Conservation biology and biodiversity: Strategies for sustainable resource management.

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Introduction

We review human effects on biodiversity using archaeological and ethnographic cases with contrasting ecologies, population densities, and economies. Relevant trends include increasing human populations, settlement sizes, and permanence; intensification of subsistence and political economies; world colonization; and changing environmental values. Although humans have always transformed ecosystems, many pre-industrial societies maintained diverse and stable environments that are now considered natural. Disastrous strategies have resulted from values associated with colonization, market economies, property systems, resource extraction and production technologies, and the isolation of decision-makers from environmental consequences. Present-day solutions should engage decision-making by local communities, especially Indigenous and traditional societies, empowering them to shape policies and achieve conservation goals [1].

Production agriculture, with its implied ecosystem simplification, pesticide and fertilizer use, and emphasis on yield, often appears to be at odds with conservation biology. From a farmer's perspective, the weight conservation biology places on wildlife may seem overly idealistic and naive, detached from economic and sociopolitical reality. In fact, these endeavors are two sides of the same coin, with a shared heritage in decades of population and community ecological theory and experimentation. Better integration of the two disciplines requires acknowledging their various goals and working to produce mutually beneficial outcomes. The best examples of this type of integrated approach result from careful implementation of sustainable agriculture practices that support biological conservation efforts via habitat amelioration or restructuring. Successful integrated approaches take into account both the environmental and economic costs of different farming schemes and compensate farmers for the costs they incur by implementing environmentally friendly farming strategies. Drawing primarily from examples in insect population dynamics, this paper highlights some innovative programs that are leading the way towards a more holistic integration [2].

Cross-disciplinay approaches stemming from the fields of resource management and biological science provide needed breadth for the education of conservation biologists. The growing urgency of training individuals to protect, maintain, and restore the planet's biological diversity is challenging academic institutions to overcome narrow disciplinary perspectives. Yet the development of programs in conservation biology is inhibited by long-standing academic constraints, including disciplinary structure, communication barriers among disciplines, and lack of reward systems, research funds, model curricula, and evaluation techniques for cross-disciplinary work descriptions of 16 graduate programs in conservation biology indicate that academia is responding to the challenge. Housed in both resource management and biological science departments, these programs offer new degree options as well as new cross-disciplinary courses, field classes, and research projects [3].

The allocation of land to biological diversity conservation competes with other land uses and the needs of society for development, food, and extraction of natural resources. Trade-offs between biological diversity conservation and alternative land uses are unavoidable, given the realities of limited conservation resources and the competing demands of society. We developed a conservation-planning assessment for the South African province of KwaZulu-Natal, which forms the central component of the Maputaland–Pondoland–Albany biological diversity hotspot. Our objective was to enhance biological diversity protection while promoting sustainable development and providing spatial guidance in the resolution of potential policy conflicts over priority areas for conservation at risk of transformation. The conservation-planning assessment combined spatial-distribution models for 646 conservation features, spatial economic-return models for 28 alternative land uses, and spatial maps for 4 threats. Nature-based tourism businesses were competitive with other land uses and could provide revenues of >US$60 million/year to local stakeholders and simultaneously help meeting conservation goals for almost half the conservation features in the planning region. Accounting for opportunity costs substantially decreased conflicts between biological diversity, agricultural use, commercial forestry, and mining. Accounting for economic benefits arising from conservation and reducing potential policy conflicts with alternative plans for development can provide opportunities for successful strategies that combine conservation and sustainable development and facilitate conservation action [4, 5].

Conclusion

Yet the development of programs in conservation biology is inhibited by long-standing academic constraints, including

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