

## MEDIA RELEASE

### UP-led Hot Birds Project homes in on how extreme heat affects bird species

Rising temperatures as a result of climate change will affect bird species differently, and their abilities to withstand extremely hot conditions depend on the part of the world that they find themselves in and the climatic region to which their physiology has become adapted over the course of millennia.

This is according to a new study by ornithologists of the University of Pretoria (UP) who are involved in the Hot Birds Research Project. The findings of the study have been published in the scientific journal *Proceedings of the National Academy of Science (PNAS)* and is based on the PhD work of UP zoology student Marc Freeman.

The study shows that birds from hot, humid climates, for instance, can handle larger spikes in body temperature than those flying about in hot deserts or cool mountains.

“It is vital to know just how much heat birds and other animals can stand before their bodies start shutting down on an extremely hot day,” says lead researcher Professor Andrew McKechnie of UP’s Department of Zoology and Entomology and South African Research Chair in Conservation Physiology. “Knowing this will help us to make better predictions about how vulnerable they are to higher temperatures and more frequent and intense heatwaves; whether such extreme events might be lethal to them; and under which conditions and at which temperatures we might see them dying on a large scale in future.”

Prof McKechnie is co-principal investigator of the international Hot Birds Research Project, a multidisciplinary research group that has involved ornithologists at UP, the University of Cape Town, Rhodes University and several institutions abroad, including the University of New Mexico, over the past decade. The project seeks to find out whether and to what degree desert birds in particular will be able to withstand rising temperatures in light of climate change and an expected 3° Celsius (C) temperature rise in some parts of the world.

In recent years, lethal heatwaves have become increasingly common worldwide. In Australia, for instance, such events have already caused the deaths of birds and fruit bats en masse. In 2018, a third of the country’s population of spectacled flying foxes (a type of fruit bat) died over the course of two extremely hot and humid days.

“The first such event in South Africa was recorded around Pongola in northern KwaZulu-Natal in November 2020, on a humid day when temperatures quickly reached 45°C,” Prof McKechnie says. “Twelve species of birds, including blue waxbills, fork-tailed drongos, maggie shrikes and yellow-fronted canaries, died, as well as 50 Wahlberg’s epauletted fruit bats.”

He explains that each bird species has a particular resting body temperature and a maximum threshold to which their internal body temperatures can increase before their activity levels and bodily function is affected. Once the threshold is reached, overheating as a result of hyperthermia and subsequent heat exhaustion can prove fatal.

---

For the *PNAS* study, members of the Hot Birds team collected data from 53 bird species across South Africa. The sites chosen experience different air temperatures and levels of humidity, and ranged from Richards Bay in KwaZulu-Natal and Harrismith in the Free State to desert areas in the Northern Cape.

The research team found that red-billed queleas (*Quelea quelea*) are able to withstand body temperatures up to 48°C, which was the highest temperature measured. At the other end of the scale, Burchell's starlings (*Lamprotornis australis*) can handle 43°C before showing signs of severe heat stress. In terms of the maximum air temperatures the various species could handle, heat tolerance limits ranged from 43.3°C to 56°C.

Unexpectedly, the team found that bird species living in humid lowland sites, and not desert birds, were able to withstand higher body temperature extremes and could tolerate hyperthermia better before experiencing difficulty moving and could no longer safely regulate their body temperatures.

“The ability of birds from lowland areas to better handle hyperthermia has to do with their internal body temperatures being able to rise higher, and them having a lower resting body temperature than birds from other regions,” Prof McKechnie says. Humid conditions are typically very difficult to handle when combined with hot weather.

Prof McKechnie says these differences have evolved over millennia as birds have become adapted to the climates of the particular regions that they find themselves in.

“Climate change is relentless and ongoing, and the habitats in which birds live are heating up,” he says. “In hot environments, many species already live life on the edge and can give us early warning of the impacts of change. We are studying the capacity of these birds to tolerate elevated body temperatures, and how this capacity varies among species.”

*Marc Freeman completed the current study under controlled hot and dry conditions, and is now analysing data from a similar study completed under hot, humid conditions.*

*For more on the Hot Birds Project, go to*

*<https://hbresearchproject.wixsite.com/hbresearchproject/hbresearchproject> or the project's Facebook page:*

*<https://www.facebook.com/hotbirdsresearchproject>*

Ends.

---

#### **Media enquiries:**

Please email Prim Gower at [Primarashni.gower@up.ac.za](mailto:Primarashni.gower@up.ac.za) or call 083 229 9011

#### **Photo captions:**

##### **Collared sunbirds or pygmy kingfishers**

*Birds such as pygmy kingfishers and collared sunbirds that are found in hot, humid climates can handle larger spikes in body temperature better than bird species flying about in hot deserts or cool mountains.*

*Photos: Marc Freeman*

##### **Red-billed queleas (*Quelea quelea*).jpg**

*Red-billed queleas (*Quelea quelea*) can withstand body temperatures up to 48 °C, the highest temperature measured. Photo: Marc Freeman*

## About the University of Pretoria

The University of Pretoria (UP) is one of the largest contact and residential universities in South Africa, with its administration offices located on the Hatfield Campus, Pretoria. This 114-year-old institution is also the largest producer of research in South Africa.

Spread over seven campuses, it has nine faculties and a business school, the Gordon Institute of Business Science (GIBS). It is the only University in the country with a Faculty of Veterinary Science, which is ranked top in Africa. UP has 120 academic departments and 92 centres and institutes, accommodating more than 56 000 students and offering about 1 100 study programmes.

UP is one of the top five universities in South Africa, according to the 2019-2020 rankings by the Center for World University Rankings. The QS World University Rankings also placed UP among the top 100 universities worldwide in three fields of study (veterinary science, theology and law), and UP is in the top 1% in eight fields of study (agricultural sciences, clinical medicine, engineering, environment/ecology, immunology, microbiology, plant and animal sciences and social sciences), according to the Web of Science Essential Indicators.

For more information, go to [www.up.ac.za](http://www.up.ac.za)