Human Organization, Vol. 49, No. 4, 1990

0018-7259/90/040373-13$1.80/1

The Effects of Settler Incursion on Fish and Game Resources of the Yuquí, a Native Amazonian Society of Eastern Bolivia

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Increasing settlement and subsequent deforestation in the Amazon are disturbing animal habitats and placing pressure on indigenous peoples who depend on hunting as a means of subsistence. As policy makers attempt to address growing environmental and social concerns, anthropologists are often in a position to provide information relating to traditional subsistence systems and how these systems may be experiencing stress due to development. Crucial to this issue is the need for anthropologists to provide in a proactive manner quantitative, longitudinal resource use data to those in policy-making positions to document the effects of settler incursion on native subsistence systems. This paper will present data from the Yuquí, a foraging people in eastern lowland Bolivia who are experiencing increased pressure on faunal resources from settlers. Using data collected in 1983 and 1988, I will suggest that the Yuquí are beginning to exhibit hunting patterns consistent with known cases of game depletion. I will argue that diminishing faunal resources are being triggered by colonist incursion into Yuquí territory and not by overexploitation *per se* by the Yuquí. Finally, the availability of these data to a local indigenous rights organization and a major lending agency offer hope that the present trend toward resource depletion in the Yuquí catchment area will be given serious consideration by regional development policy-makers.

Key words: game depletion, foraging societies, Amazonian development, lowland Bolivia, Yuquí

THE UNPRECEDENTED RATE of settlement and resulting deforestation in the Amazon Basin has been an issue of growing concern among members of the scientific community; more recently it has stirred considerable attention from the general public as well (e.g., Planet of the Year 1989, Can Man Save This Fragile Earth? 1988). It is becoming evident that the release of large amounts of carbon dioxide into the atmosphere through forest burning may be affecting the world climate. Researchers also fear that thousands of species of plants, many with potential use to humankind, will be lost through extinction. A by-product of settlement and deforestation of large, or even small, segments of the Amazon forest is the disruption of animal habitats and the resulting stresses placed on the indigenous peoples who depend on fish and game as primary sources of food (Clay 1988).

The direct effects of contact between western society and native Amazonians such as disease, genocide, and social disintegration are readily observable (Bodley 1988), but the indirect consequences of environmental changes due to settler encroachment may be less so. Changes in the subsistence base of a population are often subtle, and in most instances occur over many years. Although studies of indigenous resource use may extend over a year or longer and be thorough in reporting the current situation, they may not reveal trends that are apparent only as the result of longitudinal research (Hames and Vickers 1983). Unfortunately, it is often only after irreversible damage has occurred to a given society that researchers then are able to reconstruct the sequence of events leading to cultural extinction (Bodley 1973, Davis 1977).

Redford and Robinson (n.d.) have commented that anthropologists, because of their traditional interests in studying native peoples in remote places, are often in a unique position to supply the kinds of information that would be useful not only

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to natural scientists and conservationists, but to those individuals involved in the planning and implementation of development policies. In dealing with policy makers, a convincing argument often necessitates providing quantitative data, not simply qualitative assessments, however well-documented by ethnographic observation they may be. Much of the work being done in the area of cultural ecology is beginning to supply the type of baseline data necessary to track indigenous resource use over time. In particular, studies such as those by Gross et al. (1979), Paolisso and Sackett (1985), Saffirio and Hames (1983), and Saffirio and Scaglion (1982) demonstrate the efficacy of gathering subsistence-related data to determine the consequences of settler incursion into indigenous territories. If indigenous peoples or those lobbying for their rights are to be effective in fighting this encroachment, it must be demonstrated beyond equivocation that the threat is real, that it is growing worse, and more importantly, that it can be measured while it is happening.

This paper will present data from the Yuquí, a foraging people in eastern lowland Bolivia. The Yuquí have experienced at least two episodes of incursion into their native habitat: the first brought them into initial contact with the outside world and resulted in their being settled permanently at a mission station on the Chimoré River. The second involves the growing pressure from frontier settlement that the mission is now experiencing.

Using data from research conducted in 1983 and 1988, I will suggest that the Yuquí are beginning to exhibit hunting patterns consistent with known cases of game depletion. Further, I will argue that diminishing faunal resources are being triggered by colonist incursion into Yuquí territory and not by overexploitation *per se* by the Yuquí.

Ethnohistory and Background of the Yuquí

The Yuquí are culturally and biologically related to the Sirionó and more distantly to other Tupí-Guaraní-speaking groups of lowland Bolivia and Paraguay (Stearman 1984). During the initial years of Spanish incursions into the region of modern lowland Bolivia, the Guaraní, who took pride in their aggressiveness and abilities as warriors, successfully attacked the Europeans and forced them into retreat. Ultimately, however, the Guaraní were unable to counter the superior technologies and military strength of their adversaries. Most of the indigenous survivors of these early Indian wars were placed on Jesuit and Franciscan missions where they were exploited as sources of labor by local settlers and were subject to rapid mestizoization.

The remainder of these Guaraní peoples fled into the forests of the Bolivian *oriente* where they evidently experienced deculturation due to dwindling numbers and the need to maintain a nomadic existence. By continually retreating into unpopulated and remote areas of the lowlands, several groups remained uncontacted until modern times. Their existence was known by lowlanders, although contacts were infrequent and usually hostile. These nomadic groups left little to mark their existence, building no structures and in some cases, planting no crops. Thus, they occupied a mythical position in lowland folklore and were often the topic of apocryphal stories. They are called *Chori*, a lowland term of unknown indigenous origin that means "savage," "wild," or "untamed." The first to be successfully contacted were the Sirionó, who achieved prominence in anthropological literature through the work of Allan Holmberg and his publication of *Nomads of the Long Bow* in 1950 (Holmberg 1969). Holmberg laid to rest much of the supposition surrounding the Sirionó, establishing that the Sirionó were indeed one of the most technologically simple societies known. In addition to lacking structures, the Sirionó had no means to produce fire, no religious specialists, no domestic animals, no watercraft, and engaged in minimal horticultural activities.

West of the Sirionó, near the base of the Andes Mountains in wetter and much more heavily forested area, was another group of people known as the Yuquí. Local residents presumed they were a splinter group of Sirionó since they exhibited traits similar to them: the Yuquí wore no clothing or other ornamentation, the women plucked their brow hair, and their arrows, occasionally retrieved from the body of a mestizo victim, were identical to those of the Sirionó. Although a few lowland families, hunters, and members of acculturated indigenous groups such as the Yuracaré had ventured sporadically into Yuquí territory since colonial times, they did so with great caution. As a result, the Yuquí remained virtually undisturbed until the late 1950s when Bolivia, like many nations with holdings in Amazonia, implemented policies to bring this region under intensive exploitation.

Colonization of the Lowland Territories

Bolivia's efforts to open its lowland territories to settlement predate those of most other nations bordering the Amazon Basin and can be attributed to policies resulting from the Social Revolution of 1952. Although the intent in 1952 was to initiate yet another palace revolt, highland peasants soon escalated the insurgence to a full-scale revolution. Sweeping reforms included the expropriation of large land holdings and nationalization of the tin mines. Attention also focused on integrating the lowland territories into the sphere of national influence.

