

Endangered Species and Precarious Lives in the Upper Gulf of California

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Setting the Scene: The Upper Gulf in June 1993

From a hilltop overlooking the community of Puerto Peñasco, Mexican President Carlos Salinas de Gortari decreed a million-hectare biosphere reserve for the upper Gulf of California and the delta of the Colorado River. Assembled with him on the podium in June of 1993 were the governors of Sonora, Baja California, and Arizona, U.S. Secretary of the Interior Bruce Babbitt, Luis Donaldo Colosio, then head of the Secretaría de Desarrollo Social (SEDESOL), and Dr. Ernesto Zedillo Ponce de León, an aide to President Salinas at the time and now his successor.

Salinas set the parameters for the reserve's management plan. Resource exploitation was to be prohibited within a nuclear zone at the mouth of the Colorado River, and offshore shrimp trawling was to be outlawed in a larger buffer zone, north of a line traversing the upper Gulf from Puerto Peñasco to San Felipe on the coast of Baja California. Within this buffer zone, too, inshore fishermen would be restricted to the use of gillnets with a mesh size of four inches or less. Salinas also called for the active pursuit of economic alternatives for the region, specifically the further development of tourism, sport fishing, and aquaculture. Such pursuits were to be underwritten by a billion dollars in regional assistance from the Programa Nacional de Solidaridad (PRONASOL), run by the Sonoran native and heir-apparent to Salinas, Luis Donaldo Colosio.

In its conception, then, the biosphere reserve was an amalgam of resource management notions. It called for a strictly protected nuclear zone—although none of its architects specifically addressed the nascent literature on "harvest refugia" as a fisheries enhancement tool (cf. Dugan and Davis 1991a, 1991b; Carr and Reed 1991; Tegner 1991; Roberts and Polunin 1993). It presumed the need for an "integrated conservation and development program" (ICDP) to relieve pressure on endangered species and a fragile environment (cf. Brandon and Wells 1992; Chou et al. 1991; Stycos and

Duarte 1995; White 1988). And, at least in the buffer zone, the plan suggested that a "sustainable" fishery could be fostered—primarily through severe restrictions on gear.

The Upper Gulf of California and Colorado River Delta Biosphere Reserve thus began as a concerted effort to arrest the deterioration of an ecosystem and to protect several endangered marine species. It is a symbol, too, of Mexico's willingness to respond to international calls for environmental consciousness. Simultaneously, though, Mexico was responding to another international agenda. The neoliberalism of the North urged—indeed, required—Mexico to undertake a multifaceted program of structural adjustment, including, in the case at hand, the privatization of the region's fisheries. The Gulf of California, thus, serves as a crucible for these two agendas, and we here take a midcourse glance at how these agendas are sorting themselves out. We examine the political environment in which the biosphere reserve was conceived and, consequently, the environmental politics accompanying the implementation process. And we assess, again in a preliminary way, since there is no closure to the process, how one small community in the upper gulf is structurally adjusting to the new economic order. These two seemingly disparate agendas are, in El Golfo de Santa Clara at the mouth of the Colorado River, very much intertwined.

Endangered Species

The gillnet restriction proposed by Salinas and his advisors was designed to save the vaquita (*Phocoena sinus*), a small porpoise endemic to the upper gulf and acknowledged by the Scientific Committee of the International Whaling Commission as the most endangered cetacean in the world. As early as 1976, the preeminent Mexican biologist Bernardo Villa warned that "through the action of man, this species was seriously endangered" (Villa-R 1976:206). The prohibition on shrimp trawling would help in the recovery efforts by arresting further environmental degradation and halting the incidental mortality of fish, one species of which, the totoaba (*Totoaba macdonaldi*), is itself on the United States' endangered species list and, like the vaquita, endemic to the upper gulf.

