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Background

Conservation and agriculture: Challenges, Limitations and Opportunities

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Globally, approximately 1.5 million species have been identified and described, a small fraction of the 10 to 100 million species that are thought to share the earth as habitat with us (Gewin 2002). Throughout the history of classification, we have been heavily influenced by the world that is directly visible to us, and thus biodiversity assessments mainly concentrated on the plant, animal and fungi kingdoms within the eukarya domain (this domain is completed by the protista kingdom comprising of those eukaryotes that cannot be classified in any of the other kingdoms of fungi, animals, or plants). Today even within these “visible, relatively known” kingdoms many species are still unexamined. Furthermore, about 90% (Lopez-Garcia et al. 2001) of all biodiversity at the species level is represented by the “invisible, generally unknown” microbial world (containing the domains of bacteria and archaea) and this certainly represents a completely new arena for us (merely app. 4500 species described today, Curtis et al. 2002, Lopez-Garcia et al. 2001, Torsvik et al. 2002). The little biodiversity that we know about already offers many direct and indirect vital services to us, such as the vast amount of medicine, food and fibre we take from the flora of this planet. In

the light of the immense unknown dimension of biodiversity, it also presents an incredible unexplored potential to us. However, in order to tap into that it is important that all facets of biodiversity, the known and the unknown, are maintained. Today, as recorded within the well documented fraction of biodiversity which presumably is of most direct importance to us, that is the flora and fauna, thousands and perhaps even millions of species are unfortunately moving towards extinction without anyone marking their passing. According to the World Conservation Union (IUCN), nearly 24% of all mammals, 12% of birds, and almost 14% of plants are threatened with extinction.

Extinction is not new, and life on our planet has gone through a tumultuous history consisting of both flowering of new species and mass extinctions. We have identified at least five major extinction episodes in the history of the planet caused by a diversity of factors including catastrophic volcanic eruptions, and the famous collision with a comet near the Yucatan. We currently are in the midst of the sixth major period of extinction at present. The distinction between this episode and the five previous is that for the first time, a biological organism, mankind, is the cause. Extinction is rarely due to a single causal factor, rather it typically is the consequence of multiple factors working together and leading to higher rates of extinction than predicted by habitat destruction alone. However, other important drivers of extinction including invasive species, and global climate change are ultimately also the result of the human footprint. Though the current rate of species extinction from habitat fragmentation is poorly known, projections estimate that extinction rates are somewhere around 1,000 species per decade per million species. The consensus is that biodiversity is being lost at a rate that is two to three orders of magnitude faster than is normal in geological history.

Challenges

Most efforts to protect biodiversity have focused on the creation and establishment of reserves, what some call reservation ecology. The international community has set a goal of having at least 10% of every habitat type under effective protection by 2015, a strategy that will protect many species and ecological communities. However, even if this plan was successful and we managed to conserve biodiversity in 10% of the terrestrial landscape, 30-50% of the world biodiversity would still be lost for two principle reasons. First, we estimate that more than half of all species exist principally outside protected areas, mostly in agricultural landscapes; and second, most reserves would be too small, or too fragmented to

support viable populations. The concept of agriculture as ecological “sacrifice” areas where no attempts are made to protect and conserve biodiversity is changing because of the increased recognition that agricultural lands both perform services and provide essential habitat to many species, that these lands can be managed to meet the dual goals of biodiversity conservation and production, and the conservation of biodiversity cannot occur unless we include areas outside of reserves. Rosensweig (2003) states, “We must abandon any expectation that reserves by themselves, whether pristine or restored, will do much more than to collect crumbs. They are the 5%. We need to work on the 95%.”

Thus the Convention on Biological Diversity (CBD) agreed in 2002 to aim for 30% of agricultural lands worldwide to be managed to protect wild flora by 2010. With the expansion of the conservation community’s “ecosystem approach” to conserving biodiversity, agricultural communities play an increasingly strong role providing a supportive matrix of land and water use, and creation of biological corridors, and as habitat in their own right. A growing number of examples exist demonstrating this role. For example, conservation of wetlands within agricultural landscapes is critical for wild bird populations demonstrating the critical role that farmers play in collaborating or leading conservation initiatives. The global challenge to the farming community is to find new ways of sustaining the increasing food and fuel needs of a growing and developing global population while increasing the amount of critical habitat for rare and endangered species. The actions of farming communities are reflected far beyond the farm boundaries. Efforts to protect rare and endangered species should not be considered solely in terms of “Which rare and endangered species exist on, or near my farm that I can protect by altering my management practices?” The extinction footprint of agriculture is felt far beyond farm fence lines as has been demonstrated by the dramatic loss and alteration of aquatic communities in the Gulf of Mexico, and in the Sea of Cortez due to spring fertilizer and pesticide applications in the Mid Western United States and the Imperial Valley of California.

