As a ground-dwelling bird that looks like a domestic chicken, Singapore’s endangered red jinglefowl is often confused for being poultry.

However, a new study by scientists from the National University of Singapore (NUS) has shed light on how the domestic chicken and its wild ancestor can be distinguished at a glance.

For example, male red jinglefowl usually sport dark green tail feathers and black primary feathers, while female red jinglefowl are often distinguished from chickens by their grey legs and black primary feathers.

These findings could help researchers differentiate birds of conservation significance from domestic or wild chickens, even when they are roaming around together in a large flock.

CROSS-BREEDING

Years of interbreeding between chickens and red jinglefowl in Singapore has resulted in cross-breeding, and today, the birds on mainland Singapore span a range of genetic profiles.

Some birds have genetic profiles that are fairly close to domestic chickens, while others are genetically closer to wild red jinglefowl, found in the latest study, which was published last month in the scientific journal Evolutionary Applications.

The researchers, supervised by NUS ornithologist Frank Rheindt, determined this by first retrieving genetic samples from five-roaming birds and chicken from a poultry farm.

These were then compared against wild specimens known as "facial marks" — historic museum specimens collected in Peninsular Malaysia in the late 19th and early 20th centuries.

As the specimens had been collected at a time when pristine habitats were separated from human dwellings by multiple vegetative barriers, the birds likely had genotypes more closely related to "pure" red jinglefowl due to reduced encounters with domesticated chickens, the researchers noted.

The red jinglefowl was previously thought to be found mainly on offshore Pulau Ubin and the Western Catchment area, while birds in other parts of the island were assumed to be chickens.

But the latest study showed that red jinglefowl can also be found islandwide.

The researchers then determined if there was a correlation between the way the birds looked and their genetic profiles. There was.

"Individuals that look 'pure' tend to score highly on our recommended panel of morphological traits," explained Associate Professor Rheindt.

"And we would expect, these individuals are always characterized by a fairly unmixed genotype, which means they are more closely related to the wild red jinglefowl.

Birds that looked "pure" often also had genotypes more closely related to the wild types, but the reverse was not always true, the study found. Noted Prof Rheindt: "A few individuals that did not score very highly on morphological traits also had morphologically unmixed genotypes too."

One likely reason for this is that the appearance of an organism — be it the colour of its plumage or its feet — is influenced by just a small part of its genetic code, he said.

If the genome of an organism reads like a book, then only parts of it — say, a sentence or chapter — determine its appearance.

So, while the appearance of a red jinglefowl could hint at its genetic purity, it may not always give the full picture.

The latest study follows a cutting controversy in 2017, when the authorities culled some free-ranging birds in Sin Ming estate to address concerns from residents who had complained about noise, and mitigate health risks from bird flu.

People were up in arms about the incident, commenting on social media and in forum letters saying the then Agri-Food and Veterinary Authority had reacted too quickly to the complaints of a few, especially since there was no immediate bird flu threat.

There were also concerns then that the culling efforts could have led to the red jinglefowl being mistakenly killed as well, because members of the non-species look alike.

FIRST OF ITS KIND

Dr Adrian Loo, group director of wildlife management at the National Parks Board (NParks), said the study was the first that looked into the extent of cross-breeding between domestic chickens and the red jinglefowl in free-ranging chickens across mainland Singapore, and the visual traits useful for identifying a red jinglefowl.

He said: "The study found that domestic chickens may affect the conservation of the red jinglefowl due to the potential of cross-breeding with the latter."

"Genetic flow from domestic to wild chickens into the wild red jinglefowl may reduce the genetic diversity of the red jinglefowl, which is a concern," he said.

NParks biologist Marina Chua said wild animals have genetic makeup that allow them to live and breed well in nature.

Domesticated animals, however, would often have been selectively bred for other traits that may not be ideal for living in the wild.

"Because of this, the genetic make-up of domestic animals is different from their wild counterparts," she said.

NParks' Dr Loo said wild red jinglefowl may be relocated to nature areas to reduce their contact with domestic free-ranging chickens.

He said: "As part of the conservation effort, we want to minimise the mixing with domestic chickens and will continue to enforce against abandoning or allowing domestic chickens to roam or forage, as this encourages mixing of domestic chickens with wild jinglefowl."

NParks will take reference from the study in using the recommended visual traits to assess whether a free-ranging chicken is likely to have the genetic profile of wild red jinglefowl, added Dr Loo.

"We will also partner our local conservation community to strengthen the conservation of the red jinglefowl and monitor their overall distribution and population size," he said.

Dr Loo said NParks will continue to undertake studies involving experts to understand the population and ecology of free-ranging wild birds and other urban birds, and explore various management measures.

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