

Int. Zoo Yb. (2015) **49**: ••–••

DOI:10.1111/izy.12066

Conservation of the Indian Gharial *Gavialis gangeticus*: successes and failures

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The Gharial *Gavialis gangeticus*, a long-snouted crocodilian endemic to the Indian subcontinent, is Critically Endangered and has teetered on the brink of extinction for the past several decades. From historical populations of perhaps 10 000 animals, Gharials numbered in the hundreds by 1974. Project Crocodile – an Indian government initiative – became a poster boy for crocodile conservation. Based almost entirely around a head-starting programme, the effectiveness of Project Crocodile was called into question when populations crashed again in the late 1990s. In the 21st century, with the support of the international zoo community and the International Union for Conservation of Nature/Species Survival Commission's Crocodile Specialist Group, Madras Crocodile Bank Trust began to address the shortcomings of Gharial conservation up to that point, to ensure that future plans for the species would succeed.

Key-words: community education; community engagement; conservation; crocodilian; gharial; India; release.

INTRODUCTION

The Gharial *Gavialis gangeticus* is taxonomically unique: it is the sole survivor of the genus *Gavialis*, although molecular studies indicate that the Tomistoma *Tomistoma schlegelii* from Malaysia and *G. gangeticus* are sister taxa (Dessauer *et al.*, 2002) (Plate 1). Largely defined by its long and thin jaws, the Gharial is equally unique among crocodilians in that mature animals are sexually dimorphic: the ♂♂ develop an enlarged nasal protuberance called a 'ghara', after the Hindi word for a clay pot. This ghara is also from where the species name is derived. Crocodilians are very vocal animals and the ghara is thought to act as a sound resonator, as well as a visual indicator of sexual maturity.

Gharials inhabit the river systems of northern India and Nepal, although historical populations – now considered extinct – occurred in Bhutan, Myanmar and Pakistan, with stray individuals still reported from Bangladesh. The preferred habitats for the species are wide rivers with high sand banks and deep pools (Plate 2). Gharials are most often seen basking on sand banks or islands mid-stream and will move into the water following any unusual disturbance. Much more adapted for aquatic life than other crocodilians, the Gharial's legs do not allow them to move rapidly or any great distance on land (Whitaker & Basu, 1983). During the wet-season monsoons, Gharials move into side channels to avoid the heavy flows of the main river channels. The National Chambal Sanctuary in India, stretching across the states of Rajasthan, Madhya Pradesh and Uttar Pradesh, is home to the largest, most-stable and most-studied Gharial subpopulation remaining in the wild (Rao *et al.*, 1995; Stevenson & Whitaker, 2010). Chitwan National Park in Nepal has a small but equally well-studied Gharial population. Corbett Tiger Reserve in Uttarakhand, India, has a small breeding population of Gharials, which are subject to ongoing studies (Chowfin & Leslie, 2013, 2014).

The Gharial's long and narrow jaws are always associated with a predominantly fish diet. Indeed, these jaws allow them to swing their heads around very rapidly underwater to catch fish (Whitaker & Basu, 1983; Thorbjarnarson, 1990; Whitaker, 2007).



Plate 1. Juvenile Gharial *Gavialis gangeticus* at Madras Crocodile Bank Trust, Chennai, India. Colin James Stevenson.



Plate 2. Nesting site for several Gharials *Gavialis gangeticus* along the Chambal River, India. Note the high sand bank. Colin James Stevenson.

However, Gharials are large animals, with ♂♂ attaining lengths over 5 m, and have been known to eat dogs and even goats – although such sightings are not common (Neill, 1971; Whitaker & Basu, 1983; Steel, 1989; Trutnau & Sommerlad, 2006).

THREATS

As with most crocodylian species, unregulated hunting for the skins took a heavy toll

on Gharial populations across the range (Whitaker, 1987; Rao *et al.*, 1995). Although hunting has largely ceased during the past several decades, isolated occurrences are still reported; for example, in the Betwa River area (Nair & Katdare, 2013). Gharials are still killed occasionally by fishermen if the animals are caught in nets. The main threats to the Gharial are the following.

- Poor enforcement of existing protection laws.



Plate 3. Gharial *Gavialis gangeticus* at the National Chambal Sanctuary, Morena, Madhya Pradesh, India. Bridge construction and water extraction units severely restrict water flow of the River. Colin James Stevenson.

