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WHO WILL SAVE THE WILD TIGER?

BY MICHAEL 'T SAS-ROLFES

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TO THE READER

“Who Will Save the Wild Tiger?” by Michael ’t Sas-Rolfes surveys the devastating decline of wild tiger populations and presents an approach that offers hope for halting that decline. This essay is based on a longer paper, “Economic Incentives for Tiger Conservation” (WP 97-4), which is available from PERC (the Political Economy Research Center).

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“**T**he tiger will be virtually extinct in the wild by 1999 unless India and the other range states declare open war on poachers and illegal traders and throw all the resources required into the battle. Some scattered individuals will remain and produce some young for a decade or two in the twenty-first century, but, in fact, we shall have seen the end of the tiger.”

— *Peter Jackson*

Species Survival Commission,
IUCN–World Conservation Union

INTRODUCTION

Few animals capture the public imagination as does the tiger, the largest member of the cat family. Dedicated conservation organizations backed by an impassioned public have given a high priority to saving this majestic animal. Several high-profile international environmental groups have initiated campaigns to save the tiger, and millions of dollars have been spent on this cause. The tiger is protected by international law through the Convention on International Trade in Endangered Species (CITES) and by an increasing number of national and local laws.

Yet none of these measures has halted the tiger’s decline.

During this century the number of tigers in the wild (as opposed to those in captivity) has fallen from about 100,000 to between 4,800 and 7,300 (Jackson and Kemf 1996, 2), largely through hunting and habitat destruction. Three subspecies have disappeared altogether. The tiger faces extinction in the wild.

This paper argues that tiger conservation is, ultimately, an issue of incentives. Command-and-control prescriptions for saving the tiger have largely failed because the people who actually determine the destiny of wild tigers have few incentives to save them. If environmentalists are to succeed in saving the wild tiger from extinction, they must understand the incentives facing the people who control the tiger's fate and change those incentives into ones that promote tiger conservation. In other words, we must convert live tigers from liabilities into assets. There are signs that this is beginning to happen, but whether it will occur fast enough to prevent the demise of the tiger in the wild is a question that has yet to be answered.

The Tiger's Decline

At the start of the twentieth century, wild tigers were widely distributed throughout Asia, ranging as far west as Turkey, as far north and east as southeastern Russia, and as far south as the Indonesian islands of Java and Bali. There may have been as many as 40,000 tigers in India alone (Gee 1964), and the total population may have numbered 100,000 animals (Jackson and Kemf 1996, 4). Today, the latest estimate is that the total number of wild tigers is between 4,800 and 7,300 (Jackson 1996b, 6).

Scientists classify the tiger into eight subspecies, based on geographic rather than genetic considerations. Three subspecies have already become extinct this century: the Caspian tiger of central Asia and the Javan and Balinese tigers (named for the Indonesian islands on which they were found). The five existing subspecies are the Bengal, Indochinese, Sumatran, Amur (Siberian) and South China tigers. The Bengal tiger is the most abundant subspecies, while the South China tiger is virtually extinct in the

wild (see Appendix A). Wild populations survive in the fourteen Asian countries known as range states (see Appendix B). India is believed to have the most, an estimated 2,500 to 3,750 wild tigers, but only two tiger populations are considered sufficiently robust for possible long-term survival: the Russian population of Amur tigers (Jackson 1997, 4-5) and a population of possibly 500 tigers in the Sunderbans mangrove forests of India and Bangladesh (Jackson and Kemf 1996, 13).

In addition to the wild tiger populations, an almost equal number of captive tigers survive in zoos and circuses (Jackson 1994a, 9). Many of these animals are of mixed or uncertain pedigree, but some 1,200 are listed as pure-bred specimens, representing one of the five subspecies (Jackson 1995a, 25; International Tiger Information Center 1996). Tigers breed readily in captive settings, and there are concerted international efforts to establish healthy captive populations of all five subspecies, with the primary goal of eventual reintroduction into the wild. This will probably be easily achieved for the Amur tiger (see Tilson, Traylor-Holzer, and Brady 1994) and perhaps the Bengal, Indochinese and Sumatran tigers, but may not be possible for the South China tiger, as the number of certified pure-bred specimens is precariously low.

Modern tiger conservation only emerged in the twentieth century. In previous times tigers were numerous and presented a threat to rural people, sometimes attacking and killing individuals and livestock (which they continue to do). Even so, people often refrained from killing tigers out of a combination of respect and various cultural beliefs and taboos (McNeely and Wachtel 1988). These traditional attitudes have been eroded by the forces of colonization, westernization, and urbanization.

In the eighteenth and nineteenth centuries, wild tigers started losing out to expanding human populations, more efficient hunting, and land conversion (Norchi and Bolze 1995, 4). Tigers were hunted under government-sponsored eradication campaigns in countries such as Malaysia, China, and Russia. They were hunted for sport and trophies, especially in India. And they were hunted

for their body parts. Tiger skins are prized for their ornamental value, and almost all tiger body parts have some value as ingredients of traditional Asian medicines, the most notable being tiger bone.

