

Resource management and fertility in Mexico's Sian Ka'an Biosphere Reserve: *Campos*, cash, and contraception in the lobster-fishing village of Punta Allen

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Abstract This case study examines the link between marine resource management, and the *universal* contraceptive use among married couples in the lobster-fishing village of Punta Allen, located in the Sian Ka'an Biosphere Reserve, Quintana Roo, Mexico. Several reasons appear to contribute to small desired and actual family sizes. Some of these include a medical clinic staff effective in promoting family planning, cooperative and private resource ownership, changing cultural attitudes, geographical limitations to population and economic growth, and a desire to conserve the environment for aesthetic and economic motives. Lastly, families desired to preserve a sustained balance between benefiting from lobster harvests today and safeguarding this marine resource for their children in the future.

Keywords Fertility · Fishing · Resource management · Population · Environment · Mexico · Latin America · Caribbean

Introduction

The earth's human population exceeded the 1 billion barrier for the first time in 1850. In less than 150 years we have added 5 billion more humans to the planet. This unprecedented population explosion, accompanied by increasingly limited land and sea resources, means that farmers and fishers have been formidably challenged to harvest sufficient nutrients to provide an adequate diet for 6 billion mouths. It has been estimated that humans yoke over 40% of the Earth's photosynthetic production, suggesting that, at current levels of production, consumption and population growth, virtually all of the Earth's biological green matter would be

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usurped for human use by the time the planet's population adds several billion additional souls to the planet sometime in the middle of the 21st century. As food production on land has become more challenging, people have turned to ocean resources as a supplement. But after more than tripling from 1950 to 1988, fish catches have stagnated due to severely depleted stocks, meaning precipitous per capita declines (Brown 1997). Regulating human fertility and the extraction of non-renewable resources are logical courses of action if it is a concern that future societies enjoy equitable and decent levels of food and commodity consumption.

The Caribbean lobster fishing village, Punta Allen, represents a leading edge of rural fertility transformations in effect in Mexico during recent decades and is thus a counter example to a global pattern of population pressures on ever-dwindling resources in ecologically protected regions of the rural developing world. This paper examines fertility and natural resource regulation in Punta Allen, Quintana Roo, Mexico. Every woman of child bearing years uses modern contraception in Punta Allen. In the years before 1994, Punta Allen's fertility rates were similar to the rest of Mexico (though they were low for rural areas). Since the mid 1990s fertility has dropped precipitously.

Several hypotheses are considered in the question of fertility decline in Punta Allen. Have cultural attitudes shifted to favor smaller family size? Has the degree and quality of access to family planning and contraception affected demand? Similarly, resource ownership has been hypothesized to contribute to smaller family sizes. Is this the case in Punta Allen? Geographical and resource limitations tend to restrict population growth. Has Punta Allen's privatized commons and its miniature-sized, insular, residential district, made locals wary of the consequences of population growth? Punta Allen is situated in a pristine biosphere reserve. Does their location in a protected area contribute to an environmental appreciation that is connected to family size preferences?

Punta Allen, Quintana Roo

The state of Quintana Roo has a unique place in Mexican demography. With only 10,620 inhabitants in 1930 and 873,800 in 2000, this Yucateco state has been long been among the Mexican states of lowest population, representing only 0.8% of the total population of the country (INEGI 2002). However, from 1970 to 1990 Quintana Roos' annual growth rate was 8.9%. These rates of growth were the highest in Mexico—during the same time period, the national growth rate was just below two percent annually—perhaps the highest of any state or province in Latin America (INEGI 1997). Most of this population growth has occurred in the Caribbean corridor due to the rapid expansion of Cancún and other tourist destinations.

Punta Allen, situated in the southern half of Quintana Roos' Caribbean coast has remained largely immune to the pressures of population growth from in-migration or from natural increase. A lobstering community of approximately 400 residents, concentrated in an area of approximately one square kilometer, Punta Allen is located near the terminus of a long, slender peninsula just north of Ascención bay