- Dams and water extraction.
- Fishing.
- Sand mining.
- Pollution.
- Egg harvesting.
- Riverbank disturbance.

Individually, these threats affect Gharials at the local level but together they are impacting not only Gharial populations as a whole but all aquatic wildlife (Gharial Conservation Alliance, unpubl.). India's natural resources are strained with a growing human population that is already extreme. Extraction of water for irrigation and drinking-water, and the flagrant disregard for environmental laws that sees untreated effluent and toxic chemicals flow directly into rivers, are having serious and deleterious effects on the riverine ecosystems.

River flows have been changed so dramatically that rivers such as the Chambal are reduced to a trickle during the dry season. The impact on Gharials is equalled by its impact on Ganges river dolphins *Platanista gangetica*, turtles, fish and other species (Hussain, 2009; Wildlife Institute of India, 2011). Dams, barrages and water extraction alter the stream hydrology such that sections

of the river become impassable barriers, fragmenting populations and having a deleterious effect on water quality and habitat degradation (Gharial Conservation Alliance, unpubl.). Such disturbances also increase access for predators to Gharial nests (Nair, 2011).

Fishing nets will continue to cause problems for Gharials as they are the most common form of catching fish, even in protected areas. Gharials and other species are caught in these nets, some drowning, some being fatally injured or killed directly by fishermen. Eggs are also still harvested for food in some areas (Whitaker, 2007).

If you travel along a stretch of the Chambal River, for example, there are very few areas where human impact is not seen (Plate 3). Boat activity, agriculture, washing, bathing, cattle grazing, fishing and sand mining are rife. Sand mining remains one of the serious concerns as the impact is striking. Sand mining not only removes important sand banks that would be used by Gharials for nesting but also it alters the dynamics of entire sections of rivers, causes a high level of disturbance to the wildlife in the area and, although illegal, continues to be widespread.

Mafia-driven, sand mining is difficult and dangerous for local enforcement officers to stop. Local communities are offered high rates of pay to participate in the activity. When these threats are combined, the situation for the conservation of the Gharial becomes dire (Basu, 1980; Andrews & McEachern, 1994; Stevenson & Whitaker, 2010; Nair, 2011).

Quite apart from these threats, Gharials also face natural predators over the first year or two of life, as do all crocodylian species. Both ♂ and ♀ Gharials exhibit parental care, with the hatchlings congregating in large crèches near the adults (Bustard, 1984; Lang, 2010). Despite this, nests are predated by jackals, wild pigs, monitor lizards, bandicoots, mongoose, honey badgers and even rats (Chowdhury, 1981; Whitaker & Basu, 1983; Hussain, 1999; Chowfin & Leslie, 2013). Young Gharials are vulnerable to large wading birds, birds of prey, domestic dogs, large catfish *Bagarius* sp and even the large soft-shelled turtles of the *Chitra* genus (Whitaker & Basu, 1983) and otters (Srivastava, 1981).

During the monsoons, young Gharials take shelter in side channels (nullahs) away from the fast-flowing waters of the main channel (Chowdhury, 1981; Whitaker & Basu, 1983). However, release of waters from dams and barrages can result in destructively high water levels that wash away nesting banks, and cause the loss of young animals to the strong flows (Chowdhury, 1981; Singh, L. A. K., 1985; Rao *et al.*, 1995; Hussain, 1999).

GHARIAL STATUS IN THE 20TH CENTURY

Up until the early 1900s, Gharials could be seen in significant numbers along many of the rivers in northern India and Nepal (Hornaday, 1885; Inglis, 1892). Inglis (1892) writes that 'the *nakar* or long-nosed species may be seen in countless numbers in any of the large streams'. The inferred population in the early 1900s is estimated at between 5000 and 10 000, across a huge range of over 20 000 km² (Chowdhury *et al.*, 2007).

Estimates of historical numbers are always 'ball park' at best. However, all indications

are that Gharial numbers were high across its former range. After the unregulated hunting that almost all crocodylian species were subjected to in the early to mid-20th century, it was clear that Gharial numbers had plummeted (Biswas, 1970; Whitaker, 1975; Singh, V. B., 1978). Surveys carried out in 1968 by Zoological Survey of India and in 1973–1974 by Madras Snake Park personnel, and other researchers during this period led to the conclusion that numbers had dropped to around 200 animals in the wild (Biswas, 1970; Whitaker *et al.*, 1974; Basu, 1980; Stevenson & Whitaker, 2010). There was unanimous agreement that something needed to be done quickly to prevent the extinction of the Gharial. A preliminary survey by R. H. Bustard in 1974 led him to conclude there were perhaps 60–70 adult Gharials in the wild (Bustard, 1977, 1999).

