# Quintana Roo Lobster Fishery, Yucatan Peninsula, Mexico

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## 1 Part I: Static Analysis - Collective action

The Quintana Roo lobster fisheries are located on the eastern (Caribbean) side of the Yucatan Peninsula in Mexico and stretch along the nearly 900 km of coastline from the border with Belize in the south to the Gulf of Mexico in the north. The original case study divides the fishery into three regions: north, central and south and is based on fieldwork conducted from mid-1978 to mid-1980. It catalogues an action situation involving approx. 643 cooperative fishermen; lobster is the stationary resource unit. The key resources (natural infrastructure) in the system are the marine food web (shared). The key shared resource relevant to the commons dilemma faced by the community are lobster stocks and their productivity (common-pool). 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

- Potential over appropriation / poor coordination of appropriation: Commercial lobster harvesting in the south zone begins in August 1956, in March 1958 in the central zone, and sometime in the mid- to late 1950s in the north zone. By the end of the 1970s, the introduction of new technologies and focus on high-value luxury species to which cooperatives had exclusive harvest rights resulted in a de-diversification of the Quintana Roo fisheries to production of luxury species only. However, there is a significant gap in catch data during the early years of the co-op, making it difficult to gauge whether a commons dilemma existed. Author mentions a lack of historical data on the fishery and that existing historical records of capture and gear are unreliable and understate extraction rates (Miller 1982:184). Regulations are circumvented routinely and lobster capture rates fail to account for about 40-60 percent of total captures sold directly to restaurants and hotels (p. 186). Transportation regulations are also circumvented routinely, introducing further sources of error in catch reports. Black market sales of lobster will persist because of the lack of manpower for patrolling the states shoreline. Therefore, very little is known about the extent of the lobster resource and its ability to sustain increased fishing pressure.

- Potential under-provision of public infrastructure: There has already been evidence of unhealthy coral reef areas and diminished water quality due to shoreside development, as well as the potential destruction of nursery grounds such as mangrove forests. There are rules to avoid free-riding behavior (licensing of fishermen, assignment of campos to cooperatives, registration process to certify captures), however, fishermen resent

federal regulations due to inconsistent application of rules, i.e., fishermen being fined for infractions that were overlooked in the past (p. 189) causing some to become alienated and unwilling to cooperate with fishery officials. The text provides no evidence of a collective action forum for fishermen grievances. Accordingly, there is evidence of inadequate soft and human-made public infrastructure that ostensibly place the lobster fishery at risk (inferred).

## 1.2 Biophysical Context (IAD)

- **Natural infrastructure:**

  The stationary resource unit is lobster. Biological productivity levels in the area are high due to the abundance of reef and shallow coastal waters, which provide high abundances of photosynthetic organisms, such as coral symbionts, turtle grass, and mangrove trees. Upwelling events contribute to high productivity by efficient re-circulating nutrients throughout the reef ecosystem. The lobster season occurs from July to early September when the resource is most abundant. Lobster stocks were known to be plentiful prior to the 1960s, and the first commercial harvests were recorded in 1956. Landings were steadily increasing up to 20 tons by 1960. In 1969, landings data showed a decrease in catch to 10 tons, after which capture nearly doubled by 1979, with lobster being unusually abundant in February, March, and from August to October. Author indicates uncertainty over long-term consequences of lobster shelter use (p. 196) which in nursery areas have resulted in the increased capture of smaller lobster leading to successful lobbying by fishermen for reduction in minimum tail size by one centimeter (from 14.5 to 13.5 cm) (p. 198).

- **Hard human-made infrastructure:**

  Human-made hard infrastructure, both public and private, mediates the interaction between the resource and the resource users. Private technologies include gear for the preferred fishing technique of skin-diving (south and central zone) or scuba-diving (Isla Mujeres), which was introduced in 1960. Skin-diving consists of shallow-water dives with inexpensive gear (mask, snorkel, fins, and a 1 meter gaff made from the branch of a mul-che tree the end of which is sharpened and to which a large fishhook has been wired). Loans for gear purchases can easily be obtained during the lobster season and be repaid from the proceeds from the first several lobsters. Technology also includes increased use of lobster shelters/casitas (north and central zone) and plywood 6-meter skiffs powered by 6 hp outboards with inboard diesel engines in which fishermen travel to fishing hotspots. In terms of public hard infrastructure, roads to remote parts of the coast were opened, the advisory function of government officials was increased, and new fisheries offices were established. Three government-funded processing plants were built to produce ice for fishermen and serve as reception and processing centers for fishery products but their design did not adequately consider the water and energy requirements of the plants which are difficult to meet in the remote and freshwater-poor region. Furthermore, the lack of adequate roads challenges inland transportation of fishery products in the south zone.

