Newsletter from African protected areas

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Editorial

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Green List

In 2012, Papaco embarked on the Green List adventure with the World Commission on Protected Areas (WCPA) and the entire IUCN family. This seemed more than normal at a time when the bulk of our work was focusing on evaluating the effectiveness of parks and reserves in Africa.

Indeed, from the start the Green List aimed to «celebrate the success of well-managed protected areas». This is a resolutely positive outlook that does not stigmatize «bad students» but, on the contrary, shines light on the ones who create, innovate, invent, generate success. There are about 25% of protected areas across the world that reach good results using the right methods, and these are the first targets of the Green List.

The idea was simple but its implementation, difficult. How, indeed, can one define what is good, useful, effective ... or not? Contexts, cultures, sites, or problems are so diverse that identifying one transparent and fair standard seems impossible. Nevertheless, this is what the Green List promoters and proponents, all around the world, set out to do through participatory reflection work coupled with a pragmatic approach, based on pilot countries and sites.

Today, the Green List is made up of four components: good governance, sound planning, effective management and, at last, positive conservation results.

These components are further broken down into various criteria, operationalized through 50 indicators that provide an objective basis for evaluation, regardless of the context or the evaluator. The decision process is now well established and everything is in place to move up from a few dozen sites registered today (including three in Africa) to several thousand across the world in the coming years.

Why is it important to do so?

As has been said, the Green List puts those who work well under the spotlight. In itself, this result is already amply enough to justify its existence. Too many sites self-evaluate themselves positively, or conversely denigrate themselves, without real justification. The Green List provides an essential framework for these sites to analyze their own results. Most importantly, it sets clearer goals for those seeking to progress and who need to see the way forward. By highlighting the strengths and weaknesses of park management and governance, this tool supports managers and institutions to plan the actions to implement and the resources to mobilize in order to improve. In this sense, it is a great tool for all protected areas in Africa, regardless of their current capacity, and for all their partners, whatever their expectations.

In these times of extreme pressure on protected areas, of great confusion on the measures to be taken and of precipitation for mobilized stakeholders, the Green List should gradually become the reference to carry out, calmly, the transformations necessary for our protected areas in spite of all the tensions and contradictions they undergo. Let's have the audacity to place the Green List at the center of our initiatives.

Geoffroy Mauvais

Our MOOCs - online courses

MOOCs

- Registrations closed -

But the session only closes the 15th of December, meaning you can still access classes and proceed to exams. If you have questions, you can contact us via Facebook or send an email to moocs@papaco.org.

If you finished a MOOC with an average over 75%, you can request a certificate of completion by sending an email to moocs@papaco.org.

Access courses: mooc-conservation.org

DATES TO REMEMBER

01 DEC 2019 :

- MOOC registrations close.

15 DEC 2019 :

- Close of Sept-Dec 2019 session of MOOCs.
- MOOC Registrations open for Feb-July 2020 session.

17 FEB 2020 :

- Start of new MOOC session.

In addition to PAPACO's page, join the 6,000 members on the Facebook group dedicated to MOOCs. All links and useful information are on papaco.org.

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Also read the newsletter of the IUCN programme of protected areas (GPAP)

Mooc Species conservation in protected areas

The MOOC-SP is ideal for people looking to get a deeper understanding of the 'species' aspect in protected areas. When we developed this MOOC, we took on a gradual approach, going from a global scale to studying the genetic aspects. In this newsletter, we cover the latter, as you will read in this excerpt from the MOOC-SP, and after that as we will talk about synthetic biology in conservation.

Goal: understand the techniques developed to conserve species in protected areas, in situ and ex situ. The main threats are also introduced in this MOOC, as well as solutions that can help face these threats.

Sequence 5.2 EX SITU ANIMAL SPECIES CONSERVATION

> Ex situ conservation: off-site conservation, or maintenance of organisms outside their natural environment (living animals and plants in zoos, aquaria and botanical gardens).

It also includes preservation of biomaterials, including seeds and gametes in forms of frozen sperm, eggs and embryos as well as tissue, cell line or DNA in genome resource banks.

Why ex situ conservation?

The collection of living, whole animals has several purposes:

1. serve as insurance for their declining wild counterparts,
2. prevent species from complete extinction,
3. serving as sources for reintroduction.

