CONSERVING ENDANGERED RHINOS IN SOUTH AFRICA

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LMacTavish

Dear Earthwatch Volunteers,

We would like to thank all the teams in 2018 for their exceptionally hard work and dedication.

With the help of 2 Earthwatch teams we successfully trimmed all 19 rhino's horns. This is necessary as the horn grows back every year so it is essential to trim the horn annually to keep the rhino safe from poachers. Everything went very smoothly and volunteers helped us collect important data on their behavior before and after the trimming. Other important data were collected such as DNA, dung samples and measurements of the rhino. Volunteers were also taught how to monitor the vital signs of the rhino while they are anesthetized which greatly helped the vets.

2018 was a wonderful year for the rhino; we celebrated the birth a 2 female calves. The arrival of these 2 new girls will do wonders for balancing the sex ratio's as the 9 previous calves have all been males. The introduction of Brutus the new dominant bull in 2015 may have something to do with this as he was seen mating with both of their mothers! The arrival of the new babies had a big impact on the groupings of the rhino. Nkombi appeared to walk across the reserve the day before new baby Leo was born to 'fetch' Willis, her previous calf, so that he could do some babysitting for Phoenix whilst she had Leo. Willis seems to have become a very protective older brother and is taking good care of Phoenix.

Kelly went into hiding after new baby Amahle was born and caused great concern to our team as we could not find her for a month! Despite daily searches with the drone and volunteers on foot. Eventually she was spotted and she now seems to have relaxed and has brought Amahle out into the open. When Kelly had Amahle, Mac joined up with Willis and Phoenix and they have been inseparable group ever since. Dougie and Sweet Chilli are becoming more dominant and there are frequent fights but fortunately there have not been any serious injuries. This may well be because they don't have a full length horn so the injuries are not so severe.

The start of 2019 has brought more good news. We celebrated the birth of Jodi's baby and have had good rains so the dams are full and grazing is abundant. We noticed on a camera trap set up by volunteers that Jodi's baby had a bad limp so we decided to call a vet and it was confirmed that his front left leg was infected and was treated accordingly.

Our rhino have survived another year and this is largely due to the Earthwatch teams who have visited in 2018. The constant monitoring of the rhino during behavioral studies provides added protection to the rhino. Invaluable data was collected during the horn trimmings which is so important for the overall study. Additionally, the international awareness the teams have created this year has been phenomenal.

We would like to thank each and every one of you for helping us on the front line and then going back and spreading the message about the plight of the rhino. Please keep in touch with us in future!

Many many thanks,

Lynne MacTavish, Dawn Scott, Melissa Dawson, Anja Rott, Rachel White, Angelo Pernetta, Maureen Berg

University of Brighton

SUMMARY

In 2018, volunteers provided approx. 4,000 hours of assistance, resulting in:

- 2,731 behavioral observations;
- 504 spatial locations, and
- 182 camera trap nights.
- 44.km transects lengths of hotspot mapping
- 14 deterrent experiments
- 28 dung samples collected
- 48 dung beetle traps
- 15 validation experiments

Along with help with video analysis, horn trimming and land management and surveillance. This has provided us with extensive amounts of data we are currently analyzing to answer key questions for rhino conservation and management. The project has also been involved with raising awareness of the current rhino poaching crisis through community engagement and media, including facebook pages, blogs and websites.

Collecting data on rhinos during horn trimming, L MacTavish

GOALS, OBJECTIVES, AND RESULTS

Rhino Project research goals/objectives:

1) To determine the consequences of dehorning on the behaviour of white rhinoceros.

In 2018 we collected 2,731 behavioral observations on horned and dehorned southern white rhinos *(Ceratotherium simum simum)*. This data has been collated with the previous year's data (to around 10,000 observations) and analysis has started on these data. From this data we are asking questions on mother and calf vigilance 1) are dehorned more vigilant? 2) do calves with dehorned mums stay closer? 3) do calves of dehorned mums stay more visible? And also on Individuals: Are dehorned individuals more vigilant? How does group size effect vigilance in horned and dehorned animals? Do dehorned groups stay closer together than horned? Does vigilance change from pre to post-dehorning? We aim to get this analysis completed by summer 2019 for publication as our 3 year data collection to address these questions is now complete.

Rhino vigilance study, L MacTavish

2) To investigate bird species and assemblages directly supported by rhinos, in order to evaluate the potential impact of localized loss of this mega-herbivore on avian communities.

In 2018 there was no direct mammal-bird data collected. Data from 2016 and 2017 have been analyzed and drafted into a publication for submission in 2019. Following on from the initial study the methods have been developed into a new objective for 2019 field season.

3) To determine what behavioral and environmental factors determine the spatial distribution of white rhinoceros in game reserves.

