

Institutional Analysis of the Chiguana Fishery, Venezuela

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1 Part I: Static Analysis - Collective action

Chiguana is a small Venezuelan community on lower end of the Gulf of Cariaco, on the northern shore. The original study, which was carried out in 1971, catalogues an action situation with approximately 343 residents. At the time of the original case, the fishery was in decline due to deterioration of the fishing zone and market conditions. The key resource is fish, principally *M. lisa*. The fishery of interest was used mostly by the immediate community but was embedded within a national, capitalistic regime. At the time of study, the local fishery was in decline due to deterioration of the fishing zone and competitive market conditions. Overall, the collective action demonstrated through this case was deemed a failure. This case study is part of the original Common-Pool Resource (CPR) database. A summary of the original CPR coding conducted in the 1980s by Edella Schlager and Shui Yan Tang at Indiana University may be found here.

1.1 The Commons Dilemma

- The potential appropriation problem was not mentioned in the study. Fishing was inherently prohibitive due to the financial investment it required.
- The potential under provision of public infrastructure was not overcome. The challenge for Chiguana was the lack of appropriate rules that set a total allowable catch. Hence, the system faced under-provision of soft public infrastructure (rules) that would have guided more sustainable practices of the fishery and achieved better economics outcomes. Several of Ostrom's design principles were absent from fishery management in Chiguana.

1.2 Biophysical Context (IAD)

- **Natural infrastructure:** In Chiguana, sardine (*M. lisa*) is the only fish species abundantly available for capture and sale. Other fish populations are too transient or do not frequent the Gulf as much. The fishing zone available to fishermen in Chiguana is 15 square kilometers. In this area, heavy rain, sun, and wind vary seasonally. A problem for fishermen arises in September-January when flooding of inland lagoons off the Gulf causes eutrophication and fish die-offs. Flooding pushes large debris, like logs, into the Gulf, preventing large nets and power crafts from being used. Spring wind also causes the stratified lagoons to mix stirring up sediment that muddies water, which makes it difficult to catch fish. Fishing conditions are therefore subject to great uncertainty when compared to other livelihoods, which explains low investment in the activity at that time.

Most fishing production occurs from October–December when the ocean tide is highest and raises the depth of the Gulf. This coincided with the schedule of the agricultural sector. Just prior to harvest, farmers are low on provisions so they would purchase fish. After harvesting their crops, farmers would have more money from selling their goods, so they had the capital to buy fish. Additionally, night fishing is sometimes practiced in spring to fall because the luminescence of the aquatic vegetation allows fishermen to find and count schools more easily.

Natural barriers may have affected commerce. A mountain chain inhibited communication with the villages on the northern side of the peninsula facing the Caribbean while the Gulf was between Chiguana and the south.

- **Hard human-made infrastructure:** Few people invest in expensive fishing gear, so methods and vessels are relatively basic. Investment in higher capacity fishing technology was not common, though there were a handful of full-time fishermen. Crews average six to seven men. In the 1970s, the introduction of synthetic materials (e.g. nylon and wire line) and motorized vessels began to replace artisanal techniques and improved efficiency, but land activities detracted from serious investment and specialization. Boating and equipment are personal assets of the fishermen. As a precondition to fish, one needs enough money to invest in fishing gear, which typically only residents that specialize in the practice of fishing do as opposed to other crafts, like farming and livestock raising. Owners of fishing equipment tended to invest in other activities to offset the risk of fishing. Fishing equipment ownership is often a joint venture between two people. The main fishing technique was a type of net called a ‘tren lisero’. Gear and boats suited for pelagic zones were not common, despite fishing conditions being less muddy there, as they were more expensive. Smaller boats adapted to low water depths were preferred because the entire fishing fleet in Chiguana was manually propelled, which was due to lack of investment and because the Gulf has calmer water than the open sea and can be maneuvered with a small, less mechanized vessel.

Some fishermen had private wharves near their homes that line the Gulf, as other tradesmen owned property further inland. Public wharves are available for registered fishermen to dock their boats without specification as to the provider of this infrastructure. Four years prior to the original study, the community was presumably provided with a rudimentary water system that had shoddy access. Electricity was introduced at the same time. No reliable road existed, so the community used boats for traveling across the Gulf to access larger towns. A sill was at mouth of Gulf to control water level. Nearby sardine operations that built up in the 20 years preceding the case competed directly with larger fish species that relied on sardines for food. In effect, the larger fish that were sought-after by fishermen were forced to migrate out of fishing zones.

