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Indotestudo elongata (Blyth 1854) – Elongated Tortoise, Yellow-headed Tortoise, Yellow Tortoise

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Summary. – The Elongated Tortoise, *Indotestudo elongata* (Family Testudinidae), is a medium-sized tortoise with a straight carapace length of up to 360 mm. The species is sexually dimorphic; among the morphological differences between the sexes, males and females differ in facial coloration during the breeding season. *Indotestudo elongata* inhabits low to mid-elevation habitats in Southeast Asia: open deciduous dipterocarp forests, grasslands, bamboo forests, secondary forests, and hilly evergreen forests. The species is a generalist omnivore. In the wild, courtship and mating take place at the beginning of the rainy season. Clutches of up to 10 eggs are laid toward the end of the wet period; hatchlings emerge from the nest at the beginning of the subsequent rainy season. The species is heavily exploited by humans for food and traditional medicine across its range. In addition, *I. elongata* is greatly affected by habitat destruction, fragmentation, and loss. As a result, although protected by international and national regulations, the species has undergone severe population declines. Recommended conservation measures include greater enforcement of wildlife protection laws, conservation breeding and monitored releases of tortoises, and continued research.

Distribution. – Bangladesh, Bhutan, Cambodia, China (Guangxi), India (Assam, Bihar, Jharkhand, Meghalaya, Mizoram, Odisha, Sikkim, Tripura, Uttarakhand, Uttar Pradesh, West Bengal), Laos, Malaysia (Kedah, Penang, Perlis), Myanmar, Nepal, Thailand, Vietnam. Distributed over most of Southeast Asia, stretching from northern India, across Indochina, to southern China and northern Malaysia.

Synonymy. – *Testudo elongata* Blyth 1854, *Peltastes elongatus*, *Testudo* (*Indotestudo*) *elongata*, *Indotestudo elongata*, *Geochelone elongata*, *Indotestudo elongata elongata*, *Geochelone* (*Indotestudo*) *elongata*, *Geochelone elongata elongata*, *Testudo parallellus* Annandale 1913.

Subspecies. – None recognized.

Status. – IUCN 2015 Red List: Endangered (EN A1cd+2cd) (assessed 2000); TFTSG Draft Red List: Endangered (assessed 2011); CITES: Appendix II; Bangladesh Wildlife (Preservation) Act: Schedule III; Indian Wildlife (Protection) Act (1972): Schedule IV; Malaysia Wildlife Conservation Act (2010): Schedule I; Myanmar Wildlife Law (1994): Protected; Thailand Wildlife Animal Reservation and Protection Act (1992 Revised): Listed; Vietnam Decree No. 32/2006/ND-CP: Group 2B.

Taxonomy. — The Elongated Tortoise was first described as *Testudo elongata* by Blyth (1854). The year of this publication has often been erroneously cited as 1853, the imprint date when the 22nd volume of the Journal of the Asiatic Society of Bengal was written. However, the paper was not actually published until the following year. Blyth (1854) designated the type locality of *Testudo elongata* as "Arakan," currently known as Rakhine State in Myanmar (Burma). The syntype series was assumed by Bourret (1941) to be deposited at the Indian Museum, Calcutta. Today, the syntypes (ZSI 796, 798-800) are in the collection of the Zoological Survey of India (Das et al. 1998).

Annandale (1913) described *Testudo parallelus* based on a single specimen from "Chaibassa (Singhblum) district, Chota Nagpur" (= Chaibasa, Jharkhand state), India. The holotype (ZSI 11379) is also in the Zoological Survey of India collection (Das et al. 1998). In his description of *T. parallelus*, Annandale (1914) noted the similarity of the specimen to *T. elongata*, but suggested that morphological differences (primarily in shell shape) justified the naming of a new species. However, Smith (1931) synonymized the two taxa, an action that has been accepted by later authors (Crumly 1988).

In addition to *Testudo*, the Elongated Tortoise has been previously placed within the genera *Peltastes* and *Geochelone* (Gray 1870, 1872; Pritchard 1979). Lindholm (1929) split the formerly very heterogeneous genus *Testudo* into different subgenera and designated *Testudo* (*Indotestudo*) *elongata* as

Figure 1. Adult male *Indotestudo elongata* in Doi Phu Nang National Park, Phayao Province, northern Thailand. Photo by Flora Ihlow.

the type species of the newly created subgenus *Indotestudo*. *Indotestudo* was elevated to a distinct genus by Bour (1980) and Crumly (1982, 1984), and this was subsequently widely accepted.

Phylogenetically, *Indotestudo* forms a monophyletic clade with the genera *Malacochersus* and *Testudo* in the family Testudinidae (Le et al. 2006; Fritz and Bininda-Emonds 2007). In addition to *I. elongata*, two other species are currently recognized within *Indotestudo*: *I. forstenii* and *I. travancorica* (Iverson et al. 2001; TTWG 2014). Studies of the phylogeny of these allopatric species have revealed that *I. elongata* and *I. travancorica* are sister taxa, while *I. forstenii* is slightly more distinct in relationship to other members of the genus (Iverson et al. 2001; Le et al. 2006; Fritz and Bininda-Emonds 2007).

Description. — *Indotestudo elongata* is a medium-sized tortoise (Fig. 1). Adults may reach straight carapace lengths (SCL) of up to 360 mm (Taylor 1970; Stuart et al. 2001, Auliya 2007), although most specimens are smaller with SCLs of 280–300 mm. The eponymous, elongated shell is highly domed with its highest point in the third vertebral scute (Das 2010). The carapace is flattened dorsally, broadest posteriorly, and possesses a single large recurved caudal scute (Fig. 2). A long and narrow nuchal scute is also typically present, but may occasionally be absent (Boulenger 1889; Smith 1931; Bourret 1941; Taylor 1970; Biswas et al. 1978; Manthey and Grossmann 1997; Auliya 2007; Das 2010). The carapace and plastron are yellowish brown or olive in color with more or less distinct black blotches in the center of each scute (Smith 1931; Taylor 1970; Manthey and Grossmann 1997; Senneke 2000; Stuart et al. 2001; Auliya 2007; Das 2010). The plastron is elongated, truncated anteriorly, and possesses a distinct posterior notch (Bourret 1941; Taylor 1970; Das 2010; Fig. 3). The head is of moderate size,

Figure 2. Dorsal views of adult *Indotestudo elongata*, female from northern Cambodia (*left*) and male from the Turtle Conservation Centre in Cuc Phuong National Park, Vietnam (*right*). Photos by Flora Ihlow.

Figure 3. Ventral views of adult *Indotestudo elongata*, female from northern Cambodia (*left*) and male from the Turtle Conservation Centre in Cuc Phuong National Park, Vietnam (*right*). Photos by Flora Ihlow.

Figure 4. Head view of adult *Indotestudo elongata* from the Doi Phu Nang National Park, Phayao Province, northern Thailand. Photo by Flora Ihlow.

yellow, covered with large symmetrically arranged scales, and possesses a slightly tricuspid hooked upper jaw with slightly denticulated horny edges (Gray 1870; Boulenger 1889; Bourret 1941; Taylor 1970; Manthey and Grossmann 1997; Stuart et al. 2001; Auliya 2007; Das 2010; Fig 4). The forelimbs are covered with imbricating anteriorly enlarged scales (Boulenger 1889; Taylor 1970). The tail terminates in a claw-like horny tubercle (Boulenger 1889; Smith 1931; Bourret 1941; Taylor 1970).

In captivity, as well as under semi-natural conditions, hatchlings range from 50–55 mm in SCL and have masses of 22–36 g (Senneke 2000; Eberling 2001; Ihlow et al. 2011). Hatchlings and juveniles have rounded shells with slightly flared and serrated posterior marginals, which become smoother with age (Boulenger 1889; Bourret 1941; Taylor 1970; van Dijk 1998; Auliya 2007; Das 2010; Fig. 5).

Males generally grow larger than females. In males, the tail is longer, thicker, and has a larger and more curved horny tubercle at the terminal end (Boulenger 1889; Taylor 1970; Biswas et al. 1978; Manthey and Grossmann 1997). The plastron of males is concave in contrast to being flat in females (Manthey and Grossmann 1997; van Dijk 1998; Senneke 2000; Auliya 2007). The anal notch of the plastron in males is generally narrower and V-shaped compared to the wider notch of females (Biswas et al. 1978; van Dijk 1998; Fig. 3). Females are more rounded in body shape and possess longer and more curved posterior claws (Senneke 2000). During the breeding season, mature individuals of both sexes develop a distinct pinkish coloration surrounding the nostrils and eyes (Spencer 1988; Zeitz 1988; McCormick

Figure 5. *Indotestudo elongata* hatchling, bred under semi-natural conditions in a large outdoor enclosure at the Angkor Centre for Conservation of Biodiversity, Phnom Kulen National Park, Cambodia. Photos by Flora Ihlow.

Figure 6. Adult male (background) and female (foreground) *Indotestudo elongata* at the Turtle Conservation Centre in Cuc Phuong National Park, Vietnam. These individuals demonstrate the characteristic of sexual dimorphism in the degree of pink nasal coloration that occurs during the breeding season. Photo by Jeffrey E. Dawson.