In 2018 we have collected 504 spatial locations of rhinos during Earthwatch teams. This has been combined with the existing database to give us >1000 spatial locations so far! Analysis has been undertaken to map rhino distributions and determine what features of the landscape are associated with movements and also how gender and grouping affects landscape use. A preliminary paper has been drafted and continues to be worked on, however the data will also provide the core data for undertaking agent based modelling. This approach will use data from spatial locations, hotspot mapping, camera trapping key features and vegetation mapping to allow us to predict/model spatial and temporal behavior of rhinos.

Data entry, M. Dawson

4) Evaluate the impact of changes in mega-herbivores (white & black rhino) in structuring the dung beetle community diversity.

Rain early in 2018 allowed us to undertake some repeats of the dung beetle study to make this data robust. Due to the seasonality and unpredictability of rain along with sometime difficulty in collecting samples, the data set for this objective has been difficult to obtain. However, the data we have has now been analysed and drafted into a paper for submission 2019.

Overall the dung beetle community did not display any significant differences between dehorned and horned white rhino (no black rhino data is available). The community similarity index (Soerensen) = 70% in 2018 and 90% in 2017, based on the key identified genera. Overall trap abundance was significantly lower

Dung beetle measurements, L.MacTavish

in 2018 compared to 2017, with the drought still affecting abundance and diversity of trapped beetles.

Table 1. Total catch abundance based on 72 trapping hours

	Horned - PNB	Dehorned - Mankwe
Jan 2017	1911	3057
Jan 2018	170	146

Overall any data is hard to interpret as the drought has impacted the community (not the dehorning) with overall lower numbers of roller compared to tunnellers. It is known that temporal variations of aridity influences dung beetle compositions (deCastro-Arrazola *et al*.2018), and that dry ground makes it harder for rollers to dig in their dung balls.

Table 2: Functional feeding group distribution (based on 72 trapping hours).

	Horned - PNB		Dehorned - Mankwe	
	Roller	**Tunneller**	**Roller**	**Tunneller**
Jan 2017	58%	39%	42%	61%
Jan 2018	10%	90%	8%	92%

5) Raise community awareness of the impacts of the decline in rhinos to raise community support in its protection.

Our focus has been to raise awareness in country by undertaking attending government forums, undertaking talks to local and national groups and internationally through talks to visiting researchers and university groups.

- Delivered 32 talks to local & university groups in 2018 and have reached approximately 523 people inclusive of international students, professionals, researches and conservationists. The response to these presentations has been very positive and has inspired people to take the message of the crisis rhino are facing back to their own countries and many students and Earthwatch volunteers have presented their own presentations in schools, zoo's and universities.
- The Earthwatch teams hosted 3 school groups from local Mogwase schools, 36 learners and 6 educators attended the conservation days.

Websites such as EW, University of Brighton and the reserve facebook and fund raising pages have raised awareness locally and international. We have also been encouraging volunteers to 'pass the message on' and raise the awareness situation of rhinos in South Africa to their local and national communities on their return and providing support for them to do that in the form of resources.

School visit game drive, M.Dawson

PROJECT IMPACTS

1. **Increasing Scientific Knowledge**
    a. **Total citizen science research hours:**

Volunteers spend approx. 8 hours per day undertaking research for 10 days in the field (80 hours per volunteer). In 2018 we had 50 volunteers. This is a total of **4000** research hours.

    b. **Peer-reviewed publications:**

Samuel G. Penny[1]*, Rachel L. White[1], Dawn M. Scott[1], Lynne MacTavish and Angelo P. Pernetta[1]
Drones and sirens reduce poaching risk by eliciting avoidance behaviour in southern white rhinoceros (*Ceratotherium simium simium*). Submitted to Proc Royal Soc B. in review.

    c. **Non-peer reviewed publications:**
    Article in Explores Journal by Robert Griffith (attached)
    d. **Non-peer reviewed publications (books):** None

e. Presentations:

Lynne was awarded an Honorary Doctorate of Science by the University of Brighton for her significant contribution to conservation and education. She delivered an acceptance speech to approximately 3000 students and academics. She mentioned the rhino crisis and the important role Earthwatch has played in their plight. This was also recorded and made available on the university of Brighton website.

2. Mentoring

a. Graduate students

Student Name	Graduate Degree	Project Title	Anticipated Year of Completion
Sam Penny	PhD	Impacts of dehorning on rhino behavior and physiological status.	2019
Margharita	Post Doc (placement)	Factors affecting the spatial dynamics of a white rhinoceros (*Ceratotherium simum*) population in a South African reserve	2018

b. Community outreach

Name of school, organization, or group	Education level	Participants local or non-local	Details on contributions/ activities
JM NTSME High School, Mogwase	Grade 10 and 11 x 36	Local	Conservation awareness day x 3
Educators for Change California	Teachers x 12	Non-local	7 day conservation and community tour
Tyger Valley College, Johannesburg	Grade 1 x60	Local	The plight of the rhino
9 x UK universities	UG	Non Local	Rhino conservation

Other social media awareness:

