

How baboons survive in world's worst desert

BABOONS living in the most arid environment of any nonhuman primates—a canyon in the Namib Desert of southern Africa—can apparently go without water for up to 26 days. A biologist who has been studying the extraordinary animals has discovered that the availability of drinking water influences how they behave to a dramatic extent.

Conrad Brain of the Desert Ecological Research Unit of Namibia has been observing the troop of 15 chacma baboons (*Papio ursinus*) in the lower reaches of the Kuiseb river canyon since 1986. The troop lives in even harsher conditions than another group that has been studied, the "desert baboons" of Ethiopia (*P. hamadryas*).

Elsewhere in southern Africa, zoologists studying chacma baboons have found that the need to drink daily has been important in determining the troops' choice of territory. But the troop in the Kuiseb canyon—known as the "lower troop" (there are two others, dubbed the "middle" and "upper" troops)—appears to have learned how to overcome this limitation. Its members can survive in a habitat which has no surface water for around eight months of the year.

The Kuiseb river runs east to west through the central Namib Desert. It forms a linear oasis that supports riparian forest, dominated by *Acacia albida* and *A. erioloba*. Some wild fig trees (*Ficus sycamorus*) also grow there, together with thick clumps of the shrub *Salvadora persica*.

The baboons' home range is a 30-kilometre stretch of the river, where it has cut a deep gorge in the desert. The animals are trapped in this area by dunes of the vast "sand sea" to the south, and a wide gravel plain to the north.

Each year, only about 27 millimetres of rain falls in the Namib Desert, and the Kuiseb river usually runs for a few weeks only between December and March. As the flood passes, pools are left in the river bed, but when these dry up the baboons have difficulty finding water. The animals regularly go without drinking for periods of seven days or more.

One source that the troop uses is a "seep" from a tiny crack in the rock high up in the wall of the canyon. They also use "excavations"—pits dug in the sand by gemsbok (*Oryx gazella*) or mountain zebra (*Eggus zebra*) in search of water.

But these water sources allow only one baboon at a time to drink, and they fail frequently towards the end of the year, when the new flood is due. Even if the seep and excavations do not run dry, the animals have to move out of range of these water supplies to find food.

The troop's prolonged periods without drinking had already been observed by Bill Hamilton, a zoologist from the University of California. But when Brain embarked on his study he considered these periods rare. He did not guess how important they were in determining behaviour.

Brain soon discovered that non-drinking was central to understanding the baboons; it affected nearly every aspect of their lives, from feeding behaviour and male aggression

Sue Armstrong, Johannesburg



Simian survivors: the desert baboons of the Namib Desert have a hard life. All sport scarred, or raw and bleeding, ears

to the high infant mortality. Now, the central theme of Brain's research is "drinking water as a determinant of behaviour".

Each month, Brain spends an average of 18 days living with the baboons, making detailed observations of their behaviour during drinking and non-drinking periods. "It's like looking at two different troops, when they have water and when they don't," says Brain.

During non-drinking periods, the animals become almost completely inactive. They cover only about a kilometre a day as they forage. For between six and eight hours, during the heat of the day, they sleep in the shade of cliffs or trees.

After several days without drinking, youngsters stop playing and incidents of male aggression are reduced by about 90 per cent. "None of the males that have been killed in dominance fights have been killed during non-drinking periods," says Brain.

Another measure of the animals' lethargy is demonstrated when the troop occasionally comes into contact with the "middle troop" from higher up the gorge, which has permanent drinking sites. The two troops will operate seemingly as one for a few days. However, when both troops are drinking, they show no such tolerance, and all contacts are marked by aggression.

Frequently, Brain has recorded a daytime temperature of 45 °C in the canyon. During non-drinking periods, the baboons adopt extraordinary postures and activities which Brain believes are means of regulating heat. For instance, while resting, they scratch away hot surface sand before laying their chests against the cooler sand. Or they rest on their backs with their legs in the air and the hairless parts of their bodies exposed to the breeze.

The animals also indulge in sand bathing,

showing their chests with handfuls of cool subsurface sand, especially after bouts of activity. Brain tried this himself, and found that sand bathing had the capacity to reduce the temperature of skin by between 5 °C and 7 °C within a matter of minutes. "If you select the right sand," he says, "it's just like having a cold shower."

Brain plans to "dart" several animals after the next flood, when they are under minimum stress. He intends to implant specially designed, battery-operated probes in their abdomens. These will monitor their core temperatures and reveal how these are affected by progressive dehydration, if it occurs, and by the various behaviour patterns the animals adopt.

At the same time, Brain plans to inject radioactive isotopes into the blood stream of animals to determine how much water is passing through their bodies. However, carrying out physiological research on animals living under such stressed conditions raises problems. Brain's water experiments require taking second blood samples, and Brain is wary of re-darting animals that may be dehydrated. He says he will either re-dart them after the baboons have gone two or three days without drinking, or he will measure isotope concentrations in faecal samples.

Brain has found that the animals' choice of food changes dramatically between drinking and non-drinking periods. While not drinking, they select food with a high moisture content, concentrating particularly on ripe figs (about 80 per cent water), and *S. persica* berries (about 71 per cent water), which, strangely, induce acute thirst when eaten by human beings.

The baboons will move more than 8 kilometres from the last remaining water source to find such food, even though this means they will be unable to drink for some days. The baboons also strip acacia bark and chew it to extract the moisture.

When their drinking is limited to the seep and the excavation, the females observe a strict hierarchy, with adult males supplanting them at will.

Both Brain and Hamilton have noted that all the baboons in the lower troop have thick white scar tissue on their ears, and many are affected by raw and bleeding lesions. Brain is investigating this strange pathological condition, which does not affect either of the other troops in the canyon. It appears to be linked to the extremely high infant mortality of the troop. In some years, 100 per cent of the infants born have died.

Brain believes it may also be linked to another strange phenomenon that he is busy investigating: an unusually high rate of immigration to the troop. This is the opposite of what zoologists would expect, given the inferiority of the habitat. During the four-year study, 10 males have joined the lower troop, while the middle troop has not had a single immigrant.

But while infant mortality remains so high, immigration of males will not ensure the survival of the troop in the lower Kuiseb canyon. Brain fears he might just be watching its slow death throes. □

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