

EFFECTS OF TRADITIONAL BELIEFS LEADING TO CONSERVATION OF WATER MONITOR LIZARDS (*VARANUS SALVATOR*) AND THREATENED MARSHLANDS IN WEST BENGAL, INDIA

SHREYA BHATTACHARYA^{1,4,5} AND ANDRÉ KOCH^{2,3}

¹*Institute of Environment Education and Research, Bharati Vidyapeeth University, Katraj, Pune Maharashtra 411043, India*

²*Zoologisches Forschungsmuseum Alexander Koenig & Leibniz Institute for Biodiversity of Animals, Department of Herpetology, Adenauerallee 160, D-53113 Bonn, Germany*

³*Co-Chair IUCN SSC Monitor Lizard Specialist Group*

⁴*Current address: Szent István University, 2100 Gödöllő, Péter Károly u.1. Hungary*

⁵*Corresponding author, e-mail: bshreya93@gmail.com*

Abstract.—Water Monitor Lizards (*Varanus salvator* spp.), though listed as Least Concern by the International Union for Conservation of Nature (IUCN), are among the most heavily exploited reptiles in the world. In northern India, for instance, at its western most occurrences, several tribal communities hunt Water Monitor Lizards for leather and meat, which is often considered as a delicacy. In addition, the reptiles are also being chased as pests and the populations are affected by the loss and fragmentation of their natural habitats, which usually include aquatic environments such as marshlands, coasts, and rivers. Unlike the general situation in most of its wide distribution range, the village of Chak Manik, located in West Bengal, India, supports a relatively large population of Water Monitor Lizards, which can be rarely seen in the nearby areas. This case study explores the effects of traditional beliefs in the village, which are responsible for the maintenance of such a relatively large population of Water Monitor Lizards. At the same time, these beliefs positively affect the conservation of the habitat for the lizards, with a diverse accompanying flora and fauna. The special circumstances and the mutual benefits for both the villagers and the monitor lizards are discussed in the paper.

Key Words.—cultural taboos; Reptilia; Varanidae; wildlife conservation

INTRODUCTION

The cultural and traditional beliefs of communities play an important role in either conservation or exploitation of a species (Ormsby and Bhagwat 2010; Chakravorty et al. 2011; Uyeda et al. 2016). Probably, the earliest recorded use of monitor lizards (Squamata: Varanidae) in India is known to be 10,000y ago from Paleolithic cave paintings (Das 1989). Several traditional beliefs and uses are known to exist for generations of humans using monitor lizards in traditional Indian medicines (da Nóbrega Alves et al. 2008) and food delicacies (Das 1989; Chandi 2006). The tribal communities of North East India, for instance, believe that the consumption of the meat of Water Monitor Lizards can provide great strength and longevity to humans (Bhupathy et al. 2013).

Within India, Water Monitor Lizards (*Varanus salvator*), the second heaviest lizards in the world, are found in the northeast of India and the Andaman and Nicobar Islands (Koch et al. 2007). They are semi aquatic reptiles and prefer aquatic habitats like marshlands and mangrove swamps (Vogel 1979; Gaulke and Horn 2004). Due to habitat fragmentation and overlap

with human development, Water Monitor Lizards are also known to feed on human leftovers (Uyeda 2009), apart from natural prey items (Losos and Greene 1988; Traeholt 1993, 1994).

Although listed as Least Concern by the International Union for Conservation of Nature (IUCN), Water Monitor Lizards are among the most heavily exploited reptiles in the world for the international leather markets with hundreds of thousands of skins being exported annually from Asian countries (Luxmoore and Groombridge 1990; Shine et al. 1996; Koch et al. 2013; United Nations Environment Programme - World Conservation Monitoring Centre. 2017. Convention on International Trade Endangered Species (CITES) Trade Database. Available from <http://trade.cites.org> [Accessed 1 March 2017]). The species is listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 2017). In contrast, India banned the commercial exploitation decades ago, and according to CITES, only about 4,000 skin pieces of Water Monitor Lizards were exported in the 1980s (United Nations Environment Programme - World Conservation Monitoring Centre. 2017. *op. cit.*).

