to analyze how groups with different fishing strategies may differ in their ties to other economic sectors by conducting multivariate regressions were not possible, given the relatively small number of “intensifiers” and “diminishers” found. Instead interpretation relies upon (a) bivariate statistical comparisons and (b) synthesis of survey and interview data to compare how various “capitals” are linked to people’s ability to adapt to uncertainty, including the interview data summarized above in Results Section A.¹⁶ In terms of the former since data are cross-sectional rather than panel we cannot directly correlate asset bases to individuals’ past mobilities throughout their career. However comparisons between those who have moved out of fishing recently (2009-11) and others may provide some insight, since their present asset bases are most similar to when they left fishing. In addition it is possible to test hypotheses around relative poverty and job satisfaction by testing across not asset bases but active and former

¹⁶ The 2012 Livelihood survey measured household assets, activities, and their changeover the past three years through various metrics and proxies (details in Ch 1). Questions can be summarized into four major categories: (i) occupational portfolios, (ii) financial and physical capital, (iii) job satisfaction and industry preferences and (iv) demographics, social and human capital. The entire survey can be found in Appendices A and B.

fishers, assuming that their measured asset bases reflect the cumulative effects of staying in or leaving fishing over time.

B1. Hypothesis I: Labor Mobility & Asset Bases

In terms of recent movements through fishing, there were no statistical differences in the asset bases among those changing fishing levels and others (Table 3.2A). This may imply that the 3-year window assessed is too short to observe any differences in wealth building, which is likely a slower process. When measured over their fishing careers however, certain assets differed significantly among people that have moved out of fishing and those who have remained (Table 3.2B). Of these factors, education is likely to have influenced labor mobility the most because it is more likely to have been attained before leaving fishing, given the rarity of fishers found who returned to school later. Other statistical differences found in boat ownership, household income, homeownership, and material standards of living are more difficult to parse out causally, since they could have been established either before or after leaving fishing. The statistically significant difference in fishing incomes is irrelevant because it is not independent of one's current fishing status. The significantly greater involvement in active cooperative management among long-term diminishers may be an indicator of thicker social ties. Putnam (1993) used formal membership in a community organization as a metric of social capital.

While statistical results weakly differentiate asset bases among households, turning to descriptive statistics and qualitative data (i.e., interviews with the 22 recent intensifiers and diminishers summarized in Results Section A above) showed that certain elements of asset bases stand out as having been important to labor movement despite not being statistically significant.

Table 3.2. Bivariate associations between different assets and metrics of relative poverty and economic security with fishing strategies from 2009 – 11 (A) and career-wide (B). Fishing strategies were condensed into three groups: intensified, diminished, and same.

	N	df (X^2)	X^2	p (X^2)	p (Fisher)
(A) Fishing Strategy (2009-2011)					
Household Income	163	8	5.9394	0.654	0.6885
Fishing Income	120	10	6.5348	0.7685	0.8224
Boat Ownership	167	2	0.6391	0.8952	0.6765
Home Ownership	164	6	4.4416	0.6171	0.7794
Ability to raise sudden cash need (\$1000)	158	10	5.0097	0.8905	0.9444
Individual Education	167	10	14.278	0.1607	0.2079
Household Education	166	8	4.9518	0.7627	0.8077
Social Relations	157	6	4.8197	0.5671	0.5604
Involvement in Cooperative	160	6	3.2189	0.7809	0.8865
Fishing generation	166	8	3.6968	0.8834	0.8253
(B) Fishing Strategy (career-wide)					
Household Income	163	8	7.553	0.4783	0.4322
Fishing Income	120	10	17.9319	0.05612*	0.1868
Ability to raise sudden cash need (\$1000)	158	2	1.5922	0.4511	0.5523
Boat Ownership	167	2	5.4347	0.06605*	0.06315*
Home Ownership	164	2	7.8337	0.0199*	0.01377*
Individual Education	167	10	17.7643	0.05907*	0.0342**
Household Education	166	8	3.8959	0.8664	0.9043
Social Relations	157	6	8.7821	0.1862	0.1702
Involvement in Cooperative	159	6	13.1471	0.04076**	0.04979**
Fishing generation	166	10	error	error	0.8493

two-tailed

** significant at the 90% level*

***significant at the 95% level*

Interviews collectively indicated that the strongest three markers of social difference in terms of the ability to capitalize on alternative livelihood opportunities, if distilled into types of “capital”, were social connections, wealth, and education. First, while it proved extremely difficult to quantify whether social ties helped people in changing jobs or maintaining their wellbeing, qualitatively its importance was self-evident for many who left between 2009-11. Two individuals who had been seeking to leave and remained in fishing until they found

alternate work both reported social connections as key factors for exiting. One asked the mayor, an old friend, and the other found contract work “politically. Through friends, well, they facilitated the work. Thank you.” Others mentioned the support of family networks in helping to invest in new opportunities such as the 2008-9 competition for tour operator permits (described below) and new business partnerships with family members.

Differences in wealth and education speak not only to differential asset bases but the specific hypothesis on poverty traps and are discussed in conjunction with this hypothesis below.

B2. Hypothesis II: Relative Poverty Comparison¹⁷

If recent “intensifiers” and “steady maintainers” have patterns of lower income, assets (boat and home ownership), and other wealth indicators than “diminishers”, some evidence for poverty traps may exist. Statistically however, short-term fishing strategy was not significantly correlated to (a) household income, (b) individual fishing income, or (c) self-assessment of how material wellbeing has changed over the past three years (Table 3.3).

Table 3.3. Bivariate correlations between fishing strategy and household income, fishing income, and self-assessed changes in material standards of living from 2009-11. Results from both Fisher’s exact tests and chi-squared tests are shown.

	N	df (X^2)	X^2	p (X^2)	p (Fisher)*
Household Income	163	8	5.9394	0.654	0.6885
Fishing Income	120	10	6.5348	0.7685	0.8224
Material wellbeing from 2009-11	163	4	4.4773	0.3452	0.2833

*two-tailed

In addition if looked at as a snapshot in time, the household income curves for 2011 were strikingly similar for those groups of people intensifying and diminishing fishing (Fig 3.3a and 3.3c). Therefore there is no evidence of relative poverty traps in recent exits from fishing (2009-

¹⁷ The relationship between relative poverty and labor mobility is focused on here; Chapter 4 focuses on the highly related analysis of relative poverty as a social outcome of fishing levels over time.

11) provided by statistical comparison of the quantitative survey data alone. However building from discussion of asset bases in general, qualitative work suggests that there are indeed poverty traps in fishing. On one hand, poverty in the conventional sense was not found as even the poorest interviewee comfortably covered his basic necessities and never went hungry or without shelter (e.g., Yapa 1996; Ellis 2000).

It is clear that socioeconomic inequality exists. The fact that part-time fishers were majority boat owners, while full-time and occasional/inactive fishers were minority boat owners indicates that owning a boat may help people transition from full-time to part-time fishing work because they can leverage higher fishing earnings into start-up costs for other careers such as trainings or business investments. Interviews substantiated this livelihood pathway.

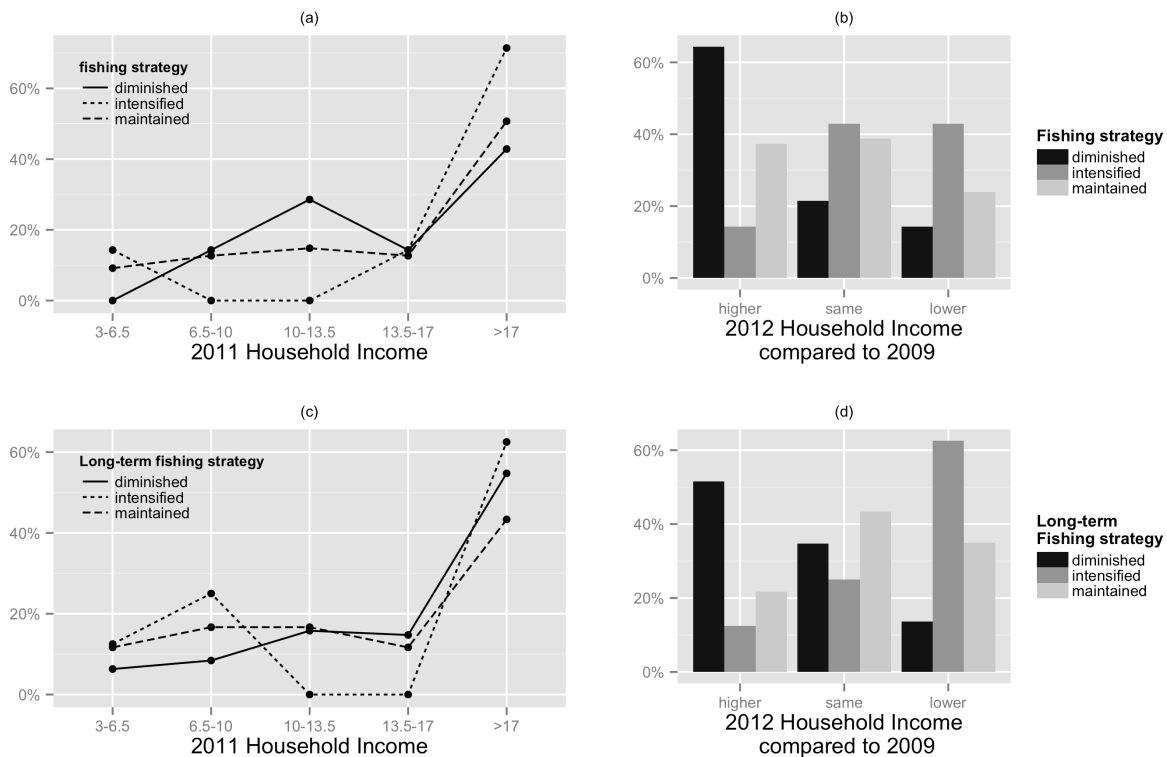


Figure 3.3. Household incomes among individuals who have diminished, intensified, and maintained fishing engagement in the short-term (a) and the long-term (b). Short-term is defined as from 2009-11, and long-term is broadly over the course of their careers. Trends are similar among groups.

In addition recent diminishers seem on more stable financial footing than recent intensifiers in several ways. Many diminishers interviewed expected their incomes to rise in coming years, because of making new investments in apartments and business ventures, while this optimism was absent in intensifiers. A quarter of diminishers also had savings that could be tapped for coping with a sudden need for cash. No one intensifying fishing reported savings they could fall back onto. If opportunity costs were assessed purely on the basis of immediate income comparisons, most people intensifying fishing recently (2009-11) would have made seemingly lateral moves or taken pay cuts, as 3 (43%) made the same household income and 3 (43%) made less in 2012 than 2008-09 (Fig 3.3b). On the other hand more of those who diminished their fishing engagement reported higher incomes in 2012 than 2008-09 (9 of 14, Fig 3.3b). These trends also hold over time in terms of career-wide transitions (Fig 3.3d).

Actions to leave fishing despite weak substitutes, acceptance of lateral or lower incomes by many leaving recently, and the relatively weak human capital of fishermen strengthen the possibility that some fishermen cannot find work alternatives equivalent to fishing to move into, despite consistent policy support in terms of retraining programs over the years.

Overall, perhaps the most critically weak and variable asset found among San Cristobal fishers was their human capital: the loose conglomeration of education, skills, and health that make up a household's labor potential, including their ability to discuss, debate, and negotiate their options (Bebbington 1999; Ellis 2000). Although the tourism industry contains many marine-based jobs, some "invisible barriers" exist in the form of formal education, which "are largely to do with navigating officialdom, in which lack of literacy, numeracy, knowledge of procedures, and contacts diminish the access of the rural poor" (Ellis 2000: 94) – or in this case, the urban fisherman. It is notable that no "intensifier" households had any member with a

tertiary education. Individual and household-level education is likely tied to the pursuit of higher- vs. lower-skilled alternate livelihood options, with accompanying levels of payoff. Many fishers seek to become *marineros*, but far fewer threw their hats in the ring of the 2009 tourism permit competition. While technically open to all, the latter is quite difficult to participate in given the high entry costs in time, money and bureaucracy. One contest entry proposal personally reviewed was 240 pages long, and from others seen around town, a typical length. As the interviews in Results Section A above show, interviewees noted a marked difference in ease in finding work with a secondary or tertiary degree. Some noted that Galápagos labor markets are unstable in general, with work difficult at times for those with tertiary degrees as well. This is substantiated by insights into segmented labor markets in other areas like India (Bremner 1978a & b), discussed in further detail below (Discussion Section B2).

Overall, evidence lends broad support to the existence of a mild poverty trap in fishing because some people, whether technically “poor” or not, are excluded from various occupational choices based on educational and financial assets.

B3. Hypothesis III: Job Satisfaction

It is theoretically possible that those who have left fishing in San Cristobal were less satisfied in the occupation than those who have remained active, as a “satisfaction bonus” hypothesizes, but was found to be untrue in the San Cristobal case. The island’s fishers report a high level of job satisfaction in line with fishers elsewhere (Pollnac and Poggie 1988; Pollnac et al. 2001), which however has had very little retentive effects on employment in the industry. A great majority of those surveyed liked being a fisher, or 152 out of 154 (98.7%)¹⁸ and would still

¹⁸ Of the two that did not, one was part-time and one was inactive.

choose to go into fishing if they had their lives to live over, for the years that they did it (84.5%). These proportions were remarkably consistent regardless of the degree that an individual fished or their fishing strategies (Table 3.4).

Table 3.4. Survey respondents who would and would not still go into fishing if they had their lives to live over.

Fishing status	Y	N
<i>Full time</i>	80.0% (40)	20.0% (10)
<i>Part time</i>	88.9% (48)	11.1% (6)
<i>Occasional</i>	85.7% (12)	14.3% (2)
<i>Non-active</i>	83.7% (36)	16.23% (7)
Fishing strategy (2009-11)		
<i>*Intensification</i>	85.6% (6)	0
<i>*Diminishment</i>	93.3% (14)	0
<i>Same</i>	89.7% (130)	1.4% (2)

* some non-responses

Bivariate correlations show that job satisfaction metrics are unrelated to recent departure from fishing, status, and fishing preference (Table 3.5), giving more credence to the likelihood that many would like to leave fishing but are constrained in various ways of doing so. This evidence helps to weaken the possibility that those who have remained in fishing simply do not want to leave. In addition over half of active fishers would prefer to work more outside of fishing (Ch 2, Table 2.4).

Table 3.5. Bivariate correlations between fishing strategy, fishing status, fishing preference, and (a) whether one would still choose to be a fisher for the years that they did/are doing it, and (b) whether one liked being a fisher for the years that they were/are one. Results from both Fisher's exact tests and chi-squared tests are shown.

Still choose to be a fisher	N	df (X^2)	X^2	p (X^2)	p (Fisher)*
Fishing strategy ('09-'11)	159	2	0.1408	0.932	1
Fishing status	159	2	3.243	0.1976	0.2038
Fishing preference	159	4	4.562	0.3353	0.3592
Liked being a fisher					
Fishing strategy ('09-'11)	152	2	0.3071	0.8577	1
Fishing status	152	2	0.8805	0.6439	1
Fishing preference	152	4	7.531	0.1104	0.2466

*two-tailed

Digging deeper into the qualitative aspects of job satisfaction led to implications for why high job satisfaction was not enough to keep people from wanting to leave fishing in the Galápagos, while it seems to be so in other areas. Pollnac and Poggie (1988) broke down job satisfaction into three basic themes: self-actualization (i.e., adventure, challenge, working outdoors, and peace of mind), a “Basic Level” of providing a good living (i.e., earnings, health, safety, fatigue), and a “Middle Level” of love, belongingness and self-esteem (i.e., time away from home, ability to come and go as you please, being your own boss, community in which you live). While these elements paralleled the reasons Galápagos fishermen gave for liking the job, interviews show that some also can be said to characterize the motives given for wanting to leave fishing as described in the Results Section A above. Notable downsides encompassed health, safety, and time away from family, falling primarily into the Middle and Basic Levels. The ability to interview former fishers confirmed that the negative rather than positive effect on labor retention in San Cristobal was not a recent phenomenon.

IV. Discussion

This chapter has provided more fine-scale descriptive socioeconomic data on labor movements throughout fishing, anchored by reasons given by fishers themselves, and has also tested various existing hypotheses around how and why people move through fishing. Below I discuss the implications and validity of the results presented above, followed by broader contextual influences beyond asset bases not yet tied into the Results above. Implications for modeling are subsequently discussed.

A. Asset Bases, Labor Mobility & Social Difference: Mixed Methods Implications & Validity

For each of the three hypotheses around labor mobility through fishing investigated in this Chapter, the quantitative results for both the 2009-11 period and longer career histories proved more weakly compelling than the qualitative results, from which a much deeper and richer story of change over time could be surmised. Taken together I argue that they show “meta-inferences” (Creswell and Plano Clark 2011: 213) about why people leave fishing and differential abilities to do so. I found overall evidence for (a) the influence of differential asset bases in the form of social connections, wealth and education, (b) the existence of a mild “poverty trap” in exiting fishing, and (c) no effect of job satisfaction on keeping individuals in fishing.

What can be said about the “approximate truth” of these inferences, or in other words, the internal validity of gathered data (Angelsen et al. 2011, Creswell and Plano Clark 2011)? Various means of validation are often used for mixed methods data (Creswell and Plano Clark 2011) and here include triangulation of conclusions with broader scholarship on Galápagos society, member checking of certain conclusions with fishermen around town in casual conversation, and a lack of divergence between quantitative and qualitative analytic results. Consistency in interviewing and analytical personnel (as the main author was present at 100% of interviews and surveys) also helps contribute to internal validity by eliminating interviewer bias possible across more than one person (Fowler 2002).

In terms of causality, although I found that asset bases (including metrics of relative poverty) did differ among San Cristobal fishers fishing at different levels over time, no causal inferences can be made with quantitative data alone since survey data does not reveal whether

measured asset bases were the cause or the consequence of labor movement decisions around fishing over the years.

Broadly, the richer implications given by qualitative and contextual data than statistical analyses of asset bases aligns with livelihoods work that has long noted that access to resources and options can be the most critical “asset” in shaping livelihood strategies (Bebbington 1999). The influence of various factors on access to livelihood pathways is discussed in further detail below in Discussion Section B.

More specifically, qualitative narratives based on project interviews as well as broader scholarship on Galápagos society give meaning to weak quantitative results in terms of both the insignificance of certain factors named as important by those recently moving out of fishing, and the weak significance of others. For instance social relations were not found to be statistically significant, even though they were named as significant for those who happened to move out of fishing recently. However, social relations permeate all dimensions of life in the Galápagos and Ecuador in complex ways (Ospina 2006), helping to explain how the metric assessed (whether an individual had friends or family working in politics or government institutions) turned out to be consistent across interviewees whether they switched jobs or not. It is far more difficult to measure who among those working in institutions actually exerts influence over hiring decisions in any given year, and in the end was beyond the ability of interviews to ascertain. The construct validity, or appropriateness of the chosen metric, was thus weak (Angelesen et al. 2011). However past work on the political nature of the Galápagos labor market (e.g., Ospina 2006) and labor markets in general (e.g., Breman 1978a & b) substantiate the importance of social connections in obtaining jobs that some interviewees noted.

Interviews also substantiate conclusions around the significance of other factors such as boat

ownership and education which were only weakly significant in bivariate statistical comparisons, but also appear critical over time. It was generally agreed by managers, scientists, and fishers interviewed that boat owners on the whole earned more profits from fishing than fishers who did not own boats, helping make sense of why part-time fishers were majority boat owners, if in fact the higher profits likely help many leave fishing by investing in other opportunities as surmised here. However the wildly variable substitutability of fishing vessels over time may help explain why boat ownership was not sufficient for leaving fishing for all who desired to do so (see discussion in Section B1 below). Education was also agreed by all as key to helping find jobs more quickly, by fishers both with and without tertiary degrees.

My arguments that relative inequality, if not poverty, is a large part of the answer to why some individuals have been better able to maintain their standards of living through alternate job opportunities are also in agreement with past scholarship on inequalities in Galápagos society. Although tourism revenues make the Galápagos one of the wealthiest provinces in Ecuador, the rising tide of prosperity has not lifted all boats but rather engendered a “bitter social mobility” among fishers and other residents (Ospina 2006).

Finally, the quantitative results around disproving the job satisfaction hypothesis are more robust than those around differential asset bases and relative poverty because they test and refute a major element of this theory, namely that individuals who have left fishing did not have lower job satisfaction than those who remain. Pollnac and Poggie (1988: 897) hypothesized, “...those who are highly dissatisfied probably leave the occupation as soon as an alternative is available, leaving behind those who are less dissatisfied.” The ability to survey over active and former fishers represents a significant improvement over past studies where only active fishers were included and given hypothetical questions about what would make them leave. Here

inactive fishers can be described as synonymous with former fishers given a lack of preference and plans to return to fishing for all except for 2 individuals (Table 2.4, Chapter 2).

B. Mediating Processes

How and why people move through fishing is also based not only on individual behavior and household needs and capabilities but interdependent with the frameworks that choices are made within, namely the broader institutional, market, political and environmental mediating processes that regulate access to assets and resources (Scoones 1998; Ellis 2000). Two processes that stand out as affecting the labor mobility of San Cristobal fishers and their use of their assets are (i) conservation governance and (ii) the broader structure of the San Cristobal labor market.

B1. Conservation Governance within a Protected Area

Perhaps the most important process influencing access to various livelihood pathways through fishing in San Cristobal over the past decade has been conservation governance and the overarching prioritization of biological conservation over fisheries economic development in the Galápagos Marine Reserve (GMR). Firstly, policies clearly affect individual attitudes toward the future and how they weigh the future potential of livelihood pathways. In terms of job satisfaction for instance, I conclude that the occupation has become less attractive to fishers for a complex variety of reasons including increasingly stringent fishing policies aimed at conserving marine resources, more risky fishing practices, and evidence of eroding incomes for the same fishing effort over time. Fishers in the Galápagos operate within a marine reserve that constrains their flexibility in fishing techniques and markets. One noted:

Fisher 37780: I would stay in fishing if there were responsible management of resources by the authorities. It doesn't exist. There are obstacles. Because nowadays, they are not on the side of fishing. Every day they confine us, confine us, and reduce the fishing sites.

This is something criminal that they are doing. I would stay in fishing because I am from a family of fishermen.

The above fisherman was using his interview to place blame on declining stocks on the side of managers; regardless of responsibility, conservation governance has undoubtedly played a role in making fishing less appealing over time, including restricting its growth.

Secondly, policies also affect how individuals can make use of their assets, and the value given to various types of capitals. Boat ownership and social capital provide the most clearcut examples.

B1.1 Policies & the Value of Boat Ownership

Fishing boats most dramatically illustrated how certain types of capital were more highly valued and fungible than others, and how this fungibility could change over time as dictated by GNP policies. Between 2009 and 2011 fishing boats had higher substitution value than any other kind of financial capital for those wanting to switch occupations to operate boat-based tours, and fishing *armadores* had a highly advantageous position in the policy framework of the Galápagos Marine Reserve. This substitutability was due to the first ever expansion of the number of permits to operate tour boats since the beginning of the infamous “cupo” system in the 1980s (Epler 2007), which was designed as a point-based competition announced in 2008 and concluded in 2009. Competition rules made several clear lines in the sand that differentiated peoples’ baseline ability to win. The competition strongly favored fishing boat owners, who got extra points for planning to retire a fishing boat. Owners of non-fishing boats received no extra points, although many had business experience conducting boat-based tours on San Cristobal. Thus people with equal or greater cash assets, income streams, credit worthiness, and tourism business experience were disadvantaged. Not surprisingly, all four cupo winners interviewed

were *armadores*, ranging from 47 to 72 in age. However, because this competition was so unique the strong advantage of boat ownership in job switching in this period is likely higher than any given year.

In sharp contrast, outside of this competition fishing boats have little to no alternate value. The selling and upgrading of fishing boats is strictly regulated in the GMR, and in many cases older boats cannot be sold but must be destroyed before permission for an upgraded vessel is granted. Several interviews with managers and conservation professionals noted the initial rationale for such a rule, where officials did not want older boats to proliferate and raise the overall number of vessels in the GMR which was strictly capped at its establishment in 2000. However since most boats cannot be sold for cash, they cannot be leveraged in non-fishing investments as in other parts of the world. In essence, their value is negated outside of fishing.

These constraints help explain why, while boat owners consistently earn more money than non-boat-owning fishers, owning a boat is not sufficient for transitioning out of fishing if one chooses to do so, as evidenced by the active *armadores* who express a desire to leave.

B1.2. Social Capital & Institutions

Livelihood policies have also inadvertently reinforced the importance of political ties in the Galápagos, most notably again, through the tourism permit competition of 2008-9 and its related Executive Order 1416. This order proclaimed that no individual could be granted a tourism permit if one had previously existed in their family, which “shall be deemed the relationship to the fourth degree of consanguinity and second of affinity” (INGALA 2009). This policy made the likelihood of being penalized from the competition stronger the larger and older one’s family network was. In the language of livelihood assets, it made “horizontal” social ties

such as family ties, often regarded as positive social capital, actively negative for many. Many fishers from older families were disqualified and instead relative newcomers to the islands and those with fewer relatives were favored. While the four cupo winners have large extended families as is common in the islands, their nuclear families are not within the 4-5 oldest island clans. Two are half brothers of the mayor, which has caused some to suspect nepotism although it may be just as true that this family has no kin with tourism permits, while others did.

In the end vertical ties to people in positions of authority have benefitted individuals more than horizontal ties to friends and family members, in terms of directing their work choices. Bebbington (1999) notes that when vertical ties are stronger than horizontal ones, there may be weaker capacity for collective action given more limited access to the state.

The positive and negative influences of conservation governance on fisher livelihoods are further fleshed out in the following Chapter, to enable a fuller discussion after analysis of social outcomes has also been presented.

B2. Labor Preferences & Multiple Labor Markets

Interviews and participant observation in San Cristobal quickly made clear that once fishermen look outward from fishing to alternate employment, there were different types of jobs that various groups of people aim for and circulate within. On the one hand there is unskilled manual labor and semi-skilled and sea-based work in jobs such as security guards, sailors, hunters, and marine resource monitoring assistance. On the other hand there are “professions”, often salaried, and found in state, municipal, and various public institutions and companies, where jobs include lawyers, teachers, bureaucrats, administrative assistants, and technicians in

businesses like the electric and telephone companies. In between are non-salaried and contract positions in public institutions and businesses.

Heen (1988) observes that labor market studies often assume that a single labor market exists. A crucial yet little discussed aspect of the Galápagos labor market is its multiple, overlapping sectors of different types of work, each with different dynamics of entry, exit, access, mobility, and degrees of scarcity of work types. In other words, the Galápagos labor market is fragmented rather than homogeneous. Individuals therefore not only have different abilities to leave fishing and different asset bases from which to draw from, but they have different constraints depending on the types of work they are seeking outside of fishing.

Breman (1976a and b) discussed two labor market dynamics in India that are highly illuminating regarding these heterogeneous constraints and abilities. First is the question of “particularistic access” to jobs. Not only qualifications but patronage played a strong role in obtaining work in India, and likely does in San Cristobal as Ospina (2006) has observed for the Galápagos and Ecuador. In other words, “not all those who meet...requirements have equal access” (Breman 1976b: 1906) and certain people at certain times can guard access to jobs. Everyone in all types of work in San Cristobal face these particularistic constraints.

Secondly, there exists scarcity and surplus labor in various areas of the labor market, alongside particularistic access to jobs. Reasons for this scarcity vary; interviewees stressed the political nature of job selection but much likely also relates to the nature of small island economies, which tend to specialize in a few areas and have limited capacity in many others (Kerr 2005). A government manager noted:

Interviewee 74999: Even today, as [title removed], I need professionals to work with me. We are three, working at this moment. Trying to cover the whole province. And I cannot find the profile [of qualified people]. And of course it is easy to say it's because in Galápagos, people don't study and we don't have professions. We *do* have profession[al]s,

but they're [emigrated] out. Because they were not given, they were not given the opportunity here. The doors were closed to them.

And nobody's going to come here to apply, to expect, to see if they are going to be called when they already have a job out there [elsewhere in the world or Ecuador].

At the same time there is a scarcity in some jobs, there is a surplus in different areas of labor demand, notably manual and semi-skilled work. Those excluded from IMO-certified sea-based work have very thin options besides fishing, on land and at sea. At the lower end, many active fishermen are ready to work for the GNP if it wants to hire seasonal help for sea cucumber or lobster monitoring activities, when less than 10 are needed in any given year. Many interviewed were looking for piecework as carpenters or other seasonal land-based jobs.

The dynamics of particularistic access, scarcity, and surplus in various segments of the labor market strengthen and make more complete the livelihoods focus on differences in asset bases, mediating processes, and access, helping explain why certain household characteristics make an individual more amenable to being able to find work, and also why not everyone with those characteristics can. It must be realized that individuals not only have differential abilities to leave fishing, they are striving for different goals.

C. Livelihoods and Bioeconomics: Implications for Modeling Linked Social-Ecological Change

Several implications for quantitative modeling efforts from this livelihoods analysis are presented below. A major conclusion of this chapter is that it is insufficient to think of latent fleet capacity (in the form of inactive fishers) as waiting to enter when market conditions improve, a conventional expectation, particularly if a timescale longer than one season and non-economic factors are considered. In addition instances where individuals do not choose to maximize profits

exist and are discussed in three areas: the relationship between income and labor mobility, satisficing, and job satisfaction.

CI. Income, Labor Mobility, and Long-Term Profit Maximizing

Income comparisons are often assumed to be the primary factor influencing mobility in economic labor market theory, which holds that individuals will seek to maximize their labor benefits and minimize costs (Gordon 1954, Heen 1988). However, at present a full-time fisherman participating in all major seasons can still earn a comparable wage to someone working in contract government jobs, or as an intermittent tour guide or sailor.

This analysis concludes that labor mobility makes most sense when considered in terms of long-term career strategies rather than seasonal profit seeking and participation. Tourism wages have slowly risen and fishing incomes fallen so that some work has equalized, and only recently has secure tourism work surpassed fishing incomes. Beyond equalizing however, the long view of tourism's bright future and fishing's dismal one now make *comparable* wages seem *better* in tourism. As one foundation manager put it, "Tourism will be what will produce income to the Galápagos Islands, you need not be wise to know that this will happen in the future. The fishing issue is going to be increasingly restricted..." (interviews 2010). Results match those of Heen (1988), who also found that "future income was more decisive than present income" in Norwegian fishermen's decisions to leave their industry (405).

Contrary to economic theory, a broad swath of the fishing community is willing to take on alternate labor that gives them lower incomes compared to year-round fishing, a trend that seems to have grown more common in recent years. Recent exits were accompanied by gains and losses in income in almost equal measure. Creating wealth while diminishing fishing

engagements was only observed with the aid of government sponsorship, for the four individuals who won tourism permits. Other exits were roughly horizontal moves or accompanied by a loss of income if an individual retired without securing alternate work or temporarily stopped fishing due to health or broken boats. Even here (long-term) profit maximization fits the behavior of some but not all. While some former fishers have gone on to great success in business, I argue that another group has no active plans to make more money in the future when they leave fishing but are driven by non-economic concerns of health, family time, and the vision of earnings that may continue to shrink in fishing at the same time that their physical strength diminishes with age. Due to the above dynamics, assuming that the labor choice with the highest economic returns can predict declining fishing effort is overly simplistic. This is not to say that as more jobs of comparable income and attainable skillsets are made available to fishermen more will seize the initiative to leave, but only that *higher* incomes outside of fishing, while desirable, may not be a necessary trigger.

Heen (1988) presents an interesting discussion on how the concepts of being “pushed” or “pulled” into work by unfavorable or favorable conditions, respectively, also present difficulties for using income as the main predictor of labor movements. Individuals who have been pushed out of work through being fired for instance, are clearly not leaving in search of greater wages elsewhere. Some may find equal or higher incomes, but these outcomes are not the cause of their mobility. The push/pull dynamic roughly parallels the distinction between coping and resource management made in livelihood work (e.g., Ellis 2000), where the former refers to reactive and the latter proactive decisions about when to change livelihood strategies.

In the end, distinctions were difficult to apply here. Many actions can be considered products of both pushes and pulls simultaneously from different factors. Some survey

respondents represent those pushed into fishing after job loss, while others represent a pull into fishing by some who chose to enter, including the younger interviewees. Tourism's increasingly favorable conditions however represent a pull on registered fishers who choose to enter that industry given its better prospects. Interestingly, out-migration for other jobs was not a common resulting push coping response observed among interviewed fishers, as it has been in other areas that have experienced fisheries declines such as Newfoundland (Antler and Faris 1979). Only one worked abroad in Spain for one year before returning, and another planned to move his family to Guayaquil to save expenses, while working apart from them in Galápagos. Regardless, the multiplicity of dynamics around labor choices presents another complication to using income exclusively as a modeling variable for understanding labor mobility. More realistic modeling of labor market movements in bioeconomic models could incorporate this empirical reality; two detailed dynamics are described below.

C.2. Good Enough to Leave: Satisficing in Exiting

“Satisficing” is usually used to describe a pattern of bounded optimization as individuals reach a certain satisfactory level of profit (rather than the maximum), after which they are driven by non-monetary goals (e.g., Robinson and Pascoe 1997). I propose an alternative, *outward* consideration of “satisficing” that considers profit seeking outside of fishing as it affects activities within fishing: a threshold of acceptable alternate income is all that is needed for individuals to leave. By assuming not that individuals will always exploit to the greatest extent possible but that they only seek means to leave, this reverse satisficing is more aligned with sustainable livelihoods approaches. These dynamics do not offer a predictive modeling solution

to fishing effort since individual thresholds are unknown and likely vary, although in effect ‘bounded optimization’ can describe actions.

