

Artisanal fishing in the Galapagos

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Introduction

El Archipiélago de Colon, more commonly known as the Galapagos Islands, is a province of Ecuador located about 600 miles off the coast of South America. It consists of approximately 45 volcanic islands (15 major and 30 minor) plus scores of smaller islets and rocks. The total land area is 7,882 square kilometers, with a coastline longer than that of continental Ecuador (1,366 kilometers).

Ecuador exercises complete sovereignty over a 200-mile territorial sea, measured from delineated baselines off the continental and insular shores. In the Galapagos Islands, the archipelagic baseline is formed by straight lines connecting the outermost islands of Darwin, Genovesa, San Cristobal, Espanola, Floreana, Isabela and Fernandina. The marine area, within this baseline is considered to be interior waters. Traditionally targeted organisms in the interior waters of the Galapagos Islands include the red and blue spiny lobster, and various types of grouper uniformly classified as "white fish". More contemporary fisheries include the mostly illicit trade in black coral, shark fin, and sea cucumber, the newly opened bill-fish sport fishery; and a recent focus on the capture of large tuna outside the baseline of the marine reserve for commercial export. The capture of any other organism within the GMRR is prohibited. However, the capture and trade of sea cucumber and shark fin are still occurring, especially around Isabela, regardless of the prohibitions on such activity.

Illicit fishing activity in the Galapagos can be attributed in part to the unavailability of regular markets for legal fishing products and, to a lesser extent, the temporal insecurity of certain existent legal fisheries. Dry-salted white fish is only marketable six months out of the year for export to the continent where it is used as a traditional ingredient in the Easter-week soup "fanescita". Even this limited market is declining due to competition with fresh fish from mainland suppliers, including Peruvian imports [1]. Fresh or frozen white fish has a severely constrained local market due to limited demand, and channels to the continental market are restricted by a lack of refrigeration facilities and transport. From year to year, there is no guarantee that the lobster season will open or during which months it will open - the National Fisheries institute designates the open season for lobster on an annual basis. Thus, any long-term investment or even subsistence planning is highly insecure. Although lobster would most likely be marketable year round for local and tourist consumption and for shipment to the continent and abroad through the refrigeration plant in Isabela, the short open season for this product, as well as the apparently low numbers of lobster remaining for capture, limit profitability. Many artisanal fishermen are turning with hope to the developing high-seas tuna fishery, which recently began in March 1996.

The "white fish" fishery began in the 1950s, concentrating on the capture of coastal, demersal species. However, as bacalao have declined gradually in abundance, fishermen have turned increasingly to substitute species [2]. As many as 20 to 32 different types of fish are now included in the white fish fishery, the number of targeted species having increased almost 100% from 1980 [3]. Because of the relatively small market for both fresh and dry-salted white fish, this insular fishery is practically self-regulating. Other factors are also cited by observers as effectively limiting the fishery to a level of activity too modest to threaten stocks, e.g., the small and decreasing (due to alternative opportunities) size of the fishing fleet and the

subsequent decline in fishing effort over time, the distribution of fishing effort over an increasingly wide geographical area and range of species, the small number of fishermen, more than half of whom are employed on a part-time basis; and the use of selective gear of limited fishing power [4]. However, several problems continue to exist. As mentioned previously, the bacalao catch has declined significantly since the inception of the fishery, and about 70% of the present-day catch are immature [5], [6]. This predominance of juveniles may be partly attributable to the habits and economic constraints of the artisanal fishermen, who prefer near-coastal fishing areas because of both familiarity and the high price of fuel. However, such coastal areas are also the natural habitat of the juveniles of the targeted species, thereby favoring their capture over adults. Furthermore, the reproductive period occurs between December and April. With the fishing season taking place from October to April, additional pressures may be placed on the depleted fishery [3], [5], [6].

