The Manjúa Fishery of Guatemala's Caribbean: Balancing the Needs for Regional Ecosystem Productivity and National Food Security

by
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Photographs by the authors

"Hey, what's that smell?" Pablo and I looked north out over the Amatique Bay (Figure 1) from where the northern breeze was picking up over the brackish shallow waters and saw what appeared to be a family of *manjueros* – fishers of the tiny anchovy, locally called *manjúa* (Figure 2). We walked to the beach and rapidly began to see the evidence of *manjúa* fishing – dead and discarded juvenile fish and crabs, littering the sand in the gently lapping waves and polluting the fresh Caribbean breeze with a putrid odor. Walking barefoot on the beach we could avoid stepping on the spiny dead creatures, but wading into the shallow bay we had to rely on luck to keep the bottoms of our feet from being punctured.

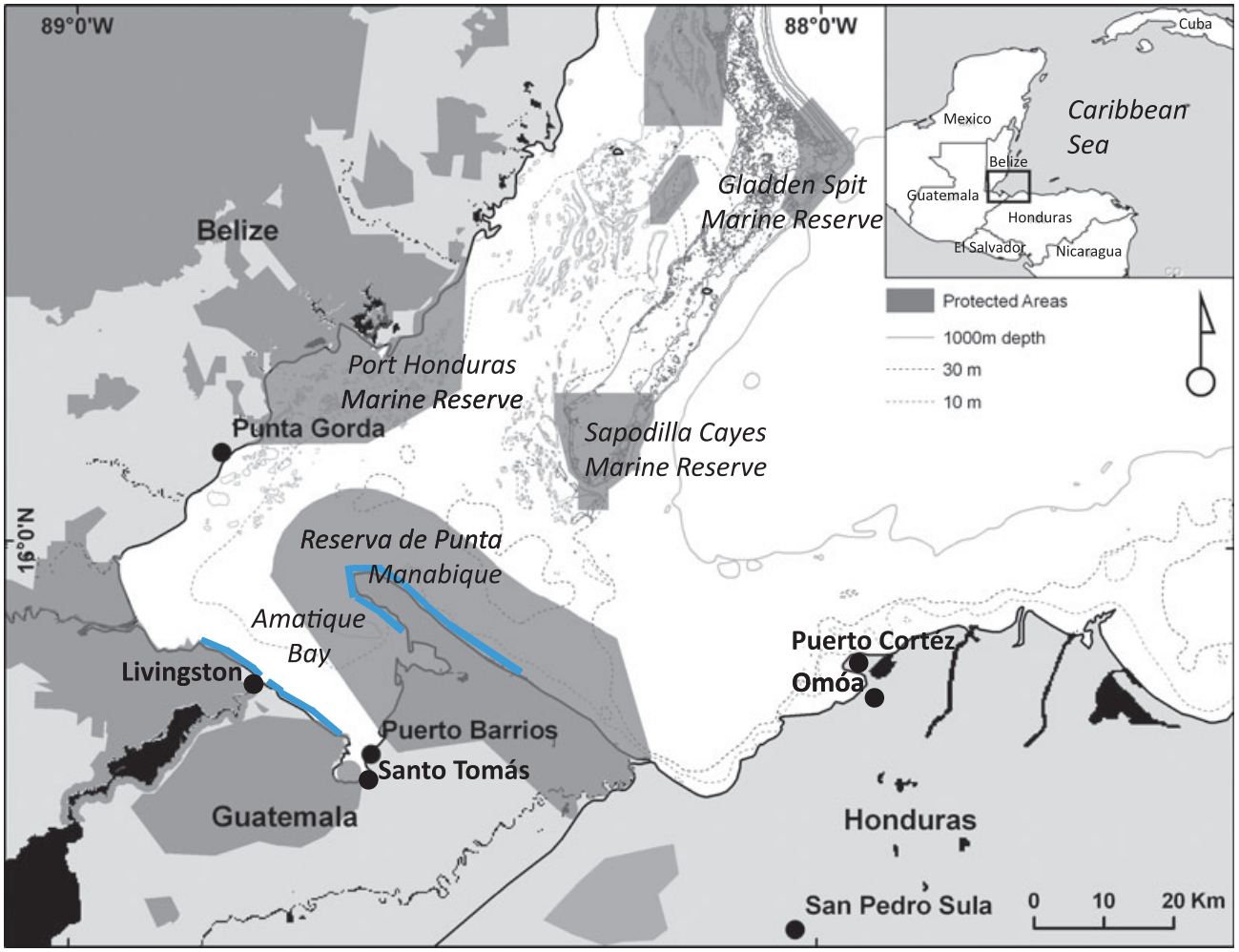

Figure 1: *Locator map showing the study area on the northern coast of Guatemala in the Gulf of Honduras (map extent). The thin blue line indicates the narrow band of coastal shoreline that provides the* manjúa *fishery area.*

After several days of stormy weather, typical for August on the Caribbean coast of Guatemala, we finally had clear skies and smooth seas appropriate for our fieldwork. By sunrise we noticed several *cayucos* (locally made dug-out canoes) preparing for a fishing day. When we returned from our day's fieldwork in the early afternoon, we found the beach littered with a wide variety of dead and decaying juvenile fish and crustaceans, a temporary feast for vultures and famished dogs on this beach that is otherwise very attractive for tourism.