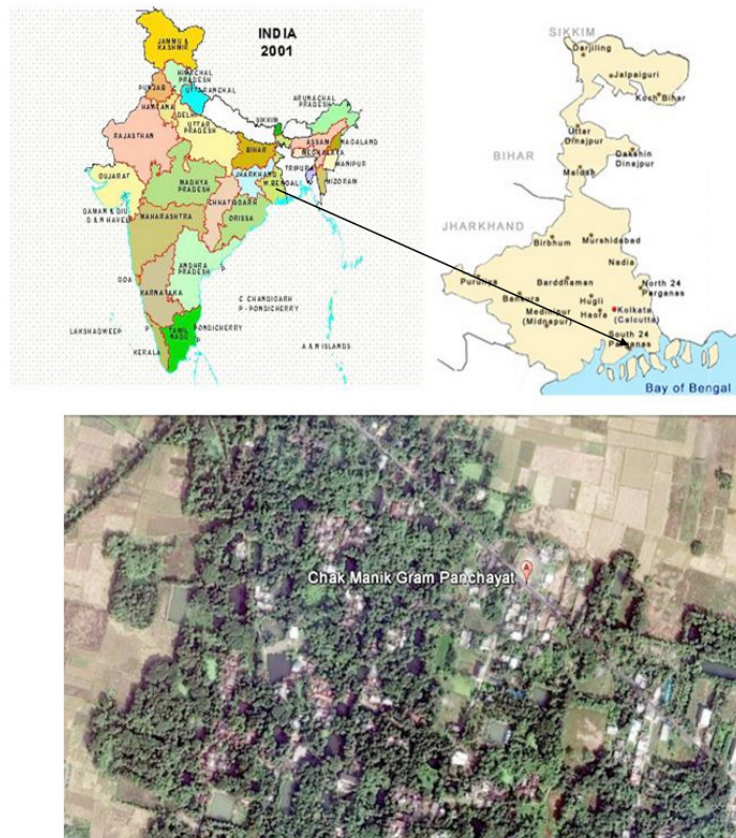


FIGURE 1. Maps of India and West Bengal showing the location of the study site, the village of Chak Manik at South 24 Parganas. The black arrow indicates the location of the village Chak Manik. (Satellite image taken from Google Earth 2018).

Apart from this minor trade aspect in the past in India, there could arise a new large-scale exploitation of these giant reptiles within the country through the illegal trade with the paired genitalia of monitor lizards declared as medical plant roots called *Hatha Jodi*, which means paired arms (Sharma et al. In press). According to this preliminary study by Sharma et al. (In press), the samples investigated derived from the Bengal Monitor Lizard (*V. bengalensis*), but also other Indian monitor lizard species such as *V. salvator* and *V. flavescens* could be affected by this new threat. Monitor lizard eggs also often are considered a delicacy (Das 1989) and the entire animal is also consumed in many parts of India (Borah and Prasad 2006; Chandi 2006). Oil obtained from the fat of the Water Monitor Lizards is used in the traditional treatment of blindness (Das 1989). The monitor skin is highly prized and constitutes a major part of the illegal reptile leather trade (Das 1989). Monitor flesh was sold openly in markets of Thakurpukur, south Kolkata, India, during the 1980s (Das 1989). Thakurpukur is about 20 km away from the study area. It can be assumed that during those times there was a fairly high density of the Water Monitor Lizards, which are now confined to some of the villages (Shreya Bhattacharya, pers. obs.).

Unlike the general situation across India where wetlands are being encroached upon and converted for various purposes, some of which include agricultural conversion, direct deforestation, and hydrologic alteration (Foote et al. 1996), the marsh lands of Chak Manik (Fig. 1) have been abandoned for decades by the villagers due to several traditional beliefs. These beliefs not only resulted in the conservation of the rich marshes but also supported diverse populations of wetland species such as the Water Monitor Lizards in the region. Elsewhere, the influence of social taboos and traditional beliefs leading to the conservation of Water Monitor Lizards and other giant reptiles, such as Reticulated Pythons (*Malayopython reticulatus*), has been studied on Tinjil Island, Indonesia (Uyeda et al. 2016). Therefore, the main objectives of this study were to understand the special situation in the village Chak Manik, which supports a relatively large and consistent population of Water Monitor Lizards that is otherwise rarely observed in other villages in India, and to understand how the traditional beliefs help to protect the species and its habitat and lastly to comprehend the mutual benefits of the co-occurrence between varanids and the local villagers.



FIGURE 2. Abandoned marshland around the village of Chak Manik, West Bengal, India. (Photographed by Shreya Bhattacharya).