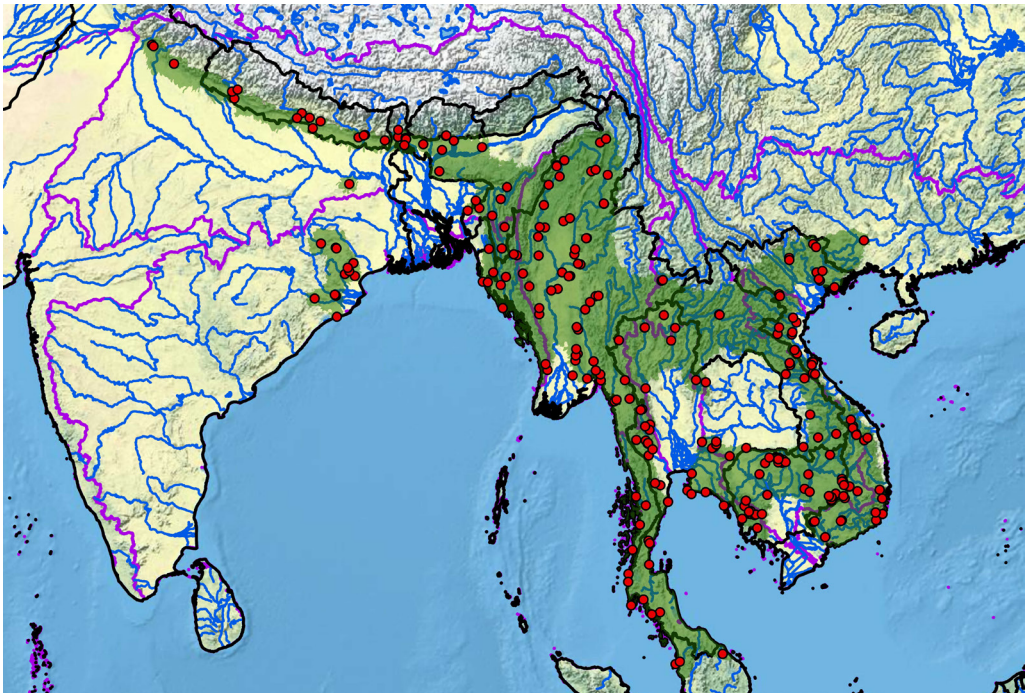

Figure 7. Distribution of *Indotestudo elongata* in Southeast Asia. Purple lines = boundaries delimiting major watersheds (level 3 hydrologic unit compartments – HUCs); red dots = museum and literature occurrence records of native populations based on Iverson (1992), plus more recent and authors' data; green shading = projected current distribution based on GIS-defined level 10 HUCs constructed around verified localities and then adding HUCs that connect known point localities in the same watershed or physiographic region, and similar habitats and elevations as verified HUCs (Buhlmann et al. 2009; TTWG 2014), and adjusted based on authors' subsequent data.

1992; Senneke 2000; Eberling 2001; Stuart et al. 2001; Auliya 2007), but the coloration tends to be brighter in males (van Dijk 1998; Sriprateep et al. 2013; Fig. 6). The sexes are not distinguishable below 152 mm SCL (McCormick 1992).

Body shape and coloration in *I. elongata* are highly variable (Gray 1870; van Dijk 1998; Senneke 2000; Das 2010, Ihlow 2013). However, coloration does not seem to be correlated with distribution (van Dijk 1998).

Indotestudo elongata is morphologically distinguishable from its congeners by the possession of an elongated nuchal scute (Smith 1931; Bourret 1941). While a well-developed narrow nuchal scute is usually found in *I. elongata*, it is generally absent (or if present, short and wedge-shaped) in *I. forstenii* and *I. travancorica* (Pritchard 2000). Additionally, the interpectoral seam is equal or significantly longer than the interhumeral seam in *I. elongata*; this ratio is reversed in *I. forstenii* and *I. travancorica* (Boulenger 1889; Smith 1931; Taylor 1970; Pritchard 2000).

Distribution. — *Indotestudo elongata* is distributed across Southeast Asia (Smith 1931; Moll 1989; Iverson 1992; Das 2010; Fig. 7). The range of the species stretches from northern India, Nepal, Bhutan, and Bangladesh in the west (Biswas et al. 1978; Ross and Crumly 1983; Das 1985, 1990, 1995; Frazier 1992; Mitchell and Rhodin 1996; Pawar and Choudhury 2000; Choudhury 2001; Schleich and Kästle 2002; Dutta et al. 2009; Baruah and Sharma 2010; Wangyal et al. 2012; Das and Gupta 2015; Rahman et al. 2015), eastward through Myanmar, Thailand, and all of Indochina (Blyth 1854; Bourret 1941; Taylor 1970; Nutaphand 1979; Thirakhupt and van Dijk 1995; Pauwels et al. 2000; Platt et al. 2001; Stuart et al. 2001; Stuart and Platt 2004; Grismer et al. 2007; Emmett 2009; Nguyen et al. 2009; Platt et al. 2010a, 2013; Hartmann et al. 2013), north to Guangxi Province of China (Fang 1930; Zhao and Adler 1993) and south to Peninsular Malaysia (Smith 1931; Sharma et al. 1996; Grismer et al. 2006; Auliya 2007).

A disjunct population of *I. elongata* occurs on the Chota Nagpur Plateau in eastern India. This region was likely inhabited by tortoises prior to the formation of the Indo-Gangetic Plain and was subsequently isolated from the Himalayan foothills by the alluvial plain and changing environmental conditions (Smith 1931; Hora 1948; Jayaram 1949; Frazier 1992).

Habitat and Ecology. — *Indotestudo elongata* inhabits lowlands and foothills up to approximately 1000 m above sea level (asl). Elongated tortoises are absent from greater elevations; high mountains (e.g., the Himalayas and Yunnan–Guizhou Plateau) form the northern distributional limit of *I. elongata*. Examples of the altitudes at which the species is known to occur include: 50–60 m asl in the northern plains of Cambodia (Hartmann et al. 2013), 255 m asl in Bhutan (Wangyal et al. 2012), 100–300 m asl in southern Vietnam (Ihlow et al. 2012), 225–560 m asl in the hills of western Thailand (van Dijk 1998), 350–560 m asl on the Nakai Plateau of central Laos (Som, unpubl. data) and 795 m asl in the southern Chin Hills of Myanmar (Platt et al. 2012).

Elongated Tortoises have been reported to occur in a variety of forest types, including open deciduous dipterocarp, mountainous and hilly evergreen, mixed semi-evergreen, bamboo, pine, and secondary forests; as well as savannah grasslands and dry thorn scrub (Taylor 1970; Inger and Colwell 1977; Ernst and Barbour 1989; Moll 1989; Thirakhupt and van Dijk 1995; van Dijk 1998; Zug et al. 1998; Cox et al. 1998; Senneke 2000; Stuart et al. 2001; Ziegler 2002; Grismer et al. 2007; Das 2010; Wangyal et al. 2012; Hartmann et al. 2013; Platt et al. 2013; Som and Cottet 2016; Fig. 8). In India and Nepal, *I. elongata* is typically associated with sal forests (dominated by the tree species *Shorea robusta*; Smith 1931). The species is mostly found in deciduous forests with monsoonal climate in Thailand (van Dijk 1998).

Open-canopied habitats of *I. elongata* can become very hot during the day (Smith 1931; Das 1985; Tikader and Sharma 1985). Swindells and Brown (1964) reported that the species is able to endure air temperatures up to 48°C. According to Das (1985) and Eberling (2001), *I. elongata* salivates on its head and front limbs for cooling when exposed to high temperatures. However, Elongated Tortoises seem to avoid temperature extremes when possible through daily and seasonal activity patterns. *Indotestudo elongata* is primarily crepuscular with a bimodal daily activity pattern; activity is mainly restricted to the early morning and the late evening (Senneke 2000; Ihlow, unpubl. data). In Cambodia, tortoises became active in the morning around 0500 hrs and continued until 0800, while evening activity started around 1600 and ended around 2000 hrs, depending on weather conditions (Ihlow, unpubl. data). Although van Dijk (1998) reported *I. elongata* to exhibit no well-defined activity pattern in Thailand, increased activity in the early morning and the late afternoon was noted. Daytime activity of tortoises was mostly restricted to cloudy and rainy weather in Thailand and Cambodia (van Dijk 1998; Ihlow, unpubl. data). In Laos, Elongated Tortoises were found to inhabit rather cold areas with minimum ambient temperatures of 2.2°C, maximum ambient temperatures not exceeding 26°C, and constant humidity values around 100% (Som and Cottet 2016). Basking behavior appears to be infrequent in this species. In Cambodia, basking was observed only a few times on cold mornings between November and January (Ihlow, unpubl. data). Basking of female tortoises in Thailand was observed in September and was likely related to egg production (van Dijk 1998).