Pablo reached the fishing family first and cautiously and respectfully asked to see their operation in action (Figure 3). The family obliged and continued seining the shallows with their ''*chinchorro mosquitero*'' or mosquito seine – aptly named since some of the mesh size resembles that of mosquito nets in the windows of local homes. Being used to typical fishing nets for food fishes with meshes of 2–4 inches, it surprised us that the minute mesh is actually legal at 0.5 cm (Jolón Morales et al. 2007; FAO 2010). The 75 m long net was average-sized and also legal for that fishery. The entire family was involved in the operation – the father, mother, two sons and a daughter, ranging in age from 8 to 17 years old (Figure 4). The *chinchorro mosquitero* hangs vertically in the water from floats along their top to weights at their bottom edge and is used to trap fish and crustaceans by enclosing them as the net is hauled in and retrieved. As the *chinchorro mosquitero* is pulled through the water, fish and accompanying crustaceans are herded toward the center of the net and into a bag at its center. The bag mesh size was significantly below the 0.5 cm size limit and resembled window screen. Because of the known destructive effects on bottom habitats and extensive capture of juveniles in the small mesh, this fishing gear and practice have been forbidden from many other coastal regions of the world (FAO 2004; 2010).

Only 20 minutes prior to Pablo's arrival, the family had encircled a school of *manjúa* using a carefully choreographed fishing technique. The eldest son served as the spotter, standing in the bow of the 24-foot dugout. The father motored slowly west and parallel to the beach through the shallows with the aid of a well-worn

Figure 2: *Examples of* Manjúa *anchovy, an adult and juvenile.*

Figure 3: *Pablo (far left) examines the* manjúa *net along with the family beside their cayuko in the shallow coastal waters near Livingston, Guatemala.*

Figure 4: *A family of* manjueros *works together to capture, sort and process* manjúa.

Figure 5: *The net is drawn to a close around a school of* manjúa *and then gradually retrieved.*

15 hp Yamaha outboard engine. The son spotted an acceptable school of *manjúa*, migrating slowly to the west and the hunters moved in. Just before reaching the leading edge of the moving school, the son jumped out of the seaward side of the dugout holding the end of the *chinchorro mosquitero* as his father speeded up. The mother fed the heavy, synthetic-line net hand-over-hand into the shallows as the boat raced first along the shore to get in front of the westward migrating school, and then turned seaward then eastward to surround them. The boat circled back such that that net enclosed an area of approximately 20 m in diameter. As the boat completed the circle the rest of the family quickly jumped out, rejoined the eldest son, and began to retrieve the seine. As they retrieved the ropes, pulling both ends together, the seine cinched in to trap the *manjúa* (Figure 5). As the bag of the net got smaller, the surface of the water that it trapped began to boil from the beating of tiny fins and tails.

When Pablo reached the family they had already begun to harvest and sort their catch. Using plastic colanders, the father and his eldest son took turns scooping from the dense mixed school, trapped in the reduced volume of the retrieved seine net (Figure 6). They bailed this mass of flittering silvery life out of the net with a colander (Figure 7) into a crude wood-framed sieve with a steel, ¼ inch mesh (Figure 8). From our observations, *manjúa*, their target fishery, made up only around 50% of the mass of animals in the sieve (Figure 9). The children quickly picked juvenile pink shrimp out of the sieve, as these are the most valuable by-catch species and are generally used for subsistence consumption.

Typical of gender roles in this region and fishery, the woman was charged with what appeared to be the toughest job: sieving and sorting the mixed species catch to identify their target, the *manjúa*. The sieve

Figure 6: *The unsorted catch is retained in a cloth mesh before sieving.*

Figure 7: *The catch is scooped with a colander for sieving. The* manjúa, *along with the associated by-catch species are visible in this close up.*

Figure 8: *The* manjúa *are sieved with a screen that allows the target* manjúa *to fall to the floor of the cayuko. Some shrimp are picked from the top of the screen.*

Figure 9: *About 50% of what is harvested is returned to the water as by-catch.*

was shaken back and forth so the larger species remained atop the sieve while the target species, *manjúa*, fell through the steel mesh to the floor of the cayuco (Figure 8). The rest of the by-catch (unwanted juvenile fish and crustaceans swept out from their nursery grounds) was discarded dead and dying to the sea. The process was repeated until the net was emptied (Figure 9). We observed and confirmed with the family that only the cleanest *manjúa*, that passed most rapidly through the sieve were saved as product. The discarded by-catch contained about 1/3rd *manjúa* by volume. When we queried them about this seemingly high by-catch, they explained that the market demanded only whole and undamaged *manjúa* and that the other ''small'' fish had no commercial value.