During the era of colonial rule, protected forest reserves provided refuges for surviving tiger populations in India, Nepal, Burma, and Malaysia (Norchi and Bolze 1995, 4). After these countries declared their independence, deforestation of some of these areas resulted in further declines in tiger numbers.

CONSERVATION MEASURES

The first conservation measure specifically for tigers was a mid-century ban by the Soviet Union against hunting the Amur tiger, which had been hunted to near-extinction by the 1930s. In 1959 the Chinese government banned hunting of Amur tigers in northern China. However, the government simultaneously encouraged the eradication of the South China tiger by paying a bounty for each killed animal. This policy was only revoked in 1977, when the hunting of all tiger subspecies in China was finally banned.

The issue of tiger conservation gained international prominence in 1969 when Indian conservation officials called for action to protect the Bengal tiger at a meeting of the IUCN–World Conservation Union (Jackson and Kemf 1996, 6). Following this meeting, the Indian government banned tiger hunting, and an international nonprofit organization, the World Wildlife Fund (WWF), started a global fund-raising campaign called Operation Tiger. The WWF offered \$1 million to Indian Prime Minister Indira Gandhi to help initiate a comprehensive tiger conservation program (Jackson 1985b, 3), and the Indian government launched Project Tiger in early 1973, which aimed at creating a number of tiger reserves. The World Wildlife Fund also supported projects in Nepal, Bangladesh, Thailand, and Indonesia (Jackson and Kemf 1996, 7). Many Asian countries passed stronger wildlife protection

laws, banning tiger hunting and creating new protected areas (Norchi and Bolze 1995, 4).

For the first ten to fifteen years, these efforts appeared to yield results. Sources from India, Nepal, and the Soviet Union reported increasing tiger numbers in many areas. However, these positive reports created a degree of complacency, while tiger numbers actually continued to decline in many states (Norchi and Bolze 1995, 7).

THE TIGER TODAY

During the late 1980s and early 1990s, there were increasing signs that the tiger's status was not secure. For example, several conservationists questioned the reported increase in tiger numbers in India, suggesting that certain conservation officials had exaggerated census figures (Jackson 1985c, 8–9 and 1990a, 8).

Where tiger numbers had grown, the animals were becoming less fearful of humans (Jackson 1985c, 8). Increased attacks on humans and livestock were reported in India, Nepal, and the Soviet Union. As tiger attacks increased, so did the number of tigers eliminated to protect people (Jackson 1985a, 6 and 1986b, 29). The prospect of available carcasses and trophies prompted proposals from the Soviet Union to engage in commercial trade of tiger products (Jackson 1987b, 15), as well as various suggestions to allow controlled trophy hunting outside reserves (Ward 1987, 61; Jackson 1990a, 18). Many conservationists fiercely opposed such proposals (Jackson 1987a, 2 and 1987b, 16, 28–30), favoring measures to intensify restrictions on all trade and use of tiger products.

Since 1975, the tiger has been listed as an endangered species by CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Such a listing amounts to a ban on all commercial trade in the species and its derivatives between signatory countries, which supposedly enforce the ban. The number of CITES signatory countries has increased to 143 (World

Conservation Monitoring Center 1997), and includes eleven of the tiger range states.

Even so, tigers continue to be killed illegally by poachers. Tiger poaching went largely unnoticed throughout the 1970s and 1980s, because it took place in countries where international conservation groups were less active: China, Burma, Thailand, Laos, Cambodia, Vietnam, Malaysia, and Indonesia. Conservationists paid little attention to this until the late 1980s, when the number of reported incidents from India, Nepal, and Bangladesh started to rise (Jackson 1990b, 7 and 1991a, 8–9).

Much of the poaching was driven by an increased demand for tiger bone (Jackson 1990a, 8 and 1991b, 3). The role of tiger bone was highlighted in 1987, when the Chinese National Pharmaceutical Bureau proposed a tiger breeding facility near Beijing. The facility was to “solve the problem of the shortage of tiger bone” (Tan Bangjie 1987, 10; Jackson 1987b, 17–18). Reports also showed that there had been significant trade in live tigers and tiger products across the Chinese border with Burma (now Myanmar) stimulated by the rapidly rising price of tiger parts.

In 1992 serious levels of poaching were recorded for the first time in two high-profile areas: India’s Ranthambore Tiger Reserve and the Russian Far East (Jackson 1992b, 20 and 1993a, 1; Zatz 1993, 20). The international conservation community reacted to these reports by undertaking, for the first time, serious research to determine the nature and extent of the trade in tiger products (Nowell 1993; Mills 1993).

One group, TRAFFIC International, conducted a detailed survey of the trade (Mills and Jackson 1994) and found it to be substantial and widespread. Tiger bone has been an ingredient in traditional Chinese medicines since at least 500 A.D., and its use is firmly established in several Asian cultures. Furthermore, traditional uses were identified for almost every other tiger body part (Mills and Jackson 1994, 4–6), and tiger meat is also considered a delicacy by some Chinese (Jackson 1989a, 11).

