


Fire and Passion – *ensuring the survival of the Chinese alligator*



A small, beautiful and inoffensive reptile, the Chinese alligator is the most endangered of the world's 23 species of crocodylians. But as befits the inspiration behind the myth of the fire-breathing dragon, it has thankfully proved to be hard to extinguish and it still survives, albeit in very small numbers in the wild. Colin Stevenson and Joe Abene report from the frontline in the battle to save this species.

Standing on the edge of a small pond, it is not immediately apparent that dragons lurk beneath our feet. Then through the chill morning air, a dark shape breaks the surface, and the creature's exhaled breath rises in a smoke-like plume above the water. This part of eastern China, amid a landscape turned to agriculture, is home to a creature entwined with dragon myths and conservation woes - the Chinese alligator (*Alligator sinensis*), whose future is now imperilled.

The plight of this species was first highlighted in 1999 by John Thorbjarnarson of the Wildlife Conservation Society, when surveys revealed alarmingly low numbers of Chinese alligators in their last stronghold of Anhui province.

The lesser-known relative

When most people think 'alligator', the image that comes to mind is that of the large American alligator – an iconic species and a symbol of how effective modern conservation techniques can be. Within

40 years, the American alligator (*Alligator mississippiensis*) has gone from endangered to numerous in the south-eastern USA.

In contrast, most people are not even aware that there is a Chinese alligator, or that it has become one of the most endangered reptiles on the planet. It is a significantly smaller species, growing to a maximum length of around 2m (6.5ft) and weighing perhaps 40kg (88lb), as compared to double that length and many times that weight for its largest American relatives.

Up until a few hundred years ago, there were possibly three crocodylians in southern China: the saltwater crocodile (*Crocodylus porosus*) and the false gharial or tomistoma (*Tomistoma schlegelii*), plus the Chinese alligator itself. It is likely that tomistoma disappeared from China during the Ming dynasty (1368-1644), and the saltwater crocodile perhaps even more recently. Many historical accounts of large crocodylians in China almost certainly refer to these species, rather than the alligator. Reports of the possible continued existence of saltwater crocodiles in extreme southern China

currently remain unverified.

As a unique, endemic species to China, the Chinese alligator is an important animal. It has strong links with Chinese culture, is the only alligator existing outside of the Americas, and helped to give rise to the mythology of the dragon which has become widespread today. We feel it is essential to ensure this species maintains its place as the earth dragon of southern China.

A dragon's life

Chinese alligators are fascinating creatures. They used to range across the marshlands and extensive lakes of the middle and lower Yangtze River from Shanghai to Jianling City, but now, they are restricted to marginal habitat. The small ponds where they occur can experience cold winters, and the alligators employ a complex system of burrows to protect themselves from environmental extremes that tropical crocodiles and caimans simply could not tolerate.

These burrows, or dens, may extend back as far as 25m (82ft) from their opening



Earth dragon

Historically, Chinese alligators have been called T'o long: the earth dragon. T'o also represents fairly accurately the sound of their coughing-like grunts at mating time. These days, the locals call them the Yangtze alligator, or "Yangzi'er". In his travels to the East, Marco Polo wrote of a huge serpent that emerged from its burrow at night – giving more fuel to dragon legends. This propensity for burrowing and the clay-based mud within their habitat serve to explain why the species has become known as the 'earth' or 'muddy dragon'.

above the waterline in pond banks. South-facing entrances take advantage of the sun's angle during spring and autumn. Even alligators are aware of the estate agent's mantra of 'location, location, location'...!

Construction or extension of the burrows is a summer activity. By using their snout and limbs to dig into the soil, the alligators slowly excavate a burrow, pressing against the walls to compact and smooth the sides. Completed dens have chambers for turning, as well as sleeping and hibernating. If the den extends below the ground water level, there is even an indoor pool!

Males will tend to have smaller burrows, with perhaps two chambers, whilst females have mansions: sometimes as many as 20 chambers to accommodate young alligators for the first years of their life. As the young gators grow, so they will dig themselves separate chambers, which adds to the complexity of the main burrow. In flood-prone areas, there are often air holes to the surface, which provide ventilation and allow the alligators to float to the surface in times of flood.

The yearly cycle

October sees the start of the winter hibernation period. Within the burrows, the temperature remains a fairly constant 10°C (50°F), compared to outside air temperatures that may dip below freezing in Anhui province. In summer, despite outside temperatures climbing to 35°C



Active burrow, being used by an alligator

© Joe Abene.



Chinese alligator feeding on a fish. These reptiles are not a danger to people.