However such an explanation aligns with much of the reasoning around job switching offered by interviewees. Empirically it was found that even though non-fishing jobs are available, a certain level of income is a prerequisite for many fishers who remain active while seeking alternate work opportunities. This level is ambiguous and often described as needing to be enough to support individual fishers and their family.

C3. The “Satisfaction Bonus”

Anderson (1980) recommends adding a variable to models that incorporate a satisfaction bonus, in the form of the monetary equivalent to what a worker’s satisfaction would be. A general equilibrium economic model could thus be formulated that accounted for both the profits from an industry and the worker satisfaction bonus, to account for why wage differentials might exist in an economy otherwise in equilibrium (since the satisfaction bonuses from each industry might differ). In this way the “social surplus” from a fishery can be formally incorporated into models, and a negative satisfaction bonus can also be presented. In the San Cristobal case the satisfaction bonus was found to be negative, in contrast to most others previously reported. The effects of any “satisfaction bonus” in the Galápagos have been contradictory - working to help people move out even before it is economically necessary because negative aspects are outweighing positive ones in terms of job satisfaction. This finding dovetails with the reverse satisficing discussed above. This analysis concludes that one should cautiously assume that a satisfaction bonus exists, and even more cautiously add it to models, perhaps only after empirical evidence of the strength and direction of any satisfaction bonus in a particular fishery.

D. A Livelihoods Approach to Declining Participation: Policy Implications

Finally, the fine-scaled empirical data generated offer various policy implications in terms of enriching socioeconomic data on the fishing sector, and knowledge around the interactions between job switching through fishing and conservation governance. First the 2012 Livelihoods Survey adds much detail to the intricacies of labor movement and preferences not before known in the Galápagos. Survey data show for instance, that most individuals who have moved out of fishing work in tourism in various capacities, although work taken up ranges from manual labor to the professions (Fig 3.2). In addition the majority of the fishing sector in 2012 could be described as waiting to exit, however compared to the few who did leave raise the question of bottlenecks to doing so.

Behind policy applications of livelihoods work to poverty alleviation is often a belief in raising the “asset status” of the poor as a means through which individuals can have greater capabilities to better their lives, since assets are “fundamental to ...the strategies [the poor] adopt for survival, and their vulnerability to adverse trends and events” (Ellis 2000: 28). However, conclusions around the equal or greater importance of access to various livelihood pathways over asset building implies that policy makers might do well by taking a two-pronged approach. Rather than focusing exclusively on programs designed to build up individual household assets such as financial credit and educational skills (while important), it is equally necessary to consider how policies might be retooled to widen various routes through which fishers can and have left the industry. Regulations demanding destruction of fishing boats stands out as detrimental to fisher capital in ways that are unusual in other areas globally. In addition the rarity of trainings to become certified naturalist tour guides might slow some from leaving fishing in this route that might adopt such a pathway as others have in earlier generations.

V. Conclusions

This chapter has provided a nuanced understanding of recent individual-level job switching through Galápagos fisheries. Boat ownership, higher educations, and vertical social connections stood out as the key factors enabling some to move out of fishing in recent years, although differences in asset bases are far from strongly distinct. The weak differentiation likely reflects the variety of occupational pathways found out of fishing over time, the equally influential mediating processes of conservation governance and a segmented labor market, and the fact that measured asset bases likely represent both the “capability” from which people draw to switch work, and the social outcomes of those changes (analyzed in Ch 4).

Several major points can be summarized. First, the prominence of institutional intervention for those experiencing rising wealth when moving away from fishing (and no one else) and the National Park’s control over the radical fluctuation in exchangeability of boats as financial assets underscore institutional influence on livelihood pathways and options for Galápagos residents. The GNP channels allowable occupational pathways to prioritize conservation over economic needs. Those with less education, wealth, and more horizontal social ties were disadvantaged from participating in the highest revenue pathway (i.e., the tour competition) out of fishing in recent years. The influence of conservation governance on fisheries change is a common thread that runs through this entire dissertation project, and will be further discussed in Chapters 4 and 5. Applying a sustainable livelihood analysis of “assets-mediating activities-access” therefore shows that individual level occupational changes can be better explained (i) with greater focus on the “mediating activities” and “access” enabled by institutional governance than on differential asset bases, and (ii) against the backdrop of broader labor market dynamics. Second, because non-fishing work was often the limiting factor in

transitioning out of fishing, I conclude that fluctuations in fishing activity are closely linked to comparable compensation and space within other economic sectors.

Third, while the sustainable livelihoods approach has been widely taken up in development and aid circles (e.g., Bebbington 1999; DFID 2000), it has yet to make inroads in modeling and management efforts and outside of largely developing countries and subsistence contexts. The bioeconomic framework assumes income predicts labor mobility; while individual motives for fishing participation do include profit maximization, they also build out from income in diverse ways that reflect longer-term concerns and responsibilities. Modeling based on higher income triggers is therefore insufficient to understand Galápagos fisher behavior in this period of decline. Work is intended to compliment past studies on the social dimensions of fishing in the Galápagos that have emphasized proximal dynamics such as choosing fishing grounds (Castrejon 2011) and quantitative analysis of fishing effort (Bucaram et al. 2014). The initial attempts at providing explicit nodes of intersection between livelihoods and modeling work is hoped to spur more such interdisciplinary research in the future.

Fourth, results extend existing scholarship on fisher livelihoods and behavior by presenting an outward facing understanding of fisher entry and exit, and data-driven testing of the potentially retentive effects of job satisfaction and poverty traps on fishing employment. Past studies on job satisfaction have relied on hypothetical scenarios of when fishers would leave, and shows that unlike other areas, high job satisfaction does not have any retentive effects on labor in this Marine Reserve. Whether these results hold over other marine reserves remains to be investigated in future studies. It is possible that as marine reserves age, conservation policies that become more effective over time in terms of both monitoring and enforcement and propaganda may affect the desire to leave the profession despite strong attachments to it and competitive

profit margins, as evidenced by those leaving who did not find comparable compensation in other jobs.

In the following chapter, results presented here will compliment analysis of the social effects of fisheries change in the Galápagos, and a more in-depth discussion of how other economic sectors have affected such outcomes on the individual as well as societal levels.

CHAPTER 4

Conservation Governance and Adaptive Fishing Strategies: Social vulnerabilities over time

I. Introduction

Galápagos fishers have moved through fishing in different ways over the course of several tumultuous decades. Previous chapters have categorized these movements by their changing environmental dependence: “intensification”, “diminishment” (i.e., growing occupational plurality outside of fishing), or “steady maintenance” of fishing practices. These strategies are, in a sense, adaptive responses to social-ecological change. Building on analyses of why and how people move through fishing (Ch 3), this chapter represents the second of a two-part analysis of the project’s 2012 Livelihood Survey, here investigating social outcomes. Analyses will show that a greater involvement in fishing is associated with higher social vulnerability in San Cristobal.

In conjunction with social outcomes this chapter considers economic and governance processes outside of fishing that have shaped the different adaptive pathways taken by individual fishers over the past decade and their resulting social welfare. Including but expanding out beyond individual-level experiences, my aim is to situate fisheries change into the broader change of the Galápagos economy, and show how the social outcomes of fisheries change are intertwined with interactions with other economic actors. Two dynamic relationships stand out as having affected the choices and social welfare of fishers over time in the Galápagos. The first is

conservation governance, and the second the labor relationship between the fishing and tourism industries. Both have and continue to change the bounds of possibility for fishermen in terms of alternate livelihoods, and this chapter extensively investigates this changing calculus. The issues addressed can be summarized into three connected questions:

1. What is the relationship between environmental dependence on fishing and social vulnerability in San Cristobal?
2. How are active and transitioning fishers intersecting with the ecotourism industry?
3. How has conservation governance affected the social welfare of fishermen?

Two main arguments are presented here. The first is that social mobility through the fishing sector has historically been high, and livelihood transitions into tourism always prominent. However the pathways into tourism have constricted alongside the slow loss of ownership over the tourism industry by local residents to outside interests (e.g., Epler 2007). More fishers now act largely as a flexible, precarious workforce of wage labor and in fewer instances, transition into roles of owner/operators of tour boats or high-level crew as they once did. Hence today's active fishers are more vulnerable to becoming "stuck" in fishing than their predecessors, and the gap between those who did and did not transition early may be widening. The second argument is that conservation governance has been a double-edged sword for the social welfare and choices of Galápagos fishermen. While the adaptive livelihood possibilities of active fishers today are channeled by regulatory impulses that grow evermore strict, the Marine Reserve is an island of steady economic prosperity, safety and security in Ecuador. This double-edged sword implies a manifestation of the mixed consequences of delineating conservation boundaries – which have accentuated unbalanced attention between "privileged spaces of nature protection" and worsening degradation in the rest of Ecuador (Zimmerer 2000: 362, Harris and

Hazen 2006).

Arguments are laid out in six sections. The methodological approach is first briefly reviewed (Section II). As a foundation for understanding the relationship between fishing and social vulnerability in the present-day (i.e, 2012), correspondence between social conditions and adaptive fishing responses are analyzed using this project's survey data (Section III). Once these social conditions have been laid out, I analyze the changing labor relationship between the fishing and tourism sectors in Section IV, the effects of conservation governance on fishers in Section V, and summarize some temporal dynamics and policy implications around social vulnerability in Section VI.

II. Methodological Approach

With a continuing emphasis on the sustainable livelihoods framework, social change in fisheries is considered here not through changing fishing practices but through changes in the broader coastal economy over time, to not divorce the sector's practices from its wider political economy (Allison and Ellis 2000). Fisher perspectives via personal employment experiences inform this chapter and continue to situate the analysis in the viewpoint of local fishing resource users.

Vulnerability is one's exposure to a risk or susceptibility to harm (Leach et al. 2008) and defined here around two areas of susceptibility: (i) being unable to retain one's economic security and income levels, and (ii) a narrowing of adaptive capacity, or the ability to change with circumstances as one so desires, as described in Chapter 1. Continuing the mixed methods analysis of this project, simultaneously collected quantitative and qualitative data are analyzed in parallel and their combined inferences inform conclusions. I pair factor analysis with interviews

and participant observation to investigate how socioeconomic conditions and wellbeing among registered fishers have changed over time. In addition, I interpret where social vulnerabilities lie in the heterogeneous fishing community and how they are shifting over time from attention to the changing and historical labor relationships between fishing and tourism, which help create economic opportunities outside of fishing that contemporary fishers react to.

III. The Social Conditions of Adaptive Fishing Responses

A. Quantitative Analysis

As an empirical basis for understanding relationships between fishing and social vulnerability, I analyze how people with different fishing patterns differ in socioeconomic conditions. Survey data captured career full-time fishers, career registered but inactive fishers, and many who had diminished engagements to different degrees over time (57% total, Ch 3). The measured assets and socioeconomic conditions reflect the social welfare that is now aligned with their pathways. A multivariate approach is useful since vulnerability is accompanied by a combination of social conditions, which should be considered in conjunction when possible.¹⁹ Using the livelihood survey described in Chapter 1, a multivariate Linear Discriminant Analysis (LDA) was conducted. LDA is a type of factor analysis that interprets the ways in which (categorical) groups differ, here fishing strategies, based on their relation to a number of “discriminating variables” (interval, ordinal, or continuous). In other words, it gives the composition of various social factors that accompany each fishing strategy, and shows how much they differ. The LDA does not test whether fishing strategies (i.e., intensification, diminishment, or steady maintenance) are *dependent upon* the discriminating variables, as in a multivariate

¹⁹ Because data are cross-sectional and not panel, they do not show social *drivers* of intensifying or diminishing fishing over time. For this reason a multivariate analysis was deemed unsuitable for the labor mobility analysis in Chapter 3, but suited for the analysis of social outcomes presented here.

regression, but only the strength of their difference among groups. Other than this fine distinction in many other respects it is analogous to multivariate regressions (Klecka 1980).

Table 4.1. Discriminant variables input into the linear discriminant analysis, and their possible responses. Responses were converted from categorical to ordinal and whenever possible, a “1” was given to the values that might align with lesser social vulnerability according to past scholarship.

Factor	Responses
Still Choose fishing	
Born in Galápagos	
Has applied for Tour Permit	
Has interviewed for a Job	
Family in Politics or Government	
Cannot Meet Sudden Cash Need	Yes/No (Y=1, N=0)
Boat Owner	
Home Owner*	
Chronic Health Issue	
Children go to School Abroad	
Fishing has Diminished Over Time	
Sea Cucumber	
Lobster	
Seco Salada	
Fresh fish (hook)	participation = 1, otherwise 0
Fresh fish (dive)	
High Seas Tuna	
PV	
Diver	
Higher Income than in '09	
Health Comparison	better (1), same(0), worse (-1)
Change in Std of Living, '09-'12	
Std of Living, 2012	good (1), bad (-1), more or less good (0)
Supports HH economically	N (1), both spouses (0), Y (-1)
Married	married/free union (1), single (0), divorced/separated (-1)
Involvement in Cooperative	none (0), membership (1), active management role (2), president (3)
Year started Fishing	
Year Born	
No. children	
No. in HH	
Individual Education	
HH Education	Numerical values
No. sub-fisheries	
HH Income	
Fishing Income	
No. Jobs in HH	
No. Jobs of Individual	

* values were own=1, rent=-1

Because a greater degree of social distinction was found between career-wide, long-term movements through fishing than changes from 2009-11, analyses focus more heavily on the former. A long-term focus is also more illuminating of the underlying dynamics of job switching across the past decade. The discriminating variables here are 37 metrics²⁰ of financial capital, social capital, human capital, relative poverty and economic security culled from the livelihood survey (Table 4.1). In the end there were 72 cases of complete information for all 37 variables out of the 167 registered fishers surveyed.

The discriminant analysis analyzed the 37 input variables and arranged them so as to maximize the “separateness” between groups (i.e., long-term fishing strategies) by weighting each variable to different degrees. These 37 weighted inputs are stored in two entirely new dimensions called Discriminant Functions (DFs), which are also presented graphically as two axes of difference, so that each data point (here representing an individual) can be graphed and their degree of similarity or distinction visualized (Fig 4.1).

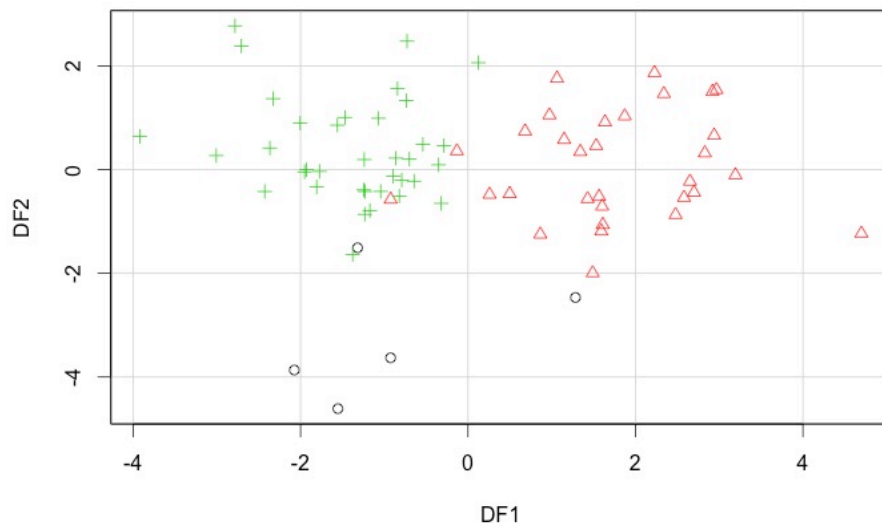


Figure 4.1. Clusters of survey respondents who have diminished (green crosses), intensified (black circles), and maintained the same fishing levels (red triangles) over their careers, as separated by via

²⁰ Survey questions on income, demographics, fishing patterns, social origins and activities that were not numeric were converted to ordinal forms.

discriminant analysis. The x- and y-axes represent calculated discriminant functions that summarize social characteristics and fishing patterns.

People with different fishing strategies over time were fairly well separated along these axes, with some overlap among those who have diminished and maintained fishing levels (Fig 4.1). More clearly showing the composition of each DF is a structure matrix (Fig 4.2) that contains simple correlation coefficients between each DF and the 37 discriminating variables. The factors that are the most powerful discriminators between groups contribute the most to DF loadings and have the highest structure coefficients (Klecka 1980), shown as the highest and lowest values in Fig 4.2.²¹

Structure coefficients show that the discriminant functions (DF) took on different characters (Fig 4.2). DF1 was characterized most strongly by birth outside of Galápagos, a lack of ownership of boats or houses, no involvement in active management of fishing cooperatives, and declining material standards of living and household incomes from 2009. DF1 also indicated weak overall wealth and community involvement. DF2 was characterized by a high number of individually held jobs, rising incomes from 2009 and improving material standards of living, and low fishing income (Fig 4.2). In contrast to DF1 birthplace was unimportant.

The low correlations with participation in sub-fisheries indicate no strong trend in leaving or remaining in certain fisheries over time as people intensified or diminished their engagement. However DF1 is associated positively with salted fish, whitefish, and sea cucumber, and negatively with lobster and Pesca Vivencial (PV). DF2 is associated positively with PV, salted fish, and whitefish, and negatively with lobster and sea cucumber.

²¹ Fishing status in the 2011-12 season was originally the strongest factor, although because of its correlation with either intensifying or diminishing strategies (i.e., no one who diminished their strategies would be a full-time fisherman), it was removed from the analysis.

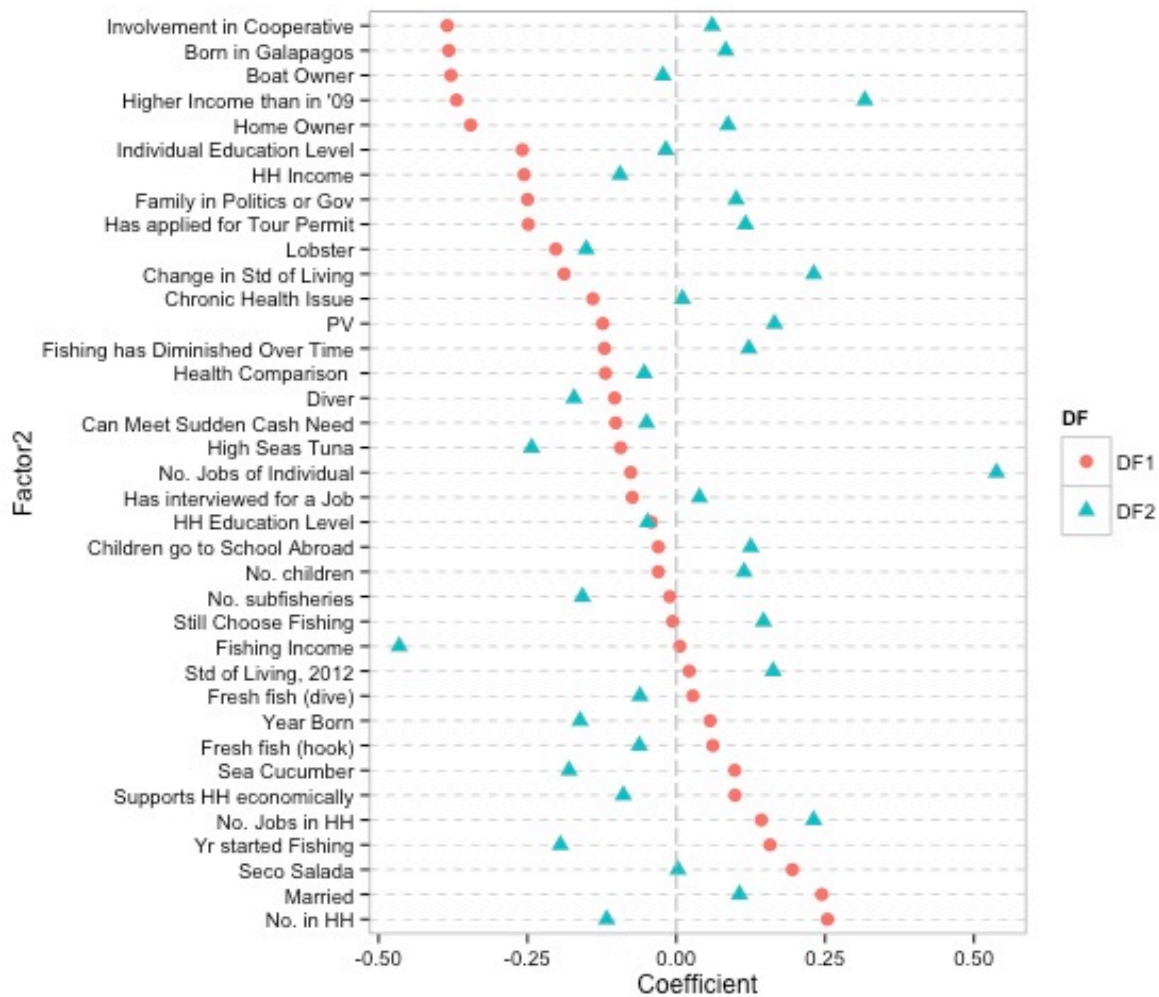


Figure 4.2. Structure coefficient values of each of the 37 discriminating variables in each discriminant function (DF). Coefficients are ordered by their DF1 value, since DF1 accounted for more of a group's character than DF2. The structure coefficients (i.e., their scores on the x-axis) signify each variable's contribution to a function. Negative scores to "yes/no" variables indicate stronger "no's", and vice versa. Scores closer to zero contribute less to a DF.

Comparing the values of the discriminating variables within each DF yields a rough characterization of the social composition linked to the different degrees of present-day environmental dependence. These characterizations are further informed by bivariate and descriptive statistics, and align with the trends found in Chapter 3. They are summarized below for each social group.

Reducing Fishing Effort: The low DF1 scores of all individuals diminishing fishing effort

over time (Fig 4.1) indicates a greater active involvement in the management of local fishing cooperatives, higher rates of home ownership (roughly equal boat ownership with intensifiers), and overall rising incomes from 2009. Many were born in the Galápagos. A greater proportion reported positive material standards of living in 2012 (i.e., good or more or less good), and from 2009-11 (i.e., better or the same). In terms of active fishing patterns, the only consistency was a more positive association with pesca vivencial and a more negative association with sea cucumbers. Because by definition no one who has reduced fishing effort over time is a full-time fisherman, these scores indicate that part-time, occasional and inactive individuals are better off than full-time fishers. In sum, a reduced environmental dependence over time corresponded overall to increasing wellbeing and a slightly higher correlation to pesca vivencial involvement.

Intensifying Fishing Effort: There were few people who intensified fishing: only eight overall, seven of whom did so from 2009-11. Increasing fishing impact was roughly aligned with decreasing human wellbeing. More people in this category reported declining incomes in 2012 compare to 2009, while more of those diminishing their fishing engagements reported the opposite, or rising incomes (Table 4.2). These same trends hold for those intensifying and diminishing recently and over the course of their careers (Fig 3.3b & d, Ch 3).

Table 4.2. Survey respondents compare their income in spring 2012 to that in 2009.

	Higher	Same	Lower
<i>Fishing Strategy</i>			
Intensify	1	3	3
Diminish [*]	9	3	2
Steady Maintenance	53	56	34
<i>Fishing status</i>			
full-time	9 (18%)	17 (35%)	21 (43%)
part-time	27 (55%)	22 (45%)	9 (16%)
occasional/inactive	25 (60%)	23 (40%)	9 (16%)

^{*} 14 out of 15 people who diminished their fishing were asked this question

Those who have intensified their fishing engagements over time scored low in both DFs (all but one < 0). People in this group hold a relatively small number of jobs individually, and have fewer jobs per household, fitting with interviews that showed that three of out the seven intensified fishing from 2009-11 as a response to job loss elsewhere. They own boats in the same proportion as those reducing fishing effort over time, although proportions of homeownership are lower. These scores also indicate a greater association with lobster and sea cucumber than the other groups.

Maintainers: Those who have maintained the degrees that they fish over time are the most heterogeneous group in terms of social conditions. Most scored highly in DF1 (< 0), signaling migration into Galápagos, a lower degree of home, boat ownership, and cooperative involvement than individuals who have diminished fishing over time. More experienced lower incomes in 2011 compared to 2009. Their even split between positive and negative DF2 scores indicate a range of fishing incomes, as expected, and that responses to self-assessed material standards of living vary.

As a final note, testing of the efficacy of the LDA analysis itself is described by two statistics (Table 4.3). The “proportion of trace” shows that the first discriminant function, DF1, accounts for 75% of the overall separation between groups, and DF2 accounts for the other 25%, still contributing significantly (Table 4.3). The canonical correlation coefficients represent the measures of association between the discriminating factors and each DF, and show that DF1 is also more highly correlated to its variables than DF2, making it more cohesive in terms of interpretation. In addition because data are a sample and not an entire population, a test of significance is also run to test the probability of having found differences among groups that

might not exist in the population²². The test shows that DF1 and DF2 distinguish differences between groups that are likely to be occurring in the broader population of registered fishers, assuming random sampling, and that both discriminant functions are contributing significantly to the overall analysis.

Table 4.3. Statistical summary of the LDA analysis. Table (A) values give metrics of the degree of separation between groups, and Table (B) tests the likelihood that the sample data findings would be found, if differences did not exist in the population.

(A)	DF1	DF2
<i>proportion of trace</i>	0.7479	0.2521
<i>canonical correlation</i>	0.7862	0.5942

(B)					
<i>Response DF1:</i>	DF	Sum of Squares	Mean Sq	F value	Pr (>F)
ldaGroups	2	167.55	83.775	80.285	<2.2 x 10-16*
Residuals	69	72	1.043		

<i>Response DF2:</i>	DF	Sum of Squares	Mean Sq	F value	Pr (>F)
ldaGroups	2	56.477	28.2384	27.062	2.11 x 10-9*
Residuals	69	72	1.044		

*significant at < 1%

B. Fishing and Social Vulnerability

In the end, the multivariate discriminant analysis produced weak cohesiveness of social “signatures” accompanying adaptive fishing strategies. Implications are not surprising, in that they indicate that following a particular strategy in terms of environmental dependence is not the only thing that defines people in terms of economic security or social welfare. However, cumulative evidence from qualitative analysis of interviews and descriptive statistics brings out a clear picture of relatively high social vulnerability and lower wellbeing in Galápagos society for

²² This test is somewhat predisposed to produce a statistically significant result since variable values that are the most different are first categorized, and then tested (C. Wiesen pers comm). Nonetheless it is the common approach to

full-time fishermen as a group, in many respects including the non-material aspects of wellbeing beyond income and assets, or “the human capabilities of doing and being, where doing involves agency, choice and freedom, and being involves welfare and happiness” (Ellis 2000:76). This is true even while some fishermen earn annual incomes on par with the Galápagos average and fish as chosen and desired livelihoods.

As a whole, fishers were neither disproportionately rich nor poor in income in 2011. However moving along the spectrum from full-time to inactive engagement, a greater proportion of households reported earning \geq \$17,000/yr in 2011 (Table 4.4). The proportion of part-time fishers that made between \$9,000 and \$16,000 in 2011 is almost on par with their full-time counterparts (Table 4.4), indicating along with interviews that boat owners have the ability to shift some physical burden of fishing onto others while sharing in profits; some do not always go out with their boats.

Table 4.4. Reported income from the entire household (left) and from fishing (right), of survey respondents²³. Total household income is reported for all survey respondents (N = 167), and fishing income for active fishers (N = 119). Survey instruments for active and non-active fishers contained slightly different income bracket questions.

HH Income	N	%	Fishing Income	N	%
			< 2	9	7.6
3-6,500	14	8.4	2 – 5,500	27	22.7
6,500-10,000	20	12.0	5,500-9,000	34	28.6
10,000-13,500	25	15.0	9,000-12,500	22	18.5
13,500-17,000	21	12.6	12,500-16,000	11	9.2
> 17,000	83	50.0	> 16,000	16	13.4
doesn't know	2	1.2	doesn't know	0	
didn't ask	2	1.2	didn't ask	0	

In addition, higher proportions of active fishers are less well off than inactive fishers in

²³ Annual income was used as an overall proxy of wealth, and because the seasonality in income streams was hard to capture in a metric. I surveyed income brackets rather than exact numbers to reduce potential model and respondent sensitivity to an unknown variance in truthfulness.

many metrics of relative poverty and economic security. Full-time fishers in the highest proportion reported that their material wellbeing had become lower, and in the lowest proportion that their lives had become better. It is notable that none of the people who intensified fishing, in the long- or short-terms, thought that their material standards of living had gotten better, and a greater percentage reported declining standards²⁴ (Table 4.5).

Table 4.5. Self-assessed changes in material standard of living from 2009 – 2011 for survey respondents who intensified, diminished, or maintained their fishing levels in the long- and short-term.

	Higher	Same	Lower	Doesn't know/remember
<i>Fishing Strategy (long-term)</i>				
Intensify	0	4 (50%)	4 (50%)	0
Diminish	40 (42%)	36 (38%)	18 (19%)	0
Steady Maintenance	15 (24%)	26 (41%)	20 (32%)	1 (2%)
<i>Fishing Strategy (short-term)</i>				
Intensify	0	4 (57%)	3 (43%)	0
Diminish	4 (27%)	7 (47%)	3 (20%)	0
Steady Maintenance	51 (35%)	55 (38%)	36 (25%)	1 (1%)

A greater percentage of active fishers also reported being in worse health than peers their age. Their cash constraints were strong; every individual that initially reported “no” to the question, “If you had to raise \$1000 in one week, could you do it?” was an active fisher (Fig 4.3). In addition to the generally lower wellbeing of full-time fishermen as a group, it is clear that for many interviewees, recent movement into fishing has been associated with more tenuous economic security following job loss as Chapter 3 described. Four of the seven recent intensifiers

²⁴ Changes in self-assessed material wellbeing are chosen as a metric of vulnerability because it has been used as a metric of general household resilience in the past (Goulden et al. 2013). This metric blends respondent perceptions of their income and asset changes with their specific aspirations and how they’ve been able to respond to them. Hallerod (1994) and Mack and Lansley (1985) also found that people in Europe with lower material standards of living also tended to suffer from other hardships such as greater economic vulnerability and weaker safety nets. The exact question asked was, “The things you can do or buy for money – for example housing, furniture, food, cars, holiday, trips – are an essential part of our material standard of living. If you think of your standard today, do you consider it higher, lower, or approximately the same as three years ago?”, used from a 1992 representative survey of the Swedish population (Hallerod 1994).

would rather work outside of fishing with three of these returning after job loss elsewhere. From a livelihood perspective, the hypothesis that those leaving the sector and diversifying income sources might have a greater capacity to weather fluctuations in fishing harvests seems borne out.

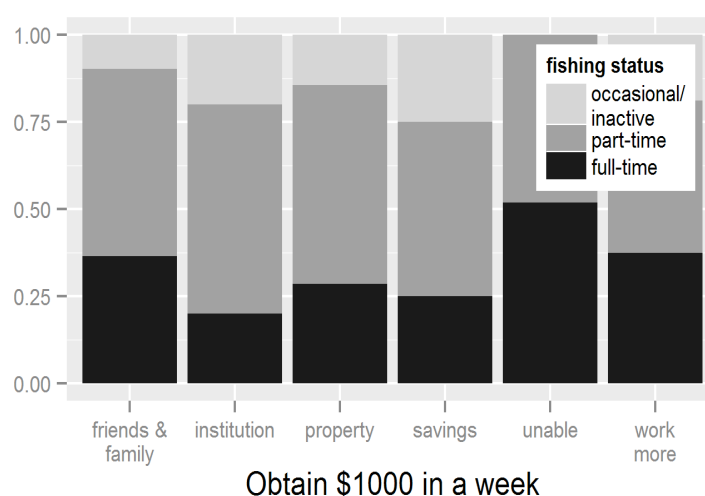


Figure 4.3. Survey respondent answer to how they would respond to a sudden cash need of \$1000 in one week.

Compared to the general Galápagos population survey respondents also have very high rates of chronic disabilities (Table 4.6). Rates are twice as high as all agricultural, livestock and fishing workers in the Ecuadorian census (grouped together in one census category). This indicates that fishers may have higher rates of disability than those in agriculture and forestry. Workers in this census category report disabilities at twice the rate again of other Galápagos workers, giving full-time fishers five times the rates of disability as all other Galápagos workers. Rates of having children that study abroad among the surveyed sample were also much lower than the Galápagos average (Table 4.7)²⁵.

²⁵ This metric could be confounded by the prevalence of children that actually live on the mainland with their mothers, discovered while in the field, which would not denote being sent abroad for better educations. Even considering the different wording of this survey and Living Standards Survey, which asked of all household members who have studied abroad rather than only the children, the large difference in rates in the general

Part of the lower social wellbeing of full-time fishers as a group likely stems from some of the attributes of the profession. Fluctuating catches from the uncertain nature of hunting, the essence of what fishing is, are compounded by market uncertainties including export prices, merchant whims and decisions, and GNP decisions around fishing spots and seasons for lobster or sea cucumber, which are not opened every year. Fishing also requires demanding physicality, and a lax attitude toward dive training that has left many with chronic ailments over time. All divers have stories of accidents, from personal experience or of friends and family. All fishers are exposed to the risks described above, regardless of their degree of dependence on fishing, although full-time fishers are clearly the most exposed.

Table 4.6. Rates of chronic disabilities among survey respondents and from the 2010 Ecuadorian census. The census question does not use the word “chronic” but records disabilities that last for at least one year.