TRAFFIC established that tiger products had been exported from almost all range states since 1980, often in contravention of

CITES. Moreover, residents in most of the range states also consumed various tiger products, and a number of other countries were found to be significant consumer states, including Japan, Belgium, Canada, Australia, Hong Kong, Macau, Singapore, South Korea, Taiwan, the United Kingdom, and the United States.

As TRAFFIC conducted its research, various environmental groups campaigned vigorously to end the trade in tiger products. Several groups lobbied the United States government to pressure certain Asian countries to abide by the CITES ban.¹ Eventually, the U.S. government persuaded the governments of South Korea, China, and Taiwan to ban domestic sales and uses of tiger bone, in spite of clear reluctance from these countries. Following the U.S. government’s actions, the Chinese government shelved plans to register a breeding facility for captive Amur tigers under CITES.

In early 1993, the Indian government convened an International Symposium on the Tiger, attended by 250 participants from eight range states (Jackson 1993a, 2–3). The meeting unanimously opposed any legal trade in tiger products, and declared that the Chinese breeding facility could “never become an economic proposition and meet the demand of the tiger bone medicine factories” (Jackson 1993a, 2). The meeting also recommended that a Global Tiger Forum be established by the range states to initiate a worldwide campaign to save the tiger. Eleven range states agreed to this idea, and it was strongly supported by organizations such as the World Wide Fund for Nature (WWF) (see Jackson and Kemf 1996, 24). However, by mid-1997 the forum had not yet been ratified by the required minimum of five parties (see Jackson 1995a, 3 and 1996a, 3).

CURRENT POLICIES

In response to the depletion of wild tigers, conservationists have advocated regulatory solutions. They have banned tiger hunting, established protected areas (tiger reserves), and banned international trade and use of tiger products. Recently, the

conservation community has recognized that these regulatory methods may not be working and that a fundamental problem must be addressed: The people who control the fate of the tiger have little incentive to save the tiger.

Currently, three major approaches are “in play” in conservation policy: trade bans, captive breeding, and securing tiger habitat. They need to be viewed in the light of their effect on the incentives of people who affect the tiger’s fate.

Trade Bans

In terms of incentives for tiger conservation, the value of trade bans is inconclusive. On the one hand, by making trade illegal, bans raise the costs of criminal activity and thus discourage poaching. On the other hand, they spur higher, black-market prices, which raise the benefit to the poacher who is successful. The outcome of a trade ban depends on which of these effects is greater.

Trade in tiger products is illegal almost everywhere. Eleven tiger range states are CITES signatories, as are most other consumer states (Mills and Jackson 1994, 25–35). Most range states and consumer states have also passed legislation restricting domestic trade and possession of tiger products (Mills and Jackson 1994, 36–43). But poaching continues.

The trade ban approach relies largely on lobbying governments and other influential organizations to adopt policies aimed at ending trade, and to supplement this with efforts to influence public opinion. For example, Norchi and Bolze (1995, 17–23), who developed a tiger policy document for the Wildlife Conservation Society, call for better trained staff, stricter laws, improved law enforcement, higher penalties for offenders, and prohibition of all trade, use, and possession of tiger products. They also recommend more in-depth scientific research and education and public awareness efforts to discourage consumption of tiger products and solicit further donations for conservation.²

Unfortunately, there is little evidence of such measures protecting tigers so far, and there are a number of reasons to believe

that controlling trade is not likely to work in the future.

One sign that controlling trade does not work is the evidence of persistent demand for tiger products and evidence that the products continue to be supplied, even with bans supposedly in effect. The evidence of trade occurs in both major consumer countries such as South Korea (Jackson 1996b, 2) and China (Mills 1997, 44), and countries such as the United Kingdom, Belgium, and Canada (Jackson 1995a, 5; Chalifour 1996). Consumers are reluctant to accept substitutes for certain tiger products, especially bone. Furthermore, tiger bones are hard to identify and easily smuggled across borders and past customs controls into Asian cities.

Rapid economic growth in countries such as China is likely to increase disposable income, possibly leading people to pay increasingly high prices to obtain tiger products, even illegally. While rising affluence could encourage consumers to switch to conventional Western medicine, the continuing demand for tiger products among Asian communities in Europe, Canada, and the United States casts doubt on this hope. Nowell and Jackson (1996, 237) suggest that demand may even be encouraged by black market “mystique.” Conservation groups such as TRAFFIC are discussing with practitioners of traditional medicine some ways to promote the prescription and use of substitute products. In December 1997, for example, the First International Symposium on Endangered Species Used in Traditional East Asian Medicine was held in Hong Kong. Whether this approach is effective remains to be seen.

Since the benefits of Asian economic growth are not spread uniformly, poor rural people living adjacent to tiger reserves will probably remain poor, so that higher prices for tiger products will make poaching more attractive. Even if demand should fall, the current supply of tiger products may diminish much faster, especially if (as has happened) authorities destroy seized stockpiles of products destined for the market (Jackson 1992a, 25). There is a high risk that a future shortage of supply will cause an increase in black-market prices.

