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PROTECTED AREAS AND THE CHALLENGE OF CONSERVING CROP WILD RELATIVES

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ABSTRACT

Crop wild relatives are a critical resource for sustaining future food security. It is widely recognised that many of the world's protected areas contain CWR diversity, but despite this, it has not yet proved possible to undertake significant actions to conserve the CWR they contain. Many challenges and obstacles need to be addressed in order to improve this situation. Recent initiatives have started to address these challenges and uncovered some key lessons. However, the need for action is urgent and the article concludes by drawing attention to the need for a global approach to conserving priority and threatened CWR in the wild.

INTRODUCTION

Crop wild relatives (CWR) – wild plant species closely related to crops to which they may contribute beneficial genes – constitute an enormous reservoir of genetic variation for crop improvement and are an important socio-economic resource. Genes from wild plants have provided crops with resistance to many pests and diseases and improved their tolerance to extreme temperatures, salinity and drought—a value of CWR that is of growing importance under the changing climate. CWR have also contributed more generically to improving variety, yield and quality. Most modern crop cultivars contain some genes that were derived from wild relatives (Maxted & Kell, 2009) and the worldwide value of these new gene introductions in increasing crop yields per year has been estimated at US$115 billion (Pimentel et al., 1997). A review of the use of CWR in crop improvement programmes by Maxted and Kell (2009) found that for 29 crop species important for food security, there are at least 183 CWR taxa containing useful traits for crop improvement. The authors found that reported uses of CWR for crop improvement have increased significantly in the last 40 years and that the most widespread CWR use has been in the development of pest and disease resistance, with the references citing disease resistance objectives accounting for 39 per cent, pest and disease resistance 17 per cent, abiotic stress 13 per cent, yield increase 10 per cent, cytoplasmic male sterility and fertility restorers 4 per cent, quality improvers 11 per cent and husbandry improvement 6 per cent of the reported inter-specific trait transfers. It is also worth noting that the same study found breeders' use of CWR taxa was increasing year on year, even though it was recognised that they were still far from being systematically exploited.

Some idea of the scale of benefits may be obtained from published estimates referring to a selected number of crops. For example, the desirable traits of wild sunflowers (*Helianthus* spp.) are worth an estimated US$267 to US$384 million annually to the sunflower industry in the United States; one wild tomato species (*Lycopersicon peruvianum* (L.) Mill.) has contributed to a 2.4 percent increase in solids contents worth US$250 million; and three wild peanuts (*Arachis batizocoi Krapov. & W. C. Gregory, A. cardenasii Krapov & W. C. Gregory and A. diogoi Hoehne*) have provided resistance to the root knot nematode, which costs peanut growers around the world US$100 million each year (Hunter & Heywood, 2011). Of course, the commercial contributions of the majority of CWR are likely to be on a much smaller scale. Godfray et al. (2010) acknowledge the important role that CWR are playing and will continue to play in broadening the current narrow genetic base of the world's important food crops, improving food production and contributing to the food security of a world projected to be home to nine thousand million people by 2050.

However, it cannot be assumed that this valuable resource will continue to be available for current and future exploitation. CWR occur in a wide range of habitats, but as numerous assessments testify, habitats

Bi-national Great Green Macaw Festival 2011 © Allan Valverde

Biosphere Reserve of Southeast Nicaragua was created, while in 2006 the 'Agua y Paz' Biosphere Reserve was created in Northern Costa Rica (Moreno, 2007).

In 2000 and 2001, The United Nations Development Programme (UNDP) facilitated bi-national meetings amongst Nicaraguan and Costa Rican institutions, establishing a working network of environmental, academic, cultural and media sectors from both countries. Since 2001, the Mesoamerican Biological Corridor has supported a bi-national collaborative process which originated as part of the SI-A-PAZ process. This led to the identification of the bi-national El Castillo -San Juan-La Selva Biological Corridor, where the great green macaw, a flagship species for these territories, thrives and reproduces (Chassot et al., 2003; Chassot and Monge, 2008).

A bi-national campaign 'Save the Great Green Macaw' has been running since 2001 in conjunction with Fundación del Río in Nicaragua and the Tropical Science Center in Costa Rica. This bi-national experience has illustrated how protected areas can maintain the biological and social relationships within the San Juan-La Selva basin (Chassot et al., 2010b). In 2002, eleven workshops on the biology and conservation of the great green macaw were held in Nicaragua and ten bi-national festivals were organized. This process also led to the creation of the Bi-national Commission of the El Castillo-San Juan-La Selva Biological Corridor (which includes government agencies, local governments and NGOs from both countries) in November 2002, which formalises the development of bi-national activities (Chassot et al., 2006).