Group	Chronic Disability %(N)		
	Y	N	No response
<i>Survey data</i>			
Full-time fishers	10% (5)	88% (43)	2% (1)
Part-time fishers	17% (10)	79% (46)	3% (2)
Occasional/Inactive fishers	14% (8)	74% (43)	12% (7)
<i>2010 Ecuadorian Census*</i>			
Workers in agriculture, livestock, forestry and fishing	5% (61)	87% (983)	8% (85)
All other workers	2% (270)	88% (10470)	9% (1116)
Galápagos average	3% (331)	88% (11453)	9% (1201)

*only data from the Galápagos Islands are used

Table 4.7. Rates of household children that have studied or are studying abroad. The Galápagos Living Standards survey question asked of all household members who have studied abroad, rather than only the children.

Group	Children studying abroad	
	Y	N
<i>Survey Data</i>		
Full-time fishers	43% (21)	43% (21)
Part-time fishers	40% (23)	52% (30)
Occasional/Inactive fishers	40% (23)	43% (25)
<i>2009 Living Standards Survey</i>		
San Cristobal average	83% (296)	17% (61)
Galápagos average	82% (768)	18% (174)

Galápagos population, twice as high as my survey, implies that fishers likely send their children abroad for schooling at lower rates.

Although the data are incomplete, it is not implausible that full-time fishers may always have had higher rates of chronic health issues and a greater proportion of low formal education than those fishing less, as was found here. The fishing profession has, until the registration system implemented in 2000, had a relatively low barrier to entry in terms of human and financial capital and thus continuously attracted some people with relatively low levels of formal education, although it has also served as overflow for educated residents who could not find adequate work (interviews 2012). These dynamics help explain how full-time fishers surveyed in 2012 were, as a group, the most socioeconomically precarious, least educated, and least healthy of all interviewees.

However, in many ways a more important finding than their lower social welfare is a narrowing of certain pathways out of fishing, particularly into tourism. Social mobility through the fishing sector is a historical reality; fishing has been a stepping-stone for many including relative newcomers of the sea cucumber era, some of whom bought houses, boats, and established tour agencies and stores with their earnings. Since the 1980s however, trends in the pathways out of fishing have slowly changed, much of it related to a changing political economy of job creation in tourism. Therefore full-time fishers today run a greater risk of becoming “stuck” in fishing than fishers of old, as elaborated upon below.

IV. Processes of Marginalization and Precarity: The Changing Face of Tourism

Happy families are all alike; every unhappy family is unhappy in its own way.
- *Leo Tolstoy, Anna Karenina (1878)*

A second implication of the weak cohesiveness of social “signatures” accompanying adaptive fishing strategies is that, like Tolstoy’s unhappy families, there is no one collection of processes and social conditions that corresponds to how individuals, households and families

have fared socioeconomically through the fishing downturn. Individuals have pursued occupational diversity in different ways starting at different times, and therefore differ widely in their social conditions.

Considering fisheries change through the factors emphasized via bioeconomics frameworks alone (e.g., the economics of costs, profits, and the monetary value of one's labor) leads to much focus put on changing individual incentives for fishing down resources faster than they can regenerate. Social scientists however have shown that changing fishing intensity is just as highly connected to larger political economic dynamics in a place as individual motives (e.g., Mansfield 2004). The diverse social signatures of San Cristobal fishers show that like many other small-scale fishing communities studied (McCay 1978; Middleton 1977; Fabinyi 2010), Galápagos adaptive fishing strategies, coping mechanisms, and vulnerability come from not only the sea but the land.

A. “All the people now here are children of fishermen”

To ask how Galápagos “fishermen” have changed over time is to run into the issue of ambiguously setting spatial and temporal boundaries. In many cases today's “non-fishermen” are yesterday's “fishermen”. Go back far enough, and you will find that “all the people now here are children of fishermen” (Fisher 32753, 2012).

Beyond general occupational diversity, I argue that a crucial aspect of “traditional” coping mechanisms to social-ecological change has been social mobility through the fishing sector *into tourism*. It must not be forgotten that as many as half of the old Cristobal fishing families have left and switched to tourism, many decades ago (Reck pers. comm; Ospina 2005; Ospina 2006). Fishermen were among the first people to see tourism's economic potential in the

Galápagos and experiment with tour businesses, with their vessels and seafaring knowledge. Local fishermen took tourists out on their small *pangas* for bird watching and trips around the bay (interviews 2012). They now appear prominently among the archipelago's proud, homegrown minority tour operators. A "substantial" part of locally owned cruise ships, most of the small 16-passenger variety, "...come from a small minority of Cristobalan fishermen that converted their fishing ships into tourism ships and transferred from San Cristobal to Santa Cruz in the seventies" (Ospina 2006: 96). The Andrades and Serranos are prominent examples, many who eventually moved to Santa Cruz (e.g., Ospina 2006, interviews 2010 and 2012). The Serranos now own three small cruise ships and an agency (Ospina 2006), and the Andrades own a hotel on San Cristobal and several businesses on both islands. The large albatross statue gracing the port landing on Santa Cruz is a gift from Hugo Andrade Serrano in "gratitude" for the good fortune that the archipelago has brought to him (Engie interviews 2010). While labor movement into tourism is still occurring however, changes over time reveal much about the shifting social vulnerabilities of the Galápagos fishing fleet.

B. The Changing Accessibility Of Touristic Labor

In the early 1980s, two brothers decided to start fishing lobster and sell them to the large international vessels that would frequent the archipelago. They decided to collect animals on the rocky seashore with bait and string at night, and in three years saved enough to help buy a 6-passenger tour boat (Ospina 2006). Rules around fishing and boat ownership were nonexistent, and one's initiative easy to capitalize on. Combined with continental educations paid for by other siblings' work on the first tour boats, "...the solidarity of family and the capacity to adapt to various jobs", these brothers are now prosperous local tour operators (95).

In 2012 a 3rd generation (part-time) San Cristobal fisherman and tour boat captain similarly decides to try something new. He imports a sailboat to the islands, noticing tourist enthusiasm for them, and plans to sell something novel – recreational *pescas vivenciales* (PV) fishing trips under sail rather than motor. Unlike the brothers above however, this recent fisher's initiative has not only gone unrewarded but put him in further debt. Plans were quickly stymied by the Park, who grounded his vessel for not conforming to a “fishing boat”, as required by PV regulations. Months of formal appeals and mounting debt and paperwork followed.

Regardless of opinions on whether a sailboat can be a fishing boat, these two contrasting stories show the slow solidification of institutionally acceptable pathways into tourism for both the local fisherman and the local resident. Today someone with an enterprising idea is far from free to try it. Labor mobility from fishing to tourism, arguably, has and continues to be an important coping mechanism to fisheries change, and the greater difficulty in becoming tour boat operators gives present-day fishers much reduced leeway in reacting to fisheries change.

The unmistakable narrowing of the possibility of legally running a boat-based tour operation has emerged through a combination of growing bureaucracy and elite capture of rights-based ownership of tour boats and operations, which were converted into private property in the 1980s with the permit or “cupo” system (Epler 2007). In many respects, the changing nature of labor mobility between fishing and tourism is a reflection of the broader nature of how local participation in tourism has changed over the years. The historical arc of a gradual weakening of local ownership of tourism operations is now well documented (e.g., Epler 2007, Ospina 2006, Quiroga 2009), including in a convenient missive by the provincial fishing cooperative:

... local fishermen, earlier owners of the patents, permits, or however one wants to call them, which were delivered to permanent residents, these (residents) for lack of economic capacity, agreed to sign work agreements with foreign investors, which resulted years later to have dodgy clauses, who today have taken over the patents.

Until today, residents have lost almost all of their rights and revenues that were

generated by operations such as day tours, cruises, and other forms that were fellow fishermen's, who started from nothing." (UCOOPEPGAL 2012, np.)

Certain avenues into tourism now are in reality quite narrow despite being technically available to all interested Galápagos fishers. Applying for tourism permits, as one interviewee put it, is "for those with money". Recreational fishing or *pesca vivencial* (PV) is the latest attempt by fishers, and local residents more broadly, to right a perceived imbalance in participating in the ever-growing tourism industry. Molina (2005: 13), in an early report for the Charles Darwin Foundation, notes that PV "could be an alternative form of tourism in Galápagos. It would differ from traditional tourism by directly involving the local population in both the activities and benefits associated with tourist activities" (see Chapter 5 for a more detailed analysis of recreational fishing).

The other major avenue through which fishers have traditionally worked in tourism has been as boat-based crew, either while fishing or transitioning completely. This avenue has similarly witnessed a reduction of access to the younger generation however, largely due to a change of rules in recent decades that make a secondary school degree a prerequisite for maritime certification courses standardized by the International Maritime Organization (IMO).

Some older individuals interviewed transitioned into comfortable careers as sailors and captains with only seafaring skills and incomplete secondary educations, working their way up the ranks. With a greater professionalization of the industry and international standardization of requirements however, younger fishers are more vulnerable to remaining "stuck" in fishing over time if they drop out of secondary school. One-third of full-time fishers surveyed lacked a secondary degree (16 of 49, 32.6%), a rate higher than part-time (9 or 15.5%) and occasional/inactive fishers (15 or 25.9%). One interviewee related that a few people have attempted to fudge a secondary degree to enroll in IMO courses. Going back to complete their

schooling is not an option they consider, since the make-up classes are incompatible with fishing trip schedules. Even for those who have completed secondary school,

Fisher 63392: It's difficult to devote oneself to [IMO] courses because...it's more studies. So then, almost the majority of the fishing sector is not prepared.

The collective results of these changes is that in many more tourism-related jobs taken up by registered fishers today, they act as a surplus labor force of precarious manual and semi-skilled positions (e.g., sailor, boat drivers and bus drivers) that can be called upon to expand or contract, providing fluctuating capacity to match local tourism flows. They have no salaried positions and loose affiliations with various agencies, often revolving around family and friend networks. Many are called upon the day before (or day of) a tour to conduct their work and are paid per outing. This labor system extends beyond deckhands out to the tour guides interviewed as well. In many respects they reflect a shared precarity with the local businesses that employ them on San Cristobal, which receive far fewer tourists seeking land-based tours than Santa Cruz

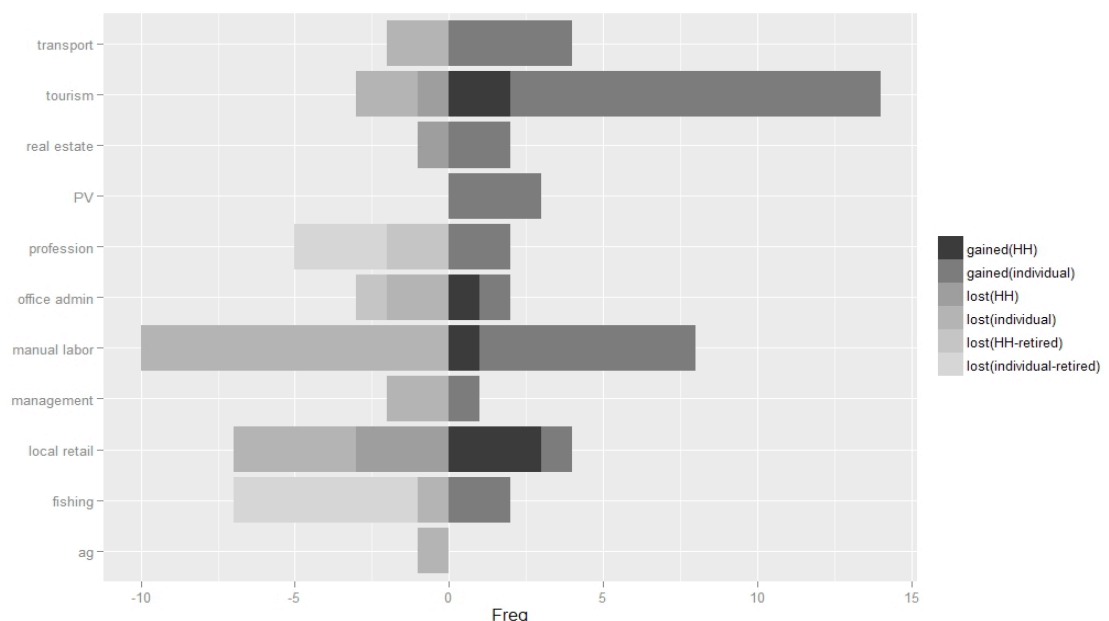


Figure 4.4. Job types gained or lost from 2009-2012. Frequency counts are overlapping, so that one person could have gained or lost more than one job type, for instance if they gained two additional jobs from 2009-12. Detailed descriptions of job types here are in Appendix B.

Island. Economic security is precarious because of a higher susceptibility to job loss. Those holding contract jobs and manual labor represent the portion of inactive fishers who are most likely to return to fishing in the future. From 2009-12, these jobs were gained and lost at the highest rates (Fig 4.4).

Registered and former fishermen are not unique in their situation, and these conditions related to tourism work have always existed. What has changed however, is the ease with which individuals can advance upwards and take greater control of the production of tourism business and its profits – as owners of agencies, tour boats, and higher-ranking crew. Some fishermen have indeed become small business owners, running tour agencies, dive shops, local retail stores of goods and clothing, restaurants, and for a handful, their own tour boats. Interestingly many of the former fishermen who have managed to establish tourism agencies have only done so with a turn toward illegality, because they operate on San Cristobal without a valid license for their tour boats. This dynamic is further elaborated upon in the next section.

Reedy-Maschner (2007), studying the privatization of fishing rights via quotas in Alaska, regarded the possession of quotas a key factor in influencing individual life histories and social relations, where owning quota widened the socioeconomic gap while building on existing social structures by rewarding the best fishermen (at the time of distribution). Arguably, the same holds true here for those who were awarded and have held onto tourism cupos; perhaps rewarded for being the most forward thinking. Social relations are not untouched, “Successful local operators...bitterly complain about the envy and evilness of the ones that forget the hard work that helped them succeed from nothing” (Ospina 2006:154).

In many ways this evolution downward in terms of shrinking abilities for upward mobility to owners from wage workers, and precarious job security of many tour jobs mirrors the

“proletarianization” of the non-fishing labor market that Antler and Faris (1979) found in Newfoundland fishing communities enduring a similar environmental decline in cod, or “making dependent and mobile laborers available to industrial capitalism”, by moving them out of the fishery (Antler and Faris 1979: 130). The greater vulnerability of active fishermen today is a reflection of an historical process of a partial loss of control of the terms in which they work – from one of strong to little control not in fishing, but in tourism.

V. The Double-Edged Sword of Conservation Governance

The constriction of adaptive pathways into tourism is highly intertwined with not only the changing tourism market (i.e., market competition) but also conservation governance (i.e., capacity ceilings and rights-based management). These dual roots show the (in many ways) highly synergistic effects of the tourism industry and conservation governance on alternate job options for fishers. Overall conservation governance has proved a double-edged sword to wellbeing by being both constraining of livelihood pathways and enabling of social wellbeing, increasingly limiting how fishers can use their assets in particular ways over time but also helping create and encourage certain elements of the local economy and protect artisanal fishing. These two effects are discussed below.

A. The Blade: Economic Trade-offs & Privileging Biological Conservation

Residing in the 3% of the archipelago’s land not designated as national park and surrounded by a marine reserve, conservation governance permeates life in general and specific ways for Galápagos fishers and other residents. This section highlights some of the ways in which conservation governance and livelihood pathways intersect for Galápagos fishermen.

A1. Socioeconomic Effects on Fishing Operations & Livelihood Diversification

Most visibly and tangibly, governance rules meant to strengthen environmental protections act to constrain the ways fishers can use their capital. For instance, regulations restricting fishing boat sales (Chapter 3) arguably constrict the ability of fishermen to accumulate wealth in traditional ways. Specifically, boats are becoming more expensive because of the cap placed on new fishing vessels. Thus the ability to move up from fisher to fisher-owner is no longer within as easy reach as it once was, pointing to an erosion of fishers' abilities to substitute asset types, or turn cash into boats and improve their fishing returns over time.

Secondly actions by the Galápagos National Park (GNP), charged with managing marine resources, have the effect of facilitating but sometimes prohibiting the exercise of labor choices and changes, creating livelihood uncertainty in various ways. A recent clear example is illustrated by Executive Order 1416 of the tourism permit competition of 2008-9. This order proclaimed that no individual could be granted a tourism permit if one had previously existed in their family, which "shall be deemed the relationship to the fourth degree of consanguinity and second of affinity" (INGALA 2009). For unknown reasons, this Order was announced *after* the date for submitting proposals for the competition, and thus many fishermen who had already spent up to \$8000 each in preparing applications were disqualified and took on unneeded debt.

An additional source of uncertainty introduced by the GNP is firing people in ways that the locals connect to political changes more than actual job performance (also extending to hiring and promotions). If one inspects job losses and gains of respondents by sector from 2009-11, it is notable that the only jobs lost from all government institutions except for the GNP, loosely categorized as "professions", were from voluntary retirements. Jobs at the GNP however (categorized here under "management") were more unstable – several respondents had been let

go or had short-term contracts not renewed (Fig 4.4).

Finally, regulations have significant consequences by forcing individuals to take on more uncertainty in terms of their business operations, specifically for local tour agencies run by former fishermen on San Cristobal (a noted issue throughout the archipelago). The undercapacity of legal tour permit operations in contrast to the actual volume of tourists visiting the islands has been a long-running and highly political issue that is clear to both the GNP and local residents (Epler 2007). One response to this backlog has been turning a blind eye to small tour agencies and operators that fill a necessary void in the tourism market, often act responsibly, but are technically illegal operations. The illegality of many local tour operations on San Cristobal is openly acknowledged at the same time it is explained.

Fisher 69972: We do this activity with much enthusiasm, we participate in conservation, but the GNP, it is a political institution. They don't give us an opening. Neither to us nor to others, they say, ok come, let's achieve, you want to do this, that, others want to do this, that...then they say no. You cannot do that. The Park could do that tomorrow, and then we could not do tourism. We, the locals. The Park could say it, and we could no longer do [tourism work]. Because we don't have the GNP required document, to do tourism.

[on having applied for tour permits:]

Many times. We have spent a lot of money, our capital, our monetary investments. Yes, we have done it all – through 10, 12 years, reinvested [in trying to get a legal permit]. But at the same time, we do not have the support of the GNP, especially. There is no support, up until now.

An owner of another dive shop, when asked about why he did not possess a Park permit, said simply “Because it's impossible (to get)”. A former Park director acknowledged the difficult bureaucracy, but also added “It's easier for them not to have one”, because they do not have to pay taxes on unreported activities.

A2. Institutions & Uncertainty

Former and part-time fishers that have both recently and distantly transitioned into

tourism work show that the adaptive potential to switch between these livelihood pathways does exist, and that there has long been at least some potential to cope with fisheries changes by tapping into the richer tourism economy, at least under certain conditions. The scarcity of recent transitions however implies that conditions have changed, including in the institutional realm.

From a livelihoods perspective, the interactions of fishers with other actors in state, market, and civil society are the conduits through which they reshape their livelihood strategies and constantly negotiate their returns from existing strategies (Bebbington 1999). The histories of change in tourism and conservation governance reviewed here show a slowly degrading ability to defend, control and transform assets over time. This loss comes from both a transfer of some resources to other actors and an overall constraining effect from institutions on fisher ability to defend their assets (e.g., loss of financial capital in boats and the 2009 competition, legal uncertainty over local businesses).

Ospina (2006) draws from an anthropological understanding of institutions which emphasizes their practices rather than just their functional purpose (i.e., existing to provide a public good and fulfill a specific function), affected by layers of historical (re)organization, connected to place-based social networks, and therefore having the effect at different times “...to embrace, moderate or exacerbate uncertainty” (Mehta et al. 1999: 37).²⁶ Galápagos stakeholders use institutions as tools for political fights and negotiations, partially defining themselves and their stances in opposition to one another (Ospina 2006). Drawing from this understanding, several factors contribute to the inconsistent and economically inefficient functioning described in Section A1 above. First is the legacy of historical instability that includes the 1990s and 2000s, where for instance, the GNP changed directors five times from 2003-05 (Ibid., 144).

²⁶ This contrasts with Ellis’s (2000) view that “the role of institutions is to reduce uncertainty by establishing a stable structure to human action” (38).

Secondly, institutional and family networks are highly overlapping on the islands, where over 35% of the economically active population work for government. The percentage on San Cristobal is the highest of all of the islands, since it is the archipelago's capitol. The lines between political and civil society are therefore blurred. Combined with a client-like system for delivering jobs, as in Ecuador, these above factors serve to make institutions and laws far from impartial or neutral spaces; the law is rather "an expression of will" (Ibid., 153). As one government manager noted, "The Special Law helps if it is applied to everybody. But the Special Law is applied only for those who are defenseless. Those who have resources or political connections go over the Special Law".

Finally, scholars have noted the influential role of governance institutions in "the discursive construction of what is meant by risk" (Mehta et al. 1999: 12). Underlying all of the above dynamics are a privileged perspective of the Galápagos as a unique ecosystem in need of protection since 1959, when European scientists advocated for and established the Galápagos National Park (Quiroga 2009). "Risk" in terms of fishing boat regulations for instance is framed in terms of the risks of overexploitation of the marine environment. Less considered has been the social "risk" to fishermen of reduced economic security and adaptive capacity, or the ability to change with circumstances as one so desires as this study emphasizes.

B. The Buffer: Conservation Boundaries and Privileged Spaces of Protection

Galápagos fishermen find themselves in a strange position. At the same time as their prospects for upward mobility slow, their social welfare has been bolstered by the GMR to a much higher level than what most of their fellow Ecuadorians experience, illustrated below through the privileging of artisanal over industrial interests and steady economic prosperity.

Geographers in political ecology and critical cartography have argued that this

contradiction comes easily. The act of bounding spaces into new conservation areas has unintended consequences, namely heightening the uneven attention given to areas that are legally protected over others (e.g., Zimmerer 2000, Harris and Hazen 2006). As Harris and Hazen (2006) note, "...we are also concurrently – albeit often unwittingly - accepting that other areas are less worthy of protection" (111). Protected Areas are recipients of considerable political influence and funds wielded by global conservation networks of NGOs and their supporters—a trend epitomized here, with at least two international nonprofit organizations dedicated solely to raise funds for conservation and research on the islands²⁷, extensively discussed elsewhere (e.g., Ospina 2006, Quiroga 2009). Contrasts are stark in the realm of fisheries as well. For instance, sea cucumbers were depleted on the coast of Ecuador in the 1980s-90s, a collapse that went almost unnoticed (and little studied) until fishers then moved speedily to the Galápagos in the 1990s. There in contrast, the strong conservation backlash ignited violent protests and an ongoing stock assessment program. Depletion and the socioeconomic "gold rush" that accompanied the "pepineros" is still considered one of the greatest environmental crises in the National Park's history.

B1. The Banishment of Industrial Fishing Development

The Marine Reserve has afforded Galápagos fishermen social protections that must also be acknowledged. Of foremost importance is the political decision that the fishing fleet will always be small-scale. As a result, greater industrialization of fishing is effectively stifled as a possible solution to fishing declines, a not uncommon approach taken outside of PAs.

The process of industrializing is a complicated issue that often gets conflated with

²⁷ These organizations include the Charles Darwin Foundation and the Galápagos Conservancy.

technological capacity building at any scale. Many fishers want more leeway in developing technologies and to “modernize” and “professionalize” the fishery while arguing to keep it small-scale. Marco Escarabay, president of the Provincial-level cooperative UCOOPEPGAL, notes that, “the fisherman should be a professional of the sea” (interviews 2012). Partial justification is that all kinds of people occasionally go out on fishing boats and give real registered fishermen a bad name by fishing in the wrong areas and times; he notes that fishermen should be knowledgeable, “not an empiricist that goes and throws a net and with this is a fisherman, no. S/he is a person properly trained and directed - one could create a fishing school in Galápagos so people can work with knowledge.” Some fishers also want to develop alternate fishing options to help relieve pressure on coastal stocks, such as longlines and aquaculture of sea cucumbers (various pilot projects have failed). Fishers have drawn an extended stalemate with conservation interests who have feared that “any acceptance of improvement of the fleet will increase total fishing effort and create a growth impossible to stop” (Ospina 2006: 164).

It is clear however that all parties are united in their desire to keep large seafood processing companies and industrial tuna trawlers out of the archipelago. This decision imparts many advantages for individual wellbeing to the Galápagos fisherman. In Newfoundland large-scale seafood processing operations reduced the incentive for small-scale fishers to conduct their own value-added processing and effectively ended a once thriving local economy in family-owned processing of salted cod. Fishers also found themselves commanding a decreasing share of harvest profits, because of the creation of producer monopolies that took away their bargaining power in selling fish. Some that then left small-scale fishing became converted to a de-skilled and wage-based crew in processing plants (Antler and Faris 1979). Prioritizing small-scale fishing has left production of fish in the hands of Galápagos fishing families, who own

their own boats, contract their own labor, and salt their own fish (in the case of the *seco salado*). While they have similarly weak bargaining power with many merchants, they nonetheless retain control over allocation of their labor power and production decisions. For now they have also sidestepped the possibility of ever undergoing a process of de-skilling and wage labor common in industrial fishing and processing.

In addition, kin-based employment in Galápagos based on blood relations, also common in other small-scale fisheries (e.g., Lofgren 1972; Terkla 1998) serves to flatten profit sharing. For instance some fishers share the catch of lobster and sea cucumber equally with *pangueros* who are kin, far more than the going rate of \$50/day (interviews 2012). Compared to anonymous “capital-based” hiring decisions, the “kinship-based” employment decisions may influence vessel decisions to keep people employed even after it is no longer profitable, in contrast to classic firm behavior (Terkla et al 1988).

B2. Economic Prosperity

Galapagueños have lived through a dramatic rise in island GDP since the 1960s (Taylor et al 2006). While inequality certainly exists and many older residents mourn the loss of life “the way it was before”, without the regulatory layers and crowds (Ospina 2006: 151), the general prosperity of the archipelago has afforded local fishermen along with all Galápagos residents a relatively high quality of life with stronger literacy, crime rates, and basic housing than mainland Ecuador (Table 4.8). While Ecuador was enduring tumultuous financial crises in the 1990s and massive inflation of its *sucre*, the Galápagos continued to prosper largely because of steady tourism and the financial security of its dollar-based economy (Ospina 2006; Hearn 2008). Ospina (2006: 174) notes, “It is strange and pleasant to encounter in a poor and undeveloped

country, a region that has exiled, as the Galápagos has done, extreme poverty and unemployment.”

Table 4.8. A selection of quality of life indicators for the Galápagos and mainland Ecuador.

		Galápagos	Ecuador
Infant Mortality (per 1000 live births)	<i>1998</i>	8.7~	31`
	<i>2013</i>	3.56**	8.64**
Annual mortality (per 1000 inhabitants)	<i>1998</i>	1.2~	5`
	<i>2013</i>	1.43**	4`
Illiteracy rate (over age 15)	<i>2009</i>	1.9%*	16%`
Houses without Sanitation	<i>2009</i>	29.5%*	20%`

*Data from Galápagos Living Standards Survey

`Data from World Bank

~Data from Kerr 2005

**Data from INEC 2013

The Galápagos has not experienced the sustained and severe economic depression of many other small fishing communities in New England, Canada and Florida (Davis 2000; Smith et al. 2003), where fishing was a more major driver of the economy. An important result of such relative prosperity and an economy diversified from fishing is a much-reduced need for work-related, long-distance migration. Of the 167 people interviewed, only two had migrated for work, or were planning to in the near future as a direct result of the fisheries downturn. As a contrast, Antler and Faris (1979) found that 79% of working men in a formerly fishing Newfoundland community had to migrate away from their homes to distant city centers. Increased time away from family negatively affects job satisfaction and family life (Pollnac and Poggie 1988), and interviewed fishers in this study corroborated the difficulty of being away from their families for long periods of time. While jobs are not unlimited, this means that those leaving fishing often do not have to leave their community, and can maintain their family and social ties intact²⁸.

²⁸ This point is a relative one, but still holds. Work in fishing, particularly the traditional seco salado where trips range from 15-20 days at sea, and aboard tour cruise ships that rotate around the islands every 8 days have also taken tolls on the family life of Galápagos fishers. Fisher GG is one example, noting that he was at sea more than home while his first two children grew up.

Finally given its geographic isolation, growing monitoring efforts, and publicity of negative events, Galápagos fishermen have also reaped the benefits of greater personal safety at sea. Fishermen on the coast of Ecuador have become entangled in several violent disputes over the years, coming from (i) border disputes with Columbia and (ii) the drug wars. Interviews in 2012 with Fisher RR in San Cristobal as well as an Ecuadorian scientist related that fishers on the Ecuadorian coast are sometimes held at gunpoint, robbed of gear and motors, and stranded at sea in skirmishes with Columbian armed vessels in years past. Such incidents do not occur in the GMR. In recent years, the escalation in narcotics activity through Manta and the coastal oceans of Ecuador has led to growing concern on all sides, for fishers who have disappeared or had boats destroyed by narco-traffickers or by U.S. warships in search of narcotics and illegal immigrants (Camargo 2014; Insight Crime 2014). Galápagos fishers have felt themselves embroiled in such trades as well; several scientists and conservation professionals noted that connections between illegal fishing and drug trafficking also extend through Galápagos waters. The Marine Reserve and geographic distance however, seems to have so far greatly attenuated the dynamics now creating turmoil in Manta. In sum, Galápagos fishermen, even withstanding recent restrictions in their pathways out of fishing, are still protected from many social issues in mainland Ecuador. In the words of one old fisher, life in the Galápagos is “one-thousand times better [than the mainland], in every way.”

VI. Institutions, Adaptation, & Change Over Time

The collective evidence in this chapter suggests that several long-term processes are implicated in the higher social vulnerability of active than inactive and former fishers, and differences between those who have (i) completely transitioned into the tourism economy, (ii)

followed a pathway of long-term diversified livelihoods in fishing and elsewhere, and (iii) remained in fishing full-time.

First, as noted above given the overlapping labor markets in the archipelago and the long-term livelihood diversity that exists, an outward perspective that goes beyond the fishing sector must be used in considering the asset bases that fishermen draw from, a point noted around many rural livelihoods in general (Bebbington 1999; Fabinyi 2010). Strategies of livelihood diversification seem to help engender stability, as those in groups (i) and (ii) above have benefitted from the economic prosperity that tourism has brought to the islands, the latter at the least indirectly with the overall growth of work in areas such as government, goods and services, and local retail (Fig 4.4). In contrast those who have remained full-time fishers have borne effects of fisheries stagnation without any compensatory economic uplift. This contrast might be even more pronounced in years when sea cucumber fisheries are not opened due to low abundance counts, since interviews note that sea cucumber could easily account for \$2-4,000 USD of fishing income, a significant amount when the median range for fishing incomes were \$9-12,000 USD/yr.

Arguably Galápagos fishers face what Mehta et al. (1999) called growing and new types of uncertainties that stem from new intersections between global economic, ecological or social processes and local actions, making constraints on rural livelihoods more complex and intertwined with more and diverse actors on various scales. These global to local intersections are evident in the Galápagos with the spread of global safety standards and certifications for instance; more education is now the key to accessing many of the new seafaring tourism jobs.

Intersections with global governance conceptions may be most explicit with the move toward privatization of both tourism and fishing rights that has been a major force in the gradual

constricting of adaptive possibilities into the highest-returning tourism occupations. The embrace of these rights-based management approaches, purporting to align economic and environmental incentives by transferring what was once common property (marine resources) to private property, are a reflection of the interaction of local livelihood processes with global conceptions of effective natural resource management, namely the increasing cache of market-based solutions in fisheries management (Mansfield 2004, Branch 2009).

Privatization as well as global safety standards are important in considering social adaptation because they effectively change the structure of access to resources for future generations, meaning that active fishers cannot now follow the all of same routes into tourism as existed in past decades. In the Galápagos the constriction into tourism due to privatization is interesting because while the effect of privatization on limiting distribution of resource benefits has been noted with quota systems in *fishing*, here a quota system *outside* of the fishing sector is affecting fishermen's labor and therefore the fishing footprint.

Temporally, the benefits reaped from the tourism economy arguably accumulate due to several interacting dynamics, widening a gap between those who have become involved in tourism and those who have not. On the flip side, this cumulative advantage also implies a cumulative vulnerability of those not involved in tourism or diversified work outside of fishing. The growth of competition in all areas of the Galápagos tourism industry has made not only financial capital but business and social networks important in staying competitive. Earlier entry could cede an advantage in accumulating such networks, as well as financial capital.

Quotas often become more concentrated over time, in fishing as more "efficient" fishers buy out less efficient ones; Branch (2009) has noted that market-based fishing quotas benefit the generation at implementation the most. Privatization also narrows the distribution of wealth from

natural resources to a smaller group of people, and has done so in the GMR (Epler et al. 2007). This is a well-known effect to policy-makers; Reedy-Maschner (2007), analyzing privatization in fishing rights in an Alaskan Aleutian community, noted that policy makers accepted the narrowing of social benefits from resources, determined to phase people out of the fishery in the name of increasing environmental protections.

Besides declining catches cited recently, the reasons given by former fishers for leaving over time (Results section, Chapter 3) paralleled reasons recent fishers gave – health, greater family time, stability, and a perceived bright future in tourism. The constancy of most of these given reasons suggest that former fishers’ maintenance of their livelihoods is due to the opportunities that the Galápagos economy afforded them as much as it was to their own choices, and the narrowing and changing nature of accessibility of these choices over time indicates this is a critical part of the degrading ability of currently active fishers to follow in the footsteps of fishers of past decades.

Several policy implications can be drawn from this analysis. The weakened ability of individuals to defend their assets over time in the fishing community implies that policies might look to aid people defending their assets in hand as well as in helping people gain new assets, a more common focal point. While a full policy and feasibility analysis is beyond this project, candidates for such policy reform include legal protections for responsible local tour businesses and a reassessment of the system of tourism governance and its distribution of wealth among the local population, although major structural changes to tourism industry regulations, admittedly, would be very complex politically.