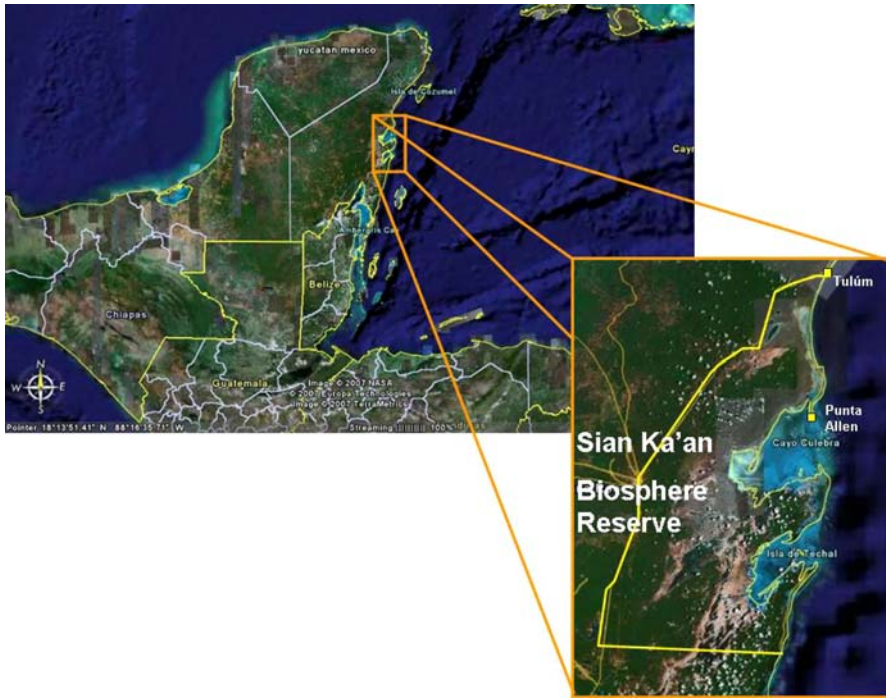


Fig. 1 Sian Ka'an Biosphere Reserve and the Yucatan peninsula

and 30 miles south of the nearest town, Tulum (Fig. 1). Enscorced in the Sian Ka'an Biosphere Reserve, Punta Allen has been buffered from the Caribbean corridor tourism explosion. A pot-hole mottled, oft-flooded dirt road is the town's only terrestrial link to the outside world (Fig. 2). But, in many aspects, Punta Allen far from typifies a community nestled in the wilds of a nature reserve. Anything but marginalized from the global economy, foreign markets constitute the bulk of Punta Allen's sales and lobsters are shipped daily to markets as distant as Tokyo.

Not surprisingly, Punta Alleños do not match the stereotype of provincial Yucateco fishermen. This is particularly true in regards to their fishing success (Figs. 3 and 4). Ramshackle cottages with dirt floors, dusty streets, and humbly attired, sun-baked fishermen belie more subtle (and sometimes invisible) signs of wealth: a mini-satellite dish nestled beneath the shade of a banana stalk, a compact solar generator disguised as a door lintel, a 1996 Ford Bronco parked unassumingly in a weed-infested backyard, a second home in Mérida. Furthermore, though virtually all men are directly involved in the fishing industry, most of them hail from other areas of Mexico—more than half from cities where they were employed in urban wage labor jobs. Frequent interaction with foreigners and other Mexicans through house ownership in major cities of the peninsula, business ties to the U.S. and Japan, and satellite television viewing therefore expose Punta Alleños to western notions of small family size to a much greater degree than most other remote villages in the peninsula.

Fig. 2 Road to Punta Allen. Source: http://cancunsouth.com/cit_siankaan.html



Fig. 3 Fishing boats in Punta Allen



Fishing became the town's primary economic activity in 1968 when 49 fishermen founded the Vigía Chico cooperative. Previously, the local economy revolved around coconut harvesting, and the hunting of alligators and turtles (Dachary and Arnaiz Burns 1989). In 1988 Hurricane Gilbert dealt a sharp blow to the lobster

Fig. 4 Lobster traps in Punta Allen



industry. Plunging lobster harvests, coupled with a mounting debt to the Federal government for subsidizing the construction of the town's lobster processing plant, contributed to an exodus of cooperative members (Leslie 1995). Since the late 1980s cooperative membership declined from over 100 to the 1996 level of 71. Concomitantly, the town's population contracted from approximately 500 residents to 400 (Dachary and Arnaiz Burns 1989; 1996 Censo de la Colonia Col. Javier Rojo Gómez [Punta Allen]). Today, the lobster population continues to rebound from Gilbert and fewer fishers means higher median income for those who remained. The desire to maintain this income may help to explain why Punta Allen's fisher population will likely remain relatively constant.

A history of hurricanes and economic devastation means that Punta Alleños are quite aware that their fate lies precariously in the hands of mother nature. One elderly fisherman sagely noted that "the environment has much more power to destroy itself that we to destroy it." Cooperative members are therefore committed to do all they can to carefully regulate their economic lifeblood, lobster fishing. But they are also aware that to ensure economic success for their children, regulating the number of children they have is a more secure long-term investment than is the regulation of highly variable lobster harvests.

An extension of the *ejidal* system, the Mexican Caribbean has been organized into cooperative-owned sea space since the existence of organized fishing in the area (Leslie 1995; Miller 1989; Price 1987). Within this *ejidal* framework, Punta Alleños have divided their commons into private parcels known as *Campos*. Owning *Campos*, or working in collaboration with someone who does, is the only way to access marine resources in or near Ascensión bay.

