

populations and their habitats is required. Public education is also necessary, particularly for local residents, to prevent further exploitation of this plant species. To encourage the legal use or commercialization of this beautiful but threatened species, we will be sharing our knowledge and expertise with local farmers and planting enterprises.

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Conserving *Cypripedium forrestii*, an orchid species endemic to China

The flora of the Hengduan mountains of China includes the lady's slipper orchids, *Cypripedium* spp., many of which are endemic to China. Over-collected by plant enthusiasts, used medically by local people and disturbed by natural disasters, many *Cypripedium* species are threatened. *Cypripedium forrestii* was first collected on Yulong Snow Mountain near Lijiang in north-west Yunnan. This sacred mountain for the Naxi people has long been a famous scenic spot and the only known habitat of *C. forrestii*. Later, another habitat was found in Haba Mountain of Diqing, c. 20 km away. *Cypripedium forrestii* has a narrow distribution and extremely small population, and is categorized as Critically Endangered on the IUCN Red List and on the threatened species list of China's higher plants. The absence of systematic field surveys and the small number of herbarium records of *C. forrestii* have hampered conservation of this species.

In July 2022, as a part of the conservation project Plant Species with Extremely Small Populations supported by Yunnan Forestry and Grassland Bureau (2021SJ14X-09), we surveyed the potential habitat of *C. forrestii* in north-west Yunnan to update knowledge of this threatened species. We found the species in four locations. The population on Yulong Snow Mountain comprises c. 60 individuals and is threatened by potential landslides and tourism. On Haba Snow Mountain of Diqing Tibetan Autonomous Prefecture, we found several populations, with a total of > 1,000 individuals. We also found the species in two locations, with c. 100 individuals in each, near Bitu Lake and beside a country road near Shangri-la city.

Anthropogenic disturbance and habitat degradation are the main threats to *C. forrestii*. Most of the populations on Haba Mountain are large in size, little disturbed, healthy and self-sustainable. These populations will be valuable for artificial propagation and reintroduction projects. Preliminary conservation work for the species, both in situ and ex situ (artificial pollination and tissue culture), is being carried out by Kunming Institute of Botany and Lijiang Alpine Botanic Garden. We plan to carry out further research on *C. forrestii*, especially on population dynamics, genetic structure and pollination ecology, to guide future conservation of the species.

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Remarkable range expansion of the black woodpecker *Dryocopus martius* in Spain

The black woodpecker *Dryocopus martius* has a large Eurasian range, occurring in temperate and boreal forests, and is categorized as Least Concern on the IUCN Red List. Along the southern fringes of its range, populations tend to be fragmented and rely on remnant mature forest patches, usually in highlands. This was the situation in Spain in the 1980s and 1990s, when the species was only known from two small populations, separated by 150 km: the Pyrenean and the Cantabrian.

But in the 2010s, monitoring revealed an unexpected range expansion. The black woodpecker was recorded breeding far from its former known range, leading to coalescence of the Pyrenean and Cantabrian sub-ranges. Previously considered a typical mountain and remote forest dweller, the species has colonized lowland, secondary forests and commercial plantations, and can even be found at sea level. This expansion is ongoing, with news of the species' establishment in Central-Mediterranean Spain, c. 250 km south of the previously known range. Surveys in February–June of 2021 and 2022 in this area have inventoried occupied territories and breeding cavities.

The biological or demographic causes are unknown, but the species' range expansion was simultaneous with the maturation and encroachment of forests as a result of a reduction

in forestry and livestock activities. Functional connectivity models match the observed distribution pattern, suggesting that colonization events were influenced by landscape spatial structure and the performance of long-distance dispersing individuals (Gil-Tena et al., 2013, *European Journal of Forest Research*, 132, 181–194).

In this expansion, the species has begun to occupy commercial plantations of *Pinus radiata*, an introduced North American conifer. This pine was extensively planted during the 20th century in the Spanish Basque region, and comprises 30% of the forest in this area. *Pinus radiata* plantations are intensively managed, and timber is harvested in 20–30 year cycles. It is unclear whether this habitat provides good quality resources for the black woodpecker, or is a sink, with woodpecker numbers sustained by immigration. Demographic parameters support the latter hypothesis, but the evidence is inconclusive. Research on how species tolerance can buffer pressures in human-made habitats has practical implications for adaptive conservation and for the compliance of commercial forestry practices with biodiversity requirements.

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The impact of avian influenza 2022 on Dalmatian pelicans was the worst ever wildlife disaster in Greece

The avian influenza wave of 2022 affected the Near Threatened Dalmatian pelican *Pelecanus crispus* in most of its European range, but the effect on the Lesser (Mikri) Prespa Lake colony, in north-west Greece, the largest colony of the species, was devastating. The first deaths were recorded in mid February, a week after the first Dalmatian pelicans arrived at Prespa. In the following weeks, the mortality rate peaked, then slowed down after mid March and ceased by the end of April. All dead pelicans were adults in breeding plumage. Laboratory results indicated the highly pathogenic H5N1 strain, clade 2.3.4.4b. By the end of April, 1,734 Dalmatian pelicans had died, c. 60% of the colony.

In addition, three other colonies at the eastern part of the country were affected: Chimaditis Lake with 181 deaths, Karla Reservoir with 103 and Kerkini Lake with 90. The two colonies on the west coast remained untouched by the virus. Overall, 2,286 Dalmatian pelican deaths were recorded in 13 wetlands. The H5N1 strain was also confirmed in the two Albanian and Montenegrin colonies, Karavasta Lagoon and Skadar Lake, and in three of the Romanian colonies in the Danube Delta, with a total of 128 deaths. No deaths were recorded in Bulgaria or Turkey. In total, > 40% of the south-east European population was lost, c. 10% of the global Dalmatian pelican population.

Other species were affected, but in small numbers, which implies that Dalmatian pelicans are particularly susceptible to H5N1. Prior to 2015 this species had not been infected by the avian influenza virus, and all previous events had resulted in minor losses.

Several factors may have contributed to high infection rates and the high vulnerability of Dalmatian pelicans, especially in the Prespa colony: early start of breeding combined with low temperatures (around 0 °C in February and March), high pelican densities and contamination of colony substrates by droppings of migratory ducks and resident greylag geese, which roost on pelican islets in winter.

Documentation of mortality, removal of carcasses and mobilization of authorities was challenging because of the large number of carcasses, difficult access, risks of personnel exposure, and the need to minimize disturbance to nesting pelicans. It took 7 days to remove 82% of the carcasses, almost 15 t, from the Prespa Lake colony.

Approximately 100 pairs managed to nest and raise c. 90 young. It will take decades for the population to recover, provided no other incidents occur. Considering that the highly pathogenic avian influenza virus is a serious global threat to wildlife, vigilance, increased protection measures at colonies and focused research are essential throughout the Dalmatian pelican range.

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