Another reason why antitrade policies are not likely to be

successful is that while most countries accede to CITES, many do not have adequate supporting laws and enforcement capacity (Hemley and Bolze 1997, 36; Mainka 1997, v–vi). Trade bans require considerable resources and effort. As penalties increase, the courts require a greater quantity of evidence before they are willing to convict poachers, reducing the probability that offenders will be penalized at all (Barnett 1993). Furthermore, corrupt officials may thwart the imposition of penalties (Jackson 1995b, 2). Far more important than the penalty in deterring poachers is the likelihood that poachers will be successfully intercepted (see 't Sas-Rolfes 1995, 30). Conservationists should concentrate on measures to facilitate early detection through steps such as increased presence of field and antipoaching staff, local community support, and incentives such as informant reward schemes.

Those who support antitrade policies completely reject the idea of providing a legal source of bone through tiger farming (Jackson 1993a, 9 and 1995a, 1). They argue that allowing any legal trade will facilitate illegal activity and lead to higher levels of poaching. This argument is understandable but it should be scrutinized objectively. While legal trade could make it easier for illegal traders to operate, a legal supply could bring down the average market price of tiger products. With lower prices, the incentive to poach wild tigers would go down.

Proponents of trade bans assume that legal suppliers cannot displace any illegal suppliers through competition, and they assume that the consumption of tiger products will increase significantly if a legal supply is provided, neutralizing any positive effects of an increased total supply. But there is insufficient evidence to support either assumption. Both may be wrong.

Captive Breeding

Captive breeding programs, known as *ex situ* conservation, aim at conserving genetically pure and robust specimens of the different subspecies with the eventual goal of reintroducing them into the wild. The chief economic question is whether governments or other

funding institutions are willing to pay to maintain captive breeding and related measures, which are often expensive.

The Tiger Global Conservation Strategy serves as a blueprint for the captive breeding approach, and is supported by members of the international zoo community (Tilson and Christie n. d.). There are also moves to establish a Tiger Genome Resource Bank, which will consist of frozen tiger sperm and embryos (Jackson 1993b, 18). Recent advances in the science of assisted reproduction will allow genetic material from captive sources to supplement wild tiger populations through artificial insemination (Nowell and Jackson 1996, 258–61).

Proponents of such *ex situ* activities point out that they do not provide a complete solution to the threat of extinction, but offer additional alternatives for long-term conservation (Tilson, Traylor-Holzer, and Brady 1994, 13). While there is clearly an important place for captive breeding, there is disagreement over the extent to which it should be used. Several Indian conservationists, for example, are opposed to the captive breeding program in China (Jackson 1995a, 2). They worry that China's captive tigers are not suited for release into the wild (Jackson 1996b, 13–14) and that the program may open the way for commercial tiger farming. Many Indian conservationists are strongly opposed to tiger farming as well as to sustainable uses of wild tigers such as trophy hunting, preferring complete bans on trade.³

Nowell and Jackson (1996, 267) express concern that captive-bred tigers may not adjust to wild conditions; they may be killed by other wild tigers or attack livestock and people (having lost their fear for humans while in captivity). However, Christie (n. d.) cites evidence that captive-bred carnivores can learn to adapt if they are suitably trained during the pre-release period. Not only can they readily acquire the requisite hunting skills, but they can also be taught to avoid humans and livestock using methods of negative reinforcement. So a tiger reintroduction program might succeed, but it certainly would be difficult, time-consuming, and expensive.

The costs of *ex situ* conservation and the reintroduction process are likely to remain high, perhaps prohibitively so (see Nowell and

Jackson 1996, 268; Jackson 1996b, 1), and certain technical issues remain unresolved (see Wildt et al. 1987; Meacham 1997, 15–27). In addition, some stress that the captive breeding approach is pointless unless habitat and prey are maintained to allow for future reintroduction and the ongoing threats to wild tigers are eliminated (Jackson 1986b, 6–7; Schaller 1995; Meacham 1997, 27). Relatively few places remain where tiger populations could be re-established, especially given the need for acceptance by local people living in the area (see Nowell and Jackson 1996, 64–65, 149–79). However, there are some opportunities for the creation of corridors between habitats and the expansion of present habitat areas.

Securing Tiger Habitat

This approach to tiger conservation focuses on direct measures to protect wild tigers, their natural habitat, and their natural prey. For such *in situ* conservation to be successful, an understanding of economic incentives is crucial. To the people who control the habitat, the value of conservation must be greater than the value of using the habitat for something else, such as agriculture or logging.

Seidensticker (1987, 7) points out that “large tracts of contiguous habitat are essential to assure the long-term survival of wild tigers,” and Karanth (1997) argues that density and persistence of wild tiger populations depends on the abundance, density, and size of prey species.