Little is written about the disappearance of the Gharial from Pakistan (Indus River straddling the Pakistan/India border), Myanmar and Bhutan. In Bangladesh, there are still reports of individual animals sighted in the Padma River, and in 1985 a total of 28 Gharials was estimated to be in that country (Faizuddin, 1985). This report was pessimistic about the future of the species in Bangladesh and no nesting has been reported since 1990 (Stevenson & Whitaker, 2010).

In 1972, India introduced the Wildlife Protection Act. Under this Act, the three native crocodile species – Gharial [Critically Endangered (CR): IUCN, 2014], Muggar crocodile *Crocodylus palustris* (Vulnerable: IUCN, 2014) and Saltwater crocodile *Crocodylus porosus* (Least Concern: IUCN, 2014) – received protection; and this protected status remains in place in India. In 1975, India's Project Crocodile was established, led by Dr R. H. Bustard.

PROJECT CROCODILE

This Project began with grand aims, fully financed and backed by the Indian government. By all accounts, the crocodile project should have seen the comeback for the



Plate 4. Young Gharial *Gavialis gangeticus* at the rearing station at the National Chambal Sanctuary, Morena, Madhya Pradesh, India. Colin James Stevenson.

Mugger crocodile, the Saltwater crocodile and the Gharial in India.

The aims of Project Crocodile were as follows.

- Create sanctuaries to protect the remaining crocodiles.
- Use 'grow and release' techniques to rebuild crocodile populations.
- Promote captive breeding.
- Increase research efforts to improve management.
- Develop and train personnel to continue the project.
- Involve local people in the project.

If all the proposed aims had been implemented fully, this Project had the scope to ensure the future of all three species of crocodiles in India. Some of the achievements are quite impressive; for example, the establishment of the Central Crocodile Breeding and Management Institute in Hyderabad, which later became the Crocodile Research Centre of Wildlife Institute of India, and another 15 rearing centres for crocodiles were established. Several of the early team members went on to become respected members of the International Union for Conservation of

Nature (IUCN)/Species Survival Commission (SSC) Crocodile Specialist Group. For the Gharial, the creation of several sanctuaries was a significant development and, at the time of writing, the National Chambal Sanctuary holds the largest population of wild Gharials.

However, even at the early stages, zoo involvement was integral to Project Crocodile. Captive breeding of the Gharials was targeted for Nandankanan Zoological Park in Orissa state, India. In order to establish the breeding group, a large ♂ Gharial was flown in from Frankfurt Zoo, Germany, rather than capture an animal from the wild. Shortly after, the world's first captive breeding of Gharials took place at Nandankanan Zoo, and the number of eggs laid each year was double the number of adult Gharials estimated to remain in the wild (Bustard, 1999).

Project Crocodile was long held up as a model against which other crocodile programmes would be measured. The captive breeding and rearing of the three crocodile species quickly saw numbers build up in the rearing centres (Plate 4). In the 1980s, releases of all three Indian crocodile species into the wild began. The model was basic. The

aim was to collect eggs from the wild, as well as achieve captive breeding, rear the young until they were predator-proof at around 1 m (3–4 years of age) and then release them into areas with existing Gharials. The total number of animals released to date is around 4500 in India (Gharial Conservation Alliance, unpubl.) and 890 in Nepal (Khadka *et al.*, 2013) under a similar head-starting scheme.

By the late 1990s, all indications were that the Gharial populations in the various regions targeted for release of animals were recovering. From lows in the 1970s of around 200 animals, Gharial populations were estimated at around 1675 in 1997/1998 surveys (Sharma, 1999). Most of the wild Gharial population was located in the National Chambal Sanctuary (Bustard, 1999).

Writing in a special crocodile issue of the *ENVIS Bulletin* of the Wildlife Institute of India (Wildlife Institute of India, 1999), Bustard commented that, despite the numbers of Gharial released under the project, ‘no systematic monitoring is being carried out. This is unsatisfactory’ (Bustard, 1999).