Secondary but important roles of ex situ conservation:

- raising awareness for conservation,
- research to better understand species biology,
- developing tools that can be applied to wild counterparts,
- training professionals in animal handling or monitoring.

Roles of genome resource banks in conservation:

The main goal for captive breeding is maintaining gene diversity of the ex situ animal population. Frozen specimens such as sperm, can be used to help genetic management of living collections:

- frozen gametes are easier to transport than live animals, thus, allowing genetic exchange among geographically isolated populations,
- extend an individual's reproductive life by using cryopreserved, or frozen sperm,
- they serve as insurance against catastrophes in wild populations.
- specimens of collected cell lines or DNA can be used for research to better understand phylogenetic, population genetics, and epidemiology of diseases.

Important: Ex Situ conservation isn't an automatic response to species conservation.

Sequence 5.3 WHEN TO START EX SITU CONSERVATION?

Is ex situ conservation an automatic response to threatened species? 'Not all species will require an ex situ component as part of their conservation strategy, and not all ex situ populations will have a direct conservation purpose.'

STRATEGIC APPLICATION OF EX SITU CONSERVATION

Step 1: review detailed information of the species (life history, taxonomy, population status, demographics, genetic viability and ecosystem functions). This step also includes identification of threats and how they impact species viability.

Step 2: define the roles of ex situ management. Will it serve as insurance population, a source for reintroduction or research? Will it serve for public awareness raising? Will it indeed contribute to the conservation of the species?

Step 3: determine the characteristics of ex situ populations

that are required to fulfil their conservation roles. How many founders are required, how many individuals should be within the population and are there any risks of adaptation to captivity. Regardless the role of ex situ population, the goal of captive management is to maximize genetic variability.

Founder requirements: they should come from multiple populations and not be related. It has been calculated that a minimum of 15 founders are required for establishing an ex situ population. However, in many cases, these minimum numbers cannot be obtained.

Step 4: define resources and expertise needed for maintaining viable ex situ populations and conduct feasibility and risk assessment. For instance, if one wishes to develop an ex situ population of the Ethiopian wolf, several factors need to be considered. First, can a captive facility be built in Ethiopia, how much will it cost and are husbandry protocols available? Although Ethiopian wolves have not been kept in captivity, information may be gleaned from other packed canids, including African painted dogs and dholes. Then, we need to conduct risk assessment - examples of risks include, adaptability (i.e., animals cannot adapt to captive environment), mortality (what are acceptable mortality rate?) and reputation (i.e., if not successful).

Step 5: making the decision whether or not to include ex situ management in the conservation strategy for a species. Weighing potential benefits against likelihoods of success and overall costs and risk. If it is determined that species will become extinct without ex situ management, then benefits clearly outweigh the risk. In this case, ex situ management should be included in the conservation strategy for the species.

This entire decision-making process is extremely important to make sure that ex situ conservation is used for the right purpose and these steps should be followed carefully before making any decision.

Sequence 5.4 FROZEN COLLECTIONS

Frozen collections.

Black-footed ferret: how frozen collections were used to preserve the species. This species was brought into captivity in the 1980s. The current population of black footed ferrets started from only 18 founders, 15 of which reproduce.

To maximize gene diversity and manage the ex situ population, researchers employed artificial insemination. In addition to this, the Black-footed Ferret Recovery Implementation Team (BFFRIT) utilizes a genome resource bank through the storage of semen samples from captive individuals and also from trapping wild-born black-footed ferrets and collecting and cryopreserving semen for potential use for artificial insemination in the captive population. To date, eight ferret kits have been produced from sperm that had been cryopreserved for 10-20 years. Most importantly, some of these sperm donors were original founders, thus, their genes were able to contribute to the population even long after their death.

Cryobanks

As a result of anthropogenic pressure and climate change, the world's coral reef is being degraded at an unprecedented rate. While in situ conservation practices, such as marine protected areas may help slow the loss of genetic diversity on reefs, the global effects of climate change will continue to cause population declines. Therefore, efforts have been made towards establishing a coral cryobank.

The Reef Recovery Initiative is a collaborative effort between cryobiologists, curators, and conservationists. To date, this team has frozen sperm, stem cells or adult fragments of 17 coral species around the world (Hawaii, Australia, Puerto Rico and Belize).