Beginning in the early 1960s, the Bolivian government received international funding assistance to develop and colonize the lowlands. In spite of institutional support, settlement was slow and patchy (Stearman 1973). Ultimately, lending agencies expressed concerns that goals set by colonization agencies were not being met, the beginning of what was to become widespread disenchantment with colonization as a development strategy. By the mid-1970s, the push for frontier settlement had abated although some spontaneous colonization was still occurring. Throughout this period, the Yuquí faced increasingly frequent and hostile encounters with settlers, but they were still able to find areas of relative isolation and safety. Although they grew no crops of their own, their taste for cultivated foods such as corn, manioc, and plantains made them frequent but unwelcome visitors to settlers' farms. Their constant pilferage of crops and willingness to shoot anyone in sight gave rise to organized manhunts whose objective was extermination, not "pacification." This situation came to the attention of the New Tribes Mission which began a ten-year effort to contact and pacify the most frequently sighted band of Yuquí and settle its members at a mission station on the banks of the Chimoré River. At the time of successful contact in 1968, this band num-

bered 43 individuals. In 1982, when I first conducted research among the Yuquí, their numbers had grown to 73. In 1986, a second band of Yuquí, 23 people, was contacted by the mission and encouraged to join the Chimoré settlement, culminating a seven-year pacification effort. At present, a third contact effort is under way with what is felt to be the last group of unacculturated Yuquí. Mission reports number this remaining forest band at 18–21 individuals.

In 1982 and 1983, the years I first worked among the Yuquí, they were in the vicinity of, but not yet threatened by, colonization in the Chapare region. As the data will show, their use of fish and game resources appeared stable and sufficient for their needs. (See also Stearman 1989b.) Although the Chapare had been a coca growing area since precolumbian times, the market was primarily legitimate, supplying pharmaceutical houses and traditional highland Bolivian coca users. Colonization programs in the 1960s brought more settlers into the area, many of whom decided to cultivate the crop, but the demand was still limited primarily to the legal drug market and national consumption in leaf form. By 1988, however, when I returned to conduct fieldwork among the Yuquí, there had been a marked change. The Yuquí were now circumscribed by settlers, most of whom were there solely for the purpose of growing coca for the illicit drug trade.

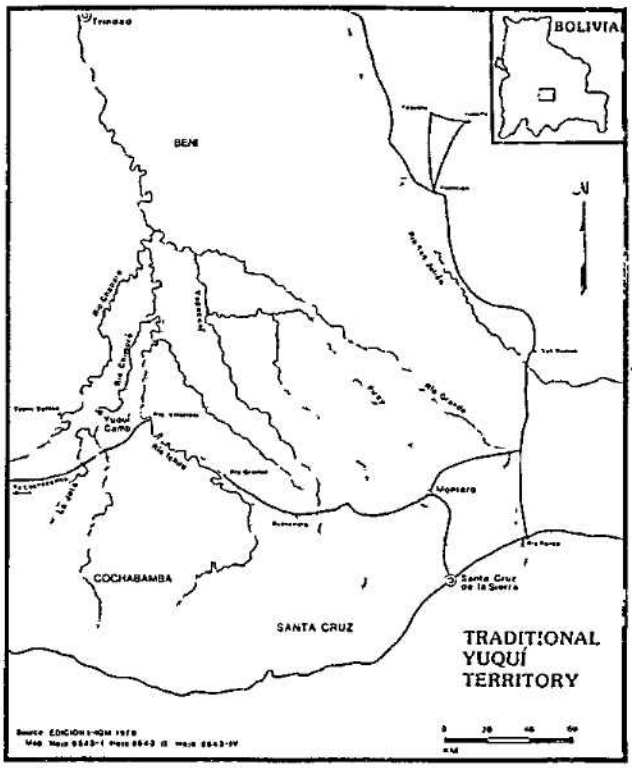

FIGURE 1 TRADITIONAL YUQUÍ TERRITORY

Location and Environment

The Yuquí camp on the Chimoré River is located at 64° 56'50" W and 16°47'00" S (Figure 1). These coordinates place it within 60 kilometers of the western edge of the Andes Mountains in an area of Bolivia that receives an average rainfall of 4,000 mm. per year at an altitude of about 250 meters (Bolivia 1975). The Chimoré River is a tributary of the Ichilo-Mamoré River system, comprising part of the Madeira River system, a southern tributary of the Amazon River.

The primary vegetation is tropical rain forest although the area also contains large marshes resulting from year round standing water. Some of the lower areas which flood only seasonally are covered with dense stands of *pachiubilla* palm (*Socratea exhorriza*). The region shows extensive river activity and is marked by overgrown abandoned riverbeds and numerous oxbow lakes.

The Chimoré area is known for its very short dry season, usually the months of July and August, and the climate is often described by local people as "wet" and "wetter." Seasons are perhaps better defined by temperature changes rather than rainfall with cold fronts or *surazos* moving through the area from May through September. Temperatures during the year may range from 39°C in February to 0°C in July. Interviews with all adult Yuquí hunters from the first group contacted indicate that in their 22 year history at their present location, they have experienced very little difference in overall game availability due to seasonality (cf. Hill et al. 1984). However, Yuquí hunters report that certain game animals, in particular primates, tend to congregate in areas where seasonal fruits occur during the months of January and February. Game species fall within the range of those generally described for Amazonia.

Fishing shows some seasonality, but again according to Yuquí as well as missionary reports, the Chimoré River does not experience prolonged periods of fish scarcity as have been reported in other regions of Amazonia due to seasonal migratory patterns and extensive flooding (Goulding 1980, Meggers 1971, Roosevelt 1980). It would appear that because the Chimoré River is located near the foothills of the Andes and is therefore a degrading, upper Amazonian white water river, it falls within a range of rivers that carry heavy silt loads when they flood intermittently, and which as a consequence, provide productive, year round fishing (cf. Irvine 1987). Now that the Yuquí are no longer fearful of approaching open waterways, river fishing has become an important subsistence activity. In the past, successful fishing in the Chimoré River was limited only by rainfall in the mountains and the resulting flooding caused by runoff which left the river silt laden for short periods. The Yuquí normally would not fish with a hook and line during these floods lasting two to seven days because it was both dangerous and not usually very successful. But once they were introduced by the mission to gill nets and canoes, they found that the day immediately following a flood surge was the most productive for this technology.

Fishing in forest lagoons and ponds (oxbow lakes and former stream courses) has always entered into Yuquí foraging strategies but will fluctuate as water rises and recedes. Many of these ponds, originally part of the larger river system, fill and empty according to the conditions of the Chimoré and other smaller streams which, when in flood, overflow into these former pathways. When extended dry periods occur, the Yuquí are able to collect fish by hand from ponds as they evaporate, increasing their fish takes during these periods. However, even during the "rainy" season, many of these shallow ponds will begin to dry up after only a few days' hot sun, delivering harvests of small,

but abundant fish. Therefore, the Yuquí are normally able to take advantage of this type of fishing throughout the year.

Methods

Data were collected during the months of September–December in 1983, and February–May in 1988. The first data collection period for foraging activities totalled 56 consecutive days of observations from October 3–18, and October 23–December 1. These 56 days fell during the transition period between the end of the drier months and the beginning of the "rainy" season. The second consisted of 80 consecutive days of observation from February 15–April 19, and April 27–May 11. For the purpose of comparability, only the first 56 days of the 1988 data have been used in this analysis, February 15–April 10[1]. This latter research segment began during the middle of the wetter season and ended with the beginning of the drier months. However, the 1988 "rainy" season was unusually dry for this area of Bolivia, resulting in activities such as collecting fish by hand in forest ponds being carried out oftener than usual.

