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Community-Based Comanagement of Wildlife in the Peruvian Amazon

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Community-based conservation approaches the conservation of species and ecosystems by appreciating the fundamental role of rural communities in managing and using wildlands (Little 1994). Local communities living around coastal estuaries, in tropical forests, savannahs, and mountain ranges have begun to take on responsibilities for conserving and managing natural resources in their vicinities (Maltby et al. 1992; Bodmer 1994; Poffenberger 1994; Wells 1994). Community-based conservation has arisen from the realization that rural people not only dwell in the vast wildlands, but have a meaningful long-term stake in their surroundings and an interest in the well-being and production of these environments (Western and Wright 1994).

Wildlife management is an important component of many community-based conservation strategies because game hunting is both economically important for local people and directly affects species conservation. Wildlife management cannot function without the input of hunters in the development of regulations. Regulations should make sense to most hunters if the management system is to be successful. However, it usually takes more than grass-roots community initiatives to attain wildlife management that concurs with conservation goals (Rettig et al. 1989). It would be unrealistic to assume that hunters could manage wildlife by themselves in the complex political, economic, and natural systems.

Thus, community-based wildlife management is likely to function best if comanaged (Pinkerton 1989). Comanagement is the division of management responsibilities between local communities and other parties through formal and informal partnerships. It strengthens technical reasons for actions, the legality of the system, and social sanctions brought against violators, among other important aspects of community-based management (Rettig et al. 1989). Comanaged

systems will result in conservation of species only if the partners agree on conservation objectives.

This chapter analyzes information and events of the Reserva Comunal Tamshiyacu-Tahuayo (RCTT) located in northeastern Peru to see if community-based comanagement of wildlife can work as a true solution for conservation in Amazonia. First, we review the structure of community-based comanagement in the RCTT and then examine the events that led to its creation and continuance. We examined harvests of game mammals before and after communities set up wildlife management programs to evaluate the impact of community-based comanagement. Lastly, using the case of the RCTT as an example, we discuss the need for training conservationists in community-based comanagement so that they understand how to integrate biological information with the needs of local people.

THE RESERVA COMUNAL TAMSHIYACU-TAHUAYO: A CASE STUDY

Community-Based Comanagement

Wildlife management in the RCTT involves a combination of community-based and comanagement strategies. The community-based side recognizes that communities are responsible for performing wildlife management. The comanagement side involves stakeholders who have a meaningful interest in the appropriate management of the Reserve and includes local communities, government agencies, NGO extension workers, and researchers.

Communities of the RCTT make decisions on how to manage resources of the Reserve. Community members vote on resource use and management issues democratically during community meetings. Government officials, extension workers, and researchers are not usually present when communities vote on management and resource use issues. However, government programs, extension activities and research results influence the management and resource use decisions. Wildlife extension workers link government regulations and results from wildlife research back to the communities.

Community-based comanagement relies on acquisition and communication of information. For example, local people perform management that affects game populations. Biological studies on game populations generate information on the impact of hunting and effectiveness of management. Extension activities convey results from biological studies to local people. The feedback loop linking game populations to local people can only be completed if it contains a research and extension component (figure 20-1). In other words, the impact of management can only be determined through research on game species. Therefore, research and extension link the realities of game populations back to community-based management.

