African wild dog dispersal study

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Botswana Predator Conservation | Maun | Botswana

Fourth Year Research Report to DWNP
1.1.2020 – 31.12.2020

Prepared by

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1. Project overview and aim

As part of a collaborative effort between the Population Ecology Research Group of the University of Zurich (www.popecol.org) and the Botswana Predator Conservation (BPC, www.bpctrust.org), few candidate dispersing African wild dogs have been fitted with GPS/Satellite radio collars. The aim of the project is to follow dispersers after emigration from the natal group and to i) investigate the effect of landscape characteristics on dispersal distance, time, movement patterns and habitat selection ii) gather crucial demographic parameters such as mortality rate, settlement success, reproductive success after settlement in a new territory iii) combine this novel information on dispersing individuals with long-term demographic information on resident groups collected by the BPCT over the past 25 years to produce population viability models.

Understanding mechanism and patterns of wild dog dispersal, and its demographic consequences is fundamental for the management and conservation of the species nationally, but also across the broader landscapes of Southern Africa such as the Kavango Zambezi Transfrontier Conservation Area (KAZA/TCA). We aim to provide scientific information and advice to policy makers, resource managers, stakeholders and the public.

Results from this research will help predict population changes under changing scenarios and thus be crucial towards the management and conservation of free-living populations of the African wild dog.

2. Field Activities

Due to the restrictions related to the COVID-19 pandemics and to a delay in the renewal of the research permit, fieldwork activities have been much reduced during 2020. We have, nonetheless, continued with routine monitoring of dispersing African wild dogs collared during the previous years. The collars used in this study (Vertex Lite, Vectronic Aerospace, Berlin) automatically record precise GPS positions several times each day and regularly send them to a base station through the Iridium satellite system. This technology allowed to remotely following the movements of collared individuals even when fieldwork was not possible. We did not collar any new dispersing individuals during 2020.

As all collars are equipped with drop-offs, many have detached from the animals. At present, we only have one collared individual. This is a male that dispersed in a coalition of eight brothers from Moremi GR 1st bridge area. After an initial exploratory attempt south-ward (140 km in 7 days), the coalition briefly returned to the natal pack and then dispersed north covering 180 km in 5 days
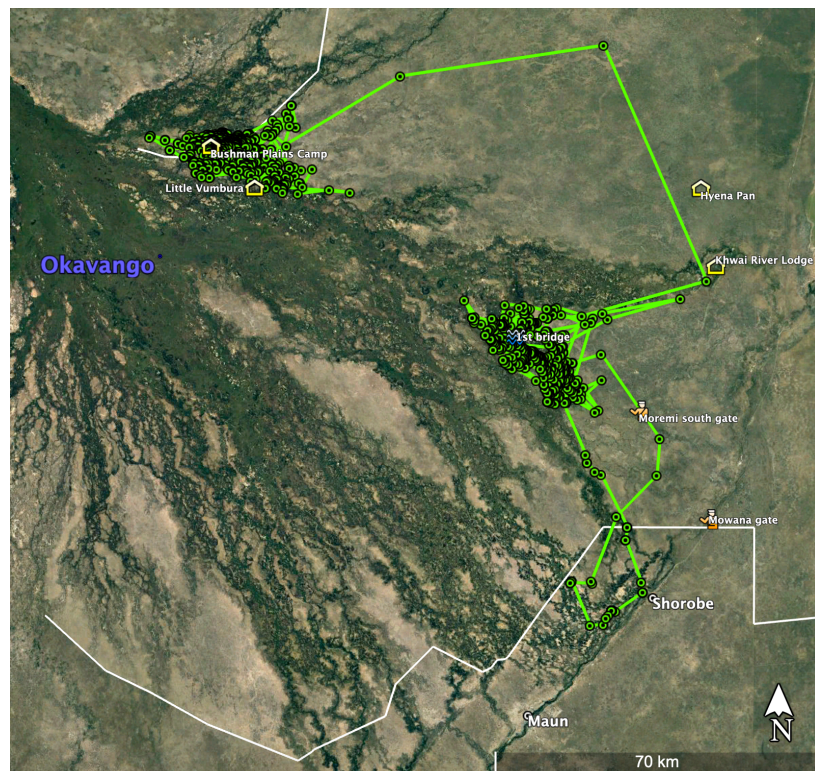

Figure 1: Dispersal trajectory (green) of a coalition of 8 males that emigrated from Moremi 1st Bridge and settled in NG12/22, in the north of the Okavango Delta. The white lines represent veterinary Buffalo

before settling in NG12/22 (Figure 1). The new pack is composed of all eight original males and four females from NG12/22. We are in regular contact with lodges in the region that send us updates on pack composition every time they see the dogs.