Records were kept on a daily basis for all adult hunters which included fish/game taken, weight in kilograms (kgs.), distance travelled, time expended, weapons used, names of companions, names of fish/game recipients and amounts received during distribution, and an account of other items such as fruit, honey, and fiber brought back from the foraging expedition. In 1983 the adult hunters totalled 16. In 1988 the number of hunters increased to 19, which represents the death of two of the original 16 hunters (Victor and Manuel) and the addition of five new men from the group contacted in 1986 (Itonubí, Fernando, Onésimo, Yaguaramá, and Yabitá). Another hunter, Timoteo, died in a canoe accident on day 42 of the 56 day research schedule. Additionally, in 1988 records were kept of contributions to subsistence by women and children under the age of 17.

Qualitative ethnographic data were also collected during both research periods, and interviews regarding subsistence activities were conducted among settlers and others in the area using a prepared interview guide.

Catchment Area

The Yuquí hunt two zones that form more or less concentric circles around the mission station at the center (Figure 2). The core area, where most of the hunting has traditionally taken place, extends approximately five kilometers and has a total area of 78.5 km^2. A larger, less frequently hunted area extends to a limit of about 10 kilometers from the mission with an area of 245.5 km^2. These two zones, totalling 314 km^2, in turn are bisected by the Chimoré River, forming four sub zones which reflect differential access to the far side of the river based on the availability of canoes. Although hunters are making increasing use of the extended hunting area, it means being away from the settlement for more than a day, the preferred length of a foraging trip. Consequently, all but two of the 358 hunts carried out in 1983 and all but 19 of the 371 hunts in 1988 were within the core area encompassing both sides of the river. In 1988, 72% of all game, by weight, was still being captured within this 5 kilometer radius of the mission.

The Effect of Settler Incursion on Yuquí Animal Protein Capture

Changes in subsistence patterns among the Yuquí since 1983 are apparent in several areas, but all generally point to a deteriorating environment from increased settlement and circumscription leading to competition for resources, particularly river fish and large game animals. An aerial survey of the colonization zone conducted in 1988 along with trips to settlement areas confirmed the extent of colonist incursion. In 1983, only one family consisting of eight people lived within the 10 km radius of the Yuquí extended hunting territory. This family had cleared four hectares of forest along the Chimoré River that were under cultivation. By 1988, settlers within this area numbered approximately 145 people divided among 29 households located primarily upriver from the Yuquí mission station. The estimated area cleared along the Chimoré River or within one kilometer from the river was 60 hectares. In the southwestern quadrant of the catchment area, recent colonist habitation now represents uninterrupted settlement moving in from the Chapare coca growing zone. Consistent with patterns reported elsewhere, there are strong indications of declining game resources as a result of this incursion. These include: an increase in the distance, frequency, and duration of hunts (Campos 1977, Hames 1979, Hames and Vickers 1982, Saffirio and Hames 1983, Saffirio and Scaglion 1982); an increase in the kills of smaller animals and less preferred species resulting in the taking of a larger number of species (Hames and Vickers 1982, Romanoff 1984, Saffirio and Hames 1983), and the adoption of new techniques and strategies to improve hunting efficiency of smaller animals (Gross et al. 1979, Hames and Vickers 1982, Saffirio and Hames 1983, Saffirio and Scaglion 1982). Although it has been suggested elsewhere that overhunting in an indigenous core settlement area is the result of game being driven in by colonization (Flowers 1983), in the case of the Yuquí, I will present evidence that indicates that certain faunal resources were probably depleted in colonization areas first, and that it was the depletion of these resources that initiated changes in Yuquí hunting patterns in the mission core zone. Before moving to these issues, however, I will briefly note patterns of game capture as they relate to changes in the Yuquí population.

Game Capture and Population Growth

Although there was no statistically significant difference in total kilograms of game captured between 1983 and 1988 (Table 1), 1169.00 kgs. in 1983 and 1213.70 kgs. in 1988, game retrieval has not kept pace with population growth. In 1983, the group at the Chimoré camp numbered 73. By 1988 the Yuquí population had grown to 103.[2] To meet the requirements of a 41.1% population increase, the Yuquí game take in 1988 should have reached at least 1649.41 kgs., 435.71 kgs. more than were actually captured. Thus, while the population has increased 41.1%, total game takes have increased only 4%. Although the Yuquí population has grown, the ratio of hunters has remained constant. In 1983, there were 16 hunters for 73 people, or a ratio of about 1:5; in 1988, there were 19 hunters for the population of 103, also a ratio of 1:5. Since hunter ratios

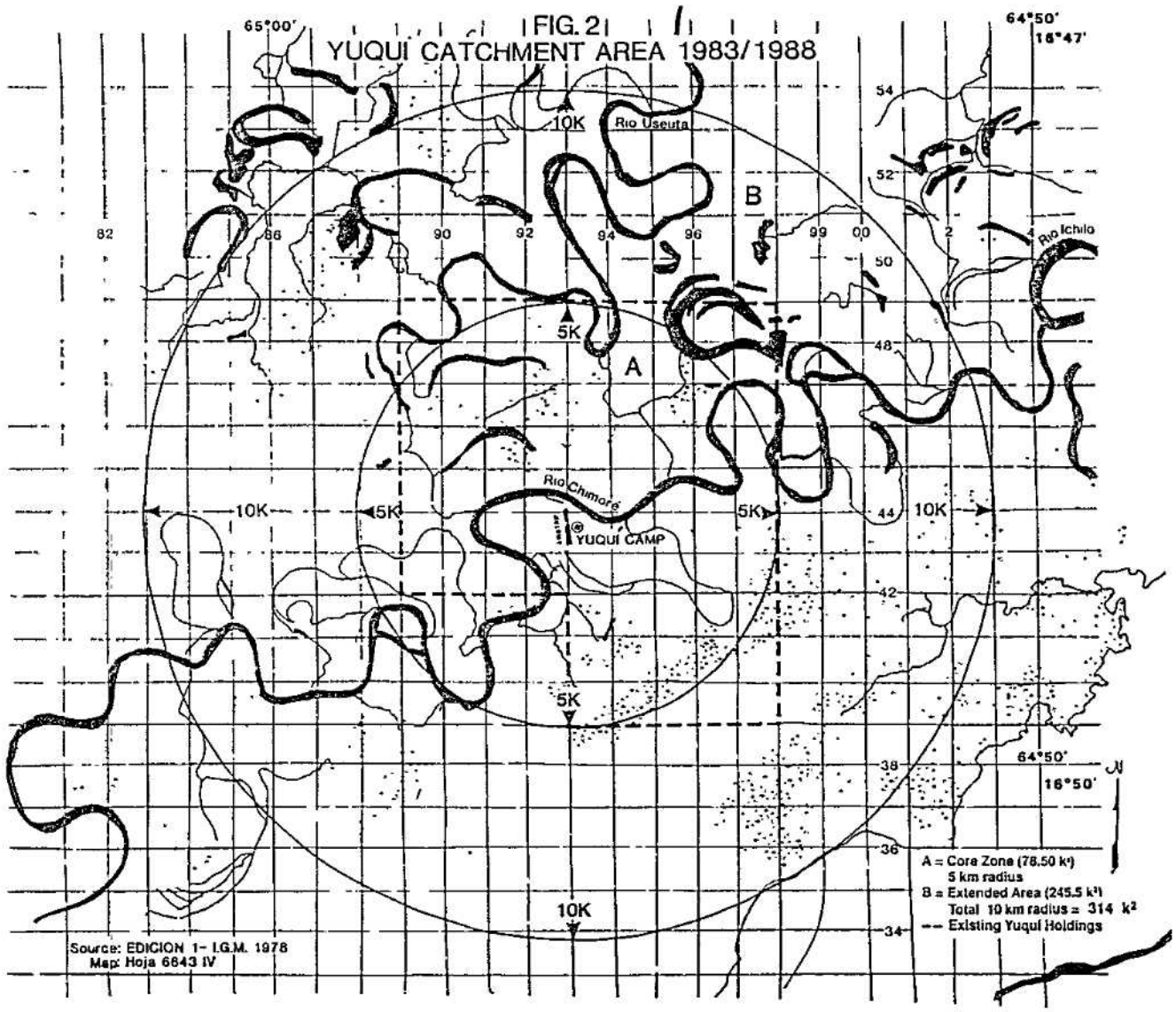

FIGURE 2 YUQUÍ CATCHMENT AREA 1983/1988

among the Yuquí have remained virtually unchanged, diminishing game resources must be considered as an alternative explanation for the decline in game takes for 1988.