Yet tiger habitat is becoming increasingly fragmented by land conversion, resulting in isolation of small populations (Nowell and Jackson 1996, 65; Tilsou 1996, 5). Even if these populations survive, isolation and lack of management may lead to inbreeding (Jackson 1993b, 16–17). As human populations continue to grow in Asia, wild tigers will face greater pressures. Increased demand for land will raise the value (and the opportunity cost) of undeveloped land, and protected areas may lose their status as reserves or simply be invaded by neighboring local people.

In the few places where tiger conservation efforts achieve

success (i.e., tiger numbers start to increase), problems of human conflict typically develop (Jackson 1992b, 4; Schaller 1995). This is also true when tigers colonize new areas (see Ming 1996). When tigers kill humans and livestock, local people may retaliate by killing the tigers. And once in possession of a carcass, people may be tempted by the considerable black-market value of tiger products.

In spite of these difficulties, there is renewed interest in these *in situ* approaches. Jackson (1996b, 3) cites recent proposals to expand Project Tiger in India, which emphasizes the establishment of tiger reserves. The World Bank’s Global Environment Facility (GEF) is becoming increasingly active in supporting related projects (see MacKinnon and Mishra 1997). A recent paper by Dinerstein et al. (1997) presents an elaborate framework for identifying priority areas for conserving tiger habitat, based on the distinctive ecological conditions of different tiger ranges.

There is also a growing awareness that local people must have incentives to protect the tiger. Innovative ideas are starting to emerge. Many of these are embodied in the Convention on Biological Diversity (CBD), which was signed by 157 countries in 1992 at the Rio Earth Summit. As of June 1, 1997, 169 countries had ratified it (Convention on Biological Diversity 1997). The CBD shifts the emphasis of international conservation policy away from conventional regulatory measures such as trade bans and protected areas and addresses the priorities of developing countries, where most biological diversity is found. The CBD states as its objectives (in Article 1) “the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.” The CBD has drawn more political support in five years than CITES has in twenty-three years (only one tiger range state had not yet ratified it by mid-1997).

Conservationists are increasingly considering the role of socio-economic factors in achieving their goals (Western, Wright, and Strum 1994; McNeely 1995). There is heightened awareness of the importance of the people who have to live with wildlife from day-

to-day and who have to bear the costs of conservation.

Tiger conservationists in range states have recognized the importance of local people for some time. In 1984, Hemendra Panwar, the director of India's Project Tiger, argued for the "need to combine community development and welfare activity to improve the living conditions of people residing in the vicinity of wildlife reserves, this being the only way to gain their support for conservation" (Jackson 1984, 7). More recently, some international environmental groups such as the World Wildlife Fund have also recognized this need (see Jackson and Kemf 1996, 22–23). Several reserves in India have taken such measures as compensating livestock owners for loss of animals due to tiger predation and rewarding informants about poachers, as well as endorsing the concept of "ecodevelopment," which is designed to both improve the quality of life of local people and protect and restore the environment they live in (Nowell and Jackson 1996, 289–90; MacKinnon and Mishra 1997).

In what is perhaps the most innovative project so far, conservation groups have helped restore the heavily deforested areas around Royal Chitwan National Park in Nepal. The project includes an "ecotourism" component that provides revenues for local people. The Bagmara User Group Committee, which manages the land, has built nature trails for elephant-back safaris and a wildlife viewing tower. The project attracted more than 10,000 tourists in the first year of operation and produced nearly \$276,432 in revenues. Revenues were shared by Nepal's Department of National Parks and Wildlife Conservation and the Bagmara Group (Dinerstein et al. n. d.).

Such a project addresses the real tiger conservation problem by turning wild animals (rhinos and other animals as well as tigers) from liabilities into assets. How widespread this changing attitude will be remains to be seen, however. For the most part, the goal of "ecodevelopment" appears to be to guide development in ecologically sensitive ways while offering local people other ways of making a living than by poaching. But only rarely does it provide direct positive incentives for tiger conservation. Von Treuenfels

(1995, 36), for example, argues that the tiger's future depends on finding a way for local people to "make a living—other than by the animals." Such an approach develops weak links, at best, between the continued existence of wild tiger habitat and the flows of benefits from the presence of the tiger. It does not address all the factors leading to the tiger's demise.

Incentives for Local People

Clearly, economic incentives can positively affect tiger conservation, but current incentives for tiger conservation are mixed. In too many cases, perverse incentives are at work. For example, many range state governments subsidize development projects and activities such as clear-cutting and conventional agriculture. Such subsidies encourage excessive land conversion (and thus habitat loss) at both the tiger's and the taxpayer's expense. Furthermore, they often displace poor people and force them to encroach upon pristine areas, including tiger habitat.

Another problem is the high value of dead tigers. In some countries the prices paid to poachers for a single tiger skeleton may be as much as ten times the average annual per capita gross national product (Mills and Jackson 1994, 10).

To develop more positive incentives for tiger conservation, the importance of interested and affected parties (Vorhies 1996) must be recognized. All too often, conservationists seem to regard governments and political figures as the most important parties in tiger conservation and attempt to use political measures and influence to achieve their objectives. For example, environmental groups often measure their success by the adoption of antitrade policies. When such policies fail, they complain of a "lack of political will" (see Jackson 1995a, 3 and 1997, 1–2).