Indeed, despite the best of intentions, and the tremendous cost and effort undertaken, there were fundamental problems. Any surveys that had been conducted were not carried out with a uniform methodology, which made it difficult to ascertain the effectiveness of the head-starting programme. There was uncertainty as to whether the numbers of Gharials recorded simply reflected the most recent releases into those sanctuaries. It was also not possible to determine the survival rates of the animals that had been released.

Furthermore, there was too much focus on the rearing and releasing components of the Project, and no effective effort to secure habitat or enforce protection of the animals in the wild. Not only were the threats to the Gharial still present but they had in fact increased. Of the listed aims of the Project, little had been done to involve local communities, which is considered a key failure of Project Crocodile (Whitaker, 2007).

In 1995, many researchers and conservationists were starting to question the effec-

tiveness of Project Crocodile for the conservation of Gharial. A Population and Habitat Viability Assessment (PHVA) workshop was carried out, with assistance from the IUCN Conservation Breeding Specialist Group, to assess the Gharial and make recommendations for future conservation and management plans. One of the recommendations from the PHVA was for an annual census to be carried out in each population using standardized methodology. The results of the PHVA also led to the recommendation that a central coordinating unit be established in order to bring together the different states and agencies involved in conservation activities for the Gharial (Rao *et al.*, 1995).

Unfortunately, there was almost no follow-up to the PHVA exercise. In 1996, Project Crocodile was considered successful (Singh, L. A. K., 1999) and funding was withdrawn. No surveys were carried out between 1998 and 2003 on the wild population of Gharial (Whitaker, 2007). In hindsight, it seems that the restocking programme at least ensured that existing Gharial populations remained to some degree. However, efforts to reintroduce Gharials into areas where they had been extirpated did not succeed (Stevenson & Whitaker, 2010).

GHARIAL CONSERVATION IN THE 21ST CENTURY

Within the National Chambal Sanctuary, dolphin surveys carried out in 2001 observed intense fishing operations on the Chambal River. Arrangements were made for a Gharial survey to be carried out in early 2003 (Sharma & Basu, 2004). The results of this survey revealed a drastic reduction in Gharial numbers. From 1289 Gharials reported in the 1997–1998 survey, 514 were recorded in 2003 and 552 in 2004 (Sharma & Basu, 2004). The Gharial population from just 5 years prior had been reduced by half.

Once again an urgent response was required from conservationists to save the Gharial. This time, the IUCN/SSC Crocodile Specialist Group formed a Gharial Task Force, based at Madras Crocodile Bank Trust

(MCBT) in Chennai, India. MCBT was the pre-eminent crocodile facility in the region and the ideal base for such a team. Formed of Crocodile Specialist Group members from around the world, and primarily from international zoos, the Task Force began to garner support and funding for Gharial conservation.

When the Task Force became fully a project of MCBT, the name was changed to Gharial Multi Task Force, in recognition that many strands of expertise were required to tackle the problems effectively. The name changed again to the Gharial Conservation Alliance (GCA) in 2007. The funding for GCA has always come from MCBT and international zoos, with various grants for surveys secured as needed.

With funding from Cleveland Metroparks Zoo, OH, USA, and San Diego Zoo, CA, USA, surveys were carried out by MCBT in 2006. This provided a baseline measure of the status of Gharial throughout much of the range of the species (Andrews, unpubl.), and formed the basis of uplisting the Gharial from Endangered to CR on the IUCN Red List (Choudhury *et al.*, 2007). The criteria for the assessment were a 96% decline in Gharial numbers across three generations, and an estimated reduction in population size between 1997 and 2006 of around 58%, leaving fewer than 250 mature individuals. Well within a single generation, the numbers had dropped dramatically (Choudhury *et al.*, 2007).

The formation of the GCA also meant that one of the recommendations from the PHVA of 1995 was fulfilled: that is, that a central coordinating body be created for Gharial conservation activities. Funding from Krokodille Zoo, Esbjerg, Denmark, also helped to provide a full-time coordinator for GCA activities.

2007–2008 MORTALITY EVENT

After the 2007 publication of the Red List assessment and with the species listed as CR, interest in Gharial conservation increased –

particularly within the international zoo community.