3. Main findings and relevance for management and conservation

During 2020 we made some important progresses in the analysis of the data collected so far and we were able to publish three scientific articles. All are of high relevance for management and conservation policies and efforts; I briefly summarizing them here. Please find a copy of each article attached to this report or at the following link:

http://www.popecol.org/research/african-wild-dog-dispersal-and-demography/

3.1 African wild dog dispersal and implications for management

Cozzi G, Behr DM, Webster HS, Claase M, Bryce CM, Modise B, McNutt JW, Ozgul A

Successful conservation of species that roam and disperse over large areas requires detailed understanding of their movement patterns and connectivity between subpopulations.

To study wild dog dispersal and investigate potential barriers to movements and causes of mortality during dispersal, between 2016 and 2019 we followed the fate of 16 dispersing coalitions (i.e., same-sex group of≥1 dispersing African wild dogs) in northern Botswana through global positioning system (GPS)-satellite telemetry. Dispersing wild dogs covered ≤54 km in 24 hours and traveled 150 km to Namibia and 360 km to Zimbabwe within 10 days. Wild dogs were little hindered in their movements by natural landscape features, whereas medium to densely human-populated landscapes represented obstacles to dispersal. Human-caused mortality was responsible for>90% of the recorded deaths. Our results suggest that a holistic approach to the management and conservation of highly mobile species is necessary to develop effective research and evidence-based conservation programs across transfrontier protected areas, including the need for national and international coordinated research efforts through collaboration between independent researchers, conservation organizations, and governmental authorities.

3.2 When to stay and when to leave? Causes of dispersal in an endangered social carnivore

Behr DM, McNutt JW, Ozgul A, Cozzi G

This article investigated the effect of individual, environmental, and social factors on decision to disperse. This article also set the foundation for a thorough understanding of the fate of missing individuals. Missing individuals are those individuals that are no longer observed within the study area and that may have either emigrated elsewhere or have died.

Natal dispersal (i.e. emigration from the natal pack) showed seasonal patterns with female dispersal peaking prior to the mating season and male dispersal peaking at the beginning of the wet season. For both sexes, natal dispersal rate increased in the absence of unrelated individuals of the opposite sex in the pack. Male natal dispersal decreased with increasing number of pups in the pack and increased in larger packs. Female natal dispersal decreased with increasing number of pups in larger packs, but increased with increasing number of pups in smaller packs. Individuals of both sexes were less likely to exhibit secondary dispersal (i.e. emigration from a pack other than the natal pack) if they were dominant and if many pups were present in the pack.

Our models predicted that 18% and 25% of missing females and males, respectively, had likely dispersed from the natal pack, rather than having died. A misclassification of this order of magnitude between dispersal and mortality can have far-reaching consequences in the evaluation and prediction of population dynamics and persistence, and potentially mislead conservation actions. Our study showed that the decision to disperse is context-dependent and that the effect of individual, social, and environmental predictors differs between males and females and between natal and secondary dispersal related to different direct and indirect fitness consequences.

3.3 Bound within boundaries: How well do protected areas match movement corridors of their most mobile protected species?

Hofmann DD, Behr DM, McNutt JW, Ozgul A, Cozzi G

Conserving and managing large portions of land to connect wildlife reserves is an increasingly used strategy to maintain and restore connectivity among wildlife populations. Boundaries of such conservation areas are often determined based on expert opinion and socio-political constraints, yet the extent to which they match species' movement corridors is rarely examined. Nevertheless, empirically assessing the adequacy of protected areas is key for the implementation of targeted management actions and efficient use of limited conservation funds.

We used GPS data on 16 dispersing African wild dog (Lycaon pictus) coalitions from a free-ranging population in the Kavango-Zambezi Transfrontier Conservation Area (KAZA-TFCA). Permeability within the boundaries of the KAZA-TFCA was more than double compared to areas outside it. Furthermore, we observed a five-fold permeability difference among the five KAZA-TFCA countries. We also showed that major movement corridors of wild dogs ran within the KAZA-TFCA, although some minor routes remained formally unprotected. Differences in permeability were mainly related to different degrees of human activities across regions, and to the presence or absence of rivers, swamps and open water.

Our analyses further revealed the central role of the Okavango-Linyanti region in northern Botswana as a wild dog dispersal hub through which dispersing wild dogs gain access to more peripheral regions of the KAZA-TFCA. It appears that the absence of human activities, the central position within the KAZA-TFCA, and the presence of relatively impermeable water bodies (e.g. Okavango Delta, Linyanti Swamp) funnel dispersal movements, resulting in a highly frequented corridor. The key role of the Okavango-Linyanti region for overall connectivity within the KAZA-TFCA thus calls for actions to secure its protection status in the future.

