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The Future of Asian Elephant Conservation: Setting Sights Beyond Protected Area Boundaries

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Abstract

Throughout Asia, elephants come into conflict with people, making elephant conservation a difficult and complex issue, with socio-economic and political overtones. Previous efforts to conserve elephants and mitigate the human-elephant-conflict in Sri Lanka have focused on translocating and confining elephants within protected areas. However, protected areas already contain the number of elephants they can carry, and a larger proportion of Sri Lanka's elephant population of about 3,000-5,000 animals range outside protected areas. Therefore, translocation and confinement is not a viable management strategy and jeopardizes the survival of Sri Lanka's elephants, both within and outside protected areas. Here, we present a landscape conservation strategy aimed at allowing elephants to continue ranging outside protected areas. The strategy is based on using on-going shifting agriculture outside protected areas to create optimal habitat for elephants, and providing benefits to farmers through elephant conservation. Based on over a decade of field research, the approach allows people and elephants to co-exist outside protected areas with minimal conflict. Since many of the issues that contribute to human-elephant-conflict are similar across the Asian elephant range, we suggest that similar landscape-scale conservation approaches that integrate traditional land-use practices may be an effective, long-term solution to elephant conservation.

Keywords: Asian elephants, conservation landscapes, human-elephant conflict, Sri Lanka

Introduction

Elephants are ecological generalists, and considered an 'edge species', able to utilize the ecotones in landscapes of forest patches interspersed with cultivation areas. Until early in the 20th century, a large extent of Sri Lanka consisted of such landscape matrices. Since then, mega-irrigation development and resettlement schemes have resulted in rapid land use changes and increase in human densities over a significant area (Abeywickrama *et al.* 1991). Consequently, the human-elephant-conflict has escalated, and conserving elephants in the midst of such changes has become a real challenge.

Because of the close religious and cultural ties that date back at least two millennia, the Sri Lankan people have had a benevolent -- even reverential -- attitude towards elephants. However, in recent years, with the increasing demand for land by a rapidly increasing human population, competition between humans and elephants has increased, resulting in a conflict that now borders on a threshold where the benevolent attitudes have begun to erode. The human-elephant conflict in Sri Lanka is now a significant socio-economic and political issue which requires an urgent long-term conservation solution.

Here, we present a strategy for elephant conservation based on over 10 years of field studies of elephant ecology, habitat use, genetics, and socio-economic surveys. The basis for this strategy is the creation of conservation landscapes integrating protected areas and areas where appropriately regulated land-use regimes can allow elephants and humans to co-exist with minimal conflict.

Elephant Conservation in Sri Lanka: A Perspective of the Past and Present

Sri Lanka is an island of 65,000 km^2 with central hills ascending to 2500m from the surrounding peneplain. The south-west quarter of the island receives rain throughout the year and is considered the 'wet-zone'. The rest of the island has a very seasonal climate with monsoon rains from October to January, and is considered the 'dry zone'.

The dry zone landscape of Sri Lanka has been influenced by anthropogenic activities for centuries, first by an agro-civilization based on irrigation using a complex system of reservoirs and canals. This period dates back a few thousand years (Abeywickrema *et al.* 1991). Subsequent to its collapse around the 14th century, small scale shifting agriculture was the primary cultivation method. These activities converted most of the dry zone to optimal elephant habitat.

In early 20th century, elephants were distributed throughout the dry zone, and the population was estimated at around 8,000-12,000 (McKay 1973; Fernando 2000). The current estimate of 3,000-5,000 represents a decrease of over 50% of the population

during the past 100 years. This decline is partly attributable to the elimination of elephants from the wet zone during the colonial era, but more to post-independence development of the dry zone for irrigated agriculture (Jayewardene 1994; Fernando 2000). Between 1956 and 1984, approximately 656,000ha of land came under irrigated paddy cultivation and settlements (Abeywickrama *et al.* 1991; Jayewardene 2003).

