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PROJECT REPORT

Safeguarding the last breeding population of River Tern *Sterna aurantia* in China

XI ZHENG, CHANG-SHENG ZUO, JIAN-HUAN YANG, DING-CAN ZHANG, ZHENG-HUA YANG & BOSCO PUI LOK CHAN

Introduction

The River Tern *Sterna aurantia* occurs widely across South and South-East Asia, and has been recorded in Pakistan, India, Nepal, Bhutan, Bangladesh, Myanmar, Thailand, Laos, Cambodia, Vietnam and southern China (Gochfeld *et al.* 2020). It is classified as Near Threatened by BirdLife International (2020), but this does not accurately report the true status of the species in South-East Asia. Although India supports a healthy population of more than 50,000 individuals, precipitous population declines have been reported across South-East Asia: in Thailand it is now considered very rare; in Laos the species is very close to being extirpated; in Cambodia it has declined by more than 75% in the past 15 years and the population is now likely to be fewer than 50 individuals. In addition, in Nepal the species is now rare and very local, with an estimated maximum population of 20 individuals in 2016; in China, the species is restricted to the Dayingjiang River in south-west Yunnan, with occasional records from south-east Tibet (BirdLife International 2020).

The last stronghold of River Terns in China

Sitting at the interface of the Palearctic and Indo-Malayan Realms, the Dehong Dai and Jingpo

autonomous prefecture (hereafter Dehong, 24.43°N 98.59°E) is located in western Yunnan province, China, bordering Baoshan to the east and Myanmar's Kachin State to the west, and is the only tropical part of the Ayeyarwady drainage basin in China, supporting a rich and unique biodiversity. With the recent surge in biodiversity research, a diverse plethora of new species has been discovered here. Dehong is extraordinarily rich in avifauna: over 700 bird species have been recorded in its 11,500 km² and it has long been a popular birdwatching destination. Yingjiang county has the best forest cover in the area; it is home to the largest patch of *Shorea*-dominated dipterocarp rainforest in China and is the only location with three breeding hornbill species (Yang & Du 2006). The Dayingjiang (Taiping) River, a tributary of the Ayeyarwady, flows through Yingjiang county before joining the Ayeyarwady near Bhamo, in Myanmar's Kachin state.

The River Tern was once described as common in west and south Yunnan, along the Xishuangbanna section of the Mekong, the Ruili River (Shweli River in Myanmar) and the Dayingjiang River in Dehong (Yang *et al.* 1995). However, the species sank into oblivion until Yingjiang became a popular birdwatching destination in the early 2000s. Every

Plate 1. View of the Dayingjiang River, Yunnan province, China, where in March 2019 the third River Tern nest was found, 13 July 2019.



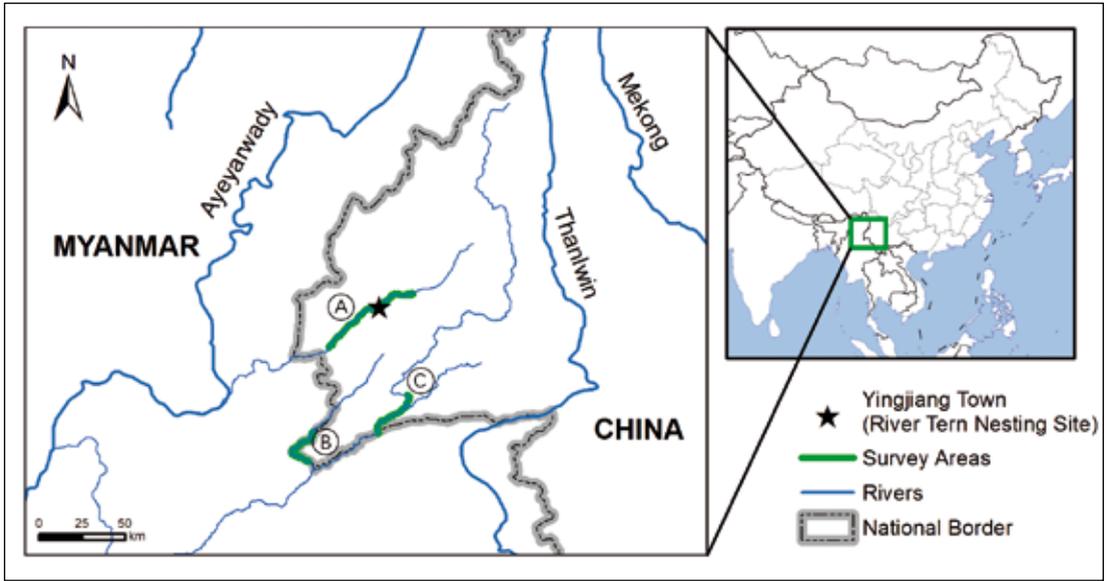


Figure 1. River Tern surveys in March 2019 covered potential habitats along three rivers in western Yunnan: A = Dayingjiang River, B = Nanwan River, C = Ruili River.