There are three species of lobster in the Galapagos (red, blue, and slipper lobsters), two of which are exploited commercially, the blue (or green) lobster (*Panulirus sgracilis*), which is found in both the continental and insular waters of Ecuador, and the red lobster (*Panulirus penicillatus*), which is endemic to the Galapagos and is the dominant species in all islands of the archipelago, except where blue lobsters dominate to the south and west of Isabela. Typically, lobster fishermen, most of whom are Galapaguenos or individuals who have lived in the islands for many years, return to the same fishing grounds repeatedly until the lobsters in the area are exhausted, at which point they seek out new fishing grounds and begin the cycle again [7]. An executive decree of 24 May 1994, that established as law the sustainable use of marine resources, allows artisanal fishermen of the Galapagos to capture lobster three months out of the year [8]. The designated three months during which lobster fishing is permitted vary from year to year, with the open season from July to October in 1994 [8]. Additional regulations include a size limit, which prohibits the taking of lobsters below 25 centimeters in length for commercial exportation. The taking of gravid females is also prohibited, as is the nocturnal capture of lobsters within the artisanal fishing zones of the reserve. There is no control over the quantity or weight of the total catch. Gear limits include a ban on harpoons; the introduction of any new gear may only occur with the approval of the National Fisheries Institute on the basis of investigations and tests. The fishery is regulated by the regional Subdirectorate of Fisheries through local fishery inspectorates, which are controlled by the Port Captains. It is the responsibility of these captains to enforce the closed seasons. Lobster boats are required to announce their time of arrival to port by radio, and when possible Navy seamen check the boats to ensure there are no lobsters less than 25 centimeters long. However, even in the face of such inclusive regulations, infractions are apparently common. Historically, few have respected the closed seasons, and lobsters below the legal size are taken, as well as gravid females [7], [9]. The enforcement of exportation regulations has also been limited because there is no inspectorate in Santa Cruz, from which much of the frozen lobster is sent by plane [2].

There is very little information available concerning the developing artisanal tuna fishery. Fishermen owning boats at least 14 meters in length, sufficient to brave the high seas, fish for large albacore and yellow-fin tuna in waters between ten and twenty nautical miles from the islands. Tuna are captured through trolling and either sold to refrigerated cargo boats from the mainland (the boat *Nautilus* from Manta was collecting tuna for transport back to the mainland during our stay) or to the fish processing plant in San Cristobal. This plant pays approximately 7,000 sucres per pound to the local fishermen and exports the refrigerated product through the continent to buyers in the United States and Japan. Tuna prices on the international market range from \$.70 to \$2 per kilogram for lesser quality to more than \$200 per

kilogram for sushi quality [6]. Besides area and gear limits within the marine reserve, there are apparently no other regulations for this fishery. National, large-scale tuna fishing boats may fish from 5 to 15 nautical miles from the baseline [5].

Twenty-seven species of shark are indigenous to the waters of the Galapagos Islands. Shark fishing is prohibited within the borders of the Marine Resources Reserve, but permitted 80 nautical miles outside the archipelago as long as the entire animal is used. Sharks are especially valued for their fins, which are considered a delicacy in Asian cooking, and in the past fishermen have often kept the fins but discarded the rest of the animal. Many artisanal fishermen consider these limitations discriminatory, however, because they do not always have a local market for the meat and many have neither the means nor the desire to invest in fuel to reach the legal fishing zones or storage space and freezers to preserve the meat for sale to the continent [10].

Environmentalists claim that, regardless of these regulations, artisanal fishermen intentionally target sharks in reserve waters using prohibited mono-filament nets and, on occasion, sea lion meat as long-line bait [10], [11]. Although the Ecuadorian Government issued a provision on 23 June 1994 allowing three months of artisanal fishing for sharks in reserve waters beyond three miles from , this controversial fishery never opened and the taking of sharks remains illegal within the GMRR. The transport and trade of shark fins to the continent is also prohibited [5].

Recreational fishing has been recently legalized in the Galapagos Islands. The fishing for black marlin, blue marlin, striped marlin, swordfish, and sailfish (Art. 119 of the Sport Fishing Regulations of the Instituto Ecuatoriano Forestal y de Areas Naturales y Vida Silvestre (INEFAN), 1995) is permitted in those areas of the Galapagos Marine Resources Reserve which have not been set aside as National Marine Park and Coastal Interaction zones according to the Park Management Plan. Sport fishing is also prohibited in those areas declared of interest to divers and in any reproductive zones so determined by the Fisheries Secretariat (Art. 117, 118). Only Ecuadorian flag boats may participate in this fishery (Art. 127), with preference given to natives of the Galapagos Islands, and particularly to full-time artisanal fishermen. Second preference is given to those who have lived in the Islands for at least six years (Art. 137).

Sea Cucumber of the several shallow-water species of sea cucumber found in the Galapagos Islands, only *Isostichopus fuscus* has a significant market value. It is considered a delicacy in Asian cooking, one of six "texture foods" eaten on special occasions, as well as a purported aphrodisiac and cure for high blood pressure. With the prices of other texture foods such as shark fin and birds nest rising (\$96 and \$320 a pound respectively), demand for sea cucumber (\$15 to \$60 a pound) is increasing. In 1992, sea cucumber fishermen were allegedly making between US\$.50 and \$2.50 per pound, as much as twenty times more than the market price for other species [12], [13].

