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CLOCKWISE FROM ABOVE: BONY-HEADED TOAD © BENNY TRAPP; MONTSENY BROOK NEWT; PIPA PIPA FROG; ANDRIAS DAVIDIANUS ENCOUNTERED IN GUIZHOU PROVINCE © ZSL LONDON ZOO

A giant challenge

HOW A TEAM FROM ZSL IS PLANNING A SUSTAINABLE FUTURE FOR THE CHINESE GIANT SALAMANDER

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The Chinese giant salamander (*Andrias davidianus*) belongs to an ancient group of salamanders (cryptobranchids) that diverged from their closest relatives during the Jurassic period. The species is considered a global conservation priority for maintaining evolutionary history and is assessed as Critically Endangered by the IUCN. The Chinese giant salamander (CGS) is protected by Chinese law, but wild populations are still in urgent need of protection. Population declines and local population extirpations have been attributed to overexploitation to supply a rapidly growing farming industry (Cunningham *et al.*, 2016) as well as habitat loss. Whilst millions of CGS are actively farmed in China, a proportion of farmed stock is released annually in local rivers as part of a government-endorsed conservation initiative. Unfortunately these releases occur without genetic or health screening and their impact is largely unknown. In 2010, ZSL and partners began a Darwin Initiative-funded project to develop the evidence base needed to determine future conservation action for this iconic species.

Despite its large size, the current CGS distribution is unknown. Historically the species was distributed across 17 Chinese provinces, but what little research has been undertaken has not been standardised and this has prevented comparison of results across study sites. We trialled and developed standardised techniques for ecological surveys (Tapley *et al.*, 2015; Tapley *et al.*, 2017) by incorporating methods that have been successfully used for other Cryptobranchid salamanders, including both active and passive survey techniques. We also trialled and developed standardised interview surveys (Pan *et al.*, 2016; Tapley *et al.*, 2017). Ten field teams received intensive training by experienced amphibian surveyors. Between 2013 and 2016 we conducted field surveys and interviews in 97 counties across 16 different provinces in what was possibly the largest wildlife survey conducted in China. These sites were selected from across the known historical range of the species using a habitat suitability model, which we developed using open-source ecological data in combination with historical records (Chen *et al.*, 2018).

In the field we spent 7.20 cumulative person-weeks of active searching and 7.33 person-years of passive searching. During this time we detected 24 CGS at four sites representing a catch-per-unit-effort of 16.23 weeks per individual. At at least two sites where we detected CGS it is highly likely that the animals we detected had been recently released from a farm; if these data are excluded, catch-per-unit effort becomes 3.73 person-years per individual (Turvey *et al.* 2018). This effort is substantially greater than that reported for other cryptobranchid salamanders. There was evidence of CGS poaching at 24 sites, including within protected areas. Our ecological surveys were verified by the local ecological knowledge surveys, which were carried out at villages closest to each ecological survey site. We interviewed 2,872 respondents; 85.5 per cent of interviewees recognised the species, but the mean last sighting date was 18.96 years earlier (Turvey *et al.* 2018).

In collaboration with the Kunming Institute of Zoology we embarked on a study looking at CGS population genetics. We acquired samples from 70 wild-caught and 1,034 farm-bred salamanders and found that the CGS, previously thought to represent a single species, consists of at least five distinct genetic lineages (Yan *et al.* 2018). Individuals detected in our ecological surveys in the Pearl and Yangtze watersheds were of the Yellow River matriline, indicating that they were farm releases or escapes. Some of the lineages appear to be exceedingly rare and possibly extinct in the wild.

Our results provide evidence of catastrophic range-wide population declines of CGS. It is critical that legislation and enforcement is strengthened in China to ensure that any remaining wild populations are protected. Whilst we received EAZA funds to develop a conservation breeding facility for CGS in China, the lack of founding stock precluded the establishment of such a facility. *Ex situ* conservation is still needed and it is imperative that dedicated breeding programmes are established in China for each distinct lineage of CGS.

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