What we witnessed that day was part of a much larger and complex story in the Gulf of Honduras (GOH), a 10,000 km^2 tri-national body of coastal and marine waters that includes territorial waters of Belize, Guatemala, and Honduras (Heyman and Kjerfve 2001). Based on a series of interviews with local fishers from around the Gulf of Honduras, conducted in 1998, we illustrated the regional importance of the *manjúa* fishery (Heyman and Graham 2000a, Granados-Dieseldorff 2000). The fishery targets at least two anchovy species, each with different distributions and migratory behaviors (Godoy-Morales, 1999). The annual *manjúa* fishery harvest of about 2.75 million pounds per year made up the largest single component (20%) of the annual fishery landings of the entire tri-national GOH region in 1999. Yet the $US 0.50 per pound paid for salted and dried *manjúa* was far lower than for any other fishery species in the region. In spite of the large volume harvested, the aggregate value of the fishery was only $US 800,000 or 7% of the value of the regional fishery (Heyman and Graham, 2000a, b, c). At the time of our first studies, the fishery was open all year. However, because of the seasonal migratory behavior of the species involved, the fishery was only active during the dry season, from January through June each year, with peak landings occurring during the Lenten season.

As noted above, however, the fishery discards about half or more of reported landings or about 1.5 million pounds of by-catch each year (Figures 10a–e). The ecological and trophic importance of this fishery cannot be overstated. *Manjúa* are primary consumers that filter the plankton-rich, turbid coastal waters of Guatemala. They then serve as forage for many of the region's most important and larger-bodied fishes, which in turn serve as commercially-harvested food fishes throughout the GOH region (e.g., snapper, snook, barracuda, jack, mackerel, and tarpon). Manjúa therefore serve as a crucially important base for the regional fishery food web. In addition, hundreds of millions of juvenile fishes and crustaceans, which would have grown up to commercially important species, are discarded as by-catch. The integrity of the ecological productivity pyramid of the entire Gulf of Honduras region is highly threatened by this enormous and unsustainable, yet legal harvest at the base of the food web (FAO 2001).

As valuable as these fish are to the trophic productivity of the Gulf of Honduras, the *manjúa* fishery is critically important for the food security of the country of Guatemala (Ruano-Andrade and Hernández, 2008). Many of the fishers involved in the fishery are recent *Mestizo* immigrants (mixed Amerindian-Spanish, locally called Ladinos) to the coastal region (Godoy-Morales, 1999). Many of them could be considered economic refugees from Guatemala's highlands, where agriculture and livestock industries are faltering, which contributes to chronic food insecurity (FEWS 2010). These people have no other source of income and generally are not landowners. They don't have access to storage facilities and are thus vulnerable to the prices that are set by the middlemen who provide them with fishing equipment and legal representation (INE 2008; Cifuentes-Velasco 2009) and purchase their product in a ''*centro de acopio*'' (a collection center) in Puerto Barrios. The once productive and open access *manjúa* fishery developed rapidly as a relatively secure occupation for otherwise destitute people and played a critically important societal role. The fishery was introduced to Guatemala's Caribbean by Mestizo immigrants from the Pacific coast of El Salvador in the

Figure 10: *By-catch from the* mosquitero *method is abundant and diverse and includes a) juvenile blue crab, b) juvenile puffer fish, c) mullet, zabaleta anchovy, and needlefish, d) permit, drum, flounder, and spadefish, e) permit.*

late 1970s (Godoy-Morales, 1999). Though initial harvests primarily served local subsistence and bait fish markets, clever middlemen discovered other interested buyers in the mid 1980s (Godoy-Morales, 1999). These entrepreneurs recognized that they could meet an existing demand for protein in the impoverished and remote Departments of Sacatepéquez, Sololá, Quiché, and Quetzaltenango in the Guatemalan highlands, west of Guatemala City. They bought dried *manjúa* in Puerto Barrios for $US 0.50 per pound and transported them to the highlands where they sold them for $US 3.75 per pound (Figure 11). As buyers controlled the market, they also demanded a minimum volume of harvest each month, or would reduce their purchase price. This in turn has increased harvest pressure on the resource. *Manjúa* began to serve as the cheapest and in many cases the only source of animal protein for impoverished upland communities. The product has helped to reduce rampant food insecurity in both coastal lowlands and in highly populated areas of mainly indigenous Mayan descendents in the highlands of Guatemala (Ruano-Andrade and Hernández, 2008; Famine Early Warning System Network (FEWS) 2010).