The Ecuadorian sea cucumber fishery began in 1988 in continental waters with an annual catch of three metric tons. This figure had increased to 29 metric tons by 1991 [14]. By late 1991/early 1992 the fishery had extended illegally into the Galapagos Islands [14], [15] where it continued for a four to five-month period, during which time divers collected between 12 and 30 million sea cucumbers [12]. Fishing activities were concentrated in the western portion of the archipelago around Canal Bolivar [11]. This area of the channel, with the exception of a small stretch of coastline between Bahia Urvina and Caleta Tagus, is designated a National Marine Park Zone,

an area of maximum protection [14]. Due to the illegal nature of this activity within the National Park, violations of marine resource regulations and related impacts on the marine and terrestrial environments associated with the fishery, harvesting of sea cucumbers was prohibited on 6 August of 1992 by presidential decree (Executive Decree No. 3570) [11]. Two years later, in October 1994, Ecuador opened a three-month "experimental" fishery in the Galapagos Islands. A limit of 550,000 sea cucumbers was set for the three-month season. However, no means of enforcement were established and in two months the number of sea cucumbers harvested was estimated to be between six and ten million.

Besides the concern that excessive exploitation of sea cucumbers will reverberate up the marine food chain because their larvae are a major component of the local zooplankton and the juveniles are an important food source for carnivorous arthropods, mollusks and marine worms, there were several other environmental concerns brought about by the opening of this fishery as well. Fishermen began establishing camps on national park land in Isabela and Fernandina, where human habitation is prohibited, and cutting mangrove trees for their cooking fires, thus endangering the only remaining habitat of Darwin's most endangered finch, the Mangrove Finch. They were also allegedly slaughtering giant tortoises for food and collecting sea horses, snails, pipe-fish, and three products for the Asian "test market", sea lion genitalia and teeth, and sea urchins, in addition to their sea cucumber harvest. Still further fears were that the live chickens, rats, mice, dogs, vegetables and insects from the mainland which were present on the fishermen's boats (some anchored as little as twenty feet from shore) would invade the islands and threaten the endemic species. Harvesting was particularly active in areas with high densities of endemic flightless cormorants.

Because the capture of sea cucumbers frequently involves removal of rocks and a substantial alteration of the sea floor where the cormorants find most of their prey, scientists also became concerned that the fishery activity would negatively affect this rare seabird [21].

In response to these concerns, and subsequent pressure from the Government of Spain, Ecuador's own Ministry of Information and Tourism, residents associated with conservation and tourism, various environmental groups, and the associations of eco-tourism, travel agents, and tour operators in the Galapagos, the sea cucumber fishery was closed on 15 December 1994 in order for scientific studies to be done in light of the alleged abuses. Less than three weeks later, on 3 January 1995, a group of several dozen-armed sea cucumber fishermen seized control of the Charles Darwin

Research Station in Puerto Ayora and all personnel. They threatened to kill the tortoises in captivity at the Station and start fires on the smaller islands if authorities did not reopen the sea cucumber fishery. The seizure ended after three days due to the intercession of the National Institute of Fisheries, supported by Ecuadorian troops, and its decision to open temporarily the lobster fishery as a concession. The sea cucumber fishery remains closed pending further studies and recommendations. However, the illegal taking of sea cucumber is still occurring as evidenced by recent arrests of fishermen in violation of the moratorium and the confiscation of their harvests.

Both the Charles Darwin Research Station and the Institut Français de Recherche Scientifique pour le Développement en Coopération (ORSTOM) have since conducted studies on the local population biology of *Isostichopus fuscus* and both recommend that the fishery remain closed. Another long-term study (1993-1996) on

populations in and around the Bolivar Channel, undertaken by the CDRS in conjunction with the National Fisheries Institute and the Permanent Commission for the Galapagos Islands, is still in progress.

Enforcement and control unfortunately, the enforcement of any specific regulations or zonation scheme by public authorities working alone is virtually impossible given the present limited resources available to such institutions. With small staffs, constrained budgets, and a dire need for additional patrol boat capacity, the agencies appointed to co-administer the marine resources reserve (e.g., the Navy, National Park Service, Subdirectorate of Fisheries) simply do not have the capacity to meet these responsibilities. For example, although the Japanese government recently donated an impressive patrol boat, the *Guadalupe River*, to the GNPS, its maintenance and use requires at least \$100,000 per year, almost 25% of the Park Service's entire 1996 budget. Furthermore, the Navy has only two 30-knot patrol vessels at its disposal (both of which were undergoing repairs or maintenance on the mainland during our visit), its post in Isabela, responsible for monitoring maritime activity around this largest of the islands, apparently consisting of only one sergeant, two sailors and no boat.