INCREASE IN THE DISTANCE, FREQUENCY, AND DURATION OF HUNTS. By 1983, the Yuquí had given up trekking, a pattern they had continued for the first several years following contact. Once the Yuquí established an ongoing dependence relationship with the mission (about 1966), they only rarely ventured forth for more than a day at a time. In 1983, the typical hunt pattern was of one day's duration within the five kilometer core area range. Only two "long hunts" outside the core area occurred during the 56 day segment.[3] By 1988, the Yuquí were beginning to engage in long hunts more frequently, openly indicating that this was necessary in order to obtain not only larger amounts of meat, but also to enjoy the meat from more preferred game animals that were not encountered in the five-kilometer range of day hunts around the mission (cf. Werner 1983). In contrast to the two long hunts totalling ten days away from the mission core area conducted during the reseach period in 1983, 19 such hunts totalling 64 days occurred during the same period of time in 1988.

The data indicate that long hunts away from the mission have become an effective strategy to improve overall foraging (both fish and game) efficiency. The mean yield for meat captured per man day for hunting/fishing activities in all hunting zones was .43 kgs. When only long hunts outside the core area are considered, this figure improves to .64 kgs. per man day. While hunting efficiency figures bear out the Yuquí's contention that they get more meat on a long hunt with less effort, it is also true that they are able to concentrate on preferred species such as primates, an important boost to Yuquí morale. In 1988, 83 kills representing six species of primates were made with over 50% of the total coming from long hunts outside the core area.

TABLE 1. YUQUÍ FISH AND GAME CAPTURED 1983/1988

	Fish (kgs)		Game (kgs)		Totals (kgs)	
Hunter	1983	1988	1983	1988	1983	1988
1. Humberto	120.50	10.20	144.75	133.60	265.25	143.80
2. Benjamin	128.00	5.70	10.50	57.50	138.50	63.20
3. Jonatán	198.00	3.00	0	25.90	198.00	28.90
4. Guillermo	199.25	77.45	45.75	42.00	245.00	119.45
5. Victor	38.25	†	29.50	†	67.75	†
6. Daniel	119.50	11.50	78.00	37.90	197.50	49.40
7. Lorenzo[a]	279.60	0	0	0	279.60	0
8. Lucas[a]	107.50	0	46.00	1.20	153.50	1.20
9. Leonardo	8.50	37.65	152.50	158.70	161.00	196.35
10. Alejandro	53.75	15.90	226.00[b]	139.90	279.75	155.80
11. Manuel	28.50	†	14.50	†	43.00	†
12. Tomás	123.80	9.45	51.00	23.50	174.80	32.95
13. Jaime	101.00	61.20	185.50	145.70	286.50	206.90
14. Jorge	23.00	0	59.50	111.40	82.50	111.40
15. Timoteo	1.50	1.50	51.00	38.10	52.50	39.60
16. Joel	34.25	1.20	74.50	203.50	108.75	204.70
17. Itonubí	–	5.70	–	28.20	–	33.90
18. Fernando	–	5.80	–	6.00	–	11.80
19. Onésimo	–	17.80	–	8.70	–	26.50
20. Yaguaramá	–	20.90	–	13.50	–	34.40
21. Yabitá	–	8.80	–	23.20	–	32.00
Totals	1564.90	293.75	1169.00	1198.50	2733.90	1492.25

With kills by women and children included, total fish taken for 1988 = 361.85 kgs; total game = 1213.70 kgs; total fish and game taken = 1575.55 kgs. In 1983, river fish accounted for 67% of the total fish taken. In 1988, river fish accounted for 16% of the total fish taken.

† deceased.

– not present.

[a] Away with the contact team for all but 11 days of the 1988 research period.

[b] Includes a 150 kg tapir kill.

Since this was the fruiting season when more primates could be expected to be taken, 39 individuals from four of the six species were also killed within the core area. Nonetheless, *all* of the howler monkeys (20) and the single spider monkey, the largest and most desirable primate species taken, were captured on long hunts at distances greater than five kilometers from the mission.

In addition to an increase in the distance of hunts, the frequency and duration of hunts show a similar trend but require some interpretation. Although the mean frequency of hunts for both time periods shows no statistically significant difference (22.5 days per hunter in 1983 and 20.52 days in 1988), the number of sick days recorded for each research period is an additional variable which influences the total number of days available for hunting. Sick days for 1983 numbered 23 man days with a mean of 1.43 sick days per hunter. In 1988 the camp suffered an epidemic of typhoid fever which affected 10 of the 19 hunters. As a result of the typhoid epidemic, other illnesses, and accidents, sick days for 1988 totalled 87 man days or a mean of 4.57 days per hunter, a significant increase over the 1983 figure ($Z = 3.6590$; $P = .0207$). Had sick days remained within the 1983 parameters, it can be assumed that more time would have been devoted to hunting in 1988 but with presumably lower returns for the effort.

In a similar manner, duration of hunts shows a trend toward increase but again without a statistically significant difference. In 1983, the mean duration of a hunt was 6.97 hours. By 1988, this figure had climbed to 7.98 hours. As was the case with frequency of hunts, other factors must be considered in the interpretation of these data. Since hunting and fishing are often carried out during the same foraging expedition, the mean hours represent *combined* time expenditures for both activities. The nature of my data is such that it is impossible to separate hunting from fishing time expenditures. However, the proportion of fish taken in 1988 was much less than that taken in 1983 (23% and 57%, respectively). Given this difference, one might assume that the Yuquí devoted at least a proportionately larger amount of time in 1988 to hunting and perhaps more, particularly since unstructured observation revealed that in most instances, the kgs/hr return rate was better for fish than for game.

INCREASE IN THE KILLS OF SMALLER ANIMALS AND LESS SELECTIVITY. In 1983, five species, deer (*Mazama americana*), tapir, capybara, collared peccary, and white-lipped peccary accounted for 65%, by weight, of the total game taken. The data are consistent with the proposition that the continuing availability at that time of these large animals contributed to the taking of fewer species of game animals, fewer numbers, and fewer of the less preferred species. In 1988, tapir, white lipped peccary, and capybara did not appear in the Yuquí hunting sample. As would be expected, the absence of these three important game sources has had significant impact on Yuquí

