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Renegotiating property rights in the Florida golden crab fishery

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Abstract: The golden crab (*Chaceon fenneri*) supports a small, economically healthy fishery in south Florida. Crabbers in the fishery have successfully protected themselves against larger outside fishing interests in the past, and management has been stable for over 15 years. Why, then, did a portion of the fleet propose shifting to individual transferable quotas (ITQs)? Our findings suggest that proponents sought ITQ management because they believed it would further limit the ability of other crabbers to enter the fishery and act as a mechanism to legally preserve the informal and formal property rights that they have previously negotiated among themselves. Opponents believed that a shift to an ITQ regime would destroy those same property rights. We explore the implications of these findings to a broader understanding of property rights and natural resource management institutions, noting that the currently existing system closely resembles a territorial use rights fishery (TURF).

Keywords: *Chaceon fenneri*, co-management, fisheries, golden crab, individual transferable quotas, ITQs, property rights, TURFs, territorial use rights *fisheries*

Acknowledgments: The crabbers are optimistic about the future of the fishery and proud of what they have accomplished in developing the gear and techniques for catching the crabs, as well as their ability to work closely with the South

Atlantic Fishery Management Council to develop sustainable management. We wish to thank them for their willingness to talk with us and provide sensitive business information. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its subdivisions.

I. Introduction

Within environmental economics and the broader common-pool resource management community, there is a long-standing debate over the role that fishery rights regimes play in common-pool resource management. Perhaps the best studied of these regimes is individual transferable quotas (ITQs) in fisheries management. An interesting point of debate centers on the potentially negative impact that ITQs have on the ability of resource users to maintain existing governance institutions (Palsson and Helgason 1995; McCay and Jentoft 1996).

In this context, the case of the Florida golden crab (*Chaceon fenneri*) fishery provides an intriguing counterpoint. Here we have an established fishery composed of a small number of crabbers who have worked together to establish sustainable fishing practices and create a market for their landings. The fishery could be described as successful co-management by the crabbers and the South Atlantic Fishery Management Council (“the Council”). Yet, a portion of these crabbers proactively sought to become the first new ITQs fishery in the waters managed by the South Atlantic Fishery Management Council in over 20 years. These events raise the following question: *Why did some golden crabbers seek out individual transferable quotas (ITQs) when their existing system appears to be working?* A second question arises from the challenges the crabbers faced in adopting the ITQ program: *What role did transaction costs play in the efforts to adopt individual transferable quotas (ITQs)?*

Our findings suggest an unusual answer to the first question: some golden crabbers sought ITQ management because they believed that it would further restrict new entry into the fishery and act as a mechanism to legally preserve the informal and formal property rights that they had previously negotiated among themselves. Meanwhile, crabbers opposed to ITQs believed that they would override those same property rights, as much of the literature suggests. Transaction costs (in particular, rent seeking) made the process extremely contentious and ultimately prevented the creation of an ITQ program. This finding emphasizes both the continued importance of rent seeking in institutional development, and the inability of strategic external intervention to overcome these barriers.

After providing context for this research in the broader literature, we describe the methods and resources used to study the golden crab fishery and then provide a history of the fishery leading to a description of its current institutional structure. This is followed by a discussion of the reasoning of the crabbers – all of whom sought to preserve their existing property rights – but took sharply different positions on whether ITQs would support or degrade the existing formal and informal management regime. Finally, we explore the implications of these

findings to a broader understanding of property rights and natural resource management institutions.

2. Literature review: research context

ITQs are now a well-established policy tool for limiting total catch and distributing catching rights. ITQs can best be described as a defined right (usually held in perpetuity) to catch a defined proportion of the total allowable catch of a specific fish species or group of species. Individuals and companies are free to buy or sell these catching rights as they see fit. The concept of ITQs was first proposed in the US (Christy 1973) and drew wider attention in natural resource economics in the 1970s and 1980s (Hannesson 1978; Moloney and Pearce 1979; Anderson 1986; Charles 1988). By the late 20th century, various programs based on the ITQ concept had been established around the world (Clark et al. 1988; Palsson and Helgason 1995; McCay et al. 1998; Squires et al. 1998; Yandle and Dewees 2008).

In the US, the adoption of ITQs has been contentious.¹ However, several fisheries in the US have programs based on the ITQ model including quahog/surf clam (McCay and Brandt 2001); pacific halibut (Knapp 1996; Matulich and Clark 2003; Carothers et al. 2010); and Alaska crab (Fina 2005). Most recently, US federal fisheries policy has focused on “catch shares” as a transferable catching right policy option including all varieties of “limited access privilege” authorized by law including ITQs, individual fishing quotas (IFQs)² and territorial use rights fisheries (TURFs) (NOAA 2010, 1). This case study examines the struggle to develop an ITQ program in the Florida golden crab fishery.

2.1. Appropriate use of individual transferable quotas (ITQs)

As described above, the impetus for ITQ programs came largely from economics research. To a large extent, the ideal setting for this approach would mirror that of one found in economic theory and modeling: enough fishers and diversity among fishers to create a functional market for ITQs, a functional market for the product (fish), and an opportunity to enter and leave the fishery (Anderson 1986; Homans and Wilen 2005); where harvesting rights will be secure, and it is feasible to set a total allowable catch (Criddle and Macinko 2000). The literature examining the implementation of ITQs confirms that these conditions do indeed exist in many fisheries, and that these conditions are important to functional ITQ regimes (Grafton 1996; Squires et al. 1998; Arnason 2002; Newell et al. 2005).

In addition, there is research (often from anthropology, political science, and sociology literature) outlining conditions in which ITQs are not the optimal choice, or where the negative consequences of the approach may outweigh its

¹ Context on US fisheries in: Johnson and Libecap 1982; NRC 1999. Anderson (2006) provides more recent context.