Genome resource bank

Blood samples are a resource for developing indices of animals' clinical well-being. Biomaterials that are cryopreserved overtime can be used to identify the onset and causes of epidemics, either in situ or ex situ populations.

The outbreak of canine distemper caused 30% mortality in lions living in the Serengeti ecosystem in Tanzania. Through analyses of blood samples that had been stored in the biobank for several decades, scientists were able to determine the time between the emergence of morbillivirus and the onset of lion morbidity and mortality, and concluded that the original outbreak was due to the spill-over from domestic dogs indicated by the peak exposure in dog population prior to that observed in the lion. However, domestic dogs are not the sole driver of CDV infection in the lion because there was no relationship in exposure peak between dog and lion population after the year 2000. The persistence of CDV in this ecosystem likely involved multiple hosts. Better understanding the dynamic of this infection disease help conservationists to develop mitigation plans and manage wildlife in this complex, species-rich ecosystem.

IN A NUTSHELL

Ex situ conservation involves maintaining organisms outside their natural environment either in the forms of whole, living animals or frozen collections. However, managing animal collections or storing biomaterials are not straight forward. It requires a long-term commitment, collaborations, good record keeping systems, expertise and resources, and when possible, should be well integrated with an in situ approach to maximize conservation benefit. Keep in mind that ex situ conservation is one of the tools on our species conservation tool box and the decision to use this tool depends on species, circumstance and conservation needs.

Sequence 5.5 RE-INTRODUCTION

Translocation: the human-mediated movement of living organisms from one area, with release in another.

The primary objective is a conservation benefit: this usually includes improving the conservation status of the focal species locally or globally, and/or restoring natural ecosystem functions or processes. Translocation describes both living organisms moved from the wild (in situ) and from captive (ex situ) origins.

To make the difference among the different types of translocation, we have to look at where the species are released into.

Population restoration. The species is released within the indigenous range. Within this category, two types of translocation can be identified:

- reinforcement: translocation into an existing population of conspecifics. Goal: enhance population viability, for instance by increasing population size, by increasing genetic diversity, or by increasing the representation of specific demographic groups or stages,
- reintroduction: translocation inside the indigenous range from which the species has disappeared. Goal: re-establish a viable population of the focal species within its indigenous range.

Conservation introduction. The species is released outside the indigenous range. Within this category, two type of translocation can be identified:

- assisted colonisation: translocation to avoid extinction of populations of the focal species. Carried out primarily where protection from current or likely future threats in current range is deemed less feasible than at alternative sites,
- ecological replacement: translocation to perform a specific ecological function. Goal: re-establish an ecological function lost through extinction, and will often involve the most suitable existing sub-species, or a close relative of the extinct species within the same genus.

RISKS OF TRANSLOCATION

Translocation is usually implemented for the benefit of a threatened species or habitat, but it shouldn't be an automatic response to threats. Translocations are indeed always risky, especially when organisms are released outside of their indigenous range (numerous species having subsequently become invasive, often with massively adverse impacts).

But most importantly, make sure to weigh the pros and cons, and see what the potential benefits and possible negative impacts could be, and how they could affect ecological, social and economic interests.

Generally speaking, in any decision on whether to translocate or not, the absolute level of risk must be balanced against the scale of expected benefits. Where a high degree of uncertainty remains or it is not possible to assess reliably that a conservation introduction presents low risks, it should not proceed, and alternative conservation solutions should be sought.

Sequence 5.6 TRANSLOCATION: PLANNING

To plan for a conservation translocation requires the specification of:

- a goal: a statement of the intended result of the conservation translocation,
- objectives: detail how the goal will be realised,
- actions: precise statements of what should be done to meet the objectives.

Two aspects mustn't be overlooked in the planning process:

1. The monitoring programme. Some aspects must be assigned to different people, and it must be carried out throughout the translocation process to measure

progress and make sure we are moving towards our clear and realistic goals.

2. The exit strategy. Allows an orderly and justifiable exit in case translocation is abandoned. Also, considering the high risk conservation translocation represents, and the many biological and non-biological factors it affects, it is important to carry out a feasibility and risk assessment.

FEASIBILITY AND RISK ASSESSMENTS

Feasibility and risk assessments are carried out throughout the entire translocation process. Feasibility is assessed at four levels:

1. biological feasibility,
2. social feasibility,
3. regulatory compliance,
4. human and financial resources availability.