Wildlife research and extension in the RCTT use participatory methods that

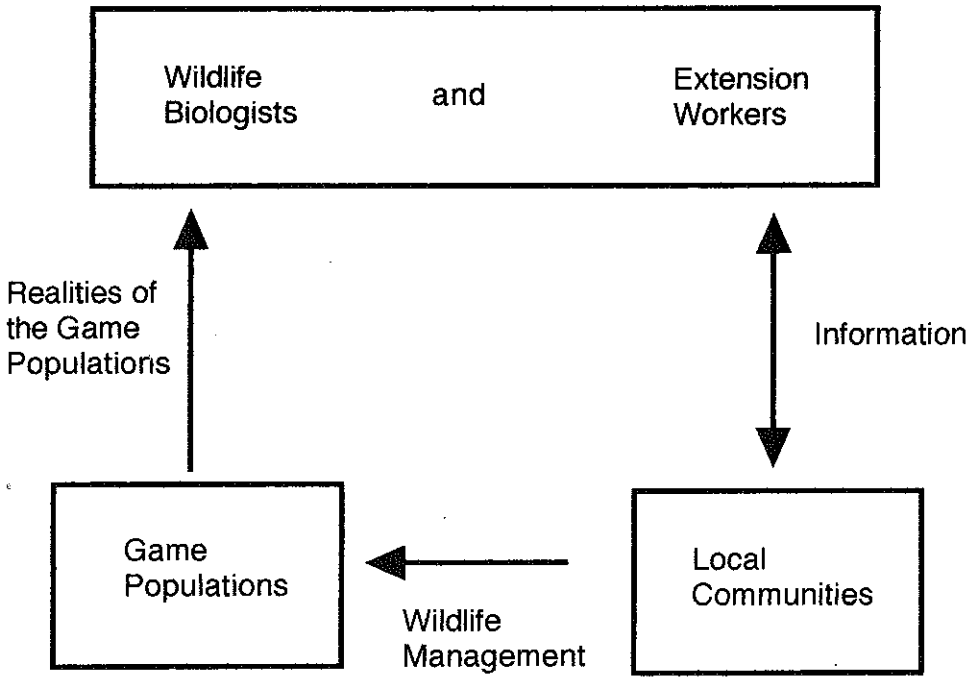


Figure 20-1. Schematic flow chart of the community-based comanagement in the Reserva Comunal Tamshiyacu-Tahuayo.

involve local people. This entails building interest in community-based wildlife management by researchers working with hunters when evaluating the impact of harvests. For example, one of these methods uses skulls from animals that hunters have shot. By collecting skulls, hunters and their families become involved in data collection. Women actively participate because they usually cook and clean skulls (figure 20-2), and often help their husbands or sons label and store them.

This participatory method helps researchers, extension workers, and hunters find common ground to discuss wildlife issues. This common ground, in this case, is the animal skull. When a researcher or extension worker discusses the sex, age, and species of an animal's skull with the hunters, they also discuss such things as the interest in community-based wildlife management or more technical issues such as registering the numbers of animals hunted. It is also possible to get hunters' opinions on issues such as hunting by people not belonging to the community. This participatory technique helps hunters to think about different aspects of wildlife management and to learn about game registries.

Pinkerton (1989), using examples from North American fisheries, presented a set of variables that favors the development and maintenance of comanagement. We found that many of the same variables applied to developing and maintaining community-based comanagement of wildlife in the RCTT specifically.

Comanagement of wildlife functions in the RCTT because there is a dedicated core group that applies consistent pressure to advance the process. Currently this

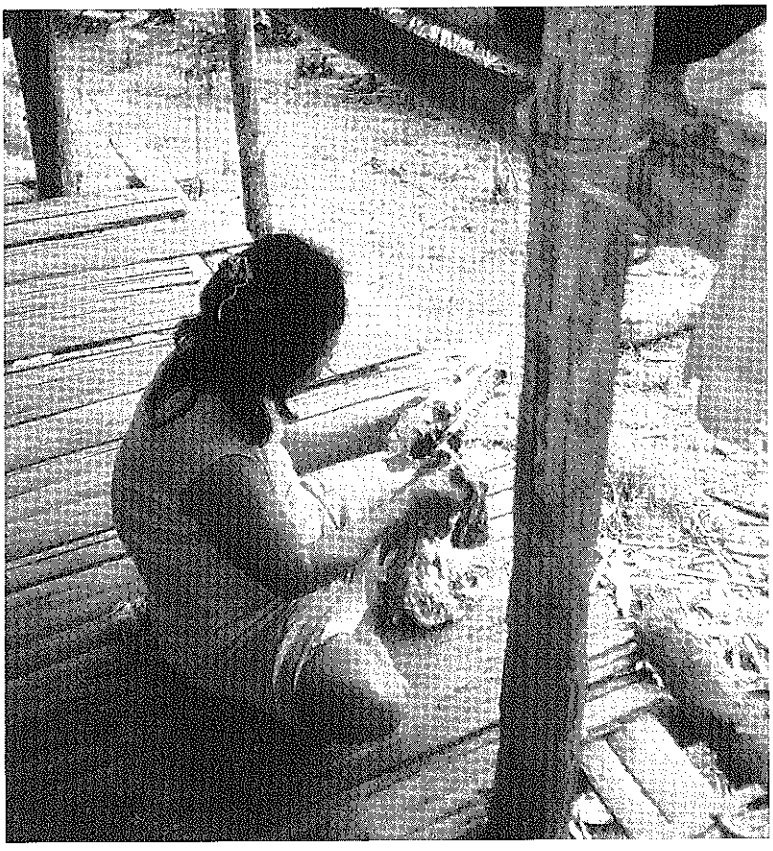


Figure 20-2. Community woman cleaning an animal skull as part of the participatory wildlife program. *Photo courtesy of Pablo Puertas.*

core group consists of the wildlife extension-research component, which includes dedicated professionals who work with communities, and community representatives. This core does not always comprise the same people. Before establishing the Reserve, for example, it consisted of a few researchers, a few government officials, and community representatives.