For periods of inactivity, tortoises seek retreats. In Thailand, tortoises rested in vegetation, alongside fallen tree trunks, in boulder caves, in a porcupine burrow, and inside a hollow *Lagerstroemia* tree trunk, but they showed a preference for resting places in dense grasses and along fallen tree trunks (van Dijk 1998). In an evergreen forest habitat in Laos, Elongated Tortoises were observed under branches of bamboo and other dense bushes beneath pine trees, beside fallen tree trunks, and in thick grasses (Som and Cottet 2016). There are few reports on the behavior of young tortoises in the wild, but a juvenile in Myanmar was found hiding alongside a termite mound at midday (Zug et al. 1998). The species is less active and appears to aestivate during the dry season (Bourret 1941; Biswas et al. 1978; van Dijk 1998; Ihlow et al. 2014; Som and Cottet 2016). Retreat sites vary seasonally in northern Cambodia; tortoises rested in dense vegetation during the rainy season but selected former burrows of other animals, which offer more shelter and stable climatic conditions, during the dry season (Ihlow, pers. obs.). Similarly, Elongated Tortoises in Bangladesh favored leaf litter retreats during the monsoon, but they chose abandoned porcupine burrows more often in the dry autumn season. Tortoises hid in bush/thickets during both seasons in Bangladesh (Rahman et al. 2014). According to hunters in Myanmar, tortoises move into vegetation along streambeds or under accumulated leaves in ravines during the dry season. Although surface water is absent during this time, these areas retain relatively mesic micro-habitats (Platt et al. 2001).

Indotestudo elongata is sympatric with the Burmese Star Tortoise (*Geochelone platynota*) in central Myanmar. While little is known about the ecological relationship between these species, habitat partitioning does not appear to occur. Both species exist in the same general area and similar micro-habitats (Platt et al. 2001). The distributions of two additional tortoise species, the Impressed Tortoise (*Manouria impressa*) and Asian Giant Tortoise (*Manouria emys*), overlap with portions of the range of *I. elongata*, but the species do not share the same habitat types (de Bruin 1998; Stanford et al. 2015). In western Myanmar, *I. elongata* and the Arakan Forest Turtle (*Heosemys depressa*), a terrestrial geoemydid, are found within the same overall habitat (Platt et al. 2010a).

Movement and home ranges of *I. elongata* have been studied in western Thailand, northern Cambodia, and central Laos (Tharapoom 1996; van Dijk 1998; Ihlow et al. 2014, Som and Cottet 2016). Van Dijk (1998) reported that *I. elongata* possesses a nomadic movement pattern, while Tharapoom (1996), Ihlow et al. (2014), and Som (unpubl. data) found the species to have highly variable home ranges. Tortoises in Cambodia were reported to maintain home ranges between 3.8 and 41.5 ha (mean 16.8 ha; Ihlow et al. 2014), while the home ranges of tortoises in western Thailand were between 8.0 and 70.0 ha (mean 26.5 ha; Tharapoom 1996). Tortoises studied in Laos maintained home ranges between 0.7 and 19.4 ha (mean 5.5 ha; Som, unpubl. data). Home ranges are significantly larger during the rainy season, when the species is most active and courtship and mating take place (Tharapoom 1996; Ihlow et al. 2014).

Figure 8. Examples of habitats used by *Indotestudo elongata*. **a**: deciduous dipterocarp forest habitat at the Kulen Promtep Wildlife Sanctuary, northern Cambodia (photo by Flora Ihlow); **b**: dry deciduous forest of Doi Phu Nang National Park, Phayao Province (photo by Flora Ihlow) and in **c**: Chiang Mai Province (photo by Flora Ihlow), both in northern Thailand; **d**: bamboo forest in Phitsanulok Province, northern Thailand (photo by Flora Ihlow), and **e**: secondary forest at Cat Tien National Park, southern Vietnam (photo by Peter Geissler).

McCormick (1992) reported that captive females reach sexual maturity between 178–203 mm SCL at 7 years of age, while Senneke (2000) and Eberling (2001) stated that females in captivity become mature at 220–230 mm SCL with a body mass of 1900 g. Van Dijk (1998) reported maturity in a male, not yet showing any external male characteristics, at 206 mm SCL and 1100 g and maturity in a female with a SCL of 198 mm and mass of 1000 g. According to Sriprateep et al. (2013), in northern Thailand, males mature at 6 years old with a SCL over 175 mm, while females take much longer to reach maturity at 8 years and 240 mm SCL. Females in Cambodia were reported to produce first clutches with a body mass of 1300 g (Ihlow et al. 2011).

In captivity, courtship and mating can be observed throughout the year, with peak activity occurring at the start of the cool season—January to April in Australia (Dunn 1976) and August to December in North America and Europe (Spencer 1988; Zeitz 1988; McCormick 1992; Eberling 2001). In northern Cambodia, courtship was only observed in the beginning of the rainy season from May to

June (Ihlow, pers. obs.). Van Dijk (1998) observed a breeding attempt in western Thailand in May during the early rainy season. Sriprateep et al. (2013) reported that breeding occurs from May to August in northern Thailand. The bright pink coloration that develops around the nose and eyes of the both sexes during the breeding season is the result of increased vascularization and may serve in species recognition or to increase olfaction (Spencer 1988; van Dijk 1998). Courtship begins with the male approaching the female and nosing around her cloaca (Sriprateep et al. 2013). Based on both captive and wild observations, a male tortoise may pursue a female for several days; during this time, the male frequently rams the female, including knocking the posterior of her shell before mating (Spencer 1988; McCormick 1992; van Dijk 1998; Eberling 2001). Male tortoises may vocalize during copulation, which lasts between 5 and 20 minutes (Spencer 1988; Sriprateep et al. 2013).

Females may lay eggs throughout the year in captivity (Spencer 1988). In the wild, clutches are generally laid at the end of the rainy season from October or November until March (Cox et al. 1998; van Dijk 1998; Ihlow et al. 2011; Sriprateep et al. 2013; Ihlow et al. 2014). Average clutch sizes in captivity range from 3–6 eggs (Zeitz 1988; Zhou and Zhou 1991; Manthey and Grossmann 1997; Senneke 2000; Eberling 2001). From 23 nests in northern Thailand, Sriprateep et al. (2013) reported a mean clutch size of 4.5 ± 2.3 eggs with a range of 1–9. Up to 10 eggs in a clutch have been reported in captivity (McCormick 1992; Manthey and Grossmann 1997; Eberling 2001). Captive females may lay up to three clutches in a season (McCormick 1992; Senneke 2000; Eberling 2001). Multiple clutching was observed in only one wild female in Thailand, which laid a second clutch 32 days after her first (Sriprateep et al. 2013). Eggs measured by Sriprateep et al. (2013) averaged 47.2 ± 2.9 mm (length) x 39.0 ± 2.5 mm (width) and 43.2 ± 7.5 g (mass), which agree with measurements taken in captivity (Senneke 2000; Eberling 2001). Eggs measured by van Dijk (1998) averaged 51.91 ± 2.74 mm x 42.27 ± 2.7 mm and 59.7 ± 9.9 g and therefore were slightly larger. Eggs are deposited during the night or in the early morning in a flask-shaped nest 10–20 cm deep (McCormick 1992; van Dijk 1998; Senneke 2000; Sriprateep et al. 2013). Nests are often constructed near the base of a tree or bamboo clump (Sriprateep et al. 2013) and van Dijk (1998) found females to favor sloped ground for nest sites.

In the wild, hatchlings emerge at the beginning of the subsequent rainy season (Cox et al. 1998; van Dijk 1998; Ihlow et al. 2011; Sriprateep et al. 2013; Ihlow et al. 2014). The lack of caruncles on hatchlings found in Thailand suggests that hatchlings might stay in the nest cavity to emerge with the first rain (van Dijk 1998). In captivity, successful egg incubation takes between 98–134 days at temperatures between 26.6 and 29.4°C. At a constant 28°C, hatching occurs in 120–180 days (Senneke 2000) and with diel cycling temperatures of 30–30.5°C during the day and 27.5–28°C at night, the duration of incubation is110–170 days (Eberling 2001). It is still unknown whether *I. elongata* exhibits temperature dependent or genetic sex determination (Senneke 2000).

Figure 9. Juvenile *Indotestudo elongata* from the Nakai-Nam Theun National Biodiversity Conservation Area, Khammouane Province, central Laos, feeding on the decomposed carcass of a snake, *Oligodon albocinctus*. Photo by Sitha Som.