Along with agricultural developments, concern for wildlife led to the design of a system of protected areas linked by corridors to conserve wildlife—especially elephants displaced by development (Jayewardene 1994). However, some of these conservation areas and corridors have been lost to development and encroachment. Efforts at translocating elephants from outside areas into conservation areas have not succeeded in eliminating elephants from irrigation development areas, or in effectively addressing the human-elephant-conflict (Fernando 1993; Jayewardene 1996). During the early period of conflict mitigation elephants were simply driven into protected areas. More recently drives have been combined with kilometers of electric fences on the boundaries of protected areas to contain the translocated animals within them.

Most dry zone protected areas prior to their declaration were under a shifting agriculture regime and consisted of secondary forest and scrub, which is optimal habitat for elephants. In Sri Lanka, once the protected areas are declared, management is on a 'hands-off' basis, with very little habitat management and manipulation. Over time and succession, the forests mature and the habitat becomes less optimal for elephants. As a result the carrying capacity of the parks for elephants decreases. Moreover, at the time of their designation, the protected areas harbored elephant populations which in all likelihood approached their long-term carrying capacities. Thus, driving and translocating elephants into the protected areas under the current management regime is not a viable practice. In fact, large-scale translocations jeopardize the survival of elephant populations that are already within the protected areas by increasing competition for limited resources (Fernando 1997).

Priority Populations and Conservation Landscapes: The Need for a New Initiative

As throughout most of Asia (Sukumar 1989), a large proportion of Sri Lanka's elephant habitat lies outside the protected areas. Because of the high demand for land to support the economic needs and development aspirations of a growing human population and developing nation, it is not possible to target this entire habitat for protection. Yet, because mega-herbivore populations are limited by the extent of area available to them (Armbruster & Lande 1993) only a fraction of the current elephant population in Sri Lanka can be sustained within the protected areas system. If the conservation goal is to protect a larger population, a landscape-scale conservation

strategy that will increase the available habitat under the conservation umbrella becomes an imperative. Because Sri Lanka has only two protected areas that exceed 1,000 km^2, such a strategy becomes even more important to accommodate the country's desire to conserve its flagship species. Thus, identifying the priority elephant populations and developing landscape-scale conservation plans to secure their long term survival is an urgent need.

Our studies using radio-telemetry have shown that Sri Lankan elephants have relatively small home ranges within which they undertake short-distance seasonal movements in response to resource availability (Fernando 1998; Weerakoon *et al.* 2003). These well-defined home ranges average less than 100 km^2 for herds (Fernando 1998; Fernando and Lande 2000; Weerakoon *et al.* 2003), and are generally smaller than home ranges of elephants in India (Datye & Bhagwat, 1995; Baskaran & Desai 1996) and Africa (Lindeque & Lindeque 1991). Genetic studies have shown distinct differences in elephant populations from different parts of Sri Lanka (Fernando *et al.* 2000). This geographic sub-division of genetic variation indicates that the small home ranges and lack of long distance movements is not an artifact of recent habitat fragmentation, but is representative of elephant behavior over evolutionary time. For conservation, these ranging patterns indicate that long-distance migration corridors linking protected areas are not necessary -- or even appropriate -- for elephant conservation; instead, the need is for distinct conservation landscapes integrating protected areas and outside areas which encompass the home ranges of targeted elephant populations.

A priority in such a landscape-scale conservation strategy where elephants are able to live outside the protected areas is to address the human-elephant conflict issue. The trend of increasing conflict and decreasing tolerance will have to be reversed through economic incentives and judicious land use planning. Our research has indicated that traditional shifting agriculture, locally known as *chena*, is highly beneficial to elephants and is compatible with elephant conservation outside protected areas (Fernando *et al.* 2005). Under this regime, a patch of mature forest, usually about a hectare, is cleared, burned, and cultivated annually for about 3-4 years, then abandoned in favor of another patch. Because *chena* is rain-fed agriculture, the cultivation is limited to the rainy season. The abandoned patch is allowed to regenerate for about 10-12 years, before the farmer returns to it. In most areas where shifting cultivation is practiced, farmers also cultivate small rice paddies immediately down-stream of small reservoirs that capture rainwater during the wet season. The result is a landscape matrix of vegetation patches in various stages of succession ranging from newly regenerating vegetation in fallow fields to secondary forests, providing substantial food resources and refuges for elephants, and a network of reservoirs providing abundant water. Such landscape matrices represent optimal elephant habitats.