The totoaba, a croaker that grows up to 6 feet and 300 pounds, was in fact the reason for the founding of the three fishing communities in the upper gulf—San Felipe, Puerto Peñasco, and El Golfo de Santa Clara.¹ Totoaba was exploited originally for its air bladder, exported to the Orient for use in

soups. The carcasses were left to rot on the beach. However, after 1920 it became a highly prized commercial and sport fish, the most valuable resource until commercial shrimp trawling developed on a significant scale in the 1950s and 1960s. Totoaba spawns at the mouth of the Colorado River, and a sanctuary, roughly coterminous with the new biosphere reserve's nuclear zone, was established in 1955. In 1975, following drastic declines in totoaba stocks, commercial and sport fishing for the species was outlawed (Craig 1926; Chute 1928; Flanagan and Hendrickson 1976). Nevertheless, totoaba gillnetting continued until very recently and was a primary cause of incidental kills of the rare porpoise.

The vaquita was defined by Kenneth Norris and William McFarland (1958) as a species from a single skull found near San Felipe in 1950. A handful of surveys were conducted in subsequent years to determine the mammal's range and population—with few definitive results on either question. Best guesses on the range of the reclusive vaquita centered it off the coast near San Felipe, up into the delta of the Colorado: "the smallest range of any marine cetacean" (Silber 1990:344; cf. also Barlow et al. 1993; Silber et al. 1994). The population was thought to be under 500. These were sufficient flags for the bulk of the community of cetacean advocates to demand immediate and drastic protection measures, not further efforts to refine population size and range estimates.

The declaration of the biosphere reserve was a direct attempt to quiet some of the concerns of the environmental lobby.

The call for action came publicly at a special conference in San Diego, sponsored by the University of California Institute for Mexico and the United States (UC-MEXUS) in July 1992. The vaquita meeting was coupled with a session on the tuna-dolphin problem in the eastern tropical Pacific, in which Mexico's contention that it had greatly reduced dolphin mortalities in recent years was largely validated by U.S. scientists and government officials. The tuna-dolphin discussion was an explicit effort to air Mexico's case to a U.S. media audience—the case against the proposed legislation in the U.S. Congress to establish a global prohibition on dolphin sets. Mexico's position was voiced by the vice president of the newly revitalized Cámara Nacional de la Industria Pesquera (CANAINPES), a group of private entrepreneurs in the country's fishing industry:

With respect to the humanitarian, moral and ethical aspect, the argument in favor of a few dolphins does not recognize that it compromises the moral, ethical, and humanitarian obligation to use the globe's resources to feed the world an economical protein while creating jobs and a better life for thousands of workers (Felipe Charat, quoted in Alvarez-Borrego 1993:11).

Similar rhetoric was offered up at the vaquita session by officials of Mexico's Secretaría de Pesca (PESCA), to the effect that fishermen are the endangered species, not vaquitas. But this claim met with a great deal more acrimony: unlike the dolphin populations of the eastern Pacific, the endemic vaquita of the upper gulf is severely endangered, even if the biologists and the assembled conservation-group representatives could not precisely estimate populations. A Mexican biologist spoke the consensus:

At least 35 vaquitas die accidentally in the fisheries each year, and unless something is done immediately, this mortality rate may exterminate the species in less than ten years. The only realistic way of ensuring the conservation of the vaquita, the totoaba, and their natural environments is the establishment of a protected zone in all of the upper Gulf (Omar Vidal, quoted in Anderson and Herrmann 1993:7).

There was a reason for airing these issues on U.S. soil, in front of the American press. The Mexican president's decree in June 1993 was as much about NAFTA—the North American Free Trade Agreement—as it was about vaquitas and totoabas. Salinas had staked his political reputation on passage of the agreement, a cornerstone of his concerted efforts to liberalize Mexico's economy, to open up opportunities for private investment, whether domestic or foreign, to continue, in short, the "structural adjustments" Mexico had been pursuing on its own and under pressure of the international banking institution since it defaulted on its foreign debt in 1982. Throughout 1992, NAFTA was being roundly vilified by the conservation community, and its ratification in the U.S. Congress was in jeopardy. The declaration of the biosphere reserve was a direct attempt to quiet some of the concerns of the environmental lobby.