The Elongated Tortoise is an omnivorous generalist (Ihlow et al. 2012; Sriprateep et al. 2013) and its diet seems to vary according to availability by habitat and season (Ihlow et al. 2012). For example, numerous authors have remarked that *I. elongata* is highly frugivorous (Bourret 1941; Pritchard 1979; Das 1985; Tikader and Sharma 1985). However, Ihlow (pers. obs.) found fruits to be nearly unavailable and of little importance in the diet of tortoises in open dipterocarp forest in northern Cambodia. Van Dijk (1998) reported that *I. elongata* in western Thailand ate primarily herbaceous leaves, fruits, and mushrooms. In areas where Elongated Tortoises do consume a variety of fruits, they may play a role in the dispersal of plant seeds (van Dijk 1998). Based on the food preferences of captive animals, Biswas et al. (1978) suggested that the fallen flowers of *Shorea robusta* were eaten by wild tortoises. One scat from a wild *I. elongata* in Myanmar consisted primarily of grass (Platt et al. 2001). Plant species confirmed to be eaten by wild Elongated Tortoises include: *Amaranthus lividus*, *Basella rubra*, *Chromolaena odorata, Coccinia grandis*, *Crytococcum accrescens*, *Cyanotis cristata*, *Cypreus* spp., *Dillenia* spp., *Ficus racemosa*, *Gomphrena celosioides*, *Ruellia tuberosa*, *Sida acuta*, and *Sida subcordata* (van Dijk 1998; Sriprateep et al. 2013; Ihlow, pers. obs.). Statements from tortoise hunters in Myanmar suggest that additional plants consumed by *I. elongata* include: *Allium* spp., *Dolichandrone spathacea*, *Millettia brandisiana*, *Markhamia stipulata*, and *Olax scandens* (Platt et al. 2001). Fungi, particularly the fruiting bodies of mushrooms (e.g., *Termitomyces*, *Russula*), are

readily eaten when available (Thirakhupt and van Dijk 1995; Manthey and Grossmann 1997; van Dijk 1998; Platt et al. 2001; Ihlow et al. 2012). *Indotestudo elongata* also frequently consumes animal material and has been observed preying upon earthworms, slugs, and thin-shelled terrestrial snails (e.g., *Quantula striata, Hemiplecta distincta*; Nutaphand 1979; Manthey and Grossmann 1997; Ihlow et al. 2012; Sriprateep et al. 2013). *Indotestudo elongata* has also been documented to scavenge carrion, such as the carcass of a snake (*Oligodon albocinctus*; Som, pers. obs.; Fig. 9) and the heavily decomposed skull of a civet (*Viverra cf. zibetha;* Ihlow et al. 2012). The species will also eat the excrement of other animals (van Dijk 1998; Sriprateep et al. 2013). The remains of insects and crabs have been found in the feces of *I. elongata* (van Dijk 1998; Ihlow et al. 2012). Juveniles have been observed to feed on ants (Ihlow, pers. obs.). Van Dijk (1998) also found sand and soil in the feces of *I. elongata*; in some cases, the volume of soil seemed to indicate that the material had been intentionally ingested. Hunters in Myanmar noted that tortoises consume eggshells from the hatched nests of the Red Junglefowl (*Gallus gallus*; Platt et al. 2001). Distinctive patterns of seasonal changes in body mass have been observed in Cambodia and Thailand (van Dijk 1998; Ihlow 2012), most likely due to seasonal availability of food and drinking water. Tortoises were found to increase in mass during the rainy season and slowly lose mass during the dry season.

Indotestudo elongata may serve as prey for a number of animals and as host to many species of parasites. Van Dijk (1998) documented adult tortoises with carapacial scars, likely the result of predation attempts, but could not identify the potential predators. Monitor lizards (*Varanus* spp.) likely prey on the eggs and young of Elongated Tortoises (van Dijk 1998). Fire ants (*Solenopsis* spp.) may also prey upon juvenile tortoises (van Dijk 1998; Sriprateep et al. 2013). Large numbers of mosquitoes have been observed feeding upon individual *I. elongata* (van Dijk 1998; Ihlow, pers. obs.). Three species of ticks (*Amblyomma clypeolatum*, *A. geoemydae*, and *A. supinoi*) are known to parasitize *I. elongata* (van Dijk 1998; Robbins and Platt 2000; Robbins and Platt 2001; Robbins et al. 2006) and 84% of tortoises analyzed by van Dijk (1998) suffered from at least one tick. Nematodes have been reported in the feces of *I. elongata* (van Dijk 1998; Bouamer and Morand 2006; Sriprateep et al. 2013). These endoparastic worms include two new species (*Falcaustra sinensis* and *Meteterakis wangi*), which were described from captive tortoises (Liu et al. 2011; Zhang and Zhang 2011).

Population Status. — Despite having a wide distribution with areas of suitable habitat remaining, *I. elongata* has recently undergone severe population declines due to human activities. Quantitative historical data are lacking, but early authors noted that the species was common in many parts of its range (Blyth 1854; Smith 1931; Bourret 1941; Lekagul 1965). However, by the late 1970s, the species was already becoming rare in India (Biswas et al. 1978). Thirakhupt and van Dijk (1995) documented the presence of *I. elongata* in the forests of western Thailand but reported that numbers of the species had declined dramatically during the previous 10–15 years. Population density at the Huai Kha Khaeng Wildlife Sanctuary in western Thailand was estimated to be in the order of only a single individual per square km (Thirakhupt and Van Dijk 1995). The sex ratio in this population was also heavily female-biased at 1:2.45, potentially a result of greater collection of males by humans (van Dijk 1998). Vietnamese populations were severely depleted by the late 1990s; after that time, many of the specimens confiscated in Vietnam likely originated in Cambodia or Laos (Bradley and Phipps 1996; Hendrie 1998; Hendrie 2000; Holloway 2003; Emmett 2009). In Cambodia, numbers have declined so heavily that local extinction is likely (Bradley and Phipps 1996; Touch et al. 2000; Holloway 2003; Emmett 2009).

Threats to Survival. — Humans have long utilized *I. elongata* as a source of food; tortoise remains have been recovered from deposits in rock shelters used by humans during the Pleistocene (Mudar and Anderson 2007). Blyth (1854) and Theobald (1868) mentioned that Burmese locals used trained dogs to locate Elongated Tortoises. However, in recent decades, anthropogenic consumption of *I. elongata* has greatly increased. Currently, *I. elongata* is heavily exploited for food and traditional medicine throughout its range. Local people often opportunistically capture tortoises while farming or extracting other forest resources. However, deliberate hunting also occurs and dogs continue to be widely used for finding tortoises (Pawar and Choudhury 2000; Platt et al. 2007; Platt et al. 2012; Som and Cottet 2016; Ihlow pers. obs.). The species is collected for both local use (Lekagul 1965; Moll 1989; Das 1990; Pauwels et al. 2000; Tungittiplakorn and Dearden 2002; Hansel 2004; Das and Gupta 2015) and for export to the international wildlife trade (Hendrie 1998; Compton 2000; Holloway 2003). In the late 1990s, *I. elongata* was suggested to be the most common chelonian species in the Vietnamese wildlife trade (Hendrie 1998). Le and Broad (1995) estimated that over 500 kg of *I. elongata* were sold every day at a market in Ho Chi Minh City, Vietnam. Within Cambodia, high levels of trade in Elongated Tortoises have been reported (Holloway 2003; Lehr and Holloway 2003; Emmett 2009) and the species continues to be observed in Cambodian markets (Ihlow and Dawson 2016). However, large specimens have become difficult to find in many areas, likely reflecting declines in adults as a result of extensive collection (Emmett 2009; Som et al. 2005, 2006, 2009; Ihlow, pers. obs.). An absence of large individuals has also been documented in a population exploited for subsistence harvest in Myanmar (Platt et al. 2012). Among all countries, China has been

the major consumer of chelonians for food and traditional medicine. During the height of the trade, China imported several thousand tons of turtles and tortoises annually (van Dijk et al. 2000) and *I. elongata* was frequently observed in Chinese markets. Indeed, it has often been recorded as being one of most abundant species available (Artner and Hofer 2001; Shi 2002; Lee et al. 2004; Shi et al. 2004; Cheung and Dudgeon 2006).

The Elongated Tortoise is also available in the international pet trade. However, the impact of trade as pets is small compared to the volume of trade for food and traditional medicines. From 1975 to 1985, roughly 3800 *I. elongata* were exported from Thailand to the United States and Europe (Tikader and Sharma 1985). Over 14000 Elongated Tortoises were exported from Malaysia to Europe, Japan, and the United States between 1985 and 1998 (Compton 2000). Although no official importation records exist, *I. elongata* has been documented from the Philippine pet trade (Sy 2015). The species has also been reported in pet shops in Taiwan (Shiau et al. 2006). Presently, the majority of the demand for pets in the United States and Europe is met by captive breeding, although importations of wild-caught animals still occur occasionally (Dawson and Ihlow, pers. obs.).

This species is also heavily affected by habitat degradation, fragmentation, and destruction. Southeast Asia has experienced extremely high rates of deforestation (Sodhi et al. 2004). Lowland habitats are converted mainly for agricultural use, such as rice paddies, cassava fields, or banana plantations. Biswas et al. (1978) blamed the decline of *I. elongata* in India on the loss of dipterocarp forests. *Indotestudo elongata* currently appears to be absent from areas of dense human population and intensive cultivation, such as the Indo-Gangetic Plain of India, the Chao Phraya region in central Thailand, and the Khorat Plateau in northeastern Thailand (Fig. 7). Forest fires also impact *I. elongata*. Open dipterocarp forests are fire-adapted ecosystems (Stott 1988) and *I. elongata* populations are likely to survive occasional fires. Van Dijk (1998), Platt et al. (2001), and Som (pers. obs.) observed living tortoises bearing scars (reaching up to two thirds of their carapace surface) from fires. However, the frequency and intensity of forest fires at present is thought to be higher than in the past (Thirakhupt and van Dijk 1995; Sodhi et al. 2004). In addition to natural fires, local people deliberately set fires during the dry season to clear land for farming and to stimulate the growth of grass for grazing (Thirakhupt and van Dijk 1995; Platt et al. 2010b; Som and Cottet 2016). In Thai and Cambodian lowland forests, Elongated Tortoises often die in these frequently recurring fires (Thirakhupt and van Dijk 1995; Ihlow, pers. obs.). Fire also exposes any surviving tortoises, allowing hunters to collect them more easily (Theobald 1868; Choudhury 2001; Platt et al. 2007, Platt et al. 2010b).