However, at the end of 2007, Gharials suffered another blow. The main population remained in the National Chambal Sanctuary (Andrews, unpubl.), containing most of the known breeding population in the wild. Across the winter of 2007–2008, over 100 adult and sub-adult Gharials were found dead within a short section of the Chambal River (Huchzermeyer *et al.*, 2008; Gharial Conservation Alliance, unpubl.). To date, the cause of this mass mortality remains unknown, although kidney failure and gout found on necropsy were consistent with damage caused by a toxicant (Huchzermeyer *et al.*, 2008). Toxins in the River, Gharials feeding on *Tilapia* sp from the heavily polluted Yamuna River and an unseasonably cold winter were all implicated (Stevenson & Whitaker, 2010; Singh, S., *et al.*, 2011; Lang & Kumar, 2013).

The important factors in this mortality event were (1) the concentrated area affected (between 12 km above the Chambal/Yamuna confluence and 75 km upriver), (2) only sub-adult and a few adult Gharials (chiefly in the 2–4 m total length range) succumbing, and (3) no real evidence of other aquatic species being affected (Lang & Kumar, 2013).

Once again, this blow to the Gharial sparked international action. MCBT and the Crocodile Specialist Group instigated immediate investigations from international crocodilian veterinarians, with assistance of the government of India, which fast-tracked visas and travel details. Unfortunately, most of the Gharials examined were in a state of decay and suitable samples could not be obtained to pinpoint any one specific problem. Even more unfortunate was the fact that samples were mislaid and poorly stored in laboratories. Once again, despite a strong response, failures of implementation hampered conservation efforts.

It is unlikely that the specific cause of the 2007–2008 mortality event will ever be identified. However, this event gave impetus to a new project to use radio-telemetry to investigate how Gharials were using the River, and

determine whether seasonal movements could help explain the small area and the restricted size of the affected individuals. The Gharial Ecology Project (also known as the Gharial Telemetry Project) initially tagged ten animals in March 2009 and a further ten in November 2010 (Lang & Whitaker, 2010; Lang & Kumar, 2013). These animals were successfully tracked until mid-2013, when the end of the battery life in the transmitters was reached.

The telemetry study continues at the time of writing, with a further 20 Gharials caught within the National Chambal Sanctuary and transmitters attached in November 2013. Already, this study is telling us much about the biology and ecology of the species, including parental care (Lang, 2010; Lang & Kumar, 2013) and spatial movements (Lang & Whitaker, 2010).

Sub-adult Gharials tagged in this study have shown a very narrow range of seasonal movement. These animals live close to the area of the mortality event, which indicates that the animals affected in that 2007–2008 event were resident animals, not those that had moved any great distance seasonally. Conversely, most of the adult Gharials would have moved further upstream to join dry-season basking and breeding groups, and to find suitable nesting sites. These aggregations can number over 60 animals (Lang & Kumar, 2013). These data explain why the deaths were largely restricted to juvenile or young adult animals. This study disproves one of the strongest suggestions as to the cause of the 2007–2008 mortality event; namely that Gharials were moving into the Yamuna River, where the pollution originating from the huge cities of Delhi and Agra affected them. The study does not support such movements and instead narrows the area to a 15 km section between the Udi and Sashon Bridges, and perhaps to a point source of toxins as the culprit (Lang & Kumar, 2013).

GOING FORWARD

The GCA is committed to follow the recommendations from the *Gharial Species Recov-*

ery Plan (Gharial Conservation Alliance, unpubl.), and the Crocodile Specialist Group Action Plan of 2010 (Stevenson & Whitaker, 2010). Both these reports were compiled specifically to provide a blueprint for Gharial conservation. The GCA does not believe that head starting is a useful strategy while the threats to the Gharial are still present in the habitats identified for release.

While it is an easy sell, and politically very visible, releasing Gharials that have been raised in captivity is ineffective unless the habitat is being protected and the Gharial populations are being monitored in a standardized manner. The important factors for the planning and implementation of a release programme, and monitoring and management of the animals post release are all clearly stated in the *Guidelines for Reintroductions and Other Conservation Translocations* (IUCN, 2013). This essential planning and monitoring is not happening currently for Gharial and regular surveys are only being undertaken in some sections of the National Chambal Sanctuary (Sharma & Dasgupta, 2013).

At the same time, the problems certain species face are not necessarily related to the species themselves, and yet the conservation approach used is to tackle the problems with the help of biologists and experts for that species.