The fact that fishermen have always drawn from assets not only in the sea but also on land, as mentioned above, suggests that policy makers might also do well to expand their

thinking beyond purely sector-based assets and activities. While new applications in managing harvest and participation continue to be developed (e.g., Ramirez et al. 2012), targeting the weak human capital of the sector could also help empower the 53 and 55% of surveyed fishers (full-time and part-time, respectively, Appendix Table C1) who would like to find more work outside of fishing. In addition serious thinking about how to make accessing important state resources easier and less bureaucratic could lessen overall, everyday livelihood uncertainty.

As the above section on *Conservation Governance* described, institutions have been arguably focused on product and outcome oriented goals rather than process, in other words, producing rules or options that officially offer a livelihood alternative like the 2008-09 competition, and creating forums for debating longlining and other fishing industry suggestions. These actions have done little to enhance the adaptive capacity of fishing households over time, if judged by their ability to change and maneuver their work portfolios (inside and outside of fishing) in the manner of their choosing. Adaptive capacity building programs might include allowing fishermen greater roles in participating in monitoring and enforcement of GMR rules, and in operating the recreational fishing sector, as will be described in Chapter 5. The effects of the thin attention to capacity building over time are also now emerging as the cumulative effects of the stagnating fishing industry continue to ripen. All in all, these factors arguably contribute to shifting the distribution of vulnerabilities in the Galápagos population to be overrepresented in the active fishing community compared to the general population, as census comparisons show (Section 3B above). Multiple approaches to possible fisheries policy reform become apparent when a broad view of who “fishermen” are and the important socioeconomic linkages between fishing participants and other stakeholders are considered. As this chapter has shown, the governance of *tourism* strongly affects the fishing community, and any actions inhibiting

occupational plurality across the sectors represent a loss of flexibility in bettering lives.

VII. Conclusion

This chapter has taken a historical and cross-sector view of the social outcomes of how “fishermen” have and continue to transition out of the industry, emphasizing the influence of the broader Galápagos economy and governance regimes rather than change within fishing itself. San Cristobal’s fishermen, historically and at present, have undoubtedly prospered from tourism, which has led to longstanding fishing-tourism occupational plurality and given them livelihood flexibility. However, the terms on which many are participating in tourism are contingent and economically insecure, and their abilities to achieve greater security are far more restricted at present than in the past.

In the end Galápagos fishermen find themselves in a strange position. Their vulnerability is situated in a particular Galápagos context, of a narrowing of adaptive coping strategies as their prospects for upward mobility slow, all the while remaining elevated in economic security above most of their fellow Ecuadorians. What to do about these growing contrasts between the Galápagos and mainland Ecuador is an issue that merits greater attention by policy makers and conservation interests alike. These contradictory impulses, visible through a combination of extensive and intensive analytic methods, show that the effects of the development of the tourism industry and conservation governance have been positive and negative in different ways.

Ultimately, these issues show the importance of taking into consideration (i) the interactions of the fishing community with other Galápagos stakeholders and (ii) the land- as well as sea-based assets that fishers draw from to better understand their adaptive pathways and social outcomes over time.

CHAPTER 5

The evolution of recreational fishing in the Galápagos Marine Reserve: adaptive livelihood feedbacks²⁹

I. Introduction

This chapter investigates an ongoing scholarly framing of the Galápagos Islands as a dynamic social-ecological system (SES), both explicitly and implicitly using concepts like “dynamic feedback loops” and “alternate stable states” from resilience and complex systems scholarship (e.g., Folke 2006) to analyze how human and non-human elements affect each other, and the growing strains on the archipelago’s ecosystems (Watkins 2008, Gonzalez et al. 2008). With the 2014 book, “The Galápagos Marine Reserve: A Dynamic Social-ecological System” (Denkinger and Vinueza 2014), such conceptualizations increasingly tackle Galápagos marine environments.

As dynamic, nonlinear systems-based frameworks continue to dominate ecological and natural resource policy understandings (e.g., Gunderson et al. 1995; Holling 2001; Levin 2005), it is important to ask what “perturbations” and other systems concepts of ecosystem change imply for the social realm, particularly when used in natural resource management contexts. Complex systems hold the promise of infusing more dynamism into fisheries governance by representing fishing systems as made of fluid relationships between constantly changing entities, connecting to regional and global networks, which help to rectify many longstanding, erroneous

²⁹ An earlier version of this chapter was published in 2014, co-authored with Diego Quiroga. It is republished here in modified form for educational purposes, as the author’s rights allow with Springer. Citation: Engie, K., and D. Quiroga. 2014. “The emergence of recreational fishing in the Galápagos Marine Reserve: adaptation and complexities.” In *The Galápagos Marine Reserve: a dynamic socio-ecological system*, ed. L. Vinueza and J. Denkinger, 203-226. Springer Science + Business Media: New York.

assumptions the behavior of fishermen and fish stocks as atomistic (e.g., St. Martin 2001; Berkes 2006; Wilson 2006; Mahon et al. 2008). However much work remains to be done to make them more realistically applicable to Galápagos issues (and other areas), including improving weak application of the social dynamics in social-ecological feedbacks.

In the Galápagos context, resilience scholarship has articulated social dynamics quite narrowly so far, important to address because this articulation tends to privilege certain policy implications over others. Who decides how to react to ecosystem change, and is there more than one policy prescription? Such questions show the importance of greater attention to analyzing processes of governance in shaping cross-scale relations in resilient feedbacks, or “arrangements for decision making and power sharing” (Brechin et al. 2002: 46).

Following this project’s broader themes, the objectives of this chapter are to use livelihoods scholarship around development interventions to better articulate the amorphous ways that resilience and complexity regard how development “alternate stable states” come about. My case study is a recent local recreational fishing industry commonly known as *Pesca Vivencial* (PV) that has emerged as perhaps the most controversial of all the various alternate livelihood programs aimed at fishers in the GMR over the past decade, and one that has gained the most traction. A newly legalized exploitation of striped marlin (*Tetrapturus audax*; Schuhbauer and Koch 2013) has led to scientific concern for potential expanding ecosystem impacts. In addition although proposed by the fishing industry itself and highly anticipated, a relatively low level of participation by local fishers and uneven business partnerships with outside interests have become controversial. In this chapter I focus on the regulatory debates that introduced recreational fishing, and trace the negotiations that changed its form from what was originally proposed to something different.

Building on research that has pointed out the various issues around PV's implementation (Schuhbauer and Koch 2013), this analysis offers a broader, systemic consideration of what implementation issues indicate. I contend that while the activity is much anticipated it has also been deeply problematic because of its potential to shift economic and political relationships. Such an analysis requires investigation building from the individual level since people have engaged with PV in diverse ways, as will be shown, and therefore contributes to a thin area of research thus far, understanding the contested politics and livelihood struggles of the local fishermen involved. More broadly, strengthening empirically-based methods of analyzing how diverse stakeholders come together to influence social-ecological feedback loops in fishing may help strengthen the weak ways in which resilience approaches have analyzed environmental politics here and elsewhere (e.g., Leach et al. 2008).

This chapter complements the socially differentiated analyses conducted in previous chapters, but places greater consideration of social difference at the sector level more than the household level. Helping to avoid a purely econometric accounting of assets that breaks processes down into inputs and outputs, this qualitative analysis focuses on how members of the fishing community have interacted with other stakeholders, a critical part of the story of the Galápagos fishing industry and how it's changing.

The following sections outline theoretical approaches (Section II) and methods (Section III), followed by PV's early social history (Section IV). Section V then advances some implications for the workings of dynamic social-ecological "feedback loops" (e.g., Gonzalez et al. 2008) brought forth by a more explicit delineation of the dynamics of one social feedback, regulatory negotiations.

II. Background & Theoretical Context

A. Adaptive Change in Social-Ecological Systems and the Galápagos

The concepts of complex systems, resilience, and social-ecological systems are highly intertwined and often used together (e.g., Folke 2006). In fisheries management, the historically lesser attention to the dynamism of natural processes than to economic stability for fishing industries by governing institutions, and continuing collapses of global fish stocks, has been a major driver of the development of resilience and complex systems frameworks to natural resource management (e.g., Holling and Meffe 1996). Recognition that these governance patterns may actually make marine ecosystems more brittle and prone to collapse even while privileging economic stability has gained strong resonance in the fisheries science community (e.g., Allen and McGlade 1987; Berkes 2006; Wilson 2006).

The current hybridization of complexity and social dynamics is reminiscent of but not the same partnership as cultural ecology's earlier embrace of the systems ecology of the 1960s to study human-environment relations (e.g., Rappaport 1968, Nietschmann 1973). While past systems were thought of as closed and possessing homeostatic equilibria with culture playing a regulatory role in sustainable use, the complex systems of evolutionary ecology since the 1990s emphasize openness and exchange, contingent boundaries, network analytic approaches, and historical determinacy and interactions of local communities with global networks. A complex adaptive system contains within it various diverse entities or agents that interact in different ways and of their own accord, driving bottom-up patterns of change. Massey (2005) has noted that complexity may be part of a larger impulse in twentieth-century science towards multiplicity, pluralism, and acceptance of ambiguity and away from certainty.

Arguably complexity and resilience have great potential to contribute to emphasizing the need for more holistic and cross-sector governance of fisheries. In its most expansive

interpretation, to assess small-scale fisheries as complex systems is to conceptualize fluid relationships between constantly changing entities: fish, fishermen, other community members and outwards to regional and global stakeholders as well. In the Galápagos as well, invoking social-ecological systems importantly calls for moving away from a historical emphasis on reductionist and discipline-based research to tackle increasingly intertwined issues (Watkins 2008).

However, assessing the social aspects of complex feedbacks in small-scale fisheries at least has often been less than expansive, one issue being a weaker articulation of the complex dynamics of social compared to ecological change. Positing a broad pattern of social-ecological change, Holling (2001) developed a larger theory of the connected complexity of “economic, ecological, and social systems”, also called the resilience perspective to analyze social-ecological systems (Folke 2006). With phases of exploitation, conservation, release, and renewal, system energy and resources are described as in a continual phase of re-formation in “Adaptive Renewal Cycles” (ARCs, Fig 5.1; Holling 2001), with successive systemic structures not exactly the same as the ones that existed before. Creative potential in terms of governance experimentation and “novel reassortments of elements” supposedly is highest in the “reorganization” phase or “backloop” of an ARC, but the mechanisms behind such are often without deep examination in resilience conceptualizations, and is admittedly the “least examined and the least known” (Ibid., 395).

When taken up in the natural resource literature, change in social-ecological systems have only used ARCs to describe wide sweeping change over time (Seixas and Berkes 2003; Gonzalez et al. 2008), and sometimes to recast interpretations of historical events (e.g., Nelson et al. 2007).

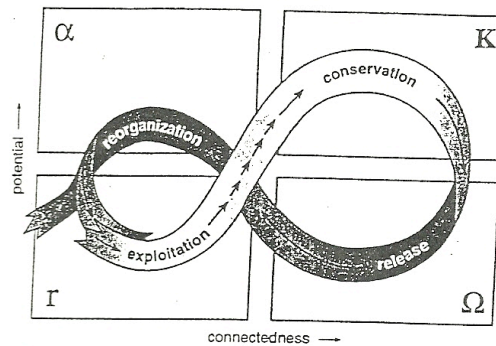


Figure 5.1. The adaptive renewal cycle or “infinity loop” developed by Gunderson and Holling (2001) and representing cycles of organization and reorganization of energy and capital in a system. The system is most brittle and least resilient in the K phase as privileging economic stability grows sectors for a time, but leads to inevitable inflexibility in both ecosystems and human response. The system is most open to various development trajectories from the “backloop” of release to reorganization. From Holling 2001³⁰.

In the Galápagos as well, resilience analyses with unsubstantiated assumptions of social dynamics have tended toward privileging a top-down institutional perspective while leaving out other community perspectives. Gonzalez et al. (2008) most explicitly used the concepts of resilience, feedbacks and cyclic change to outline multiple possible development trajectories into the future. They concluded that shifts to new, less extractive *isleno* lifestyles over current, *insular* lifestyles attached to goods and services on mainland Ecuador were the key social change needed, as articulated by key stakeholders:

“It is, however, not inconceivable that such a shift [*to a less extractive lifestyle*] could occur, relying largely on a new generation of galapagueños (Galápagos people) who have a different attitude toward the environment. These individuals must be willing to adopt a new lifestyle that is adjusted to the carrying capacity of the islands, only slightly dependent on continental resources, and highly conscious of the fragility and limits imposed by living in an oceanic archipelago. Unfortunately, the curriculum of the Galápagos educational system lacks the necessary elements to instill an understanding of the unique and fragile nature of the islands and create a sense of living in a special place.” (np, underline added)

I argue these outlined feedbacks are only partial truths of how exactly Galápagos society and ecosystems interact – they provide no mechanistic clarity on state transitions and therefore

³⁰ This figure is reproduced with permission from Springer New York LLC.

link societies and ecologies weakly. Must we wait for a new generation of galapagueños to willingly consume less, “highly conscious of the fragility and limits imposed” by the unique environment? Why does this generation not “change” fast enough?

B. Study Contributions: Strengthening Social Application of Resilience and Complex Systems in the GMR through Livelihoods Perspectives on Adaptive Change

Scholars within and outside of resilience and complexity work have called for deeper thinking around resilience and its social implications (Leach et al. 2008; Bassett and Fogelman 2013). This analysis heeds such a call by seeking to engage with rather than reject these frameworks. Resilience and complex systems frameworks are not the only ones to have emphasized the need to attend to dynamism in social-ecological conditions, processes, and outcomes over time. Coming from an entirely different intellectual heritage, livelihoods frameworks have also dovetailed in critiques of conventional fisheries management and their inattention to the dynamism of natural processes and clearly influential cross-sector linkages (e.g., Allison and Ellis 2001).

My analytic intervention is to trace the changing regulations of PV and use regulatory debates as a highly visible and socially (as opposed to biophysically) centered feedback loop where constant negotiations between different stakeholders with varying interests, needs, and levels of authority serve as the drivers of change. I draw from broad scholarship across marine policy, political ecology, and natural resource management that more rigorously asks how stakeholders co-create alternate livelihood policies via regulations to help inform the broad, sweeping, but unarticulated social dynamics of the reorganization phase posed in resilience feedbacks.

Following the broader themes of this dissertation project, I analyze how cross-sector interactions relate to (i) the use and transformation of household assets over time and (ii) the nature of participatory management, which strongly affects differential social outcomes at the sector level.

B1. Dynamism in Asset Bases & Scale

Bebbington (1999) proposes two manners in which livelihoods frameworks should ideally cross scales of analysis: addressing relationships between economies at the intra-household, household, regional, and macro levels, and specifically addressing how households interact with institutions and organizations that shape how development interventions occur. This chapter, by virtue of its close attention to one particular development intervention, allows for closer analysis of the latter. As was discussed in Chapter 4, the ways that fishers interact with other actors in the state, market and civil society are key to understanding the changing, dynamic nature of access to resources and subsequently how livelihood options change over time (Bebbington 1999).

Over time, the ability to obtain and renegotiate favorable terms of transaction in substituting or obtaining new capital has been found to be important for household abilities to maintain and develop “viable” new livelihood opportunities in other regions like the Andes (Bebbington 1999). Institutional spaces are important arenas for such negotiations, particularly participatory management schemes that engage community groups to help empower their control over resource management decisions. When participatory management schemes are unable to provide such terms for local partners, in contrast, efforts have been stymied. For instance Robards and Lovecraft (2010) noted that despite walrus comanagement in Alaska, “Alaska

natives do not hold collective choice rights to reinterpret the rules that govern them to reflect current social and ecological realities” such as the changing nature of “authentic” uses for hunting (269). Such factors show the importance of close examination of how participatory management works in terms of rights around asset transformation, elaborated upon below.

B2. The Politics & Structure of Participation

As an idea that originated within the community of resource users, one thing Pesca Vivencial represents is a community-driven preference for evolving resource use practices. Locally rooted ideas are now accepted as strengthening development and NGO interventions via participatory management arrangements such as co-management and community-based management, thought to impart more legitimacy and stakeholder buy-in and reflect local needs more than top-down governance that lacks community consultation (e.g., Christie et al. 1994; Pollnac et al. 2001; Day 2002; IUCN 2007; St. Martin et al. 2007; Charles and Wilson 2009). Scholarship on the legally mandated participatory comanagement system of the GMR confirms its credibility as a legitimately viewed arena in which stakeholders interact meaningfully, if not completely satisfactorily. Ospina (2006) argues that despite ongoing tensions, the participatory system has created spaces for dispute resolution and negotiation, and a slow improvement over the 1990s when local protests and tensions were even higher. Heylings and Bravo (2007) give an optimistic conclusion to their early evaluation of participatory governance conducted four years after its 1999 implementation, noting a steady expanse in “the capacity of the co-management process to effect real change in the dominant governance paradigm” and “novel solutions” to old issues, which they called the first 5-year fishing calendar and provisional zoning scheme (205-206).

However experience over the past few decades has shown that the simple existence of participatory management rules and structures does not guarantee effective or socially accepted interventions. Work has focused on the need to account for not only who can participate but differential rights around the areas of rule setting, monitoring, and enforcement, and nonlocal forces that shape power dynamics and stakes among people (Brechtin et al. 2002; Acheson 2006).

First, even when participatory management enables community perspectives to be heard, without shared rights to create rules, often imparted to state partners, participation is not 100% co-management. Participatory structures can be pre-set as uneven because “when institutional preconditions or rules frame comanagement, they alter collaborative possibilities by providing the structural basis upon which comanagement efforts are built” (Robards and Lovcraft 2010: 259). Secondly, with differing emphases than the above the broad scholarship on resource management in the political ecology literature has noted that beyond and perhaps contributing to any structural unevenness, struggles over different modes of resource use often represent broader stakes in terms of control and authority of economic wealth and development options in society (e.g., Peet and Watts 1996; Robbins 2004, Forsyth and Walker 2008). Fisheries management is an inherently political exercise as well, in the sense that decisions often allocate limited resources among users so that “deliberately or not, management systems express a political position on relations of power, conflict, and social justice” (Jentoft 2007: 428). It is thus important to pay attention not only to rule structures but to power imbalances and what is at stake in negotiations for different stakeholder groups, and various individuals within those groups.

Past work on Galápagos management helps inform this analysis’s understanding of some constraints to the actions of different human agents. In terms of the structure within which fishers

and others interact in regulatory negotiations, the system is not technically 100% co-managed since the higher level AIM retains rights to rule-making authority over the lower-level Participatory Management Board (PMB) of local stakeholders (Fig 3, Chapter 2; Baine et al. 2007; Engie and Quiroga 2014). Heylings and Bravo 2007 also concluded that the system suffered from a clear frame of reference for handling property rights and resource use, particularly relating to “maximum limits on fishing and tourism effort...and conditions for future access” (205), thus opening more ambiguity in how stakeholders might handle these points. In historical and layered power dynamics, Ospina calls the final value of the PMB “worse for the fishermen, better for the environmentalists” (137). They do not have international constituencies like tourism and conservation interests, nor is their promotion an aim of society since Galápagos stakeholders have chosen tourism over fishing as the pathway to more sustainable, non-extractive long-term development (Gonzalez et al. 2008).

Historical context also helps inform understanding of how actors react to and perceive each other in participatory management, which (broadly sketched) may have affected how they reacted to PV’s introduction and negotiations. As a World Heritage Site, the Galápagos Marine Reserve (GMR) has become enrolled into the goals of interest groups in conservation, tourist business and academic research with not only local but also global constituencies (Nash 2009; Quiroga 2009). For instance it is economically and politically important to Ecuador, representing over 10% of all tourist business at the national level (Ospina 2006, Epler 2007). With such value it has been coined a “golden egg” (Stacey and Fuks 2007).

The long-standing dissatisfaction of the fishing community with the application of conservation regulations described in Chapter 4, despite the fact that many were formed through a consensual and participatory process as part of the GMR management plan shows that fishers

perceive themselves on the downslope of power dynamics with other stakeholders. While Heylings and Bravo (2007) cite past fisher propensities to take to street protests as undermining the legitimacy of the officially legislated comanagement channels, Ospina (2006) implicates all sectors and argues that these reflect uneven power dynamics. Each sector appeals to governance channels they perceive as most friendly to them: other sectors might appeal directly to ministries or institutional connections and circumvent the need for agreement with the fishing sector, but fishers have the weakest direct institutional access and so take to the streets. This work also shows that regulatory debates are used by stakeholders as strategic means to promote particular agendas and challenge others in deciding what should be done in response to environmental changes (e.g., Lu et al. 2013).

B3. Significance

It is important to engage with resilience and complexity frameworks for several reasons. First, constructive critiques are vital since there is strong interest in a research agenda delineating social-ecological feedbacks in the Galápagos (Watkins 2008), and conceptualizing change via alternate stable states (Gonzalez et al. 2008).

Helping to better address how social dynamics are understood in complex feedbacks with livelihoods insights, given the growing influence on natural resource management and many other arenas of global governance (e.g., Walker and Cooper 2013), parallels a movement in “strategic positivism” (Wyly 2009), which has shifted from deconstruction toward “...more judicious strategies to (1) distinguish constructions that are useful from those that are irrelevant or dangerous, and (2) imagine and create more emancipatory constructions of economy, society, or space” (317). Therefore while others have noted that issues of power, poverty, or social

injustice have been treated lightly in complex systems work (e.g., Leach et al. 2008, Walker and Cooper 2011), we must also ask if they can be better addressed. In examining the history of Pesca Vivencial's rise, one can note who benefits from ecological, political, legal or economic modifications (here emphasizing fisher perspectives on outcomes), and which modifications have persisted in the outcomes of regulatory debates and negotiations. Such an interpretation treats power as the ability of individuals and groups to constrain each other's actions and opportunities (Dahl 1957), bringing political dimensions of resource use decisions into discussion with policy makers in their own language in a limited but strategic essentialization.

In addition while thin on social theory, the bridging potential of resilience and complexity to link social dynamics to ecosystem change in traceable ways and via specific mechanisms should not be dismissed. This linking is perhaps what most strongly marks the appeal of a resilience and complex adaptive systems framework. While Galápagos environments have been intensely studied for instance, it was once common to note that social science scholarship was rare. Such claims no longer hold (e.g., Ospina 2006, Constantino 2007, Grenier 2007, Lu et al. 2013), but there is still a need to engage this social science with ecological research at the fine scale of specific species and populations of concern (e.g., striped marlin), and to trace specific mechanisms of connection to ecosystem impacts.

III. Methods

I draw heavily from interviews with 18 fishers in San Cristobal and two in Santa Cruz involved in Pesca Vivencial via license ownership, vessel ownership, or partnership in business operations. As with this entire dissertation project, focus is on the evolution of PV on the island of San Cristobal, here of historical prominence because a local island fisherman is often credited

with first creating the idea. I ascertained information on occupational dynamics via questions from the larger 2012 livelihoods survey and accompanying interviews described in Chapter 1. Due to the open-ended nature of research, not all fishers were asked all of the same questions. However the data gathered gives various understandings of PV as individually practiced. I ascertained attitudes and motives from open-ended interviews and participant observation around town, focusing on local fishers and business partners. Because interviews were anonymous unless given express permission to identify people, few interviewed sources are directly named. I draw more broadly from interviews with 184 people in total, including 18 on Santa Cruz, and also from continuous conversations with fishing and cooperative leadership from 2009 – 2012. I trace regulatory changes through document analysis of meeting summaries, reports, and published rule sets and statements around them.

IV. Pesca Vivencial: A Very Brief Social History

A. Setting the Stage

Two major dynamics in the 1990s and early 2000s strongly shaped the emergence of PV. First, PV was proposed in the midst of a belief in continuing overcapacity³¹ in the sector, despite the departure of many fishers and “opportunists” since the collapse of high sea cucumber harvests. A second major ongoing issue has been continuing attempts by fishers to break into tourism, the most obvious contender to replace or supplant local fisher livelihoods that have

³¹ Overcapacity is defined by the FAO as the existence of “more than the minimum fleet and effort required to produce a given output (harvested catch) level.” It is regarded as the primary reason for crises in fisheries because “in output terms, overcapacity means that the maximum harvest level that a fisher could produce with given levels of inputs, such as fuel, amount of fishing gear, ice, bait, engine horsepower and vessel size would exceed the desired level of harvesting” (FAO 2015). As noted in Chapter 2, people previously unassociated with fishing had swelled the first official roster of registered fishers, lured to the job by high sea cucumber profits or to simply lay claim on future options and potential industry buy-outs (Castrejon and Charles 2012, Bucaram and Hearn 2013, Engie unpublished data).

declined in profitability over the past decade (e.g., Stacey and Fuks 2007). While increasing numbers of fishers are indeed leaving the sector for wage labor on tourism vessels, interviews noted that this option has been viewed as suboptimal and not providing a living wage equal to a fishing livelihood until recently. Even though land-based tourism has been growing at the expense of cruise-based tourism (Quiroga 2013) and has wider local participation, fisher perception of inaccessibility of the lion's share of the tourism market is unmistakable³². In part due to their failures, Pesca Vivencial's originators utilized their fishing skill sets, knowledge of the ocean and ready possession of boats and aquatic permits (for fishing) to try and break into the tourism market in a novel way when they perceived other avenues closed.

B. The Stakeholders and Visions of Pesca Vivencial

An important point to remember in the GMR is that fishers are not the only stakeholders affecting fishing. As soon as Pesca Vivencial was proposed, its systematically hybrid character across fishing and tourism triggered the involvement of stakeholders in tourism, marine safety and others, forcefully illustrating how each marine activity in the GMR must go through various jurisdictional layers. Those sharing the overlapping space of the GMR include the Galápagos National Park (GNP), the Ecuadorian Navy via the Directorate General of the Merchant Marines (DIGMER), the National Association of Tourist Businesses in Galápagos (ASOGAL in Spanish), smaller tourism vessels and operators, seafood merchants, scientists and students. The first two have direct oversight in fisheries rule making with jurisdiction over managing fisheries resources and maritime security and traffic, respectively. The others influence local fisher options by indirectly affecting markets or from lobbying influence over zoning or other resource

³² Carlos Ricaurte, largely credited as one of pesca vivencial's creators, viewed breaking into tourism as an inherently political process and one in which established routes such as converting his vessel to a tourism operation were closed to him, as proven by his unsuccessful application for a bay tour permit in 1997.

use rules. In addition as detailed in Chapter 2, Galápagos fishers themselves are not homogeneous but have varying political interests and coalitions, sub-fishery participation and techniques, and vessel ownership status (e.g., Wilen et al. 2000; Zapata 2006; Murillo et al. 2007). All of these groups are not always considered when discussing fisheries change.

Stakeholders held multiple visions of what the activity should and could be from the beginning, although commonalities included providing alternate income sources for Galápagos fishers, engaging in some kind of cultural exchange, and achieving a more sustainable fishery (Table 5.1).

As originally conceived fishers would not alter their typical fishing practices or equipment but simply demonstrate them to interested tourists; the proposed name Pesca Artesanal Vivencial (PAV) stressed the continuity with typical artisanal practices. PV was to be cultural tourism, a demonstrational and *commercial fishing* activity that did not focus on giving tourists their own recreational fishing experience but offered a glimpse in the world of a fisher, although tourists might participate in fishing at times (Reck, interview, 2012). Molina (2005: 2) called it “demonstrational artisanal fishing”. In addition, the activity was not necessarily thought of as a replacement to commercial fishing but could be a supplement that freed the fisher to catch less (Reck, interview, 2012). This idea was discussed during the creation of the GMR’s first set of Fisheries Regulations written at the establishment of the GMR in 2000, although PV was not ultimately incorporated. It thus predates 2005, when UCOOPEPGAL, the provincial-level cooperative of Galápagos fishers, first presented PV largely unchanged to the JMP and AIM (Table 5.1). They noted that a vacationing tourist would accompany a fishing vessel for a day while “conversing about the life of the fisherman, one’s happiness and difficulties in a true spirit

of intercultural exchange” (Table 5.1; UCOOPEPGAL, 2005).³³

Sport fishing on the other hand, long conducted in sporadic and unregulated fashion in the Galápagos since the 1950s (Molina 2005; Epler 2007), was immediately suggested instead of PAV inside and outside of the fishing community. However supporters of PAV were wary of any market labeled and practiced as sport fishing eventually being captured by outside and inside elites, as has happened in tourism to some extent (e.g., Epler 2007). Fishers were far from united; some may have been opposed to a recreational fishery outright from the beginning while others championed either sport fishing or PV (Reck, pers. comm). Still others have consistently advocated sport fishing instead of PV because of its established global market appeal. Finally, *some* opportunity is simply the goal for many fishers who support any development of Pesca Vivencial, sport fishing, or some combination.

At present, visions of PV continue to evolve in step with the fishing practices that were ultimately allowed (details in Section E below), so that many local license holders now associate PV with sport fishing, if we define that as being oriented toward giving a tourist their own recreational fishing experience. However in 2012 fisher interviewees still differentiated PV from sport fishing elsewhere, strongly at times, by the following characteristics: being in the hands of local ownership, having a broad base of target species that is always catch and release (after a 50 lb trip limit) and ability to be conducted on a wide variety of vessels beyond luxury sport fishing yachts. In mainland Ecuador in contrast, sport fishing has historically been an elite activity in which comfort and luxury vessels were essential (Molina 2005).

³³ This idea also draws continuity from the 1970s and earlier, before the rise of large cruise ships, when tourists commonly paid fishermen to take them around the islands and to participate in fishing activities (Stacey and Fuks 2007, interviews).

C. Regulatory Evolution

Arguably, legal recognition is a significant marker of the establishment of an activity in the GMR, where:

“there is a long history of officials turning a blind eye toward certain unofficial or non sanctioned forms of tourism. If a major controversy does not arise, regulations are often then formulated and the activity permitted. Cases in point include the status of land-based diving operations, sport fishing that exists but is not legally sanctioned, and large cruise ships based elsewhere that sporadically run cruises through the islands.” (Epler 2007: 52)

Historical contingency likely aided PV's uptake in 2005. The speed with which the idea was quickly taken up was clearly at least partially due to its potential as a viable economic alternative for commercial fishing that could reduce harvests, although stakeholders harbored varied reservations (see below). The fishing sector was placing mounting pressure on governance institutions to help find viable economic alternatives after the sea cucumber collapse. In December 2004 Pesca Vivencial was included within an official baseline list of acceptable alternatives for the fishing sector, of which local cooperatives subsequently decided PV was the highest priority (Zapata 2006). Approving Pesca Vivencial may also have been partially a political trade-off by decision makers, as our interviews with AIM members reveal. Managers saw PV as something that could be a concession to local fishers for accepting the elimination of longlining, which many fishers advocate and had been legal prior to the GMR (interviews 2012). Despite its extractive impact on fish populations, Pesca Vivencial was seen as an activity with a comparatively lower ecological impact than longlining. A subset of international NGOs, government, and those in fishing communities thus became united in pushing forward PV as a legally sanctioned activity once the idea reached the JMP in 2005 (Table 5.1).

“Consensus was achieved thanks to the existence of a common objective, where different stakeholders reached a win-win solution. The conservation sector (GNP and CDF) win as fishing effort is reduced, decreasing pressure on the marine ecosystem, the fishing sector (Fishing Cooperatives) win as they have found an alternative economic activity that will allow them to gradually abandon extractive activities, the tourism sector (CAPTURGAL

and the naturalists guides) win as this mechanism has reduced the level of conflict and allows the members to obtain higher incomes.” (Zapata 2006, 47; translated from Spanish)

In retrospect it is fair to say that collective efforts to approve Pesca Vivencial were achieved not through actors sharing a common vision, but through sets of actors that happened to see different needs met through a common action. These diverse reasons may also help to explain the protracted negotiations that began as soon as PV was given a legal nod of approval in 2005, which eroded consensus (see below)³⁴.

D. Governing Boundaries: Tourism & Fisheries

A dilemma of whether to categorize PV as a fisheries or tourist activity surfaced amidst provisional approval, and has been by far the most significant regulatory debate³⁵. To help resolve concerns over tourist passenger safety, environmental NGOs helped mediate a trial PV trip in Puerto Ayora in 2006 (Zapata 2006). While considered a success in demonstrating feasibility, it also marked a seminal moment - official agreement that Pesca Vivencial vessels had to be converted away from basic fishing boats to accommodate tourists safely. Molina (2005) noted the following governance issues:

- According to Section 40, article 2 of the GMR management plan, fishing vessels cannot be used for tourism activities, and tourism vessels are prohibited from fishing.
- Fisheries monitoring, specifically regulating catch sizes is the responsibility of the GNP, and "this should not be done by the Fishermen's Ecological Organization (EFO) from

³⁴ These disputes extended even into the fishing community, where debates over initial exclusion of two of the three types of fishing boats as potential PV vessels delayed approval of provisional rules by several months. Beyond this many fishers took a “wait and see” approach because of a lack of clarity on PV’s market potential (Zapata 2006).

³⁵ Objections were raised by ASOGAL and DIGMER during the AIM meeting where PV was introduced in 2005 (Zapata 2006). ASOGAL’s approval is needed on all marine activities in the GMR, giving added weight to its objection.

Isabela." (15)

Regulations and Park-fisher partnerships in 2005 were not well set up to accommodate an activity hybridized across fishing and tourism, and trust too thin to allow the fishing sector to self-monitor. Molina (2005: 15) also noted "tourists should not be required to sign a document freeing a boat owner from liability in the case of accidents (common in fishing)."