² ITQs are transferable IFQs. Although the South Atlantic Council documents refer to this proposal as an IFQ, it included transferability, so we use ITQ throughout this paper.

benefits. Perhaps the most fundamental institutional concern over ITQs and similar externally imposed arrangements is their potential to override informal resource management arrangements (Ostrom 1990, 177) or replace social relationships as the foundation for constructing fishing norms (McCay et al. 1995, 1998). There are also concerns that the consolidation and aggregation of catching rights may move control of the fishery out of the local community and “on the water” fishers and to larger corporate entities that may not be based in the community (Palsson and Helgason 1995; Sumaila 2010). Additionally, initial allocation of catching rights looms large as an important issue not only in terms of efficient allocation (Morgan 1995) but also in terms of equity for all those engaged in the fishery at time of allocation (National Research Council 1999; Tietenberg 2003; Copes and Charles 2004) and inter-generational transfer (McCay 1995; Copes and Charles 2004).

In summary, research to date suggests that ITQ-based programs are best suited to fisheries large enough to support a functional market, and where overriding traditional management institutions and social equity issues will not be a concern. As described by Charles:

“ITQ schemes may be most feasible in industrially-oriented fisheries where the goal of rent generation may dominate over such community and socioeconomic sustainability considerations as employment stability and an equitable catch distribution” (Charles 1994, 208).

Thus, participant interest in an ITQ program in a small fishery (<10 participants) with a history of collaborative management efforts (both among themselves and with regulatory authorities) is, to put it mildly, a surprise. Understanding why a group of golden crabbers sought out this management approach, while others opposed it, is important because it offers both insight into both how fishers perceive ITQs and an expanded vision of the role ITQs as a policy option.

2.2. Emergence of resource management institutions

In addition to understanding why a contingent of golden crabbers sought an ITQ management regime, we also examine the challenges they faced once they moved forward with amending their Fishery Management Plan. A transaction cost is defined as the “costly activity expended in the process of achieving agreement before and continuing to coordinate activities after an initial agreement is reached in an uncertain environment” (Ostrom et al. 1993, 47). Transaction costs are a useful lens for understanding the efforts to develop this regime and this approach is well established in the institutional analysis literature (North 1990; Jung et al. 1995; Ostrom 2009).

Three broad categories of transaction costs are identified as relevant to the governance of natural resources:

- Information costs: costs of searching for and organizing information and errors resulting from ineffective blends of scientific, time, and place information (Hayek 1945)

- Coordination costs: costs of negotiation, monitoring, and enforcing agreements, and the rules that govern use of a natural resource (Ostrom et al. 1993, 120)
- Strategic costs: costs from asymmetries in information, power, or other resources. Some receive benefits at the costs of others. Freeriding, shirking, corruption, and rent seeking are examples (Ostrom et al. 1993)

Many forms of transaction costs are problematic during the establishment of a new institutional arrangement (Libecap 1989; North 1990). Strategic costs, particularly rent seeking, are potent issues during the initial allocation of a de facto property right such as ITQs (Criddle and Macinko 2000; Phillips et al. 2002) and have been documented in the allocation of other common pool resources (Libecap 2007). Thus, understanding the role transaction costs played in the efforts to develop an ITQ approach to golden crab management is critical.

3. Methods

Gathering and presenting data on the golden crab fishery presents somewhat unique challenges in comparison to most commercial fisheries. Because the number of participants is very low (seven participants owning the 11 permits at the time of this writing), great care must be taken to preserve the confidentiality of social and economic data. Additionally, the small size of the fishery renders even descriptive statistics of sociodemographic data meaningless – factors such as median income or education are not appropriate descriptors for a handful of individuals.

Accordingly, we collected data from multiple sources and cross-checked them to verify the accuracy of the information gathered (Poteete et al. 2010). These data sources are described below, and summarized in Table 1. Broadly, they fall into five categories: interviews, primary documents, existing studies, economic survey, and participant observation.

Unless otherwise cited, the source for quotations in the history is the group interview, with the broad sweep of this narrative confirmed through the other sources. Group interview participants are identified by letter (e.g. “CRABBER A”). We also rely on participant observation as one of many data sources because “more subtle perceptions and behaviors can be observed over time to gain a deeper understanding of their meaning.” (Donahue and O’Leary 2012, 399). In analyzing these data and developing this history, we are guided by Robert Putnam: “No single source of data is flawless, but the more numerous and diverse the sources, the less likely that they could all be influenced by the same flaw” (Putnam 2000, 415). Thus we practice triangulation (Yin 2008), in which combinations of multiple documentary sources and/or multiple interviews are used to reconstruct and confirm information presented. Triangulation is particularly important when there is concern that some sources of information (e.g. interviews, group interviews, and statements in the public record) should, perhaps, not be taken at face value but instead may be driven by more hidden

Table 1: Summary of data sources.

Data Source	Description	Application
Interviews		
Group Interview	Group interview with four active and one former crabber conducted at WAC Focus Group Facilities in Ft Lauderdale, Florida on February 6, 2012	Fisher perspective on origins and history of fishery and reasons for seeking catch share program
Interview with Gregg Waugh	Individual interview with South Atlantic Fishery Management Council Deputy Executive Director, a staff member with responsibility for the golden crab fishery over the past 18 years. Conducted April 5, 2012	Regulatory staff perspective on history of fishery and reasons for seeking catch share program
Interview with David Cupka	Individual interview with current South Atlantic Fishery Management Council Chair who has served on the Council since 1993. Conducted July 30, 2012	Council (rule making) perspective on history of fishery and reasons for seeking catch share program
Primary Documents		
SAFMC Primary Documents	Minutes from South Atlantic Fishery Management Council meetings and associated documents	Documentation on history of fishery and reasons for seeking catch share program; scientific assessment of condition of the golden crab fishery
Local Newspapers	Newspaper articles from Florida newspapers related to golden crab. All Florida newspapers in the Lexis-Nexis Database were searched for the terms “golden crab” and “ <i>Chaceon jennetti</i> ” (January 1975 through September 2012)	Documentation of history and politics of the fishery
Survey		
Survey	Economic survey of active permits. The survey was mailed to the permit holders in the fall of 2011. ³	Fishery economic performance data
Participant Observation		
Participant Observation	Co-Author Scott Crosson has worked with and observed regulatory activities in the golden crab fishery since 2009 as a NOAA economist and member of the SAFMC Scientific and Statistical Committee, and attended the permit holders’ meeting in August 2012.	Observation of development of catch share proposal
Participant Observation	Co-Author Tracy Yandle has observed regulatory activities in the golden crab fishery since 2011 as a member of the SAFMC Scientific and Statistical Committee and observed the public hearings and Council meeting in June 2012 in which distribution issues arose.	Observation of development of catch share proposal

³ Five vessels (out of 11 permits) were active in 2010 completed and returned their forms, making this a complete census of economic performance for that year – a necessity given that a single missing boat would have seriously impacted the estimates. Because the fleet is so small, only summary information is provided. For additional economic information and copies of the survey forms, see <http://www.sefsc.noaa.gov/socialscience/CrossonIJC2013.htm>.

motivation. By confirming findings across multiple independent sources, we gain confidence in our findings.