1.3 Attributes of the Community (IAD)

- **Social Infrastructure** Chiguana was a very insular society. The populace was mostly black, poor, and uneducated. There was a prominent gender bias, yet one-third of homes were headed by a matriarch who was typically a major buyer of fish. Half the population was under the age of 15, and many young males worked as crew members. Emigration was growing, as the younger generations were attracted to opportunities

in urban centers. The impetus was likely the deteriorating environment that limited historical sources of income. The community relied in part on fishing as a means for subsistence and income. Fishing yields primarily went to families and locals from whom crews could reap a modest profit, but catches were never substantial enough to satisfy large groups. Crew composition was largely dictated by kinship because family relations and culture were held to high esteem in Chiguana. Strong community ties enforced local norms. The practice of fishing followed an annual cycle mostly dictated by land activities. Fishermen varied in their level of investment in fishing based on their involvement in other land occupations, which were a more reliable source of goods and income. Fishermen tended to demonstrate a willingness to forgo a larger salary elsewhere to invest in fishing.

- **Human Infrastructure** Fishing required skills and techniques passed down by elders and acquired through experience. Traditional beliefs influenced their understanding of the ecosystem (e.g. rains washed evil organisms to the bottom of lagoons). Fishing was a collaborative process, and catch was shared among the crew. The small fishing zone meant crews could talk about the size and location of fish schools. Higher status individuals could conduct better economic negotiations and exchanges. Fishermen had the opportunity to establish their own collective choice arrangements, since the government had a minor enforcement presence (design principle #3).

1.4 Rules in Use (IAD)

Position Rules: 1) Skippers, owned boats and maintained a crew, 2) Community members, 3) Consumers, 4) Crew members, who came from the community and also acted as consumers, 5) Matriarchs, who were female heads of household in the community and purchased from the fishermen at a price determined by the crew and skipper, 6) Permanent retail buyers from outside Chiguana who buy fish at the market price set by regional offices, 7) Government officials at the regional and national levels who ostensibly set the rules, regulated disputes, controlled price of fish, and penalized lawbreakers.

Boundary Rules:

- Non-members of the community are likely not able to fish because outsiders were viewed with skepticism.
- Only men were allowed to fish.
- Dropping out of a crew was frowned upon and lessened one's chances of being hired on another boat.

Choice Rules:

- Fishermen may fish as much as you want
- Skippers may hire whoever they want (blood relatives or otherwise)
- Fishermen may exchange goods between households
- Fishermen may sell in the larger, regional market to permanent buyers
- Matriarchs can work outside of domestic sphere to provide for family, but male relatives are obliged to help

- Fishermen may fish in coastal and/or pelagic zones where fishing is permitted
- Fishermen may fish at any time of day or year but most engage October to December
- Fishermen may work full-time or part-time
- All skippers, sellers, and crew must register with the fishing authority
- All gear owners must pay a registration fee, obtain a permit, submit fishing plan and intentions, provide stats on their catch, prove literacy
- Gear owners must declare the nature and value of their fishing gear and amount of production
- Small gear owners must use cast net or else they'll be fined and have equipment confiscated
- Fishermen must comply with hygiene/ sanitation requirements/ health standards
- Fishermen must dock at a personal wharf or at registered wharfs

Aggregation Rules: Skippers were not necessarily entitled to ultimate authority, as they took the feedback of the crew seriously in decision making, e.g. how to sell was debated amongst skipper and crew and was not an easy process.

Scope rules:

- Gas lamps to attract fish are forbidden within three miles of coast
- Purse seines are prohibited in the coastal zone
- Crews of 3 or more people must wear designated colors to demonstrate compliance with national fleet
- Behavior in the market is controlled in part by jurisdiction of state but fee and equipment inventory is delegated to state and local authorities, like Fisheries Offices
- Must not fish in restricted zones outside of designated commercial fishing area

Information Rules: Fisheries Offices determines prices for the season based on demand and stock

Payoff Rules: Fishermen were paid in cash and/or share of the catch; the allocated portion of the catch was based on the amount of work contributed and money invested in equipment

1.5 Summary

At the time of study, the lack of (1) formal exclusion rules (2) scope rules defining total allowable take and (3) a platform to facilitate decision making (public infrastructure) and discussion between actors were the most significant faults of the institutional arrangements. Granted, fishing was inherently prohibitive because of the financial investment it required. There was little scientific data that would inform a long term plan to guide fishing practices. Despite ostensibly being governed by national jurisdiction, enforcement was particularly weak, though not sufficiently described. The people of Chiguana seemed to be a relic of

traditional beliefs and practices. Social networks and strong kinship ties dictated the use of resources *in lieu* of economic efficiency and/ or ecological sustainability. Many young, community members were emigrating, driven out by deteriorating environmental conditions that were not profitable in an area mostly endowed with natural capital. The community had little money to invest in risky activities, like fishing. These factors suggest that the future economic stability of the community was tenuous.

2 Part II. Dynamic Analysis - Robustness

2.1 Update on the Commons Dilemma

No follow-up research has been done on Chiguana. Information is available on the national economy and population as a whole, which provides some indication of how communities, like Chiguana, may be faring and have evolved since the 1970s. Recovering data on Chiguana was challenging, so the following assessment is a snapshot of changes Venezuela has experienced, which undoubtedly impact fishing that takes place in Chiguana.