As one AIM participant decidedly put it, the dual concerns raised over safety and jurisdiction were "the knife in the back" of PV as it was originally conceived.³⁶ This is because (i) as outlined above from a governance standpoint demonstrational fishing was difficult, and (ii) economically, these debates fundamentally changed how local fishermen could participate in PV. First, the decision triggers regulations under RETANP (Special Regulation for Tourism in National Protected Areas, or Reglamento Especial de Turismo en Areas Naturales Protegidas in Spanish), the national law that regulates tourism. It states that vessels must have certain characteristics of other tourism boats and therefore narrows the accessibility of PV to most Galápagos fishers, most of whom do not have the capital to set up their vessels to cater to tourists like established Galápagos tour agencies. Traditional boats used for daylong artisanal fishing trips are fiberglass or wood-hulled, often uncovered, and contain no restrooms, cabins, or many other features comfortable for tourists. While not technically necessary, some license holders have bought more luxurious sport fishing boats which comply with safety measures while catering to customer comfort at levels competitive with sport fishing ventures elsewhere.

In sum, PV gradually became less associated with commercial fishing and is now largely perceived as a touristic activity that some fishers engage in (Table 5.1). As a result however, the pool of people potentially most likely to succeed in PV, and possibly to apply for licenses in the

³⁶ The total lack of knowledge about the economic viability and market potential of PV was also an issue (Zapata 2006), although the debate over whether to categorize PV as a tourist activity was immediate and overshadowing.

Table 5.1. Regulatory evolution of Pesca Vivencial, from the proposal as first presented by fishing sector representatives (top row), followed by major changes in subsequent legislation.

Event	Goals and objectives	Legal Classification & Zoning	Vessel requirements	Manner of cultural transmission	Activities	Monitoring and Implementation
Presentation by UCOOPEPGAL to JMP, July 21-22, 2005	<ol style="list-style-type: none"> 1. Establish income for Galápagos fishers 2. Improve knowledge of the reality of Galápagos fishing 3. Foster intercultural exchange 	<p>A fishing activity, called Pesca Artesanal Vivencial (PAV)</p> <p>No further framework yet proposed</p>	<ol style="list-style-type: none"> 1. Fibra with fishing license, 6.5 – 9.5 m length 2. Security equipment required by DIGMER 	<p>The fisher: presents attractions and dangers of the sea, demonstrates fishing techniques, reminds all of targeted species, fishing spots, security norms. Lunch onboard as a time for sharing histories, dinner in the house of the fisher with their family.</p>	<ol style="list-style-type: none"> 1. Line techniques (capture of bait fish, shore fish and tunas with hand lines and lures) 2. Submarine fishing (diving) 	
↓ MAJOR CHANGES ↓						
Provisional Regulations, July 28, 2005	<p>The Galápagos fisher... <i>uses their own work infrastructure and vessels ...</i> to sell their fishing culture (emphasis added)</p>	<p>Relevant laws: LOREG¹, Constitution, Special Fishing Regulations in the GMR</p> <p>Exclusively in fishing zones (2.3)</p>	<p>Additions: Emergency oxygen equipment for diving</p> <ol style="list-style-type: none"> 1. Vessel owners present cooperative membership 	<p><u>Art. 21:</u> Fishers will participate in training courses to offer good service, to be offered by various organizations.</p>	<p>Additions: Resting site for snorkeling or swimming</p> <p>While diving, tourists can only observe, not fish.</p>	<p><u>Implementation:</u> Shared among the GNP and fisher groups.</p> <p><u>Monitoring:</u> Fisher groups, with support of GNP.</p> <p>Fisher groups also define regulations for species not currently in the Fishing Calendar.</p>
Feb 23, 2011	<p>Same as Provisional Regulations, but language omitted about fishers' use of their own vessels</p>		<p>Additions/changes:</p> <ol style="list-style-type: none"> 1. All boats allowed except wooden, between 7.5 - 12.5 m length 2. Vessel cannot have a permit for other tourist activities 		<p>Additions:</p> <ol style="list-style-type: none"> 1. Trolling (dragging a baited lure behind the boat) 2. Fishing rod, with reel or without. 3. Nets 	<p>GNP controls monitoring, control and registration of vessels and fishers.</p> <p>GNP defines regulations for species not currently in the Fishing Calendar based on technical studies.</p>
JMP meeting, Oct 4, 2012		A touristic activity, called PAV				
Nov 9, 2012	<i>Reform of Fishing Regulations that eliminates any mention of PAV</i>					
Res. 7, GNP, Jan. 18, 2013		<p>A touristic activity, called Pesca Vivencial (PV)</p> <p>Inclusion of RETANP with above statutes. Resting sites in zones 2.3 and 2.4²</p>	<p>Additions/changes:</p> <ol style="list-style-type: none"> 1. Vessels can be used for <i>either</i> artisanal fishing or PV, but not for both. 2. Cabin now mandatory. 	<p>Fisher and Naturalist Guide.</p> <p>Guide will relate safety at sea, development, techniques and regulations of fishing, and conduct in the GMR.</p>	<p>Additions: PV vessels will be able to travel among ports.</p>	<p><u>Monitoring:</u> GNP will establish participatory monitoring.</p>

1: the Special Law for Galápagos, or Ley de Régimen Especial para la Conservación y Desarrollo Sustentable de la Provincia de Galápagos (LOREG in Spanish)

2: In the Provisional zonation rules of the GMR, zone 2.3 are the areas where artisanal fishing is allowed, and zone 2.4 is designated for special, temporal management.

first place, may not be the same pool of commercial fishers who now seek to leave the fishery. The implications of these developments remain to be decided - some may worry that PV will not help reduce commercial fishing harvests or provide alternate livelihoods to fishers. On the other hand, participation in local tourism may increase for Galápagos residents in general, touching upon an equally important concern for social equity. In accord with the worries (or hopes) of both sides, both things seem to be happening (Table 5.2).

E. Fishing Practices and Participants

Because PV has never actually been practiced as a demonstrational, commercial fishing activity, some believe “there is no PV in Galápagos” (interviews 2012), meaning that all license holders are involved in various types of sport fishing. Putting aside debates over the definition of PV for the moment fishing practices under its name have bifurcated into two main styles, the nearshore fishery or “pesca chica” and the high seas fishery or “pesca grande” or “pesca de altura”. Importantly, on San Cristóbal most operators offer and engage in both styles to maximize opportunities in a market many perceive as sluggish, and to expand activity beyond the few months of the year when migratory billfish can be found in greatest numbers. The pesca chica is closest in vision to the original proposal for tourists to participate in traditional Galápagos fisheries. Multiple species are targeted, with bottom fish such as groupers caught around coastal areas using fishing rods as well as traditional *empates*, consisting of a fishing line held in one’s hand with a baited hook at the end³⁷. However, no one makes a living solely based on such trips, and observations imply that this trip type is the minority of all PV outings. The “pesca de altura” immediately differed from the version first presented by UCOOPEPGAL delegates (Table 5.1). More closely resembling sport fishing in other areas, it mainly targets

³⁷ Empates may also be demonstrated around deeper water seamounts in the high seas fishery.

larger striped marlin and tunas that swim midwater using the method of trolling fishing poles from the boat through deeper waters. Commonly targeted environments are underwater seamounts or “bajos” that are scattered around the Galápagos platform where marlins can be most reliably found (see Schuhbauer and Koch 2013). Beyond a profit motive, the high seas trips seem to be promoted also because they are popular and familiar to tourists³⁸. Even when clients are interested in learning about the *empate* they want to use familiar rods and reels during a costly day trip.

Table 5.2. Summary of select involvement among surveyed fishers involved in Pesca Vivencial in San Cristobal. Numbers in each column indicate the frequency of responses. In 2012, these questions were posed about pesca *artesanal* vivencial, in accordance with the name at the time.

Personal role in PAV*	# people	Years since was fishing full-time~	# people
owner	1	0	3
owner, operator	1	1-2	1
owner, fisher (as mate or captain)	3	3-5	1
all	11	6-10	2
		> 10	5
		N/A	2

Days at sea in the PV in 2011	# people	Occupational Diversity	# people
1	1	PAV, commercial fishing	4
4^	2	PAV, other jobs	3
5	2	PAV, commercial fishing, other jobs	7
6-7^	1	PAV, other business owned	4
8	1		
>=20	7		

*including 2 not currently operating

~unclear for 4 respondents

^trips, instead of days at sea

Inter-actor relations have also been influenced by categorizing PV as a tourist activity. Because boats must be outfitted with expensive insurance, safety, and navigation equipment, significant start-up capital is needed. This need might contribute incentives to makes certain

³⁸ The high seas trips being offered in 2011 were around \$1200/day, and nearshore trips were only slightly less.

types of engagement in the PV industry more likely, such as the “testaferro” phenomenon, where some license holders have partnered with outside investors or family members who finance and own the vessels in all but name and run PV operations in a variety of partnership arrangements. *Testaferro* is made fertile with a constant pressure from non-residents seeking entry into a market seen as potentially extremely lucrative. People who are not licensed fishermen have entered the activity by partnering with amenable local fishers. This dynamic combines with a risk aversion of many local fishers to borrowing money, given negative experiences with falling behind on bank loans and losing or nearly losing homes or land in the past (interviews 2012).

The local fisher is usually a minority partner in the business and profit sharing, which has given the “testaferro” term a negative implication, although partnerships vary. One fisher described his business arrangements of owning the boat with a partner running an agency. For every day the boat was used, he collected around \$2000USD and his partner the rest. While other details were not disclosed, implied is that his partner also handled and profited from any extras such as package deals with hotels and day tours around the archipelago. Other fishers may not own the PV boat completely, but may have attained the license. Still others own a boat and have partnered with family members who own agencies, getting various cuts or trip-based crew payments.

While unequal, these arrangements are ambiguously negative but also ambiguously beneficial for local fishers, some of whom work on the vessels regularly or have aligned with several PV license holders in larger tour agencies. Arguably in all cases, fishers have increased their income and economic security for the present, while remaining connected to the sea. Interviews imply that a significant proportion of all PV license holders in San Cristobal are in such arrangements.

The demographics of license holders are highly diverse and reflect how PV is being taken up by people who see various opportunities to better their lives. Three out of 18 interviewed fishers in San Cristobal were full-time commercial fishers when they began PV activities. Two fishers have become passive recently in the past five years, one by choice and one reluctantly for family needs. An additional two have transitioned during the last five to ten years to fishing only occasionally or on weekends. When the opportunity arose, both wanted to enter PV and retain fishing ties. Some license holders have roots in fishing families but have had full-time careers elsewhere, still fishing on weekends and participating in long trips when possible over the years (Table 5.2). Pesca Vivencial represents the possibility to stay connected to their fishing culture. For all, in an economy where job security is never assured, PV has provided an additional activity where they may leverage their property (in vessels and commercial licenses) and fishing skills for a safer and more diversified livelihood.

Within the industry, it is clear that differences in individual capital, skill sets and motives all affect how PV has grown and for whom. The number of trips our interviewed operators and license holders were involved in ranged widely, between being at sea just 1 day to more than 60 days in 2011 (Table 5.2).³⁹ The subsequent divergence of business growth trajectories may imply that after obtaining licenses and eventually outfitting boats, some fishers lack capacity in strategic business and social networks, which are vital to staying competitive in the tight Galápagos tourism market and which distinguish those with the most PV business from the rest.

³⁹ Since data is self-reported the accuracy is not guaranteed, but regardless of exact numbers unevenness in the days worked in the pesca vivencial is undoubtedly a feature of the social landscape.

V. Discussion: Pesca Vivencial's Complex Feedbacks: Contributions from a Livelihood Perspective

Arguably, the controversies around recreational fishing are part of broad deliberations by Galápagos stakeholders over future “alternate stable states” of development. Tourism that relies on the draw of big game fishing, if PV continues to develop in this mode, evokes unwanted “continentalization” since it markets the appeal of the Galápagos as a generic island destination rather than a unique educational destination, the former potentially degrading the high-end, lower capacity tourism market that the archipelago has cultivated.

In the language of resilience, some elements of the transitioning Galápagos fishing industry have begun to reorganize into new configurations, laying particular pathways for future development. Regulatory debates have markedly changed the nature of Pesca Vivencial since its first proposal in 2005. Completing the loop to ecosystem impacts, rule sets now set the stage for structuring the nature of participation and target species for the new industry in ways that arguably have made PV much more narrowly accessible to the fishing community, benefitted non-fishers as much as fishers, and left recreational fishing for coastal species much less targeted than for big game billfish.

What has shaped reorganization to these ends, influencing how and which Galápagos fishermen will move out of the industry through PV? A complex systems analytic in some ways provides a striking analogy to PV's history, although offering no evaluation of winners and losers. The PV practices taken up arose from actions of non-united, independent individuals on their “local” level that, over time, were unpredictable, individualistic, and uncoordinated, just as occurs among agents in a complex system (Levin 2005). Historical contingencies (e.g, political expediency and declining abundance of commercial fishing stocks) eventually became amplified

at local (in terms of individual businesses) and institutional (in terms of regulations) levels in different ways. The activity showed no signs of being orchestrated by some “grand plan,” on the contrary one could say that as an emergent process, PV continued from the bottom-up despite the efforts of government regulators to control and even stop it at various times.

Livelihoods based, community perspectives on social adaptation contribute to our knowledge of these feedbacks and interactions by foregrounding different perceptions of “alternate stable states” and their formation, and by giving structure to the resilience “reorganization” phase by helping sharpen articulation of what regulatory negotiations are about and what influenced their outcomes.

A. Which Roads to Alternate Stable States are Being Paved?

Resilience scholarship, assuming underlying CAS dynamics at work, often places much analytic attention on conditions that might make potential “alternate states” more or less likely, (e.g., Cumming et al. 2005; Nelson et al. 2007).

One of the most pondered alternate states concerning Pesca Vivencial is whether commercial fishing effort on coastal fish stocks will decline in part because it is transferred to the PV, through either helping commercial fishers diversify incomes or leave commercial fishing entirely. This hope has been a prominent reason for institutional support. However while it is unknown how commercial harvests have changed because of PV, it appears to have become a complementary rather than alternate activity for the three interviewed PV license holders that were previously full-time fishers. The other PV license holders interviewed had already transitioned away from commercial fishing either partially or completely, so PV represents no reduction in effort on their parts. A focus solely on the conditions precipitating alternate states

thus might note that present conditions lead to a failure to reduce fishing effort by any significant amount.

Local fishers however have different perspectives on trends, namely a common long-term goal to transition from commercial fishing to PV. One interviewee was pursuing strategic partnerships with new tour agencies locally and abroad in 2012. Over time this license holder aims to quit commercial fishing for the PV full-time as their business expands to support them. Other license holders interviewed still hope that PV will one day replace their commercial fishing activities, though they did not have active leads on new partners. Out of the seventeen asked of their future job preferences in an open-ended question, eight declared a preference to work exclusively in the PV if their business supported them. Nine more would prefer to work more in PV than they currently do. Therefore fishers view the present pattern of complementarity to commercial fishing as a dynamic state that can be either transitory or permanent, depending on the business opportunities they find moving forward.

These perspectives dovetail with the theoretical insistence that not just particular properties (i.e., PV as complimentary to commercial fishing) but the trajectories they are on are key to determining ecological change moving forward. It must be remembered that in a constantly changing system tracing every feedback loop is impossible; however which feedback loops to attend to can privilege stressing environmental outcomes but not the market and legislative structures that shape individual choices around resource use and environmental outcomes. This is certainly the case for PV; much hinges on market possibilities for the pesca chica and altura although regulations have focused on the proper conduct of fishermen.

Ultimately while a useful analytic, conceptualizing alternate states must be conducted with an explicit recognition of (a) change over time and (b) historical conditions, or they may

arguably reify a focus on trends and away from the diversity of social practices and historical legacies that individual actions are situated within.

B. Failures, Opportunities, & Struggles for Social Equity & Access

Livelihoods attention to access, social difference, and control and authority over resource rights helps to note that PV was about much more than letting fishers take tourists out to sea for a day. At the heart of regulatory negotiations were struggles over control of private property rights to boating on the GMR, and the flexibility these rights imply in economically benefitting, now and in the future, from GMR's rich resources. Pesca Vivencial licenses are highly restricted in supply compared to demand akin to licenses to own other tour boat operations, as discussed in Chapter 4.

In the end, regulatory outcomes show that fishers gave ground or were out-negotiated on many of their desired points by other sectors. They retained no control over cultural transmission, monitoring or enforcement of PV activities as first proposed, and PV boats are classified as tourist rather than fishing vessels, triggering much higher start up costs. It could be argued that outcomes reflect the minority political positions of fishing representatives in the two participatory boards rather than willing concessions, because many PV stakeholders have signaled oppositional stances to outcomes (e.g., GALEODAN 2012).

Whether as concessions or from simply being outvoted against their will however, a livelihood interpretation helps make sense of continued fisher support, broadly, for the contemporary version of PV that has emerged, far different from the original vision. A key point to note about fisher perspectives around Pesca Vivencial is that they represent the desire for *equity and fairness* on top of replacing lost fishing incomes in a 1:1 manner. The ability to

improve one's life and not just maintain it appeals to many local residents and fishermen, surrounded by a visibly growing tourism industry that has attracted increasing visitors for several decades and bestowed wealth to the tourism business owning class. For these reasons both Pesca Vivencial and sport fishing continue to be championed as democratic activities to develop by various fishing factions. On the flip side, the desire for equity in sharing tourism benefits found among *non-fishing* residents also may contribute to the difficulty of regulatory negotiations. With their accompanying rights to take tourists snorkeling and rest at various beaches, fishers argue that some opposition stems from misplaced perceptions of others that fishers will get a new, exclusive door to legal rights to many lucrative tour operations. As one license holder noted,

Fisher 71949: The assumption is that we want to create a superpatente⁴⁰. But if we were to have a superpatente then we would be millionaires. Because I've already worked 4 years in this activity, and what we have is, sporadic work. And if we didn't have the freedom to go (commercial) fishing, [which now is] normally what we have – I don't know how I could pay even a minimum debt [on investment].”

The search for equitable opportunities to materially advance from tourism and local perceptions of the limited space in charter tourism also play prominently into the sector's origin story of how PV first came to be, since PV's originator has inferred that charter tourism was his original desired route, and only after his applications for two different tourism operator permits were denied in the late 1990s that he came up with the PV idea. The social consequence of this unavailability was the proposal of a newly repackaged idea of recreational fishing.

Other non-economic factors also play into Pesca Vivencial's appeal to the fishing community. Pesca Vivencial has been perhaps the only alternate livelihood thus far to offer a chance to diversify one's labor into tourism while simultaneously allowing people to keep links

⁴⁰ A patente is a local term for a license. The fisher here refers to non-fisher opinions that a PV license would represent rights for commercial fishing as well as valuable tourism boat operations.

to fishing. Bebbington (1999) has called this aspect of livelihood value “cultural capital” as it helps to maintain important cultural aspects of a livelihood, much like rural residence (more than agricultural activities) does in certain Andean communities.

In other words, PV can be interpreted as one attempt by the Galápagos fishing community to not only recover lost fishing income over time, but adapt in new directions according to the opportunities they see developing in the archipelago and the multiple ways they value fishing.

Considering social equity also affects the light in which not only PV’s creation but also its outcomes so far can be seen. Schuhbauer and Kock (2013) conclude that the original *pesca artesanal vivencial* idea of taking tourists to experience an “authentic day at sea” with a fishing boat has been a failure (103), one that I concur with here since the original idea was never really implemented as proposed. However, *pesca vivencial* is not entirely void of silver linings in terms of broad social benefits. Recognizing fisher perceptions of historical social conditions of exclusion (along with other local residents) to the lion’s share of ownership of tour operator permits brings to light the social benefit of more fishers (i.e., PV license holders) having gained a foothold in the tourism market. Those involved are part of a larger local tourism economic base and now well-poised for market growth, and their privileged access over mainlanders for the limited number of licenses has given some an edge they may not have been able to begin competing without. Such an analysis puts a more tempered spin on the failure of PV to launch as originally proposed.

C. Regulatory Feedbacks: The Negotiation & Creation of Livelihood Alternates

Related to the above outcomes, while Holling (2001) notes the transitional reorganization

phase is theoretically more open to policy experimentation, in the end very little experimentation of governance structures in the GMR occurred. By situating the current vision of PV under the governance of tourism institutions, many established jurisdictional boundaries remain unchanged and in the end no responsibility in these areas was devolved to the fishing community, as they first requested. The difficulty of changing established governance boundaries can be understood as related to (i) the goals, rights, and structure of participatory management in the GMR and (ii) the political heterogeneity of the fishing sector and its (iii) weak organization.

Firstly, as Brechin et al. (2002) note, “participation is...a necessary but not sufficient component of governance” (47). There are different forms and goals of participatory conservation governance. The legally mandated participatory management structure of the GMR within the 1998 Special Law (see Chapter 2 for greater description) imparted substantial control of resource management to local stakeholders, but was also designed to contain contradictory goals (e.g., extractive and non-extractive uses) and provide a forum for compromise rather than universally help all achieve their desires (Ospina 2006). It arguably falls short of what Robards and Lovecraft (2010) suggest as a “deliberative” obligation of co-management, to seek mutually beneficial compromise rather than aggregate individual preferences of various stakeholder partners, which often imply different outcomes.⁴¹

While aiming for consensus, ultimately the right to craft and approve laws rests only with the National Park, making management less than 100% participatory. The social agents in this complex system are therefore imbued with different constraints and cannot be assumed to have the same abilities and rights in negotiations. These constraints and abilities are brought forth in starker contrast when considered in terms of the rights, obligations, and intentions of the

⁴¹ See Ospina 2006 for deeper analysis of the Special Law. He argues that sectors have different projects and visions for the GMR that often conflict.

regulatory system in which policies that shape new livelihood options are debated. As a consequence of divergent stakeholder interests, legalization was a negotiated process couched in the socio-political and ecological needs of the time and not contingent upon the simple innovation of a new idea, as cultural ecologists have long pointed out (Denevan 1983).

There are numerous examples of policy outcomes reflecting aggregations of stakeholder preferences, even during political compromise, among Galápagos stakeholders. The banning of industrial fishing involved a “practical alliance between fishers and environmentalists after many years of disagreement” (Ospina 2006: 130) that did not however, engender any further closeness or trust among the sectors; tensions again returned after the industrial fleet was kicked out. Many fishers are disillusioned with the general evolution of GMR regulations that did not go entirely as they wanted – for instance to kick out the industrialist fleet in order to be able to fish the waters within 40 nm themselves, and to receive help in developing their fishing abilities. Instead, fishers have had to negotiate for use, not with industrial vessels but with the tourism and conservation users of the GMR. They consider themselves having lost many of battles, over zoning and ability to upgrade technology, even while they have been empowered over industrial fishing within the GMR for instance (e.g., Ospina 2006, Engie and Quiroga 2014).

Pesca Vivencial could be seen as the latest temporary compromise among sectors to legally approve new regulations, but not alter the manner in which stakeholders view each other’s overall actions, motives, and needs – which have suffered from a long-term lack of trust and a “volunteerist vision” of disagreements, where if a desired outcome does not occur deliberate blockage is assumed and fault is laid on each other’s feet (Ospina 2006).

Other sectors were not obligated to devolve any authority over their monitoring, enforcement, and niche labor rights (in the case of naturalist guides) to the fishing sector, and

they did not. While perhaps the most emancipatory proposed livelihood alternate so far, PV also asked the most of other sectors, to make space for fishermen in areas that are well established by other groups of people with local organizations that also display social cohesion at least as strong and often stronger than local fishing cooperatives.

This short genealogy of regulatory change also opens up further avenues of future analysis, including the effect of the political heterogeneity of the fishing sector and its weak organization on collective action on San Cristobal, discussed in Chapter 2. Although fishing cooperatives were involved in stakeholder meetings, to a large extent individual license holders speak for themselves. Cooperation is low, for instance some have formed an association for PV license holders and boat owners while others refuse to participate and call it unnecessary (interviews 2012). “Grassroots perceptions” of a fear of individual personal and political interests trumping the defense of sectoral rights by fishing representatives in negotiations (Heylings and Bravo 2007: 188) also exist, part of broader dissatisfaction of local fishers with their representatives in cooperative management (Ospina 2006). These concerns for the legitimacy of fishing representatives among the fishing community could contribute to fractured political interests in the fishing community and lower collective action than among other sectors. Whether a lack of social cohesion had any impact on regulatory outcomes is unknown, but it has been observed in general that greater community collective action is one of a set of common factors often present when social conflicts are minimized in conservation governance, along with “...strong governance institutions...stable entitlements, strong self-enforcement mechanisms, strong local organizations, and a supportive policy environment” (Brechtin et al. 2002: 47). Arguably, most of the above are absent in San Cristobal.

D. Dynamism in Assets & Policy Implications

This chapter continues a theme presented in Chapter 4, which argued that opportunities to transition from fishing to tourism are narrowing. In the Galápagos as elsewhere, the linkage between assets and poverty (Bebbington 1999) is contingent and subject to re-negotiation over time. While for a short time a window was open wide to the PV idea, the inability to hand over authority in different governing areas greatly narrowed its accessibility among the fishing community. Pesca Vivencial in many ways illustrates the contrast with the past generations of fishers who transitioned to tourism in the 1970s and '80s; the regulatory negotiations discussed above are part of the greater constraints and opportunities in using their assets (also considering access as an asset) to create livelihood strategies away from fishing.

In addition the PV case study provides a concrete example of several points made in previous chapters about the breadth and width of assets that Galápagos “fishermen” draw from, with their long history of occupational plurality. Looking to non-fishing components of livelihoods such as tourism is essential to understanding the evolution of alternate livelihoods. Although PV license holders relied upon certain fishing assets such as licenses and vessels, their progression in the PV has hinged upon an overlapping but distinct set of the skills and assets compared to commercial fishing. Key to succeeding in the PV are possession of social and human capital to access this niche market and institutional knowledge or networks to navigate the bureaucracy to get a license. PV has created spaces of opportunity, but only for some. As Adger (2006) noted, “adaptive actions often reduce the vulnerability of those best placed to take advantage of governance institutions, rather than reduce the vulnerability of the marginalized...” (277).

This analysis can offer further suggestions to the question of possible solutions for

helping channel PV to better achieving a reduction in fishing effort and benefit for local fishers. Schuhbauer and Koch (2013) suggest a code of conduct for recreational fishing designed and implemented specifically for the GMR, more rigorous enforcement of current regulations, and aid to local fishers for investing in PV such as micro-financing as an alternative to uneven business partnerships. To reforms focusing on the fishing sector should be added consideration of how evolving policies may take PV out of the hands of fishers on the low end of the income spectrum, such as classification as a tourist activity and the proposed ban on using commercial fishing vessels in the PV. Another important influence on PV, although indirect, may be consideration of job opportunities elsewhere in tourism for local fishers. A realization that the push for PV came partly out of a perceived lack of openings as tour operators begs the logical inverse question of whether a greater ease in benefitting from tourism in more “traditional” ways from charter tours might alleviate some interest in the PV. Future growth is an issue of concern by scientists given the 600 inactive, registered fishers now in the GMR. Therefore continuing to attend to the other livelihood alternates that fishers have is critical, along with strengthening enforcement and norms.

Foremost in encouraging transformative change as well as incremental adaptation, by fishers as well as more broadly in Galápagos society, is the need to consider how far other stakeholders are willing to devolve authority to the fishing sector, a critical element of whether hybrid fishing-tourism activities will ever be allowed in the GMR. While certainly complex, in order for the most innovative approaches to social-ecological adaptation to take hold there is no escaping the role of reconsidering governance structures across not only the fishing sector, but tourism and other activities as well. Beyond neat, contained, sector-based reform, for truly transformative change and adaptation to occur as Galápagos stakeholders purport is needed and

one reason they look to resilience and complex systems frameworks academically, difficult issues around control, authority, and trust must be more deeply dealt with.

Beyond the above, other basic policy implications echo those of past chapters: an outward look in terms of focusing on access to various routes out of fishing as well as building up capital assets, and the need to look beyond the individual to structural constraints created by governing institutions. As noted in Chapter 4, bolstering the weak human capital of the sector and assisting fishers in securing financial loans and partnering with local businesses could help residents avoid partnerships with outside companies that might have a higher risk of transferring privatized rights outside over time. Finally these attempts by fishers to carve new tourism livelihoods shows that they see tourism and fisheries reform as joint concerns, necessarily considered together.

VI. Conclusions

By taking seriously community perspectives on social-ecological feedbacks and more rigorously analyzing the nature of regulatory negotiations, this analysis draws attention to the inevitable relatedness of individual actions, perspectives, livelihood strategies, and environmental impacts. Analyses have argued to broaden thinking around (a) the evolution of PV and intentions of its practitioners, and (b) the intricacies of social dynamics in Galápagos social-ecological feedback loops. Scholarship on governance from livelihoods, political ecology, and biodiversity literatures informs and takes some mystique out of Holling's (2001) "reorganization" phase, by noting that rights to participation and rule-setting represent differential constraints to individual "agents" in complex social-ecological systems, as do existing power dynamics. In turn, the integrative emphasis of complexity and resilience

scholarship helps foreground how not only small, incremental changes to households affect livelihood changes over time, but also transformative governance actions must be confronted.

The evolution of Pesca Vivencial provides a concrete example of the ways that fishers intersect with institutions and governing organizations, a major structural constraint shaping livelihood adaptation, as mentioned in Chapter 4. The overarching argument made here is that in resilience and social-ecological systems terms, the birth of this industry is a “response” and a bottom-up adaptation by fishers to changes in not only fishing but also tourism and overall GMR management. From fisher perspectives, while PV and sport fishing both expand the number of exploited species in the GMR as currently practiced (notably striped marlin), they are also partial reflections of a local desire to participate more substantially in the multimillion-dollar Galápagos tourism industry. Because fishers did not view recreational fishing as inevitable, PV and sport fishing within it should be understood as byproducts of social struggles *as well as* of much-commented environmental declines in commercial fishing.

CHAPTER 6

Concluding Reflections

I. Introduction

Reducing the fishing footprint within marine protected areas (PAs) has been a longstanding concern of biologists to achieve conservation goals (Carr et al. 2003). Galápagos fisheries present a rare case of a fishery with decreasing participation for ten years, largely independent of policy directives to do so and in the face of plentiful tuna stocks that would be marketable if outside of a marine reserve.

The Galápagos transition period provides a timely window for studying a broader set of issues, including the alignment of human and ecosystem wellbeing within PAs. While one could argue that reducing fishing within PAs always benefits humankind broadly and in the long-term, it does not necessarily benefit humans on a local and immediate level. If fish stocks become depleted from overexploitation and a drop in food and incomes results for local fishers, then reducing fishing does become linked to human health and wealth. However, such a causal chain is far from inevitable. Fishers have the power to substitute other goods and resources for fish to maintain their wellbeing in the face of declining stocks. If they can harness new economic opportunities from nature-based tourism, as the Galápagos is famed for, the conservation benefits from reducing fishing can build alongside social benefits.

This project provides an empirical case for evaluating long-term social outcomes of protected areas. The fate of former fishers in the Galápagos Marine Reserve effectively reflects its long-term social outcomes. Reaching out even *more* broadly beyond PAs, understanding how

to protect ecosystem functions through increasingly stringent regulations while not depressing local communities socioeconomically holds a key to relieving many conflicts in the global conservation movement related to social justice.

The social focus of this dissertation does not exclusively serve social goals around equity, however. Complex social dynamics could also affect the strength of future environmental protection. Underscoring these points is that fact that continuing declines in extraction of marine resources is far from inevitable in the Galápagos. Ongoing debates on developing sport fishing, more localized forms of tourism, and niche markets for Galápagos seafood all have the potential to strain the resource base, but also hold promise in providing biologically sustainable livelihoods for local residents. Ensuring human wellbeing within channels that have smaller environmental footprints could very well sway their success. In this sense the crossroads of Galápagos fishers reflects larger global crossroads in resource use governance.

This project presents a strongly interdisciplinary approach to understanding social outcomes in conservation governance. I have studied job switching and recreational fishing with quantification of work decisions, preferences, and outcomes on one hand, and delved into historical analyses of the changing ways that fisheries livelihoods have diversified and been involved in other areas over time on the other hand, particularly tourism. Qualitative analysis, participant observation, and interviews have been linked to quantitative resource use patterns in order to effectively analyze how social change in turn affects resource use, and thus environmental change.

This dissertation analyzes the social dimensions of the Galápagos fishing industry downturn through a number of different theoretical lenses and methods. In Chapter 3 I ask how some individuals are better able than others to leave fishing by analyzing differential household

asset bases via a Sustainable Livelihood framework that conceives of various “capitals” as capabilities to direct one’s life (e.g., Scoones 1998; Bebbington 1999; Allison and Ellis 2001). I surveyed 167 fishers across a spectrum of levels of active and inactive participation. Inactive fishers provide an important comparison group with which to analyze the wellbeing of active fishers. Since present-day asset bases reflect both the foundation people have to work with as they build livelihood strategies and the material outcomes of those strategies, separate but related analyses used the survey to partially analyze how people left fishing (Chapter 3), and who was better off (Chapter 4). Bivariate statistics and linear discriminant factor analyses parse out the differences in the social conditions of active and former fishers. In Chapter 5 I analyze human and non-human actions as elements of a complex adaptive system, and conceptualize regulatory debates as complex and adaptive feedbacks that worked within and helped produce the multitude of styles of recreational fishing that have sprouted in the GMR since 2005. All of these analyses have looked outward from fishing activities to the other types of work and family obligations and ties that were part of Galápagos fishermen’s lives.

In the end I have argued that Galápagos fishers’ uneven ability to find alternate work is as great an influence on fishing pressure than profit-seeking behavior regarding fish, a more conventional focal point. Adaptation to environmental transitions is shaped by diverse issues around social mobility and the structures of economic opportunity outside of fishing, as well as the economic incentives of fishing itself. In addition I argue that both the social and ecological effects of fisheries stagnation are inextricably tied to the structure and management of the tourism industry and the jobs it produces, as one of the main economic engines on the islands.