Those who have a direct influence on the tiger's destiny are, primarily, conservation field staff members and subsistence farmers living in the vicinity of tiger reserves. While people in developed countries such as the United States express a desire to "save the tiger" by donating money to environmental groups, people in

developing countries may not want to “save the tiger.” Since it threatens the lives of both humans and livestock, the costs to local people are usually high and the benefits low.

Tigers regularly attack people, causing injury or death (Jackson 1996b, 5). Although tiger-caused deaths have declined recently, more than 100 people were killed by tigers between 1989 and 1991 in the Chandpai range of the Bangladesh Sunderbans (Jackson 1992a). Deaths in the Kheri District of Uttar Pradesh state in India totaled 138 in six years (Jackson 1985b). Livestock losses caused by tigers represent considerable economic penalties. To most subsistence farmers, a single domestic animal represents a significant portion of their livelihood. Unless there are benefits that exceed those costs, the people who experience the costs are not going to protect tigers.

Are there benefits that can be derived from tigers? Yes, but the problem for tiger conservation today is that currently the benefits are more potential than actual.

For most local people, there are only two positive values of live tigers (other than any traditional cultural values they might hold that favor the tiger). First, tigers prey on wild animals such as deer, boar, and pig that destroy crops in many areas (see Jackson 1985a, 11; 1986b, 5; and 1987b, 18). Second, some people are employed as staff in protected areas, and thus earn a living from tiger protection. But even then, their salaries are often low, so that the incentive for good performance is lacking.

Tigers have significant potential value for sport or trophy hunting. Hunts involving captive-bred tigers in the United States and China (Jackson 1991b, 4–5 and 1992a, 7) and illegal hunts in range states confirm this (see Ward 1987, 61; Jackson 1988b, 26). In Africa, regulated trophy hunting of charismatic wild species such as elephants, rhinos, buffalos, lions, and leopards earns a great deal of money that is used for conservation (Nowell and Jackson 1996, 190), but in Asia, and especially India, most conservationists fiercely oppose sport hunting (Ramakrishnan 1994).

Live tigers have several other potential positive values, but few are currently captured for tiger conservation. For example, a

growing number of tourists want to view wild animals, especially charismatic species such as tigers, in their natural habitat. Many tiger reserves cater to tourists, especially in India and Nepal. But tourist revenues in India make no significant contribution to either local communities or reserve management costs; the principal beneficiaries are commercial tourism service providers (Nowell and Jackson 1996, 190). This suggests that the Indian wildlife tourism industry is not structured in a way that fosters tiger conservation. Either tourists and tourist operators are not paying their fair share for the benefits they receive from tiger reserves, or their contributions are being misdirected (or both).

Enthusiasts for tiger-based tourism should recognize that it poses some difficulties. Tiger habitat is often so dense that it is difficult to see tigers. And since searching on foot for tigers is dangerous, reserves must provide viewing from vehicles or elephants or high structures, all of which are costly. However, these limitations are not insuperable. The famed Tiger Tops lodge and other tourist camps in and near Royal Chitwan National Park have attracted tourists for years, and the Bagmara Group’s new “ecotourism” project outside Royal Chitwan suggests that there is potential for additional tourism (see Dinerstein et al. n. d.).

Tigers also have substantial indirect positive values for environmentalists concerned with protecting forests and watersheds—but, again, these benefits do not reach local people. Tigers act as a “flagship” species, both as indicators of habitat loss and as a reason to conserve habitat. Tigers may also have ecological values—for example, by controlling the numbers of prey species that might otherwise overuse natural vegetation, causing land degradation and soil erosion.

Perhaps the greatest values for conservationists are encapsulated in the concept of “existence value.” This is the value that people place on just knowing that tigers exist, even if they never get to see them. While existence value is impossible to measure accurately, it is reflected in the willingness of many people to donate large sums of money to protect wild tigers (see Jones and Goodman 1997). Interest in tiger conservation in developed

countries is strong. Appreciation of wild tigers is a luxury to which most people in poorer countries cannot afford to devote their time and money.

Currently, most of the benefits flowing from the tiger's existence value are captured by environmental groups, zoos, and the media in developed countries. Environmental groups receive substantial revenues for the protection of tigers. Zoos provide direct opportunities for people to view tigers. And the media sell articles and images relating to tigers in the wild. Unfortunately, little of this money reaches the states where tiger conservation must occur if it is to be successful.

A host of factors hinders private foreign investment in tiger conservation activities in range states. Poor infrastructure and communications inhibit the collection of data and flow of information. Weak property rights and widespread government ownership of land make it difficult for private conservation interests to control habitat. Excessive bureaucracy and corruption frustrate foreign aid spending for conservation.

Furthermore, existence values may be incompatible with some of the policies that will actually lead to tiger protection. People who find killing animals morally repugnant might not donate money to environmental groups that support tiger hunting or tiger farming, even if these activities could help conserve the tiger in the wild.