The North American Free Trade Agreement is a marker for the new economic order of trade, free flow of capital across borders, forced competitiveness, and, ironic in its consequences for the biosphere reserve, of privatization of industry. While CANAINPES spoke to the San Diego audience on behalf of endangered fishermen, it was mobilizing its considerable forces in the Gulf of California on behalf of the newly privatized offshore shrimp trawler fleet, historically held by cooperatives.

Precarious Lives

In 1992, small-boat fishermen in the upper gulf began to hammer chano (*Micropogonias megalops*), an endemic croaker. Heretofore, chano appears not to have been exploited commercially and had received virtually no mention in the natural history of the region (cf. Walker 1960). The massive quantities of the fish gillnetted in 1992 were in response to an experimental effort by a Korean processor to supply the Asian market for *surimi*, the processed fish paste. While some of the fish did reach the intended market, tons were left to rot on the sandy streets of El Golfo de Santa Clara. Sufficient ice and transport were unavailable to move the product, and drivers had a penchant for going home at night, as provided for in their contracts, while chano was being landed.

The chano tale can be told several ways. In a multidisciplinary study of the "fragile ecosystem of the upper Gulf," we addressed the fishery in terms of chaos and switching. Blue shrimp (*Penaeus stylirostris*), the prime target of the inshore gillnet fishery and the more economically important of the two predominant shrimp in the upper gulf,² collapsed in the late 1980s. Perforce, inshore fishermen looked for alternative product: totoaba for a time, and then, when a market opened up, chano. The chano market was hardly a windfall. Prices received are ten times less than those for blue shrimp, and while fishermen from El Golfo de Santa Clara landed some 700,000 kg of chano in 1992, they would have had to catch 2 million kg to replace the income lost from an average shrimp catch. Moreover, chano, with a razor-sharp spine, is destructive of nets, requiring gear replacement every season.

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We surmised that if the upper-gulf ecosystem was behaving "chaotically" (there was no way to tell, with the data at hand), then the chano fishery looked "adaptive" (cf. Wilson and Kleban 1992; Smith 1990). But with nothing whatsoever known about the population, it was risky to continue such heavy levels of exploitation.

Colleagues in our multidisciplinary study of the fragile ecosystem of the upper gulf were simultaneously collecting data on vaquita mortality, gear type, and fishing effort by the small-boat (*panga*) fleet based at El Golfo de Santa Clara (Vidal and D'Agrosa 1994). From January to October 1993, 12 vaquita kills were documented during 16,000 hours of fishing

by El Golfo's panga fleet of about 200 boats. Gillnets with a mesh size of 10-12 cm, targeting medium-size finfish such as chano, were the primary killers—with 0.0018 vaquitas killed per hour of effort. Large-mesh totoaba nets, previously documented as the primary cause of vaquita incidental mortality (Taylor and Gerrodette 1993:491), were not blamed for any kills during the 1993 monitoring effort: enforcement levels had increased.

Vidal and D'Agrosa (1994:5) acknowledged that the economic importance of chano accounted for the very high levels of fishing effort during the 1993 season, and that chano gear had the highest ratio of incidental vaquita kills per hour of gillnetting. However, they did not draw any intermediate conclusions from these observations, e.g., that their vaquita mortality figures may represent an aberrant phenomenon, driven by a marketing experiment and an "adaptive" response by economically depressed inshore fishermen. Rather, they reiterated the call for a complete ban on gillnets as the only way to reduce or eliminate incidental mortality of the vaquita (Vidal and D'Agrosa 1994:8).

These conclusions are driven, ultimately, by a zero-mortality criterion, a value that finds support in the science of conservation biology.