All possible hazards both during a translocation and after release of organisms should be assessed in advance. Where substantial uncertainty about the risks of a translocation outside indigenous range remains, such a translocation should not be undertaken.

IMPLEMENTATION OF THE TRANSLOCATION

A translocation, even to a highly suitable area, can fail due to a poorly-designed process. It should therefore take into account legal requirements, public engagement, habitat management, sourcing and releasing organisms, interventions and post-release monitoring. The release site and area are of course vital in the implementation phase. The following aspects of the release strategy are central:

- the life stage and season of release,
- the age/size, sex composition and social relationships of founders,
- translocation success increases with the numbers of individuals released,
- releases at multiple sites may serve to spread out the released organisms, with several potential benefits,
- minimising stress during capture, handling, transport and pre-release management will enhance post-release performance,
- various management interventions and support before and after release can enhance performance.

Translocation management is a cyclical process of implementation, monitoring, feedback and adjustment of both biological and non-biological aspects until goals are met or the translocation is deemed unsuccessful. Monitoring and continuing management is crucial in this regard.

Sequence 5.7 FUTURE/PROSPECTIVE

Species extinctions are currently estimated to be more than 1000 times what would have occurred in the absence of anthropogenic change, and smaller-scale evidence suggests that our projections often greatly underestimate the true rates of loss.

Protected areas. More than 3400 (or 83%) of the 4100+ globally threatened vertebrate species are represented within protected areas. 627 of these have more than 50% of their range within the protected area system and so rely largely on this system for their conservation. However:

- there is not a perfect overlap between the distribution of protected areas and threatened species,
- PA boundaries pose few barriers to the spread of invasive species and disease.

Species-centred conservation to complement the PA approach. Essentially, species conservation is about ensuring that productivity is greater than mortality. Lack of breeding sites, predation, competition for resources and disease are the consequences of human activities that we need to manage in order to reverse downward population trends; protecting areas can only go so far towards achieving this.

The protection of areas and protection of species are not mutually-exclusive approaches. Species conservation can contribute to the recovery of degraded systems, and vice versa.

Ecological replacement. Where species have already been lost to extinction, ecological replacement presents us with exciting additional string to our conservation bow. By carefully selecting those species that we can move outside of their historic range, we can begin to re-establish lost ecological roles through novel connections.

Genetic manipulation. Our ability to recreate extinct species, such as the passenger pigeon as become a reality. Such possibilities bring with them a raft of ethical or societal questions, as well as more pragmatic ones, such as how do we select species of priority for restoration and management? Should we only go for those which can be demonstrated to fulfil important ecological function?

Risks of intervening at species level: if we're considering moving species across natural boundaries, how do we ensure that their movement doesn't lead to exacerbated problems in the form of disease, competition or predation on other species? Perhaps more significantly, with thousands of species becoming threatened with extinction, how do we plan their joint recovery and do so with meaningful actions that lead to their recovery?

Protected Areas will remain a central pillar of our response to conserve multiple threatened species. Alongside this though, we need to recognise that for a growing number of species, we also need efforts targeted towards those factors limiting their population growth if we are slow or stop the current rate of biodiversity loss on planet Earth. ● Access the MOOC: mooc-conservation.org. End of session: 15 December.

IUCN Issues brief

Synthetic biology and its implications for biodiversity conservation

- Synthetic biology refers to technologies that allow humans to make precise alterations to the genes of organisms.
- Synthetic biology applications have important positive and negative implications for biodiversity conservation depending on how they are designed and targeted.
- Potential benefits range from protecting threatened species to providing synthetic alternatives to wildlife products.
- Potential detrimental effects include changes to ecological roles played by target organisms, and negative impacts on the livelihoods of indigenous and local communities who largely depend on biodiversity.
- The use of synthetic biology needs to be informed by case-by-case assessments, guided by empirical evidence, and incorporating traditional knowledge, religious and ethical values in decision-making.

What is the issue?