## 1.3 Attributes of the Community (IAD)

- **Social Infrastructure**

Initially, the employees of PESCA, the national fisheries government organization, were civil servants that were for the most part locals who knew the fishermen and often were related. They were familiar with the local culture and remoteness of Quintana Roo which the author asserts resulted in a certain flexibility and reasonableness in interpreting and enforcing fisheries rules and regulations (p. 188). Increasing federalization of Mexican fisheries management eroded that system and as more outsiders were put in charge, it became more difficult to bend the rules and provide preferential treatment. In response to these changes and the manner and approach by Pesca staff, fishermen became increasingly resentful, especially when several were fined for infractions that in the past were overlooked. At the time of the report, many fishermen were determined to cooperate as little as possible with new regime (p. 190). Rules that were ignored include the 1968 prohibition on scuba gear use for lobstering (not enforced since the early 1970s) and the 1975 restriction on use of spearguns with scuba gear which remains in effect but is widely ignored (p. 195). After the cooperative was formed, many fishermen kept previous arrangements with fish buyers who sponsored them with loans, gear, and boats in exchange for a share of the capture and the exclusive right to purchase the rest. Although buyers were instrumental in organizing their own people into cooperatives, this activity allowed the buyers to retain access to the high profits of the fishery. In the central zone, the campo system has become an administrative nightmare due to the splitting of coops by disgruntled coop members which led to the splitting of the campo and increasing disputes over campo ownership and boundaries. Cooperative fishermen are generally local villagers which view coop membership as an opportunity to harvest high-value species exclusively and see little reason to diversify their operations. Furthermore, the demand for lobster by the local tourism industry coupled with the registration process that certifies captures and assesses taxes facilitates black market trade of lobster directly to hotels and restaurants.

- **Human Infrastructure**

  The human infrastructure in the Quintana Roo fisheries is generally believed to be good. Fishermen have good knowledge of the fishing grounds and they are highly skilled and experienced in harvesting lobster. However, their understanding of governance structures and resource extraction is tainted by a distrust of government outsiders and rules that are designed to incentivize the targeting of a limited number of high-value species which has resulted in de-diversification of the fishery and overexploitation of these marine species.

### 1.4 Rules in Use (IAD)

**Position Rules:** Lobster fishermen Fish buyer (sponsor with loans, gear, and boats in exchange for a share of the capture and the exclusive right to purchase the rest). Local representatives of the federal fisheries department (CONAPESCA), charged with enforcing regulations, issuing permits, and certifying legality of capture. Representatives of the National Fisheries Institute (INAPESCA) charged with providing data to assist planning, regulation, and management. Hotel and restaurant operators Tourists

**Boundary Rules:** Fishing permits for lobster, shrimp and conch are reserved for cooperatives. Permitting process assigns each cooperative a site (campo) where they have the exclusive rights to the resource. Any citizen has the right to join a cooperative as long

as they can establish that they are of good moral character.

**Choice Rules:** All fisherman may fish for scale and shark anywhere in the state (but co-op members generally limit this activity to their own zone to avoid suspicion of invading another co-ops zone and to avoid disputes). All fishermen must have identity cards. All fishermen must have the fishing permits/licenses necessary for harvesting various categories of marine life (except when fishing for subsistence or domestic consumption). All boats and gear must be registered by paying a minimal fee. Capture must be legally registered and certified by CONAPESCA officials upon landing for the transportation of the product to the market. Receipts for tax payment are necessary to obtain a permit for shipping, and these are checked at various checkpoints along the highway. Fishermen must not use scuba gear for lobstering (rule no longer enforced) Fishermen using scuba gear must not use spearguns, except to protect themselves from sharks. Fishermen must not capture lobster with a tail size smaller than 13.5 cm. Fishermen must not capture lobster during closed season (March 16 through July 16 - lobster spawning season).

**Aggregation Rules:** The text provides no information on specific aggregation rules within the lobster fisheries.

**Scope rules:** Government development policies to create the nutritional needs of an increasing population have created a monopolistic fishery that specializes in the extraction of a few luxury species for export and tourist consumption. Registration process which certifies the captures of cooperative fishermen provides an incentive to understate catch to avoid tax payments, including black market sale of lobster directly to hotels and restaurants.

**Information Rules:** Lack of historical data on the fishery and inaccurate reporting of catches is inhibiting knowledge of lobster stocks and impact of extraction rates and methods on resource.

**Payoff Rules:** Fishermen may sell their catch for market price and pay taxes or sell directly to restaurants and hotels on black market and pocket the profit. Disputes tend to occur when members of a co-op poach a skiff-load of harvest from another co-ops zone.

## 1.5 Summary

The federal focus on targeting the states fishery for increased production to provide more food and employment comes in conflict with the lack of effective monitoring strategies for catch, the control that fish buyers have over the development of cooperatives, and the problem of specialization in place of fishery diversification.

The general specialization in all zones for the production of luxury products, such as lobster, brought employment, social mobility, and some degree of financial independence among fishermen, yet it did not contribute significantly to the development of the infrastructure necessary to meet the countrys ever-increasing need for protein. In the original case, there was little mention on the success of enforcement in the lobster fishery. However, the situation with the conch fishery is likely a reflection of the lobster fishery as well. Given the high exploitation of lobster and conch and the scarcity of fish in Chetumal, monthly quotas were assigned to members by the co-ops administration set to lower catch levels in order to stimulate fishermen to return to scale fishing. However, these were generally ignored and officials were forced to put increasing pressure on the co-op to observe the quotas. Situations where registration of the resource had been significantly reduced while still being double what the quotas allowed were not uncommon. Black market trade also developed as a consequence. Despite concerted efforts to diversify the zones fishery, fishermen resisted and continued to have conch and lobster fishery as their primary activity, leaving Chetumals

demand for fresh fish unsatisfied. This situation is mirrored in the central and northern parts of Quintana Roo as well.

