African wild dog dispersal study

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Yearly Research Update
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Report submitted by Gabriele Cozzi on behalf of the research team

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 Trust (BPCT, 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.

Understating 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). 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.

Collaring activities:

To achieve the project goals, we plan to fit state-of-the-art GPS/Satellite-enabled collars to young individuals (between 18 and 42 months old) prior to emigration from their natal group. At present, we successfully deployed radio collars on few wild dog dispersing candidates. Candidate dispersing individuals were collared in six resident packs regularly monitored by BPCT.

We dart-injected individuals using lightweight darts propelled by a pressure-gun (Dan-Inject ApS, Denmark) at a distance of 10-12 meters. Individuals were immobilized using a well-established protocol and anesthetics mixture described in Osofsky et al. (1996)[1]. Body measures and blood samples were taken and are available for further analyses. We made all efforts to minimize stress to the immobilized animal and disturbance to other group members (Fig. 1). This included blindfolding the immobilized individuals, reducing any noise or other

[1] Osofsky S.A., McNutt J.W. & Hirsch K.J. 1996. Immobilization of free-ranging African wild dogs using a ketamine/xylazine/atropine combination. *Journal of Zoo and Wildlife Medicine* 27:528-532

Figure 1*: Wild dogs are blindfolded to reduce stimuli during anesthesia. A Botswana registered veterinarian oversees all procedures to ensure safety of animals and people. The animal's body temperature, heart rate and respiration rate are checked throughout the anesthesia*

sudden stimuli and keeping a low profile to avoid scaring other group members. The immobilized individuals always re-joined the rest of the group within less than one hour after darting. All procedures were undertaken and supervised by a Botswana registered wildlife veterinarian (Fig. 1). We visited all collared individuals within five days after immobilization to ensure that the collar wasn't in any way impeding the animal. We did not record any anomalies nor did the collar influence the animals' behaviour.

The collars (Fig. 2) used in this study automatically record precise GPS positions several times each day and regularly send them to a base station through the Iridium satellite system. This technology allows to remotely follow the movements of collared individuals even where field conditions are prohibitive, and to more easily locate animals on the ground to collect the needed information. Collars are fitted with an independent VHF beacon that allows locating individuals in the field for routine monitoring during the dispersal events, and retrieving the collars after they detach from the animals. All collars have a drop-off mechanism timed to last 18-24 months.

Recorded dispersal events:

During the first phase of the project, we were able to assist to the dispersal of some individuals and the formation of new packs. Some collared candidate dispersing individuals are still with their natal pack, however, they are expected to disperse soon, as emigration events tend to peak during the wet season.

The recorded dispersal events can be summarized as follows:

i) <u>Dispersal distance:</u>

- *Short-distance dispersal*: Some of the collared dispersing wild dogs have dispersed within the broad BPCT core study area (NG28, 33, 34), which spans about 3'000 km^2 (Fig. 3). By closely monitoring the movements of these dispersing coalitions, we were able to simultaneously monitor the dispersal of some coalitions that were not equipped with collars, thus allowing a more comprehensive understanding of some social mechanisms. Two coalitions were killed during dispersal (see below).
- *Long-distance dispersal*: One male circumvented the Okavango Delta, moved to within 20 km south-east of Gumare and finally settled at the boundary between NG26 and 29 (Fig. 3 & 4). This male covered a minimum of 370 km in 17 days and so represents the first well-documented long-distance dispersal event in the region.

Two independent coalitions (one composed of two males, and one composed of two females) dispersed north-east and are currently in the Savuti region of Chobe National Park (Fig. 3 & 4). The two-males coalition has already associated with an unrelated female early in 2017 and produced the first litter. The exact trajectory of this dispersing coalition will be available after retrieval of the store-on-board GPS collar. The two-females coalition has not yet encountered males and settled.

An additional coalition composed of two males that originate from a pack resident in the northern top of the Chitabe peninsula have dispersed 60 km into the swamp, distance that they covered in only three days (Fig. 3 & 4).

Based on our preliminary findings, we can conclude that African wild dogs cover an average distance of 20 km each day during dispersal; this is 2.5 time more than the distance covered by resident individuals (8 km). Based on this information, wild dogs that emigrate from the Okavango region can be expected to easily reach the Namibian Caprivi border in five or six days. They can equally be expected to reach the Kaudom region in Namibia, and the Zimbabwean border in two weeks when moving along a fairly straight line. The data in hand already shows that the Moremi ecosystem is intimately linked with the Savuti-Linyanti ecosystems. Furthermore, we observed several movements across water bodies (Gomoti River, Khwai river, perennial swamp), suggesting that water may be more permeable to dispersing individuals than it is for resident packs. This finding could have important implications for connectivity of landscapes across a wet ecosystem. Long-distance dispersal events seem to be characterized by few days of uni-directional movements followed by days or weeks of more localized movements, which may be associated with local search of potential mates and establishment of an exclusive territory.