Resource management is regulated internally and externally. Internally, Punta Allen's Vigía Chico cooperative has established a fishing moratorium from March 1 to June 30 to allow the lobster population to reproduce. Furthermore, cooperative members have mandated that lobsters carrying eggs must be thrown back and that

lobster-grappling hooks may not be utilized for fear of puncturing eggs. Lastly, no fishermen can fish in the Campos of other fishermen without the campo owner's permission. A vigilance committee enforces regulations and violators face financial sanctions or dismissal from the cooperative.¹

In addition to strict internal codes, soon after the town was incorporated into the Reserve, external regulations were imposed by the federal Department of the Environment, Natural Resources and Fisheries (SEMARNAP in Spanish; Young 1999). Some of the prohibitions include: cutting the local palm wood, chit, (from which their lobster traps and houses were traditionally built); the use of fishing nets; and the capture of sea turtles. Furthermore, limitations on the entrance of construction materials precludes the establishment of tourist infrastructure in the form of, for example, multi-storied, beach-front hotels. Regulations imposed by reserve custodians hamper construction of new homes within Punta Allen. Construction outside of the town limits is constrained for most, not so immediately by building regulations, but by the exorbitant prices of land ownership.² Thus, new household formation, and therefore marriage and childbearing, is, to a large extent, constrained within the square kilometer that the town proper represents.

It appears that Punta Allen's privatized commons may exert a regulatory effect on family size preference, and thus on fertility (e.g., a lower demand for children and a financial security that has increased access to cosmopolitan values favoring smaller families and to contraception). Punta Allen's crude birth rate of approximately 10 births (per 1,000 population) strikingly contrasts fertility patterns typical of the developing world. Only four countries in the *developed* world had lower rates in 1999. It was less than half the national average for Mexico of (24.6) and Central America (26.5) from 1995 to 2000. This is of particular importance given the problems high population growth has posed for the conservation of protected areas in Latin America.³

Punta Allen's low fertility rate occurred during a period of rapidly falling fertility throughout Mexico. Nationally, the total fertility rate (the number of children a woman would have if the fertility rates for a given year applied to her throughout her lifetime) fell from almost seven in the late 1960s to three in 1994. Total fertility has been slightly lower in Quintana Roo, having dropped under three births per woman. In Punta Allen it has dropped below two births per woman. This rapid decrease in fertility coincided with a dramatic expansion of contraception access throughout Mexico. Contraceptive usage rose from 30% in 1976 to 66% in 1995.

¹ The enforcement of these regulations challenges the assumption of Hardin's Tragedy of the Commons model that users of commonly held resources will not self-regulate absent state policy (Hardin 1968).

² As is typical of ejidal systems, Punta Alleños do not own their land, they hold life-long use rights that can be transferred to sons. But land outside the town is privately owned—much of it by a few of the village's founding families.

³ Population pressure frequently compromises conservation in Latin American Protected Areas. Donovan (1994) suggests that high rates of natural increase among locals has accelerated deforestation rates to approximately 5% per annum in Costa Rica's Corcovado National Park. Wells and Brandon (1992) found that population growth exacerbated deforestation in core areas of the Mexican Monarch Butterfly Overwintering Reserves. Similarly, Herlihy (1985) documented how continued high fertility is straining the environment of Panama's Chocó Indians.

But many remote rural areas have remained beyond the reach of modern health care. As a result, the total fertility rate in communities with fewer than 2,500 people, nearly a third of Mexico's population remained 4.7 in 1990, double the rate in urban areas. By 2000, rural municipios in Mexico retained TFRs above 4, including those in Quintana Roo (INEGI 2001). Considering the remote location of Punta Allen, the community's low fertility is unusual. By the early 1990s Punta Allen at 3.9 persons per household had by far the smallest household population size in the entire municipio of Cozumel, including urban areas! (INEGI 1993).

Resource access, ownership, and fertility

Since the 1960s, when concern for the unprecedented swelling of the human species captured the public's attention with books such as *The Population Bomb* (Ehrlich 1968), demographers and economists have generated an impressive corpus of literature on the determinants of fertility in the developing world. Echoing many Western European turn-of-the-century demographic transition patterns, much of the developing world continues in a transition characterized by rapidly falling mortality rates that precede declining fertility rates.

With some revisions to this framework, researchers claim that families today are having fewer children where certain enabling conditions are gaining purchase on rapidly changing cultural mores. Some of these conditions include: a shift in cultural values to smaller families (Caldwell 1980, 1987; Lesthaeghe and Surkyn 1988), which reduces the "demand" for children (Demeny 1992); greater access to contraception—in Mexico federal funding for this has helped halve fertility levels in little over a decade—which helps to meet latent demand for contraception and to create new demand (Ross and Mauldin 1996; Freedman 1997); lower infant mortality, obviating the need for "insurance" births (Singh 1994; Davis 1963); marriage postponement and greater child spacing (Davis 1963; UN 1987); improved education and empowerment among women (UN 1987; Easterlin 1978; Easterlin and Crimmons 1982); and, last but certainly not least, ascending socio-economic levels among populations increasingly employed in wage-labor jobs. This last condition raises the costs of child-rearing and tends to place women in propinquity to most other fertility suppressing determinants (Knodel et al. 1987; Singh 1994; Agadjanian 2001).