MATERIALS AND METHODS

Study site.—We conducted this case study in the small village called Chak Manik about 20 km southwest of Calcutta in West Bengal, India (Fig. 1), where there is abundance of marshlands and Water Monitor Lizards. There exist around 20 segregated wetlands (which are often merged during the monsoon season) in the village, 12 of which have been abandoned by villagers due to various spiritual beliefs related with these marshlands (Fig. 2). The rest of the water bodies are used by the villagers for fishing and household purposes. Most of the wetlands are directly or indirectly connected to a main canal, which merges with the Hooghly River. These patches of wetlands support a diverse ecosystem found in the region. There are four commercial and several private poultry farms in the village. Poultry farming is one of the major occupations of the villagers, besides fishing. As the villagers use the main canal for their dumping ground, all the organic wastes including the poultry wastes are regularly disposed of in the main canal. Therefore, the main canal acts as an appropriate foraging ground for the Water Monitor Lizards in the village (Fig. 3).

Field study.—Between August 2015 and June 2016, we conducted a behavioral study of the Water Monitor Lizards in Chak Manik to understand the persistence limits of this suburban population. For this purpose we observed the reptiles in each of the isolated ponds surrounding the village at an interval of 15 min for a 6 h stretch per day. We used the feeding patterns and behavioral observations, such as sun basking and land and water movements as parameters for the study.

Interviews.—In addition, in November 2015, we randomly interviewed 50 people of various age groups of the village as part of an open ended semi-structured questionnaire (Barriball and While 1994) to understand

the beliefs and traditional approaches of the villagers towards the abandoned marsh lands, the use of the canal, and their perceptions of the Water Monitor Lizards. The open-ended questionnaire used consisted of the following questions: (1) What is the general perception of the local villagers towards the Water Monitor Lizards? (2) Why are the marsh lands abandoned? (3) What are the traditional beliefs related to these marsh lands? (4) Are there any conflicts due to the presence of a relatively high density of Water Monitor Lizards in the village? (5) Are there any benefits that the local people receive from the varanids? (6) How do the villagers tend to co-exist with the monitor lizards? (7) Are there any poaching activities observed around the village? (8) Do the local people participate in bush meat hunting or poaching? (9) What are the future plans of the young generation related to the abandoned marsh lands? and (10) What are the perceptions regarding the conservation of the marsh lands and the Water Monitor Lizards in the near future (irrespective of the traditional beliefs and mutual benefits of the villagers)?

RESULTS

Traditional beliefs in Chak Manik village.—The interviews revealed that village people have several cultural and traditional beliefs and taboos related to the marsh lands. In the area there is an ancient temple of Goddess Durga (Bagchi 2013), the local deity of the Hindu religion. According to the villagers, the land belonged to the Goddess, and the priests with their families lived in those lands. Several decades ago, one of the care takers of the land was murdered and beheaded by some burglars, who came to loot the temple. The crime was performed in front of one of the ponds, which is now known as *Yam Pukur* (*Yam* refers to the Hindu God of death and *Pukur* refers to the pond). This history constitutes a major part of the cultural taboos in the region. Furthermore, the other lands and ponds enclosed within the boundary of *Yam Pukur* are also abandoned by the locals. They strongly believe that the marshes should be preserved to maintain the welfare of the village.

Behavior of the Water Monitor Lizards.—In general, the Water Monitor Lizards in the surroundings of Chak Manik village move freely from one water body to the other. They use burrows under the tree roots near the periphery of the abandoned marshlands for resting and are often sighted swimming across the weed infested ponds. It also turned out that individuals in the respective abandoned marshlands move to the main canal during the afternoon between 1400 and 1600 in search of food. Juvenile individuals were often seen feeding on small fishes and insects in ponds around the village.



FIGURE 3. Water Monitor Lizards (*Varanus salvator*) at the main canal of Chak Manik village, West Bengal, India, feeding on poultry waste. (Photographed by Shreya Bhattacharya).

A large number of dead hens are regularly thrown in the main canal by the poultry farmers while cleaning the enclosures. During this time of the day, around seven to eight Water Monitor Lizards on average gather around the main canal (Fig. 3). Large splashing sounds of water can be heard at this time due to intraspecific competition for the waste between the monitor lizards. Due to the regular availability of food and a secluded habitat, the population of the Water Monitor Lizards is relatively high. On average, four to five adult specimens were counted at a large pond, while juveniles usually hide due to cannibalism. The total population of lizards around the village is estimated at 50 to 80. From the behavioral observations, it was seen that the Water Monitor Lizards are rather shy reptiles that tend to avoid human interactions and inside the village they are only sporadically spotted one or two at a time. These reptiles regularly spend at least 1–2 h basking in the sun during both summer and winter. A large number of adult specimens move from their nesting ponds to the main canal during the afternoon. Frequent movements can be seen between land and water which form a composite habitat for these semi-aquatic reptiles. After feeding, they move slowly and return to their own burrows in the irrespective ponds. They usually return at sun set. During the dry periods of winter (November to January), they return between 1700 and 1730 and during summer and long stretches of humid monsoons (April to July) between 1730 and 1800.

