# *Tupinambis* Lizards and People: A Sustainable Use Approach to Conservation and Development

Millions of rural and indigenous people in developing regions of the world depend on flora and fauna for income and food (Robinson & Redford 1991). Many species are collected from the wild for skins or to be sold as pets on the international market or food in local markets (Luxmoore et al. 1988; Fitzgerald 1989; Robinson & Redford 1991). An unfortunate but typical pattern in developing countries is that the destiny of the resource is out of the hands of those harvesting it. Because of the monetary value of wildlife and the demands for wildlife from external economies, wildlife is taken without regard for the ability of wildlife populations to sustain exploitation. The reality is the more one can collect, the better, because someone else will get it anyway. Exploitation patterns of this type, when left uncontrolled, result in boom-and-bust cycles that are catastrophic for natural resources as well as for the people who depend on them. For these reasons sustainable use approaches to conservation problems in developing regions of the world have become important tools for modern conservation biologists and development specialists (McNeely et al. 1990; World Resources Institute et al. 1992).

The relationship between the sustainable use of resources, conservation, and development is obvious: Development practitioners are motivated to ensure that natural resources continue to benefit those people who need them most and to encourage systems that guarantee maximum benefit to those who harvest wildlife. Conservation biologists are interested in preserving high levels of biodiversity and natural ecosystems, but recognize that wildlife is used by people.

Although not stated as such in the literature, sustainable use as a conservation strategy is based on the hypothesis that the economic value of wild resources can foster development in poor countries that is compatible with preserving biological diversity. The prediction is that if local people are allowed to value wild species, whether for tourism, subsistence use, or commercial trade, development can occur without sacrificing as much biological diversity as would be lost if the potential value of wild resources were not realized. Obviously, experiments can't be done, so the approach can only be tested via the accumulation of case studies. Our attempts to convert the exploitation of South American tegu lizards into a system of sustainable use is one such case study.

## Steps Toward Sustainable Use of Tegu Lizards

Two species of tegu lizards, *Tupinambis rufescens* and *T. teguixin,* are heavily exploited in Argentina, Paraguay, and parts of Brazil and Bolivia. Tegus, the largest members of the Teiid family, occur throughout South America east of the Andes. Tegus have always been hunted for food, but are now exploited in astonishing numbers for their skins which are made into exotic leather accessories, especially cowboy boots. During the 1980s an average of 1,900,000 ($n = 11$, $sd = 660{,}000$) tegu skins were traded yearly, mostly to the United States, Canada, Mexico, Hong Kong, Japan, Korea, and several European countries (Fig. 1; Hemley 1984; Norman 1987; Luxmoore et al. 1988).

In spite of the large trade in tegus and their importance as a resource they have never been managed; their populations have only been exploited at a rate defined by the market demand for skins. We still know relatively little about the biology of the lizards, and the effects of harvests on tegu populations and associated biotic communities are absolutely unknown. It is clearly prudent to institutionalize management and conservation programs if the ecological, economic, and cultural values of the resource are to be guaranteed.

The *Tupinambis* exploitation system has the potential to become a model for the sustainable use of wildlife in Latin America. The trade is legal where most of the skins are harvested, and the total trade is rel-



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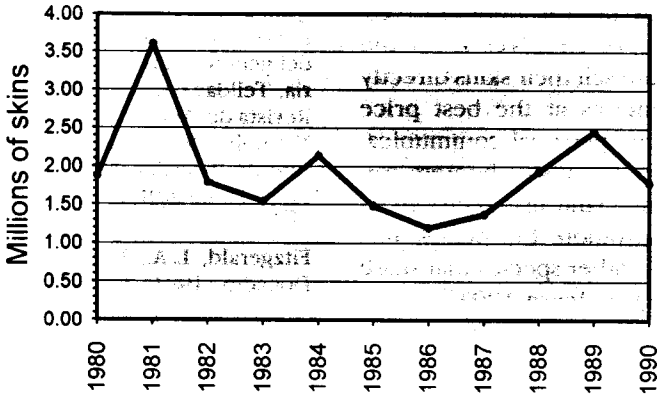


*Figure 1. The total trade in* Tupinambis, *based on import data from CITES transactions. The peak in 1981 presumably was a response to high demand for skins for cowboy boots after the movie* Urban Cowboy *was released in 1980. In every year when more than 2,000,000 skins entered the trade, fewer skins were harvested in subsequent years, indicating the market was saturated. Data are from Luxmoore et al. (1988) and the World Trade Monitoring Centre, Cambridge, England.*

atively well monitored internationally by the Convention on International Trade in Endangered Species (CITES). Although harvests have been high for more than a decade there is no evidence that either species is becoming endangered. The tegu trade is important to every level of the economy in Argentina and Paraguay. The export value of the resource is worth at least $20,000,000 (U.S.) annually. The skins are tanned before export, thus the tanneries provide jobs for local people. For rural peoples with low wages or intermittent work, tegu hunting is a significant source of income.