4. The history and regulation of the golden crab fleet

The golden crab fishery is, in some ways, an accident. It is a young fishery, barely a quarter of a century old, with many of the original participants still active, although the transition to the next generation of crabbers has begun. In this section, we outline the history of the fishery with observations on the habitat and known biology of the crab, both of which place significant technological and coordination challenges on the crabbers that would harvest them.

4.1. Species description

Golden crab (*C. fenneri*) was not clearly identified as a distinct species until 1984 (Manning and Holthuis 1984). Prior to that point, it was thought to be a subspecies of either red crab (*C. quinqueedens*), which sustains an active trap fishery off the coast of the northeastern US, or *C. affinis*, another related (and gold-colored) species (Lockhart et al. 1990). Golden crab inhabit the cold, deep waters near Bermuda, in the Gulf of Mexico and off the southeastern US, but the species was unknown to Florida crabbers for a long time due to its preferred deepwater habitat on the continental slope (see Figure 1). The crabs live in a relatively food-deprived area, scavenging off of local fauna and whatever remains drift down from higher waters.

The crabs have an extensive range, with one banded crab deposited off Ft Pierce being later re-caught 50 or 60 miles further south. Crabbers have followed the crabs moving up and down the continental slope as water temperatures change throughout the seasons. Because the crabs do travel, local depletion has not been an issue, but (like many deepwater species) golden crabs are slow growing animals, and overfishing is always a concern.

4.2. Origins of the South Florida golden crab fishery

In our group interview, the golden crabbers from the Fort Lauderdale area recalled that an unmanned research submersible dove down to the continental slope near the 1000 foot level in 1976 and gathered video footage for several hours. Another scientific expedition dragged a trap along the same bottom a few years later, but encountered no crabs.

The late Dick Nielsen, a local Fort Lauderdale crabber, witnessed these encounters and similar encounters by local fish/lobster trapper Howard Rau, who began to encounter the crabs as he gradually pushed into waters of over 700' depth (Lindberg and Wenner 1990). Nielsen began experimenting with traps to catch golden crabs in 1984. The late Bill Whipple, a red crabber from Massachusetts, had begun trapping golden crabs in the Gulf of Mexico off the southwest coast of Florida the year before (Figure 2). In 6 months of effort Whipple caught half

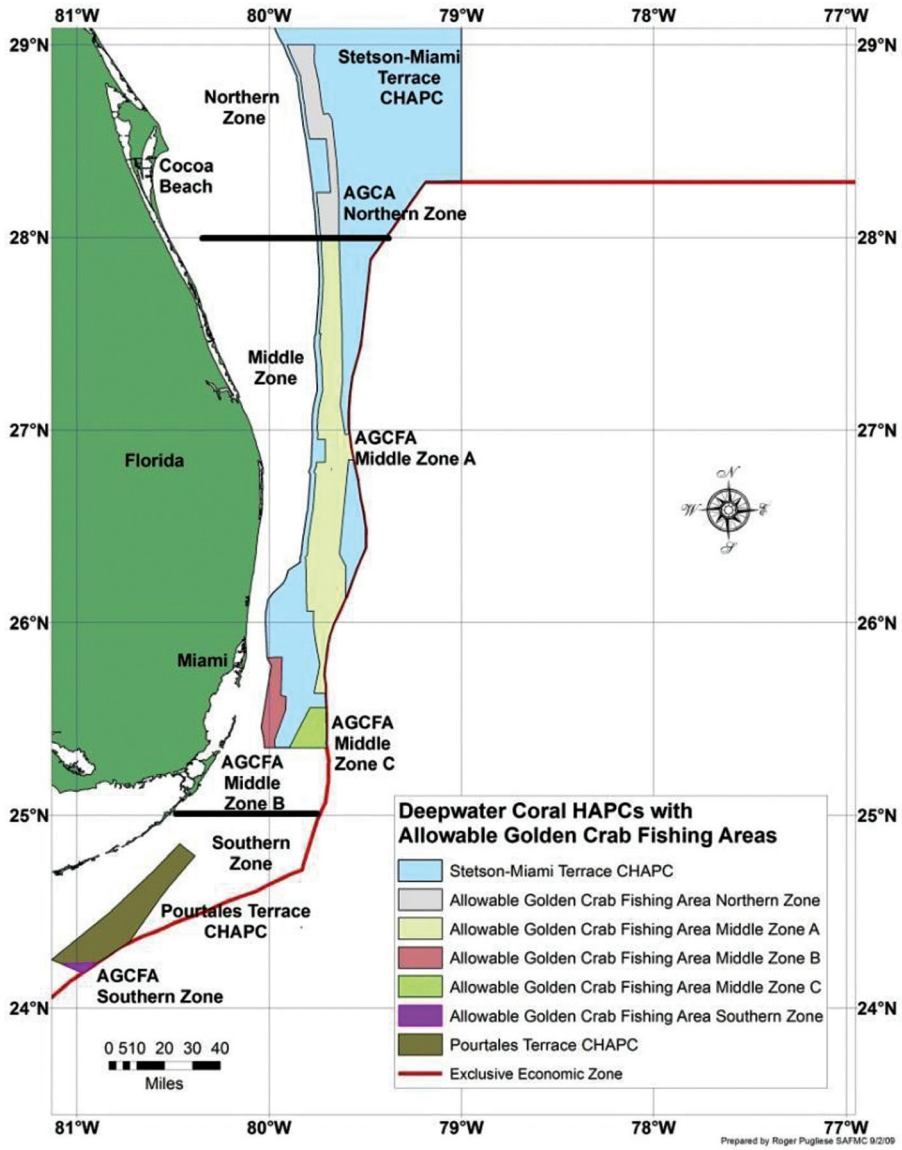


Figure 1: Allowable Golden Crab Fishing Zones (AGCFA) and Deep-water Coral Habitat Areas of Particular Concern (CHAPC) (SAFMC 2009, 4–54).

a million pounds of golden crabs, but he was unable to find a reliable market or a buyer who could handle the volume. He also found that his wooden traps were quickly smashed on the hard bottom and abandoned his efforts despite an apparent abundance of crabs in the Gulf. Whipple quickly relocated to the Fort



Figure 2: Bill Whipple crabbing in the Gulf of Mexico, 1983.