Attitudes of local villagers towards the monitor lizards.—Based on interviews of villagers, 98% support the conservation of the marshlands. Only one person (i.e., 2%) believed that conversion of the abandoned

marshlands for agricultural land or urbanization is necessary for the village. In addition, 96% were in favor of conservation of the Water Monitor Lizards, while only one person was against protecting them and another one chose not to comment. During the interviews, the villagers also claimed that they largely depend on the monitor lizards for cleaning the canal and thus reducing the potential spread of diseases. Apart from feeding on poultry wastes, the monitors also prey on snakes, which the local people are afraid of without distinguishing between harmless and venomous species. Thus, the villagers appreciate the presence of the Water Monitor Lizards and share a symbiotic relationship with them. There also have been a few reports, however, of conflicts between the monitors and fishermen, as fish is one of the main sources of food of Water Monitor Lizards, mainly for juveniles. The villagers often complained that their ducks, fish, and at times even puppies, are taken away by the monitor lizards. Nevertheless, they tolerate the large reptiles due to the above mentioned benefits they provide for the village.

DISCUSSION

The traditional beliefs and taboos of the villagers of Chak Manik play an important role in conserving the marshlands and the species diversity they support. They protect the water bodies because according to their traditional beliefs, these are important for the welfare of the village and its people. From these observations it becomes obvious that there is a close mutual link between the abandoned marshlands and the existence of a large population of monitor lizards. The presence of abandoned marshlands and the peaceful coexistence

of the villagers and the Water Monitor Lizards in Chak Manik are a rare situation compared to its surrounding villages. The abandoned marshlands support an undisturbed complex wetland ecosystem amidst a suburban environment. These abandoned marshlands provide rather undisturbed natural habitats for the Water Monitor Lizards along with other wetland species found in the region. The villagers also play an important role in protecting the Water Monitor Lizards. Although being protected by Schedule one, part II of the Wildlife Protection Act of India, 1972 (offenses can result in imprisonments between three to seven years along with a minimum penalty fine of 10,000 INR), Water Monitor Lizards are subject to regular exploitation across the country for bush meat and illegal leather markets. We have been told that there were situations in the past when the villagers stood against poachers to protect the Water Monitor Lizards from being hunted. It is noteworthy in this respect that, when starting field work in the village, we were questioned about the purpose of our visit and we had to assure the people we would not harm the monitor lizards.

Our observations are similar to the situation on Tinjil Island, Indonesia (Uyeda et al. 2016). There, likewise due to spiritual beliefs and social taboos of the local people relating to the forest guardians, hunting of Water Monitor Lizards and Reticulated Pythons was absent for generations, which is otherwise practiced in other Indonesian islands where these giant reptiles are heavily exploited for their leather and as pets (Luxmoore and Groombridge 1990; Shine et al. 1996; Koch et al. 2013; Natusch et al. 2016). Few of the perceptions of the local villagers regarding Water Monitor Lizards of Southern West Bengal (Chatterjee and Bhattacharyya 2015) were similar to our observations. Three species of monitor lizards, Bengal Monitor Lizards (*Varanus bengalensis*), Yellow Monitor Lizards (*Varanus flavescens*), and Water Monitor Lizards occur at this site and there seems to be no spiritual taboos related that led to the abandonment of marshlands or the conservation of marshland and lizards (Chatterjee and Bhattacharyya 2015).

The major causes for the decline of the monitor lizard populations in southern West Bengal were because of (1) non availability of carcasses on which lizards can scavenge, (2) ponds are used for commercial pisciculture and other species, such as lizards, are not tolerated, and (3) loss of sheltering habitats such as groves of trees, bushes, and thickets around wetlands and crop fields due to expanding cropping and settlement areas within the last two decades (Chatterjee and Bhattacharyya 2015). Thus, in regard to the general situation across southern West Bengal, our case study of the Chak Manik village not only contradicts these rather general circumstances,

but also supports a healthy, undisturbed (though human-influenced) wetland habitat along with a considerable large population of Water Monitor Lizards among several other diverse wetland species. Also, Water Monitor Lizards often visit the village houses in Chak Manik in search of food, but surprisingly, the villagers patiently wait for the monitors to leave instead of disturbing them or throwing stones as is usually observed in other places of India (Shreya Bhattacharya, pers. obs.). According to the villagers, who are generally scared of snakes, the Water Monitor Lizards play an important role in controlling the local snake populations. Hence, this can be considered as another reason for protecting them.