Nevertheless, perhaps the most powerful fertility determinant in rural areas, and one that has received paltry attention in social science literatures, is the role of resource ownership, access, and management on fertility (De Sherbinin et al. 2007). The scant research that has been published on resource-fertility relationships generally (though far from conclusively) supports two hypotheses: (1) where access to resources is expanded in the form of more land (or other resources), fertility ascends and, conversely, (2) resource ownership suppresses fertility as economic security *vis a vis* children is replaced by security due to resource ownership (Doveri 2000).

Several studies worldwide support the positive correlation between resource access and fertility. Perhaps the most striking study positively relating fertility and

farm size was the Philippine Rural Survey of 1952 (Hawley 1955) in which average total fertility rose from 4.8 to 7.0 (per woman in her last decade of childbearing) as plot size increased from under 1 ha to over 4 ha. Stokes et al. (1984) cite more recent evidence from among the diverse environments of Bangladesh, Philippines, India, Latin America, Mexico, and Brazil. Similarly, Cain (1984) found a positive correlation between farm size and fertility in Egypt and Thailand. This study is significant because it rectified a neglect in previous research by controlling for education, age, income, age at first marriage, and land ownership. More recently Carr et al. (2006a, b) found rapid fertility decline in the Ecuadorian Amazon was related to the sub-dividing of farms during the 1990s. Nevertheless, some studies show only insignificant differentials in family size relative to land access (e.g., Tuladhar et al. 1982).

In support of the thesis that resource security suppresses fertility, Cain (1984) found a statistically significant negative relationship between resource ownership and fertility. But a study in three East Azerbaijani villages discovered that land owners have only slightly fewer (0.3) children than non owners (Good 1980). And in direct counterargument to the land security hypothesis, Hawley (1955) found Philippine landowners tended to have more children than farm laborers. Even more compellingly, in examining studies from India since the 1960s, only one (Singh 1986) showed a negative relationship between landholding and fertility while several contradicted the resource ownership—fertility hypothesis.⁴

In summary, the relationship between resource access and fertility is inconclusively positive; between resource ownership and fertility it is inconsistently negative. Place-relevant contingencies often play a greater role. Some of them may include the nature of local on or off-farm child labor demands, market supply for renting access to resources, and income yielded per unit area. These factors, in turn, can be variably affected by the resource richness of the area, resource use, market access, and levels of product demand. Larger plots and ownership may be associated with higher socioeconomic status that would hypothetically reduce fertility. Still, the direction of presumed causality remains unclear. Does greater access to resources stimulate a demand for child labor or do more children stimulate a demand for more resources (see, e.g., VanWey et al. 2007)? Does ownership stimulate suppressed fertility due to resource security or do couples who a priori desire fewer children tend to invest in resources? Research probing the land-fertility hypothesis has tended to be inadequate in scope and number, to be plagued by modest differentials, to lack variability controls, to inconsistently and unsatisfactorily define ownership, and to commit the ecological fallacy of imputing aggregated data to the household level.⁵ Indeed, due to the manifold interactions among contextual variables, a qualitative approach may be more appropriate than the more common statistical analysis in studying resource-fertility interactions.

⁴ Studies that showed a positive relationship between land security and fertility in India include: Driver (1963); and Singh (1986).

⁵ For a more in-depth critique, see Thomas (1991).

This paper probes whether a cooperative structure may affect fertility where—as in the case of the Punta Allen fishing cooperative—a commons has been divided into private plots whose resource access is secured and regulated by the individual plot owner and the cooperative. Much has been written on “Tragedy of the Commons” scenarios and, conversely, on successful examples of commons resource use by cooperative communities (see, e.g., Ostrom 1990; Hardin 1968; Leal 1998). It has even been noted by some that fertility regulation has played as important a role in successful commons management systems as unhindered fertility has played in commons tragedies (e.g., Dasgupta 1995). But, to this author’s knowledge, nothing has been written on the supply and demand for children in response to spatial and social limitations operating in a community-regulated, privatized commons.

Methods

To explore why Punta Alleños prefer small family sizes, four methods of data gathering were employed: archival research; participant observation; in-depth individual interviews; and community-level interviews with key informants. Archival research was conducted at the local Non-Governmental Organization (NGO), *Amigos de Sian Ka’an*, at Punta Allen’s medical clinic, and at various governmental archives in Mexico City. Participant observation included living in the one room house of a local family, and eating, fishing, conversing, recreating, and cohabiting with locals. In this regard, I straddled the continuum between participant by observation and observer by participation. In-depth interviews were conducted with 26 fishermen (representing 30% of household heads), their wives (if married), and fifteen key informants from June to August of 1997.