The preconditions that applied to the initial phases of community-based comanagement in the RCTT were a real or imagined crisis in game depletion and an opportunity for experimental management of wildlife.
Comanagement of wildlife in the RCTT operates because:

- There are formal, legal, and multi-year agreements.
- There is the assumption that long-term economic benefits will be realized through management.
- There is a mechanism for conserving wildlife in a manner compatible with the cultural system.
- There is external support from universities, research institutions, and research NGOs that provide technical information.

- The area is not too large (i.e., a watershed system).
- The number of community members is not too large for effective communication, and communities already have cohesive social systems and can effectively define their boundaries and membership.
- Technical decisions are separate from allocation decisions.

New relationships have been created because of community-based comanagement in the RCTT:

- Cooperation of individuals in planning the use and conservation of wildlife
- Commitment among local hunters to share the costs and benefits of their efforts
- Increased motivation to negotiate sharing of access to the resources
- Creation of a more equal negotiating relationship between hunters and other users
- Willingness among all stakeholders to share information and reach a more complete understanding of the resource
- Creation of greater trust between stakeholders and a greater sense of control by hunters, thus reducing the motivation to overhunt
- Greater trust between stakeholders that has led to more appropriate enforcement regimens.

DEVELOPMENT AND MAINTENANCE OF MANAGEMENT

The RCTT is in the northeastern Peruvian Amazon, in the state of Loreto, and covers an area of 322,500 hectares (ha). The Reserve is in the upland forests, which divide the Amazon valley from the Yavari valley (figure 20-3). The closest city to the RCTT is Iquitos, which has approximately 300,000 inhabitants and is around 100 km northwest of the Reserve.

The RCTT is a community reserve decreed regionally on June 19, 1991 (Resolución Ejecutiva Regional No. 080–91-CR-GRA-P). Community reserves in Peru legally give the responsibility of managing resources to local communities. They are conservation areas, and communities are responsible for managing resources in a manner consistent with biodiversity conservation.

To realize the conservation objectives, the RCTT is divided into three land use zones: (a) a buffer zone for subsistence use of approximately 160,000 ha, (b) a fully protected core area of approximately 160,000 ha, and (c) an area of permanent settlement that lacks definite boundaries. The fully protected and subsistence areas fall within the official limits of the Reserve and have no human settlements. The fully protected zone does not usually have extractive activities and is far from any human settlements. This zone acts as a refuge and source area for species. Local residents of the permanent settlement zone use the subsistence zone for extraction of natural resources. Residents cannot set up permanent settlements or clear land for agriculture within the boundaries of the subsistence use or fully