(95°F) or more, the burrows stay around 25°C (77°F).

Alligators emerge from their dens in March or April, and courting starts around May, continuing into June. Females build their nests by scraping together vegetation into a mound that in the case of this Chinese alligator will measure around 91cm (3ft) wide by 46cm (1.5 ft) high. The nesting season peaks in late June or early July, about one month after mating, when water levels are at their highest. The nests are built on elevated sites to avoid flooding, and many nests of wild Chinese alligators are found on islands. Females lay anywhere from 5 to 52 eggs, although the average is 20. Incubation periods for the species typically last 56-60 days.

During September, the young alligators

will hatch. Chinese alligators show parental care, and the mother will open the nest and assist the young as they emerge from their eggs, taking them to the water and remaining with them for the first year or two of life. Hatchling Chinese alligators are the smallest of the crocodylians, around 21cm (8.2in) long and weighing a tiny 30g (1oz). Their 'cuteness' cannot be exaggerated! The young gators are black, or dark grey, with very distinct bands of whitish-yellow, which fade to a uniform grey colour with age. Their lifespan in captivity exceeds 60 years.

Young Chinese alligators feed on aquatic insects and fish. As they grow, the diet changes to include larger prey: rats, rabbits, ducks, as well as river snails, shrimp, mussels, frogs will all be eaten



A beautiful hatchling Chinese alligator

© Joe Abene.



Examining a wild nest.

© Joe Abene

Sex determination

The sex of the young, as with all crocodylians, is determined by the incubation temperature. Whilst the precise thresholds are not fully understood for the species, temperatures of around 28°C (82°F) produce females, 31°C (88°F) gives a mix of males and females, and 33-35°C (91-95°F) yields mainly males.

More studies are required for these to be confirmed, and most crocodylians exhibit a female:male:female ratio, where more females develop at both extremes of the safe temperature range, and males develop at temperatures slightly above the mean. Joe is assisting in a study of this in nests in the wild, with his Chinese colleague and project leader Dr Zhang Fang.

Habitat

Vast stretches of wetland are things of the past in southern China. Forests have been cut down, river flows modified, and agriculture granted priority. Within the protected area of the National Chinese Alligator Reserve (NCAR), there are thirteen sites at which wild alligators definitely occur. However, given the scarce habitat left for them, they are also found in various hill ponds both within and surrounding the NCAR. These hill ponds are a last refuge for a remarkable animal that has simply nowhere else left to go.

The species is now found only in three broad habitat types:

- ▶ Best: remnant wetlands in low valleys.
- ▶ Intermediate: ponds in low hill valleys, with significant agriculture above the pond.
- ▶ Marginal: artificial ponds created by damming streams, edged by rice cultivation or tree plantations.

The relict wetland habitat sites are small in size, but support around half the wild alligator population. The rivers that once flowed through the valleys have been dyked and modified, leaving a series of small ponds instead. These have good, rich soil for burrowing and plenty of prey species. However, they are still surrounded by agriculture, with rice paddies extending right to the water's edge of alligator ponds.

The artificial pond habitats are the most

marginal for alligator ecology. However, they have low levels of human use. Whilst alligators can survive in these ponds, surveys reveal that they often abandon these sites, and move lower down the valley to other ponds. These areas have poor soil for burrowing, little in the way of suitable prey species, and sites that are not very good for nesting. The difficulty in burrowing has caused alligator deaths in recent years

during the cold winters.

The intermediate sites are most variable, ranging from small ponds in rice fields to medium-sized hill ponds, again surrounded by farm lands. The two largest protected sites are of this type. Since these are relatively large, they represent almost half of the area within the protected zones for Chinese alligators, although they contain only about 25% of the wild population. ▶

The alligator's habitat.



The alligator's habitat.

© Joe Abene.



Farmer watching over nesting alligators on his land © Joe Abene.

Status

Chinese alligators are the most endangered of the crocodylians in the wild today. Current estimates give figures of around 100-110 animals. In reality, these figures may well be optimistic, with the population probably having fallen by a quarter since the 1980s.

The species has been listed as a Class 1 endangered species since 1972 in China, and the thirteen main sites that have alligators are within the NCAR. However, enforcement of their endangered status was never strong, and the reserve exists in name only. Rice and other crops extend to the water's edge of the alligator ponds; cattle graze and destroy the banks and burrows; chemical run-off goes into the water and poisoned rats killed around farm houses are thrown into ponds and eaten by alligators.

In the past, alligators were sometimes killed as they ventured across farm land in search of suitable ponds although farmers

are now paid as a way of protecting them. However, ducks are a delicacy in China, and alligators unfortunately share this taste, which is not appreciated by poor farmers who rely on the income from the birds.