Other threats are minor and localized. Mitchell and Rhodin (1996) reported that decorative masks produced from the carapaces of *I. elongata* were available for sale to tourists in curio shops in Kathmandu, Nepal. Road mortality and trampling by livestock may be a concern in some areas (Sriprateep et al. 2013).

Conservation Measures Taken. — *Indotestudo elongata* was listed as globally Endangered on the IUCN Red List in 2000 and was consequently included in the 'Global Action Plan for the Conservation of Tortoises and Freshwater Turtles' of the Turtle Conservation Fund (TCF 2002; TTWG 2014). It is also listed in Appendix II (as Testudinidae spp.) of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (UNEP 2014). Additionally, Elongated Tortoises are protected by national legislation in many countries throughout the range of the species.

Indotestudo elongata has been recorded from many protected areas across its range, including: Lawachara National Park in Bangladesh (Rahman 2012, Rahman et al. 2014); Kulen Promtep Wildlife Sanctuary (Hartmann et al. 2013), Central Cardamom Protected Forest (Som et al. 2005), Prey Lang forest (Som and Kheng, unpubl. data), Phnom Nam Lyr Wildlife Sanctuary (Som and Sun, unpubl. data), and Virachey National Park (Som, unpubl. data) in Cambodia; Jim Corbett National Park (Ross and Crumly 1982), Rajaji National Park (Frazier 1992), and Simlipal National Park (Dutta et al. 2009) in India; Nakai Plateau Protected Area in Laos (Som, unpubl. data); Shwe Settaw Wildlife Sanctuary (Platt et al. 2001); Rakhine Yoma Elephant Reserve (Platt et al. 2010a), and Natma Taung National Park (Platt et al. 2012) in Myanmar; Sakaerat Biosphere Reserve (Ward, pers. comm.) and Huai Kha Khaeng Wildlife Sanctuary in Thailand (Tharapoom 1996; van Dijk 1998); and Cat Tien National Park in Vietnam (Ihlow et al. 2012).

This species is the focus of conservation projects at the Angkor Centre for Conservation of Biodiversity (ACCB) at Kbal Spean, Phnom Kulen National Park, Cambodia and the Turtle Conservation Centre (TCC) in Cuc Phuong National Park, Vietnam. Work at both ACCB and TCC includes the rehabilitation and captive breeding of tortoises confiscated from illegal trade.

Conservation Measures Proposed. — In general, the coverage of protected areas is considered suitable to conserve sufficient tracts of habitat for the Elongated Tortoise. However, hunting of tortoises has been reported within protected areas in the past (van Dijk 1998) and illegal poaching continues to occur (Ihlow et al. 2014). Therefore, greater law enforcement and awareness in the surrounding communities are desperately needed to reduce poaching within protected areas so that remaining populations can recover.

The rehabilitation of confiscated individuals and production of captive offspring, conducted by local wildlife

rescue and nature conservation centers (ACCB, Cambodia; TCC, Vietnam), have proven highly successful in recent years. In order to improve conservation breeding efforts, studies of sex determination in this species should be undertaken. Reintroduction and reinforcement of populations using rehabilitated and captive-bred tortoises are potential tools for conservation (Ihlow et al. 2014). In addition, the translocation of tortoises from habitats destined for development may be a viable option (Som and Cottet 2016). As a result, further conservation measures should include release studies, incorporating post-release monitoring of rehabilitated and captive-bred tortoises to determine survival and movements patterns (Ihlow et al. 2014). During a 2011 IUCN-TFTSG workshop in Singapore, the species was prioritized as a key species for which assurance colonies already exist in multiple countries (Horne et al. 2012). Additional assurance colonies (both *in situ* and *ex situ*), particularly in currently unrepresented areas of the species' distribution, should be established.

Captive Husbandry. — *Indotestudo elongata* has been described as hardy and easy to keep. Hence, it has been successfully kept and reproduced by numerous private breeders (Zeitz 1988; McCormick 1992; van Putten 1992; Senneke 2000; Eberling 2001; Sanz and Valverde 2002), zoological institutions (Dunn 1976; Spencer 1988), and wildlife rescue centers (Ihlow et al. 2011). Housing of adults requires enclosures with sizable floor space (> 2.7 m x 1.35 m); young animals may be housed in smaller enclosures and transferred to larger ones as they grow. All enclosures should have large shallow pools for the tortoises to soak and drink (Zeitz 1988; Sanz and Valverde 2002). Natural substrates (e.g., mulch, soil, leaf litter, sphagnum) that retain humidity, multiple hiding spots, and visual barriers should be used within enclosures to reduce stress. Although Elongated Tortoises are rarely seen basking, in indoor enclosures it is recommended to install lighting that provides both heat and ultraviolet-B radiation (Senneke 2000; Eberling 2001; Sanz and Valverde 2002). When night time temperatures exceed 15°C, *I. elongata* can be kept in outdoor pens (Senneke 2000; Eberling 2001; Sanz and Valverde 2002). While males are best kept separately from each other, females can be kept together in groups (Senneke 2000; Eberling 2001). Care must be taken during the breeding season to watch for injuries to females from overly aggressive males (Zeitz 1988).

Captive *I. elongata* have been reported to accept a number of foods, including: fresh or dried greens (i.e., morning glory, dandelion, kale, collards, alfalfa, clover, plantain, chickweed), vegetables (i.e., bamboo shoots, tomatoes, mushrooms, pumpkin, cucumber, carrot), fruits (i.e., papaya, mango, banana, pitaya), animal matter (i.e., earthworms, snails, shrimp), and commercial tortoise pellets (Spencer 1988; Zeitz 1988; van Putten 1992; Senneke 2000; Eberling 2001; Sanz and Valverde 2002; Dawson, pers. obs.). An assortment of foods should be offered to match the variety and seasonality of the natural diet of *I. elongata*. Foods should be nutritionally balanced and supplemented with vitamins and minerals as necessary. Cuttlefish bones can be offered *ad libitum* to provide additional calcium (Dunn 1976; Senneke 2000; Eberling 2001).

As of September 2013, the Zoological Information Management System (ISIS 2013) reported 110 specimens held by eleven zoological institutions in Asia, 27 specimens in three institutions in Australia, 68 specimens among 15 institutions in Europe, and 34 specimens in nine institutions in North America. In addition, there are large numbers of captive individuals in non-ZIMS institutions and private collections. A studbook for *I. elongata* is maintained by the European Studbook Foundation (ESF) and consists of 235 specimens (Zwarteporte and Fontijne 2010). However, according to Zwarteporte and Fontijne (2010), no European Studbook (ESB) or Endangered Species Program (EEP) is in use or planned for the Elongated Tortoise to date. Likewise, no studbook currently exists for *I. elongata* in Association of Zoos and Aquariums (AZA) institutions.

Slavens and Slavens (2000) reported the record longevity for this species in captivity to be 14 years and 1 month. However, A. Rhodin (pers. comm.) has had a female *I. elongata* in captivity for 44 years, originally obtained in 1972 when she was an adult and still growing slowly, probably ca. 8–10 yrs old at the time, indicating probable longevity of well over 50 years, and still active and producing eggs annually as of 2016.

Current Research. — A conservation project has been initiated surrounding Lawachara National Park, Bangladesh (Rahman 2012; Rahman et al. 2014) and includes ongoing radiotelemetry and translocation studies by the Bangladesh Python Project. Ecological research was recently conducted at the western distributional limit of the species in Rajaji National Park, northern India by the Wildlife Institute of India. The results of this study are currently being prepared for publication and monitoring of the population is continuing (Kumar, pers. comm.). A year-round radio tracking study focusing on habitat use and behavior ecology is presently being conducted at the Sakaerat Environmental Research Station in the Sakaerat Biosphere Reserve, Thailand (Ward, pers. comm.). Finally, a study to assess morphological variation and genetic divergence across the species' distributional range is presently being prepared for publication.

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LITERATURE CITED

Annandale, N. 1913. The tortoises of Chota Nagpur. Records of the Indian Museum 9:63–78.

Artner, H. and Hofer, A. 2001. Observations in the Qing Ping Free Market, Guangzhou, China, November 2000. Turtle and Tortoise Newsletter 3:14.

Auliya, M. 2007. An Identification Guide to the Tortoises and Freshwater Turtles of Brunei Darussalam, Indonesia, Malaysia, Papua New Guinea, Philippines, Singapore and Timor Leste. Petaling Jaya, Malaysia: TRAFFIC Southeast Asia, 90 pp.

Baruah, C. and Sharma, D.K. 2010. Checklist of turtle fauna so far recorded from northeast India. NeBIO 1:10–13.