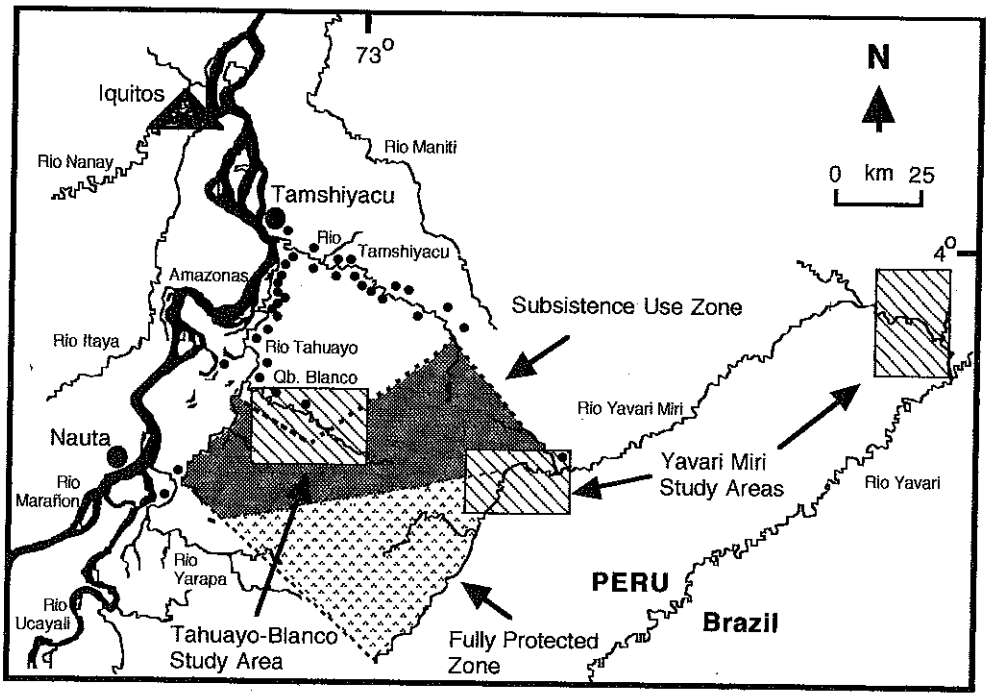


Figure 20-3. Boundaries of the Reserva Comunal Tamshiyacu-Tahuayo depicting the fully protected and subsistence zones. The small black dots are villages of the permanent settlement zone. Also shown are the persistently hunted Tahuayo-Blanco study area and the slightly hunted Yavari Miri study areas.

protected zones. The zone of permanent settlements along the Tamshiyacu, Tahuayo, Yarapa, and Yavari Miri rivers is next to the Reserve. This area encompasses the villages and is for intensive land-use activities, such as agriculture. The permanent settlement zone was not officially incorporated into the Reserve to avoid conflict over land uses, but it is an important part of the RCTT management plans (Bodmer et al. 1997b).

Nontribal people, known in Loreto as *ribereños*, inhabit the settlement zone of the RCTT. *Ribereños* have diverse origins and include detribalized Indians and varied mixtures of Indians, Europeans, and Africans (Lima 1991). They commonly practice fishing, agricultural production, small-scale lumber extraction, collection of minor forest products (such as fruits, nuts, and fibers), and hunting. Hunters in the RCTT obtain economic benefits from market sales and subsistence consumption of mammals. Hunters receive cash for the meat of peccaries (*Tayassu* spp.), deer, lowland tapir (*Tapirus terrestris*), capybara (*Hydrochaeris hydrochareris*), and paca (*Agouti paca*) in city markets. Peccary hides are also legally sold by hunters. Mammals not sold in markets have value as subsistence food and substitute for purchases of animal protein and include primates, small rodents, edentates, marsupials, and carnivores. The most frequently hunted mammals in the RCTT include collared (*T. tajacu*) and white-lipped peccaries (*T. pecari*), red brocket deer (*Mazama americana*), paca (*Agouti paca*), agouti (*Dasyprocta* spp.) (figure 20-4), and large-bodied primates (Bodmer et al. 1994).

Figure 20-4. Agouti (*Dasyprocta* sp.). *Photo courtesy of Andrew Taber.*

There are 32 villages in the Tahuayo, Tamshiyacu, Yarapa, and upper Yavari Miri river basins, with a population of approximately 6000 inhabitants. They use resources of the RCTT to varying degrees. For example, only about 40 households from the Tahuayo River regularly use the Reserve for extraction, and only 9 villages consider themselves close enough to the Reserve to participate in management programs. Almost 100% of 541 households surveyed in the Tahuayo basin practice some type of agricultural production, whereas 42% fish as a major financial activity, 19% hunt wildlife, 23% commercially extract nontimber plants, and 6% extract timber (calculated from Coomes 1992).

Communities of *ribereños* in the RCTT organize themselves around political units, often with an elementary school and several health officials. Inhabitants within each community decide by concensus on rules for land use and extraction of natural resources. These rules govern titled land owned by community members and land officially recognized as part of the community reserve.

The first *ribereños* entered the Tahuayo River basin shortly after the construction of a naval base in Iquitos in 1862 (Coomes 1992), but it was the rubber boom of 1880 to 1920 that brought a large influx of people to the area. With the crash of the rubber boom, the area experienced a net emigration. Communities of *ribereños* consolidated during the recession of the 1930s saw an influx of people of Cocama/Cocamilla Indian origin. With the increase of market-oriented agriculture and an increase in extraction of forest resources after 1940, the population of the Tahuayo River basin increased and continued to do so until the end of the 1980s.

The abolition of estates after the enactment of the agrarian law of 1969 produced an open access system that initiated the uncontrolled extraction of natural resources. Natural resources were rapidly declining through the 1970s and early 1980s, and many were scarce by the mid-1980s. These resources fulfilled both financial and subsistence needs of local inhabitants. The communities were particularly unhappy about the exploitation of fish by freezer vessels, the extraction of timber by city-based operators, and the hunting of meat by merchants from Iquitos. As a result, communities organized a system of controls that began to prohibit the extraction of natural resources by nonresidents.

The environmental actions taken by the communities of the upper Tahuayo during the 1980s were the major influence promoting the legal creation of the RCTT. During the 1980s people living closest to the proposed reserve were seriously discussing the issue of fair natural resource use. They began to take community initiatives to protect natural resources by setting community regulations among themselves.