II. Summary of Main Findings

This project was designed, executed, and written with dual theoretical and applied goals, to explicitly consider Galápagos policy needs while also speaking to interdisciplinary scholars across fisheries social science, an area with a still weak tradition of integrated understandings across quantitative and qualitative research.

Chapter 2 began with a summary of livelihoods as found in 2012, which sharpen and in some ways differ from past characterizations. Net labor flows are now decidedly pointed out of the sector rather than flooding into it, and full-time participation is declining among new fishers (Wave 3 described in Ch. 2). A small but dedicated group of fishers who seek to continue fishing attest to the continuation of the sector in some capacity, which managers agree is desirable given the cultural history of the islands and ability of the GMR to support some ambiguous level of artisanal fishing. The proportion of fishers who can be described as waiting to leave –over half of active fishers surveyed (Chapter 2) however attest to an overall sea change in fisher priorities, which is driven by declining incomes but also a long-term view of non-extractive activities as the future of the archipelago.

Beyond enriching an historic void in socioeconomic data on the fishing sector, theoretical and applied implications are interwoven in the following Sections, which outline the main themes and findings around the social dimensions of fisheries change and adaptation (Section A), fisher exits (Section B), and how conservation governance intersects with fisher exits (Section C). Future directions for research follow (Section III).

A. The Political Ecology and Economy of Adaptation: Individuals, Institutions, Communities, & Responsibility

The question of how Galápagos fishermen are adapting to their industry downturn is in reality many questions. To adapt is simply to change, but is change beneficial or detrimental, and for whom? Borrowing insights from the political economy of adaptation literature around climate change and natural hazards work (Bassett and Fogelman 2013), the social-structural creation of vulnerability and the indeterminacy of adaptive pathways around the declining Galápagos fishing industry are described below.

A1. Responsibility & the Social-Structural Creation of Vulnerability

While different in their conceptualization of individual behavior, both bioeconomic and livelihood framings of fisher exits can share a tendency to focus on the individual: decisions are often the analytic focus, and questions revolve around whether they are made based on profit seeking, business investments, or changing household needs. After initial analysis however, I found that individual motives yield only a partial view of the nature of movement through Galápagos fisheries.

For instance, the “job satisfaction” hypothesis is often invoked as explanation for labor immobility in fishing, assuming a reluctance to leave based on attachment to the profession (e.g., Pollnac and Poggie 2008). A common viewpoint given by Galápagos scholars is that the relatively young age of the Galápagos fishing culture makes people less attached to fishing and more willing to leave than in other places (e.g., Ospina 2006; Schuhbauer and Koch 2013, Castrejon and Charles 2012), implying a greater potential labor mobility. It is true that many active fishers are immigrants, including 40% (67 of 167) of survey respondents in this study.

However, if examined rigorously it should be found that new immigrants are less attached to fishing than those from older families and are more likely to want to leave or to have left. In fact I found that those born on the islands were more likely to have left fishing. The testimonials of those who seek to remain in fishing in Chapter 2 attest to a love of fishing as strong as that found elsewhere among some, and the reverse “satisfaction bonus” among others described in Chapter 3 applied equally to people from the oldest fishing families and newer immigrants. Results therefore show that Galápagos fishers are more amenable to leaving *despite* a high job satisfaction in fishing.

We must take care not to attribute too much of labor immobility in fishing to individual-level traits such as job satisfaction or poverty, or even profit seeking motives. While their effects are real, fishing is neither anathema nor a romantic calling for most people. When given the opportunity, and with strong family networks and educational opportunities, (details in Section B below) Galápagos fishermen diversify their work portfolios, and many do eventually leave fishing. In one sense this is a positive finding for environmental conservation outcomes, since it shows that it’s not impossible for fishing effort to decline as fishers leave of their own accord.

Present-day Galápagos fishers seeking to exit the industry have a number of alternate work options, as they always have, but there has been a clear constriction around the highest-returning tourism occupations with the privatization and capping of tour operator rights in the *cupo* system (Epler et al. 2007). There is a similar constriction around alternate sea-based work with which fishing skills match up the most, with the increasing robustness of tourism safety standards. Such standards are beneficial in a global sense but leave the least educated in increasingly marginal positions as educational standards lag.

In a sense then, this project has found that Galápagos fishers have newer coping options

in terms of alternate work than past generations, but in a narrower range of work types and economic return. The changing nature of their vulnerability and adaptability to the “shocks” of declining fishing profitability clearly emanate from not only individual and household adaptive capacities, but broader structures of conservation governance and a changing tourism market.

The implications are that not only small, “purposeful” adjustments might help increase capacities to exit fishing, but more socially and politically “transformative” adjustments should be considered if shrinking overcapacity is a serious policy goal. The former include strengthening the educational system of the archipelago and encouraging secondary school completion, as well as English skills and better naturalist guide training. The latter however, would require serious thinking around the structure of the tourism industry and specifically, ways to spread the distribution of tourism more equitably to the island’s local residents. “Local tourism” is a popular rallying cry among island residents and politicians, but much remains to be addressed that has so far been avoided, along with the inevitably complex power plays that will accompany any reforms of the multimillion-dollar tourism industry. For instance, as described in Chapter 4 the GNP conducts a delicate balancing act in allowing boat-based day tours to thrive on San Cristobal, filling market demand and providing non-extractive nature-based work to many citizens, despite the technical illegality of the vast majority since the GNP has also committed to not increasing the number of permits for operating tours. Whether Galápagos institutions can delay a day of reckoning indefinitely remains to be seen.

A2. Adaptive Pathways, Uptake, and Indeterminacy

Collectively, chapters clearly show that most work alternates that round out the present occupational diversity of fishers have existed and been known by fishers for many years, with

some growing in proportionate use only recently. These include IMO sailor certifications, local commerce, transport, farming, and government-based work. Many interviewed fishers had been certified to work as professional sailors for years or decades before they decided to seek out such jobs. Sport fishing and pesca vivencial were also both practiced or conceived of, respectively, before the uptake of recreational fishing in the legal framework of the GMR. Adoption of labor pathways therefore does not follow invention and simple diffusion. Instead the trends in employment growth that are now apparent –most notably in local transport, semi-skilled tourism work, local retail, and pesca vivencial speak to the triggering of several broad mechanisms.

On the individual level, they show the diversity in individual thresholds for weighing the costs of fishing, in terms of finance, time and effort, affected by different attachments to the profession. Practices are becoming more strenuous with the need for longer and more offshore trips at sea to fill cargo holds (interviews 2012). One fisher related how filling up a *fibra*'s hold used to take 1 day and now might take 2-3, with travel further offshore needed. Because of this he began working as a professional sailor 2 years ago using the certifications he first obtained 20 years ago. Other friends still prefer fishing to other work.

Individual-level thresholds intersect with declining marine abundance and changing cultural needs and priorities of Galápagos society toward nature-based tourism and away from fishing as a more sustainable mode of development (e.g., Gonzalez et al. 2008). Fishers perceive that they are seen as the “bad men of the movie” and the “predators of the marine reserve” (interviews 2012), a collective societal frowning upon their profession. At the same time, stronger enforcement of labor laws has helped raise tourism wages to acceptable levels for more fishermen as related by survey respondents, who now split their time between fishing and tourism or have transitioned completely. In short, not only declining marine abundance but the

confluence of the evolution of the tourism industry and conservation governance has created this historical moment of declining fishing participation.

Finally, my arguments that pesca vivencial and sport fishing practices were not predestined but completely avoidable most clearly illustrate the indeterminacy of adaptive pathways. It should be recognized that certain labor trends, a.k.a. adaptive pathways, are growing in part because others are blocked.

B. Fisher exits

A classic concern to fisheries management is that of fisher exits from declining fisheries to prevent degradation of stocks (Terkla et al. 1988). This study contributes to knowledge of fisher exits in several ways: advancing data-driven evaluation of conservation outcomes, here the effects of marine reserves on displaced fishers, and advancing an expansive, outward-looking interpretation of fisher behavior.

B1. Evidence-Based Evaluation of Conservation Outcomes

The large global investments in protected areas, which now number over 5000, made with little social evaluation has led to calls for evidence-based and data-driven social science to more rigorously assess conservation outcomes (Ferraro and Pattanayak 2006). The fate of former fishers in the Galápagos Marine Reserve described in this study effectively reflects its long-term social outcomes, as translated into employment and economic security.

One of the major questions central to this project was: What has made some fishers better able than others to reduce their dependence on fishing while maintaining their material standard of living? The careful empirical detailing of individual work histories and preferences collected

in this project provides a valuable case study of how these labor decisions and acts relate to various “capitals”, both generally in an inductive way and specifically around two of the most theoretically developed hypotheses around fisher exits: their linkages to poverty (e.g., Bene et al. 2003; Cinner et al. 2009) and job satisfaction (e.g., Pollnac et al. 2001).

General inductive assessment showed that in San Cristobal, in the short-term individuals and households moving into and out of fishing only weakly differed in their asset bases. If their “capitals” were also their “capabilities” to be and act in the manner of their choosing (i.e., Bebbington 1999), then having friends with power over providing jobs (i.e., vertical social ties), owning a fishing boat, and a higher education (part of human capital) gave one a leg up in partially or completely leaving fishing as desired. However perhaps the most notable aspects of this livelihood-based asset analysis is the degree of social heterogeneity across people who have left fishing or remained.

The rare negative “satisfaction bonus” found here in fishing (Chapter 3), where many individuals would leave despite earning less elsewhere, is in direct opposition to most empirical studies (e.g., Pollnac et al. 2001; Pollnac and Poggie 2008). I found that while poverty conceived of as an inability of people to “satisfy their basic needs for food, clothing, shelter, and health” (Yapa 1996:707) was rare, inequality played a parallel role in creating weak “poverty traps” to leaving fishing. Displaced workers and the creation of winners and losers in transitioning industries are nothing new, including in fishing (e.g., Davis 2000, Smith et al. 2003). However this inequality deserves to be recognized. Whether and the extent that it is attended to is up to Galápagos stakeholders. The connections that the Galápagos case has to the general issue of equity in conservation outcomes are discussed in further detail below.

The support for both poverty traps and high job satisfaction on the one hand and the

qualified ways that they applied to the specific Galápagos case makes visible two dynamics. First is the value of empirical studies that go beyond hypothetical questions to track *which* fishers are better able than others to maintain their standard of living, and link their economic trajectories with their ecosystem impact: whether they fish more, less, or relatively constantly over time. Pollnac et al (2001) note the danger of generalizing even within one country, of what fishers actually want, given the variability they found within villages of the same country.

Second, the answer to the question of why some individuals are better able than others to leave fishing in San Cristobal seems to demand a partial reformulation of the original question. The individuals most able to leave fishing make up a very small minority of registered and active fishers who have tertiary degrees or large family and social networks that make searching for a job easier. For the vast majority of active fishers, the ability to leave fishing is largely equal, and actions are only partially answered by their different “capitals”. On top of asset bases, both exits and social outcomes seem to be influenced by a combination of factors beyond individual actions.

B2. Livelihood Contributions to Cross-Sector Analysis of Fisher Behavior

Scholarly attention to “fisher behavior” is not new (e.g., Hilborn 1985; Robinson and Pascoe 1997; Salmi et al. 1998; Salas and Gaertner 2004). While agreement is unanimous on the importance of social dynamics however, quantitative fisheries scientists have thus far focused predominantly on peoples’ harvesting and investment practices as they pertain to catching fish, with named foci including investment, movement, catching power, and discarding (Hilborn 1985). This scholarship is still thin on how processes outside of fishing rather than internal to it affect effort and ultimately harvests.

This dissertation directly translates qualitative livelihoods work to recommend ways to inform quantitative modeling efforts often focused on catch and short-term seasonal behavior, to present an expansion to the literature on fisher behavior to areas outward from the fishing sector and through more rigorous social science methods. Methodologically, this was done in two ways. First, cataloging complete occupational portfolios allowed for a fuller assessment of livelihood strategies and how fishing fit into household activities, as well as quantified individual ties to other sectors via work. Secondly, studying the local perspectives and actions of former and active fishers gives an empirical narrative of the drivers of labor retention and movement out of fishing, not only in the short-term but over ten or more years for some people.

Significant findings (Chapter 3) include altering the assumption of profit motive and income comparisons as a primary proxy for labor mobility in San Cristobal. The long-term considerations of fishing's increasingly restricted and tourism's bright future make fishers now willing to leave the sector with wages comparable to or even less than that found in fishing, as illustrated by all who reduced their fishing from 2009-11 without government intervention. In addition limited non-fishing work opportunities are non-trivial drivers of fishing effort, and therefore can be linked to catch levels. Going by surveyed preferences to fish less, helping all the fishers who would rather fish less find alternate work would partially remove the fishing effort of 31 full-time fishers and 26 part-time fishers (Table 4, Chapter 2). Therefore, continuing alternate livelihood programs are critical accompaniments to strengthening monitoring and enforcement of fishing regulations. Finally the fact that the factors above were not possible to test statistically but in fact highly influential to labor mobility out of fishing is another warning bell against relying solely on quantification in fisher behavior. They show the value of merging analytic approaches such as livelihoods to study resource use from community perspectives.

C. Conservation Governance

The ways that conservation governance intersects with social change in Galápagos fisheries illustrate multiple layers around its influence. On one hand, I argue that broad conservation outcomes are reducing the adaptive capacity of the least educated and poorest fishers in the form of narrowing their options to diversify. On the other, the global prioritization of maintaining the ecosystem integrity of the Galápagos Islands has imparted benefits to residents that increase their economic security, and arguably give the Islands the potential to negotiate an exemplary human-environment balance in fishing.

C1. Structuring Forces: Conservation Governance and Tourism Markets

Galápagos fishers live and work while completely surrounded by a marine reserve and a terrestrial national park. Conservation governance permeates and influences every aspect of their fishing practices, from the species and harvest levels allowed, to more indirect decisions around non-fishing job options. While institutional prioritization of conservation outcomes in a UNESCO World Heritage Site is not out of place or in the least surprising, it should be acknowledged that this prioritization plays just as pivotal a role in prolonging some fisher exits as any profit seeking motive of individual fishers, a common point of focus. The majority of the fishing sector in 2012 can be described as waiting to exit – all that is needed is for opportunities that will allow them to earn comparable wages and match their skillset. The 2008-09 competition for tour operator permits (Chapters 3 and 4) most visibly exemplifies this. Although concern over tourism's unknown environmental capacity is understandable, a way must also be found for fishers to find stable occupations outside the sector.

This project has shown how in both overt and subtle ways conservation governance has

created direct and indirect structural blockages to the ability to transition away from fishing that individuals have overcome in various ways, but nevertheless leave fishers at a financial disadvantage. The need to destroy old fishing vessels, negating their financial value outside of fishing described in Chapters 3 and 4 is perhaps the starkest example. Such rules protect the proliferation of vessels in the GMR, but transfer the financial cost of this protection to certain individuals who are unable to recover or convert the largest sunk cost of fishing into any other type of activity. More subtle elements of this dynamic of prioritizing conservation privilege include the perceived enforcement of fishing rules more than tourism rules, which continues to drive a sense of injustice among fishers and degrade their buy-in to conservation initiatives. These perceptions are not completely unfounded. For instance the caps on fishing vessels also apply to tourism vessels. While the Galápagos tourism fleet remained at 80 vessels from 2000 – 2006, total berths in that time grew from 1733 to 1805 as some ships got bigger. In addition, while tourism “cupos” cannot be legally sold, “it is common knowledge that they are sold and rights to their use transferred” (Epler et al. 2007; 47).

The influence of conservation governance is also felt on the continually evolving labor flows between tourism and fishing, which are historically deep and play a pivotal role in this story. In Chapter 4 I showed the historic precedence of transitioning from fishing to tourism-based livelihoods among San Cristobal fishermen, and how the growing bureaucratization, increasingly competitive tourism market, and capacity ceilings on certain tourism occupations has synergized to constrain the range of adaptive pathways for fishers to move into tourism over time. In the end, this project argues not against prioritizing environmental conservation, but for recognition of the inadvertent effects this prioritization has on people looking to leave fishing.

C2. Environmental Implications & Fishing For “Win-Win” Solutions” in Conservation

Interventions

While this project focuses on human behavior and equity, it is equally driven by the goal of informing environmental conservation within the GMR and marine protected areas in general. The reduction in Galápagos participants and catch over the past ten years might seem to be positive for marine ecosystems; however this assumption should still be investigated. Logical questions around the reduction of Galápagos fisheries include whether current declining trends are permanent, transitional, market-driven, stable, or unstable, given that market conditions may change and the capacity to fish more is still present. In addition Castrejon (2012) notes that Galápagos marine resources are unevenly exploited – even with reductions in active participation, whitefish and high seas tunas may very well be “under-exploited”, while evidence shows that lobster and sea cucumber are likely “over-exploited”, if one’s yardstick is the theoretically maximum harvest amount that balances population replenishment rates.

What I found in the course of this project has both positive and negative implications for marine resources. Positive implications include the fact that the decline in fishing does indeed seem permanent. Part-time and former fishers are virtually unanimous in not wishing to return to full-time fishing (45 of 46 part-time, 49 of 50 occasional/inactive fishers). This preference combined with trends in tightening enforcement of rules around obtaining licenses to fish and maintaining a cap on fishing boats implies that the days of open access fishing are over in the GMR. Without open access, in the event that a lucrative market for an as-yet-untapped marine resource suddenly develops another “gold rush” is highly unlikely.

While some scholars argue that despite tighter controls, a more restricted “race for fish” among registered fishers continues to degrade resources (Castrejon 2012), I argue that

collectively, the desire to leave fishing and demonstrated multi-year efforts to find other jobs make a lack of alternate work the real culprit behind any race for fish – and its best cure.

Negative implications to the manner of unfolding of this decline in fishing were also found, however. As Chapter 5 notes the saturation of tour operator, guide, and sailor labor markets has helped push *pesca vivencial* into existence, showing how the will to diversify out of commercial fishing will spill over into new forms of marine exploitation if other avenues are blocked. Patterns of environmental exploitation and resource use develop alongside certain social structures, and to ensure desired, non-extractive resource use practices, one must also work on amenable ways to direct labor flows.

As described in Section A2 above (“Adaptive pathways, uptake, and indeterminacy”), if the willingness to leave the sector can only be harnessed, then the Galápagos Marine Reserve may very well become a rare example of an environmental intervention “win-win” that has boosted social as well as fish stock protections. This project advances understanding of how the social fallout from decreasing environmental exploitation ultimately affects the strength of environmental protection, a necessary counterweight to work on growing exploitation of fishing in many places (e.g., Pauly et al. 1998; Daskalov 2002; Acheson 2006; Wilson 2006). Evaluating such synergies to be found within PAs is an understudied but increasingly important area.

III. Future Directions

This study has made apparent how social changes among fishers have been just as fast moving as those of the marine stocks that they harvest, although less documented. One obvious research option into the future is to maintain engagement with the fishing community and track occupational diversity and preferences. However, such social monitoring is of little use,

particularly among a population with clear signs of respondent fatigue to surveys, if not accompanied by serious efforts at building alternate livelihood options, particularly in tourism.

While not a full assessment, the careful accounting of household asset bases and activities captured in the 2012 survey has made apparent that policies focused on attending to human needs, in other words strengthening the weak human capital of the fishing sector (i.e., subsidizing IMO certifications, retraining as naturalist guides), have been highly leveraged by fishers to diversify out of the sector, enhancing economic security as well as reducing fishing effort. Policies aimed at restricting access and then raising the efficiency of remaining fishers (i.e., taking away licenses of occasional fishers, processing plants built) a conventional approach to fisheries reform, have had more ambiguous impacts on economic security and reducing fishing effort. Policies continuing to bolster the weak human capital of the sector offer clear advantages into the future.

Room also exists to study how climate change and the increasing frequency of El Nino events might affect fisher livelihoods. Although El Nino years are known to often correspond to poor fishing returns due to rough weather, flooding, and changing spatial distributions of nearshore fish, not one interviewee mentioned El Nino disturbances as influential to their labor decisions. Reasons may be because one bad fishing year might not be sufficient to sway individuals in changing long-term livelihood strategies, or because the last strong El Nino year was at the time 15 years ago in 1997-8. However little is known about these relationships.

I highlight two other fruitful areas that stand out as important themes to look into in the future: equity in conservation outcomes, and the ongoing debate around dealing with overcapacity, or the presence of a number of people in the sector that can harvest more than the resource can support (UCOOPEPGAL 2005; Viteri et al. 2005; Ramirez et al. 2012; 2012

interviews; FAO 2015).

A. Equity: Conservation Within & Beyond Protected Areas

The somewhat uncommon circumstances of the social vulnerability of Galápagos fishers – part of a society buoyed by the capital markets that conservation governance has created on one hand, but (for some) losing adaptive capacity through the slow constriction of adaptive pathways out of fishing, particularly into tourism (Chapter 4) - makes visible a wider global debate on social equity in conservation outcomes beyond the Galápagos.

Vulnerability analyses are based on the premise that “some risks are *unacceptable* and should be avoided at all costs” (Leach et al. 2008:5, italics in original); its minimization is regarded as a social benefit. Is an increase in social vulnerability in one respect due to conservation governance, even if not to engendering any crisis of poverty, food security, or migration, acceptable? While debates over the potential inhibition of poverty alleviation efforts in protected areas (Adams et al. 2004; Sanderson and Redford 2003), displacement of local populations (Agrawal and Redford 2009), and immigration as a threat to environmental protection (Scholte 2003) continue, the question should be broached: does the absence of absolute poverty, increasingly strict controls on immigration (Nuñez 2007), and higher general level of wellbeing within this particular PA (Kerr 2003) sufficiently counterbalance a degrading potential to adapt that some fishers face moving forward?

It could be argued that the GMR and protected areas in general should and could do better in attending to the residents and fishers most vulnerable to being marginalized. Galápagos fishermen (and all residents) continue to push not only for equitable livelihood alternates, but the potential to better their social welfare, and this potential is central to whether people will

continue to willingly reduce their environmental dependence on marine resources. Persha et al. (2010) note, “substantial increases in the existing global extent of protected areas seem unlikely, particularly for stricter categories (IUCN categories I-III), due in part to the vocal reaction against them in many parts of the world” (2918). In many ways the conservation movement stands at a crossroads; the vast success of the push to set aside protected areas has helped strengthen environmental regulations within them. However, many now question the efficacy of protected areas in the face of global challenges that cannot be confined to bounded spaces, such as climate change and the fishing down of the world’s oceans.

Arguably and propitiously, the choices that fishers face in the Galápagos are exceptionally open compared to other areas where there is often little option but to leave stagnating industries or suffer both environmental degradation and worsening incomes (Allison and Ellis 2001; Cinner et al. 2009; Fulanda et al. 2009). The GMR therefore provides an important vantage point from which to debate the ways that conservation policies balance human and ecosystem wellbeing outside of crisis-driven situations, thanks to marine ecosystems’ relative health compared to many other places from what is discernible from sparse data accounts. Grappling seriously with such issues will enhance understanding of developing socially just policy outcomes within and outside of in protected areas globally, ultimately needed to achieve important conservation goals.

B. Dealing with Overcapacity: Rights-Based Approaches and Livelihood Diversity

The need for reform of Galápagos fisheries management is agreed upon by scientists, fishing cooperatives and institutions (e.g., UCOOPEPGAL 2005; Viteri et al. 2005; Ramirez et al. 2012; 2012 interviews). Among the most pressing issues identified is dealing with

overcapacity, or the presence of a number of people in the sector that can harvest more than the resource can support (FAO 2015). Narratives of profit seeking and “tragedy of the commons” have long driven understandings of overcapacity in the GMR, largely set around the sea cucumber “gold rush” in the 1990s that spurred rampant in-migration (Bremner & Perez 2002). However, attributing ongoing degradation to individual profit seeking is overly simplistic, and may be being transferred over to the issue of current overcapacity in ways that should be reexamined.

A rights-based solution is gathering momentum among fisheries scientists and conservation organizations working in the Galápagos who argue that, “an efficient long-term management...requires fishermen to have secure property rights over the resource” (Viteri et al. 2005: 24). The rights-based argument is being advocated by the Worldwide Fund for Nature (WWF), who have laid out a proposal for a pilot implementation in the lobster fishery (Ramirez et al. 2012). However it must be noted that rights-based management could very well change a longstanding characteristic of fishing in the Islands, that of the part-time fisherman. This is because rights-based schemes tend to dis-incentivize part-time activity. Privatization of access rights to fewer people has the effect of promoting greater full-time participation in fishing because it reduces mobility out of the industry if a particular species begins to decline due to the deeper sunk economic costs involved in participation (Mansfield 2004; Reedy-Maschner 2007; Branch 2009). Those who own costly quotas must fish full-time for it to be worth their while. In addition, they necessitate defining a community of fisherman and excluding others, who may formerly have fished inconsistently. They would therefore likely have the effect of reducing the livelihood diversity of participating fishermen, or excluding a portion of the current community of part-time and occasional fishers. As Epler et al. (2007) note for the similar market-based

“cupo” mechanism of capping the number of boat berths allowed in the GMR, one of the biggest social impacts of “gift[ing] a public resource or property rights to a limited number of private enterprises” (46) is that “the system influences the distribution of wealth by limiting who has the option of reaping the economic benefits attributed to having access to the National Park and Marine Reserve” (48).

A more outward and holistic understanding of the dynamics that keep people in fishing reveals alternate ways to reduce overcapacity with softer social impacts. Fishing acts as a safety net in times of job loss for those with PARMAs, and also a pressure valve for labor in the Galápagos when a paucity of other jobs exist, as Chapter 3 showed. Understanding the latent desire to exit that exists, overcapacity could be reduced tomorrow if broader (but stickier) labor issues in San Cristobal were addressed. Regardless of outcomes, I hope that this project brings recognition of these issues to policy makers and scholars working in this unique archipelago.

APPENDIX A: SURVEY FOR ACTIVE FISHERS
ENCUESTA PARA LOS PESCADORES ACTIVOS EN LOS GALÁPAGOS

Fecha

Entrevistador(a)/Asistente

Nombre / HHID

Pueblo

Tiempo de inicio

Tiempo de finalización

I. PERFIL DEL PESCADOR

A. HISTORIA

1. ¿En qué año comenzó a pescar? _____
2. ¿Por cuántos años ha sido un pescador artesanal, y activo? _____ hasta ahora _____
_____ Ocasionalmente o por diversión _____ Pasivo
3. ¿En esta temporada (2011-12), ejerce la actividad a por...
 - a. Tiempo Completo (> 90% del ingreso)
 - b. Medio-tiempo (entre 30-90% del ingreso total)
 - c. Ocasionalmente (< 30% del ingreso)
 - d. Pasivo
 - e. Nunca estuvo activo
4. ¿Por cuántas generaciones, en total, ha pescado su familia? _____
5. ¿Cómo usted obtuvo su primer trabajo **en la pesca?**
a través de amigos cercanos, conocidos, o familiares? S/ N (*indicar cual*)
6. ¿Si pudiera elegir una vez más, todavía elegiría pescar? S / N
(*por los años que era un pescador solamente, no por toda de su vida.*)
6a. ¿Le gustaba ser un pescador, por los años que se pescó?
7. En que sector le gustaría que trabajaran sus hijos? ¿Se la recomendaría la pesca? S / N

II. DEMOGRAFÍA (*Cabeza de hogar/Otro*) _____ Género: _____

8. ¿En qué año nació?
9. ¿Nació aquí en Galápagos?
NO (*y la EDAD cuando llegó, continúe*) SI (**va a #15**)
10. ¿En qué año vino a vivir aquí?
11. ¿De qué provincia vino?
12. ¿A qué se dedicaba antes de venir a Galápagos?
 1. Agricultura
 2. Pesca
 3. Ganadería cría de animales
 4. Comercio
 5. Servicios
 6. Otro, ¿cuál? _____
13. ¿Por qué decidió salir de su lugar de residencia?
(*si más de uno razón, orden*)
 1. Falta de tierra
 2. desempleo
 3. bajos ingresos trabajo
 4. me trajeron (familia/parientes)
 5. problemas familiares
 6. desastres naturales
 7. Otra, ¿cuál? _____

14. ¿Por qué seleccionó Galápagos en lugar de ir a otras provincias?

1. Más fácil conseguir tierra
2. Oportunidades para trabajo
3. Tenía familiares
4. Oportunidades para LA PESCA
5. Otra, ¿cuál? _____

15. ¿Cuál es su estado civil? (**Marque con una X**) *casado* _____ *viudo* _____ *separado* _____
divorciado _____ *en unión libre* _____ *soltero* _____ (# hijos total)

16. ¿Cuántas personas normalmente viven en su casa, incluyendo a usted? _____ personas,
 ___ hijos

17. ¿De las personas que viven con Usted, puede indicar la relación de parentesco, edad y género?

Relación	Edad	Géner	1 año	3 años
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

17a. ¿Por cuánto tiempo en los últimos 3 años cada persona ha vivido en su casa? (**en meses, señale en la tabla de abajo**)

18. Las personas que viven en su casa, ¿dependen económicamente de Usted?

SI / NO / N/a

19. ¿Cuál es el nivel de instrucción educativa que **USTED** tiene aprobado?

- | | | |
|-----------------------|-----------------------|------------------------|
| 1 Ninguno | 4 Secundario | 6 superior o postgrado |
| 2 Primario incompleto | incompleto | |
| 3 Primario completo | 5 Secundario completo | |

20. ... lo mas alto **EN SU CASA**? _____

21. ¿Usted vive en Galápagos todo el tiempo a temporalmente? S / N
 Donde: _____

III. DIVERSIFICACIÓN

22. ¿Es usted miembro de alguna cooperativa de pesca?

22a. ¿Ha tenido un posición en la cooperativa? _____

23. ¿Es usted miembro de algún otro grupo comercial, cooperativas o asociaciones?

24. ¿Alguien en su hogar es miembro de algún grupo comercial, uniones, o cooperativas?

25. ¿A veces, ustedes están voluntarios para organizaciones aquí?

S / N Detalles : _____

A.1.Preferencias de Diversidad (Pollnac et al. 2001)

26. ¿Hoy, le preferiría tener más de un solo empleo EN EL HOGAR?

27. ¿Quiere que continuará en sus actividades de sustento que tiene hoy, por el resto de su vida?

S / N / Otra_____

28. ¿Si hay un tipo de empleo preferido, que es esto? (1^{er}): _____

(Pesca vivencial, operador de tours, turismo en general, transporte (en la isla y en el mar)

28a. ¿Qué necesitaría?

¿Habría algún tipo de problemas?:_____

29. ¿Alguna vez ha aplicado para conseguir uno permiso de turismo?

B. Redes Informales en la ocupación (Lazos Sociales)

→ 30. ¿Quién más pesca en su hogar?

31. ¿Por todos los años, tiene actividades afuera de la pesca entre de las temporadas de pesca? S / N

32. ¿En el último año (2011), que otra actividad ha trabajado usted, y su hogar, distinto de la pesca?

	Quien
a. sector público (asalariado)	
b. sector turístico (asalariado o no)	
c. comercio-servicios	
d. taxista - transporte	
e. comerciante compra - venta productos	
f. Otros negocios de familia	
g. Otro (trabajos ocasionales etc.)	

33. ¿Hay **otros actividades**, negocios o trabajos en los años recientes (y desde 2009)?

¿Cómo usted obtuvo esos trabajos/actividades?

...a través de amigos cercanos, conocidos, o familiares?

S / N / N/A (indicate which)

34. ¿Tuvo una entrevista de trabajo para cada uno de ellos?

Empleo	Sí/No

35.Entonces, el número/la diversidad de sus trabajos desde el 2009:

a. Igual #, los mismos empleos:

b. Igual #, diferentes empleos:

c. Ha aumentado #:

d. Ha disminuido #

36. ¿Qué tal este AÑO? **2012**

37. ¿Hay MIEMBROS DE su FAMILIA tenían un empleo diferente de la pesca? *(escribir las detalles)*

→ 38. *(medio-tiempo)* Antes de que usted inicie actividades de trabajo fuera de la pesca, cuántos miembros de su familia tenían un empleo afuera de la pesca?

39. ¿Tiene ud. alguna familia en política o gobierno? Si / No *Detalles*_____

IV. PATRONES DE PESCA

39. ¿Qué tipo de pesquería realiza Usted?	1 pepino de mar 2 langosta 3 pesca blanca 4 atún
40. (N° total de pesquerías participantes en)	No:
41. ¿Qué tipo de ocupación desempeña en la pesca?	1 armador (owner) 2 Capitán 3 Panguero 4 Pescador 5 Buzo 6 Cocinero

42. ¿De qué manera le pagan? ¿Qué porción de la pesca usted recibe?

43. En el ultimo año (2011) cual ha sido su actividad en la pesca artesanal? ...vivencial? ...por diversion?

ESPECIES	¿Cuál es el arte de pesca que utiliza? 1 empate (draw) 2 chinchorro o red de cerco (seine or circle net) 3 red de enmalle o transmalle (gillnet or trammel) 4 gancho (hook) 5 a mano (Hand) 6 línea con anzuelo (bait hook) 7 señuelo (line, lure) 8 hooka o compresor de aire	¿Cuántas MESES al año realiza esta pesquería? (Durante de 2011-12)	¿Cuántas (libras) saca en promedio a la MES durante la temporada? (Durante de 2011-12)	¿Como ha cambiado desde 2009? (viajes, cantidades, especies) subía, bajaba, igual, inactividad

52. ¿Qué influencia de *cuánto se coge pesca*? En otras palabras, si usted tendría que jerarquizar los siguientes factores en orden de su influencia, ¿cuál sería el orden? **(1 es el más importante)**

Ítem	Grado
Precio en el Mercado	
Promesa de compra de comida marina	
Calidad/Temperatura del Agua	
Abundancia en la pesca durante un viaje	
Ingresos de otros miembros de la familia	
Deseo de comer comida marina en casa/ para la familia/amigos	
Oferta para pescar con otros	
Otras oportunidades de trabajo (por ejemplo, ofrecimiento de más horas de trabajo)	
Otra:	

➔ 53. (PASIVOS) Si usted no pescó regularmente en el último año, diga, ¿por qué no?