Biswas, S., Acharjyo, L.N., and Mohapatra, S. 1978. Notes on distribution, sexual dimorphism and growth in captivity of *Geochelone elongata* (Blyth). Journal of the Bombay Natural History Society 75:928-930.

Blyth, E. 1854 ["1853"]. Notices and descriptions of various reptiles, new or little-known. Part I. Journal Asiatic Society of Bengal 22:639–655.

Bouamer, S. and Morand, S. 2006. Nematodes parasites of Testudinidae (Chelonia): list of species and biogeographical distribution. Annales Zoologici 56:225–240.

Boulenger, G.A. 1889. Catalogue of the chelonians, rhynchocephalians, and crocodiles in the British Museum (Natural History). London, UK: British Museum, 311 pp.

Bour, R. 1980. Essai sur la taxonomie des Testudinidae actuels (Reptilia, Chelonii). Bulletin du Museum National d'Histoire Naturelle Paris 2:541–546.

Bourret, R. 1941. Les tortues de l'Indochine. Institute Océanographique de l'Indochine 38:1–235.

Bradley, E. and Phipps, M. 1996. A Review of the Wild Animal Trade in Cambodia. TRAFFIC Bulletin 16:54–56.

Buhlmann, K.A., Akre, T.S.B., Iverson, J.B., Karapatakis, D., Mittermeier, R.A., Georges, A., Rhodin, A.G.J., van Dijk, P.P., and Gibbons, J.W. 2009. A global analysis of tortoise and freshwater turtle distributions with identification of priority conservation areas. Chelonian Conservation and Biology 8(2):116–149.

Cheung, S.M. and Dudgeon, D. 2006. Quantifying the Asian turtle crisis: market surveys in southern China, 2000-2003. Aquatic Conservation: Marine and Freshwater Ecosystems 16:751–770.

Choudhury, A. 2001. Some chelonian records from Mizoram. Journal of the Bombay Natural History Society 98:184–190.

Compton, J. 2000. An overview of Asian turtle trade. In: van Dijk P.P., Stuart, B.L., Rhodin, A.G.J. (Eds.). Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. Chelonian Research Monographs No.2, pp. 24–29.

Cox, M.J., van Dijk, P.P., Nabhitabhata, J., and Thirakhupt, K. 1998. A Photographic Guide to Snakes and Other Reptiles of Peninsular Malaysia, Singapore and Thailand. Sanibel, FL: Ralph Curtis Publishing, 144 pp.

Crumly, C.R. 1982. A cladistic analysis of *Geochelone* using cranial osteology. Journal of Herpetology 16:215–234.

Crumly, C.R. 1984. A hypothesis for the relationship of land tortoise genera (Family Testudinidae). Studia Geologica Salamanticensia, Vol. Especial 1. Studia Paleochelonologica 1:115–124.

Crumly, C.R. 1988. A nomenclatural history of tortoises (Family Testudinidae). Smithsonian Herpetological Information Service, Number 75, 17 pp.

Das, I. 1985. Indian Turtles: A Field Guide. Calcutta, India: World Wildlife Fund-India, 119 pp.

Das, I. 1990. The trade in freshwater turtles from Bangladesh. Oryx 24:163–166.

Das, I. 2010. A Field Guide to the Reptiles of South-East Asia. London, UK: New Holland Publishers Ltd, 376 pp.

Das, I., Dattagupta, B., and Gayen, N.C. 1998. History and catalogue of reptile types in the collection of the Zoological Survey of India. Journal of South Asian Natural History 3:121–172.

Das, K.C. and Gupta, A. 2015. New distribution records of tortoises (Chelonia: Testudinidae) from Barak Valley, Assam, northeastern India with notes on ecology and vernacular traditional taxonomy. Journal of Threatened Taxa 7:7017–7023.

de Bruin, R. 1998. Schildpadden in het Phu Luang Wildlife Sanctuary, Thailand. Lacerta 56:111–116.

Dunn, R.W. 1976. Breeding the elongate tortoise *Testudo elongata* at Melbourne Zoo. International Zoo Yearbook 16:73–74.

Dutta, S.K., Nair, M.V., Mohapatra, P.P., and Mahapatra, A.K. 2009. Amphibians and reptiles of Similipal Biosphere Reserve. Bhubaneswar, India: Regional Plant Resource Centre, 174 pp.

Eberling, G. 2001. Haltung und Nachzucht von *Indotestudo elongata* (BLYTH, 1853). Draco 2:61–72.

Emmett, D. 2009. Current conservation status of turtles in Cambodia. TurtleLog Number 1. www.iucntftsg.org/turtlelog_online_newsletter/tln001/. Accessed 20 October 2010.

Ernst, C.H. and Barbour, R.W. 1989. Turtles of the World. Washington D.C., USA: Smithsonian Institution Press, 314 pp.

Fang, P. W. 1930. Notes on chelonians of Kwangsi, China. Sinensia. 1:95–135.

Frazier, J. 1992. The land tortoise in Nepal: a review. Journal of the Bombay Natural History Society 89:45–54.

Fritz, U. and Bininda-Emonds, O.R.P. 2007. When genes meet nomenclature: tortoise phylogeny and the shifting generic concepts of *Testudo* and *Geochelone*. Zoology 110:298–307.

Gray, J.E. 1870. Supplement to the Catalogue of Shield Reptiles in the Collection of the British Museum. Part I. Testudinata (Tortoises). London, UK: Taylor and Francis, 120 pp.

Gray, J.E. 1872. Appendix to the Catalogue of Shield Reptiles in the Collection of the British Museum. Part I. Testudinata (Tortoises). London, UK: Taylor and Francis, 28 pp.

Grismer, L.L., Youmans, T.M., Wood, P.L., Ponce, A., Wright, S.B., Jones, B.S., Johnson, R., Sanders, K.L., Gower, D.J., Yaakob, N.S., and Lim, K.K.P. 2006. Checklist of the herpetofauna of Pulau Langkawi, Malaysia, with comments on taxonomy. Hamadryad 30:61–74.

Grismer, L.L., Chav, T., Neang, T., Wood, P.L. Jr., Grismer, J.L., Youmans, T.M., Ponce, A., Daltry, J.C., and Kaiser, H. 2007. The herpetofauna of the Phnom Aural Wildlife Sanctuary and checklist

of the herpetofauna of the Cardamom Mountains, Cambodia. Hamadryad 31:216–241.

Hansel, T. 2004. Observations on subsistence hunting along the Phu Yai Mountain Range, Xanakham District, Vientiane Province, Lao PDR. Natural History Bulletin of the Siam Society 52:195–200.

Hartmann, T., Ihlow, F., Edwards, S., Sovath, S., Handschuh, M., and Böhme, W. 2013. A preliminary annotated checklist of the amphibians and reptiles of the Kulen Promtep Wildlife Sanctuary in northern Cambodia. Asian Herpetological Research 4:36–55.

Hendrie, D.B. 1998. Protecting Viet Nam's turtles, report of the Cuc Phuong Conservation Project. October 1998. www.cites.org/eng/cop/11/doc/35.pdf. Accessed 27 February 2008.

Hendrie, D.B. 2000. Status and conservation of tortoises and freshwater turtles in Vietnam. In: van Dijk, P.P., Stuart, B.L., and Rhodin, A.G.J. (Eds.). Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. Chelonian Research Monographs No. 2, pp. 63–73.

Holloway, R.H.P. 2003. Domestic trade of tortoises and freshwater turtles in Cambodia. Chelonian Conservation and Biology 4:733–734.

Hora, S.L. 1948. The distribution of crocodiles and chelonians in Ceylon, India, Burma and farther east. Proceedings of the National Institute of Sciences of India 14:285–310.

Horne, B.D., Poole, M.C., and Walde, A.D. (Eds.). 2012. Conservation of Asian Tortoises and Freshwater Turtles: Setting Priorities for the Next Ten Years. Recommendations and Conclusions from the Workshop in Singapore, February 21-24, 2011. Singapore: Wildlife Conservation Society Singapore Ltd, 28 pp.

Ihlow, F. 2012. Release study of the Elongated Tortoise *Indotestudo elongata* (BLYTH, 1854) (Testudinidae) at the Kulen Promtep Wildlife Sanctuary in the Northern Plains of Cambodia with remarks on ecology and natural history. Diplom Thesis, Rheinische Friedrich-Wilhelms-Universität, Bonn, Germany.

Ihlow, F. 2013. Geografische Variation der Gelbkopf-Landschildkröte *Indotestudo elongata* (BLYTH, 1854). Testudo 22:7–19.

Ihlow, F. and Dawson, J.E. 2016. Fang und Handel der aquatischen Schildkröten im Tonlé Sap Biosphären Reservat in Zentral Kambodscha. Schildkröten im Fokus 1:23–31.

Ihlow, F., Handschuh, M., and Raffel, M. 2011. Haltung und Nachzucht der Gelbkopf-Landschildkröte (*Indotestudo elongata*) im "Angkor Centre for Conservation of Biodiversity" (ACCB), Kambodscha. Marginata 8:24–30.

Ihlow, F., Geissler, P. Sovath, S, Handschuh, M., and Böhme, W. 2012. Feeding ecology of *Indotestudo elogata* (Blyth 1853) in the wild in Cambodia and Vietnam. Herpetology Notes 5:5–7.