The life history of tegus and the characteristics of the traditional system of exploitation increase the likelihood that their populations can be managed sustainably. Tegus are large (males can reach 1.3 m in length and weigh 5 kg), have a long life span of about 13 years, grow rapidly to maturity by their fourth year, and have a clutch size of 20–35 eggs, depending on the species and locality. This life history should enable tegu populations to withstand periods of decline and respond relatively quickly to management aimed at population recovery (Fitzgerald et al. 1993; Fitzgerald in press).

The geographical distribution of *T. rufescens* and *T. teguixin* is much larger than the area where they are hunted. Within their ranges, both species occupy a variety of habitats, including forest clearings, secondary forest, and other disturbed habitats, such as roadsides and fence rows. Tegus are hunted on foot using trained dogs that track the lizards to their burrows where they are dug out and captured alive. The hunting season corresponds to the activity period of the lizards, roughly October to April. Hunters capture significantly more males than females during the spring breeding season, presumably because males are more active and have larger home ranges (Fitzgerald et al. 1991). The demand for skins has always been met and the trade has fluctuated widely over the years. Peak harvests have been followed by much smaller harvests, presumably because the market was saturated (Fig. 1). This pattern does not mean that *Tupinambis* exploitation is automatically self-sustaining, but the indication that *Tupinambis* populations have endured large and variable harvests is encouraging for the prospects of implementing management.

The governments of Argentina and Paraguay are taking steps to implement real sustainable use management programs for *Tupinambis*. Both countries are carrying out similar plans that should help tegu populations sustain harvests. In 1990 the government of Paraguay legalized the *Tupinambis* trade that always existed there, providing a legal framework for implementing management. Laws in each country were passed prohibiting the sale of skins from subadult tegus. This policy is aimed at the hide industry, which is the conduit for the external demand for tegu skins. Saving subadults from harvest should allow more of them to reach maturity and reproduce and result in a higher population growth rate.

Population monitoring will give a solid base to the management programs. Tegus are difficult and costly to study in the wild, but size and sex can be determined from harvested skins. Hence valuable demographic information is available from annual harvest data (Fitzgerald et al. 1991). In 1992 the wildlife authorities of Argentina and Paraguay began harvest monitoring programs to provide data on the sex ratios, size distribution, and total number harvested of each species. Harvest monitoring also provides data for evaluating and enforcing harvest regulations. Importantly, the monitoring programs will be permanently funded by a legally binding tax paid by the tanning industry.

## Will Tegu Management Help People?

Sustainable use management of tegu populations is the best guarantee that they will not be overexploited. As long as there is a demand for skins, rural and indigenous peoples will be able to supplement their incomes with tegu hunting (there are some individuals whose entire livelihood is tegu hunting).

Many rural people depend on tegus for food and income. In the vicinity of Joaquin V. Gonzalez, Salta,

Argentina, where we concentrated field work in 1987–1988, hundreds of people hunted tegus. The sale of each skin was equivalent to a day's wages for a farm hand. In 1992–1993 in Paraguay large skins brought up to $10.00 (U.S.). About half the families eat tegu meat, and those who don't use it to feed their hunting dogs. Practically everyone values tegu fat for medicinal purposes and it is traded locally (Donadio & Gallardo 1984; Fitzgerald et al. 1991). The number of people that derive benefit from tegu hunting is not precisely known, but even crude estimates point out the importance of the annual harvest. Norman (1987) calculated that in Paraguay the average tegu hunter sells 15 skins/year. There is great variance around this estimate, but it is obvious that thousands of hunters contribute to an annual harvest of 1,900,000 skins. Such a harvest is worth about $7,500,000 (U.S.) to those hunters.

The traditional tegu exploitation system is manipulated by middlemen who collect skins from hunters, hoard them, then sell them at a profit to the tanning industry. Middlemen thrive in exploitative systems, taking profit from hunters and impeding management objectives. Small skins have little value, for example, but end up being traded because middlemen refuse to sell large skins unless their entire stock is purchased. Once tegu management guidelines take hold, however, it is likely that middlemen will drop out of the system and the hunters themselves will reap a higher profit. This phenomenon is already occurring in the province of Santa Fe, Argentina, where the number of middlemen dropped from more than a dozen to only four (Ing. R. Biani, personal communication).

Especially intriguing is the idea that hunters could form cooperatives for selling skins and actively participating in the management of tegu populations. The CITES office of Paraguay is working to establish a program of hunter cooperatives, wherein representatives from the co-ops would sell their skins directly to the tanneries at the best price (A. L. Aquino, personal communication). Organizations of hunters can also influence land use decisions in ways that promote the persistence of tegus and other species that share their habitats (Alcorn 1993).

Hunter education began in 1990 in Argentina when the Argentine Wildlife Service, in collaboration with a local nongovernment organization, launched an environmental education campaign to teach hunters why small tegus should be left alone and why they no longer have any value. The message *"Cuide su dinero, dejar las iguanas chicas para el futuro. Las iguanas chicas no tienen valor comercial."* ("Take care of your money, leave the small tegus for the future. Small tegus have no commercial value.") drives home the connections between the population biology of the lizards, sustainable use, economy, and the best interests of the hunters.

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