Spatial variability played a key role in the sample design. Punta Allen is divided by the town square between Jehova’s Witnesses in the north, and Roman Catholics in the south. More than religion divides these groups. The Jehova’s Witnesses are the population majority (over 75% are “*hermanos*”), tend to be more recent arrivals, and dominate community and fishing cooperative politics. The Roman Catholics of the southern end of town consist in a few of the founding families.

A second sampling division involved modeling socio-economic and cultural stratification after fishing success. Measurement was based on two questions: “Does the fisherman own fishing rights, or is he an assistant?” and “How much fish did the fisherman catch last year, and on average in the last 5 years?” I obtained this information from the administrative offices of the fishing cooperative and corroborated the findings during interviews.

An equal number of lobstermen and their wives (if applicable) were randomly interviewed in the north and south, with an equal representation of those whose average annual catch during last year and the previous 5 years was in the bottom, middle and upper ternary of the cooperative. All the interviewed fishermen’s *chalanés* (assistants) and their wives (if applicable) were interviewed as well. Since southerners (Catholics) constitute only 25% of the town’s population, this group was oversampled. This 50–50 stratification was initially conceived based on the

expectation that religious differences would explain much of the variability between the two groups. This assumption turned out to be false.

In addition to fisher families, I interviewed key informants such as the director of Amigos de Sian Ka'an, the mayor, two former town mayors, the president of the fishing cooperative and his secretary, two former presidents of the cooperative, the minister of the Jehova's Witness temple, the president of the "Women's Club of Punta Allen," the doctor and nurse serving the community, as well as deviant cases such as two foreigners living in the community, an ecotourism operator, and an unemployed family from Mexico City.

In all interviews, questions ascertained the respondent's number of children, their children's ages, the family size, and contraceptive use. Semi-structured research questions explored respondent's opinions regarding their family size choices. Some of these questions included:

Why did you want x number of children?

Why do you consider x an ideal number of children for a couple to have?

Why do Punta Alleños have fewer children than people in other parts of Mexico?

Based on answers to these questions, conversation elicited further dimensions. For example, when fishermen answered that they wanted only two children, because they were not confident of future lobster harvests, asking "why?" initiated responses that illuminated a number of reasons for low ideal family size.

Findings

Universal contraception

Medical records from Punta Allen's community health center confirmed that, as of 1996, *all* married women were using some form of modern contraception. Even without medical records, shown a map of Punta Allen, the village nurse, a Punta Alleña since birth, can effortlessly provide the names and ages of all household members, as well as their detailed medical and personal histories. She claimed that the pill is by far the most popular form of contraception. This is largely due to the fact that the majority population of the town, Jehova's Witnesses, believe that IUDs may be used as abortion devices—a practice to which their faith is opposed. Medical records were corroborated by interviews in which every woman surveyed (16 out of 83, 20% of women aged 12–49) claimed to be using modern contraception.⁶

It is safe to assume that all women in the town are included in local medical records. Virtually every household head is a member of the town's fishing cooperative and, therefore, benefits from its comprehensive health insurance program. Those who are not cooperative members still receive affordable care from the village clinic. Due to the small number of inhabitants in Punta Allen, any

⁶ Twelve is employed as the first year of childbearing potential since some girls under the age of 15 have been pregnant in Punta Allen, as is typical for rural areas in Mexico.

woman who was not seeking medical care would be conspicuous to the town nurse, and would likely be sought out by her were she not attending the clinic. Many women mentioned how important it was that their nurse was a Punta Alleña:

She has grown up here all her life. She knows us all and we know that she cares about our health in a real, personal way, that an outsider couldn't.

Such ubiquitous contraceptive use may seem incompatible with the finding that in 1996 the average number of children per woman in Punta Allen was 3.0—almost identical to the Mexican national average of 3.1 in 1995. Indeed, Punta Allen's crude birth rate from 1990 to 1996, 27/1000, was the same as Mexico's in 1995. But Punta Allen's birth rate has fallen dramatically. In 1996 there were 55 children aged 0 to 5—an average of 11 births per year. But of these children only 3 were under the age of 1. In July of 1996 only 4 women were pregnant. By 1996, Punta Allen's fertility profile—a faithful microcosm of Mexican fertility before 1994—resembled countries with the lowest birth rates in the world. Indeed, in 1995 only Estonia, Russia, and Italy had lower CBRs than Punta Allen's. Due to variable rates of rapidity of fertility decline, those countries' total fertility rates ranged from 1.1 to 1.7—well below the universal replacement level of 2.1. Though Punta Allen's population is far too small, and the decline is yet too short-lived, to conclude that recent fertility trends are not a function of periodic variability, evidence suggests that low rates may continue.