In sum, most of the interest in tiger conservation occurs in the developed countries, but little of that interest translates to actual protection of wild tigers in their natural habitat. Few local people benefit directly from the presence of wild tigers, but they bear considerable costs. It is mostly people in developed countries who benefit from tiger conservation campaigns.

GETTING THE INCENTIVES RIGHT

To encourage local people to protect the tiger, conservationists must recognize the incentives that are driving the loss of tiger habitat and illegal hunting of wild tigers. Incentives must be changed in three key areas: land conversion (including loss of the species on which tigers prey), tiger-human conflict, and markets for tiger products.

Land Conversion

Tiger habitat is being lost because land is being converted to other uses. In most range states, tigers occur mainly on state-owned lands, where property rights may be weakly enforced. This leads to problems such as uncontrolled exploitation by local people and a tendency of governments to sell development rights cheaply. Strengthening property rights over land and allowing these rights to be allocated to local communities, private owners, or environmental groups would mitigate against these problems. If property rights to land were clearly defined and protected, conservation groups could encourage interested parties to purchase tiger habitat or obtain conservation easements on the habitat. This could greatly facilitate the creation of tiger corridors, which would allow tigers to move from one habitat area to another.

The extensive privately owned and managed wildlife reserves in Africa provide models for protection of the tiger through private reserves, but few Asian conservationists currently favor privatizing existing state reserves. Moreover, governments are reluctant to change the legal status of land, especially land designated for conservation. However, if governments could improve the incentives for existing wildlife agencies by adopting commercial principles, they could increase funding for conservation. In a study that covered a number of Caribbean and African countries, James, Kanyamibwa, and Green (1997) found that "parastatal" wildlife

agencies (i.e., those with independent control of their finances) are better funded than state wildlife departments funded from central government treasuries.

To discourage conversion of tiger habitat to other uses, conservationists should identify ways to make wildlife conservation an economically competitive form of land use (Nowell and Jackson 1996, 188). Wildlife tourism and sport hunting represent opportunities for tigers to generate additional economic benefits. However, these benefits will have little effect unless they reach the relevant people: field staff in reserves and other local people. In most cases, legal and political reforms are needed to redirect the flows of benefits.

Another way to discourage the loss of tiger habitat—and to encourage the addition of tiger habitat—is to capture and transfer the existence value of tigers. Nowell and Jackson (1996, 262) discuss so-called “Adopt-a-Park” programs to provide technical support and funding to tiger reserves. These could be funded by those in the developed countries who appreciate the existence of tigers, and the funds could flow to park managers in the range states. The success of this approach in enhancing duck habitat in North America has been dramatic (Anderson and Leal 1991).

In addition, perverse incentives should be removed. For example, if government subsidies destroy tiger habitat by promoting unsustainable development projects, conservationists could lobby against these subsidies. Unfortunately, there are usually powerful vested interests behind such subsidies, and this approach will often encounter overwhelming resistance. Nonetheless, it is worth pursuing, because subsidies are a very powerful force driving land conversion.

Tiger–Human Conflict

Reducing conflict between tigers and people is vital to tiger conservation. Nowell and Jackson (1996, 183–88) discuss several specific measures to reduce or prevent livestock predation, and there are established techniques to mitigate against attacks on

humans. A classic example is the practice of people wearing masks on the back of their heads to discourage tiger attacks from behind, a technique that emanates from the Sunderbans region of India and Bangladesh (see Jackson 1990b, 2). In parts of Africa, fences separate wildlife from humans and livestock, and such fences represent a possible solution for the tiger in Asia. However, this solution is not feasible where habitat and range requirements necessitate that people and tigers share the same tracts of land.

Where people and tigers cannot be separated, measures such as compensation for livestock damage—an approach that has been recently tried by a few reserves in India (Nowell and Jackson 1996, 289–90; MacKinnon and Mishra 1997)—may reduce conflict between farmers and wildlife. In the United States, a program sponsored by Defenders of Wildlife that compensates ranchers for livestock predation by wolves has helped ease the re-introduction of wolves into Yellowstone National Park (Anderson and Leal 1997). This may provide a model for compensation against tiger predation.

A more fundamental approach is to form meaningful partnerships between conservation groups or agencies and local people by providing local people with a stake in the ownership and management of wildlife. In some countries, governments have created institutions that allocate property rights to local people, allowing them to benefit directly from wildlife management. The most frequently cited example is the CAMPFIRE program in Zimbabwe (Metcalf 1995). Such community-based wildlife management programs are difficult to implement and even in Africa have not been entirely successful. Yet over the long term they could prove to be effective. Unlike conventional regulatory approaches, they can provide the essential positive incentives that are currently missing (see Gibson and Marks 1995).

Poaching

The continuing demand and black market for tiger products provide incentives for criminals to kill tigers for profit. As long as

the prices of tiger parts are high and incomes are low, some people will poach. The best countermeasure may be to lower the price by increasing the supply. The fact that there are several tiger breeding facilities in countries such as China and Thailand (Jackson 1995b, 5) suggests that tigers could be raised commercially to produce an alternative supply of products.