Source: Brad Whipple.

Lauderdale area to take advantage of the area's closer proximity to the edge of the continental shelf and to urban markets. In 1985, two Alaskan boats also attempted to catch golden crabs in the Gulf (current golden crabbers referred to this, jokingly, as the "First Gold Rush"). The Alaskans left after failing to make a profit due to gear loss, poor sales, and fuel-intensive journeys over at least 100 miles of continental slope to reach the crabs' preferred deepwater habitat in the eastern Gulf of Mexico (Erdman and Blake 1988). At the present time, there is still not an active golden crab fishery in the Gulf, which crabbers attribute to the challenges posed by the region's remote location and the presence of physical obstacles on the ocean bottom.

While the crabs are located much closer to Florida's east coast than to its west coast, Atlantic crabbers quickly found that catching the crabs in that area poses its own technical challenges. The greatest of these is the overlap between the Gulf Stream and the crabs' Atlantic habitat. The Gulf Stream exerts such a strong northward pull in the area that buoys cannot be used lest they drag the traps along the bottom. Consequently, golden crabbers learned to place a mile-long line of traps (generally between 35 and 50 traps on a "set") on the ocean floor 1000 to 2000 feet below, and leave it for several days. To retrieve it, they "grappled" the cable by towing for it with a hook. Before the advent of GPS, this meant using landmarks to navigate to where the traps had been set. Even now, finding a deployed set is hardly an easy task. With current average costs at

\$143/trap according to our economic survey, losing a set is an expensive lesson. By the crabbers' reckoning, "it takes years and years and years to learn how to grapple, and it takes years and years and years to master the Gulf Stream...you just can't go out there, go throw a trap and expect to go golden crab fishing." (Group interview, Crabber A).

Despite an apparent abundance of golden crabs off the southeast coast of Florida, the economic potential of the fishery was very slow to develop. Throughout much of its commercial history, golden crab served as a substitute for other crab species. The species was, and still is, largely unknown, even in local markets. One of the biggest problems has been the crab's unusual response to being cooked: "a lot of people would try the crab and they would cook it and cook it and cook it, and then it was rubber ... a big hurdle was they didn't turn red when they cooked it" (Group interview, Crabber A). Golden crabs were often shipped to northern or west coast markets to substitute for snow crabs and Dungeness crabs, and most crabbers were fishing it as a supplement to income earned in other fisheries. The Rustic Inn (a crab restaurant in Fort Lauderdale) began selling them as a specialty item in the early 1990s, after the crabbers worked for years to convince the owners to put it on the menu – the crabbers recalled that they "actually had to go out and catch them and cook them and bring them in there, sit the guys [owners] down and have them eat them and such and say okay" (Group interview, Crabber A).

4.3. Influence of snapper grouper regulatory change on the golden crab fishery

In 1991, the South Atlantic Fishery Management Council passed Amendment 4 to the Snapper Grouper Fishery Management Plan which, among other actions, banned the use of fish traps for harvesting reef fish in the region (SAFMC 1991). Most of the members of the Fort Lauderdale golden crab fleet were also involved in trapping snappers and groupers, but were gradually increasing their harvests of golden crabs as they grew more practiced at deploying and retrieving the traps in the deep waters under the Gulf Stream. Nonetheless, the sudden regulatory change in the snapper/grouper fishery impacted these crabbers.

Economically, removal from the snapper/grouper fishery caused significant financial harm to those who split their harvest between golden crab and reef fish by revoking their access to a large part of their previous harvest. Worse (for the crabbers), the fish trap ban pushed some displaced fishermen towards the golden crab fishery (then still open-access). Simultaneously, Pacific Northwest crabbers appeared again, following a decline in Alaskan crab stocks. They outfitted a 180 foot vessel to harvest and process large amounts of golden crabs on the central Florida coast and trapped with an 85 foot vessel off Florida's northeast coast (SAFMC 1995). The number of vessels in the golden crab fishery climbed steadily from 2 to 38 in the first 8 months of 1995 during the time the crabbers termed the "Second Gold Rush".

Many of the golden crabbers felt betrayed by the South Atlantic Fishery Management Council's decision to spare the larger groups of fishermen who used mechanized reels, while effectively removing the crabbers from the snapper grouper reef fishery. In a 1995 interview, Dick Nielsen recounted the years spent fighting against the fish trap ban and estimated the financial and legal cost to his family at \$110,000 (Childers 1995). These themes were reiterated in our group interview:

- Crabber A: Three hundred fish traps we had to eat; no money to train us for jobs, no money for a buyout, no nothing; you guys eat them traps, you and your family...
- Crabber B: For pennies on a dollar those traps we sold.
- Crabber A: Yes, we did, too. We were afraid of –
- Interviewer: You were afraid that it would happen again?
- Crabber A: Yes.
- Crabber C: Exactly.

The crabbers learned the importance of paying attention not just to the technical aspects of crabbing, but also to the political and regulatory activities surrounding their work. From this point on, crabbers were acutely aware of the impact of regulatory authority and were determined to influence how that authority was wielded. This change in approach to regulation was noted by both the crabbers themselves and Council staff in interviews. Both the South Council and existing crabbers recognized the potential for the rapid influx of new effort to quickly overfish and deplete the stock of such a slow-growing species. Overcoming significant concern about his previous interactions with the Council, Dick Nielsen led the crabbers' approach to the Council to establish a Fishery Management Plan that would restrict participation in the fishery and formalize many of the informal standards that the Florida crabbers had already developed to preserve the existing stock.