The National Fisheries Institute is represented wholly by its on-board observer program. The primary purpose of this program is to accumulate data that may later be useful in developing regulations appropriate to the insular fisheries. It is also intended to assist with the enforcement of present regulations. Although there were originally 15 observers in the islands, lack of funds and the re-routing of funds to continental programs have decreased their number by half. With at least 116 boats out of Santa Cruz alone and only two field observers assigned to that Island, the coverage is obviously lacking. On the island of Isabela, one of the observers also serves as the fishery inspector. He and apparently a few others besides the Subdirector of Fisheries in Santa Cruz are the sole representatives of the General Directorate of Fisheries, the province's primary fisheries regulatory agency. None of these representatives (including the observers) has their own office space or equipment, and relies on the generosity of the Galapagos National Park Service to supply both.

Fisheries management authorities are further straddled by the weak sanctions associated with illegal fishing activity as well as their limited or unclear jurisdiction in issuing these sanctions. Fines for some violations are as low as 1,000 sucres (about US\$33). The Galapagos National Park Service neither may board vessels in the marine reserve nor carry arms. Therefore, although it has complete jurisdiction over the terrestrial areas of the park, it must be accompanied by representatives of the Navy in order to investigate illegal activity within the marine areas of the park. The Navy may hold a boat and its crew in port only 48 hours while awaiting the decision of the fisheries Directorate stationed in the continental city of Guayaquil. If no communication is received within this time, as is often the case due to the unstable phone lines to and from the islands, they are free to leave port. In July 1995, the authorities were able to charter a patrol plane and station the *Guadalupe River* and one of the Navy speed boats in two strategic locations near the island of Isabela. As a result, the joint Park Service and Navy force were able to spot the illegal taking of sea cucumbers near the Bolivar Channel and take one of the fishing boats into custody.

This incident portrays the potential capabilities of the management authorities when provided with sufficient funding and equipment.

Analysis The real problem facing Ecuador is the development of a philosophy and a set of institutions and operating procedures for the management and utilization of living marine resources in and around the Galapagos Islands that are in harmony with the use of the archipelago as a cultural and scientific reserve. The issue of resource management is a very basic problem which applies to some extent to the operation of land and marine based reserves the world over. The specific context may vary, but the basic problem is the same.

In one sense, it can be viewed as the traditional problem of sustainable fisheries management with an extra constraint. The constraint being that fisheries utilization over time not interfere, directly through biological interactions or indirectly through processing, marketing, or other such fishery related activities, with the achievement of the goals and objectives of the reserve. Evidence from around the world indicates that solving the basic fisheries management problem is difficult enough. The extra constraint makes the search for a solution much more demanding.

In order to address the issue of fisheries utilization in the Galapagos Islands, the Ecuadorian Government must (1) specify a fundamental philosophy of fisheries management for the Galapagos, (2) organize an institutional structure that is capable of implementing that philosophy, and (3) specify a range of management tools and procedures that may be used in the implementation process. To some degree the three steps are interdependent and due consideration must be given to these inter-relationships.

Only time will tell if Ecuador will be successful in its attempt merge the interests of the world community and the local participants in developing a fisheries management regime for the Galapagos. The sea cucumber may actually provide a way to do so. Some have suggested that fishing for sea cucumber should be permanently banned because the potential profits and current problems with enforcement will likely result in a fishery which is incompatible with the maintenance of the park. They do agree, however, that a properly designed and operated fishery could be sustainable and compatible. Such a fishery would require, among other things, conservative quotas, year to year rotation of fishing grounds, closed nursery areas, and provisions to do preliminary product preparation on barges rather than on park land. It has been estimated that the illegal fishery has grossed about \$60 million over the last eighteen months, even though a large part of the actual harvest does not make it to market because of improper handling. Therefore it is not unreasonable to expect that a properly managed fishery could generate between five and ten million dollars a year and perhaps more. It would be a shame to forgo the potential returns from such a fishery, especially given the relative incomes and lack of other targets for local fishermen, and the crying need for funds for fisheries enforcement and general park operation.

I would suggest that using combination of co-management with a variant of ITQs. exclusive rights to the sea cucumbers in the Galapagos could be granted to the three cooperatives with the specification that no individuals from the mainland be allowed to participate. They would have full control over harvesting, processing, and marketing subject to oversight from the management agency. All management and enforcement costs would be paid out of the gross proceeds, and the net returns would be split among the cooperatives, the local communities, and the park. Instead of being a source of park degradation, under proper management, sea cucumbers could be a valuable asset providing benefits to all interested parties on the islands.

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