Though there is an active international discussion on how best to define synthetic biology, it generally refers to **technologies that allow humans to make precise alterations to the genes of organisms to make them do things that humans want and that those organisms would not normally do.**

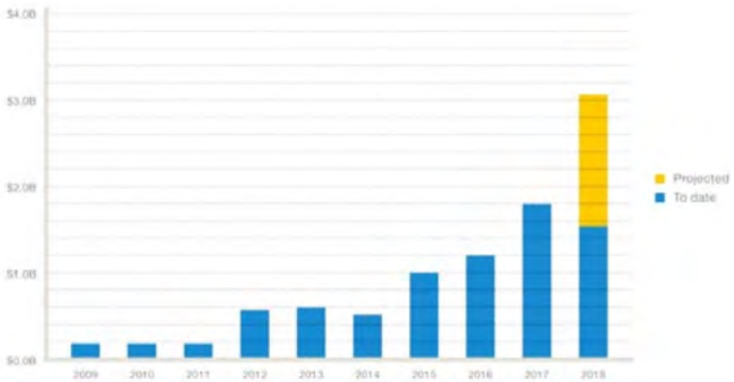
Recent advances at the intersection of biotechnology,engineering, computation and chemistry have enabled scientists to design and synthesise new sequences of the genetic code (DNA), which can support the design of cells and organisms that do new things. **Precise manipulation of DNA to obtain specific functions is the essence of synthetic biology.**

The practice of synthetic biology is increasing rapidly, with major developments being promised and some delivered across multiple sectors. Over the last 15 years there has been a five-fold growth in companies working on aspects of synthetic biology, with public and private investment approaching US$10 billion over this period.

Investments and research in synthetic biology mainlyfocus on products and processes that may improve agriculture, e.g. more disease-resistant crops, or human health, e.g.

new medicines. There has been little investment directed at specific conservation benefits. No technology developed for conservation purposes is yet ready to be tested in the field, let alone applied for management, with the possible exception of disease-resistant American chestnut trees.

One area of synthetic biology that has attracted significant attention is the development of engineered gene drive systems. A gene drive, which can occur naturally, is a phenomenon in which a particular gene gets passed down with a higher probability than the usual 50%. Scientists are exploring the possibility of harnessing gene drives to spread engineered genetic changes through wild populations over many generations. Engineered gene drive systems are still years away from any deployment, despite the fast pace at which this technology is being developed.



Growth in funding for synthetic biology companies © IUCN (2019)

Why is this important?

Certain synthetic biology applications, depending on how they are designed and targeted, **have the potential to enhance or disrupt biodiversity conservation, acting through both direct and indirect pathways**.

Potential positive impacts on conservation

Engineered gene drives and other synthetic biology applications could complement current efforts to halt biodiversity loss and enhance biodiversity conservation, for instance by eradicating invasive species through engineered gene drive systems or by modifying genes to increase the ability of organismsto resist climate impacts. The engineering of microbes to biosynthesise products sourced from threatened species, such as a medically-valuable molecule found in the blood of horseshoe crabs, are already underway.

Potential adverse impactson conservation

There are concerns that synthetic biology is fraught with uncertainty, and could have detrimental effects. These may stem from the movement of organisms carrying engineered gene drives impacting non-target populations or species, or from changes to ecological roles played by target organisms and broader ecosystem effects.

The introduction of biosynthesised wildlife products may have negative socio-economic effects on livelihoods and on production and consumption patterns. For instance, a legal market for synthetically manufactured products could render attempts to curb illegal trade in wild-sourced products difficult or impossible, especially when the illegal trade is currently run by corrupt syndicates. Synthetic biology applications may affect the cultures, rights and livelihoods of local and indigenous communities, which manage, govern, reside in or depend on a large part of the world's biodiversity.

New technologies may divert funding from other conservation approaches, whereby the urgency and importance of biodiversity conservation rooted in addressing fundamental socio-political problems is ignored in favour of synthetic biology applications.