The marshlands of Chak Manik are the home of numerous species of birds, reptiles, and amphibians, next to countless invertebrates (Shreya Bhattacharya, pers. obs.). Besides the spiritual and cultural beliefs of the local people that lead to the conservation of these threatened marshlands, the existence of a considerable population of Water Monitor Lizards, on which the villagers largely depend for the waste management, are also solely dependent on these abandoned marshlands for their survival. Hence, if these marshlands were disturbed, then the whole ecological balance of the village would be disrupted. The strong co-existence and inter-dependence pattern of humans and monitor lizards in this village suggest that there are unusual local specific circumstances that can lead to conservation of natural sites and species diversity. Due to the global effect of modernization, in the near future, the traditional beliefs of the local people are bound to change and hence the marshlands and their diverse fauna and flora may face an uncertain future. Therefore, it is essential for the persistence of these environments that the younger generations of the village earn a deeper understanding of the ecological importance of the marshlands and their species diversity (Maltby 1991). Otherwise, conservation education programs might become necessary, but we hope that the traditional beliefs will be transferred from elder people to the younger ones, which are a key in the future conservation of these rich marshlands in West Bengal.

Acknowledgments.—This study would not have been possible without the kind cooperation of the seniors, associates, friends, and family of SB. Therefore, she is thankful to her Professors Erach Bharucha, Shamita Kumar, and Kranti Yardi and her supervisors Tiasa Adhya and Subhankar Patra for their constant support and motivation. In addition, she is grateful to her friends Anish Das for introducing her to Chak Manik, as well as Arka Karmakar and Tatsama Motilal for their support and help during data collection.