4.4. The golden crab fishery management plan as a tool for co-management

The golden crabbers asked the Council to codify many of the informal rules they had previously developed. We confirmed the crabbers' involvement through our interviews with Council Chair David Cupka and Deputy Director Gregg Waugh. The Golden Crab Fishery Management Plan was created in 1995 and was subsequently amended four times.

Both the initial plan and amendments were developed in close cooperation between the crabbers and the Council and can be described as a co-management regime. Following Ostrom (2007), we identify the following elements as part of the formal Golden Crab Fishery Management Plan or part of the informal governance system. The characteristics described below reflect the cooperative nature of the governance arrangement.

4.4.1. Operational rules

The crabbers had developed a number of practices to protect the slow-growing golden crab stock, including requiring escape rings for undersized crabs, limiting the harvest to male crabs, and requiring biodegradable panels on crab trap doors. Furthermore, concern that the “big [Alaskan] boats were going to come in and vacuum up” (group interview, Crabber A) the golden crab stock also led the longstanding golden crabbers to request that the Council place limits on maximum boat length and disallow on-board processing of harvested crabs (SAFMC 1995).

4.4.2. Network structure

Because of the technical difficulties of retrieving strings of traps from the deep ocean floor without the use of buoys, crabbers needed to avoid laying traps in the same areas lest the lines get dangerously entangled. Golden crabbers communicated about where traps were deployed and if they had been moved. The newer boats from the Pacific Northwest were less communicative and in some cases had continued to use buoy-dependent techniques from their home territories. The longstanding golden crab Fleet asked the South Atlantic Council to formalize their current informal fishing territories by creating three fishing zones (Northern, Middle, and Southern, see Figure 1) in the Fishery Management Plan so that crabbers could keep track of the movements of all local crab boats and limit the potential for gear interactions. Crabbers were restricted to the zone listed on their permits.

From our group interview:

Crabber B: We'd have certain areas, we'd set up one another, but we never cut one another. And if we moved the gear by grappling, we'd always be on the phone telling one another where it was. We always communicated, let's put it that way, if there was a problem out there.

Interviewer: Have complete outsiders tried to come in? You've mentioned some of the big boats coming in. Has that been the only real time outsiders that have tried to come into the fishery?

Crabber C: For the most part. There were always a couple of guys here and there, I guess.

Crabber A: I think those big boats came in; they had some big gear and heavy rope.

Crabber B: The Gulf Stream got them.

Crabber A: They thought that they could do it.

Crabber C: And they set all over each other and they just made a mess out of it. They didn't work with anybody; they made a mess.

Crabber B: You heard of the reference to the small vessel subzone. That was sad because of four of those smaller vessels and because of the gear conflicts that go on with the big vessels and the small vessels.

Interviewer: Like you said, they weren't communicating?

Crabber C: They were "independent."

4.4.3. Property-rights systems

The crabbers requested that the Council end the fishery's open access status and replace it with a limited entry system. Only established crabbers were issued permits.⁴ Permit holders were based almost exclusively in southeast Florida (primarily crabbers who occasionally fished) or in the Florida Keys (primarily fishers who occasionally crabbed). Furthermore, as described above, rights to harvest crabs were allocated into zones that were based on the crabbers' home ports. The zones are sized to allow clear lines of communication between active crabbers. The intent behind that regulation was safety-based (not crossing up the pot lines) but its effects are economic as well. While all the zones share a species-wide TAC, these port-based zones of crabbers are mindful of each other's gear and safety – creating most of the elements of a de-facto Territorial User Rights Fishery (TURF) (Dahl 1988; Gonzalez et al. 2006; White and Costello 2011; Wilen et al. 2012) in which as a group the crabbers hold property rights for a specific zone and take on responsibilities within that zone. During our group interview, the Fort Lauderdale crabbers were aware of the New England "lobster gangs" (Acheson 1988), and saw parallels in the development of their own territorial system; they also noted that Bill Whipple and Dick Nielsen were originally from the same area of New England and had American lobster experience.

This system developed organically, and the ever-present threat of tangled lines acted as a deterrent. During an Advisory Panel meeting (see below), one crabber stated:

...when this all first started, you know, commercial fishermen are kind of territorial and they have their spots, and also there is a pecking order and seniority and stuff like that that comes into play with commercial fisheries not only here but elsewhere. It is so deep and it's so dangerous that you don't want to tangle. When we things started, we were in an area and you couldn't come into that area because you're going to tangle, so the right thing to do was to go to your area (SAFMC 2012a, 17).

4.4.4. Collective-choice rules

The Council developed a Golden Crab Advisory Panel to assist in the long-term management of the species and its unique habitat. Both Dick Nielsen and his

⁴ Eligibility criteria for permits were to have either landed 600 pounds of golden crab by April 7, 1995, or to have landed 2500 pounds by September 1, 1995.

son, Richard,⁵ were members of the Advisory Panel, with the latter serving as Panel Chair. During our interviews with crabbers and Council members and staff alike, all mentioned the very positive relationship that has developed between the Council and the crabbers. The Council members and staff showed great respect for the willingness of the crabbers to return after the fish trap ban and work cooperatively on management issues. Following the discovery of deepwater corals in the crabbers' areas of activity, the Golden Crab Advisory Panel worked with the Council as it designated Habitat Areas of Particular Concern to prevent deepwater trawling and other potentially coral-damaging fishing activities (ENS 2009).

Although a number of permits were initially issued in the Florida Keys and Central Atlantic coast areas, crabbers in those areas were much less likely to specialize in the species, and the heaviest activity remained off the Fort Lauderdale area (the Middle Fishing Zone). With most of their businesses dependent on to the decisions of the Council, the Middle Zone crabbers continued to remain engaged with the political process as members of the Advisory Panel even after the management system stabilized. Council staff confirmed that crabbers from the Keys or other areas increasingly declined to participate on the Advisory Panel or attend Council meetings, probably because they had much less at stake in this one particular fishery (Olson 1965). Thus, the Middle Zone crabbers eventually came to represent the fleet in the management process. While this configuration of representation came about as a natural results of crabbers' varied levels of participation in the fishery, it had significant consequences as it led participants in the regulatory process to believe there was a single block of crabbers, when there was a greater diversity in crabber interests.