year, River Terns visit and breed along the Dayingjiang River in Yingjiang in the dry season, and this is currently the only known River Tern breeding site in China (Plate 1). However, the riverine habitat utilised by River Terns has been deteriorating and a continuous population decline has been reported in the last few years. Among the various anthropogenic pressures, hydropower development is probably the biggest threat as it alters the hydromorphology of the river and destroys critical sandbar habitat where River Terns nest. Intensive sand mining activities in parts of the river where River Terns nested further exacerbate habitat disturbance—the breeding population along the Dayingjiang River declined from 13 individuals in 2014 to seven in 2017, and only five birds were recorded in 2018 (X. Zeng pers.

comm.). These anthropogenic threats also affect other declining riverine bird species, including Little Pratincole *Glareola lactea* and the Near Threatened River Lapwing *Vanellus duvaucelii*.

River Tern field surveys

The River Tern has received minimal research and conservation attention in China despite being a highly threatened Class II nationally-protected species. A systematic survey was urgently needed to understand its current distribution and status in China. Kadoorie Farm and Botanic Garden (hereafter Kadoorie), together with Dehong Forestry Bureau and other partners, launched the nation’s first River Tern population survey from 11–13 March 2019. The joint team simultaneously searched potential

Plate 2. One of the breeding River Tern *Sterna aurantia* from Dayingjiang River, 29 March 2019.



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Plate 3. One of the three nests found along Dayingjiang River, 29 March 2019.



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Plate 4. Our team race against time to fence off the nest to keep predators at bay and increase breeding success, Dayingjiang River, 29 March 2019.

habitats along the trunk and major tributaries of three rivers in Dehong (the Dayingjiang River, Ruili River and Nanwan River) which drain into the Ayeyarwady after leaving China (Figure 1).

Six Kadoorie and 17 Dehong Forestry Bureau personnel participated in the survey; team members were divided into nine groups to cover all the potential habitat in Dehong. In total, 129 km of river was systematically surveyed in the three-day survey, resulting in seven River Terns (Plate 2) and one active nest being recorded along the Yingjiang section of the Dayingjiang River. The survey also identified several other potential breeding sites; these were re-visited during a supplementary survey on 28 and 29 March 2019 and the team discovered two more active nests (Plate 3).

Nest-site protection

Anthropogenic activities considered to be detrimental to River Tern survival were documented during the surveys. Dedicated conservation measures were then implemented to mitigate a litany of threats that might devastate nesting successes of River Tern.

Regulating water discharge by hydropower dams

Sporadic releases of water from upstream hydropower dams cause surges in water flow which may cause flash flooding and destroy the nests.

When Dehong Forestry Bureau staff received notice of a scheduled hydropower maintenance discharge in late March 2019, they immediately contacted several relevant government departments and the hydropower company. After much negotiation, a safe discharge volume was agreed in order to protect the nests. The joint team also monitored the water level continuously using a water level meter to ensure the safety of the nests.

Minimising human disturbance

According to the latest notice from local government, an official hunting and fishing moratorium is in force from 1 March to 30 June every year from 2018 to 2023 (Government of Dehong Dai and Jingpo Autonomous Prefecture 2018). However, illegal fishing activities including electrofishing were found around the nest-sites; such fishing activities not only disturb the breeding birds but also reduce their food sources. This was reported to law enforcers and patrolling was enhanced. Additionally, three villagers from neighbouring communities were recruited to protect the nests, and each nest protector was assigned one nest for daily monitoring. With the help of the local nest protectors, threats such as poaching and egg collection were prevented. The nest protectors also monitored nesting bird behaviour and the information collected will be analysed for future nest-site management.

Table 1. Nesting data for three River Tern nests in Yingjiang county, Yunnan province, China.