LITERATURE CITED

- Bagchi, J. 1990. Representing nationalism: ideology of motherhood in colonial Bengal. *Economic and Political Weekly* 25:WS65–WS71.
- Barriball, K.L., and A. While. 1994. Collecting data using a semi-structured interview: a discussion paper. *Journal of Advanced Nursing* 19:328–335.
- Bhupathy, S., S.R. Kumar, P. Thirumalainathan, J. Paramanandham, and C. Lemba. 2013. Wildlife exploitation: a market survey in Nagaland, North-eastern India. *Tropical Conservation Science* 6:241–253.
- Borah, M.P., and S.B. Prasad. 2016. Ethnozoological remedial uses by the indigenous inhabitants in adjoining areas of the Pobitora wildlife sanctuary, Assam, India. *International Journal of Pharmacy and Pharmaceutical Sciences* 8:90–96.
- Chakravorty, J., V.B. Meyer-Rochow, and S. Ghosh. 2011. Vertebrates used for medicinal purposes by members of the Nyishi and Galo tribes in Arunachal Pradesh (North-East India). *Journal of Ethnobiology and Ethnomedicine* 7:13.
- Chandi, M. 2006. The use and knowledge of herpetofauna on Little Nicobar Island, India. *Conservation and Society* 4:155–165.
- Chatterjee, A., and S. Bhattacharyya. 2015. Distribution and abundance of monitor lizards (*Varanus* spp.) in human habitations of South West Bengal: people's tradition of coexisting with wildlife. *African Journal of Science and Research* 3:1–7.
- Da Nóbrega Alves, R.R., W.L. da Silva Vieira, and G.G. Santana. 2008. Reptiles used in traditional folk medicine: conservation implications. *Biodiversity and Conservation* 17:2037–2049.
- Das, I. 1989. Indian monitor lizards: A review of human utilisation patterns. *Hamadryad* 14:16–19.
- Foote, A.L., S. Pandey, and N.T. Krogman. 1996. Processes of wetland loss in India. *Environmental Conservation* 23:45–54.
- Gaulke, M., and H.-G. Horn. 2004. *Varanus salvator* (nominate form). Pp.244–257 *In* *Varanoid Lizards of the World*. Pianka, E.R., and D.R. King. (Eds.). Indiana University Press, Bloomington, Indiana, USA.
- Koch, A., M. Auliya, A. Schmitz, U. Kuch, and W. Böhme. 2007. Morphological studies on the systematics of South East Asian water monitors (*Varanus salvator* complex): nominotypic populations and taxonomic overview. *Mertensiella* 16:109–180.
- Koch, A., T. Ziegler, W. Böhme, E. Arida, and M. Auliya. 2013. Pressing problems: distribution, threats, and conservation status of the monitor lizards (Varanidae: *Varanus* spp.) of Southeast Asia and the Indo-Australian archipelago. *Herpetological Conservation and Biology* 8, Monograph 3:1–62.
- Losos J.B., and H.W. Greene. 1988. Ecological and evolutionary implications of diet in monitor lizards. *Biological Journal of the Linnean Society* 35:379–407.
- Luxmoore, R., and B. Groombridge. 1990. Asian Monitor Lizards. A Review of Distribution, Status, Exploitation and Trade in Four Selected Species. World Conservation Monitoring Centre, Cambridge, UK.
- Maltby, E. 1991. Wetland management goals: wise use and conservation. *Landscape and Urban Planning* 20:9–18.
- Natusch, D.J., J.A. Lyons, A. Riyanto, and R. Shine. 2016. Jungle giants: assessing sustainable harvesting in a difficult-to-survey species (*Python reticulatus*). *PloS ONE* 11, 7:e0158397. <https://doi.org/10.1371/journal.pone.0158397>.
- Ormsby, A.A., and S.A. Bhagwat. 2010. Sacred forests of India: a strong tradition of community-based natural resource management. *Environmental Conservation* 37:320–326.
- Sharma, C.P., Kumar, A., Sharma, V., Singh, B., Kumar, G.C. and Gupta, S.K. In press. Online selling of wildlife part with spurious name: a serious challenge for wildlife crime enforcement. *International Journal of Legal Medicine*.
- Shine, R., P.S. Harlow, J.S. Keogh, and Boeadi. 1996. Commercial harvesting of giant lizards: the biology of Water Monitors *Varanus salvator* in southern Sumatra. *Biological Conservation* 77:125–134.
- Traeholt, C. 1993. Notes of the feeding behaviour of the Water Monitor, *Varanus salvator*. *Malayan Nature Journal* 46:229–241.
- Traeholt, C. 1994. The food and feeding behavior of the Water Monitor, *Varanus salvator*, in Malaysia. *Malayan Nature Journal* 47:334–343.
- Uyeda, L. 2009. Garbage appeal: relative abundance of Water Monitor Lizards (*Varanus salvator*) correlates with presence of human food leftovers on Tinjil Island, Indonesia. *Biawak* 3:9–17.
- Uyeda, L.T., E. Iskandar, A. Purbatrapila, J. Pamungkas, A. Wirsing, and R.C. Kyes. 2016. The role of traditional beliefs in conservation of herpetofauna in Banten, Indonesia. *Oryx* 50:296–301.
- Vogel, P. 1979. Zur Biologie des Bindenwarans (*Varanus salvator*) im Westjavanischen Naturschutzgebiet Ujung Kulon. Ph.D. Thesis, University of Basel, Basel, Switzerland. 139 p.



SHREYA BHATTACHARYA is currently an undergraduate student of Wildlife Conservation and Management at Szent István University, Gödöllő, Hungary, after she graduated in Electronics Science at the University of Calcutta, India. Her research interests are behavioral ecology and conservation biology concentrating mainly on amphibians, reptiles, and cetaceans. The documentation of the mutual relationship between humans and monitor lizards in the village of Chak Manik is her first research project. Shreya is currently involved in a project about the diet preferences of Golden Jackals (*Canis aureus*) in Hungary using stomach content analysis at the Department of Wildlife Conservation and Management at Szent István University. (Photographed by Arka Karmakar).



ANDRÉ KOCH is an Affiliated Researcher at the Zoological Research Museum Alexander Koenig in Bonn, Germany, where he also received his diploma and Ph.D. Since he started his scientific career in 2003, André has published more than 100 papers and reports mostly about Southeast Asian and Indo-Australian monitor lizards. During field work in Indonesia and collection-based investigations, André and his collaborators have documented the neglected and underestimated diversity of these CITES-relevant giant reptiles, which face several threats through habitat destruction, pursuit as pests, as well as the international trade in reptile skins and as pets. He is the co-founding Chair of the newly established IUCN SSC Monitor Lizard Specialist Group (2014). In addition, André is interested in the herpetofaunal diversity of Indonesia with a special focus on Sulawesi and the history of herpetology. (Photographed by André Koch).