4.5. Request to add an individual fishery quota (ITQ) system

Following the establishment of the Golden Crab Fishery Management Plan, the fleet was small enough that members continued to abide by informal rules such as communicating fishing effort to minimize gear conflicts. At this point in time, the fishery could be characterized as a successful co-management regime (Plummer and Fitzgibbons 2004; Pomeroy and Rivera-Guieb 2006; Yandle 2006). Indeed, in interviews both Council staff and leadership described it as a co-management regime. Upon learning that the Council would be establishing quantitative catch limits on each of its fisheries, members of the Advisory Panel approached the Council and asked to have the opportunity to present data to the Councils' Scientific and Statistical Committee (Rau et al. 2009). They subsequently received a fleetwide catch limit of 2,000,000 lbs based on the small size of the fishery and relatively low level of exploitation (SAFMC 1999, SAFMC 2010). This is approximately quadruple than landings averaged from 2000 to 2009, providing substantial room for the fishery to grow (Crosson 2010).

⁵ In 2003, Richard Nielsen was tragically killed at sea while deploying a line of golden crab traps.

Surprisingly, the Advisory Panel also requested that the Council consider an Amendment to the Fishery Management Plan that would, among other reforms, establish a catch share system developed around individual transferable quotas in the fishery. They submitted documentation that provided reasons why a catch share system would resolve their worries about the future direction of the fishery (Whipple and Rau 2009). In this documentation and our group interview, the crabbers identified three reasons for wanting ITQs: new technology, the need for increased flexibility, and the need for continued co-management.

4.5.1. Impact of new technology

In 2008, crabbers began using refrigerated circulating seawater systems onboard to quickly chill the harvested live crabs back down to the cold temperatures of their native habitat on the deep ocean floor. This practically eliminated the previous severe mortality rate of up to 80% 6 days after harvest. It made the fishery more economically attractive to new entrants and allowed the shipment of golden crabs to new markets, including China, where it is marketed as a North American version of Australian crystal crab (*C. albus*). In turn, this led to increases in dockside prices for their catch. Some crabbers believe that increased demand and prices will lead to renewed interest in the commercial harvest of golden crab from outsiders who will not cooperate with the existing norms. This concern became acute with the new regulations to protect the deepwater corals adjacent to golden crab habitat – as stated by a crabber during an Advisory Panel meeting,

If you do tangle up with somebody, too, where you could be drifting, to clear yourself out. I don't know how long it would take, hours, probably, and by that time you may drift into some of the sensitive areas of the coral (SAFMC 2012a, 16).

Crabbers expressed concern that a single inexperienced permit holder could directly or indirectly cause coral damage, which would negatively affect the entire fleet. Given the behavior of outsiders during previous “gold rushes”, they have little confidence that new entrants will work with the Council and with the existing crabbers.

4.5.2. Need for increased flexibility

Proponents of ITQs emphasized that their proposal would not replace the existing system of regulations but would augment it. Instead of having to sell a permit – and allow a new entrant unfettered access to the catch – they could choose to lease quota gradually before deciding whether to make a permanent sale. Essentially, they saw ITQs as giving existing crabbers control over new entrants. As the crab fishery continues to supply a growing market, the crabbers could also ensure that the Council would not have to impose seasons or other market-disrupting mechanisms to keep the total catch within the Council's prescribed quota.

4.5.3. Need to continue cooperative management

Many crabbers are aware of the Federal interest in catch shares (NOAA 2010). One of the longstanding lessons from fleet members' experience being removed from the snapper grouper fishery was the need to adopt a strategy of being proactive with the regulatory process. In the group interview, ITQ proponents expressed a preference to adapt this potential management change to their existing systems.

Crabber C: It's kind of ahead the curve. It's an extension of how the Nielsen family started the management plan in the first place with the fishermen being, like, we see this coming.

The Whipple and Rau (2009) letter to the Council expressed a hope that an ITQ regime would necessarily prompt increased monitoring by law enforcement – an unusual stance for members of a commercial fishery. But they also described how tightening regulations in other fisheries were leading to a renewed interest in golden crab.

4.6. Discord in the pursuit of a catch share program

The South Atlantic Council began drafting an amendment to the Fishery Management Plan focused on an ITQ-based catch share program in 2010 (SAFMC 2012c). The principal components of the proposal were to develop an individual transferable quotas program for the fishery, define initial allocation and transferability rules, set a cap on ownership of shares, and lessen or eliminate restrictions on fishing zones and maximum boat lengths for permitted boats. For the initial 2 years of development, the proposal gathered little notice and no dissent in public hearings. Council sessions were mostly dominated by discussions of the economic hardship in various overfished snapper and grouper fisheries, with golden crab items commonly allocated to an hour or less of time during 5-day Council meetings. The Golden Crab Advisory Panel met in January 2012 and finalized its recommendations to the Council, again without dissent. We conducted our group interview shortly thereafter, before discord emerged. The Council prepared to finalize the proposal during the first half of 2012.

During an official public input session in March 2012, for the first time, permit holders from outside the Middle Zone area spoke in opposition to the individual transferable quotas proposal, as did a Florida Keys commercial fishing representative. Crabbers from the Keys stated that they are multi-species fishermen, with golden crab comprising only one part of their fishing business, and that there was no biological need to introduce catch shares into management. The Middle Zone crabbers rebutted that the opposition was new, that they had been speaking with all of the permit holders for several years, and that the source of the opposition was non-crabbers eager to prevent an ITQ precedent for other fisheries (SAFMC 2012b). At the Council's June meeting, further emotional debate erupted during public hearings, focused primarily on ITQ allocation issues

and philosophical objections to ITQs. In response, the Council ordered a mediated discussion of all permit holders be held, with the goals of finding the basis of the opposition and looking for consensus among the crabbers (SAFMC 2012d,e,f).