Limitations

Loss of habitat is the number one cause of loss of biodiversity globally. This poses one of the greatest limitations to conservation of endangered species. If agricultural conversion is the primary driver of extinction, can we reverse the situation and make agricultural landscapes one of the primary drivers of species conservation? At the start of the millennium, this concept would have been ridiculed by conservationists and farmers alike. Conservation goals

and production goals were regarded as diametrically opposed. However, conservationists, and farmers are increasingly showing interest in collaboration with important results. This is no small challenge, with the limitations particularly glaring as we increasingly demand our farming communities to not only provide us with food and fiber, but now also fuel. There is also ample room for opportunities, however, with the greatest gains made through win-win opportunities between conservation and production.

Opportunities

There are two overarching strategies for protecting endangered species in agricultural landscapes that are driven by the state of knowledge on endangered species. We have only identified between 10-20% of the world's biodiversity, and the easiest species to identify at that. Of the known species, we often know little more than the name; of the unidentified species we know close to nothing at all. This means that there are really two kinds of endangered species, those that we know are endangered (by far the minority), and those that we have no idea are endangered (the vast majority).

Therefore conservation of endangered species encompasses two predominant strategies. The first is a species-specific approach, where a landscape is specifically managed for a known and identified threatened species. And the second is the ecosystem approach which assumes that we do not know the majority of the threatened and endangered species and whose strategies aim to conserve the matrix.

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The underlying rationale of Kuzikus Wildlife Reserve

Fostering ecological integrity as an alternative land use system to livestock farming in arid savannahs

[Experiences from converting a marginal cattle ranch into a reserve for wildlife in the south-eastern Kalahari of Namibia]

The survival of biodiversity and the preservation of the rapidly disappearing individual character of landscapes is one of the major human challenges of our time. Agriculture as the major human land use activity has a particular responsibility in this context. Agricultural intensification has caused a rapid decline in biodiversity across most taxa worldwide (e.g. Krebs et al. 1999).

Today there exists a broad consciousness that agriculture is far more than food production. The present and future form of agriculture will substantially influence conditions of all life on earth and the sensual qualities of our living environment and landscape (Bosshard et al. 2009)

In the beginning of the 20th century the start of commercial livestock farming at the edge of the Kalahari in south-eastern Namibia marked the start of men's landscape modification even in this part of the world!

In the farmer's attempt to modify the harsh environment to suit his introduced and very much un-adapted livestock populations, he created artificial boundaries (fences), drilled for water and eradicated naturally occurring wildlife that he believed was detrimental to livestock due to disease transmission, fodder and water competition or predation. Unstable population dynamics, reduced species richness, and dwindled numbers of wildlife populations were the result to this sudden selection pressure created by men. However, over the last two decades tourism has increased the value of wildlife substantially and some farmers are looking to tap this value by re-introducing a range of different wildlife species. In the face of the modified landscape, however, stable and self-sustaining ecosystems with predator-prey dynamics and migration patterns cannot easily be brought back, and the wildlife farmer has to realise, that in reality his newly created or restored private wildlife reserve is often an isolated pocket within

a livestock dominated landscape and that he has to constantly farm with nature, making a few but important management decisions at the right time in order reach the condition of a sustainable wildlife farming system.

Kuizkus was one of the first cattle farms in Namibia that was slowly restored into a reserve only for wildlife starting in 1964. In a landscape which was and still is dominated by private rangeland management for livestock (mainly sheep and some cattle), Kuzikus today forms one of the few hotspots for ecological integrity and a biodiversity stepping stone in south-eastern Kalahari Region of Namibia.

Since 30 years Kuzikus is working on a sustainable wildlife management system that produces livelihood for more than 4 families as well as natural habitat for endangered species. Considering the biomass production in form of meat alone the “wildlife farming system” easily out competes its alternative “cattle ranching system” in that area. Furthermore it offers an income from tourism and education. The system is based on farming with nature in such a way as to support the condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes.

Since Kuzikus, is surrounded by sheep and cattle farms, the integrity of ecological functionality at the landscape level, however, could hardly be brought back, and, here, constantly controlling the population numbers of larger mammals by mimicking the function of predators and droughts (in which a big proportion of the population migrates or dies) has proven to be a very effective way to ensuring resilience and resistance of ecological processes at the farm level. Furthermore it has proven to be a sustainable way of meat production.

Today Kuzikus facilitates and conducts biological and ecological research within the “small scale ecosystem Kuzikus” as well as comparative studies on livestock farms in the same region in order gain a deeper understanding of how wildlife farming systems on marginal land in arid savannas could contribute towards conservation of the wider landscape currently dominated by livestock farming.

The research is important for future modern conservation that is able to substantially enhance biodiversity and sensual landscape quality within the social, economic and agronomic restrictions of a farm as conventional conservation in form of protected parks

alone cannot be the solution for reverting the biodiversity crisis in the face of an ever growing human population which will need land for food production and resources.

Kuzikus offers 5 guestrooms (full board) and conducts Kalahari excursions for tourists who wish to gain a deeper insight into the fascinating world of biology and the importance of ecological research and its application in the arid savannahs of Africa.

Furthermore Kuzikus runs a program called BRinK which aims to document all biodiversity on Kuzikus. In that framework BRinK also offers a fully equipped tented camp available for independent researchers or university students who wish to conduct their own research project on Kuzikus.

For safari bookings, research projects ideas, or any other kind of support please contact berend@kuzikus.de

We greatly appreciate your support.

Yours sincerely,



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