Comanagement also began during the early 1980s, because community representatives approached the Ministry of Agriculture and scientists working in the area to gain support for their community conservation initiatives. The Ministry of Agriculture and the scientists worked with the communities to begin the legal actions required to gazette a reserve. Fortunately, the Peruvian government had recently created the protected area category of "community reserve." This coincided nicely with the communities' requirements and the conservation ambitions of the Regional Ministry of Agriculture.

Government agencies and nongovernment groups took particular interest in the area and in comanaging the Reserve because of its unique biodiversity. For example, the RCTT is the only protected area in Peru that includes the red uakari (*Cacajao calvus*). This species is rare in Peru and considered vulnerable to extinction (IUCN 1996).

After the creation of the RCTT, much debate began over who had access to the Reserve and how much could be taken out. The four groups involved with settling this included (a) the local communities, (b) government agencies, (c) NGO extension workers, and (d) researchers. These groups coordinated many activities, but often had different approaches to comanaging the Reserve depending on their interests and the resource of concern.

For example, after establishing the Reserve, NGO extension workers collaborated with the regional government and local inhabitants to ensure that the number of people using the RCTT did not increase. Extension workers held many informal and formal meetings in villages of the upper Tahuayo to discuss the concept of the Reserve and resource extraction. Extension workers encouraged agreements whereby communities could have authority to manage resource extraction through reasonable accords. This process has continued since 1989. It has evolved from a consciousness-raising exercise to detailed discussions about the legalities of the Reserve and the biology of sustainable resource use.

Currently, decisions on resource use and management in the RCTT are voted upon democratically during community meetings. This allows communities to

experiment with different types of management and to find management systems that are compatible with their culture. In addition, the size of communities is not too large for effective communication, and they can easily define their boundaries and membership. The four villages of the upper Tahuayo River and Blanco Creek are closest to the Reserve, and they have been the most active in managing it. They regularly meet to discuss resource issues and amend intracommunity agreements.

Community-based comanagement in the RCTT has resulted in management actions. For example, communities restrict access to hunting grounds, with access permitted only to people who live in nearby villages. Professional hunters from urban centers, such as Iquitos, cannot enter hunting areas. The communities have also established a game register and appointed game inspectors who are responsible for noting the number of animals harvested by each family. In addition, the communities have experimented with a game tax system, a quota system, and a male-directed harvesting program (Bodmer 1994).

Comanagement in the RCTT has external support from universities, research institutions, and research NGOs that provide technical information. Although researchers sometimes differ in their approach to the RCTT, most have interest in local participation and develop research that aids local people with community-based management.

Under the comanagement, technical decisions are separate from allocation decisions. Technical decisions use information from researchers, which is communicated to the hunters by extension workers. In contrast, community members make allocation decisions during community meetings. Shortly after the creation of the RCTT, researchers thought that NGOs and government agencies were not adequately communicating research results to local communities and that community-based management required input from objective studies to attain the goals of more sustainable resource use, including socioeconomic analyses. This input is now achieved through extension workers.

Because the communities already had an interest in managing their resources, it was easy for them to register the amount of resources used and to stop people from outside the boundaries from using resources. However, converting nonsustainable use of resources to more sustainable use by community members is more difficult because it often entails short-term economic costs.

A financial cost/benefit analysis showed that over the short term (0–5 years) there would be economic costs for local inhabitants if they used wildlife more sustainably in the RCTT (Bodmer et al. 1997b). These costs are around 25% of the annual financial income that would be earned by maintaining the current unsustainable system. Over the long term (6–30 years), there would be financial benefits for local people if they establish a more sustainable system in the RCTT. These benefits are around 66% above the annual income that would be earned by continuing unsustainable practices. Local inhabitants will only use resources more sustainably if short-term costs can be overcome. Lowering revenues would not be acceptable to many families because of their poverty and would only increase their discontent. However, if people do not set up a more sustainable system, poverty will eventually worsen once resources become depleted.

Communities are staggering management programs as a way to spread the economic costs over a longer period. This enables local people to accept economic costs more readily than bearing them all at once. They are doing this by setting up management programs for a given resource only when they receive the economic benefits of a previous management program. For example, the increased access to game animals that resulted from restricting access to outsiders has enabled local residents to consider additional game management programs.

IS COMMUNITY-BASED COMANAGEMENT CONSERVING WILDLIFE POPULATIONS?

Studies were conducted on the harvests and populations of game mammals in the RCTT to evaluate the effectiveness of community-based comanagement. Studies on animal populations included comparative density analysis, age structure analysis, harvest models and vulnerability models. These studies clearly showed that before establishing the Reserve, people overhunted primates and tapirs, but did not overhunt artiodactyls and large rodents.