Seriously impeding river water flows, continued degradation of riverine habitats and unsustainable use of riverine resources threaten not only Gharials but also every other aquatic organism in the area as well as the people who rely on these resources. Conservation is not a wildlife problem – it is a ‘people’ problem. The GCA recognizes that it must address the issues and concerns of the people that live side by side with the Gharial to have any effect on conservation outcomes. It is only by working with and for the local communities – seeing first-hand the problems the people face daily, and educating them about ecology and wildlife – can solutions for conservation of species in the area be determined. As stated, this is one of the biggest failings of Project Crocodile, and an area that

has not yet been explored satisfactorily for the Gharial.

If the local communities continue to struggle to survive, they will do whatever is necessary to provide for their families, even if that means destroying habitats through sand-mining, illegal fishing, logging, extracting water from the rivers, or encroaching on riverbanks for agriculture and cattle grazing. In order to bring about an understanding of the long-term effects of these activities, conservation programmes need to provide not only more education for the local community but also alternative livelihoods so the people have a better chance of a sustainable future. This should have beneficial flow-on effects for the wildlife in the area.

At a higher level, government agencies need to understand that large-scale dams, barrages, water-extraction plants and schemes such as the proposal to interlink major Indian rivers, have disastrous impacts on habitats and wildlife across vast areas (see also Grant *et al.*, 2012; Kumar & Devi, 2013). The short-term political gains over long-term common sense that such developments generate are prevailing.

What is needed is an accurate assessment of the remaining Gharial populations, a programme of education, awareness and help for local communities within Gharial areas, pressure on government agencies to enforce protective environmental laws, support for wildlife authorities to help them carry out some of these programmes, and continuing research into the Gharial that will inform the management programmes.

In 2011, the first meetings were held of a National Tri-State (NTRIS) committee that will develop a comprehensive management plan for the National Chambal Sanctuary. The NTRIS committee was started with the determination of Rom Whitaker of MCBT, who realized that only with government backing did the Sanctuary and, therefore, the most important remaining wild Gharial population stand a chance of survival. While there have been teething problems with this committee, it remains one of the strongest hopes to ensure the careful management of

the National Chambal Sanctuary. With members of GCA/MCBT, Wildlife Institute of India, WWF India, as well as representatives from all three states and experts in hydrology, the broad range of knowledge can, in theory, advise on management strategies across the Sanctuary. Time will tell how effective this NTRIS committee will be.

During 2013, surveys across the Gharial's range were initiated by GCA (e.g. Nair & Katdare, 2013), supported by San Diego Zoo. Similarly, an Education and Awareness campaign within the National Chambal Sanctuary commenced in 2012, funded by MCBT and small grants from international agencies. This project is being scaled up with funds in late 2013 from Prague Zoo in the Czech Republic including a promise of continuing funds into the future. This Education and Awareness project targets specifically the community/social and economic issues within the National Chambal Sanctuary. Prague Zoo has already produced a children's book about the Gharial for distribution under the project, and community acceptance of the programme shows promise (Chaplot & Humraskar, 2013). A presentation given by the author at the World Crocodile Conference (22nd working meeting of the IUCN-SSC Crocodile Specialist Group, in Sri Lanka) in May 2013, informed the Specialist Group about the work and aims of the Gharial Conservation Alliance. San Diego Zoo has also helped fund the initiation of a geographic information system (GIS) project that ultimately aims to map and rate each Gharial population across the range, determining conservation priority areas, as well as establishing a detailed database of survey and biological data (<http://www.gharial.info>).

When working within a zoo, the question of conservation and research always rears its head. Within the crocodilian world, there is little doubt that the zoo world is a major – perhaps *the* major – contributor to conservation projects. With the Gharial, Project Crocodile started in a zoo, enlisted the help of other zoos for captive breeding and later MCBT became the organization that provided the central coordinating unit for

conservation efforts. To achieve and continue successful Gharial conservation, the support of international zoos, including San Diego Zoo, Prague Zoo, Cleveland Metroparks Zoo, Dallas Zoo (TX, USA), Krokodille Zoo and Ocean Park (Hong Kong), in particular, have been integral to the efforts. The Gharial is an example of how zoos have helped shape conservation efforts and driven support for projects that we hope will ensure that a species survives in the wild, now and into the future.

ACKNOWLEDGEMENTS

The Author gratefully acknowledges his Gharial Conservation Alliance colleagues, especially Dr Ravi Chellam, Tarun Nair, Shakthi Sritharan, Dipti Humraskar, Saniya Chaplod, Suresh Katdare, Pankaj Kumar and Dr Jeffrey Lang.

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Manuscript submitted 7 January 2014;
revised 11 August 2014; accepted 19 August
2014