Figure. 2: *A young African wild dog wearing a GPS/Satellite radio collar (left) and pups of a litter born in a newly formed group in 2017 (right).*

ii) <u>Mortality:</u>

Mortality during dispersal seems to be mainly linked to human intervention. So far, two mortality events were recorded. One dispersing female had associated with four unrelated males but was shot, together with at least one male of her new pack members, 10 km west of Shorobe. Another collared female and her littermate sister were found dead at Shokomokwa Gate of the Southern Buffalo Fence after having eaten a poisoned carcass during dispersal. So far, we have not record any mortality during dispersal due to natural causes.

iii) Settlement and reproduction:

Some dispersing individuals have successfully formed new packs and settled in a new territory. In total, six new packs formed so far.

Four packs formed at the beginning of 2017, and had pups in June.

- Mula pack formed from 6 dispersing males from a pack resident in the eastern section of Moremi Game Reserve and from four females from a pack resident in the Budumatau area of Moremi Game Reserve. The pack has established its territory along the Khwai river around Xakanaka. The pack reproduced successfully.
- Paradise pack formed from four dispersing males from a pack (now extinct) that was resident along the Khwai river and from two females from a pack resident in the Black Pools area of Moremi Game Reserve. The pack has established its territory between Sankuyo village and Mowana Gate. The pack reproduced successfully.
- Fiji pack formed from 2 dispersing males from the pack resident in the Black Pools area of Moremi Game Reserve and from one female of unknown origin. The pack has currently settled in the Savuti area of Chobe National Park and has reproduced succesfully.
- Plains pack formed from the association of one dispersing females that dispersed from the top of the Chitabe peninsula and three males of unknown origin. The pack has established around Morutswe gate and has reproduced successfully.

Two packs formed only recently and missed the 2017 reproductive season. Because both packs have just recently formed, it is possible that they will still move in search of a more suitable territory where to settle permanently.

- Kalahari pack formed from seven dispersing females from the pack (now extinct) resident in the Black Pools area of Moremi Game Reserve and from three males from a pack resident in the Santawani area. This pack seems to be stable.
- Amacuro pack formed from three dispersing females from the pack resident in the Budumatau area of Moremi Game Reserve and from six males from a pack resident near Khwai village. Interestingly, the males emigrated from their natal pack in two separate coalitions (of three individuals each) and eventually re-joined forces when they met Amacuro and her sisters (Fig. 1). These nine-members group remained together for about two months before splitting again. Amacuro was last been seen with one of her two sisters and no males.

One additional pack formed as a result of the dispersal event of one male that emigrated from a pack resident on the northern top of Chitabe peninsula and settled in NG 29. The collar of this individual dropped and we were therefore not able to find the pack and monitor its reproductive success. (Fig. 3). Nonetheless, we assumed new group formation because the last recorded movements resembled those of resident packs (Fig. 3).

Over the last months we observed new groups join and separate again after few weeks, the latest example is provided by Amacuro and the six Khwai males. The formation of stable packs is essential for successful reproduction and population stability. Therefore, we will direct future efforts to try to understand under which circumstances new packs remain united while other separate.