Our models also detected a potential southwards corridor between the Okavango-Linyanti

ecosystem and the Central Kalahari National Park. Some areas through which the corridor runs are neither part of the KAZA-TFCA nor profit from any form of protection status. Human presence and activities along the national road that longitudinally traverses this corridor may limit functional connectivity. At present, however we have yet to witness a dispersal event from north to south across the Nata–Maun–Toteng–Gumare main road, along which main human activities take place.

4. National networking and outreach activities

We continued to intensify and tighten our information exchange with tourists and tour operators in the tourism sector, with the aim to obtain wild dog pictures across the Okavango-Chobe and KAZA/TFCA ecosystems. We have already received reports from over 400 sightings totalling more than 10'000 single pictures. These span the entire Northern Western and Chobe District. Our networking efforts are paying off as highlighted by the information exchange related to the dispersal of the coalition of 8 males. Please refer to the following blog post, which shows how we, researchers, can benefit from sightings from tourists and how in return we can provide valuable information back to the tourists and to the government and decision makers.

We have been reciprocally exchanging information, mainly sightings and pictures, with other researcher groups active at the regional/national level including Cheetah Conservation Botswana (mainly through Leanne van der Weyde), WildCRU (Robynne Kotze), Okavango Research Institute (Emily Bennitt), Rhino Conservation Botswana (Kyle Burger).

As we receive and process pictures we create identification booklet. Such booklets allow us to monitor packs outside our core study areas, which has its centre in NG28/31/32/33/34. We share ID booklets with lodges and tour operators that are active where the pack of interest is. This has proven a very powerful tool to facilitate information transfer, to increase interest in our project, and to enhance awareness towards matters related to African wild dog management and conservation. An example of such booklet is shown in Figure 2.
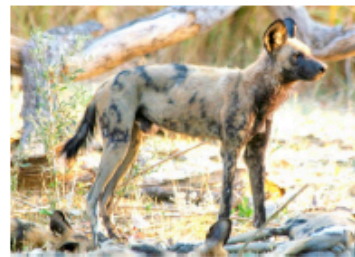
Figure 2: *Example of identification booklet for a pack of wild dog. Each individual is best recognized by coat patterns of the left, right and hind side*

5. International collaboration

We have consolidated our collaborating with the US-based non-profit organisation Wild Me (https://www.wildme.org), which is specialized in patterns recognition analysis. The aim is to finalize an algorithm that will be able to automatically identify individual wild dogs from pictures. Such algorithm is the backbone of the African Carnivore Wildbook (http://www.africancarnivore.wildbook.org) platform, where images are uploaded and processed. This platform, which has been finalized at the end of 2020, will speed up individual identification and allow mapping dispersal events and distribution of resident packs as well as involve the tourism community and the wider public to African wild dog conservation matters.

During 2021, we will start matching the thousand pictures obtained so far (see Section 4.) against all pictures collected over the years and catalogues in the BPC database. This shall allow us to:

i) More precisely following the fate of dispersing wild dogs, including those individuals that are not equipped with a radio collar. Based on sightings we will be able to assess where dogs originate from and where they disperser to.

ii) Gaining a comprehensive understanding of the distribution of resident wild dog packs across the Okavango-Chobe ecosystem. This will (1) help us understanding how resident individuals influence the movement patterns of dispersing individuals and, (2) provide us with a minimum estimate of abundance in the entire ecosystem.

6. Future perspectives and directions

Our project is a complementary project to the long-term wild dog research and monitoring program at BPC. We therefore see the dispersal project as a long-term project to be developed and integrated in other wild dog-related activities at BPC. The novelty of the dispersal project is that it adds a new spatial and population dynamic dimension to BPC wild dog research. However, the core of the dispersal project is and remains the wild dog population resident in the Okavango Delta, which acts as source for the dispersing wild dogs that are the focus of this study.

In the short term, we plan to continue our research, which focuses at understanding the fate of individuals that disperse from the main BPC study area across northern Botswana and use this information to assess population viability under changing environmental and anthropogenic scenarios.

In the medium to long term, we can foresee expansion of activities to a larger national (and international) extent, and this will be much dependent on the movement trajectories of the dispersing wild dogs. We would also welcome a collaborative effort with other researchers working in other areas of the country to gather information on dispersing wild dogs across different ecosystems. This information will be invaluable given the mosaic of ecosystems that characterize Botswana and the KAZA/TFCA landscape.

In accordance with the Botswana National Wildlife Conservation Research Action Plan, through our wild dog dispersal project we aim to provide scientific information and advice to policy makers, resource managers, stakeholders and the public. The information gathered through the wild dog dispersal project will provide evidence-based information for the conservation and management of the African wild dog, nationally and internationally. In this respect, the spatial extent of the dispersal project can help support research and conservation across transboundary ecosystems such as the KAZA/TFCA, for which we identified Botswana as a key African wild dog conservation hub.