TABLE 2. YUQUÍ HUNTING/FISHING EFFICIENCY 1983/1988

Hunter	Total kgs		Total hours in pursuit		Mean hourly rate	
	1983	1988	1983	1988	1983	1988
1. Lorenzo[e]	279.60[a]	0	116.56	1.75	2.39	0
2. Benjamin	138.50[b]	63.20[c]	69.50	188.85	1.99	.33
3. Leonardo	161.00[c]	196.35[c]	118.35	142.33	1.36	1.37
4. Jonatán	198.00[a]	28.90[c]	150.00	65.33	1.32	.44
5. Tomás	174.80[b]	32.95[c]	137.50	107.00	1.27	.30
6. Alejandro	279.75[c]	155.80[c]	235.20	180.75	1.18	.86
7. Guillermo	245.00[b]	119.45[b]	224.10	267.33	1.09	.44
8. Humberto	265.25[d]	143.80[c]	245.60	226.20	1.08	.63
9. Jaime	286.50[d]	206.90[d]	263.50	286.00	1.01	.72
10. Jorge	82.50[d]	111.40[c]	97.50	125.25	.84	.88
11. Daniel	197.50[d]	49.40[c]	266.50	172.96	.74	.28
12. Victor	67.75[d]	†	95.00	†	.71	†
13. Lucas[e]	153.50[d]	1.20[c]	218.50	16.00	.70	.07
14. Joel	108.75[d]	204.70[c]	173.25	300.50	.62	.68
15. Timoteo	352.50[d]	39.60[c]	85.50	139.91	.61	.28
16. Manuel	43.00[d]	†	103.00	†	.41	†
17. Itonubí	–	33.90[d]	–	152.50	–	.22
18. Fernando	–	11.80[b]	–	74.00	–	.15
19. Onésimo	–	26.50[d]	–	193.88	–	.13
20. Yaguaramá	–	34.40[b]	–	166.10	–	.20
21. Yabitá	–	32.00[d]	–	157.28	–	.20

Mean kgs per man hour: 1983, 1.08; 1988, .43.
† Deceased.
– Not present.
[a] All fish.
[b] Mostly fish.
[c] Mostly game.
[d] Both fish and game.
[e] Away with contact team for all but 11 days of the 1988 research period.

hunting patterns. In 1983, only 156 individuals representing 27 taxa comprised the 1169.00 kgs. of game retrieved. By 1988, this number had grown to 348 individuals representing 44 taxa captured in order to obtain a comparable amount of meat (Table 3). The proportion of smaller animals (0–5 kgs.) to medium and large has also increased from 62% of the total take in 1983 to 88% in 1988 (Figure 3). Both the frequencies of species taken and weight distributions by species (Table 3) show significant differences between 1983 and 1988 ($Z = -3.8398$; $P = .0001$ and $Z = -2.8859$; $P = .0039$). In addition, the Yuquí are now intensively hunting animals that they classify as less desirable meat sources. These include primarily kinkajou and coati which are said to "taste bad and make you sick."[4] In 1983, five animals in this category were captured. By 1988, this number had increased to 58 (Table 3).

The disappearance of white-lipped peccaries and capybara most probably can be attributed to settler hunting and increased disturbance rather than to overexploitation by the Yuquí. Although studies of white-lips are incomplete, it is known that, along with spider and wooly monkeys, they are highly susceptible to disturbance (Romanoff 1984). In her study of the Runa of Ecuador, Irvine notes:

> As little as ten years ago, according to my informants, white-lipped peccary still roamed the Loreto plateau, but they have not been sighted since then. One Runa noted that they have not passed through this territory since the road was built from Baeza to Coca by the oil companies between 1972 and 1975 (1987:135).

The Yuquí have not killed or sighted a while-lipped peccary since 1985. Prior to that time, while-lipped peccaries were hunted on an average of twice a month. The nine kills recorded for 1983, for example, occurred on four spearate hunts during the 56 day data collection period. When questioned about the apparent disappearance of white-lipped peccaries, the Yuquí like the Runa claimed that settlers have interfered with herd movements by building roads and houses, and clearing land.

White-lipped peccaries are also a preferred game of Bolivian nationals because of the similarity in the taste and texture of the meat to that of domestic animals (Redford and Robinson 1987, Vickers 1984) and are hunted intensively during initial periods of settlement when they are still plentiful (cf. Bodmer et al. 1988). Their disappearance in 1985 also coincides with the increased settlement of the region resulting from the growing cocaine trade. Although white-lipped peccaries are known to vacate areas for lengthy periods and to have irregular migration patterns (cf. Campos 1977; Vickers 1988, 1990), the Yuquí recall no time in their past when pecarries disappeared for such an extended time.

Capybara apparently have also succumbed to the presence of settlers, but for different reasons. In addition to considering capybara meat bad-tasting, Bolivian nationals throughout the lowlands believe that capybara carry leprosy, probably stemming from the knowledge that they transmit a similar-appearing disease to cattle. In farming regions, capybara are considered a threat to cultivated fields which they routinely invade. From time to time, their hides may also have value in the international market. Since they are relatively slow on land and travel in groups, they are easy to kill. Also, they are prone to sit along the banks of rivers where they can be readily shot from a canoe, or as is now common in the Chimoré area, from the silent rafts that bring timber to sawmills downriver. Consequently, when Bolivian nationals are present, capybara are killed in great numbers as an extermination measure, for gain, or just for sport.

It is possible that deer and in particular, tapir, are also experiencing the effect of settler incursion since they, like the peccaries, are considered a preferred game meat by colonists (cf. Beckerman 1978). Although tapir densities, and hence kills, are expectedly low (Robinson and Redford 1986), only one being taken during the 1983 research, the Yuquí claim that they are growing scarcer. No tapir were taken during the five months, January–May, that I resided at the Chimoré in 1988. However, additional longitudinal data on both tapir and deer kill rates will be necessary to confirm the Yuquí's observation that like the peccaries, these two species are declining in number as well.

Of the large terrestrial animals discussed, collared peccary seem to be maintaining steady to slightly increasing kill rates, implying that they may be avoiding overexploitation by colonists. Unlike the white-lipped peccary, collared peccary do not travel in large herds and they take to ground, making them harder to find if dogs are not used. However, with the absence or scarcity of other large mammals, the Yuquí may now be hunting these animals at unsustainable rates.