Some outcomes from the transboundary conservation process include (Chassot and Monge, 2008):

- Integration of local communities into monitoring and raising awareness to protect the habitat of the Great Green Macaw
- Development of a participative process to build-up stakeholders capacity
- Integration of policy planning at the local government scale
- Dramatic increase in available information
- Sharing of experience (for example: environmental services payment)
- Assimilation of different topics related with natural resources management by local people

Thus the effort to conserve the meta-population and habitat of great green macaws has helped strengthen collaborative links between Nicaragua and Costa Rica – at least on some levels. Even after more than 10 years of transboundary cooperation between Nicaragua and Costa

Key values

Well-known academics plus first-time writers. An emphasis on practical work in protected areas

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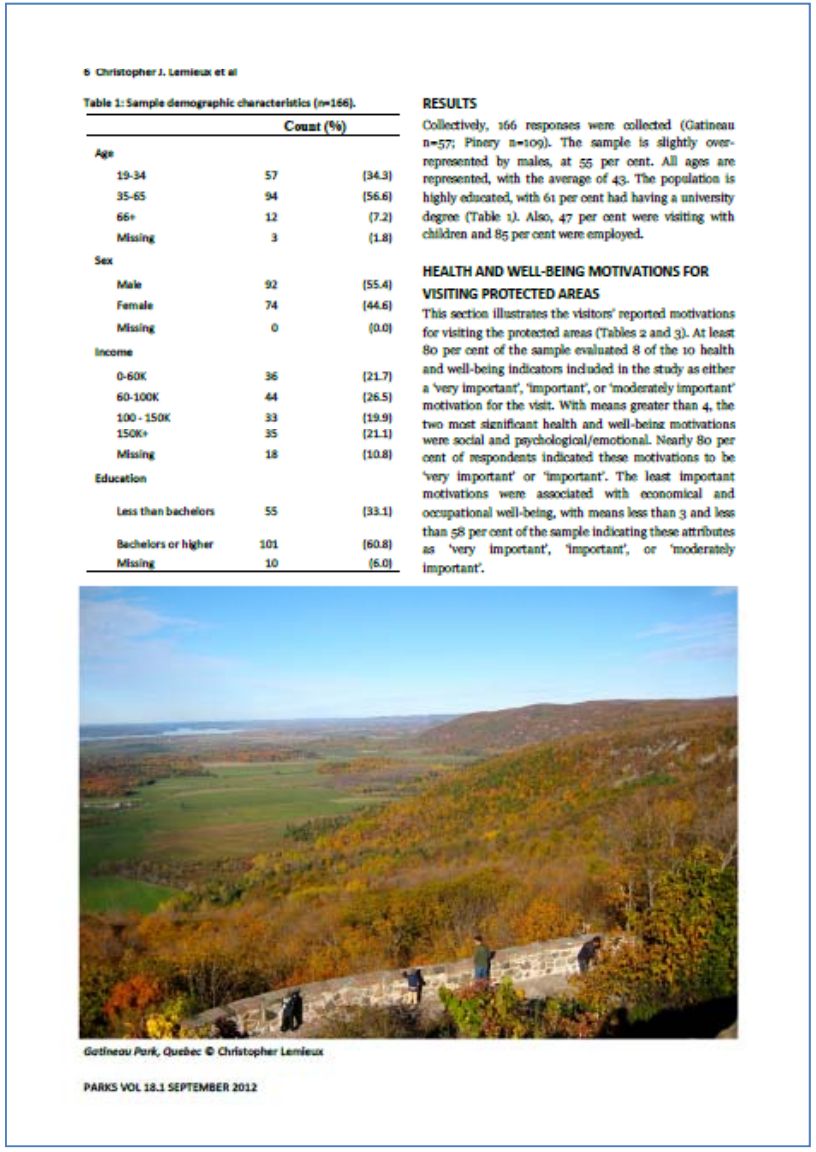

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Table 1: Sample demographic characteristics (n=166).

	Count	(%)
Age		
19-34	57	(34.3)
35-65	94	(56.6)
66+	12	(7.2)
Missing	3	(1.8)
Sex		
Male	92	(55.4)
Female	74	(44.6)
Missing	0	(0.0)
Income		
0-60K	36	(21.7)
60-100K	44	(26.5)
100 - 150K	33	(19.9)
150K+	35	(21.1)
Missing	18	(10.8)
Education		
Less than bachelors	55	(33.1)
Bachelors or higher	101	(60.8)
Missing	10	(6.0)

RESULTS

Collectively, 166 responses were collected (Gatineau n=57; Pinery n=109). The sample is slightly over-represented by males, at 55 per cent. All ages are represented, with the average of 43. The population is highly educated, with 61 per cent had having a university degree (Table 1). Also, 47 per cent were visiting with children and 85 per cent were employed.