Ihlow, F., Rödder, D., Bochynek, T., Sovath, S., Handschuh, M., and Böhme W. 2014. Reinforcement as a conservation tool - assessing site fidelity and movement of the endangered Elongated Tortoise *Indotestudo elongata* (Blyth, 1854). Journal of Natural History 48:2473–2485.

Inger, R.F. and Colwell, R.K. 1977. Organization of contiguous communities of amphibians and reptiles in Thailand. Ecological Monographs 47:229–253.

Jayaram, K.C. 1949. A note on the distribution of chelonians of Peninsular India with Malayan affinities. Proceedings of the National Institute of Sciences of India 15:397–398.

International Species Information System (ISIS). 2013. Zoological Information Management System. zims.isis.org. Accessed 28 September 2013.

Iverson, J.B. 1992. A Revised Checklist with Distribution Maps of the Turtles of the World. Richmond, IN: Privately Printed, 363 pp.

Iverson, J.B., Spinks, P.Q., Shaffer, H.B., McCord, W.P., and Das, I. 2001. Phylogenetic relationship among the Asian tortoise genus *Indotestudo* (Reptilia: Testudines: Testudinidae). Hamadryad 26:272–275.

Le, D.D. and Broad, S. 1995. Investigations into Tortoise and Freshwater Turtle Trade in Vietnam. Gland, Switzerland and Cambridge, UK: IUCN Species Survival Commission, 34 pp.

Le, M., Raxworthy, C.J., McCord, W.P., and Mertz, L. 2006. A molecular phylogeny of tortoises (Testudines: Testudinidae) based on mitochondrial and nuclear genes. Molecular Phylogenetics and Evolution 40:517–531.

Lee, K.S., Lau, M.W.N, and Chan, B.P.L. 2004. Wild animal trade monitoring at selected markets in Guangzhou and Shenzhen, South China, 2000-2003. Kadoorie Farm and Botanic Garden Technical Report Number 2, 36 pp.

Lehr, E. and Holloway, R. 2003. Turtle trade in Cambodia. Reptilia 30:64–71.

Lekagul, B. 1965. Tortoises of Thailand. Conservation News, S. E. Asia 7:56–59.

Lindholm, W.A. 1929. Revidiertes Verzeichnis der Gattungen der rezenten Schildkröten nebst Notizen zur Nomenklatur einiger Arten. Zoologischer Anzeiger 81:275–295.

Liu, B., Zhang, S., and L. Zhang. 2011. *Falcaustra sinensis* sp. nov (Nematoda, Kathlaniidae) from *Indotestudo elongata* in China. Acta Parasitologica 56:208–212.

Manthey, U. and Grossmann, W. 1997. Amphibien und Reptilien Südostasiens. Münster, Germany: Natur und Tier Verlag (NTV), 512 pp.

McCormick, B. 1992. The elongated tortoise. *Indotestudo elongata*. Tortuga Gazette 28(3):1–3.

Mitchell, J.C. and Rhodin, A.G.J. 1996. Observations on the natural history and exploitation of the turtles of Nepal, with life history notes on *Melanochelys trijuga*. Chelonian Conservation and Biology 2:66–72.

Moll, E.O. 1989. *Indotestudo elongata*, elongated tortoise. In: Swingland, I.R. and Klemens, M.K. (Eds.). The Conservation Biology of Tortoises. Occasional Papers of the IUCN Species Survival Commission, No. 5. Gland, Switzerland: IUCN, pp. 116–117.

Mudar, K. and Anderson, D.D. 2007. New evidence for Southeast Asian Pleistocene foraging economies: faunal remains from the early levels of Lang Rongrien Rockshelter, Krabi, Thailand. Asian Perspectives 46:298–334.

Nguyen, V.S., Ho, T.C., and Nguyen, Q.T. 2009. Herpetofauna of Vietnam. Frankfurt am Main, Germany: Edition Chimaira, 768 pp.

Nutaphand, W. 1979. The Turtles of Thailand. Bangkok, Thailand: Siamfarm Zoological Gardens, 222 pp.

Pauwels, O.S.G., Laohawat, O.-A., David, P., Bour, R., Dangsee, P., Puangjit, C., and Chimsunchart, C. 2000. Herpetological investigations in Phang-Nga Province, southern Peninsular Thailand, with a list of reptile species and notes on their biology. Dumerilia 4:123–154.

Pawar, S.S. and Choudhury, B.C. 2000. An inventory of chelonians from Mizoram, north-east India: new records and some observations on threats. Hamadryad 25:144–158.

Platt, S.G., Saw Tun Khaing, Win Ko Ko, and Kalyar. 2001. A tortoise survey of Shwe Settaw Wildlife Sanctuary, Myanmar, with notes on the ecology of *Geochelone platynota* and *Indotestudo elongata*. Chelonian Conservation and Biology 4:172–177.

Platt, S.G., Khin Myo Myo, Win Ko Ko, Aung Maung, and Rainwater, T.R. 2010a. Field observations and conservation of *Heosemys depressa* in the Rakhine Yoma Elephant Range of western Myanmar. Chelonian Conservation and Biology 9:114–119.

Platt, S.G., Win Ko Ko, Khin Myo Myo, Lay Lay Khaing, Platt, K., Aung Maung, and Rainwater, T.R. 2010b. Notes on *Melocanna*

baccifera and bamboo brakes in the Rakhine Hills of western Myanmar. Bamboo Science and Culture: The Journal of the American Bamboo Society 23:38–48.

Platt, S.G., Win Ko Ko, Platt, K., Khin Myo Myo, Me Me Soe, and Rainwater, T.R. 2012. Species inventory and conservation status of chelonians in Natma Taung National Park, Myanmar. Hamadryad 36:1-11.

Platt, S.G., Platt, K., Khin Myo Myo, Kyaw Moe, Me Me Soe, Thet Zaw Naing, Naing Lin, and Rainwater, T.R. 2013. Noteworthy records of chelonians from the Chindwin River Basin and Naga Hills of western Myanmar. Herpetological Conservation and Biology 8:335–350.

Pritchard, P.C.H. 1979. Encyclopedia of Turtles. Neptune, NJ: TFH Publications, 895 pp.

Pritchard, P.C.H. 2000. *Indotestudo travancorica*…a valid species of tortoise? Reptile & Amphibian Hobbyist 5:18–28.

Rahman, S.C. 2012. The last of the yellow tortoises. Bangladesh Nature Quest 9:14–17.

Rahman, S.C., Jenkins, C.L., Trageser, S.J., and Rashid, S.M.A. 2014. Radio-telemetry study of Burmese python (*Python molurus bivittatus*) and elongated tortoise (*Indotestudo elongata*) in Lawachara National Park, Bangladesh: a preliminary observation. In: Khan, M.A.R., Ali, M.S., Feeroz, M.M., and Naser, M.N. (Eds.). The Festschrift on the 50th Anniversary of the IUCN Red List of Threatened Species. Dhaka, Bangladesh: IUCN, pp. 54–62.

Rahman, S.C., Rashid, S.M.A., Datta, R., Mro, P., and Roy, C.J. 2015. Status, exploitation, and conservation of freshwater turtles and tortoises in Chittagong Hill Tracts, Bangladesh. Chelonian Conservation and Biology 14(2):130–135.

Robbins, R.G. and Platt, S.G. 2000. First report of *Amblyomma clypeolatum* Neumann (Acari: Ixodida: Ixodidae) from the Union of Myanmar, with two new records from tortoises. Proceedings of the Entomological Society of Washington 102:225–226.

Robbins, R.G. and Platt, S.G. 2001. First report of *Amblyomma supinoi* Neumann (Acari: Ixodida: Ixodidae) from the Arakan Forest Turtle, *Geoemyda depressa* Anderson (Reptilia: Testudines: Emydidae), with additional records of this tick from the Union of Myanmar. Proceedings of the Entomological Society of Washington 103:1023–1024.

Robbins, R.G., Bui, D.P., McCormack, T., Behler, J.L., Zwartepoorte, H.A., Hendrie, D.B., and Calle, P.P. 2006. Four new host records for *Amblyomma geoemydae* (Cantor) (Acari: Ixodida: Ixodidae) from captive tortoises and freshwater turtles (Reptilia: Testudines) in the Turtle Conservation Center, Cuc Phuong National Park, Vietnam. Proceedings of the Entomological Society of Washington 108:726–729.

Ross, C.A. and Crumly, C.R. 1982. A range extension of *Geochelone elongata*. Journal of the Bombay Natural History Society 79:429–430.

Sanz, A. and Valverde, J. 2002. Captive breeding of the elongate tortoise *Indotestudo elongata*. Reptilia (GB) 20:43–47.

Schleich, H.H. and Kästle, W. (Eds.). 2002. Amphibians and Reptiles of Nepal. Ruggell, Liechtenstein: A.R.G. Gantner Verlag, 1201 pp.

Senneke, D. 2000. Keeping and breeding *Indotestudo elongata* the elongated tortoise. Tortoise Trust Newsletter. 15:3–4. www.chelonia.org/articles/elongatacare.htm. Accessed 20 December 2010.