Densities of mammals in the persistently hunted areas of Tahuayo-Blanco were compared with the lightly hunted areas of Yavari Miri. Results showed that collared peccary, white-lipped peccary, red brocket deer, grey brocket deer, and agouti densities were similar between these areas. However, densities of lowland tapirs and large primates were considerably less in the persistently hunted areas (Bodmer et al. 1994).

The harvest model calculated the percentage of production taken by hunters. Again, results indicated no overhunting of peccaries and deer in the Tahuayo-Blanco area, but severe overhunting of lowland tapirs (Bodmer 1994).

An age-structure analysis compared the demography of ungulate populations in persistently hunted and slightly hunted sites. Results concurred with the other analyses by showing no significant difference in age distributions of peccaries and deer with hunting pressure. In contrast, there was a significant depression in the age distributions of lowland tapirs in the persistently hunted site, again suggesting overhunting (Bodmer 1995b).

Vulnerability models suggest that lowland tapir and large primates are vulnerable to overhunting because of their low rates of reproduction and slow intrinsic rates of population increase. In contrast, deer, peccaries, and large rodents are less vulnerable to overhunting because they have faster rates of reproduction and intrinsic rates of population increase (Bodmer et al. 1997a).

Research played an important role in determining the thrust of extension programs. Extension workers conveyed the information on overharvesting of primates and lowland tapir to the communities. They stressed the need to decrease harvesting of these species and maintain current harvest levels on artiodactyls and large rodents.

Harvests were evaluated in 1991 before communities set up wildlife manage-

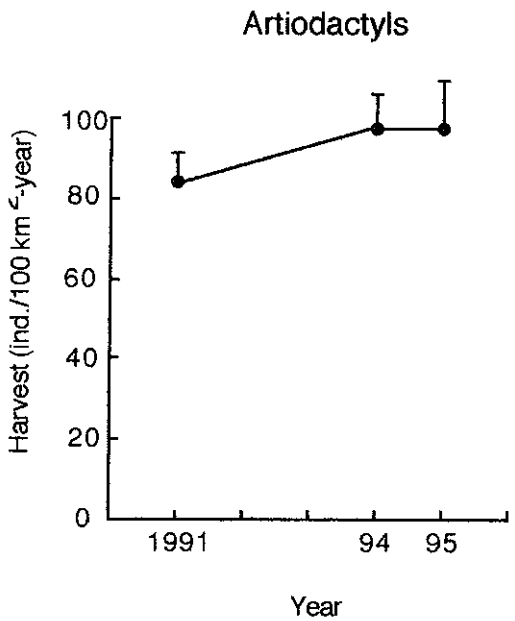
ment programs. They were reevaluated in 1994 and 1995, 3 and 4 years after the onset of the community-based programs. The impact of management was examined by comparing harvests of artiodactyls, large rodents, primates, and tapirs pre- and postmanagement (Bodmer et al. 1997b). The number of animals hunted was determined from skulls collected by hunters and by interviewing hunters about skulls not collected. An error margin was added to the hunting pressure to account for animals hunted but not recorded either by skulls or interviews. This was calculated by determining which local hunters were not participating in the project. The error margin varied between 10% and 20%.

Over the 4-year period spanning premanagement and postmanagement, harvests of artiodactyls showed a slight, but not significant, difference between 1991, 1994, and 1995, measured as the number of animals harvested per 100 km^2 per year (p = not significant [NS]) (figure 20-5). Similarly, harvests of large rodents and tapirs showed no significant difference between 1991, 1994, and 1995 (p = NS) (figure 20-6). However, hunters harvested significantly fewer primates between 1991 and 1994, and again between 1994 and 1995 (f ratio = 9.823, p = 0.002) (figure 20-7).

To examine whether harvest patterns were related to changes in the wild populations or a real decrease in hunting effort, we looked at the abundance of game mammals in Tahuayo-Blanco between 1986 and 1994. The year 1986 corresponds to the premanagement census and 1994 to the postmanagement census. Transects were used to calculate abundance of mammalian game species. Trails of 3 to 5 km were cut in the forest and censused in the morning and evening, and records were made of the number of groups sighted of each species, the number of animals in each group, and the perpendicular distance of the first sighting to the trail. Totals of 120 km and 626 km were surveyed in 1986 and 1994, respectively.

