

Noteworthy Records and Exploitation of Chelonians from the Ayeyarwady, Chindwin, and Dokhtawady Rivers, Myanmar

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ABSTRACT. – We investigated the occurrence and conservation status of turtles in the Ayeyarwady, Chindwin, and Dokhtawady rivers, Myanmar, in 2000–01. The occurrence of *Kachuga trivittata* was documented in the Dokhtawady River, but viable populations apparently no longer remain in the lower reaches of the Ayeyarwady or Chindwin rivers that we investigated. We provide the first field report of the recently described *Chitra vandijki*, and distributional records for *Cuora amboinensis*, *Heosemys grandis*, *Melanochelys trijuga edeniana*, *Morenia ocellata*, *Amyda cartilaginea*, and *Nilssonina formosa*.

Species inventories of particular regions provide essential data sets for conservation and resource management (Oliver and Beattie, 1993), and acquiring baseline data on the distribution and status of even common species is important (Dodd and Franz, 1993; Gibbons et al., 1997). Furthermore, knowledge of distribution patterns is fundamental to understanding community and ecosystem dynamics (McDiarmid, 1994). This is especially important in Myanmar, which has one of the most diverse, but least studied chelonian faunas in Asia (Kuchling, 1995; van Dijk, 1997; McCord, 1997; Platt et al., 2000, 2001a,b). Most data originated prior to 1900 and these old, fragmentary observations remain the principal source of information (van Dijk, 1997). Even basic distributional studies have yet to be undertaken for most

species (van Dijk, 1997; Platt et al., 2000). In particular, few data are available on the chelonian fauna of the major rivers of Myanmar.

We here report the results of three expeditions to central Myanmar conducted during 2000 and 2001. Our primary objective was to determine the current distribution and conservation status of the endemic Burmese roofed turtle (*Kachuga trivittata*) and Burmese peacock softshell (*Nilssonina formosa*) in the Ayeyarwady, lower Chindwin, and Dokhtawady rivers. Incidental to this investigation we gathered data on the occurrence of other chelonians as well.

The Ayeyarwady (formerly known as Irrawaddy) River (Fig. 1) is among the largest river basins in Asia with a watershed that includes almost 70% of Myanmar (Roberts et al., 1968). Unlike most rivers in Asia, the Ayeyarwady is confined within the political boundaries of a single nation (Roberts et al., 1968), and originates from mountain streams in northern Myanmar flowing southwards over 2000 km to the Andaman Sea (Gresswell and Huxley, 1965). Mean annual flow (136,245 m³/sec) is lowest during January and February (24,993 m³/sec), but increases when water levels rise sharply during April and May as a result of snow melt in the upper catchment, and again in June at the onset of the monsoon (June to October). Maximum flow (351,129 m³/sec) occurs in August and is unequaled by any similar-sized river in a monsoonal climate (Gresswell and Huxley, 1965; Scott, 1989).

The upper Ayeyarwady flows through two defiles; one between Myitkyina and Bhamo, and the other downstream from the Great Bend at Bhamo. These defiles are narrow gorges ranging from 50 to 100 m wide and in places are nearly 75 m deep (Gresswell and Huxley, 1965). Elsewhere

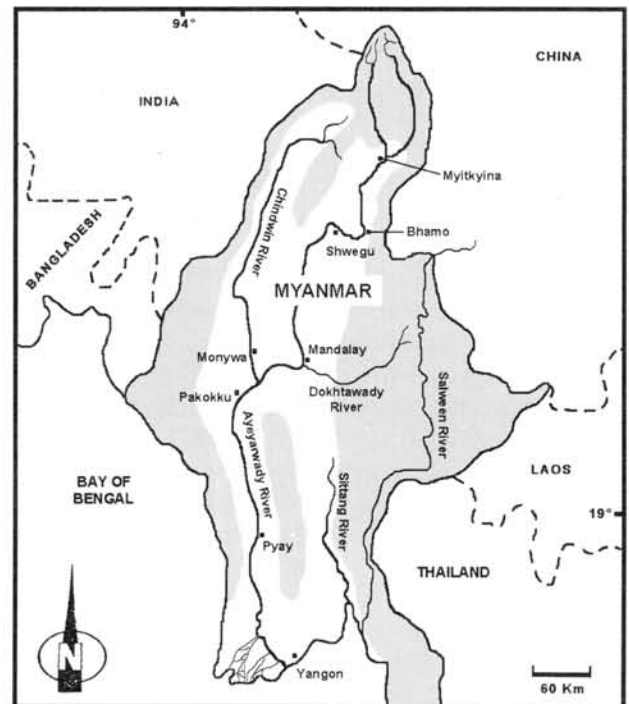


Figure 1. Map of Myanmar showing rivers and major population centers mentioned in text. Shaded areas denote hill ranges and mountains.

the river is characterized by wide meanders, braided channels, extensive sandbars, and numerous islands. The Ayeyarwady is one of the most heavily silted rivers in the world due to deforestation, erosion in the watershed, and floodplain agriculture. The annual silt load of 260 million tons results in the creation of 1000 ha of new land in the delta each year (Scott, 1989). Little natural vegetation remains in the floodplain owing to government-sponsored conversion of alluvial wetlands to rice by the British colonial administration during the late 19th century (Scott, 1989; McNeill, 2000).