Conservation biology has been defined by one of its leading practitioners as a crisis science, one that seldom has the time, or takes the time, to study ecosystems (Soulé 1985). Indeed, haste drove the debate over the fate of the Gulf of California. While more traditional biologists called for more, and more careful, study of the vaquita (cf. Fleischer and Pérez-Cortés M. 1991), conservation biologists demanded immediate action and buttressed that call with statistical analyses demonstrating that even accurate knowledge of the vaquita's population and mortality would not yield conclusions of decline: the population, whatever it was, was too small to statistically detect such a decrease (Taylor and Gerrodette 1993). Moreover, the vaquita may have hit a bottleneck, and any further removal of genetic variation would be deleterious (Rosel and Rojas-Bracho 1993). And the population, whatever it is, appeared to be below 500, a popular cut-off point for "minimum viable populations" in conservation biology (Silber 1990; cf. Simberloff 1988).

All of these tools and tenets of the crisis science were deployed in the fight to save the vaquita. Alternatives to the gillnet ban—ones we felt might lead to a responsible fishery—were, in fact, rather easy to suggest. For the inshore sector, there was a clear direction to take, although it contravenes the wise advice of fisheries management in the face of chaos and stochasticity (cf. Hilborn and Sibert 1988). The direction would be to promote the small-boat shrimp fishery, where the small-mesh gear has little direct impact on the vaquita population and the product price exceeds, by an order of magnitude, that of other targeted species.

In addition, vigorous enforcement of the 20-year ban on totoaba fishing would alleviate much of the problem of incidental vaquita kills, and it would be relatively easy to enforce (cf. Vásquez León 1994). The fish is captured with a distinctive and species-specific gillnet, quite easy to detect in the face-to-face communities of the upper gulf. Moreover, totoaba concentrate to spawn in relatively predictable times and places (Flanagan and Hendrickson 1976), and it was "local knowledge" (cf. Berkes and Folke 1992) of this pattern that led to the demise of the species. Again, pinpoint enforcement would be feasible.

... events would soon conspire to reshape the landscape.

It was clear, as well, that the offshore trawler fleet working the upper gulf—whose nets took a heavy toll on juvenile totoaba—needed to be reduced for its own economic reasons. Such an action, coupled with the use of turtle- and finfish-excluder devices, would at least statistically reduce bycatch. Through our own estimations of operating costs and revenues through the 1980s (cf. Vásquez León and McGuire 1993), we suggested a 40 percent reduction in the offshore fleet (which, during the decade, had grown to about 600 boats, operating at least part of the season in the upper gulf). We suggested as well, based on our bycatch analyses, that trawling be prohibited in waters shallower than 10 fathoms (as required by law) and over muddy/loamy bottoms which are particularly rich in marine life (Vásquez León, McGuire, and Aubert 1993).

The fleet in fact was being reduced drastically, as a result of a stock collapse of the late 1980s, high interest rates and bankruptcies, and soaring fuel costs (McGuire 1991; Vásquez León and McGuire 1993). What was left of the operating fleet in 1994 was owned no longer by cooperatives but by private entrepreneurs, aligned in the powerful CANAINPES—the Cámara Nacional de la Industria Pesquera. There were concomitant effects on local labor—depressed wages on the boats and the blackballing of a number of former cooperative members.

The solutions that flowed from the premises of conservation biology were different. From the wisdom that "fishermen can change occupations, vaquitas can't," tourism was to be promoted, sport fishing encouraged, and aquaculture expanded. The future of the commercial fishery in the region was indeed precarious in the wake of President Salinas's declaration and the potential influence of the international cetacean lobby, but events would soon conspire to reshape the landscape.

Fortuity and Change in the Upper Gulf, 1993-1996

The Colorado River and its major tributary, the Gila, flooded in February 1993. For the first time in a decade, fresh water had a chance to flow into the Gulf of California. Folk wisdom crystallized: fishing would improve significantly, as it had appeared to do following floods in the early 1980s. Indeed, blue shrimp catches during the 1993-1994 season increased, and the corvina golfina (*Cynoscion othonopterus*), a fish that had not been seen in the upper gulf for 40 years, returned in large numbers.

Despite the declaration of the biosphere reserve—which, in its original conception might well have closed down the industry—fishermen and their families who had left the region when shrimp stocks collapsed began returning to El Golfo de Santa Clara in anticipation of this increased productivity. Some obtained boats and motors through a new program directed by PRONASOL, Luis Donald Colosio's agency for rural assistance—despite Colosio's own intent to close the upper gulf to fishing.