HEALTH AND WELL-BEING MOTIVATIONS FOR VISITING PROTECTED AREAS

This section illustrates the visitors' reported motivations for visiting the protected areas (Tables 2 and 3). At least 80 per cent of the sample evaluated 8 of the 10 health and well-being indicators included in the study as either a 'very important', 'important', or 'moderately important' motivation for the visit. With means greater than 4, the two most significant health and well-being motivations were social and psychological/emotional. Nearly 80 per cent of respondents indicated these motivations to be 'very important' or 'important'. The least important motivations were associated with economical and occupational well-being, with means less than 3 and less than 58 per cent of the sample indicating these attributes as 'very important', 'important', or 'moderately important'.

Gatineau Park, Quebec © Christopher Lemieux

Practical management

Exchanging information on practical management issues, especially those learning lessons from research and case studies of applied ideas

Developing capacity for a protected planet a resource for people actively involved in establishing and managing protected areas, under any management category or governance type

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CONSERVATION IN TROPICAL PACIFIC ISLAND COUNTRIES: CASE STUDIES OF SUCCESSFUL PROGRAMMES

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ABSTRACT

Biodiversity in the tropical Pacific is seriously threatened as a result of decades of habitat destruction and degradation. Intensive conservation efforts and considerable financial investment have failed to stem this crisis. To understand better how to achieve conservation success, this paper examines six case studies of conservation area programmes in five independent Pacific Island nations: Sovi Basin Conservation Area (Fiji), Tetepare Island and Bauro Highlands Conservation Area (both Solomon Islands), Takitumu Conservation Area (Cook Islands), Pohnpei Island (Federated States of Micronesia), and Adelbert Ranges (Papua New Guinea). Four common themes emerge from these case studies: active participation of landowning communities; involvement of all relevant stakeholders; the generation of tangible benefits for landowning communities, and external support for the project over long (five years or more years) time periods. Although the socio-cultural situation differs among locations, these themes should be considered when conservation projects in the Pacific are initiated.

INTRODUCTION

Oceania has high terrestrial diversity and endemism (Keast & Miller, 1996, Kier et al., 2009), including more than 30,000 plant and 3,000 vertebrate species (Legra et al., 2008, Mittermeier et al., 2004). More than half of this diversity is found in the 14 independent developing island nations of the tropical Pacific (Keppel et al., 2012, Mittermeier et al., 2004). However, much of this rich and unique biota is poorly known and afforded little protection (Wardell-Johnson et al., 2011). The government departments dealing with the environment and conservation in these countries are poorly funded (Axlford et al., 2008; Lees & Siwatibau, 2009) and protected area systems fail to protect major components of the biodiversity (Lees, 2007, Shearman & Bryan, 2011). As a result, habitat loss and degradation remains the biggest threat to biodiversity, and an increasing number of invasive species and anthropogenic climate change are likely to exacerbate the effect of these stressors (Wardell-Johnson et al., 2011).

To address this biodiversity crisis, developed nations have invested considerable funding into the conservation sector of these 14 countries over the last three decades, either through support for local and regional conservation organisations and projects or by an increasing presence of international non-government organisations. Despite these efforts biodiversity continues to decline and most conservation programmes have been considered unsuccessful (Hunnam, 2002; Lees & Siwatibau, 2009). In fact, environmental degradation has continued at similar rates or even accelerated in some Pacific Island countries (Lees & Siwatibau, 2009; Shearman & Bryan, 2011).

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MEETING AICHI TARGET 11: WHAT DOES SUCCESS LOOK LIKE FOR PROTECTED AREA SYSTEMS?

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ABSTRACT

The Convention on Biological Diversity Strategic Plan for Biodiversity 2011-2020 was adopted at the 10th Conference of the Parties in Nagoya, Japan. The plan outlines 20 Aichi Targets to achieve global biodiversity conservation. A fundamental global approach to biodiversity conservation is the use of protected areas. Arguably all 20 Aichi Targets have implications for the establishment and management of protected areas, but only Target 11 addresses them directly. This paper carries out a clause by clause analysis of Target 11 and makes recommendations to countries on interpreting each clause in order to best achieve biodiversity conservation using protected areas. Despite containing only 61 words, Target 11 is surprisingly dense. It applies to both marine and terrestrial ecosystems, and sets goals for spatial planning (representiveness, ecological connectivity and areas of importance for biodiversity); protected areas management (including management effectiveness and social equity); and criteria about what counts toward being a protected under Target 11. We argue for a holistic interpretation of Target 11 as a way for the global community to use protected areas to change the current unacceptable trends in global biodiversity.