The wild populations of artiodactyls did not change significantly between 1986 and 1994 (p = NS) (see figure 20-5). Similarly, the abundance of large primates in the forest did not change significantly between 1986 and 1994 (p = NS) (see figure 20-7). People hunt primates in the RCTT mainly as a source of subsistence food because they have little market value, so it is unlikely that a change in market demand caused the change in primate harvests. Hence, the decrease in the harvests of primates between 1991 and 1995 was ascribed to community-based comanagement.

Lowland tapir harvests should also be decreased to prevent overhunting. However, the first several years of community-based comanagement did not result in a decrease in such harvests. Tapirs are the largest terrestrial mammal in the area and represent substantial cash income for hunters. Extension activities have focused on finding solutions to tapir overhunting. Communities of the upper Tahuayo have recently stated that community members will not be allowed to sell tapir meat to city markets. Setting up this policy might be difficult, however, because of economic demands. The best management strategy for the species might be total protection of the fully protected zone, allowing it to act as a source area.



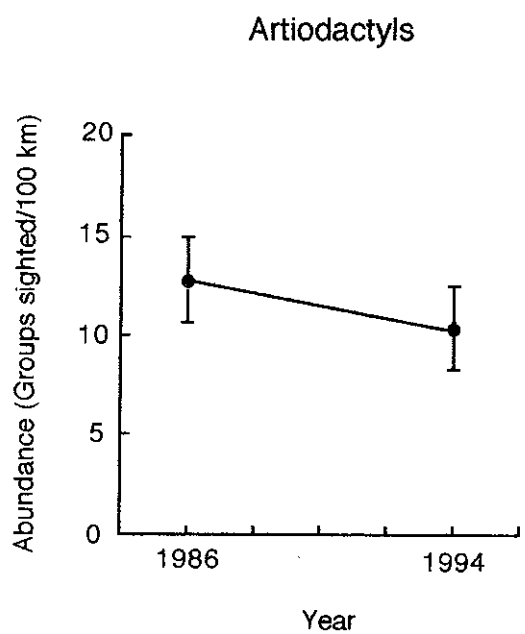
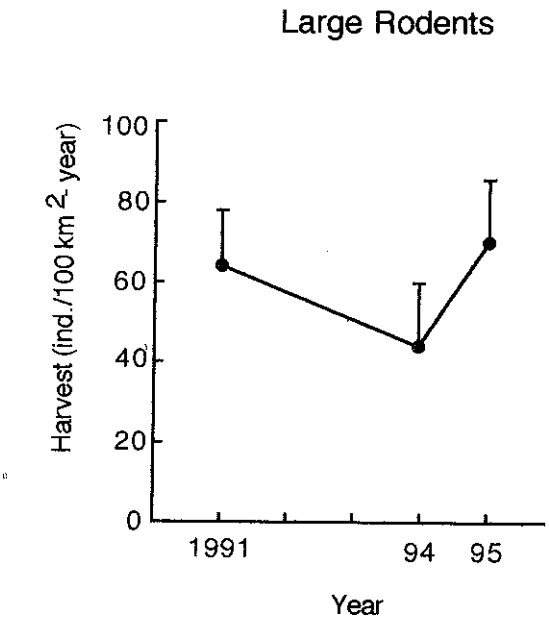


Figure 20-5. Harvests and abundances of artiodactyls in the Tahuayo-Blanco area of the RCTT. The error bars of the harvests were determined through interviews with local people and represent the error in calculating actual harvests. The error bars of the abundance data represent the standard deviation calculated using the coefficient of variation of relative densities for foot transects with an average transect length of 7 km (Seber 1982).



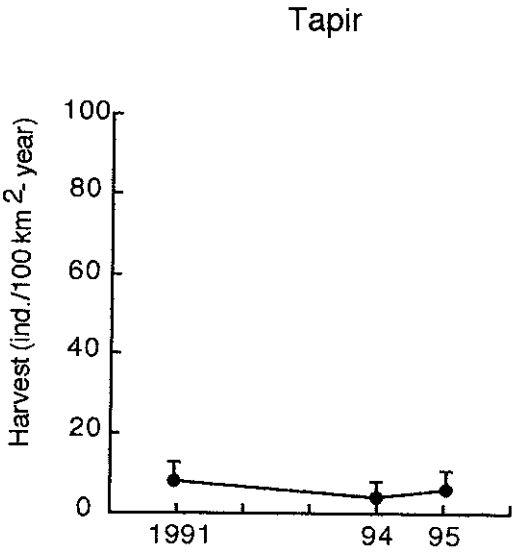


Figure 20-6. Harvests of large rodents and lowland tapirs in the Tahuayo-Blanco area of the RCTT. The error bars of the harvests were determined through interviews with local people and represent the error in calculating actual harvests. Large rodents have a greater error because hunters often sell pacas with the skull attached, thus making the harvest more difficult to calculate.

