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A CASE OF SUN-BATHING IN THE MONTAGU'S HARRIER *CIRCUS PYGARGUS* ON ITS AFRICAN WINTERING GROUNDS

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The Montagu's Harrier *Circus pygargus* is a medium size bird of prey that breeds in the Palearctic, from Spain to Mongolia, and overwinters in Africa (south of the Sahara) and India from September to March. Large scale monitoring of the species has been conducted in Senegal since 2009 over a 17 000 km² study area (Fig 1, left panel) to investigate its ecology and estimate population size.

On the 29 of January 2011, while controlling potential wing-tagged Montagu's Harriers at a water hole within a currently unexploited small quarry (Fig 1, left and central panels), we observed previously undocumented behaviour for this species. An untagged individual, identified as a young female by its plumage, shortly after landing on the shore, walked away from the water and spread its wings and tail in an unusual manner, its feathers facing the sun (Fig 1, right panel). After eight minutes remaining still in this position, the bird walked toward the water and started drinking. It did not resume the wing-spreading behaviour but alternated drinking and preening, as the other harriers present were doing, until it took off. At 16:11 (GMT), the air temperature was 42°C, there was no cloud cover and no wind.

Wing spreading, also sometimes termed sun-bathing or sunning, has been described in over 50 bird families, from passerines to birds of prey (Hauser 1957, Coutlee 1968, Clark 1969, Clayton et al. 2010). Several explanations have been proposed for such behaviour: drying wet plumage, thermo-regulation (thanks to conductive, convective or radiative heat loss), aid in vitamin D synthesis or decrease of parasitic load (Hauser 1957, Simmons 1986, Moyet and Wagenbach 1995, Blem and Blem 2000). Drying of wet plumage and thermo-regulation are obvious reasons why birds would display such behaviour, especially for species whose plumage lacks complete water-repellency, such as cormorants and shags (Rijke 1968, Cook and Blanc 2007). In the latter species, wing drying would improve both thermoregulation balance, by decreasing heat loss, and flight performances. Species getting wet – dew at night or rainfall – would also be expected to display this behaviour. Thus, the proportion of Turkey Vultures *Cathartes aura* with wing spreading behaviour tends to be higher after rainfall (Clark and Ohmart 1985). But in this species, wing spreading is also common in the early morning, independently of the weather. By adopting such posture, Turkey Vultures are supposed to improve the thermal gradient between themselves and their environment (Clark and Ohmart 1985), a behaviour also suggested for Bateleur Terathopius ecaudatus (Reid 2014).

However, wing spreading was also described for various species in stressful conditions, e.g. elevated temperature and high solar radiance regardless of humidity conditions, leading to apparent signs of overheating (Cade 1973, Blem and Blem 1993, 2000). From an adaptive point of view, wing spreading in such detrimental conditions (dehydration and hyperthermia in particular) requires to be balanced by some benefits.