The people defend and protect the *chena* patches from depredations by keeping vigil in watch huts during the night and by erecting thorn fences around the periphery. Surveys have shown that the few depredations which occur in the *chena* patches during the wet season are by solitary males, whereas herds rarely raid cropped chena (Fernando *et al.* 2005). Although the frequency of both males and females entering chena patches increases during the dry season, the fields are fallow so there is no conflict (Fernando *et al.* 2005).

In a landscape such as this, which is a matrix of secondary habitat that encourages high elephant densities, humans are a 'keystone species', creating and maintaining optimal conditions for elephants. Removing the keystone species when protected areas are established changes the ecological dynamics that sustain high elephant densities. Thus, the people help to create an 'enriched habitat' for elephants, which is an often-discussed management target in protected areas, but at a scale that will be prohibitive in terms of funds and spatial scale for park management to undertake.

Sharing Benefits: Landuse Management for Elephants and People

Based on our findings we propose a land management strategy that maintains the 'keystone species' role of the local farmers in these landscapes, but to regulate the land-use regimes to better complement elephant conservation objectives. The extent and areas to be cultivated in a given year will be determined based on the extent of the area to be managed, its proximity to protected areas, existing land use and land cover, and the ranging patterns of elephants in the area.

In small parcels of shifting agriculture lands contiguous with protected areas that can serve as elephant refuges, dispersal of cultivation plots over the entire area may be acceptable. While the fine-grained landscape mosaic (Fig. 1) may be applicable where depredations are few and there are seasonal movements of elephants into adjoining protected areas in the cultivation season, in larger blocks of shifting agriculture lands, consolidating *chena* plots to create a coarse-grained habitat mosaic (Fig. 1) could decrease the potential for conflict between elephants and people by providing larger feeding areas and refuges for elephants. The consolidated *chena* patches will be rotated to allow them to succeed into secondary forest before they are cleared and cultivated again (Fig. 2).

Consolidating smaller patches provide other added advantages to the farmers. The task of protecting the *chena* patches through nocturnal vigils can be shared; market access will be more cost effective; and temporary electric fences around the larger *chena* patches can be installed against depredations. Shifting cultivation is mostly practiced on state land, and is technically illegal. However, the Forest Department has the authority to sanction the practice as a land-management regime, which will be an

incentive for farmers to conform to a regulated and sanctioned shifting cultivation regime in the conservation landscapes. Under the proposed land-use regime, permanent settlements and cultivations will have to be fenced out or excluded from these landscapes to reduce conflict.