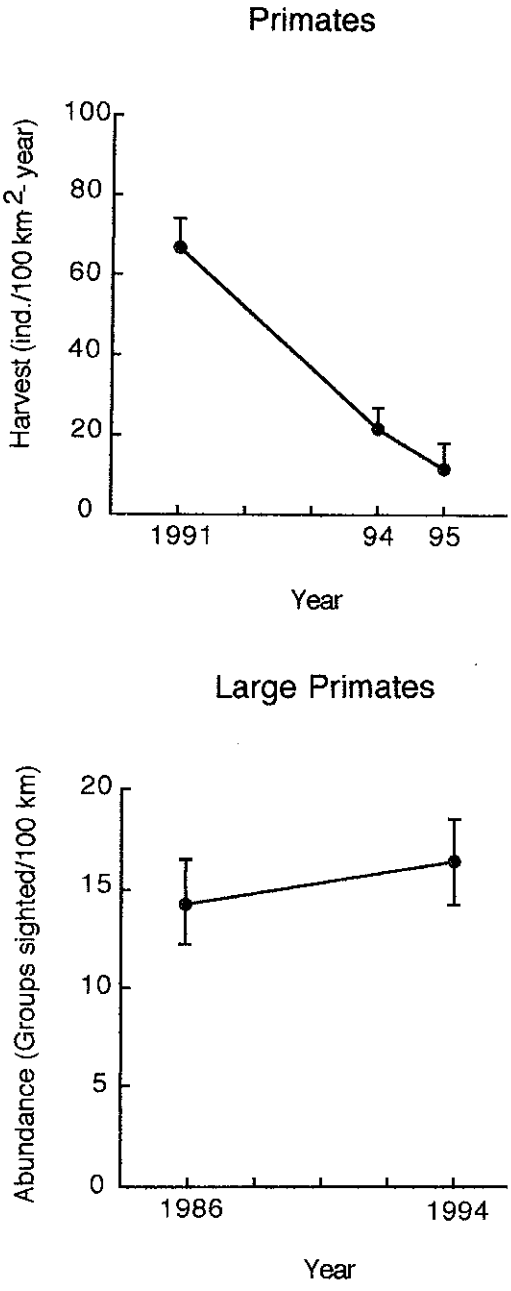


Figure 20-7. Harvests and abundances of large primates in the Tahuayo-Blanco area of the RCTT. The error bars of the harvests were determined through interviews with local people and represent the error in calculating actual harvests. The error bars of the abundance data represent the standard deviation calculated using the coefficient of variation of relative densities for foot transects with an average transect length of 7 km (Seber 1982).

CONCLUSION

Community-based efforts will only lead to successful conservation if the socioeconomic realities of local people operate within the biological limits of the ecosystems. Recently, prerequisites for sustainable development have focused on the socioeconomic conditions of local people and their need to attain an improved life (Robinson 1993). There is no doubt that this is of the utmost importance, especially in light of community-based conservation. Of equal importance, however, is the recognition that better information on the biology of ecosystems and species must be incorporated into community-based conservation efforts. Community-based conservation will undoubtedly fail if these biological attributes are not adequately considered (Robinson and Redford 1994a).

Throughout the tropics, rural communities have taken initiatives to set up their own resource management. These communities frequently seek assistance on the technical aspects of resource use; for example, communities often want to know the sustainable level of resource extraction. Currently, there is a lack of adequately trained professionals who can give these local people a workable answer. Failure to provide technical support is a tragedy for community-based conservation because it discourages the efforts of rural people. On the other hand, by providing adequate technical assistance, communities will be encouraged and community-based conservation can endure.

Recently there has been a rapid increase in the number of communities who have taken their own initiatives to manage and conserve their neighboring habitats (Western and Wright 1994). Unfortunately, many of these initiatives become distorted when it becomes evident that there is insufficient knowledge on managing many natural resources in a way that is compatible with the socioeconomic abilities and aspirations of the local people. One of the greatest challenges of conservation today is whether professionals can be trained fast enough to address resource use and simultaneously respect local people's needs.

Community-based comanagement appears to be working as a conservation strategy in the RCTT. Our experience is that combining research biologists with extension responsibilities is necessary for comanagement because these professionals must assist local people on the biological limitations of resource use while fully respecting the socioeconomic realities of the communities. Community-based resource specialists are in a new field of expertise. Through their efforts, local communities will assume the responsibility of designing, implementing, and monitoring the management of their natural areas.