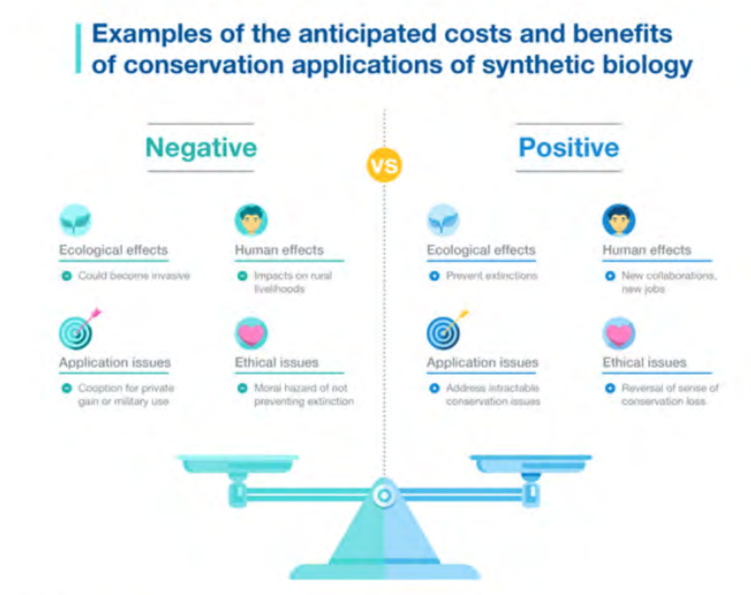
Unintended impacts from other sectors

Applications that are not designed with a specific conservation goal could have an indirect impact on biodiversity. For example, agriculture is one of the major sectors for investment, research and development of synthetic biology. Potential impacts from agriculture include the creation of new invasive species and crops that are better adapted to marginal land, or to previously unusable land. Potential benefits to biodiversity include reducing theapplication of fertilizer and better forest restoration.

What can be done?

Unfortunately, there is no universal path for minimising the potential detrimental effects and maximising the potential benefits of synthetic biology for biodiversity conservation. The use of synthetic biology needs to be informed by case-by-case assessments incorporating empirical studies examining its efficacy, potential benefits and risks. Traditional knowledge, religious and ethical values also need to be considered in decision-making.

Deeper collaboration between conservationists and synthetic biologists will be necessary to both develop



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evidence and to create the frameworks for understanding and using that evidence. There is an opportunity for conservationists to shape how these fields interact and to set the research agenda. This will require the engagement not just of scientists, but also of the government at all levels, civil society, and indigenous peoples' organisations.

Multiple existing governance structures are relevant to synthetic biology. **However, synthetic biology and engineered gene drives raise questions and challenges for these existing frameworks**. For instance, there are challenges related to mechanisms that address environmental harm, particularly transboundary impacts, or benefit-sharing questions where inventions involve genetic elements from multiple organisms both within and beyond national jurisdiction.

In assessing risk, national decision-makers may be required to consider different factors, including socio-economic concerns as well as impacts on indigenous and local communities. Informed consent or approval and involvement of potentially affected indigenous peoples and local communities should be a prerequisite to introducing engineered gene drives into the environment. Legislation may provide for monitoring of regulated activities, with regulation revised frequently to keep up to date with technological changes.

Where can I get more information?

IUCN Task Force on Synthetic BiologyRedford, K.H., Brooks, T.M., Macfarlane, N.B.W. and Adams, J.S. (eds.) (2019). Genetic frontiers for conservation: An assessment of synthetic biology and biodiversity conservation. Technical assessment. Gland, Switzerland: IUCN. ● Access the PDF of the Issue Brief here.

Announcements

PANORAMA

SOLUTIONS FOR A HEALTHY PLANET

Supporting UNCCD Parties to embrace gender equality and women's empowerment as a guiding principle in LDN projects

In 2018 and 2019, IUCN with UN Women and the UNCCD (United Nations Convention to Combat Desertification) facilitated gender mainstreaming workshops in the Caribbean, the Philippines and Zambia to support development of gender-responsive Land Degradation Neutrality (LDN) projects. These workshops, as part of the «Anchoring agreements on gender equality and women's empowerment in the Rio Conventions» project, aimed to meet the specific needs of Parties toward meeting implementation of the UNCCD Gender Action Plan and national LDN targets.

The workshops utilised a unique, participatory methodology, bringing together stakeholders from national and local governments, CSOs, women's groups, and more, to gain a better understanding of gender considerations in LDN specifically, and in the project cycle in general. These workshops complemented a help desk mechanism that provided tailored feedback to nine LDN project proposals made to major funding mechanisms.

Gender mainstreaming workshop in Lusaka, Zambia
© ARE Boyer | IUCN

Full article here.
More info on Panorama, here.

SANCCOB
Save seabirds

Veterinary Nurse or Animal Health Technician

Where? Cape Town, South Africa

Application deadline: 19 Dec 2019

>> Click here for more info <<

Okapi Wildlife Reserve

Operations manager

Where? DRC

Application deadline: 31 Dec 2019

>> Click here for more info <<

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