Extreme associations: the Sociable Weaver – Pygmy Falcon system of the Kalahari

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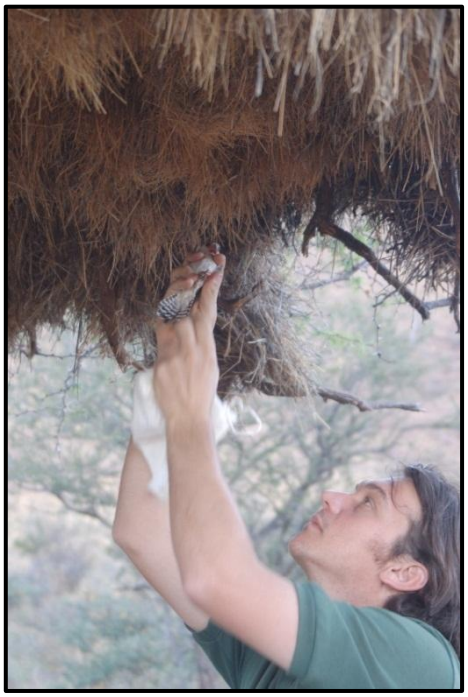
Starting a project at Tswalu Kalahari has been a home-coming for me. Spending my teens and early adulthood birding and exploring South Africa fostered a fascination about natural history. I always enjoyed the bushveld, particularly Acacia woodlands and the associated bird life. I conducted my first research project in the Acacia woodlands of Limpopo province. Ironically it was this project that led me away from the bushveld and resulted in me completing my PhD in Finland, in the white city of the north, Oulu.



After some time in Asia, I have settled in the south-western part of Finland. I am currently a researcher at the Department of Biology of the University of Turku. Most of my research is conducted in Finland, but funding and logistics support from the Academy of Finland and Tswalu Foundation has allowed me to initiate this exciting new project on Tswalu Kalahari.

THE SYSTEM….

Associations between two or more species are a prominent feature of nature. Frequently associations are observed during the breeding of animals, and are perhaps most conspicuous when involving birds. An extreme nesting association occurs between the sociable weaver *Philetairus socius* and the pygmy falcon *Polihierax semitorquatus*. This is the only known association between birds that is essentially obligate for one of the species involved, and is endemic to southern Africa. In addition, the weaver colonies attract a range of other species, resulting in interesting interactions around these colonies.

a) b)

Sociable weavers (a) build massive nest structures that also host breeding pairs of Pygmy Falcon (b)

Tswalu Kalahari Game Reserve is an ideal site to study this nesting association and all the other interactions on weaver nests. High numbers of sociable weaver colonies are found throughout the reserve, and the densities of pygmy falcons are the highest for any reported area. The system also lends itself to study; involving charismatic bird species. Sociable weavers build the biggest avian nesting structure known to science (up to 500 individuals), which then hosts one of the smallest bird-of-prey species in the world, the pygmy falcon.

However, despite the fame and conspicuousness of this system, it remains largely unstudied. In fact, the true nature of the relationship between the species in this association remains unclear. Three main research lines will be investigated using this unique system.

OBJECTIVES….

1. I will investigate the importance of Sociable weaver colonies to the animal community and ecology in the Kalahari.

   Various other animal species, both vertebrate and invertebrate, utilize the impressive and massive nest structures built by the sociable weavers. The nests can be seen as *islands of diversity* in a sea of sand and grass.

a) b)

Several species from a range of different taxa use Sociable weaver nests as an important part of their reproduction, foraging or daily activities. Some conspicuous examples include paper wasps (a) that sometimes form extensive colonies on the underside of nests, or Kalahari Tree Skinks (b) that occur in much higher densities on nests that in the surrounding landscape

How do these weaver nests influence animal community structure? And what would happen if these nests were no longer there? To some organisms these nests are vital and existence would be impossible without them, while some use them opportunistically. This includes large mammal species which congregate under these nest trees during the heat of the day; several bird species that roost in the chambers overnight to gain thermal benefits during both winter and summer; reptile species which congregate on weaver nest trees to gain protective cover and perhaps for foraging advantages, wasp species that form colonies on the underside of nests, and even plants species that likely gain nutrient advantages in proximity to colonies.