An increase in the kill rate of rodents other than capybara

TABLE 3. GAME ANIMALS IN YUQUÍ HUNTING SAMPLES 1983/ 1988

Animal	Number		Total Weight (kgs)	
	1983	1988	1983	1988
Mammals				
(Rodentia)				
1. Squirrel (Sciuridae)	4	6	1.75	2.70
2. Agouti (*Dasyprocta spp.*)	2	14	1.00	45.60
3. Paca (*Agouti paca*)	5	1	33.50	6.00
4. Capybara (*Hydrochaeris hydrochaeris*)	9	0	259.00	0
5. Porcupine (*Coendu spp.*)	2	4	7.50	14.10
6. Spiny rat (*Proechimys spp.*)	0	7	0	1.10
(Edentata)				
7. Giant anteater (*Myrmecophaga tridactyla*)	0	1	0	34.00
8. Anteater (*Tamandua tetradactyla*)	2	2	13.00	9.80
9. Armadillo (*Dasypus novemcinctus*)	14	3	67.50	13.10
10. Armadillo (*Dasypus kappleri*)	0	1	0	12.00
11. Sloth (*Bradypus tridactylus*)	1	2	6.00	14.30
(Artiodactyla)				
12. White-lipped peccary (*Tayassu pecari*)	9	0	174.00	0
13. Collared peccary (*Tayassu tajacu*)	8	12	141.00	201.30
14. Deer (*Mazama americana*)	2	1	36.50	31.00
(Perissodactyla)				
15. Tapir (*Tapirus terrestris*)	1	0	150.00	0
(Primates)				
16. Capuchin monkey (*Cebus apella*)	12	23	29.50	67.10
17. Howler monkey (*Alouatta seniculus*)	0	20	0	130.50
18. Night monkey (*Aotus spp.*)	5	15	5.00	16.20
19. Spider monkey (*Ateles spaniscus*)	0	1	0	8.00
20. Squirrel monkey (*Saimiri sciureus*)	0	21	0	18.60
21. Titi monkey (*Callicebus moloch*)	0	3	0	3.50
(Carnivora)				
22. Coatimundi (*Nasua nasua*)	5	43	17.00	147.50
23. Kinkajou (*Potos flavus*)	1	15	2.00	32.70
24. Puma (*Felis concolor*)	0	1	0	16.00
25. Tyra (*Eira barbara*)	1	4	4.00	13.80
(Marsupialia)				
26. Opossum (*Didelphis marsupialis*)	0	3	0	3.50
Reptiles and Amphibians				
27. Caiman (*Paleosuchus spp.*)	5	7	29.50	32.50
28. Tortoise (*Geochelone spp.*)	17	37	92.50	164.50
29. Turtle (aquatic species of Chelonia)	0	13	0	24.00
Birds				
(Tinamidae)				
30. Tinamou (undet.)	3	2	3.00	3.10
(Ardeidae)				
31. Heron (undet.)	0	4	0	4.70
(Ciconiidae)				
32. Wood stork (*Mycteria americana*)	0	1	0	2.00
(Threskiornithidae)				
33. Ibis (undet.)	0	1	0	1.50
(Anatidae)				
34. Duck (undet.)	8	11	18.00	16.00
(Cathartidae)				
35. King vulture (*Sarcoramphus papa*)	0	2	0	5.50
36. Vulture (*Coragyps spp.*)	3	4	5.50	5.60
(Accipitridae)				
37. Hawk (undet.)	0	3	0	5.10
(Cracidae)				
38. Guan (*Penelope spp.*)	14	25	20.00	32.20
39. Curassow (*Mitu spp.*)	13	12	40.00	58.30
(Psittacidae)				
40. Macaw (*Ara spp.*)	6	10	8.00	9.50
41. Parrot (*Amazona spp.*)	2	3	1.25	1.50
(Strigidae)				
42. Owl (undet.)	0	1	0	.20
(Ramphastidae)				
43. Toucan (*Ramphastos spp.*)	0	4	0	2.10
44. Birds (undet.)	2	5	3.00	3.00
Totals	156	348	1169.00	1213.70

Wilcoxon paired sign test for difference in frequencies of kills 1983/1988: $Z = -3.8398$ ($p = .0001$); for difference in kill weights 1983/1988: $Z = -2.8859$ ($p = .0039$).

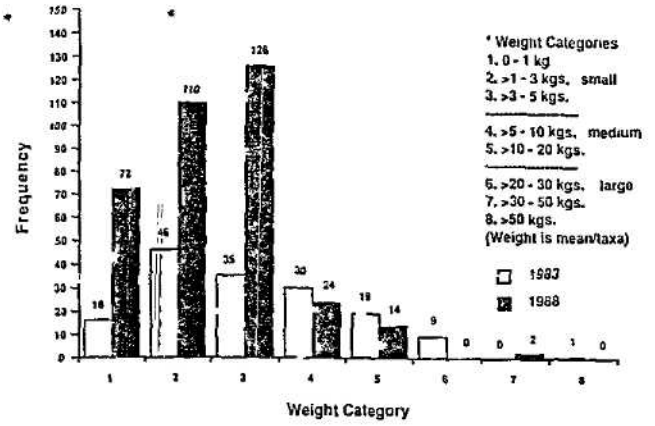

FIGURE 3 FREQUENCY OF GAME TAKES BY WEIGHT CATEGORY

was also observed and is another indicator of declining game resources (Table 3). The assumption is that rodents are ignored when larger, more preferred game is available; thus, when low kill rates are combined with high reproductive potential, their encounter rates will be high, leading to increased takes when hunters are forced by scarcity of larger game to kill them (Vickers 1988). The small spiny rats (*Proechimys spp.*, average weight 150 grams) now being taken around the mission fall into this category. Agoutis, however, present a somewhat more complex problem. While there is little doubt that they are being hunted now in numbers they were not in the past, their encounter rate five years ago also may have been much lower. Agoutis are known to be associated with human activities such as gardens or forest fallows where a steady supply of food may also increase their already high reproductive rates (Irvine 1987, Linares 1976).

Until recently, when the Yuquí began to clear small areas for planting, the camp area was surrounded by forest. As the Yuquí clear more gardens, albeit small, there is more to attract these animals into the areas contiguous to the mission. At the same time, the Yuquí's poor gardening habits leave these cleared patches undisturbed and unprotected for long periods, making them an ideal habitat for rodents. Consequently, the substantial increase in agouti kills could be attributed in part to an increase in the agouti population itself and not necessarily to their being ignored in the past. The Yuquí have always considered them a very acceptable prey. Nonetheless, a change in hunting patterns to specifically target agouti indicates that depletion of larger species must be considered a factor in these increased kills. In my experience, successful agouti killing, such as is done by the Siriono, requires that the hunter use dogs to run the agouti to ground, or lie in wait at a place they are known to frequent. Since the Yuquí do not use dogs, they are now noting locations, particularly garden sites, where agoutis are likely to appear. The hunter often leaves camp before dawn to await the agouti and make his kill. In the past, apparently there was not enough concern over encountering game of some sort during the daylight hours to merit the additional effort it takes for this type of hunt. In contrast to the accidental encounters of agouti in 1983 during normal hunts, which resulted in only two kills (and these were the offspring of adult animals), in 1988, 14 agoutis were killed using this specialized strategy. During recent years and declining yields, the Yuquí have learned that gardens are good places to hunt and have increased their exploitation of them accordingly.

ADOPTION OF NEW TECHNIQUES AND STRATEGIES. In addition to innovative hunting strategies and techniques such as garden stalking and the timing of agouti appearances, other changes in Yuquí hunting patterns were observed in 1988 which reflect diminishing game resources. The weapon inventory has shifted from an equal number of shotguns and .22 rifles, nine each, to a predominance of shotguns, nine shotguns; two .22s. All of the hunters in the new group still use only bows. This change has occured in spite of the fact that ammunition for a .22 rifle is considerably less expensive (US .10/.22 bullet) than that for a shotgun (US .70/16ga. shell). The shotgun, however, is a better all-round weapon and is more effective in killing smaller terrestrial game and the arboreal animals. Since these animals now make up 88% of the Yuquí game inventory (Figure 3), the shift to shotguns was an appropriate response to changing game conditions.

Curiously, the change to predominately shotgun use has had an unexpected effect on the preservation of traditional technology. Contrary to my predictions in 1983 that the bow and arrow would be discontinued from use (Stearman 1989), it is once again being used quite regularly. With the trade or sale of .22 rifles and their cheap ammunition, the Yuquí are now without ammunition more often and must resort to bow hunting. According to the Yuquí, this lowers their success rate and leads to more wounding of animals. The Yuquí are accurate with a bow only to a distance of 10 meters when shooting horizontally, and less than 10 when shooting vertically (cf. Hill and Hawkes 1983).

The Effects of Settler Incursion on Fish Resources.