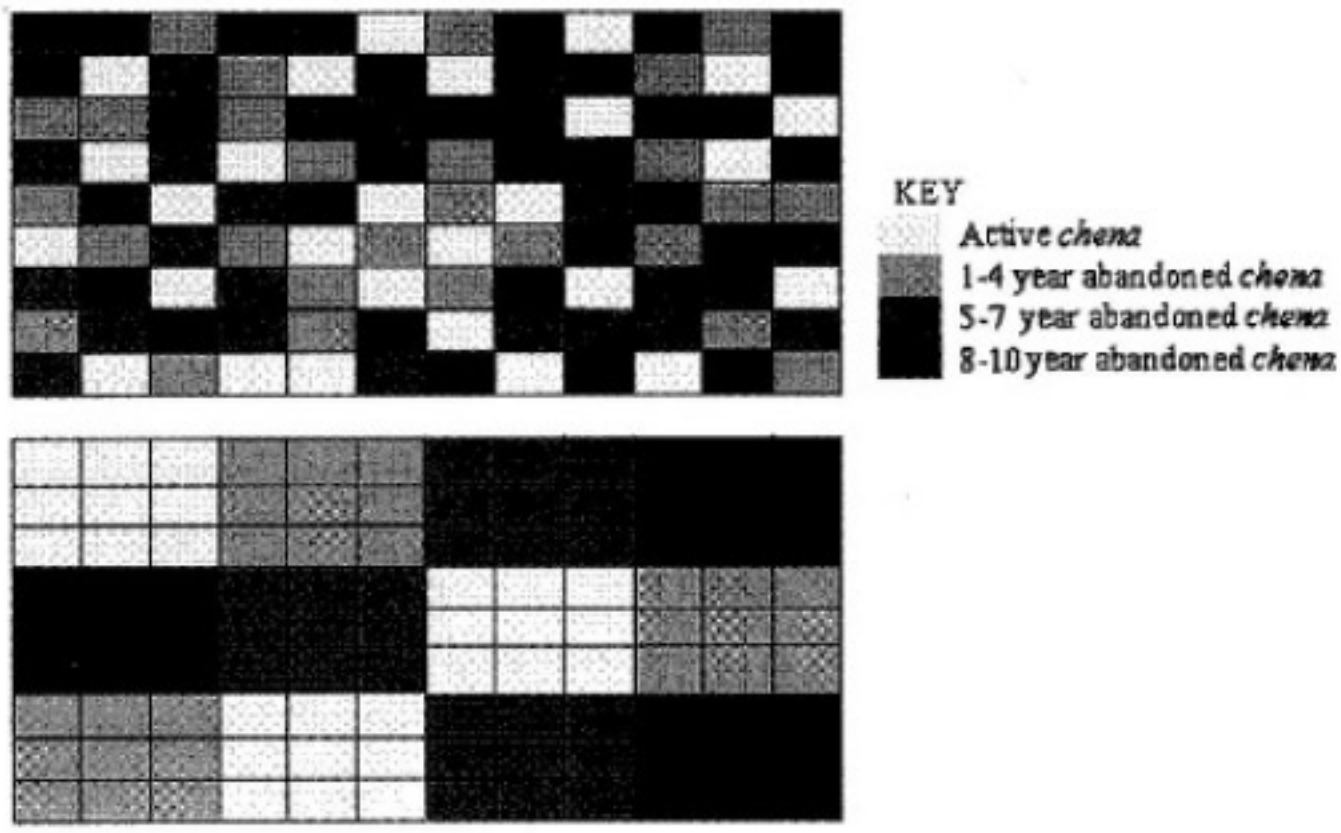

Figure 1. Conceptual diagram to show the fine-grained landscape mosaic created by the current *chena* cultivation practice (top), and how consolidating the small *chena* patches can create a coarse-grained landscape mosaic (bottom). The Key indicates the succession and age of the secondary vegetation relative to the active *chena* patches. A patch of *chena* is usually cultivated for about 4 years.