In order to survive, the alligators have a number of basic habitat requirements. They require ponds with vegetative cover (which is especially important to help young alligators to avoid predators), banks which allow them to excavate burrows in, soil that will not collapse as a result of tunnelling activity, areas where they can bask undisturbed, suitable nesting sites, and sufficient prey.

These habitats are almost entirely gone now. Ponds that have islands are now favoured by alligators, as the island offers them a refuge. As mentioned earlier, many of the nests we find of wild Chinese alligators are located on islands, as these offer undisturbed locations that allow the eggs to incubate to full term.



Children pointing out the entrance to an alligator burrow.

The Anhui Research Centre

Sadly, the Chinese alligator has become a creature without a home. The ironic part is that the Chinese forestry authority was actually working hard on alligator conservation nearly 30 years ago. Starting back in the late 1970s, they began to collect alligators and take them to a new, specially-constructed breeding centre called the Anhui Research Centre for Chinese Alligator Reproduction (ARCCAR). This centre is where most research has been – and continues to be – carried out. They have been very successful in breeding the species there, and it now houses around 10,000 of these alligators.

During the initial stocking of the centre, around 212 adult alligators were captured and moved to the centre. Then, wild nests were opened and the eggs taken back to the centre for incubation. While this aided breeding and research, the wild population of alligators continued to plummet,



A view of the ARCCAR breeding centre © Joe Abene.

essentially because of the almost total loss of habitat. No-one was protecting the wild population, or the areas in which they lived.

The ARCCAR is registered with CITES as a breeding centre, and the alligators bred there can be traded on CITES Appendix 2, while their wild counterparts are listed on Appendix 1. The aim was to raise funds by selling alligators and alligator products. However, demand was low, and this never realised substantial sums.

Several exports of live alligators have been made to Europe for the pet trade, and some alligators have again been available this year to licensed keepers. These exports only help to pay the high costs of maintaining the breeding centre though, and are not aimed at wild alligator conservation. Buying that cute little Chinese alligator does not help the wild population, unless the acquisition is used to educate people about the species, which is possible especially in public collections.

The future

There are, it must be said, a lot of people in China - over a billion people. The average is 119 people per km² (0.4ml²). Such huge numbers and their need for cities, infrastructure, food, water and other similar requirements is always going to create difficulties for wildlife.

But there is hope. We are quietly optimistic about the Chinese alligator's future. China is capable of amazing things, and the alligator is a tenacious survivor. Indeed, the fact that there are still small populations of breeding alligators in a landscape so removed from their ideal habitat is testament to their ability to survive in the face of adversity.

In recent years, several trials of releases



Colin with a potential breeding male Chinese alligator at the Danish Crocodile Zoo © Colin Stevenson.

of alligators have been made. The animals have been captive-raised alligators from either ARCCAR or American Zoos. So far, three sites have had alligators released, and monitoring of these sites shows that they are not only surviving, but successful nesting has occurred at each site too. These are at Hongxing, Gaojinmiao Forest Farm, and Chongming Island near Shanghai.

The most recent alligator surveys indicate that there are now nineteen sites that have resident alligators in the wild. The population, though still alarmingly small, seems stable and is even increasing at some sites. During a meeting in 2001, various Crocodile Specialist Group (CSG) members were delighted by the determination of the Chinese to learn from experiences of their overseas colleagues, and begin taking further steps toward ensuring the Chinese alligator's survival.

This year, Joe will return to China with hopes of having further sites set aside for

habitat restoration and the subsequent release of alligators in a few years. The main aim of conservation work for the species really calls for complete protection of existing alligator sites, new sites to be set aside and restored, and on-going monitoring to maintain a watchful eye over the entire population. The Chinese authorities have the capacity to achieve this, and both Chinese and Western crocodile specialists are passionate to keep working towards their shared goal. ■

About the authors: *Colin and Joe are both members of the IUCN/SSC Crocodile Specialist Group. Colin moved to the UK from his native Australia and runs Crocodile Encounters, as well as being Vice Chair of the CSG's Tomistoma Task Force, and involved in gharial conservation. Joe is formerly of the Bronx Zoo, where he was co-ordinator of the American Zoo and Aquarium's Chinese Alligator Species Survival Plan. He now travels to China to continue the vital field work for this species.*

Chong Ming Island release site. © Joe Abene/Lu Shunqing



Gator Aid

If you want to help us ensure that the Chinese alligator does not become the first crocodylian to go extinct in historical times, then please contact the authors: coleosuchus@hotmail.com