	Nest 1	Nest 2	Nest 3
Date eggs detected	13 March 2019	28 March 2019	28 March 2019
Date chick detected	4 April 2019	18 April 2019	13 April 2019
Incubation period (days)	23–24	22–23	Unknown
Fledging period (days)	22–23	26–27	25–26

Minimising disturbance from livestock and wild animals

One of the nests, located on a sandbar adjoining the river bank, was easily accessible to dogs and rodents and to trampling by grazing buffalo herds. To mitigate these threats, we adopted the field-proven Cambodian approach of fencing off the nest (Claassen 2018). The study from Cambodia demonstrated that nest enclosures (fences) significantly increased the breeding success of River Tern during a five-year study (Claassen *et al.* 2017). To minimise disturbance to parent birds during installation, a big team installed the fence as swiftly as possible (Plate 4).

The fence inevitably made the nesting site more obvious to casual observers. The nest protector was asked to closely monitor the nest from a safe distance and was able to stop people from approaching the fence. Leaders from neighbouring communities were also mobilised to cut off access to the sandbar to ensure that the birds could breed in peace.

Breeding success at all three nests

Three eggs were laid in all three nests, but only two eggs hatched from each clutch. According to a study of breeding River Terns in Cambodia, the average incubation period is 23.5 ± 2.6 days and the average

fledging period is 22.0 ± 1.3 days (Claassen *et al.* 2017). The incubation and fledging periods of the three nests in Yingjiang were in line with the Cambodia data (Table 1). The exact incubation period of the third nest is unknown because the eggs were laid before the nest was detected during the supplementary survey in late March.

Thanks to months of intensive conservation work, all six juveniles born in 2019 fledged (Plate 5); they were flying very well, and taught to fish by their parents. The terns started to leave the breeding sites in early June and the last juvenile left on 1 July 2019. With concerted efforts from the joint conservation team, the successful breeding of all three nests had doubled the number of this imperiled population from seven to 13 individuals.

Raising awareness and capacity building

To raise the awareness of local communities about this overlooked species, billboards were installed at major road and bridge crossings along the river (Plate 6) to make sure the conservation message reached a wider audience. We printed 2,000 leaflets for distribution in the surrounding communities to raise the awareness of River Tern conservation, wildlife protection laws and regulations. Kadoorie and the Dehong Forestry Bureau also hosted two

Plate 5. Immature River Terns, Yingjiang county, Yunnan province, 23 May 2019.



Plate 6. Billboard erected near River Tern nesting site to raise awareness, Dayingjiang River, July 2019.

educational funfairs for the public on 21 June and 13 July 2019, which attracted 317 and 151 local residents respectively (Plate 7).

Training and experience from the project proved to be a great capacity-building opportunity for local forestry officials and volunteers. Three training workshops were organised by Kadoorie before the field survey and educational funfairs. All field surveys, conservation interventions and community outreach activities were carried out by the joint team to ensure that local participants received adequate training and on-site guidance. Local forestry officials, volunteers and nest protectors trained during the project will also be an invaluable resource for future conservation work targeting this highly endangered species and other bird conservation projects.

Plate 7. Children heard about the ecology and conservation of waterbirds, including River Terns, at educational funfairs organised by Kadoorie Farm and Botanic Garden and Dehong Forestry Bureau in Yingjiang town, Yunnan province, China, 13 July 2019.



Future conservation plan

The River Tern is reported to be a sedentary species with some short nomadic movements (Gochfeld *et al.* 2020). However, the whereabouts of the Yingjiang River Terns between July and December is currently unknown. It is our hope to investigate the movements of these River Terns with the help of tracking devices so that we can expand our conservation network to ensure their safety throughout their annual cycle. The breeding sites of River Tern discovered in 2019 were located upstream of the Yingjiang National Wetland Park, which covers 20 km of the Dayingjiang River and its floodplain. Kadoorie and Dehong Forestry Bureau will discuss the possibility of expanding the wetland park to include the river section containing the known breeding sites with the relevant government authorities.

We also plan to continue working on the monitoring and conservation of other riverine species sharing the same Dayingjiang River habitat, especially the healthy populations of River Lapwing and Little Pratincole, which are also in decline in South-East Asia. The conservation measures taken to protect River Terns will also benefit these species.

[Editors' note: As this article went to press, we learnt from the authors that, unfortunately, only five individuals returned to the breeding site in 2020. With continued conservation efforts, six juveniles fledged in June 2020, making the total population in Yingjiang county 11 individuals. This sad state of affairs following all the efforts made underlines the necessity to discover the whereabouts of the Yingjiang county River Terns between July and December.]

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