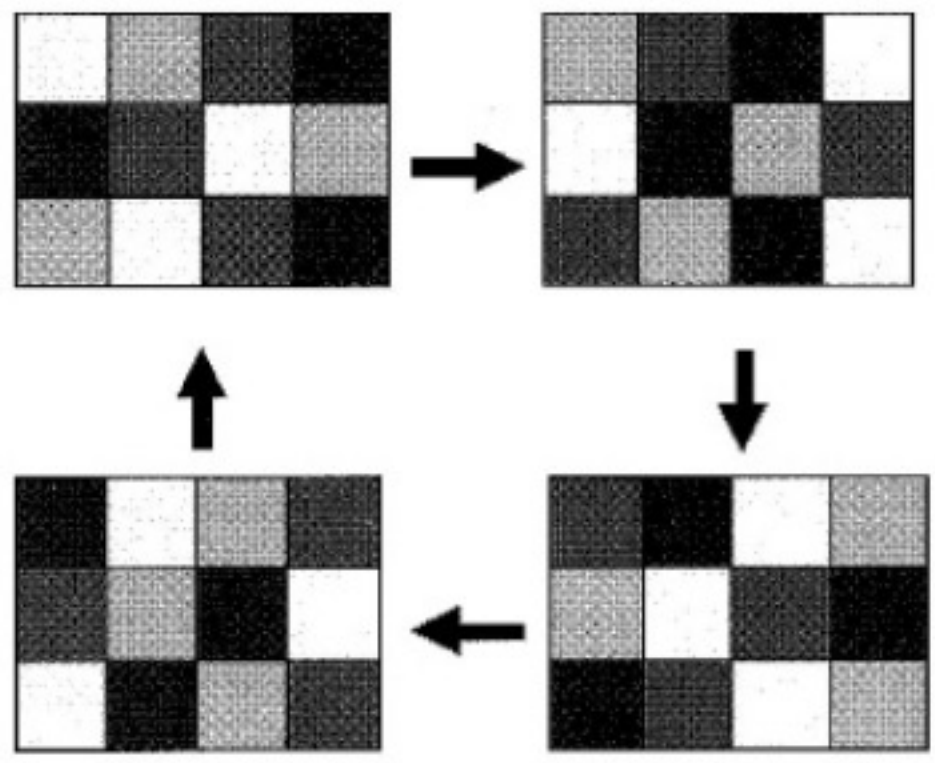

Figure 2. Conceptual diagram to show the rotation patterns of the consolidated *chena* patches to create a coarse-grained landscape mosaic, which will be rotated every 3-4 years.

Dealing with Conflict Through Incentives

Conflict between humans and elephants has occurred throughout history, wherever and whenever the two overlap and compete for habitat. In Sri Lanka, around 50 people and over 120 elephants die each year as a result of the human-elephant conflict (Jayawardene 2003). The people who bear the brunt of elephant depredations are amongst the poorest, and the conflict exacts a heavy economic toll from them. They do not receive any benefits from the presence of elephants, and usually receive no compensation for depredations. Consequently few are receptive to elephant presence and bring pressure on the authorities to remove them, although farmers who have traditionally lived and cultivated in elephant areas for generations tend to be more tolerant (Fernando *et al.* 2005).

If elephant presence can bring economic benefits, people in elephant ranges would be more amenable to sharing habitat with elephants, and be more tolerant of conflict. Therefore crop protection methods, compensation or insurance schemes, value addition for produce by marketing as specialty 'conservation produce', and activities that capitalize on elephant presence, such as community-based elephant viewing tourism and elephant-centered cottage industries such as handicrafts, and elephant-dung paper are potential strategies that can provide for opportunity costs and augment the benefits of farming in elephant habitat.

Conclusion

Persisting with the strategy of limiting elephants to protected areas will result in a continued decline of elephants, with the eventual collapse of populations even within the protected areas. Instead, adopting a landscape approach to elephant management will benefit both elephants and people, and ensure the continued survival of Sri Lanka's elephant population. A management strategy for the future should look beyond protected areas. As a large fraction of elephant habitat lies outside protected areas; barriers to exclude elephants should be constructed along ecological boundaries that separate human-use areas, such as permanent settlements and permanent agricultural areas, from elephant habitat, rather than around protected areas. Smaller elephant conservation landscapes could be associated with large protected areas as buffer zones, while larger landscapes can be specifically designated as managed elephant ranges where the land use will be compatible with elephant conservation.

The issues pertaining to conserving elephants in the midst of exponentially growing human populations are not restricted to Sri Lanka, but are common to much of the Asian elephant range. Conservation of elephants under the prevailing socio-economic, cultural, and political context of Asia, which prohibits sanctioned culling, poses a major challenge to wildlife managers, conservationists, and scientists. However, given the close association of Asian cultures with elephants, a resurgence of the benevolence

with which Asians still regard elephants can change the outlook for the future of the Asian elephant as a free ranging species, but only if new and innovative approaches to conservation are adopted.

Acknowledgements

We would like to thank Karl Stromayer, Mary Pearl, Fred Koontz, Julie Hughes, Robyn Cashwell, Susan Elbin, Meenakshi Nagendran, Andrew Taber, Peter Leimgruber, Sumith Pilapitiya, and Jayantha Jayewardene for encouragement; the Department of Wildlife Conservation Sri Lanka, Dayananda Kariyawasam, Edmund Wilson, HD Ratnayake, Tharaka Prasad, SRB Dissanayake, WS Weragama and other officials of the DWC for support of our research; and the US Fish and Wildlife Service-Asian Elephant Conservation Fund, and Wildlife Trust for funding. The Centre for Conservation and Research is a member of Wildlife Trust Alliance and this is WTA publication No. 03.

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CONSERVATION BIOLOGY IN ASIA

2006

EDITORS
Jeffrey A. McNeely, Thomas M. McCarthy, Andrew Smith,
Linda Olsvig-Whittaker and Eric D. Wikramanayake

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