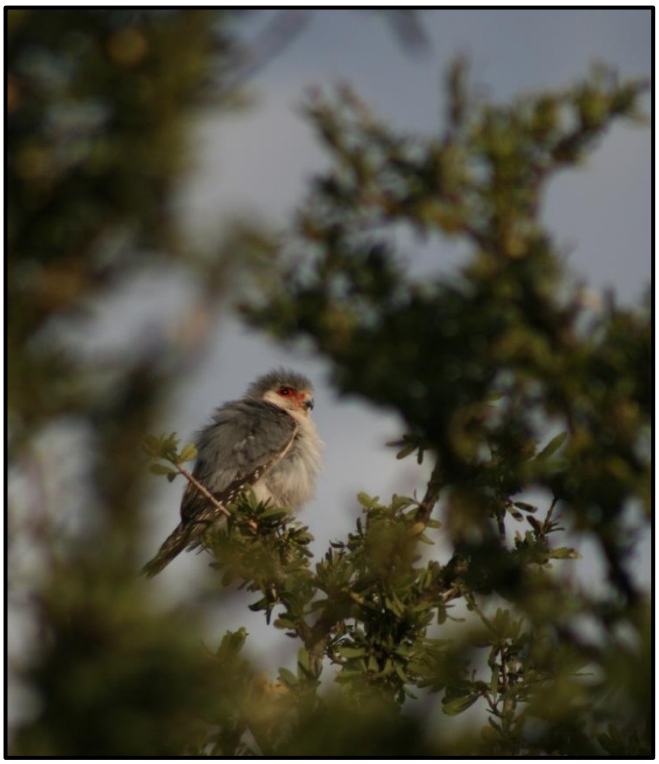
2. I will investigate species interactions, firstly between the weavers and falcons but also how other species interact in the weaver colonies.

Are pygmy falcons just a vertebrate parasite of sociable weavers? Or do weavers gain a benefit from hosting falcons and other species in their colonies? This involves determining the costs and benefits for the sociable weavers when in association with pygmy falcons, compared to when falcons are not present. This is done using measures such as adult survival, nesting success, and the natal and breeding dispersal movements by individuals between colonies.

3. I will investigate the biology, demography and breeding system of the pygmy falcon

As a species, the pygmy falcon still remains largely unstudied. Little is known about the dispersal and habitat selection strategies used and about the population demography in this species. With discrete localities in the form of sociable weaver nests used for nesting (obligate to weaver nests) the systems presents a unique possibility to understand these decisions in one of the world's smallest raptors. Using intensive marking individuals will be followed throughout their lifetime to investigate these questions.

The breeding system of the falcon has largely been speculated about. There is observational data that suggests this species uses a form of cooperative polyandry (one female reproducing with multiple males). This breeding system will be studied using genetic and behavioural data.



Pygmy falcons perch conspicuously near their nest sites

EXPERIENCES AND ACTIVITIES….

Having just started the second field season in this project has been an exciting time. The dynamic nature of this system is starting to reveal itself. Some falcons pairs have moved to a different colony, but the exact identity of the pairs will only be found when the birds are caught after breeding. The actual sociable weaver colonies are also constantly changing. With so many individuals renovating and improving, the change can be surprisingly swift. I have lost digital equipment in nests over a few months as the structural changes swallowed them. But constant renovations by the weavers are needed, as the harsh Kalahari system slowly breaks down nests with time. Fires ensure that nothing lasts forever, and with time incorporating this long term dynamic in this system will provide further insights to the communities using these structures.

Time spent below or around these colonies is fascinating. Nests are hotpots for some of the regions deadliest snakes which visit colonies to feed on the abundant food source of breeding birds A thorough check on approach to the nest is all that is needed though, but it definitely gets the blood pumping watching the ease with which a Cape Cobra moves through these structures. There are also many other organisms that regularly use these structures and I am documenting these as the colonies are visited over the weeks.

Night visits to nests have proved a good addition to the field protocol. I am now able to observe which other bird species are using the colonies as roosting sites. This involves quiet visits under the colonies with a torch, and the colony inhabitants can be seen looking down.

Pied Barbets frequently use Sociable weaver nests for roosting at night. Up to 8 barbets may use a single weaver nest and initial data suggests they evict weavers from these chambers.