# 2 Part II. Dynamic Analysis - Robustness

This update extrapolates from research on changes to the Quintana Roo lobster fishery and is based on additional literature related to this fishery published in 1988 and 2006.

## 2.1 Update on the Commons Dilemma

By 1997, the lobster fishery had become very minor in Xcalak compared to the production of conch and scale-fish. At one point, conch became the primary focus over lobster and scale-fish, despite lobster bringing more earnings per kg and due to its high catches, ease of capture, and tighter packing in ice boxes allowing more catch to be transported. Eventually, scaly fish became the dominant product for the village of Xcalak (Daltabuit et al. 2007), yet the San Andres co-op remained focusing mainly on lobster. In 2011, the co-op harvested 3 tons of lobster tail, which is a substantial decrease in the last of catch reports (50 tons by 1979). The resource has not been fully exploited, yet it has been significantly decimated. As of 2013, the co-op is composed of 35 core members led by Simitio Pena Novelo, and they mainly harvest lobster during the lobster season, and scaly fish during the closed lobster season. They own a total of 13 ships and continue to carry out fishing expeditions in Banco Chinchorro, where their camp still holds. However, despite the ability of subsisting through fishing activities, the economic dependency of the community on the fisheries might be at risk due to overexploitation and lack of regulation.

## 2.2 Shocks, Capacities, Vulnerabilities

**External shocks:**

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

Reefs are highly susceptible to changes in water quality associated with shore-side development (increased dumping of sewage, increasing microbial activity, and physical damage to the reef from construction or dredging, increasing turbidity). The destruction of mangrove forests due to increasing urban development also presents a risk of lowering production in neighboring aquatic ecosystems since they are a major source of organic nutrients and they provide physical structure. Interception of freshwater at the shoreline could speed the collapse of the fishery since a substantial reduction of groundwater to sea would allow accumulated contaminants to flush into the estuary with heavy rains, resulting in a super shock for shallow water organisms. At some point, the focus of fishing effort may have to shift to deep-water stocks and to areas farther from shore, just north of Chinchorro Bank.

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

The southern coast of Quintana Roo has the least amount of basic infrastructure for fishing activities compared to other coasts in the state. It wasnt until recently that processing plants were built given that there was a shortage of continuous electric energy. Therefore, there was also a shortage of ice factories near areas close to the fishing sites, and fishermen had to go all the way to Chetumal to get ice. Additionally, the low quality of the built hard infrastructure has rendered it prone to being negatively affected by environmental catastrophes, such as hurricanes, winter storms, floods, etc. The processing plant, although located within distance from the beach to prevent hurricane damage, the roads leading to

it are little more than bulldozed traces prone to flooding during rainy seasons. These roads also pass close to the beach in many places, being at risk for breaching during hurricane season. Also, the desalinization plant is exposed to an open site only 50 m from the shore.

**...to and of the Public Infrastructure Providers (link 8 to PIP):**
During the building of the processing plants, officials often failed to communicate with the co-ops (resource users) about the ownership and administration, and there was much resentment among the fishermen who felt they had been given no real input in planning.

**...to and of the Resource Users (link 8 to RU):**
Population numbers in the village of Xcalak fluctuated from 527 in 1950 to 176 in 1960, with population severely dropping to 35 inhabitants in 1955 due to hurricane Janet, which left deaths and emigration to Chetimal or Belize. As of today, the population size of Xcalak consists of 375 inhabitants. Since 1996, the San Andres co-op underwent a series of administrative issues along with a massive shortage in members, going from 121 to 35 most of which were ex co-op members who had been part of the co-op for many years carrying out the heavy labor tasks. For the most part, membership of a co-op had only meant the opportunity to capture lobster. Economic decisions and operating constraints imposed by the federal development program and fish buyers have compromised the development of fishing co-ops, as fish buyers have attained unchallenged control over the destiny of a co-op.

### 2.3 Robustness Summary

The San Andres Quintana Roo lobster fishery is not a robust system of CPR governance. The primary contributor to resource declines seems to be the lack of enforcement and weak governance structure. Environmental damage might contribute to some extent, yet this is something that hasnt been fully explored yet. There is a clear distrust between the cooperative members (resource users) and the public infrastructure providers since it is extremely well known that monitoring and enforcement of regulations is almost non-existent. Given that the fishery is still in place and continues to be an important part of the communitys economic subsistence, there seems to be no commons dilemma in place yet. However, the governance structure seems to be failing at producing an equitable distribution of the benefits provided from the resource exploitation so long as the system allows a few permit holders, sponsors, and fish buyers to remain in control of the cooperatives potential.

## 3 Part III. Case Contributors

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