The program replaced the existing small-boat cooperatives with "unions," with a stipulation that PRONASOL itself would be a nonworking partner in each of the unions and would share in the profits. PRONASOL also financed the purchase of gear, permitting inshore unions to buy chano and sierra gillnets though not shrimp nets, an apparent concession to the competing offshore shrimpers.

Private capital took up the slack. Investors from San Felipe, across the gulf, built a freezing plant in Santa Clara in 1994 and began supplying shrimp nets to the inshore fishermen in return for their product. The plant itself is a symbol of the new economic order: until the early 1990s, all shrimp had to be delivered to the plants operated by the Mexican parastatal, Ocean Garden. El Golfo's offshore fleet, like that of Puerto Peñasco and San Felipe, was largely privatized during the 1993-1994 season. A supermarket proprietor from San Luis Rio Colorado, on the US border, runs 6 of the 10 boats in El Golfo. He cut back on the number of fishermen working each boat—several of whom have now joined the inshore sector—and placed his "observers" on board to guarantee that none of the catch is diverted through black market channels or taken home for family consumption. In an irony of vertical integration, he is now purchasing shrimp from the inshore sector to process in his packing plant in San Luis.

The entrepreneurial fleet owner also lent his support to a proposal put before PESCA officials by CANAINPES. The request, to which PESCA officials acceded, called for extending the offshore trawling season through June of 1994. Traditionally, PESCA closes down the season in March, when gravid shrimp start appearing in significant numbers in the catch. The logic of the extension mystified and angered

smallboat shrimpers, whose inshore season had closed months earlier.

PESCA's action in response to the private offshore trawler owners was perhaps not unrelated to another fortuitous event. Luis Donaldo Colosio was assassinated in Tijuana in March 1994. His influence—as the apparent heir to Salinas, as head of SEDESOL, which ran PRONASOL, as a Sonoran native, and as a primary proponent of the biosphere reserve and the cessation of shrimp trawling—ended abruptly. There was an immediate power vacuum, and Sonoran delegates to the Mexican congress, who had been reluctant to publicly oppose Colosio and Salinas, rose at a public meeting in Puerto Peñasco to assure fishermen that nothing would be imposed on them in the biosphere reserve unless they were all in accord.

It appears now that a responsible fishery may be achievable in the upper Gulf of California.

Throughout this string of events—acts of nature, acts of self-interest, acts of investment, acts of violence—the biosphere reserve's management³ team pursued its mandate to construct an operational plan and to solicit and win local approval. In a show of unity at one of the public forums convened by the team, inshore fishermen from El Golfo demanded a ban on offshore trawling in the biosphere reserve—as called for in Salinas's original pronouncement. Then, in a letter to the head of the new Ministry of the Environment, Natural Resources, and Fisheries, two smallboat unions made some reasonable requests:

We seek your intervention to solve our problems and obtain help.... We reject the proposal of CANAINPES from Puerto Peñasco which supports the continued trawling in the Buffer Zone of the Reserve, because they use trawl nets that catch all kinds of marine species and damage the sea floor. We also reject the open period they propose. They can fish in the open sea.

We want the Buffer Zone of the Reserve to be permanently closed to trawlers because the area is very shallow and supports many species who live and reproduce here, and supports a great quantity of marine organisms.

We want the upper Gulf of California declared solely for the use of selective commercial fishing gear which does not damage species, and that the seasonal use of these gears be defined by the fishermen of the inshore communities [*los pescadores de las comunidades ribereñas*] (Marron Gonzalez et al. 1996:6).

To these demands, which explicitly invoke the goals of the biosphere reserve in the contest against CANAINPES, the inshore cooperatives appended a detailed plan with opening and closing dates, appropriate gillnet mesh sizes, and specific targeted species. They proposed a diversified, multispecies, multigear fishery in the area.