The resource-fertility hypothesis: the privatized commons and economic sustainability

In unregulated commons, or open-access areas, more children are an advantage for the capture of resources such as wood and water (see, e.g., Caldwell 1987). Children, therefore, may be the decisive instrument in the hands of the household that will determine the amount of resources acquired. While for the household, large families are optimal in an open access environment, for the local community (and, many would argue, the global community) continued high fertility is usually disadvantageous.

Conversely, lobstermen in Punta Allen do not benefit from more labor than is already applied to their fixed “plots.” Furthermore, a dearth of economic alternatives in the area means that children are unlikely to generate income outside of fishing. Thus, in Punta Allen, more children are viewed as disadvantageous at the household and community levels. Therefore, couples invariably expressed a desire to have only one, or at most, two (the mean and median was 2.1) children to inherit their Campos in order to ensure bountiful resources for their future namesakes.

Indeed, in planning for the economic security of their children, number of children is a much easier factor to control than is the highly unpredictable harvesting of lobsters. Though Punta Allen's fishers clearly take measures to control both, they are aware that maintaining the number of children at one or two helps to safeguard a higher standard of living given *any* level of lobster production. This concept was lucidly expressed by a recently married 27-year-old lobsterman who

desired only one child. In response to the question “Why do you want only one child?”, he replied:

How do I know that the global market will continue to value lobsters. How will I support my children if lobster prices collapse?

Nevertheless, since men wish to have at least one boy to inherit fishing Campos, it may be expected that some families will exceed their stated ideal number of children in order to assure a male heir to fishing grounds. This male preference effect will be mitigated to the extent that women disagree, and are able to assert their position.

Perhaps not surprisingly, given the universal use of family planning, those who enjoyed access to more or larger Campos, or to better quality Campos, tended to have similar family sizes as those with less privileged access. This suggests that greater resource access did not engender larger families. On the contrary, many respondents cited their secure fishing plots as motivation for limiting family size. Although campo owners did have somewhat larger families, this appears to be mostly a function of age differentials. Younger fishermen have yet to complete their families. Furthermore, owners tend to be original members of the cooperative, in their forties and fifties, and, therefore, members of a generation that favored larger families. One young cooperative member summed up a commonly aired sentiment among fishermen old and young:

Having fewer means giving them more. Twenty pesos for two is ten pesos each; but for four, it is five.

Changing generational attitudes

Generational differences in family size preference appear to have attenuated over recent years. Campo owners invariably expressed that an ideal family size is 1–3 children, regardless of the number of children they actually had. Many talked openly about how their generation represented a transition in attitudes about family size and conceded that in their teens and twenties they wanted more children than they would today. Most concluded that virtually all of their children will surely have no more than two children. The president of the cooperative, for one, opined that more kids may have been appropriate for his parents, but that continued population growth is no longer ideal for the community’s relation with the environment that nourishes it:

Twenty years ago we didn’t have so many people here. Couples had four kids or more, and that was O.K. But the lobster population goes up and down unpredictably. We have enough people here now, and I think of course people should limit the number of children they have. I think they should stop at two.

Chalanes, or fishing assistants, are usually sons of owners, who will someday inherit their father’s Campos. Like their fathers, they invariably expressed a desire for only 1 or 2 children and recognized the changing attitudes among today’s

parents. Unlike their fathers, no married son of campo owners had more than one child. One young couple claimed that they would have no more. Said the father:

My granddad was one of the three original founders of Punta Allen. He had ten kids. Then my mom had 5. Now in my generation we are conscious that having many kids is not good and we are aware of the benefits of birth control. In our case we are thinking of just having one.

It seems clear that, as the population grew and the limits to resource extraction on Campos became evident, fertility was purposely reduced and fishing regulations were more stringently enforced. Further, many respondents mentioned the importance of television messages regarding fertility regulation and North American sit-coms, with small family sizes and thirty-something bachelors, are popular. It is noteworthy, then, that there has been a rapid growth in satellite dishes in the last few years. That the change in attitudes translated into lower fertility only recently is not unusual given that it is expected that cultural values regarding family size often lag behind other fertility-lowering factors (e.g., Davis 1963). This suggests the powerful role that the media can play in regulating fertility and conserving the environment. Indeed, since the impact on the lobster harvest of a larger household would not be shared equally by the community, the community not only regulates fishing rules, but also fertility rules through adaptive social norms.

Terrestrial limitations to growth, environmental protection, and lobster regulation

Whereas seafaring men were more likely to respond that they desire fewer children than their parents because of their finite fishing Campos, landlocked women often invoked geographical limitations not of the fishing grounds but of the town itself—a reflection of how “mental maps” and thus, perceptions and realities of inhabited space, differ between the two genders. Punta Allen is circumscribed by park boundaries to about a 1 km north–south extension and by the ocean to only a couple hundred meters width. In recognition of this geography, one housewife quipped:

The town is so small there is no more room for us to grow.