Prior to contact, according to Yuquí accounts, fishing was of secondary importance in their total meat intake. Their fishing technologies consisted of bow fishing, the use of *barbasco* vine in still water, and capturing fish by hand or in basket scoops as ponds dried. Fear of detection by Bolivian nationals made both hunting and fishing in open areas along rivers a rare activity. Yuquí lack of technologies for fishing in large rivers also limited their use of this resource. Following contact, hook and line as well as nets and canoes were introduced to the Yuquí, greatly enhancing their ability to exploit the Chimoré River. Although hunting remained an important source of animal protein in 1983, it provided only about half the total protein intake (Table 1) for the Yuquí. This proportion falls within the range of other riverine people (cf. Berlin and Berlin 1983). While game depletion due to overhunting in areas of extended settlement, especially mission centers, has been widely reported (Ayres and Ayres 1979, Hames 1979, Hill and Hawkes 1983, Hill and Kaplan 1989, Romanoff 1984), little mention has been made of the effect that river exploitation, if a factor, may have on relieving pressure on game resources particularly in situations of sedentism. Recent colonist exploitation of fish resources has serious implications for Yuquí subsistence patterns and the Yuquí's ability to continue to successfully exploit wildlife in the core hunting area.

As noted previously, between 1983 and 1988, the boom in coca production for the illicit drug trade brought unprece-

dented settlement to the Chimoré region. While land clearing and increased population may have negatively affected habitats and migration patterns of game and contributed to the declining integrity of the Chimoré River, the peculiar nature of coca production has contributed to the diminishing fish and game resources in the Chimoré region in unexpected ways.

Coca production is a specialized form of farming which, together with traditional highland Indian patterns of exploiting several ecological niches simultaneously (Brush 1976, Murra 1972), has led to an unusually accelerated exploitation of the natural resources in the Chimoré area even for a colonization zone. In more typical situations, settlers plant food crops to support themselves along with cash crops. Hunting and fishing are supplemental to these activities (cf. Redford and Robinson 1987). The settlers regard their plot of land as a homestead, with perhaps short absences for visiting family members in other areas or to perform wage labor as a source of additional income (Stearman 1985). In contrast to this pattern, highlanders in the Chimoré area are within one day's travel of the mountain city of Cochabamba and so are able to continue an age-old tradition of exploiting two or more environments at the same time. Consequently, they plant coca and very little else, since they often have other business enterprises in the Cochabamba Valley where the majority of time is spent. Coca is an ideal crop for this type of calculated neglect, thriving in weeds which also act as a convenient camouflage. Because efforts are put into coca cultivation and not food crops in these colonies, settlers are prone to make use of food sources derived from hunting and fishing to a greater extent than colonists in other areas. Then too, as long as resources such as fish and game are readily available, it is a better expenditure of time and energy for the short-term resident to pursue these sources of food rather than to expend the effort in planting crops that may not mature when needed.

In just the past two years, the Chimoré River has suffered a devastating reduction in fish resources which, like most situations involving a complex natural system, is the result of several processes at work. As noted above, it is likely that erosion from deforestation and the resulting increase in siltation have affected fish populations. In addition, an undetermined number of settlers in the Chimoré region are displaced miners. They bring to the area an expert knowledge of handling dynamite and are not adverse to breaking the law by using it to kill fish. This practice no doubt has done inestimable damage to spawning areas in the river.

Along with settlers using dynamite, commercial fishermen began to exploit the Chimoré River employing large gill nets and boats outfitted with ice chests. The opening of new roads in 1987 within a half day's travel by boat from the Chimoré made this type of commercialization possible. Nets were stretched across the entire width of the river, and one colonist reported watching a single fisherman take almost 3,000 fish from the river in a day. There is also indication that increased commercial fishing downstream in the Mamore-Madeira River system may be seriously depleting fish and disrupting migration patterns, particularly of the catfishes, that may periodically contribute to restocking the Chimoré (Goulding 1981). Whatever the many probable contributions to fish depletion, by January, 1988, the Chimoré River effectively had been fished out.[5] The take in river fish for the 1988 research period amounted to only 59.50 kgs., an astounding decrease from the 1983 figure of 1055.85 kgs., even accounting for seasonal variation. Accompanying this figure, the average size of fish taken from the Chimoré dropped from 6.13 kgs. in 1983 to 1.19 kgs. in 1988.

With fishing no longer profitable, the commercial fishermen have stopped coming up the river. The Yuquí and the missionaries have complained to colonists on numerous occasions about the use of dynamite and it has been a while since dead fish have been seen floating down from the colonies upstream. There is some indication that fish are returning to the river, but not in previous quantities. Those being taken now are small and not numerous. With the area becoming increasingly available to settlement through improved transportation systems, it is unlikely that the Chimoré River will ever again provide the bounty of the past.

The Importance of Fish and Large Game Animals to Yuquí Well-being.

Although the data demonstrate that fish and game returns are better farther away from the settlement as would be expected, it is apparent that the abundance of fish in the Chimoré River and the availability of large game animals (Figures 4 and 5) were key factors in the Yuquí's continuing successful exploitation of resources within a five kilometer range of the mission for 19 years. These important sources of animal protein relieved the hunting pressure on the smaller game animals in the core area that are now being taken in numbers that are most likely unsustainable. River fish and large game animals were largely responsible for the Yuquí's continuing success in achieving mean yields of 1.08 kgs. per man hour within this area in 1983. Without these two sources of meat, Yuquí hunting and fishing yields dropped to .43 kgs. per man hour in 1988, a markedly significant change ($Z = 3.6590$; Prob $> |z| = 0.0003$). Success rates (calculated by dividing the number of successful trips by the total number of trips) also declined from 79% in 1983 to 52% in 1988 (Table 4) and these differences are significant as well ($Z = -2.7605$; $P = .0058$).[6]

As would be expected from the above figures, the decline in captures of river fish and large game animals has directly influ-

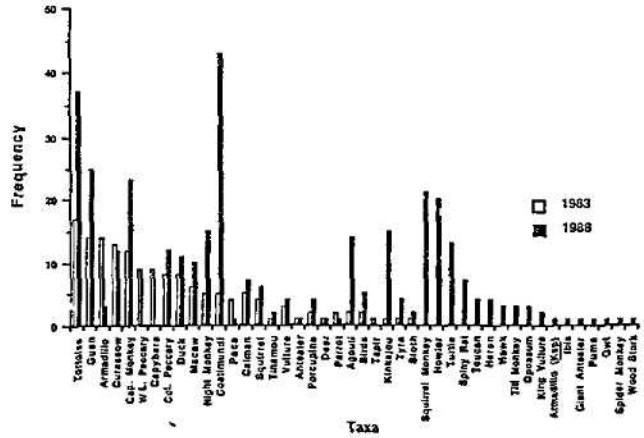

FIGURE 4 FREQUENCY OF GAME TAKES BY TAXA 1983/1988

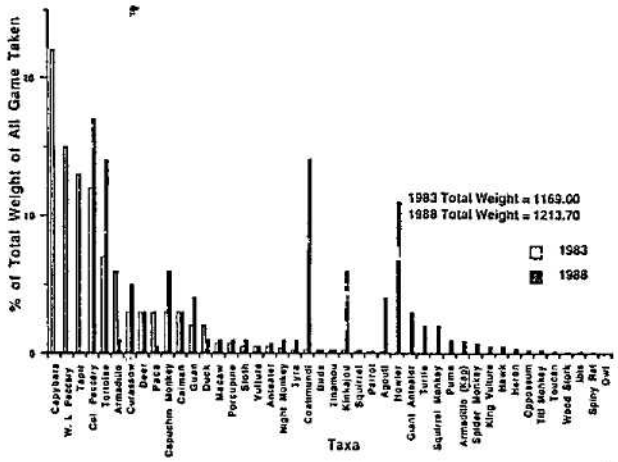

FIGURE 5 PROPORTIONAL TAXA CONTRIBUTION TO TOTAL WEIGHT OF ALL GAME TAKEN

enced the amount of animal protein in the Yuquí diet. In 1983, the average per capita consumption rate of animal protein was 88 grams per day, well within the range of other Amazonian peoples and well above the recommended daily allowance of 56 grams of protein per day for a 70 kilo man and 44 grams for a 55 kilo woman (Lieberman 1987:229). By 1988, the average per capita consumption of animal protein had dropped to 40 grams per day (Table 5). Since meat not only provides the majority of protein in the Yuquí diet but most of the lipid content as well, a decline in consumption from 440 grams to 200 grams of meat per capita per day may have adverse nutritional consequences. As noted above, in 1988 the group experienced a three-fold increase in sick days, perhaps not only a consequence of more frequent contact with outsiders but of possible lowered nutritional intake as well (cf. Pellett 1987).