Of course, there are arguments for and against commercial tiger farming (Meacham 1997, 165–79). Conservationists should weigh these carefully. Because tigers breed easily in captivity, farming could provide a substantial volume of tiger products in a relatively short time, thereby greatly reducing their market prices. This has occurred with other wild animals such as crocodiles (see Mitra 1995). The lower market price would reduce the incentives to poach. On the other hand, a lower market price for tiger products would tend to raise consumption levels.

In fact, whether farming could benefit wild tigers largely depends on the relative costs of obtaining tiger products from legal rather than illegal sources—something that is difficult to predict. Experience with bear farming in China suggests that consumers will accept “farmed” products as substitutes for wild-harvested products if they are cheaper and easier to obtain. The demand (and relative price) for illegal wild-harvested bear products has dropped considerably in China; most consumers now purchase farmed products (’t Sas-Rolfes n. d.). If consumers accept farmed tiger bone as a substitute for bones from wild tigers, and if the farmed product is readily available and cheaper, incentives to poach wild tigers will be reduced.

Another reason why commercial farming could succeed as a conservation measure is that tiger bones are virtually impossible to distinguish from the bones of other large cats, or indeed of many other mammals (Meacham 1997, 123–58). Currently, consumers buying tiger bone on the black market have little way of knowing whether the products are genuine. If tiger farming was legal, producers could join forces with associations of traditional medicine practitioners to create a certification and distribution system. This would be analogous to “eco-labeling” of tiger

products, except that purchasers would be motivated mainly by the knowledge that they would be buying the genuine item. Illegal (that is, poached) tiger bone would be far less attractive because it could be fake. Traditional Asian medicine specialists appear to favor this approach over a trade ban (see Mills 1996, 8).

Supplying commercially farmed tiger bone and other products would not eliminate the need for habitat protection and antipoaching measures, but it would discourage further short-term increases in the prices of products from wild tigers—increases that reward poaching. With commercial farming of tigers, some consumers would still probably continue to favor products from wild tigers (and therefore pay more for these). In addition, consumer demand for wild-harvested products could increase with rising levels of affluence (see Meacham 1997, 172–74). For these reasons, a limited legal supply from naturally deceased and problem wild animals should also be investigated as an option for increasing supply.

SAVING THE TIGER

Until recently, conservationists have skirted some of the key issues. They have relied excessively on emotional media campaigns for public support and money, backed up by strings of regulatory measures that are poorly enforced and poorly funded. Fortunately, some environmental groups are redirecting their attention to the role of incentives. They recognize that regulatory measures do not provide sufficient incentives for tiger conservation, and some, such as complete bans on hunting and trade, may even be counterproductive by driving up prices of tiger products.

Some programs funded by development agencies and non-governmental organizations are focusing on incentives, but we must go further. The existence of market demand for tourism viewing, sport hunting, tiger body parts, and vicarious enjoyment through the media suggests directions for future initiatives. Meeting these demands is not immediately feasible in all cases, largely because of political constraints, but possibilities include:

- private purchases of land to secure tiger habitat and create new private sanctuaries that operate independently from state conservation agencies and are thus immune to political and bureaucratic constraints;
- tiger-based tourism ventures to raise money that will be spent directly on conservation measures and used to directly compensate local people;
- limited, highly exclusive, legal commercial trophy hunting of wild tigers to generate money for conservation measures and local people; and
- commercial tiger farming under a regulated system that involves associations of traditional Asian medicine specialists who certify and distribute tiger products.

Governments may resist these market-based approaches, but tiger conservationists should not.

NOTES

1. It was somewhat ironic that the U.S. government should take such a strong stance—according to Chinese export statistics, the United States was the largest single recipient of tiger products from China in 1990 but had no official records of any imports or seizures in that year (Nowell and Jackson 1996, 236).
2. They also call for relocations of people living inside areas of critical tiger habitat, and suggest that forestry exploitation and certain developmental projects should be prohibited in such areas.
3. This view is not universally shared by Indians—see Mitra (1995).

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APPENDIX A

Subspecies of the Tiger (*Panthera tigris*) and Estimated Numbers 1996

Common Name	Scientific Name	Minimum	Maximum
Bengal tiger	<i>P. t. tigris</i>	3030	4735
Indochinese tiger	<i>P. t. corbetti</i>	1180	1790
Sumatran tiger	<i>P. t. sumatrae</i>	400	500
Amur (Siberian) tiger	<i>P. t. altaica</i>	162	230
South China tiger	<i>P. t. amoyensis</i>	20	30

Source: Jackson (1996b, 6).

APPENDIX B

Tiger "Range States" and the Subspecies Present

Range State	Bengal	Indochinese	Sumatran	Amur	South China
Bangladesh	X				
Bhutan	X				
India	X				
Nepal	X				
Myanmar	X	X			
Cambodia		X			
Laos		X			
Malaysia		X			
Thailand		X			
Vietnam		X			
Indonesia			X		
Russia				X	
North Korea				X	
China	X	X		X	X

Source: Jackson (1996b, 6).