The crabbers spent a full day in mediation in August 2012. Staff provided all permit holders a list of their projected personal catching rights allocations under the different options and information on the current landings, which were projected to a million pounds by the end of 2012. The Middle Zone crabbers argued that increased vessel monitoring and individual accountability were needed to protect habitat and biomass and that the potential capacity in the fishery would overwhelm the fishery catch limit, perhaps within a few years. Crabbers from other areas stated that the fishery was not overfished, existing regulations had worked well to protect the fishery and crabbers alike in the past, and that individual transferable quotas would force most permit holders to buy more shares in order to grow or maintain their businesses. During the mediation, the permit holders requested and received an opportunity to hold a private, unrecorded caucus. Nonetheless, they were unable to overcome their differences.

At its March 2013 meeting, the South Atlantic Fisheries Management Council shelved the proposal to create a catch share program for the golden crab fishery, citing a lack of agreement among the members of the Advisory Panel (SAFMC 2013).

5. Analysis

In the aftermath of the March meeting and the decision to abandon the catch share program, a key question is: why was the proposed catch share program not adopted? More specifically, what explains the dynamics behind this decision? Why did members of the fleet (particularly longstanding members) push for new management? Conversely, why did other members of the fleet resist such a change? We see four causes of disagreement. The economic and biological condition of the fishery were strong, reducing the sense of urgency often accompanying the adoption of an ITQ program. In this setting, not driven by crisis, subsequent disagreements over the allocation of catching right (rent seeking) combined with differing business models, and created an insurmountable disagreement about the nature of the fishery and whether there was a need to change the existing regulatory system (rules-driven coordination costs). Below, we explore each of these components in detail.

5.1. Economic and biological condition of the golden crab fishery

Historically, fisheries that adopted ITQs or catch share regimes were often under severe economic and/or biological stress before adopting ITQs (Deweese 1998; Eytþórsson 2000; Arnason 2002; Yandle 2008). That is not the case here, allowing the crabbers an opportunity to more thoroughly examine and think through the long-term implications of adopting such a program. Golden crab revenues more

Table 2: Summary of golden crab economics for 2010.

Total landing revenue	\$1,133,522
Total operating costs	\$824,516
Fleet net revenues (Profit)	\$309,006
Fleet assets	\$1,476,500
Fleet return on assets	21%

than tripled between 2004 and 2009 (Crosson 2010).⁶ Our analysis updated those results with revenues and costs data from an economic survey. We found that the golden crab fishery was remarkably healthy from an economic perspective (see Table 2). All of the golden crab operations were profitable in 2010, with a return on assets⁷ for 2010 of 21%. In comparison, the shrimp industry in the Gulf of Mexico had a negative return on assets in every year from 2006 to 2009 (Liese et al. 2009; Liese and Travis 2010).

Nor were the crabbers facing imminent harvest restrictions. Annual landings have not exceeded one million pounds since 1997 and have been below 800,000 pounds for the past decade (Crosson 2010). Given a healthy economic return on investment and a fleetwide quota over double recent landings, the golden crab fishery does not fit the profile of fisheries that have historically adopted ITQ programs as part of a fishery rationalization process.

5.1.1. Disagreement over the allocation of quota

We would have been surprised to learn of an ITQ regime negotiation that did not contain disagreements over the initial allocation of catching rights. This is well documented in the literature (Deweese 1998; Squires et al. 1998; Eythórsson 2000; Arnason 2002; Matulich and Clark 2003), and has been described as rent seeking (Bergland et al. 2001). In this case, the evidence of rent seeking is mixed. As described above the crabbers were not faced with immediate pressure of catch reductions. Indeed, the golden crab fishery has received a fleetwide quota that is over twice the size of any year's landings over the past 15 years and over nine times that of its lowest point in 2004. Thus, even those with a relatively small allocation would still receive more than their present catch.

Nonetheless, there was still considerable maneuvering and concern about quota allocation. In public comments in both March 2012 (SAFMC 2012b) and June 2012 (SAFMC 2012d), opponents critiqued the "fairness" of allocation. During the mediated permit holders' meeting and in both the formal statements of proponents (Whipple and Rau 2012) and opponents (Almeida et al. 2012)

⁶ In that report, data was limited to the Accumulated Landings Series (ALS) and logbook programs of the NMFS and the commercial trip ticket program of the state of Florida; none of which included business costs.

⁷ Calculated using the National Marine Fisheries Service Southeast Science Center standard method of dividing the fleet's net revenue for the calendar year by its assets.

of ITQs, we observe a shift in expectations of future catch allocation. This shift was at least partially based on every crabber's perceptions of how they could or could not grow their businesses within the new quota allocation. While they still would receive a greater allocation than they had in the past, there was now a defined upper bound on growth (unless they bought additional catching rights). At the mediation, permit holders convened a private caucus wherein they presumably negotiated directly with one another on allocation alternatives.

This disagreement can be interpreted as classic rent-seeking. Participants have a fundamental disagreement over how to allocate the ITQs and associated wealth anticipated to flow from these rights. The literature leads one to expect rent seeking to emerge in this situation (Ostrom et al. 1993). Proponents of the ITQ repeatedly indicated their intention to grow their businesses and argued that ITQs would protect those business decisions by ensuring a more predictable supply if and when the fleet catch meets the new quota. In contrast, opponents cited concerns about the "fairness" of certain permit holders relatively large shares, and their worry about not being able to grow their business in the future.

While rent seeking was clearly present in discussions, it is not the sole reason for the failure to adopt ITQs. Given the highly technical challenge of trapping for golden crabs, it is unlikely the value of the ITQs would quickly rise as in fisheries at full capacity with large numbers of participants. Quota prices in the only existing ITQ (for wreckfish) in the South Atlantic Council's jurisdiction were depressed for the first decade of the program while the fleet was unable or unwilling to harvest at full capacity (Waters 2002). Opponents of the ITQ proposal stated that (while they wanted the option of growing their catch) they did not intend to enlarge their catch of golden crab unless other species became unavailable, and perceived the current system as the best provider of that flexibility. They also outlined concerns over institutional design issues that went beyond simple rent seeking. (These concerns are discussed in detail below.) These statements illustrate that rent seeking over quota allocation clearly occurred, but rent seeking alone does not explain the decision to not adopt ITQs. As summarized by the moderator of the mediated discussion,

[T]here are entities in the fishery that there is no way that a catch share – and under any format. There are other people who would say a catch share might work I get enough pounds allocated to me. Then there are still other people that it sounds like that there are alternatives that are currently in the amendment that they would be happy with (SAFMC 2012g, 65).