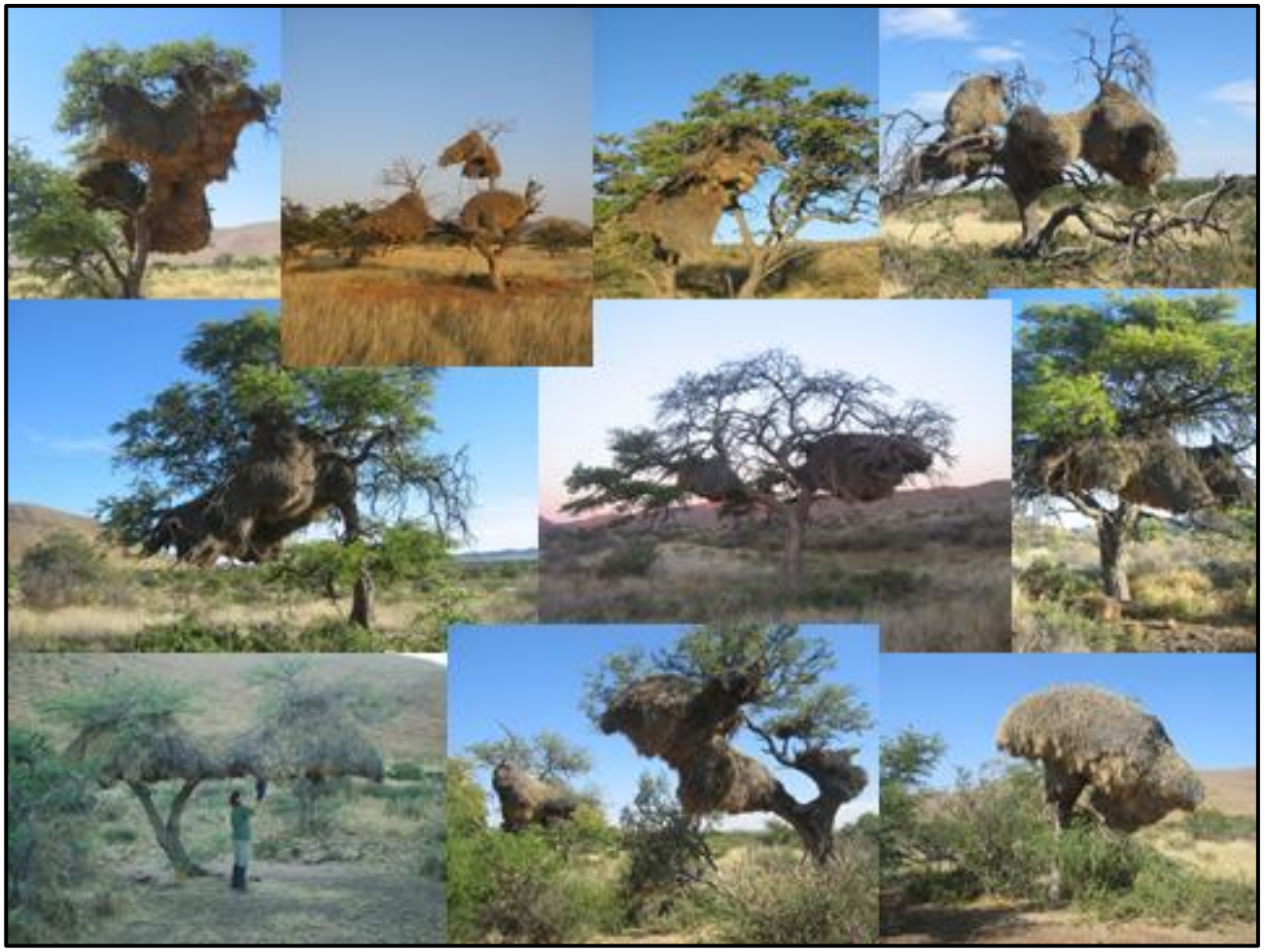
OUTCOMES….

Especially in harsh, extreme and unpredictable environments like the Kalahari, animal community persistence and structure is thought to favour positive interactions and close associations. By exploring the keystone species nature of Sociable weavers, we will gain an understanding of how a community is structured and how species life histories shaped by a species that can be viewed as an ecological engineer.

In an environment that may become increasingly extreme under global change, this is vital knowledge to allow predictions about the consequences of increasing temperature or the decline or loss of this single species will impact the ecology of the Kalahari.

Utilizing the obligate nature of the weaver – falcon system and the plethora of other species that these nests attract, I ultimately aim to develop an understanding of the mechanism that results in close between-species associations.

However, this study will take a traditional natural history perspective too. System-specific information is needed to develop question-based research. This project will also therefore focus on the intricacies and details of the weaver-falcon system. In particular, the pygmy falcon is poorly studied. The sociable weaver, in contrast, is better studied, but the interactions with its obligate guest, the falcon, which are surely vital to the biology of the species, remain unknown.



Sociable weaver nests are impressive structures that are all unique and they take an infinite numbers of shapes and styles.