INTRODUCTION

Biological diversity underpins ecosystem functioning and the provision of ecosystem services essential for human survival and well-being. It provides food security, clean air and water; it contributes to local livelihoods, human health, and economic development, and thus is essential for the achievement of the Millennium Development Goals, including poverty reduction. Accordingly the 10th Conference of the Parties (COP) to the Convention on Biological Diversity (CBD), in Nagoya, Japan, adopted the Strategic Plan for Biodiversity 2011-2020.

This Plan is comprised of a shared vision, a mission, strategic goals and 20 ambitious, yet achievable, targets, collectively known as the Aichi Targets (www.cbd.int/sp/targets/). At first reading, the Targets are straightforward and require little policy elaboration. Closer examination however reveals that they are complex parts of a whole, and require considerable interpretation if countries are to be able to move ahead in a consistent and fair manner and achieve the Targets.

Arguably all 20 Aichi Targets have implications for the establishment and management of protected areas, but only Target 11 addresses them directly. Protected areas are a tried and tested approach to nature conservation. For centuries they have been created and managed by local communities, indigenous peoples, governments and private organizations. They remain one of the most diverse and adaptable management and institutional tools for achieving conservation. Their effectiveness can be measured, evaluated and enhanced. In addition to conserving nature, protected areas are critical for a range of other benefits, including providing ecological services, reducing the impacts of disasters such as flooding, and storing carbon (Dudley et al., 2010, World Bank, 2010).

Aichi Target 11, which falls under Goal C of the Strategic Plan for Biodiversity, '*Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity*' reads: "*By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular*

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THE EFFECTS OF PROTECTED AREA AND VETERINARY FENCING ON WILDLIFE CONSERVATION IN SOUTHERN AFRICA

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ABSTRACT

The use of park and veterinary fences to separate wildlife, people and livestock is increasingly threatening the fragmentation of African rangelands. However, the curtailment and eradication of wildlife borne animal diseases has necessitated the use of fencing as a blunt instrument. The dilemma inherent in the removal of fences to make way for large contiguous transfrontier conservation areas is that new diseases may spread and cause hardship to rural communities and harm national livestock exports. New and creative thinking is required to balance these opposite outcomes such that an era that will encourage the sustainable development of African rangelands can be ushered in.

INTRODUCTION

The conservation of protected areas and large mammals in Africa is inextricably linked in terms of ecological dependency and historical necessity (Craigie et al., 2010). The migration of large mammalian herbivores in the savannahs of east and southern Africa either delimit the boundaries of ecosystems that are in need of protection or simultaneously underline the hazards that exist for these populations if the migration range is partially or wholly unprotected. An added concern is the role of fencing which frequently aids and abets the fragmentation of the landscapes that surround protected areas and furthermore can result in impassable barriers to the dispersal of highly mobile species (Ferguson & Hanks, 2010).

Human-wildlife conflict (HWC) is increasing in those places where the boundaries have hardened between wild and domestic use of rangelands. A less publicised form of HWC is the transmission of endemic and emerging animal diseases that filter across the human-wildlife interface. Fencing is seen as one method of reducing this by directly halting host/ pathogen traffic, but inevitably protected areas will then be seen as reservoirs of economically important diseases that risk a spill-over into economically struggling communities (Bengis *et al.*, 2005). However, the expansion of conservation paradigms into the realm of sustainable natural resource utilisation and a move away from the 'fines and fences' approach (Brockington, 2002), has blurred the boundaries of protected areas by benefitting both human social development and conservation. Transfrontier Conservation Areas (TFCAs), which are growing in acceptance and extent in southern Africa, have the potential to turn conflict into consensus by advocating a mixed (wildlife and agriculture) economy where conservation areas and people are not seen to be mutually incompatible.

Threats to rangelands (natural or semi-natural) come from three primary sources. Habitat conversion for arable production is the most irreversible and inevitably leads to steep declines in wildlife. Habitat degradation due to overstocking of livestock can increase bush encroachment and lower carrying capacities of wildlife and livestock, but this can be reversed by sustained management and by allowing wildlife to decrease woody growth (Augustine & McNaughton, 2004). Habitat fragmentation dissects the landscape into smaller parcels of land that may or may not be interspersed with degraded or converted habitat. Fencing can play a role in all three of these modes of rangeland manipulation, but is especially effective at fragmenting large tracts of lands into compartments for disease control purposes.

Whilst large migratory mammals are the most obvious casualties of rangeland conversion and fragmentation, these species are also threatened when they leave a protected area to utilise external resources. Controlled killing of 'fence escapees' and the payment of compensation to neighbouring communities for the loss of human lives, crops and livestock are generally not well

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