In addition to rent seeking, fundamental differences in business models, and the resulting regulatory priorities, were also key issues. These differences, while still transaction costs, are better described as "coordination costs" – specifically disagreement over the rules that govern use of the resource.

5.1.2. Disagreement based on business models

Another factor evident during the permit holders meeting was the influence of different business models. The Middle Zone crabbers exclusively or near-exclusively harvest golden crabs while other crabbers' harvests are diversified. As stated by an ITQ opponent during mediation:

We do multispecies. We do kingfish, we do lobster, we do mackerel, and we do golden crab. We fish; so it's hard to put a date and time on when we do things and when we don't do it, but it is seasonal for us. When it ain't right to go do something, we go crabbing (SAFMC 2012g, 16).

This qualitative observation is supported by an analysis of historical catch. From 2007 to 2011, golden crab constituted 99% of the landings value of the ITQ supporters in the Middle Zone but only 37% of the landings value of the ITQ opponents elsewhere (see Table 3). These approaches are what Smith and McKelvey (1986) label the "specialist" and "generalist" approaches to fishing. Specialists are dependent on few species and seek regulatory stability. Generalists adapt their fishing to what is available and are resistant to regulations that would limit their ability to adapt to differing abundances of species (whether from biological or management causes). Their preference is for flexibility over stability. Essentially, ITQs reinforce the specialist business model, and potentially threaten the generalist's business model by reducing flexibility.

5.1.3. Disagreement on the need to replace an existing, successful regulatory system

The final disagreement was perhaps the most intractable. Opponents of ITQs repeatedly cited the longstanding success of the current regulatory system as a reason not to change management. During the mediated permit holders meeting, a Keys crabber asked the other permit holders:

I would like to find out who has any concern of the way it's been managed until now. What concerns do you have about the way it is being fished with facts, not speculations about what's going to happen. What is wrong with it the way it is managed now? (SAFMC 2012g, 27).

Table 3: Characteristics of ITQ proponents and opponents.

	ITQ proponents	ITQ opponents
Fishing zone	Middle	Northern and Southern
Permit holders	3	4
Permits	6	5
Business model	Specialist	Generalist
Golden crab value/all species value	99%	37%
Management involvement	Heavy	Light
Near-term gold crab business plans	Expansion	No expansion
Social context	Pro ITQ	Neutral to anti ITQ

This opposition extended beyond the ITQs to other proposals in the amendment that would have undermined the existing zone system, which had in many ways become a de-facto TURF system (see property rights section, above). Among many crabbers, this zoned system was a key component of the regime's success. However, the new amendment would have allowed vessels to cross out of their zones:

...when you start stacking permits and vessels crossing lines with those permits, nobody knows where each other's gear is. For example, I don't intend to do this, but if, say, somebody got a big boat and they go from my zone to their zone or something, northern zone to middle zone, they could be dragging through everybody's gear. I've seen it happen in the lobster fishery (SAFMC 2012g, 26).

In their formal position paper, these crabbers stated that "there are no gear conflicts and no user conflicts because permit holders fish by zone" (Almeida et al. 2012). Without evidence of conflicts, they saw no need to risk change.

The Middle Zone fleet, while not contesting the success of the existing management system, noted that the landings and prices were on a sharp uptick. They also stated the number of participating boats had recently increased to nine in the current year (Whipple and Rau 2012).⁸ Combined with their memories of past surges into the fishery in the eighties and early nineties, they stated the fishery needed additional management now, before history repeated itself. Thus, the third fundamental disagreement was over the value of the zone system and the de-facto TURF system it created. ITQ opponents highly valued this approach, crediting it with enhanced cooperation and reduced user conflict. We characterize this difference as "coordination costs" as it is again was a disagreement over the how to best structure the rules governing use of the resource.

6. Conclusion

The golden crab fishery presents an unusual case study of a small, apparently successfully co-managed fishery in which one contingent of crabbers sought to introduce an ITQ-based catch share program into the fishery. Their reasons for this approach were different from those usually noted when an ITQ program is introduced. They sought to control entry to the fishery and provide predictability for future fishing effort, but this fishery was not under the biological or economic stress that is often associated with a fishery entering ITQ management. The absence of this stress may partially explain why ITQs were eventually not adopted.

⁸ During the review process for this article, information on 2012 landings became available. In 2012, eight vessels landed 970,714 lbs of golden crab, compared to five vessels landing 648,095 lbs in 2010.

A variety of high transaction costs impacted this process. First, disagreement over how catching rights would be allocated was a primary force in derailing the catch share program. This disagreement was a strategic cost in the form of rent seeking. But there were also other more fundamental differences at work. The different incentive structures and constraints of the specialist and generalist crabbers brought into focus different long-term visions of the fishery between the two groups, and their different beliefs about how the fishery should be managed – coordination costs. These high transaction costs, in the form of both strategic costs (rent seeking) and coordination costs (negotiating the rules that govern the fishery) proved to be insurmountable and resulted in the shelving of the both ITQ proposal and changes to zone management.

This case illustrates the subtlety and importance of property rights and transaction costs in institutional design. In the golden crab fishery, opposition initially appeared to be simple rent-seeking (in the form of desire for greater ITQ allocation). While that rent seeking was certainly a component, there were also more fundamental issues of institutional design (coordination costs) that went un-recognized for much of the policy development process. From a policy perspective, this case illustrates that analysis of proposed institutional changes through the theoretical lens such as we use (after the fact) here, may be a useful approach. From a theoretical perspective, this case illustrates the usefulness of these theoretical tools in teasing apart a complex case to gain an understanding of the complex dynamics at play when dramatic changes to property rights and institutional arrangements are proposed.

When considering the future of the Florida golden crab fishery, we note that the current divergence in business plans between the crabbers in the different fishing zones has the potential to cause disruption in coming years if all parties act according to their stated preferences. If the fleetwide quota is exceeded, then new management measures will have to be implemented that may not integrate well with the existing zone system. The simplest solution to this dilemma would be to build upon the success of the zone system by dividing the fleetwide quota between the different fishery zones, creating a true TURF – provided the Council can find zone allocations acceptable to the different groups of crabbers.

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