One of the reasons cited by more than half of the respondents, slightly more women than men, for wanting small families was to protect the environment. The natural environment, residents claim, makes Punta Allen a special and even enviable place to live. Many spoke with pride that Punta Allen has remained an environmental oasis on an otherwise burgeoning Caribbean coast, and with fear that population growth could turn Punta Allen into a mini-Cancun:

We are privileged to live in an ecological lung where wildlife abounds...Unlike in other places, until now at least, nature has been conserved here, not like Cozumel where huge constructions are everywhere.

But this desire is not totally without economic considerations as several informants—particularly young men—mentioned the value of conserving the local

environment for the ecotourism revenues conservation could help generate. The president of the Punta Allen tourism cooperative explained that population growth could damage the sustainability of the lobster industry, and that tourism may be necessary to compensate:

I think in 20 years there will be a lot of people here and we will need another economic activity because lobster fishing is unpredictable.

Financial security is a forceful motivation for conservation. But I argue that it is also a motivating and enabling force behind fertility regulation.

Indeed, an underpinning cause of low fertility demand—and high contraception supply—in Punta Allen can be traced to the bounty of the natural environment. The only lobster cooperative in the province of Quintana Roo that has privatized fishing grounds, Punta Allen's Vigía Chico cooperative has consistently yielded more lobster than any of the other 21 cooperatives along the Yucatán's Caribbean coast (Leslie 1996). At approximately \$18 U.S. dollars per kilo of lobster, it is not uncommon for fishermen to earn \$10,000 to \$40,000 during peak fishing months. Even less successful fishermen earn salaries well above the national average. Many fishermen own homes in Cancún, Mérida, or Carrillo Puerto where they maintain family ties, send their children to high school, and vacation during the off-season. Two car households with parabolic television antennas are common. Such a level of financial security appears to have played an important enabling or contributing role in some of the proximate determinants of fertility mentioned in this paper.

On the contraception "supply" side, wealth has enabled cooperative members access to the most expensive state-operated medical program in Mexico, *Salubridad*. Perhaps unlike any other remote village its size, Punta Alleños are provided immediate, constant, and reliable access to a medical clinic whose staff earnestly promotes family planning. On the contraception "demand" side, high incomes have allowed fishermen to limit immediate lobster catches as a form of investment in future harvests. It is this same motivation for long-term investment in the economic welfare of their children that has made popular smaller family sizes. Unlike the developed nations where increased income means greater consumption and environmental degradation, or like rural peasants in the developing world who have little incentive to conserve natural resources, in Punta Allen, increasing income appears to have had a positive effect on the environment.

Also affecting contraception demand, fishing success has enabled greater interaction with the outside world through connections with global markets, Mexican and North American television programs received through satellite channels, and frequent contact with Mexican urbanites and foreigners through travel to cities in the peninsula and elsewhere.⁷ As a result, villagers invoked a rhetoric that reflected exposure to global media when speaking about population and environmental conservation. Several locals actually referred to the "global demographic explosion problem." As depicted in the media, smaller families were

⁷ There is substantial evidence in the Public Health and Communications literature that supports the effectiveness of mass media campaigns on changing fertility behavior (See Bankole et al. 1996; Westoff et al. 1996; De Jong and Winsten 1996; Piotrow et al. 1994.)

associated with a more North American or European way of life. In contrast, high fertility was cited by many as characteristic of unsophisticated remote rural farmers, or the “Mayans” as they are often referred to:

Farmers in the country don't get the television commercial messages promoting the importance of family planning like we do...They are less civilized and they don't study in school. They live off of their corn, squash and beans and have up to 10 kids. And they are very Catholic and say that they should not take pills or limit their number of kids.

Conversely, Punta Alleños perceive themselves more like urbanites in their education and sophistication levels. With exceptional exposure to more cosmopolitan values, it is understandable that cultural mores favoring smaller families have gained acceptance in Punta Allen before most other remote villages in Latin America. But to say that Punta Alleños have simply parroted western cultural values is incorrect. Rather, villagers seem to possess both a surprising level of western sophistication and a more organic understanding of their relationship to their unique environment.

Punta Allen's fishers have forfeited some immediate financial gain in favor of regulatory measures that are a form of insurance for future incomes. Environmental sustainability has taken precedence over short-term profitability in Punta Allen. This has affected other proximate determinants of fertility in a way that windfalls or ephemerally high incomes might not. A gold rush harvesting of lobsters would not likely lead a cooperative to invest in an expensive health-care system or to immediately desire fewer children. Rather, it is this shared notion of sustainability—of human and lobster populations—that has been key to the Punta Allen's cooperative success in striking a balance between their economy and the environment, the present and the future.