But how is food insecurity defined? The term is difficult to generalize and it should be scaled to appropriate regional, national, community, and family levels (McGoodwin 2001). There is no *manjúa* fishery in surrounding Belize or Honduras, yet this species does occur in those territorial waters. Instead, those countries' harvests have focused higher on the trophic pyramid. Many of the other fishers from the Gulf of Honduras complained that the *manjúa* fishery removed the foods for higher trophic level species that they target, especially jack and mackerel, and that the *chinchorros mosquiteros* degraded critical nursery grounds and disrupted the life cycles of commercially important fish and crustaceans (Heyman and Graham, 2000a,b,c).

Declines are evident in nearly all of the fisheries of the Gulf of Honduras, on which over a million coastal inhabitants depend directly. Overfishing of *manjúa* was documented in both a steady decline in annual landings and in fish sizes (FAO 2001; FAO 2004; Ixquiac-Cabrera et al. 2008; Figure 2). Other species around the Gulf of Honduras have also seen severe declines (Heyman and Graham et al., 2000a,b,c). These observed declines are a direct result of the growing number of fishers and the intensive extraction of the *manjúa* on which higher trophic level fishes feed (FAO 2001). Fishers throughout the region recommended 1) increased research on the population dynamics of the *manjúa* in the GOH, 2) increased education to locals about the important role that *manjúa* plays in the local food web, and 3) severe restrictions on the harvest of *manjúa* (Heyman and Graham, 2000a,b,c).

A decade after our first studies in the region (Heyman and Graham 2000a,b,c; Granados-Dieseldorff 2000), the *manjueros* we approached confessed that the fishery was not economically viable. The continuous decline in *manjúa* stocks, the variations in their seasonal abundance, and the low price for their sale, could not keep pace with the rising costs of fuel, vessel maintenance, and processing of the salt and dried product. When we asked about the price that they got for their product, we were surprised that in the decade between 2000 and 2010 the price had not varied from US $0.50 per pound during the peak harvest season. Moreover, they felt disenfranchised by and disconnected from the organizations responsible for marine resources management.

In spite of the concerns expressed by fishers and scientists, no additional management measures were applied to the *manjúa* fishery for more than a decade prior to 2005 when the season was reduced from seven to five months per year (Jolón-Morales et al., 2005). Regulatory restrictions were only applied to fishing gear (i.e., a net no more than 75 m long and with mesh size above 0.5 cm) and the exclusion of *manjúa* fishing from certain nursery habitats (Godoy-Morales, 1999; Jolón et al., 2007; FAO 2010). Finally, in 2010, with documented overfishing; conflicts erupting at community, national, and regional levels (Heyman and Graham, 2000a; Hidalgo and Méndez, 2007); and international pressure from FAO; the *manjúa* fishery was totally closed for two months every year (May 15–June 14 and November 1–30, and a minimum capture size was set at 2 cm total length) (FAO 2010).

As indicated herein, *manjúa* presently serve as the base of a regionally important food web in the Gulf of Honduras, and also as a direct food source for impoverished local and upland communities of Guatemala. Are the new regulations and their implementation sufficient to ensure sustainable productivity to support both of these uses? How should these uses and demands be balanced? What new management measures might be required?

We suggest ecosystem-based solutions (Pikitch et al., 2004) that serve the public good for the maximum amount of people. The management of the manjúa fishery suffers from typical, piecemeal and multilevel fisheries governance (Armitage et al.,

Figure 11: Manjúa *for sale in the San Lucas market, Department of Sacatepéquez, in the Guatemalan highlands, 340-km away from Puerto Barrios.*

2009), under-representation of key stakeholders in management strategies (Pauly, 1997), and geographically misplaced legislation (St. Martin, 2001). We suggest that impacts of the *manjúa* fishery can be reduced by 1) reducing by-catch mortality whereby fishers carefully and rapidly return by-catch to the sea; 2) reducing the total fishing effort through limited access licensing, limiting total harvest volume, and increasing closed seasons and areas; and 3) ensuring equity in the marketing of the product whereby fishers get a higher percentage of the total price and thus can still make a living while catching less volume. Reducing pressure on this common property resource will allow *manjúa* to rebound, and thus be able to help mitigate food insecurity in coastal and upland Guatemala, and also support sustainable trophic productivity throughout the Gulf of Honduras.

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