Razón	Rango
Enfermedad/Lesión	
Necesita dinero para el bote/reparaciones de la maquinaria	
Encontró otro trabajo	
Está recibiendo entrenamiento en algo distinto	
No es rentable (por los precios del mercado o las ventas)	
La pesca no es la ocupación principal	
Otra:	

V. INGRESOS/BIENES

54. Considerando sus ingresos, diría su nivel de vida es

- Bien
- Más o menos bien
- Mal

55. Las cosas que usted puede hacer o comprar con dinero – por ejemplo vivienda, muebles, comida, carros, vacaciones – son parte esencial de nuestro estándar de vida material. Si usted piensa en su estándar de vida en la actualidad, considera que es más alto, más bajo, o aproximadamente el mismo que el de **3 años atrás**?

56. ¿Cuánto ingreso tuvo con cada empleo y en todo el transcurso del año (2011)?

	Temporada (o anualmente)	Horas/semanas	Horas/semanas	Ingresos (unidades)
1				
2				
3				

57. Y si tuviera que estimar, ¿Cómo cree compara este año?

58. Usted diría que su INGRESO TOTAL DE LA PESCA en el temporada 2011-12 fue de:

¿Más de \$2,000/por año? S / N

¿Más de \$5,500/por año? S / N

¿Más de \$7,000/por año? S / N

¿Más de \$9,000/por año? S / N

¿Más de \$12,500/por año? S / N

¿Más de \$16,000/por año? S / N

59. ¿Es aquello representativo de su ingreso de la pesca, en general? S / N

Si No, ¿por qué? : _____ (incluya si es mayor/menor)

Solo por la pesca vivencial:

➔ 60. Usted diría que su INGRESO TOTAL DE LA PESCA VIVENCIAL en año 2011 fue de:

¿Más de \$2,000/por año? S / N

¿Más de \$4,000/por año? S / N

¿Más de \$6,000/por año? S / N

¿Más de \$7,000/por año? S / N

¿Más de \$10,000/por año? S / N

61. ¿Es aquello representativo de su ingreso de la pesca vivencial, en general? S / N

Si N, ¿por qué? : _____ (incluya si es mayor/menor)

62. Si tuviera que estimar, ¿Cómo cree compara este año? (bracket)

63. Usted diría que el INGRESO TOTAL EN SU HOGAR en el 2011 fue de: (asumiendo que la pesca = 60% del total)

¿Más de \$3,000/por año? S / N

¿Más de \$6,500/por año? S / N

¿Más de \$10,000/por año? S / N

¿Más de \$13,500/por año? S / N

¿Más de \$17,000/por año? S / N

¿Más de \$20,500/por año? S / N

64. ¿Es aquello representativo del ingreso de su hogar, en general? S / N

Si N, ¿por qué? : _____ (incluya si es mayor/menor)

65. Si tuviera que estimar, ¿Cómo cree compara este año? (bracket)

66. ¿Usted diría que de acuerdo con el **INGRESO DE LA PESCA**, usted (SOLAMENTE USTED) está mejor, o peor, o más o menos igual que HACE TRES AÑOS ATRÁS? (2008-9)

67. ¿Usted dirías que de acuerdo al **INGRESO TOTAL**, usted (SU HOGAR) está mejor, peor, o más o menos lo mismo que HACE TRES AÑOS ATRÁS? (2009)

68. ¿Alguna persona que NO vive con usted, contribuye regularmente con dinero en su hogar durante en el 2011? (*remesas, pensiones*)

S/N	Persona	Cantidad

Entonces, en acuerdo de las preguntas antes, la actividad más importante económicamente para su hogar es... (recap of order)

Ocupación	Clasificación

B. Limitaciones en los Créditos: *Con esta investigación queremos conocer, si hay limitaciones en los créditos para la gente.*

69. ¿Alguna vez usted ha prestado dinero o ha aplicado por un préstamo para desempeñar una actividad laboral, sea para la pesca o de otro tipo?

... fue a través de (a) familia o amigo(a)s, o (b) del banco u otra institución financiera.

70. ¿Tiene deudas? S / N / Poco tipo: _____
las más comunes: hogares, carros, negocios, motores

71. Si Ud. estuviera en una situación donde tendría que conseguir \$1000 en una semana, ¿podría solucionarlo? ¿Cómo lo solucionará?

- ahorros propios
- Préstamo a familiares
- préstamo a amigos
- préstamo al banco
- ir a pescar
- otro

72. ¿Usted posee un barco?

1 lancha

2 fibra

3 panga

73. ¿Si usted compara su salud con la de otros de su misma edad, cree que su salud es, mejor, peor, igual? **(Encierre una)**

74. ¿Tiene alguna enfermedad crónica o inhabilidad? _____

75. ¿Cuál es su tenencia de su casa? En arriendo

1. Propia
2. Cedida
3. Recibida por servicios

76. ¿Tiene o tenía hijos, o miembros de su hogar que estudian afuera, o en otra lugar?
 S / N / N/a

VI. Elecciones (e Historia)

77. Cuando piensa en el futuro, ¿qué es lo que mejor describe su percepción de la pesca vivencial?

[muy positiva, positiva, pesimista, muy pesimista]

78. ¿Podría decirme si usted tiene fuertes relaciones de amistad con [todos, la mayoría, algunos, casi ninguno, ninguno] de sus compañero(a)s de la pesca vivencial?

79. ¿Cree Usted que durante el tiempo que llevó pescando, la pesca hubo disminuido?

S / N

79a. ¿Por qué? (Si la respuesta es Sí)

80. ...hay animales o peces que han crecido? _____

81. Podría usted decirme, “Yo tengo [bastante, algo, mucha, no mucha, ninguna] confianza en el Parque Nacional de los Galápagos”

82. Qué tanto usted estaría de acuerdo con la siguiente afirmación: “Los pescadores pueden poner en prácticas nuestras ideas, en la Junta de Manejo Participativo”

(encierre uno) [muy fuertemente, fuertemente, indiferente, está en desacuerdo, está en fuerte desacuerdo]

83. ¿Ud. cree que es necesario para limitar/reducir el esfuerzo en la pesca? ¿Con qué método usted está más de acuerdo?

___ El acceso no debería ser limitado

___ Temporadas de veda

___ Licencia de entrada limitada (*similar al actual*)

___ Cuotas individuales de pesca (*permisos negociables*)

___ Recompras (*el GNP compra los PARMAs*)

___ Otro

84. ¿Cuáles son las políticas que han tenido mayor impacto en sus capacidades para que cambien sus actividades de vida?

- *que han ayudado o no han ayudado*

¿Cuántas veces ha sido entrevistado antes?

¡Muchas gracias por la entrevista!

APPENDIX B: SURVEY FOR INACTIVE FISHERS
ENCUESTA PARA LOS EX - PESCADORES EN LOS GALÁPAGOS

Fecha

Entrevistador(a)/Asistente

Nombre / HHID

Información de Contacto

Pueblo

Tiempo de inicio

Tiempo de finalización

I. PERFIL DEL PESCADOR

1. ¿En qué año comenzó a pescar? _____
2. ¿En qué año SE REGISTRÓ como pescador? _____
3. ¿Durante cuántos años ha sido un pescador artesanal, solamente? ____ hasta ahora

____ Ocasionalmente o por deportes ____ Pasivo ____ Nunca fue activo
4. ¿Por cuántas generaciones, en total, había pescado su familia? _____
5. ¿Usted se consideraría un “pescador de los Galápagos”? S /
N
6. ¿Cómo usted obtuvo su primer trabajo **en la pesca?**
a través de amigos cercanos, conocidos, o familiares? S/ N (*indicar cual*)
- 7. ¿Quién más pesca en su hogar?
8. ¿Si pudiera elegir una vez más, todavía elegiría pescar? S / N
(*por los años que era un pescador solamente, no por toda de su vida.*)
9. ¿Le gustaba ser un pescador, por los años que se pescó?
10. En que sector le gustaría que trabajaran sus hijos? ¿Se la recomendaría la pesca?
S / N

II. DEMOGRAFÍA (*Cabeza de hogar/Otro*) _____ Género: ____

11. ¿En qué año nació?
12. ¿Nació aquí en Galápagos?
NO (*escribe la EDAD cuando llegó, continúe*) SI (**va a #17**)
13. ¿En qué año vino a vivir aquí?
14. ¿De qué provincia vino?
15. ¿A qué se dedicaba antes de venir a Galápagos?
 1. Agricultura
 2. Pesca
 3. Ganadería cría de animales
 4. Comercio
 5. Servicios
 6. Otro, ¿cuál? _____
16. ¿Por qué decidió salir de su lugar de residencia?
(*si más de uno razón, orden*)
 1. Falta de tierra
 2. desempleo
 3. bajos ingresos trabajo
 4. me trajeron (familia/parientes)
 5. problemas familiares
 6. desastres naturales
 7. Otra, ¿cuál? _____

17. ¿Por qué seleccionó Galápagos en lugar de ir a otras provincias?

1. Más fácil conseguir tierra
2. Oportunidades para trabajo
3. Tenía familiares
4. Oportunidades para LA PESCA
5. Otra, ¿cuál? _____

18. ¿Cuál es su estado civil? (**Marque con una X**) casado _____ viudo _____ separado _____ divorciado _____ en unión libre _____ soltero _____ (___ # hijos total)

19. ¿Cuántas personas normalmente viven en su casa, incluyendo a usted? ___ personas, ___ hijos

20. ¿De las personas que viven con Usted, puede indicar la relación de parentesco, edad y género?

Relación	Edad	Géner	1 año	3 años
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

20a. ¿Por cuánto tiempo en los últimos 3 años cada persona ha vivido en su casa? (**en meses, señale en la tabla de abajo**)

21. Las personas que viven en su casa, ¿dependen económicamente de Usted? SI / NO / N/a

22. ¿Cuál es el nivel de instrucción educativa que **USTED** tiene aprobado?

- | | | |
|-----------------------|-----------------------|------------------------|
| 1 Ninguno | 4 Secundario | 6 superior o postgrado |
| 2 Primario incompleto | incompleto | |
| 3 Primario completo | 5 Secundario completo | |

23. ... lo mas alto **EN SU CASA?** _____

24. ¿Usted vive en Galápagos todo el tiempo a temporalmente? S / N
Donde: _____

III. DIVERSIFICACIÓN

A. Actividades diversas

25. ¿Es usted miembro de alguna cooperativa de pesca? S / N

Si No, Fecha de finalización de la membrecía: _____

¿Ha tenido un posición en la cooperativa? ____

26. ¿Alguien en su hogar es miembro de alguna cooperativa de pesca? S/ N
27. ¿Es usted, o alguien en su casa, miembro de algún otro grupo, cooperativas, o asociaciones?
28. ¿A veces usted, o alguien en su hogar, están voluntarios para organizaciones aquí?
S / N detalles: _____
29. ¿Cuál es su ocupación principal? _____
30. ¿Hoy, le preferiría tener más de un solo empleo EN EL HOGAR?
31. ¿Quiere que continuará en sus actividades de sustento que tiene hoy, por el resto de su vida? ¿hasta su jubilación?
S / N / Otra actividad preferido _____

B. Redes Informales en la ocupación (Lazos Sociales)

32. ¿En el último año (2011), que otra actividad ha trabajado usted, y su hogar, distinto de la pesca?

	Quien
h. sector público (asalariado)	
i. sector turístico (asalariado o no)	
j. comercio-servicios	
k. taxista - transporte	
l. comerciante compra - venta productos	
m. Otros negocios de familia	
n. Otro (trabajos ocasionales etc.)	

- ➔ 33. ¿Hay **otros actividades**, negocios, o trabajos en los años recientes (y desde 2009)?
- ¿Cómo usted obtuvo esos trabajos/actividades?
- ...a través de amigos cercanos, conocidos, o familiares?
- S / N / N/A (*indicate which*)

34. ¿Tuvo una entrevista de trabajo para cada uno de ellos?

Empleo	Sí/No

35. *Entonces, el número/la diversidad de sus trabajos desde el 2009:*

- e. Igual #, los mismos empleos:
- f. Igual #, diferentes empleos:
- g. Ha aumentado #:
- h. Ha disminuido #:

36. ¿Qué tal este AÑO? **2012**
- permiso de turismo?

37. Alguna vez ha aplicado para conseguir uno

38. ¿Tiene ud. alguna familia en política o gobierno? Si / No *Detalles*_____

39. ¿Cuántos MIEMBROS DE su FAMILIA tenían un empleo diferente de la pesca, antes de que usted inicie actividades de trabajo fuera de la pesca? (*escribe detalles y trabajos*)

IV. PATRONES DE PESCA

<u>A. Actividad/Ingreso</u>	Antes	2011
40. ¿Qué tipo de pesquería realizaba Usted?	1 pepino de mar 2 langosta 3 pesca blanca 4 otra, ¿cuál?	
40a. (N° total de pesquerías participantes en)	No:	
41. ¿Qué tipo de ocupación desempeñaba en la pesca?	1 armador (owner) 2 Capitán 3 Panguero 4 Pescador 5 Buzo 6 Cocinero	

42. ¿De qué manera le pagan?

Tiempo exacto cuando dejó de pescar, si lo recuerda: _____

43. En el último año (2011), cual ha sido su actividad en la pesca por diversión? La pesca artesanal?

ESPECIES	¿Cuál es el arte de pesca que utiliza? 1 empate (draw) 2 chinchorro o red de cerco (seine or circle net) 3 red de enmalle o transmallo (gillnet or trammel) 4 gancho (hook) 5 a mano (Hand) 6 línea con anzuelo (bait hook) 7 señuelo (line, lure) 8 hooka o compresor de aire	¿Cuántas MESES al año realiza esta pesquería? (Durante de 2011-12)	¿Cuántas (libras) saca en promedio a la MES durante la temporada? (Durante de 2011-12)	¿Como ha cambiado desde 2009? (viajes, cantidades, especies) subía, bajaba, igual, inactividad

C. Comida de mar/ Consumismo

44. ¿Tenía contactos para vender pescado con negocios del turismo directamente ?	
45. ¿Tenía miembros de su familia en ese negocio?(o amigos o conocidos)	
46. ¿ Tenía contactos para vender pescado con negocios más local directamente ? (tambien vecinos, familia)	
Contactos de mariscos: Locales_____ Exportares_____ Turismo_____ #____	

E. Preferencias

47. ¿Hipotéticamente, si las oportunidades será mejorar en la pesca, preferiría a pescar, o ya no volver?

➔ 48. Si hubiera una nueva pesquería (o más grande) de atún en el RMG, y tenía el capital inicial, ¿estaría interesado en participar? Y / N

V. INGRESOS/BIENES Con esta investigación queremos entender, y comparar el bienestar de la gente con actividades diferentes.

49. Considerando sus ingresos, diría su nivel de vida es

d. Bien

e. Más o menos bien

f. Mal

50. Las cosas que usted puede hacer o comprar con dinero – por ejemplo vivienda, muebles, comida, carros, vacaciones – son parte esencial de nuestro estándar de vida material. Si usted piensa en su estándar de vida en la actualidad, considera que es más alto, más bajo, o aproximadamente el mismo que el de **3 años atrás**?

A. Actividades – Diversidad Ocupacional, importancia relativa, cambios recientes

51.¿Cuánto ingreso tuvo con cada empleo y en todo el transcurso del año (2011)?

	Temporada (o anualmente)	Horas/semanas	Horas/semanas	Ingresos (unidades)
1				
2				
3				

52. Y si tuviera que estimar, ¿Cómo cree compara este año?

53. Usted diría que el INGRESO TOTAL EN SU HOGAR en el 2011 fue de:

¿Más de \$3,500/por año? S / N

¿Más de \$6,500/por año? S / N

¿Más de \$10,000/por año? S / N

¿Más de \$11,500/por año? S / N

¿Más de \$17,000/por año? S / N

54. ¿Es aquello representativo del ingreso de su hogar, en general? S / N

Si N, ¿por qué? : _____ (incluya si es mayor/menor)

55. Si tuviera que estimar, ¿Cómo cree compara este año? (bracket)

56. ¿Usted diría que comparado con **LA PESCA** (durante su ultimo año que pescó solamente), su ingreso (SOLAMENTE USTED) es mejor, o peor, o más o menos igual ahora?

57. ¿Usted dirías que de acuerdo al **INGRESO TOTAL**, usted (SU HOGAR) está mejor, peor, o más o menos lo mismo que HACE TRES AÑOS ATRÁS?(2009)

58. ¿Alguna persona que NO vive con usted, contribuye regularmente con dinero en su hogar durante en el 2011? (**remesas, pensiones**)

S/N	Persona	Cantidad

Entonces, en acuerdo de las preguntas antes, la actividad más importante económicamente para su hogar es... (recap of order)

Ocupación	Clasificación

B. Limitaciones en los Créditos: Con esta investigacion queremos conocer, si hay limitaciones en los creditos para la gente.

59. ¿Alguna vez usted ha prestado dinero o ha aplicado por un préstamo para desempeñar una actividad laboral, sea para la pesca o de otro tipo?

... fue a través de (a) familia o amigo(a)s, o (b) del banco u otra institución financiera.

60. ¿Tiene deudas? (*de las más comunes: hogares, carros, negocios, motores*)

S / N / Poco tipo_____

61. Si Ud. estuviera en una situación donde tendría que conseguir \$1000 en una semana, ¿podría solucionarlo? ¿Cómo lo solucionará?

- | | |
|-------------------------|---------------------|
| - ahorros propios | - préstamo al banco |
| - Préstamo a familiares | - ir a pescar |
| - préstamo a amigos | - otro |

62. ¿Usted posee un barco?

1 lancha 2 fibra 3 panga

63. ¿Si usted compara su salud con la de otros de su misma edad, cree que su salud es, mejor, peor, igual?(**Encierre una**)

64. ¿Tiene alguna enfermedad crónica o inhabilidad?_____

65. ¿Cuál es su tenencia de su casa?

- | | |
|----------------|---------------------------|
| 1. En arriendo | 4. Recibida por servicios |
| 2. Propia | |
| 3. Cedida | |

66. ¿Tiene o tenía hijos, o miembros de su hogar que estudian afuera, o en otra lugar?
S / N / N/a

VI. Preguntas sobre Políticas Específicas

67. ¿Cree Usted que durante el tiempo que llevó pescando, la pesca hubo disminuido?
S / N

67a. ¿Por qué? (Si la respuesta es Sí)

68. ...hay animales o peces que han crecido? _____

69. Podría usted decirme, “Yo tengo [bastante, algo, mucha, no mucha, ninguna] confianza en el Parque Nacional de los Galápagos”

70. Qué tanto usted estaría de acuerdo con la siguiente afirmación: “Los pescadores pueden poner en prácticas sus ideas, en al Junta de Manejo Participativo”

(encierre uno) [muy fuertemente, fuertemente, indiferente, está en desacuerdo, está en fuerte desacuerdo]

71. ¿Cree que es necesario para limitar/reducir el esfuerzo en la pesca? ¿Con qué método usted está más de acuerdo para limitar/reducir el esfuerzo en la pesca?

___ El acceso no debería ser limitado

___ Temporadas de veda

___ Licencia de entrada limitada (*similar al actual*)

___ Cuotas individuales de pesca (*permisos negociable*)

___ Recompras (*el GNP compra a los Pescadores fuera de la pescadería*)

___ Otros

72 ¿Cuáles son los políticas que han tenido mayor impacto en sus capacidades para que cambien sus actividades de vida?

- *que han ayudado o no han ayudado*

¿Cuántas veces ha sido entrevistado antes?

APPENDIX C: DESCRIPTIVE STATISTICS OF OCCUPATIONAL DIVERSITY

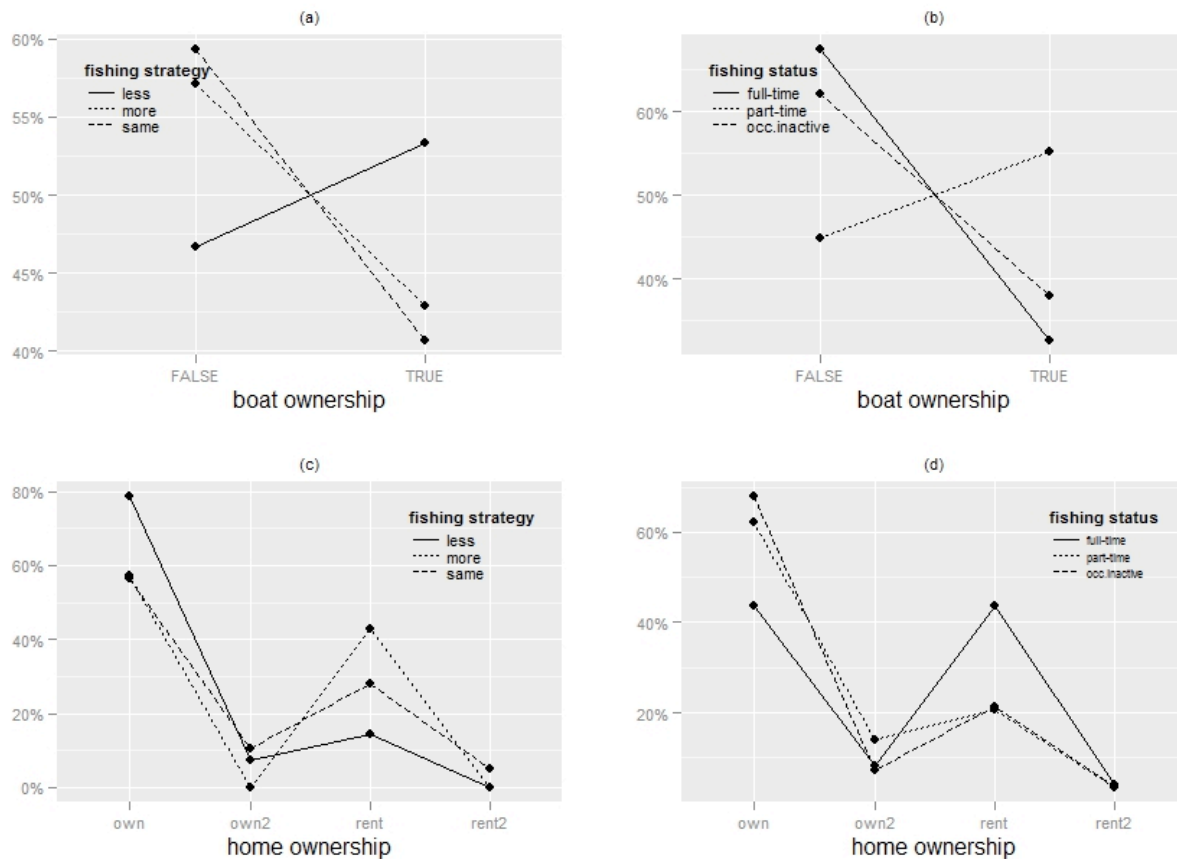


Figure C1. Boat ownership and home ownership among individuals who have diminished, intensified, and maintained fishing engagement in the short-term (a and c), and among individuals based on their fishing status in the 2011-12 season. Part-time fishers are majority boat owners, as are diminishers. Rates of home ownership are similar among groups.

Table C1. Survey respondents' preference for ways to earn greater incomes. The survey question was, "Which would you prefer, to sell more fish or have part-time work that would not be in the fishery, with an equivalent income?"

	do both	either	other part-time work	sell more fish
<i>Fishing Strategy</i>				
Intensify~	1 (14%)	0	3 (43%)	2 (29%)
Diminish`	1 (7%)	0	4 (27%)	2 (13%)
Same	1 (0.6%)	2 (1%)	58 (40%)	33 (23%)
<i>Fishing status*</i>				
full-time	0	1 (2%)	26 (53%)	21 (43%)
part-time	3 (5%)	1 (2%)	32 (55%)	15 (26%)

~6 out of 7 people who intensified their fishing were asked this question

`7 out of 15 people who diminished their fishing were asked this question

*inactive fishers were not asked this question

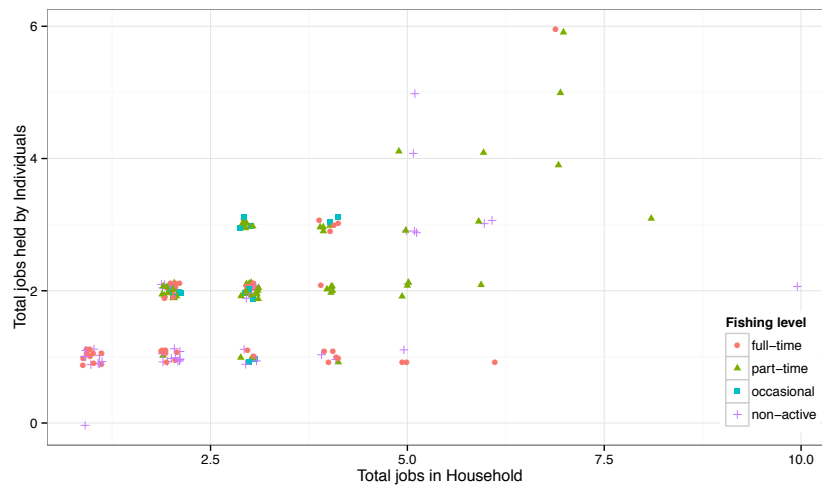


Figure C2. Total jobs in survey households and total held by surveyed fishers in that household. All data points are whole numbers, and presented slightly jittered to show overlapping data.

Table C2. Demographic statistics according to fishing strategy and status.

	Fishing Strategy (2009-11)			Fishing Status			Overall	
	Intensify	Diminish	Maintain	Full-time	Part-time	Occasional /Inactive		
<i>Year Born</i>								
min	1956	1940	1941	1943	1940	1941	1940	
median	1968	1961	1968	1969	1968.5	1964	1967	
max	1983	1994	1993	1984	1994	1993	1994	
<i>Years Actively Fishing</i>								
min	11	6	0	11	2	0	0	
median	16	30	19	23	22.5	14	20	
max	44	53	56	56	53	50	56	
<i># of children</i>								
min	0	0	0	0	0	0	0	
median	3	3	2	2	2	2	2	
max	4	5	8	7	6	8	8	
<i># in Household</i>								
min	1	1	1	1	1	1	1	
median	5	4	4	4	4	4	4	
max	7	7	11	11	9	10	11	
<i>Civil Status</i>								
single	1	1	23	9	9	6	25	
married	5	10	87	32	28	41	102	
free union	0	1	9	2	6	2	10	
divorced*	1	3	26	6	15	9	30	

*includes individuals who are separated

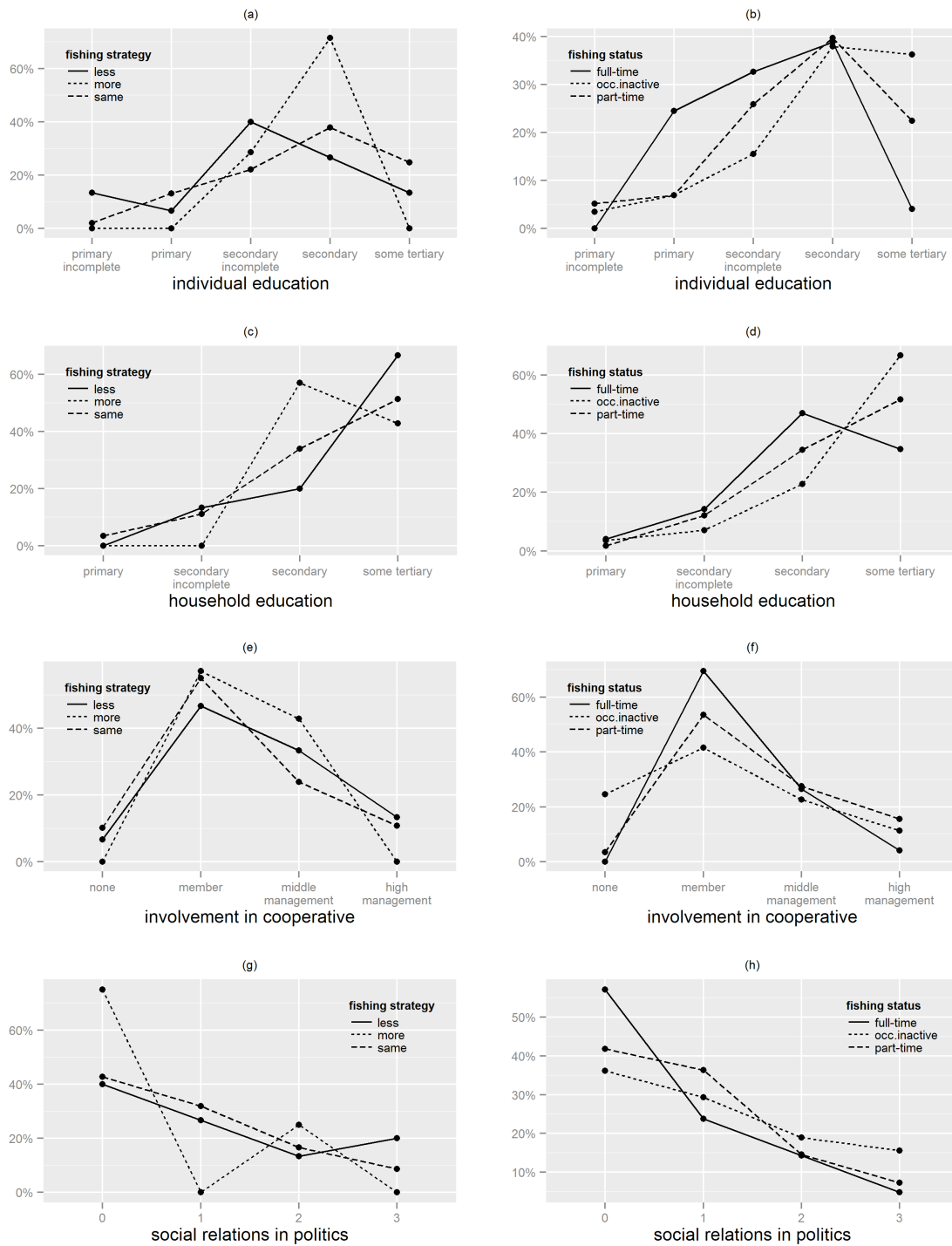


Figure C3. Metrics of human and social capital, against fishing strategy (left column) and fishing status (right column).

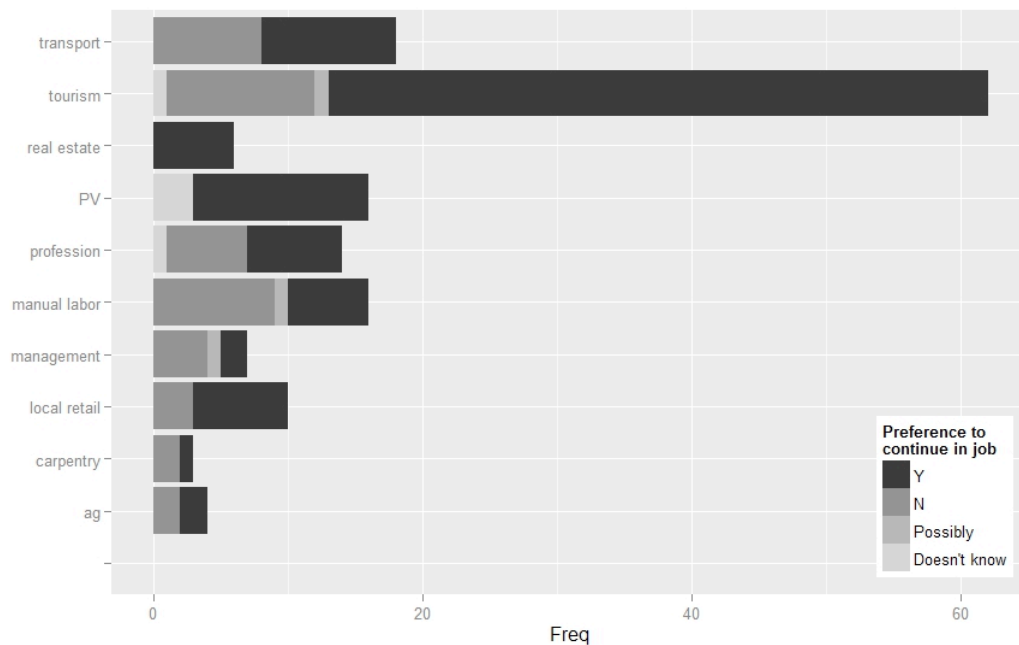


Figure C4. Individual preference to continue in current work activities across sectors of employment. This graphic helps place job satisfaction in broader context, as it shows that a non-trivial portion of survey respondents working in many sectors would rather do other things. Thus seeking to switch jobs may not be uncommon in the Galápagos in general.