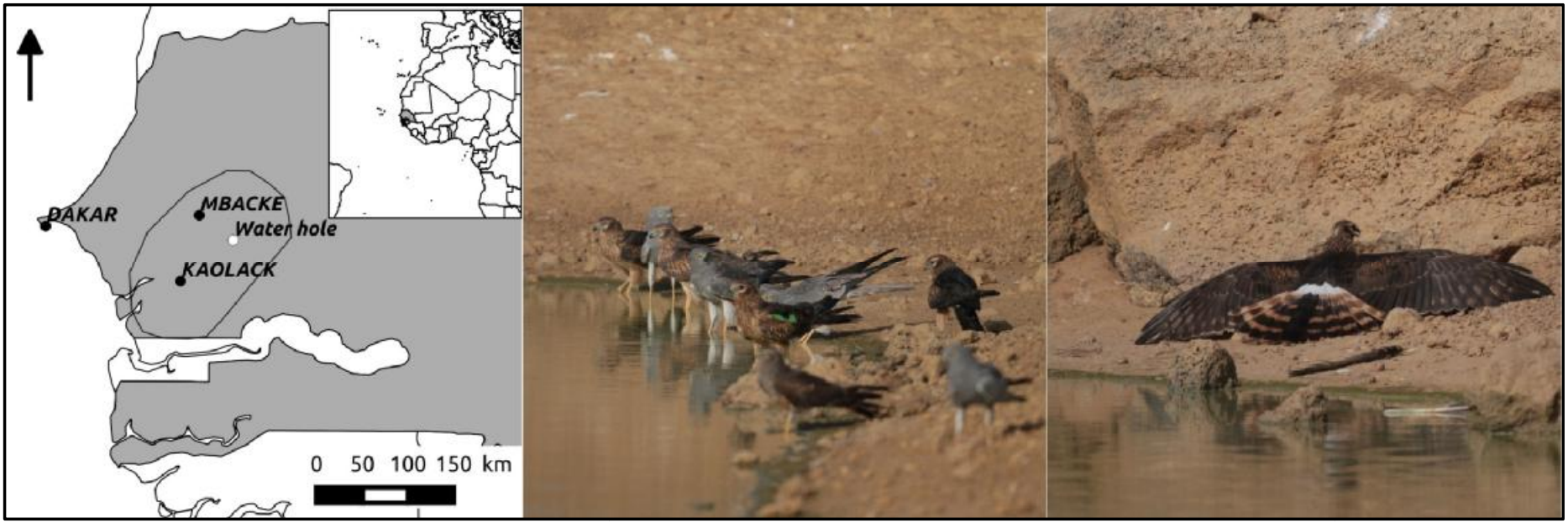

Fig 1 - From left to right: location of the water hole in Senegal, close to the town of Mbacke (the cricular line delimits the study area of our research project); a group of Montagu's Harrier standing by the water; female Montagu's Harrier in position typical of wing spreading behaviour, wings and tail largely spread. Note that the bird is panting.

It has been hypothesised and further demonstrated that birds could use sun radiation as a way to decrease their parasite load. High temperatures may directly kill ectoparasites as suggested with Chewing Lice in Black Noddies (Moyer and Wagenbach 1995) or deter them from feathers, increasing their vulnerability to preening. Thus birds showing lower parasitic loads would be expected to reduce their wing-spreading behaviour, as tested by Blem and Blem (1993): by experimentally manipulating the parasitic load of individuals, these authors showed that swallows sprayed with insecticide displayed a much reduced rate of sun-bathing behaviour as compared with untreated birds. Furthermore, Saranathan and Burtt (2007) demonstrated that feather-degrading bacteria, such as *Bacillus licheniformis*, a common bacterium known to degrade bird feathers and present in many bird species (Burtt and Ichida 1999), can be inhibited by sunlight, which could also explain sun-bathing behaviour in some birds.

Though we have no information on harriers' bacteria load, neither on their breeding nor wintering grounds, we observed that five out of fifteen birds handled in winter, between 2011 and 2014, presented ectoparasites of the genus *Hippobosca*. Thus it is possible that this female was also hosting this type of flies. We believe that anti-

parasitic behaviour, i.e. killing of ectoparasites or the inhibition of feather-degrading bacteria, is therefore the most probable explanation for our observation, although the bird was not observed trying to remove ectoparasites while sun-bathing. Indeed, the air temperature was high (above 40° C), with no wind thus minimizing the possibility of a thermo-regulation purpose; in addition the bird could not have had wet plumage given the hot and sunny conditions that day.

Given the air temperature at the time of the observation, it is likely that the location chosen by this female for sunning was not random. Indeed, the proximity of the waterhole would enable birds to adopt wing spreading behaviour, by allowing them to rapidly decrease potential dehydration and hyperthermia through drinking, tarsus bathing and the local conditions of moisture in the air. However, we observed only one sunbathing harrier out of ~1000 birds that were controlled in day time near water holes, during the wintering period in 2010-2014. Similarly, researchers extremely experienced with this species (e.g. B Arroyo in Spain and France, J Terraube in Kazakhstan; hundreds hours of observation of Montagu's Harrier each) could not recall observing similar behaviour on the species' breeding grounds. Thus, we cannot exclude the possibility of an outlier individual displaying an anecdotal behaviour. If not, our observation suggests this behaviour, though potentially crucial for self-maintenance, remains largely undetected and potentially limited to water holes, or exceptional in this species and restricted to individuals with higher than normal parasitic loads. Year to year variations in the accessibility to water during the month of our survey could limit the detection probability of such behaviour. Additional information collected on trapped Montagu's Harrier (feather-degrading bacteria, uropygial gland secretions, flies) and more behavioural observation, e.g. via camera traps at different waterholes, may enable to confirm our hypothesis in the near future.

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