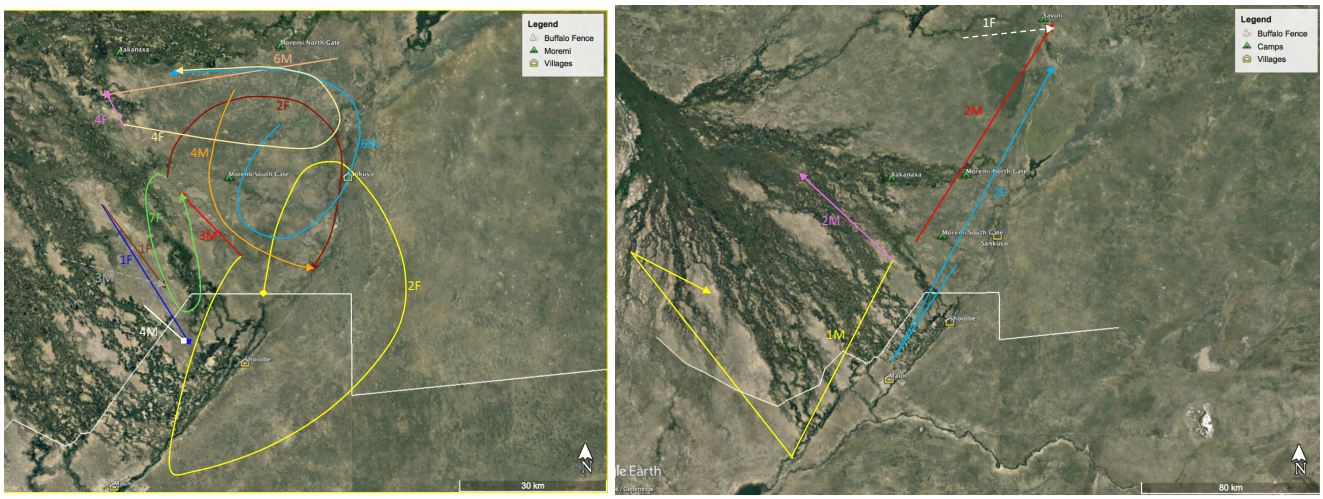

Figure. 3: *Schematic representation of short-distance (left) and long-distance (right) dispersal movements. Arrows show dispersal paths (dispersal distance and direction). Squares at the end of a dispersal path represent mortality events. M: males, F: females; Arrows origin: centre of the territory of the resident pack from which dispersers emigrated; Arrow end: last observed location; Overlapping arrows: show that unrelated dispersing coalitions have joined.*

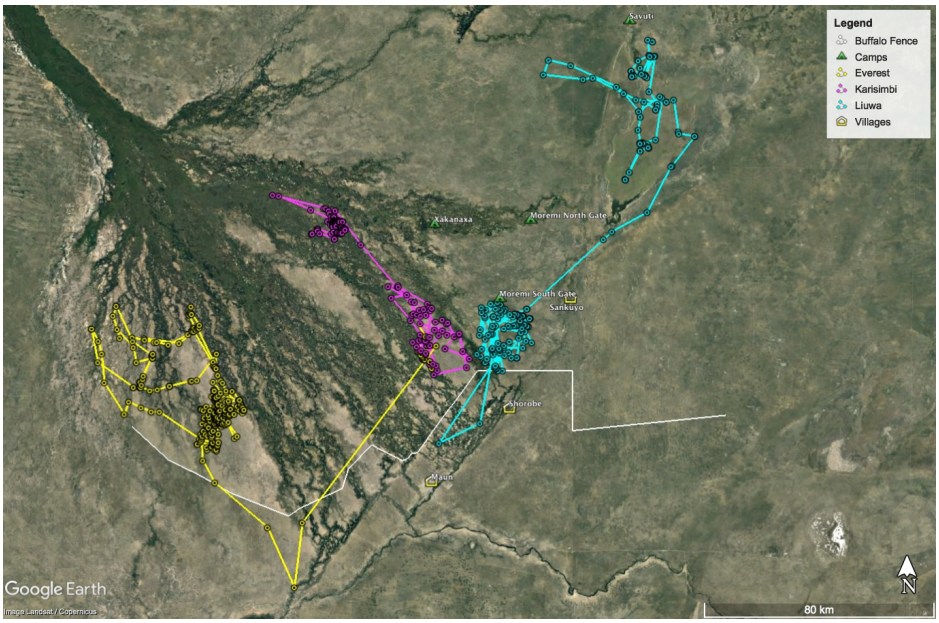

Figure 4*: Detailed dispersal trajectory for three long-distance dispersal events. Each dot represents a GPS location; colors are according to the right panel of Figure 3.*

Outlook and next steps

The information gathered during the recorded dispersal events have revealed some interesting first insights into African wild dog dispersal. However, as we have only observed few dispersal events so far, these preliminary findings should be regarded with caution as we are still far from drawing significant conclusions. For example, information on habitat selection during dispersal can be used to create corridors to promote connectivity among subpopulation and foster long-term conservation of Africa's most endangered large carnivore at the national and international level. Hence, it is crucial to collect more information during dispersal events. Finding what factors drive young wild dogs to emigrate or remain in the natal group is an additional aim of our study. By regularly monitoring compositions and locations of established wild dog groups in the field, we aim to investigate ecological, environmental, and social drivers of emigration from the natal group.

Acknowledgements

This project would not have been possible without the constant support of people on the ground, including camp managers, tour operators, and self-driving tourists. Despite the newest technology implemented in the collars facilitates our work, following dispersing wild dogs over several hundred kilometers still represents a major challenge. We are therefore very thankful for any sighting, report and picture of wild dogs that we have received in the past, and that we will hopefully still received in the future. We will make our best to keep all interested parties updated on any exciting event.

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