REFERENCES

- Acheson, J. M. 2006. Institutional failure in resource management. *Annual Review of Anthropology*, 35:117-134.
- Adams, W. M., Aveling, R., Brockington, D., Dickson, B., Elliott, J., Hutton, J., ... and Wolmer, W. 2004. Biodiversity conservation and the eradication of poverty. *Science*, 306(5699):1146-1149.
- Adams, R. H., and He, J. J. 1995. *Sources of income inequality and poverty in rural Pakistan* (Vol. 102). International Food Policy Research Institute.
- Adams, W. M., and Mortimore, M. J. 1997. Agricultural intensification and flexibility in the Nigerian Sahel. *Geographical Journal*, 150-160.
- Adger, W. N. 2006. Vulnerability. *Global environmental change*, 16(3):268-281.
- Agrawal, A., and Redford, K. 2009. Conservation and displacement: An overview. *Conservation and Society*, 7(1):1.
- Allen, P.M., and McGlade, J.M. 1987. Modelling complex human systems: A fisheries example. *European Journal of Operational Research*, 30(2):147-167.
- Allison, E. H., and Ellis, F. 2001. The livelihoods approach and management of small-scale fisheries. *Marine Policy*, 25(5):377-388.
- Allison, E. H., Ellis, F., Mathieu, L., Musa, A., Mvula, P. M., and Tinch, R. 2002. *Sustainable Livelihood Strategies from Fluctuating Fishery Resources in Malawi and Indonesia*. Final Technical Report. DFID Fisheries Management Science Programme (R7336).
- Allison, E. H., and Horemans, B. 2006. Putting the principles of the sustainable livelihoods approach into fisheries development policy and practice. *Marine Policy*, 30(6):757-766.
- Angelsen, A., Larsen, H. O., Lund, J. F., Smith-Hall, C., and Wunder, S. (Eds.) 2011. *Measuring livelihoods and environmental dependence: Methods for research and fieldwork*. London: Earthscan.
- Antler, E., and Faris, J. 1979. Adaptation to changes in technology and government policy: A Newfoundland example. In *North Atlantic Maritime Cultures*, ed. R. Anderson, 129-154. Bristol: Mouton Publishers.
- Baine, M., M. Howard, S. Kerr, G. Edgar, and V. Toral. 2007. Coastal and marine resource management in the Galápagos Islands and the Archipelago of San Andres: Issues, problems and opportunities. *Ocean & Coastal Management*, 50(3-4):148-173.

- Banks, S. 2002. Ambiente Físico. In *Reserva Marina de Galápagos, Línea Base de la Biodiversidad*, ed. Danulat E. and G. Edgar, 22-37. Santa Cruz, Galápagos: Fundación Charles Darwin y Servicio Parque Nacional Galápagos.
- Barnes, T. 2009. "Not only ...but also": Quantitative and Critical Geography. *The Professional Geographer*, 61(3):292-300.
- Bassett, T. J., and Fogelman, C. 2013. Déjà vu or something new? The adaptation concept in the climate change literature. *Geoforum*, 48:42-53.
- Batterbury, S. 2001. Landscapes of Diversity: A Local Political Ecology of Livelihood Diversification in South-Western Niger. *Cultural Geographies*, 8(4):437-464
- Bebbington, A. 1999. Capitals and capabilities: A framework for analyzing peasant viability, rural livelihoods and poverty. *World Development* 27(12):2021-2044.
- . 2000. Reencountering development: Livelihood transitions and place transformations in the Andes. *Annals of the Association of American Geographers*, 90(3):495-520.
- Becker, H., and Geer, B. 1957. Participant observation and interviewing: A comparison. *Human Organization*, 16(3):28-32.
- Ben-Yami, M. 2001. *Managing artisanal fisheries of Galápagos. A Consultancy Report—07-01-2001—03-02-2001*. Santa Cruz, Galápagos: Charles Darwin Research Station.
- Béné, C., Neiland, A., Jolley, T., Ovie, S., Sule, O., Ladu, B., ... and Quensiére, J. 2003. Inland fisheries, poverty, and rural livelihoods in the Lake Chad Basin. *Journal of Asian and African Studies*, 38(1):17-51.
- Berkes, F. 2006. From community-based resource management to complex systems: the scale issue and marine commons. *Ecology and Society*, 11(1):45.
- Bernard, H.R. 2002. Participant Observation. In *Research Methods in Anthropology: Quantitative and Qualitative Methods*, ed. H. R. Bernard, 323-364, third ed. Walnut Creek: Altamira Press.
- Branch, T. A. 2009. How do individual transferable quotas affect marine ecosystems? *Fish and Fisheries*, 10(1):39-57.
- Brechin, S. R., Wilshusen, P. R., Fortwangler, C. L., and West, P. C. 2002. Beyond the square wheel: toward a more comprehensive understanding of biodiversity conservation as social and political process. *Society & Natural Resources*, 15(1):41-64.
- Breman, J. 1976a. A Dualistic Labour System? A Critique of the 'Informal Sector' Concept: I: The Informal Sector. *Economic and Political Weekly*, 11(48):1870-1876.
- . 1976b. A Dualistic Labour System? A Critique of the 'Informal Sector' Concept: II: A Fragmented Labour Market. *Economic and Political Weekly*, 11(49):1905-1908.

- Bremner, J., and Perez, J. 2002. A case study of human migration and the sea cucumber crisis in the Galápagos islands. *AMBIO: A Journal of the Human Environment* 31(4):306-310.
- Bucaram, S. J. and Hearn, A. 2013. Factors that influence the entry-exit decision and intensity of participation of fishing fleet for the Galápagos lobster fishery. *Marine Policy*, 43:80-88.
- Burbano, D., Mena, C.F., Guarderas, P., Vinueza, L. and Reck, G. 2014. Shifting Baselines in the Galápagos White Fin Fishery, Using Fisher's Anecdotes to Reassess Fisheries Management: The Case of the Galápagos Grouper. In *The Galápagos Marine Reserve: A Dynamic Social-Ecological System*, ed. J. Denkinger and L. Vinueza, 227-246. New York: Springer Science & Business Media.
- Bustamante, R. H., Reck, G. K., Ruttenberg, B. I., and Polovina, J. 2000. The Galápagos spiny lobster fishery. In *Spiny Lobsters: Fisheries and Culture*, ed. B. F. Phillips and J. Kittaka, second ed. Oxford and Malden, MA: Fishing News Books.
- Camargo, A. 2014. The Crisis of Small-Scale Fishing in Latin America. *NACLA*, 8 August 2014. Retrieved from <https://nacla.org/news/2014/8/8/crisis-small-scale-fishing-latin-america>
- Carney, J. 2004. Gender conflict in Gambian wetlands. In *Liberation Ecologies: Environment, Development, Social Movements*, eds. R. Peet and M. Watts, 316-335. London: Routledge.
- Carr, M. H., Neigel, J. E., Estes, J. A., Andelman, S., Warner, R. R., and Largier, J. L. 2003. Comparing marine and terrestrial ecosystems: implications for the design of coastal marine reserves. *Ecological Applications*, 13(sp1):90-107.
- Carswell, G. 2002. Livelihood diversification: increasing in importance or increasingly recognized? Evidence from southern Ethiopia. *Journal of International Development*, 14(6):789-804.
- Castrejón, M. 2011. *Co-manejo pesquero en la Reserva Marina de Galápagos: Tendencias, retos y perspectivas de cambio*, first ed. Kanankil, Plaza-Valdés, Mexico: Fundación Charles Darwin.
- . 2012. Derechos de pesca alternativos para el manejo de las pesquerías de invertebrados bentónicos de la Reserva Marina de Galápagos. In *Mejorando la pesquería de langosta espinosa en la Reserva Marina de Galápagos*. Eds. J. Ramirez, M. Castrejon, and M.V. Toral Granda, 233-264. Galápagos, Ecuador: WWF
- Castrejón, M., and Charles, A. 2013. Improving fisheries co-management through ecosystem-based spatial management: the Galápagos Marine Reserve. *Marine Policy*, 38:235-245
- Chambers, R., and Conway, G. 1992. *Sustainable rural livelihoods: practical concepts for the 21st century*. IDS Discussion Paper, No. 296. Brighton: Institute for Development Studies.
- Charles, A. and Wilson, L. 2009. Human dimensions of Marine Protected Areas. *ICES Journal of Marine Science*, 66:6-15.

- Christie, P. 2004. Marine protected areas as biological successes and social failures in Southeast Asia. Pages 155-164 in *American Fisheries Society Symposium*, Vol. 42.
- Christie, P., White, A.T., and Buhat, D. 1994. Community-based coral reef management on San Salvador Island, the Philippines. *Society & Natural Resources*, 7(2):103-117.
- Cinner, J. E., T. Daw, and McClanahan, T. R. 2009. Socioeconomic factors that affect artisanal fishers' readiness to exit a declining fishery. *Conservation Biology* 23(1):124-130.
- Collier, A. 2005. Philosophy and Critical Realism. In *The Politics of Method in the Human Sciences: Positivism and its epistemological others*, ed. G. Steinmetz, 327-345. Durham and London: Duke University Press.
- Constantino, J.C.C. 2007. *Fishermen, Turtles, and Darwin: Galápagos Lives in Evolution's Laboratory*. (Doctoral dissertation). Available from University of Michigan, ProQuest, UMI Dissertations Publishing (3276122)
- Côté, I. M., I. Mosqueira, and Reynolds, J. D. 2001. Effects of marine reserve characteristics on the protection of fish populations: A meta-analysis. *Journal of Fish Biology* 59(sA):178-89.
- Creswell, J. W., and Clark, V. L. P. 2007. *Designing and conducting mixed methods research*. 2nd Ed. Thousand Oaks: Sage.
- Dahl, R. A. 1957. The Concept of Power. *Behavioral Science*, 2:201-205.
- Daskalov, G. M. 2002. Overfishing drives a trophic cascade in the Black Sea. *Marine Ecology Progress Series*, 225:53-63.
- Davis, D. 2000. Gendered cultures of conflict and discontent: Living the crisis in a Newfoundland community. *Women's Studies International Forum* 23(3):343-353.
- Denevan, W. M. 1983. Adaptation, variation, and cultural geography. *The Professional Geographer*, 35(4):399-407.
- Denkinger, J., and Vinuela, L. 2014. *The Galápagos Marine Reserve: A Dynamic Social-Ecological System*. New York: Springer Science & Business Media.
- DFID (Department for International Development), 2000. Sustainable Livelihoods Guidance Sheets. <http://www.eldis.org/vfile/upload/1/document/0901/section2.pdf> (last accessed 14 July 2015)
- Dercon, S. and Krishnan, P. 1996. Income portfolios in rural Ethiopia and Tanzania: Choices and constraints. *Journal of Development Studies*, 32(6):850-875.
- Dixon, J. 2007. The Galápagos – A Unique and valuable Resource.

- Edgar, G. J., Banks, S., Fariña, J.M., Calvopiña, M., and Martínez, C. 2004. Regional biogeography of shallow reef fish and macro-invertebrate communities in the Galápagos Archipelago. *Journal of Biogeography* 31(7):1107-24.
- El Universo. 2009. Denuncia de influencias en los cupos turísticos para Galápagos.” El Universo [Guayaquil] 19 July 2009, Noticias, País.
<http://www.eluniverso.com/2009/07/19/1/1447/DA25C09651BB42A087C97EFA9D154737>
 (last accessed 11 April 2011)
- Ellis, F. 2000. *Rural livelihoods and diversity in developing countries*. Oxford and New York: Oxford University Press.
- Engie, K., and Quiroga, D. 2014. The Emergence of Recreational Fishing in the Galápagos Marine Reserve: Adaptation and Complexities. In *The Galápagos Marine Reserve: A Dynamic Social-Ecological System*, ed. J. Denkinger and L. Vinuesa, 203-226. New York: Springer International Publishing.
- Epler, B. 2007. *Tourism, the Economy, Population Growth, and Conservation in Galápagos*. Santa Cruz, Galápagos: Charles Darwin Foundation. pp 68.
- Fabinyi, M. M. 2010. The intensification of fishing and the rise of tourism: Competing coastal livelihoods in the Calamianes Islands, Philippines. *Human Ecology* 38(3):415-27.
- Ferraro, P. J., and Pattanayak, S. K. 2006. Money for nothing? A call for empirical evaluation of biodiversity conservation investments. *PLoS biology*, 4(4):e105.
- Finchum, R. n.d. Informing Co-management in the Galápagos Islands: A case study.
- Folke, C. 2006. Resilience: The emergence of a perspective for social–ecological systems analyses. *Global environmental change*, 16(3):253-267.
- Food and Agriculture Organization of the United Nations (FAO). 2015. Assessing fishing capacity and overcapacity. <http://www.fao.org/fishery/topic/14858/en> (last accessed 9 Jan 2015)
- Fowler, F.J. 2002. *Survey Research Methods. Applied Social Research Methods Series Volume 1*. 3rd Edition. Thousand Oaks and London: Sage Publications.
- Frank, K. A., Mueller, K., Krause, A., Taylor, w. w., and Leonard, N. J. 2007. The intersection of global trade, social networks, and fisheries. In *Globalization: Effects on Fisheries Resources*, eds. W. W. Taylor, M. G. Schechter, and L. G. Wolfson, 385-423. New York: Cambridge University Press.
- Fulanda, B., Munga, C., Ohtomi, J., Osore, M., Mugo, R., and Hossain, M. Y. 2009. The structure and evolution of the coastal migrant fishery of Kenya. *Ocean & Coastal Management*, 52(9):459-466.

- Galápagos National Park (GNP) 2013. Entry tax to protected areas.
http://www.Galápagospark.org/nophprg.php?page=programas_turismo_tributo (last accessed 13 July 2015)
- GALEODAN 2012. What is Vivencial Fishing?
http://www.galeodan.com/html/what_is_vivencial_fishing.html (last accessed 13 July 2015)
- Garcia, S.M., and Charles, A.T. 2008. Fishery systems and linkages: Implications for science and government. *Ocean and Coastal Management*, 51:505-527.
- García-Charton, J. A., Pérez-Ruzafa, A., Marcos, C., Claudet, J., Badalamenti, F., Benedetti-Cecchi, L., Falcón, J. M., Milazzo, M., Schembri, P. J., Stobart, B. 2008. Effectiveness of European Atlanto-Mediterranean MPAs: Do they accomplish the expected effects on populations, communities and ecosystems? *Journal for Nature Conservation* 16(4):193-221.
- González, J. A., Montes, C., Rodríguez, J., and Tapia, W. 2008. Rethinking the Galápagos Islands as a Complex Social-Ecological System: Implications for Conservation and Management. *Ecology and Society*, 13(2):13
- Gordon, H. S. 1954. The economic theory of a common-property resource: the fishery. *The Journal of Political Economy*, 62(2):124-142.
- Goulden, M. C., Adger, W. N., Allison, E. H., and Conway, D. (2013). Limits to resilience from livelihood diversification and social capital in lake social–ecological systems. *Annals of the Association of American Geographers*, 103(4):906-924.
- Gravez, V., C. Segura, and Gelin, A. 2008. *Análisis de la situación socio-económica del sector pesquero artesanal de Isabela, Galápagos*. Cooperativa de pesca artesanal Horizontes de Isabela & Fundación Futuro Latinoamericano, Proyecto COPAHISA-FFLA-FIA noEC-402, Ecuador: 1-17+anexos.
- Grenier, C. 2007. *Conservation Contra Natura: Las Islas Galápagos*. Quito: Abya Yala
- Guarderas, A. P., Hacker, S. D., and Lubchenco, J. 2008. Current status of marine protected areas in Latin America and the Caribbean. *Conservation Biology*, 22(6):1630-1640.
- Guba, E. G., and Lincoln, Y. S. 1994. Competing paradigms in qualitative research. In *Handbook of qualitative research* 2, 163-194.
- Gunderson, L. H., Holling, C. S., and Light, S. S. 1995. *Barriers and Bridges to the Renewal of Ecosystems and Institutions*. New York: Columbia University Press.
- Halleröd, B. 1994. *A new approach to the direct consensual measurement of poverty*. Social Policy Research Centre Discussion Paper, 50.
- Harris, L., and Hazen, H. D. 2006. Power of maps:(Counter) mapping for conservation. *ACME: An International E-Journal for Critical Geographies*, 4(1):99-130.

- Hearn, A., Murillo, J. C., and Reyes, H. 2007. Declining Profitability of Fisheries in the Galápagos Marine Reserve. In *Galápagos Report 2006-2007*, 19-22. Santa Cruz, Galápagos: Galápagos National Park, Charles Darwin Foundation, and National Institute of Galápagos (INGALA).
- Hearn A. 2008. The rocky path to sustainable fisheries management and conservation in the Galápagos Marine Reserve. *Ocean & Coastal Management* 51(8-9):567-74.
- Heel, L. 2012. *Assessment of a Bait Fishery in the Galápagos Marine Reserve: Implications for Sustainable Management*. Unpublished Bachelor's thesis, Leuphana University, Lüneburg, Germany.
- Heen, K. 1988. Norwegian fishermen: Labour market behaviour and analysis. *Marine Policy*, 12(4):396-407.
- Heylings, P., and Bravo, M. 2007. Evaluating governance: A process for understanding how co-management is functioning, and why, in the Galápagos Marine Reserve. *Ocean & Coastal Management*, 50(3):174-208.
- Hilborn R. 1985. Fleet dynamics and individual variation: why some people catch more than others. *Canadian Journal of Fisheries and Aquatic Science* 42: 2-13
- Holling, C. S., and Meffe, G. K. 1996. Command and control and the pathology of natural resource management. *Conservation Biology*, 10(2):328-337.
- Holling, C. S. 2001. Understanding the complexity of economic, ecological, and social systems. *Ecosystems*, 4(5):390-405.
- Hussein, K. and Nelson, J. 1998. *Sustainable Livelihoods and Livelihood Diversification*. IDS Working Paper, No. 69. Brighton: Institute for Development Studies.
- Insight Crime. 2014. Ecuador's Cocaine Pirates. 14 March 2014.
<http://www.insightcrime.org/news-analysis/ecuadors-cocaine-pirates-part-i> (last accessed 13 July 2015)
- IMM 2008. *Sustainable Livelihood Enhancement and Diversification – SLED: A Manual for Practitioners*. IUCN, International Union for the Conservation of Nature. 87 pp.
- Instituto Nacional de Estadística y Censos (INEC). 2010. Censo de población y vivienda, Galápagos 2010. Quito, Ecuador: Instituto Nacional de Estadística y Censos.
- Instituto Nacional Galápagos (INGALA). 2009. Resolución No. CI-23/15-VI-2009.
- International Union for Conservation of Nature (IUCN) 2007. *Establishing Marine Protected Area Networks: Making it Happen. A guide for Developing National and Regional Capacity for Building MPA Networks*. World Conservation Union. 15 pp.
- Jentoft, S. 2007. In the power of power: the understated aspect of fisheries and coastal

- management. *Human Organization*, 66(4):426-437.
- Kerr, S. A. 2005. What is small island sustainable development about?. *Ocean & Coastal Management*, 48(7):503-524.
- King, B. 2011. Spatialising livelihoods: resource access and livelihood spaces in South Africa. *Transactions of the Institute of British Geographers*, 36(2):297-313.
- Klecka, W. R. 1980. *Discriminant analysis*. Sage University Paper Series: Quantitative Applications in the Social Sciences, No. 19. Beverly Hills and London: Sage
- Kleinman, S., Copp, M. A., and Henderson, K. A. 1997. QUALITATIVELY DIFFERENT Teaching Fieldwork to Graduate Students. *Journal of Contemporary Ethnography*, 25(4):469-499.
- Larkin, P. A. 1977. An epitaph for the concept of maximum sustained yield. *Transactions of the American fisheries society*, 106(1):1-11.
- Leach, M., ed. 2008. *Re-framing Resilience: a Symposium Report*, STEPS Working Paper 13. Brighton: STEPS Centre
- Levin, S. A. 1998 Ecosystems and the biosphere as complex adaptive systems. *Ecosystems*, 1(5):431-436.
- . 2005. Self-organization and the emergence of complexity in ecological systems. *Bioscience*, 55(12):1075-1079.
- Lindenberg, M. 2002. Measuring household livelihood security at the family and community level in the developing world. *World Development*, 30(2):301-318.
- Löfgren, O. 1972. Resource management and family firms: Swedish West Coast fishermen. In *North Atlantic fishermen: Anthropological essays on modern fishing*, eds. R. Anderson and C. Wadel, 82-103. Newfoundland: University of Toronto Press.
- Lu, F., Valdivia, G., and Wolford, W. 2013. Social dimensions of 'Nature at Risk' in the Galápagos Islands, Ecuador. *Conservation and Society*, 11(1): 83-85.
- Macdonald, T. 1997. *Conflict in the Galápagos Islands: Analysis and Recommendations for Management*. Prepared for the Charles Darwin Foundation, 31 pp. Cambridge: Harvard University Weatherhead Center for International Affairs.
- MacFarland, C., and Cifuentes, M. 1996. Case Study: Ecuador. Biodiversity Conservation and Human Population Impacts in The Galápagos Islands, Ecuador. In *Human Population, Biodiversity and Protected Areas: Science and Policy Issues*, ed. V. Dompka, 135-188. American Association for the Advancement of Science (AAAS).
- Mack, J. and Lansley, S. 1985. *Poor Britain*. London: George Allen and Unwin.

- Mahon, R., P. McConney, and Roy, R. N. 2008. Governing fisheries as complex adaptive systems. *Marine Policy*, 32(1):104-112.
- Mansfield, B. 2004. 'Neoliberalism in the Oceans: "Rationalization," Property Rights, and the Commons Question'. *Geoforum* 35(3): 313–326.
- Manson, S.M. 2001. Simplifying complexity: a review of complexity theory. *Geoforum*, 32(3):405-414.
- Massey, D. (2005) (a reliance on science? 3) In *For Space*, 126-129. Thousand Oaks and New Delhi: Sage.
- May, R. M., Levin, S. A., and Sugihara, G. 2008. Complex systems: Ecology for bankers. *Nature*, 451(7181):893-895.
- McCay, B. 1978. Systems Ecology, People Ecology, and the Anthropology of Fishing Communities. *Human Ecology*, 6(4):397-422
- McSweeney, K. 2004. Forest product sale as natural insurance: the effects of household characteristics and the nature of shock in eastern Honduras. *Society and Natural Resources*, 17(1):39-56.
- Mehta, L., Leach, M., Newell, P., Scoones, I., Sivaramakrishnan, K., and Way, S. 1999. *Exploring understandings of institutions and uncertainty: new directions in natural resource management*. IDS Discussion Paper 372. Brighton: Institute for Development Studies
- Michener, W. K., Baerwald, T. J., Firth, P., Palmer, M. A., Rosenberger, J. L., Sandlin, E. A., and Zimmerman, H. 2001. Defining and unraveling biocomplexity. *BioScience*, 51(12):1018-1023.
- Middleton, D. R. 1977. Changing economics in an Ecuadorian maritime community. In *Those Who Live From the Sea: A Study in Maritime Anthropology*, ed. M. E. Smith, 111-124. St. Paul: West Pub Co.
- Molina, L.M. 2005. *Sport Fishing in the Galápagos*. Santa Cruz Island, Galápagos: Charles Darwin Foundation. pp. 42.
- Murillo, J. C., Reyes, H., and Hearn, A. 2007. Social aspects of fisheries in Galápagos. In *Galápagos Report 2006-2007*, 15-18. Santa Cruz, Galápagos: Galápagos National Park Service, Charles Darwin Foundation and National Institute of Galápagos (INGALA).
- Nash, S. 2009. Ecotourism and other invasions. *BioScience*, 59(2):106-110.
- Nelson, D. R., Adger, W. N., and Brown, K. 2007. Adaptation to environmental change: contributions of a resilience framework. *Annual Review of Environment and Resources*, 32(1):395.

- Nietschmann, B. 1973. *Between land and water: the subsistence ecology of the Miskito Indians, Eastern Nicaragua*. New York and London: Seminar Press.
- Nuñez, R. B. 2007. Galápagos: La difícil relación entre lo demográfico y lo ambiental. In *Galápagos: Migraciones, economía, cultura, conflictos, y acuerdos*, eds. P. Ospina and C. Falconí, 59-74. Quito, Ecuador: Corporación Editora Nacional, and Universidad Andina Simón Bolívar.
- Ospina, P. 2005. Carlos Ricaurte. In *Desde las islas encantadas: historias de vida de colonos en Galápagos*, ed. P. Ospina, 141-190. Quito, Ecuador: Corporación Editora Nacional/UNDP.
- . 2006. *Galápagos, naturaleza y sociedad: actores sociales y conflictos ambientales*. Quito, Ecuador: Corporación Editora Nacional, and Universidad Andina Simón Bolívar.
- Ostrom, E. 2009. A general framework for analyzing sustainability of social-ecological systems. *Science*, 325:419-422.
- Owusu, F. 2009. Livelihoods. *International Encyclopedia of Human Geography*, 6:219-224.
- Pauly, D., Christensen, V., Dalsgaard, J., Froese, R., and Torres, F. 1998. Fishing down marine food webs. *Science*, 279(5352):860-863.
- Payne, E. 2007. Caught in the Middle: Impoverished fishermen in the Galápagos struggle to stay afloat. University of Oregon School of Journalism and Communication, Eugene, OR.
- Pender, J., Jagger, P., Nkonya, E., and Sserunkuuma, D. 2004. Development pathways and land management in Uganda. *World Development*, 32(5):767-792.
- Perramond, E. 2010. *Political ecologies of cattle ranching in northern Mexico: Private revolutions*. Tucson: University of Arizona Press.
- Persha, L., Fischer, H., Chatre, A., Agrawal, A., and Benson, C. 2010. Biodiversity conservation and livelihoods in human-dominated landscapes: forest commons in South Asia. *Biological Conservation*, 143(12):2918-2925.
- Peterson, G. 2000. Political ecology and ecological resilience:: An integration of human and ecological dynamics. *Ecological Economics*, 35(3):323-336.
- Pollnac, R. B., and Poggie, J. J. 1988. The structure of job satisfaction among New England fishermen and its application to fisheries management policy. *American Anthropologist*, 90(4):888-901.
- . 2008. Happiness, well-being and psychocultural adaptation to the stresses associated with marine fishing. *Human Ecology Review*, 15(2):194-200.
- Pollnac, R. B., Pomeroy, R. S., and Harkes, I. H. T. 2001. Fishery policy and job satisfaction in three Southeast Asian fisheries. *Ocean & Coastal Management* 44(7-8):531-544.

- Poon, J. P. H. 2005. Quantitative methods: not positively positivist. *Progress in Human Geography*, 29(6):766-772.
- Prowse, M. 2008. Locating and extending livelihoods research. *Brooks World Poverty Institute Working Paper*, 37.
- Putnam, R. 1993. Making democracy work: civic traditions in modern Italy. *Princeton University Press*.
- Quiroga, D. 2009. Crafting nature: the Galápagos and the making and unmaking of a “natural laboratory”. *Journal of Political Ecology*, 16(1):123-40.
- Ramirez, J., Castrejon, M. and Toral Granda, M.V. 2012. *Mejorando la pesqueria de langosta espinosa en la Reserva Marina de Galápagos*. 275 pp. Santa Cruz, Galápagos: WWF
- Rappaport, R. A. 1968. *Pigs for the Ancestors: Ritual in the Ecology of a New Guinea People*. New Haven: Yale University Press.
- Reedy-Maschner, K. 2007. The best-laid plans: limited entry permits and limited entry systems in eastern Aleut culture. *Human Organization*, 66(2):210-225.
- Reidinger, M.A., Steinitz-Kannan, M., Last, W.M., and Brenner, M. 2002. A similar 6100 C-14C y record of El Nino activity from the Galápagos Islands. *Journal of Paleolimnology* 27:1-7
- Robards, M. D. and Lovcraft, A. L. 2010. Evaluating comanagement for social-ecological fit: indigenous priorities and agency mandates for Pacific Walrus. *Policy Studies Journal*, 38(2): 257-279.
- Robbins P. 2004. *Political Ecology: a critical introduction*. Oxford: Blackwell Publishing
- Robinson, C., and Pascoe, R. 1997. Fisher behaviour: Exploring the validity of the profit maximizing assumption. *EAFE 1997*, Quimper, France. , 110 192-16.
- Salas, S., and Gaertner, D. 2004. The behavioural dynamics of fishers: management implications. *Fish and fisheries*, 5(2):153-167.
- Salmi, P., Salmi, J. and Pentti, M. 1998. Strategies and flexibility in Finnish commercial fisheries. *Boreal Environment Research* 3:347-359.
- Sanderson, S. E., and Redford, K. H. 2003. Contested relationships between biodiversity conservation and poverty alleviation. *Oryx*, 37(04):389-390.
- Scholte, P. 2003. Immigration: a potential time bomb under the integration of conservation and development. *AMBIO: A Journal of the Human Environment*, 32(1):58-64.
- Schuhbauer, A., and Koch, V. 2013. Assessment of recreational fishery in the Galápagos Marine Reserve: Failures and opportunities. *Fisheries Research*, 144:103-110.

- Scoones, I. 1998. *Sustainable Rural Livelihoods: A framework for analysis*. 72. Brighton: Institute for Development Studies.
- . 2009. Livelihoods perspectives and rural development. *The Journal of Peasant Studies*, 36(1):171-196.
- Seixas, C. S., and Berkes, F. 2003. Dynamics of social-ecological changes in a lagoon fishery in southern Brazil. In *Navigating social-ecological systems: Building resilience for complexity and change*, eds. F. Berkes, J. Colding, and C. Folke, 271-290. Cambridge: Cambridge University Press.
- Smith, C. L. 1981. Satisfaction bonus from salmon fishing: implications for economic evaluation. *Land Economics*, 57(2):181-196.
- Smith, S., Jacob, S., Jepson, M., and Israel, G. 2003. After the Florida net ban: the impacts on commercial fishing families. *Society & Natural Resources*, 16(1):39-59.
- Snell, H. and Rea, S. 1999. The 1997-98 El Nino in Galápagos: Can 34 years of data estimate 120 years of pattern? *Noticias de Galápagos*, 60: 11-20.
- St Martin, K. 2001. Making space for community resource management in fisheries. *Annals of the Association of American Geographers*, 91(1):122-142.
- Martin, K. S., McCay, B. J., Murray, G. D., Johnson, T. R., and Oles, B. 2007. Communities, knowledge and fisheries of the future. *International Journal of Global Environmental Issues*, 7(2-3):221-239.
- Stacey, L., and Fuks, V. 2007. Struggling for the Golden Egg: Conservation politics in the Galápagos. (Masters thesis). Available from Roskilde University Digital Archive
- Taylor, J. E., Hardner, J., and Stewart, M. 2006. *Ecotourism and Economic Growth in the Galápagos: An Island Economy-Wide Analysis*. Department of Agricultural and. Report nr 06-001
- Terkla, D. G., Doeringer, P. B., and Moss, P. I. 1988. Widespread Labor Stickiness in the New England Offshore Fishing Industry: Implications for Adjustment and Regulation. *Land Economics*, 64(1):73-82.
- Thrift, N. 1999. The place of complexity. *Theory Culture Society*, 16(3):31-69.
- Toral-Granda, V. 2005. *Requiem for the Galápagos sea cucumber fishery?* SBC Beche-de-mer Information Bulletin #21
- UCOOPEPGAL. 2005. Pesca artesanal vivencial: una diversificación para el pescador, una apertura hacia la población para el visitante. Propuesta del Sector Pesquero Artesanal del Galápagos. Presented at the meeting of the Participatory Management Board (JMP), July 21-22 2005, Santa Cruz, Galápagos. Annex 7 in F. Zapata (ed.), *La pesca artesanal vivencial en Galápagos. Sistematización del proceso*. Fundación Futura Latinoamericana. pp 52.

- UCOOPEPGAL. 2012. *Galápagos Fishermen denounce the violation of our constitutional rights by authorities of the Galápagos National Park*. Pto Baquerizo Moreno.
- Vayda, A. P., and Walters, B. B. 1999. Against political ecology. *Human Ecology*, 27(1):167-179.
- Viteri, C., Conrad, J., Nøstbakken, L., Stone, S., and Franklin, H. 2005. *Fisheries Management in the Galápagos Marien Reserve: A Bioeconomic Perspective*. Inter-American Development Bank. 33 pp.
- Walker, J., and Cooper, M. 2011. Genealogies of resilience From systems ecology to the political economy of crisis adaptation. *Security Dialogue*, 42(2):143-160.
- Walker, B., and Salt, D. 2006. *Resilience thinking: sustaining ecosystems and people in a changing world*. Washington, DC: Island Press.
- Watkins, G. 2008. A paradigm shift in Galápagos Research. *Galápagos Research*, 65:30-36.
- Watkins, G., and Cruz, F. 2007. *Galápagos at risk: A socioeconomic analysis of the situation in the archipelago*. Puerto Ayora, Galápagos: Charles Darwin Foundation.
- Watts, M. 1983. *Silent violence: Food, famine and peasantry in Northern Nigeria*. University of California Press.
- West, P., Igoe, J., and Brockington, D. 2006. Parks and peoples: The social impact of protected areas. *Annual Review of Anthropology* 35(1):251-277.
- Wilen, J. E., Stewart, M., and Layton, D. F. 2000. *Economic analysis of the Galápagos Marine Reserve resources management plan. Report for the Inter-American Development Bank*.
- Wilson, J. A. 2006. Matching social and ecological systems in complex ocean fisheries. *Ecology and Society*, 11(1), 9. [online] URL: <http://www.ecologyandsociety.org/vol11/iss1/art9/>
- Wyly, E. 2009. Strategic Positivism. *The Professional Geographer*, 61(3), 310-322.
- Yapa, L. 1996. What causes poverty?: A postmodern view. *Annals of the Association of American Geographers*, 86(4), 707-728.
- Young, E. H. 2003. Balancing conservation with development in marine-dependent communities. In *Political Ecology: An integrative approach to geography and environment-development studies*, eds. K. S. Zimmerer and T. J. Bassett, 29-49. Guilford Press.
- Zapata, F. 2006. *La pesca artesanal vivencial en Galápagos. Sistematización del proceso*. Fundación Futura Latinoamericana. pp 52.
- Zimmerer, K. 2000. The Reworking of Conservation Geographies: Nonequilibrium Landscapes and Nature-Society Hybrids. *Annals of the Association of American Geographers*, 90(2):356-369.

Zimmerer, K. S. 2006. Cultural ecology: at the interface with political ecology-the new geographies of environmental conservation and globalization. *Progress in Human Geography*, 30(1):63.