Nevertheless, the management plan, finalized in 1996, allows offshore trawling in the buffer zone of the reserve. Fleet size is to be limited, and trawlers will be required to carry turtle-excluder devices. In a partial concession to the inshore sector, and to the viability of the shrimp stocks, the offshore season is to be closed in mid-February.

A number of other provisions in the management plan depart significantly from the original specification of the reserve, and from the desires of the community of conservation biologists. Harvesting of clams is to be allowed on the islands and estuaries of the nuclear zone, but no other extractive activity will be permitted there. Smallboat fishing with gillnets can continue in the buffer zone, in fact, in areas from which offshore trawlers are to be excluded. Small-scale aquaculture, low-impact tourism, and modest sportfishing are encouraged, a much less enthusiastic endorsement of these "occupational alternatives" than had originally attended the reserve's creation. The plan, finally, calls for extensive efforts at environmental education, the refinement of fishing gears, and further research on the stocks, the ecosystem, and the residents of the reserve. In short, the management plan for the biosphere reserve in the upper gulf is more benign to the fishermen—inshore and offshore—than the original decree.

Conclusions

We had just come out of the field when President Salinas de Gortari, flanked by dignitaries from Mexico and the United States, delineated the biosphere reserve of the upper Gulf of California and the delta of the Colorado River. As social scientists, we were troubled by the fact that our "clients," the fishers and their families of Puerto Peñasco, San Felipe, and Santa Clara, had virtually no knowledge of what was occurring and appeared to have few prospects at that time for input into the management plan. Indeed, they seemed to be in as much danger as the vaquita and the totoaba. We frankly objected to what we perceived as a complex environmental imperialism—the marshalling of the international cetacean lobby in the service of President Salinas's free trade and neo-liberal agenda.

It appears now that a responsible fishery may be achievable in the upper Gulf of California, precisely because of the complex interplay of two agendas. These are tentative conclusions: First, the political, if not economic, weight of the newly privatized offshore sector may have been largely responsible for the continuation of commercial fishing in the

region. And it is quite likely, now that private entrepreneurs rather than the Mexican government will bear the brunt of overcapitalization, that the offshore fleet will be substantially reduced. Second, private owners of processing plants now have a vested interest in the viability of the inshore shrimp-ing sector and its product and may thus thwart ongoing ef-forts by offshore boat owners to curtail the inshore fishery. Third, a financially lucrative and efficient inshore shrimp fishery may relieve fishing pressure on other stocks—recall the tale of chano—and facilitate enforcement of the ban on totoaba fishing and the incidental kills of the vaquita. Fourth, the pronouncements over the biosphere reserve have given local fishermen justification to seek some degree of local man-agement, a necessary if not sufficient requisite for a respon-sible fishery. Finally, and this is perhaps the most speculative, the presumed benefits of structural adjustment may eventu-ally allow fishermen to change occupations even if vaquitas can't. For now the life of El Golfo de Santa Clara remains inextricably tied to the Gulf of California.

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Notes

1. The 1990 Mexican census enumerated 26,141 inhabitants for Puerto Peñasco and 9,263 for San Felipe. Both of these communities have a significant tourist sector, in addition to the fisheries sector (Anon. 1994:8). El Golfo de Santa Clara, the most heavily fisheries-dependent of the communities in the upper gulf, had 1,500 residents in 1990 (McGuire and Greenberg 1993:19).
2. *P. californiensis*, a deeper-water bottom burrower, is the target of the offshore trawlers, at least when they are fishing offshore; by law, they are precluded from trawling in waters shallower than 10 fathoms.
3. Responsibility for drafting the management plan for the biosphere reserve was given to the Centro de Investigaciones Científicas y Tecnológicas of the Universidad de Sonora, Hermosillo. The draft was delivered to the Secretaría de Desarrollo Social (SEDESOL) in November of 1994. It was then issued in final form in 1996 by the Instituto Nacional de Ecología of the Secretaría de Medio Ambiente, Recursos Naturales y Pesca (SEMARNAP). Under the Zedillo administration, SEDESOL ceased to exist.