Sharma, D., Kamarudin, H., Ibrahim, H., and Chooi, O.H. 1996. The fauna and flora of a semi-deciduous forest in Perlis, Peninsular Malaysia. In: Edwards, D.S., Booth, W.E., and Choy, S.C. (Eds.). Tropical Rainforest Research – Current Issues: Proceedings of the Conference Held in Bandar Seri Begawan, April 1993 74:153–161.

Shi, H. 2002. Results of turtle market surveys in Chengdu and Kunming. Turtle and Tortoise Newsletter 6:15–16.

Shi, H., Fan, Z., Yin, F., and Yuan, Z. 2004. New data on the trade and captive breeding of turtles in Guangxi Province, South China. Asiatic Herpetological Research 10:126–128.

Shiau, T.-W., Hou, P.-C., Wu, S.-H., and Tu, M.-C. 2006. A survey on alien pet reptiles in Taiwan. Taiwania 51:71–80.

Slavens, F. L. and Slavens. K. 2000. Reptiles and amphibians in captivity: breeding – longevity and inventory (current January 1, 1999). Seattle, WA: Slaveware, 400 pp.

Smith, M.A. 1931. The Fauna of British India, including Ceylon and Burma. Reptilia and Amphibia, Vol. I, Loricata, Testudines. London, UK: Taylor and Francis, 179 pp.

Sodhi, N.S., Koh, L.P., Brook, B.W., and Ng, P.K.L. 2004. Southeast Asian biodiversity: an impending disaster. TRENDS in Ecology and Evolution 19:654–660.

Som, S. and Cottet, M. 2016. Rescue and relocation programme of turtles and tortoises and elongated tortoise monitoring programme in the Nam Theun 2 Reservoir (Laos). Hydroécologie Appliquée 19:383–406.

Som, S., Chey, K., and Sun, Y. 2005. Tortoise and Freshwater Turtle Conservation in the Cardamom Mountains, Cambodia. Final Report. Phnom Penh, Cambodia: Cambodian Turtle Conservation Project, 104 pp.

Som, S., Sun, Y., Kim, C., Kheng, S., and Chea, K. 2006. Extending Chelonian Research, Education and Conservation in Southwest Cambodia. Final Report. Phnom Penh, Cambodia: Cambodian Turtle Conservation Project and Conservation International, 106 pp.

Som, S., Sun, Y., Kim, C., and Kheng, S. 2009. Community-Driven Conservation of Cambodian Chelonian. Final Report. Phnom Penh, Cambodia: Cambodian Turtle Conservation Team and Conservation Leadership Programme, 56 pp.

Spencer, B. 1988. The elongated tortoise and its management at the Minnesota Zoo. Bulletin of the Chicago Herpetological Society 23:37–40.

Sriprateep, K., Aranyavalai, V., Aowphol, A., and Thirakhupt, K. 2013. Population structure and reproduction of the elongated tortoise *Indotestudo elongata* (Blyth, 1853) at Ban Kok Village, Northeastern Thailand. Tropical Natural History 13:21–37.

Stanford, C.B., Wanchai, P., Schaffer, C., Schaffer, R., and Thirakhupt, K. 2015. *Manouria emys* (Schlegel and Müller 1840) – Asian Giant Tortoise, Giant Asian Forest Tortoise. In: Rhodin, A.G.J., Pritchard, P.C.H., van Dijk, P.P., Saumure, R.A., Buhlmann, K.A., Iverson, J.B., and Mittermeier, R.A. (Eds.). Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Chelonian Research Monographs 5:086.1–9.

Stott, P. 1988. The forest as Phoenix: towards a biogeography of fire in mainland South East Asia. Geographical Journal 154:337–350.

Stuart, B.L. and Platt, S.G. 2004. Recent records of turtles and tortoises from Laos, Cambodia, and Vietnam. Asiatic Herpetological Research 10:129–150.

Stuart, B.L., van Dijk, P.P., and Hendrie, D.B. 2001. Photographic Guide to the Turtles of Thailand, Laos, Vietnam and Cambodia. New York, NY: Wildlife Conservation Society, 84 pp.

Swindells, R.J. and Brown, F.C. 1964. Ability of *Testudo elongata* Blyth to withstand excessive heat. British Journal of Herpetology 3:166.

Sy, E.Y. 2015. Checklist of exotic species in the Philippine pet trade, II. Reptiles. Journal of Nature Studies, 14:66–93.

Taylor, E.H. 1970. The turtles and crocodiles of Thailand and adjacent waters. The University of Kansas Science Bulletin 49:87–179.

Tharapoom, K. 1996. Radio-telemetry study of home range size and activities of elongated tortoise *Indotestudo elongata* (Blyth, 1853) at Huai Kha Khang Wildlife Sanctuary. M.Sc. Thesis, Chulalongkorn University, Bangkok, Thailand.

Theobald, W. 1868. Catalogue of the reptiles of British Birma, embracing the provinces of Pegu, Martaban, and Tennasserim: with descriptions of new or little known species. Journal of the Linnean Society (Zoology) 10:4–67.

Thirakhupt, K. and van Dijk, P.P. 1995 ["1994"]. Species diversity and conservation of turtles in western Thailand. Natural History Bulletin of the Siam Society 42:207–259.

Tikader, B.K. and Sharma, R.C. 1985. Handbook: Indian Testudines. Calcutta, India: Zoological Survey of India, 156 pp.

Touch, S.T., Park, L.H., Chul, T., Lieng, S., Chun, S., Hout, P. and Heng, K. 2000. Overview of turtle trade in Cambodia. In: van Dijk, P.P., Stuart, B.L. and Rhodin, A.G.J. (Eds.). Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. Chelonian Research Monographs No. 2, pp. 55–57.

Tungittiplakorn, W. and Dearden, P. 2002. Hunting and wildlife use in some Hmong communities in northern Thailand. Natural History Bulletin of the Siam Society 50:57–73.

Turtle Conservation Fund (TCF). 2002. A Global Action Plan for Conservation of Tortoises and Freshwater Turtles. Strategy and Funding Prospectus 2002-2007. Washington D.C., USA: Conservation International and Chelonian Research Foundation, 30 pp.

Turtle Taxonomy Working Group (TTWG). 2014. Turtles of the world, 7th edition: annotated checklist of taxonomy, synonymy, distribution with maps, and conservation status. In: Rhodin, A.G.J., Pritchard, P.C.H., van Dijk, P.P., Saumure, R.A., Buhlmann, K.A., Iverson, J.B., and Mittermeier, R.A. (Eds.). Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Chelonian Research Monographs 5:000.329–479.

United Nations Environment Programme (UNEP). 2014. The Species+ Website. www.speciesplus.net. Accessed: 13 August 2014.

van Dijk, P.P. 1998. The natural history of the elongated tortoise, *Indotestudo elongata* (Blyth,1853) (Reptilia: Testudines) in a hill forest mosaic in western Thailand, with notes on sympatric turtle species. Ph.D. Thesis, National University of Ireland, Galway, Ireland.

van Dijk, P.P., Stuart, B.L., and Rhodin, A.G.J. 2000. Executive summary. In: van Dijk, P.P., Stuart, B.L. and Rhodin, A.G.J. (Eds.). Asian Turtle Trade: Proceedings of a workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. Chelonian Research Monographs No. 2, pp. 13–14.

van Putten, S. 1992. Kweken met de Geelkopschildpad (*Indotestudo elongata*). Lacerta 50:118–120.

Wangyal, J.T., Wangchuk, D., and Das, I. 2012. First report of turtles from the Himalayan Kingdom of Bhutan. Chelonian Conservation and Biology 11:268–272.

Zeitz, D. 1988. The elongated tortoise *Geochelone* (*Indotestudo*) *elongata* (Blyth, 1853). The Forked Tongue 13:8–9.

Zhang, S. and Zhang, L. 2011. A new species of *Meteterakis* Karve, 1930 (Nematoda: Heterakoidea) from *Indotestudo elongata* (Blyth) in China with a key to the species of *Meteterakis*. Zootaxa 2869:63–68.

Zhao, E.-M. and Adler, K. 1993. Herpetology of China. Contributions to Herpetology 10. Oxford, OH: Society for the Study of Amphibians and Reptiles, 522 pp.

Zhou, J. and Zhou, T. 1991. Chinese Chelonians Illustrated. Nanjing, China: Jiangsu Science and Technology Publishing House, 89 pp.

Ziegler, T. 2002. Die Amphibien und Reptilien eines Tieflandfeuchtwald-Schutzgebietes in Vietnam. Münster, Germany: Natur und Tier Verlag, 342 pp.

Zug, G.R., Htun Win, Thin Thin, Than Zaw Min, Win Zaw Lhon, and Kway Kway. 1998. Herpetofauna of the Chatthin Wildlife Sanctuary, north-central Myanmar with preliminary observations of their natural history. Hamadryad 2:111–120.

Zwarteporte, H. and Fontijne, W. 2010. Studbook breeding programme *Indotestudo* (*Geochelone*) *elongata* (yellow-headed tortoise). Annual report. www.studbooks.eu. Accessed 12 September 2013.

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