TABLE 4. YUQUÍ HUNTING/FISHING SUCCESS RATES 1983/1988

	No. trips out		No. trips successful		Rate (%)	
Hunter	1983	1988	1983	1988	1983	1988
1. Humberto	31	23	29	14	93	60
2. Benjamin	12	31	11	19	91	61
3. Jonatan	27	7	24	4	88	57
4. Guillermo	37	30	31	25	83	83
5. Victor	12	†	10	†	83	†
6. Daniel	34	21	28	11	82	52
7. Lorenzo[a]	23	1	19	0	82	0
8. Lucas[a]	29	3	23	1	79	33
9. Leonardo	18	17	14	10	77	58
10. Alejandro	30	28	23	18	76	64
11. Manuel	12	†	9	†	75	†
12. Tomas	20	21	15	7	75	33
13. Jaime	30	43	22	23	73	53
14. Jorge	11	18	8	10	72	55
15. Timoteo	11	22	7	9	63	40
16. Joel	21	31	12	26	57	83
17. Itonubí	–	16	–	5	–	31
18. Fernando	–	6	–	4	–	66
19. Onésimo	–	20	–	11	–	55
20. Yaguaramá	–	16	–	8	–	50
21. Yabitá	–	17	–	8	–	47

Mean success rate: 1983, 79%; 1988, 52%.

† Deceased.

– Not present.

[a] Away with the contact team for all but 11 days of the 1988 research period.

Conclusion

The data presented here give strong indication that the Yuquí are experiencing declining hunting and fishing returns and that this may be attributed to the effects of settler incursion and the resulting competition for faunal resources. The results also suggest that the Yuquí are attempting to compensate for this decline through changes in hunting patterns and strategies. Unfortunately, these responses have only been partially effective as evidenced by lowered yields, lowered success rates, and lowered meat consumption. However, data taken from the several long hunts in 1988 indicate that game resources as well as pond fishing in areas outside the core zone hold promise for increased yields should they be exploited on a more regular basis. It is therefore incumbent that these areas be permanently secured for the Yuquí before settler incursion precludes such a move and that the Yuquí be encouraged to make better use of them possibly through the establishment of satellite communities. At present, Yuquí holdings encompass only 7,800 hectares, an area somewhat smaller than the core area they presently hunt. According to biologist John Robinson (personal communication), at a minimum, this range should be increased to 80,000 hectares (800 k^2), more than doubling the area the Yuquí consider part of their extended foraging territory. Robinson based his calculations on one of the most frequently taken species for which there is information on densities, *Cebus apella*, although he believes that this is probably a reasonable

TABLE 5. YUQUÍ ANIMAL PROTEIN CONSUMPTION 1983/1988

	1983	1988
Number of consumers	73	96[a]
Gross kilos	2733.90	1616.35
Game only	1169.00	1254.50[b]
Fish only	1564.90	361.85
Gross kilos per capita	37.45	16.84
Gross kilos per capita/per diem	.67	.30
Edible portion per capita/per diem[c]	.44	.20
Animal protein consumption per capita/per diem[d]	88 grams	40 grams

[a] The actual number of inhabitants in 1988 was 103. For this table, the seven Yuquí away with the contact team for all but 11 days of the 56 day research period were not included.

[b] This includes a 40 kg capybara killed by a colonist and given to the Yuquí plus four tinamou eggs (.80 kgs.) not included in game counts.

[c] 65% of live weight.

[d] Protein per 100 grams edible portion of fish/game is 20 grams (Leung and Flores: 1961).

land area for the other prey species as well. However, he stresses that the estimated area of 800 k^2 is an absolute *minimum* to produce sustainable harvests at the 1988 level. His figures are also based on assumptions of optimal densities, which in actuality rarely occur in areas that are hunted.

In addition, it is advisable that the Yuquí be given assistance in crop cultivation. This would reduce their dependence on fluctuating food supplies provided by the mission as well as provide alternative food sources to offset declining fish and game resources in the core zone around the mission, to date the preferred permanent resident area. Although the Yuquí have been at the Chimoré mission station for 22 years, they still do not farm on a regular basis. Small gardens are cleared periodically and planted with rice, corn, and manioc, but because of their inadequate knowledge of farming and lack of commitment to the task because of repeated failures, harvests are poor (Stearman 1989a). The produce from these efforts rarely provision for more than a few weeks each year those few Yuquí who have decided to clear a garden.

An opportunity now exists for both land and farming needs to be met through a regional development loan underwritten by the Interamerican Development Bank. The project paper specifies that the Yuquí, who fall within the area targeted by the loan, shall be assured the land they require to continue traditional patterns of subsistence. It also provides funding for assistance in the form of agricultural extension and social services for the Yuquí. In addition to involvement by the Bolivian Ministry of Agriculture, this assistance plan should include inputs from CIDOB (Central de Pueblos y Comunidades Indígenas del Oriente Boliviano), an organization of lowland Bolivian indigenous peoples dedicated to furthering the cause of indigenous rights and familiar with traditional and appropriate technologies. If these provisions are implemented as specified, the Yuquí stand an excellent chance of securing both an adequate land base and the agricultural expertise that would greatly enhance their chances for cultural survival in the future.

NOTES

[1] At the suggestion of a colleague concerned about the exclusion of the remaining 24 days of data, I ran a statistical test (paired *t* test) comparing the mean hourly rate of meat capture for the entire 80 days of data with the 56 days selected for study to ascertain if the addition of this second data set would affect my results. There was no significant difference between the two ($t = -1.294$; $P = .2128$).

[2] Nutritional data were computed on a base figure of 96, which excludes those seven individuals away on the contact effort for all but 11 days of the research period.

[3] I have elected to use this term to distinguish it from a "trek," or continual movement over several days; the Yuquí no longer practice this type of hunting although it was their normal pattern under precontact conditions. At present, they go out to a particular site where they remain for one or more days hunting, and then return to the mission.

[4] Yuquí distaste (but not avoidance) for coati, kinkajou, and olingo meat does not appear to be based on some food taboo, of which they have few. Rather, they claim that the taste is strong, and that the fat, if eaten in large quantities, can induce vomiting.

[5] During the initial stages of my research in 1988, I found it difficult to believe that the fish were gone from the Chimoré River, wondering if the Yuquí were perhaps only experiencing a run of unusually bad luck. My doubts were laid to rest with the accidental drowning of one of the Yuquí men, Timoteo. His corpse was found after having been in the river for three days. The Yuquí were surprised that it was entirely intact. On a previous drowning episode two years earlier and at the same time of year, fish had stripped the cadaver clean after a simiar amount of time in the river.

[6] Although the amounts of fish taken in 1988 are already low, it is probable they would have been even lower if we had not supplied the Yuquí with fishooks as gifts for assisting with our research efforts to weigh all fish and game. We distributed 350 fishooks during five months.

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