Conclusion

That every woman of child-bearing years uses modern contraceptive methods in this lobster-fishing village represents the pioneering edge of demographic transformations reverberating throughout rural Mexico. Indeed it is a rare case for a community its size in the developing world—perhaps a unique case considering that the 100% user rate has been accomplished without external aid to bolster contraceptive supply or demand, but rather as the result of community will. There are several reasons that appear to contribute to small ideal and actual family sizes in Punta Allen. Some of these include a medical clinic staff effective in promoting family planning, cooperative and private resource ownership, changing cultural attitudes, geographical limitations to population and economic growth, a desire to protect the beauty of the natural environment for aesthetic and economic motives.

In reference to the resource access hypothesis, those who had access to more Campos, or to better quality Campos, tended to have similar family sizes as those with less privileged access. Conversely, the resource security hypothesis would suggest a negative relationship between resource ownership and fertility resulting

from the substitution of owned resources for children as a security asset. Consistent with this premise, Punta Alleños candidly expressed disadvantages to population growth in their privatized commons. Though campo owners did have somewhat larger families, this appears to be mostly a function of age differentials (and different generational attitudes).

That lower fertility has occurred only recently is not surprising given that cultural values governing family size often lag behind other fertility-lowering determinants. Many respondents mentioned the importance of television messages regarding fertility regulation and North American sit-coms, with small family sizes and thirty-something bachelors, are popular. It is noteworthy, then, that there was a rapid growth in satellite dishes during the 1990s years.

Regarding geographical limitations to growth, seafaring men were more likely to desire fewer children than their parents because of finite fishing Campos while “landlocked” women more often mentioned the geographical limitations of the residential area of the town. Another gender difference was that men more often mentioned economic reasons for protecting the environment while women would invoke the aesthetic value of environmental conservation. Both genders, however, appeared to consider fertility regulation an important form of conserving their protected environment.

Families’ high incomes enable the existence or enhance the effect of some of these proximate determinants. On the contraception “demand” side, wealth has meant increasing access to western notions of smaller families and, on the “supply” side, wealth has purchased the community a high quality health clinic with a staff committed to women’s reproductive health. The desire to maintain a high standard of living has, in turn, translated into strict community regulations restricting lobster harvesting and membership into the fishing cooperative. This desire, coupled with resource security through campo ownership, has meant that campo owners would prefer fewer children to ensure a greater lobster—and thus income—to child ratio.

Besides limiting fertility, the structure of Punta Allen’s privatized commons has been a prohibitive barrier to in-migration while its economic success has limited out-migration. There no longer remain unowned Campos in the bay and all Campo owners in the same fishing group are nuclear relatives. By cooperative decree, nobody can join the cooperative who is not a son of a current member. As long as the economy remains based on the Campo system of lobster fishing, Punta Allen is unlikely to be a popular destination for in-migration. This is not insignificant given that 57% of the province of Quintana Roo is composed of migrants who, along with their children, have been largely responsible for the quintupling of the provinces’ population from 1970 to 1990 (INEGI 1992).

Historical and geographical providence, coupled with a commitment to community cooperation, has placed Punta Alleños in a unique position to benefit, and to conserve, their natural environment. Blessed with lucrative and bountiful marine resources, and little internal or external population pressures, residents have been able to operate with an extended time horizon, to self-regulate their economy and their fertility as an insurance investment in the future.

In addition to self-imposed restraints, Punta Alleños are constrained by their physical geography, a constraint that has perhaps helped them to preserve their

wealth. Geographical limitations are defined by isolation as much as by water, park and private property borders that girdle Punta Allen to Vatican-esque dimensions. Such geography fosters a heightened sense of community cooperation, a cooperation that is evident in the agreement upon and adherence to fishing regulations. Perhaps most importantly, Punta Allen's physical geography makes evident spatial limits to internal growth and galvanizes locals against the intrusion of readily-recognized outsiders.

Punta Alleños have so far chosen to prioritize the conservation of their natural resources. In other contexts locals may not enjoy such choices. Landlessness and lack of land tenure often causes squatters to rapaciously exhaust land on which there exists no guarantee of permanent residence (Fearnside 2001; Carr 2004, 2005; Carr et al. 2006a). Among rural communities in isolation from each other, regional consensus on "internal" regulations is difficult to attain (let alone the attainment of their enforcement). It is all too common that splintered interests lead to commons tragedies.

Nonetheless, if people engaged in economies of primary resource extraction are to enjoy an economically sustainable future, and if we are serious about helping bequeath to our children natural wildlands worthy of protection, it may behoove communities to follow the example of the Punta Allen fishing cooperative. This approach will not work everywhere. Where population pressures on dwindling and degraded resources are high, privatizing resources to the exclusion of intruders will not reverse an inherently unsustainable situation. Nevertheless, Punta Allen's privatization of aquatic resources supports the notion that, in places that have resources left to conserve and a sustainable population, conservation and economic sustainability can be achieved wedding resource tenure with community-level regulations. Indeed, the case of Punta Allen suggests that the successful privatized commons can improve per capita income through both the numerator and the denominator.

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