In 2013, due to scarce availability of information pertaining directly to Chiguana, few specifics of the socio-ecological system can be inferred. Despite environmental degradation that was reported in the mid 1970s, the biophysical conditions of the fishery today are not reported since conservation efforts, offensive human activity, and shifting climate have affected the area. Laws regulating commercial fishing have helped sustain the conduct of artisanal and subsistence fishing, so there may have been opportunity for small-scale fishermen to earn a modest profit. It is unclear if the State has implemented new rules or taken a more active role in the monitoring and sanctioning of fishing in Chiguana.

2.2 Shocks, Capacities, Vulnerabilities

External shocks:

...to and of the Resource (link 7 to R):

In regards to the biophysical conditions of the resource, it is probable that the overall capacity of the system to cope with shocks was faulted by the institutional arrangements. Low because the fishery in the 1970s already showed grim evidence of decline. A stark turnaround in the waning fish stock is doubtful since the stocks today are products of intense harvesting in the 1980s. The fishery located in the Gulf was highly susceptible to human activity, which deteriorated environmental quality. Since *M. lisa* are sensitive to habitat alternations, they migrated into deeper, inaccessible waters, limiting extraction of the resource. Plus, schools that were present were difficult to see through the turbid water. Sucre (the state that Chiguana occupies) self-imposed a fragility to the system by allowing sardine fisheries to wipe out the food for *M. lisa*.

Already climate change has impacted the availability of fish. Because of temperature increases, trade winds have mitigated, which tended to oxygenate coastal waters and stimulate phytoplankton growth. As a result, there is less food for higher trophic levels (<http://www.sciencedaily.com/releases/2012/10/121018094853.htm>). In many instances, coastal communities are vulnerable to climate change, which manifest as rising acidity and sea levels, a particularly salient notion for Chiguana, a community beset with rigid, non-adaptive practices.

...to and of the Public Infrastructure (link 7 to PI):

The institution governing the fishery was not diverse, and redundancy did not exist. Its focal fragility was the lack of enforceable soft measures. Monitoring (design principle #4) by state authorities had subsided since fishing in the area was atrophying. As a result, graduated sanctions were not described for the original case and none could be identified for today. Hence, the community was not noted to be challenged by authority (design principle #7), but in this case, that feature does not contribute to the sustainability of the CPR. No formal platform was said to exist to facilitate communication between government and community members. There appeared to be little conflict, so resolution mechanisms were likely endorsed by local norms (principle # 6). The institution lacked polycentricism most likely because nested organization was unnecessary for governing the resource (design principle #8). While Chiguana had deficient management of fishing, it appeared trivial to craft better strategies. Because the community did not invest heavily in the practice, they likely did not suffer if the fishery completely collapsed with time.

New laws since the 1970s may have enhanced the competitive edge of small-scale fishermen having access to enough fish and brokering good deals on the market, though this is fairly uncertain. In 2010, the Fishing Law eliminated trawling as a form of fishing and was intended to protect coastal biodiversity and increase production by small fishermen, who [had] petitioned governments to outlaw the technique for decades. Small-scale fishermen were important, as they supplied 70% of the nation's yield up until that time (<http://venezuelanalysis.com/news/4302>

). An offhand news report (http://axisoflogic.com/artman/publish/Article_62565.shtml

) asserted that two years into the ban, fishermen reported greater production rates and the reappearance of threatened species along the coast of Sucre. It is likely that this report was colored by government censorship and views.

...to and of the Public Infrastructure Providers (link 8 to PIP):

The government claims to be socialist but tends towards communism in practice perhaps due to their close political ties with Cuba, and the President is uneducated and deemed ineffectual by the public. Since Chavez took office, most industries that once profited the country, except for oil, which accounts for 95% of current export earnings, were eliminated (<https://www.cia.gov/library/publications/the-world-factbook/geos/ve.html>

). What used to be 80% internal food production prior to the present administration has now sunk to 20%. Grocery stores are critically low on supply, which erupts in tension (anecdotal information).

...to and of the Resource Users (link 8 to RU):

The resource users were vulnerable due to their socio-economic characteristics. Chiguana, like all economies small and large, was subject to globalization and competition by other sellers at the regional market (capitalism). Fishermen were at a disadvantage because of their juxtaposition in the Gulf, which perhaps restricted their fishing opportunities and concurrent potential to sell. In reference to the second design principle, there were disproportionately hefty costs for the small benefit of fishing. Fishing in Chiguana was probably replaced fully by other land-based practices that provide a more reliable, less costly source of protein with the exception of undocumented, personal fish catches.

2.3 Robustness Summary

The Chiguana fishery is not a robust system of CPR governance. Whereas the enforcement and governing structure was weak and overall attention paid to the resource was low, fish were not susceptible to overtake per se. The quality of the environment was the primary contributor to the fisheries decline. Had a greater abundance and diversity of fish existed within the fishing zone, fishermen could have improved their yield and made more money to narrow the cost-benefit margin as to substantiate the rationale to fish rather than invest in other occupations. Lack of enforceable soft measures and a non-diverse economy are also potential culprits.

3 Part III. Case Contributors

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