and 2019, but there were detections in 6 months of both 2020 and 2021, with the last record in November 2021 and a total of 20 observations of at least two individuals. Following similar protocols, camera trapping in Jbil National Park (Governorate of Kebili) and Sidi Toui National Park (Governorate of Medenine) in southern Tunisia for 14,377 and 4,006 camera-trap days during April 2019–October 2021 and October 2020–March 2021, respectively, failed to detect the species.

Our findings suggest the presence of an increasingly sedentary population of hyaenas in Dghoumes National Park, and that overall the species remains rare in Tunisia. Our ongoing monitoring will provide more information about the population size and ecology of hyaenas and other less known species in southern Tunisia.

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Rediscovery of the striped hyaena *Hyaena hyaena* in the central High Atlas after 22 years

The geographical range of the striped hyaena *Hyaena hyaena* extends from North and East Africa through Arabia and Anatolia to India, and it is categorized as Near Threatened on the IUCN Red List. The Moroccan central High Atlas Mountains have a rich and varied biological diversity and are home to > 24 wild mammal species, including the striped hyaena. With support from The Rufford Foundation, we surveyed the wild carnivores of this area during 2019–2022, concluding that a number of species have been extirpated and others are at risk of extinction. The leopard *Panthera pardus* and serval *Leptailurus serval* are extirpated, the Egyptian mongoose *Herpestes ichneumon* and common genet *Genetta genetta* have become rare, the Eurasian otter *Lutra lutra* and wildcat *Felis silvestris* less abundant, and only the golden jackal *Canis aureus*, African wolf *Canis lupus lupaster*, red fox *Vulpes vulpes* and least weasel *Mustela nivalis* are still relatively abundant.

Formerly, the last observation of the striped hyena in these mountains was in 2000. On 20 April 2022, however, an adult hyaena was killed by an inhabitant in the region of Faryata, 22 km north-east of the town of Beni Mellal, and was photographed by local residents. The publication of the video mobilized the local authorities to examine the circumstances of the killing, as capturing or killing threatened species is illegal. This record confirms the species has not completely disappeared from the central High Atlas Mountains. Our previous studies showed that the range of the striped hyaena has declined in this area and that the greatest threats to the long-term survival of this carnivore are overhunting, habitat destruction and highly fragmented populations. Measures are required to conserve the striped hyaena and other native carnivores of these mountains, including education to raise awareness about the ecological and economic roles of wild carnivores, and monitoring of native carnivores and their habitats. It is also important to manage human–carnivore interactions, such as that which resulted in the killing of this striped hyaena in April, to increase public tolerance for wild carnivores.

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Successful ex situ conservation of *Salvia daiguii*

Salvia daiguii Y.K.Wei & Y.B.Huang is a species of *Salvia* native to the Tianmenshan National Forest Park, Hunan Province, China, newly described in 2019. No more than c. 200 wild individuals are known, occurring only beside rocky streams, on cliffs and in crevices in Tianmenshan National Forest Park, over altitudes of 600–700 m. We have recommended that it should be categorized as Critically Endangered based on the IUCN Red List criteria (Wei et al., 2019, *Edinburgh Journal of Botany*, 76, 359–368). Because of its narrow geographical distribution, the species is potentially facing a high risk of extinction and conservation action is therefore required.

Since 2011, researchers have been propagating *S. daiguii* in Shanghai Chenshan Botanical Garden, both in vitro and by division, and thousands of individuals have been propagated. In addition, hand pollination was undertaken in July 2019 and 2021 at the nursery of Shanghai Chenshan Botanical Garden, where we collected 140 and 150 hand-pollinated

Propagated *Salvia daiguii* flowering at Shanghai Chenshan Botanical Garden, and hand-pollinated individuals covered with nylon mesh bags, in early July 2021. Photo: Hanwen Xiao and Yanbo Huang.

seeds, respectively. Seeds collected in 2019 were sown in petri dishes in August 2019 and 57 seedlings successfully germinated. Seeds collected in 2021 were sown in nurseries in March 2022 and 11 seedlings successfully germinated. As a result of these various efforts, thousands of *S. daiguii* plants in Shanghai Chenshan Botanical Garden produced inflorescences and started flowering in mid June 2022.

Normal germination, flowering and fruiting of *S. daiguii* in Shanghai Chenshan Botanical Garden indicates successful ex situ conservation of this species, and provides an insurance in the case of any potential threats to the small wild population. Physiological tests on plants growing in the nursery have shown that the species can tolerate high temperature and humidity, drought, salinity and acid rain. To provide information for the recovery of the wild population, we are conducting a comprehensive study of the species' population ecology, seed physiological ecology and genetics, and of artificial hybridization.

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Little time left to conserve the Asiatic cheetah

There are currently an estimated 12 free-ranging Asiatic cheetahs *Acinonyx jubatus venaticus* in the wild in Iran, excluding four newborn cubs recorded by remote cameras in 2021 and three other cubs separated from their mother in early 2021, and potentially a few individuals in North Khorasan Province for which there are not yet identifiable, independent images. Following our recommendation to the Iranian government in 2017, Iran's Department of the Environment developed a breeding programme to save this Critically Endangered subspecies (Parchizadeh & Williams, 2017, *Nature*, 552, 31). Iran is the only country where the Asiatic cheetah subspecies is known to occur in the wild (Parchizadeh et al., 2018, *Current Biology*, 28, R1141–R1142).

In a historic event, three Asiatic cheetah cubs were born in captivity in Iran on 1 May 2022. However, two of these cubs died shortly thereafter, apparently as a result of poor husbandry. According to the Deputy Head of Natural Environment and Biodiversity of the Department of the Environment, their biologists and veterinarians lacked experience with large carnivore captive breeding programmes. The Plan and Budget Organization of Iran did not provide the Department with funding to train biologists and veterinarians abroad, and in 2018 the Department ceased working with an NGO specializing in felids.

Collaborative and international cooperation has potential to resolve diverse conservation issues in Iran. For instance, in 2013 the Government of Iran partnered with Japanese experts and the UN to revive Lake Urmia (AghaKouchak et al., 2015, *Journal of Great Lakes Research*, 41, 307–311). Subsequently, the surface area of Lake Urmia was restored to $>$ 50% of its maximum size in recent decades, and migratory birds returned. We recommend the Department of the Environment consider seeking expert assistance from programmes with long-term success in breeding African cheetahs in captivity (e.g. Saint Louis Zoo, USA), as cheetahs require unique breeding and behavioural practices.

Iran has lost two felid species (the Asiatic lion *Panthera leo persica* and Caspian tiger *Panthera tigris virgata*), and there are unsubstantiated estimates of only 550–850 free-ranging Persian leopards *Panthera pardus saxicolor* remaining in the country (Parchizadeh & Adibi, 2019, *Ecology and Evolution*, 9, 11972–11978), further emphasizing the need for conservation of the Asiatic cheetah. Recovery of the Asiatic cheetah will require immediate and close cooperation among the Government of Iran and its agents (Parchizadeh et al., 2018, *Oryx*, 52, 211–212), Iranian and international experts, and NGOs.

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