LADBIBLE: Devastated woman sits next to her white rhino killed for her horn (21k shares 50k likes)

http://www.ladbible.com/news/animals-feels-news-devastated-woman-sits-with-poached-white-rhino-20180819?c=1534708670614&fbclid=IwAR1V6cL2LYx_axluU84b4cO1dKUX4dSwdEgdHg8Z4UGNQj2CsLNXT6QiOtw

YouTube: The woman behind the photo (6532 views)

https://www.youtube.com/watch?v=YSz0gkvU1HE&feature=youtu.be&fbclid=IwAR25a9u_Og1F-L40JtrOlCq5UCfrwGQEwGM9O8iijWJmbI-xHh3iQIT9cGQ&app=desktop

YouTube: Dr. Evan Antin helps Dr. Lynne MacTavish trim her rhino's horns (223 views)

https://www.youtube.com/watch?v=dnElUvCcNhQ&feature=share

Leisha John (Director of Environmental Sustainability) GreenBiz website: "What Conserving Rhino's Taught me about Climate Economics"

https://www.greenbiz.com/node/111963#disqus_thread

3. Partnerships

Partner	Support Type(s)[1]	Years of Association
Pilanesburg National Park/NWPB	Collaboration, permits	2006-present
Mankwe Wildife Reserve	Collaboration, logistics	2006- present
Penny Rees	Cultural/education support	2008 – present
John Hanks	Academic support	2015 – present

1. Support type options: funding, data, logistics, permits, technical support, collaboration, academic support, cultural support, other (define)

4. Contributions to management plans or policies

Plan/Policy Name	Type[2]	Level of Impact[3]	New or Existing?	Primary goal of plan/policy[4]	Stage of plan/policy[5]	Description of Contribution
CITES	Legalization of trade	international	Existing	Species conservation	Discussed and adopted	Input information on private landowners views on legalizing rhino horn trade

2. Type options: agenda, convention, development plan, management plan, policy, or other (define)
3. Level of impact options: local, regional, national, international
4. Primary goal options: cultural conservation, land conservation, species conservation, natural resource conservation, other
5. Stage of plan/policy options: proposed, in progress, adopted, other (define)

5. **Conserving natural and sociocultural capital**
   a. **Conservation of taxa-**
      i. List any focal study species that you did not list in your most recent proposal
      ii. In the past year, has your project helped conserve or restore populations of species of conservation significance? If so, please describe below.

Species	IUCN Red List category	Local/regional conservation status	Local/regional conservation status source	Description of contribution	Resulting effect[6]
White Rhino	Near Threatened	769 poached in 2018. Currently consider high risk due to poaching crisis	Savetherhino.org	Protected a population by increase research activity in area.	No loss of rhinos in study area in 2018 (improved population structure; increased breeding success)

6. Resulting effect options: decreased competition, improved habitat for species, range increased, population increase, improved population structure, increased breeding success, maintained/enhanced genetic diversity, other (define)

   b. **Conservation of ecosystems** – in the past year, has your project helped conserve or restore habitats? If so, please describe below.

Habitat type	Habitat significance[7]	Description of contribution	Resulting effect[8]
Bushveld Savannah	Feeding site and full range	Helped to maintain existence of reserve by generating revenue for its persistence	Extend maintained.

7. Habitat significance options: nursery, breeding ground, feeding site, corridor, migration path, refuge, winter range, summer range, spring range, fall range or other (define)

8. Resulting effect options: extent maintained, condition achieved, restored, expanded, improved connectivity or resilience

   c. **Ecosystem services** - Indicate which ecosystem service categories you are directly studying in your Earthwatch research and provide further details in the box below.

☐Food and water ☐Flood and disease control
☐Spiritual, recreational, and cultural benefits ☒Nutrient cycling

Functional role of rhinos in ecosystems is being assessed by how they support bird and invertebrate diversity.

RESEARCH PLAN UPDATES

Report any changes in your research since your last proposal/annual report. For any 'yes' answers, provide details on the change in the 'Details' box.

1. **Have you added a new research site or has your research site location changed?** ☐Yes ☒No
2. **Has the protected area status of your research site changed?** ☐Yes ☒No
3. **Has the conservation status of a species you study changed?** ☐Yes ☒No
4. **Have there been any changes in project scientists or field crew?** ☒Yes ☐No

Details - provide more information for any 'yes' answers

We have two new field staff members. With changes in project objectives following renewal we have lost Anja Rott as co-PI as dun beetles no longer within objectives.

5. **Provide details on any changes to your objectives, volunteer tasks, or methods, include reason for the change.**

For 2019 we have undertaken a project renewal which has new objectives. Please see new project renewal for full list of objectives and methods.

ACKNOWLEDGEMENTS

We would like to thanks all the people who continue to support us, those linked with us via Earthwatch Institute and also the wider community who continue to support us and the conservation of rhino.

Recording spatial locations, M.Dawson