Riverside forests were also heavily impacted in the past by cutting to supply fuelwood for river steamers (Wheeler, 1871; Raven-Hart, 1939). Temporary villages are scattered along the river, and agricultural crops are cultivated during the dry season in soil exposed by falling water levels. Dense stands of *kaing* grass (*Saccharum* spp.) are common in the floodplain and dominate fallow agricultural fields. Mats of the exotic water hyacinth (*Echhornia crassipes*) are absent from the main river channel, but obstruct some secondary channels during the dry season, before being flushed by the rising waters of the monsoon.

The Chindwin and Dokhtawady (also known as the Myitnge or Namtu) rivers are major tributaries of the Ayeyarwady (Fig. 1). The Chindwin is the largest tributary, arising in extreme northwestern Myanmar and flowing 800 km south before joining the Ayeyarwady near Pakokku. The upper reaches of the Chindwin are characterized by a series of deep gorges, while the lower reaches flow through a densely populated and heavily cultivated floodplain (Gresswell and Huxley, 1965). The Dokhtawady is a deeply entrenched river arising in the Shan Plateau and flowing through a series of rapids and waterfalls within a constricted valley to meet the Ayeyarwady south of Mandalay (Roberts et al., 1968). Most of the floodplain is devoted to agriculture. A hydropower dam currently under construction is projected

to inundate almost 30 km of river valley, creating an impoundment of approximately 23,886 ha, which will greatly alter the ecology of this river.

METHODS

Fieldwork was conducted during 2000 and 2001. From 29 November to 7 December 2000 we traveled by road and boat along the lower Chindwin River south of Monywa to its confluence with the Ayeyarwady near Pakokku, and then visited a number of sites along the Ayeyarwady between Pakokku and Pyay (Prome). From 6 to 15 March 2001 we traveled by boat up the Ayeyarwady River from Mandalay to Bhamo. Fieldwork along the Dokhtawady was conducted from 18 to 22 March and 22 June to 1 July 2001. We traveled by boat upstream to Salin Village where passage was blocked by rapids. Moreover, travel by foreigners beyond this point is forbidden by military and civil authorities. During these trips we interviewed fishermen and villagers regarding the local occurrence of turtles, patterns of exploitation, fishing and hunting methods, and general knowledge of turtles. Available specimens were examined, measured, and photographed. The coordinates of locations mentioned in the text were determined with a Garmin® GPS 48 (Table 1).

RESULTS AND DISCUSSION

Geoemydidae

Heosemys grandis. — The distribution of this species in Myanmar is poorly documented. Theobald (1868) stated that *H. grandis* is “not abundant in either Pegu [Bago] or Tenasserim [Tanintharyi]”. Museum specimens are available from Bago, the Thai-Myanmar Border in Shan State, and Myitkyina (Iverson, 1992), although van Dijk (1993) questioned the validity of the latter record. We examined three living specimens and eight carapaces in Shwegu that were locally collected. Our records and the previously collected specimen from Myitkyina constitute the northernmost records in the global distribution of *H. grandis*.

Kachuga trivittata. — This endemic species is known only from the Ayeyarwady, Chindwin, Sittang, and lower Salween rivers where it was historically abundant (Theobald, 1868; Maxwell, 1911; Iverson, 1992; van Dijk, in press). Large numbers of females congregated on beaches at the mouth of the Ayeyarwady River about 100 years ago (Maxwell, 1911), and Smith (1931) stated that *K. trivittata* was “fairly common” in the Ayeyarwady as far north as Bhamo. Morris (1936) collected several nesting females on the upper Chindwin River during an expedition in 1935 (see Vernay, 1935, for an account of this expedition).

However, the few available recent reports suggest that *K. trivittata* populations have precipitously declined due to the over-harvesting of eggs and adults. Thorbjarnarson et al. (2000) concluded *K. trivittata* was extirpated in the Ayeyarwady Delta, and van Dijk (in press) found no evidence of extant populations in the Salween River along the

Table 1. Coordinates of localities mentioned in the text.

Location	Latitude (N)	Longitude (E)
Bhamo	24° 14.33'	97° 13.27'
Hti Chaing Town	23° 44.84'	96° 08.93'
Kathar	24° 09.47'	96° 20.38'
Khayansat Kone Village	23° 16.30'	95° 58.99'
Kyauk Myaung Town	22° 35.79'	95° 56.81'
Letpangon Village	23° 20.16'	96° 00.55'
Letpadon Village	22° 03.73'	95° 08.47'
Male Village	23° 01.35'	95° 58.47'
Mandalay	21° 58.75'	96° 03.50'
Mau Village	22° 40.76'	95° 54.34'
Monywa	22° 06.43'	95° 07.80'
Myinthar-Kyarnyut Village	23° 14.55'	95° 59.40'
Nandaw Kyun	22° 03.05'	96° 01.99'
Pakokku	21° 78.98'	95° 03.70'
Pyay	18° 50.09'	95° 13.08'
Salin Village	21° 41.04'	96° 28.86'
Sheinmaga Village	22° 16.83'	95° 58.91'
Shwegu	24° 13.51'	96° 47.79'
Singkaing Village	22° 11.77'	95° 59.49'
Tagaung Town	23° 29.87'	96° 00.40'
Thapaybin Village	24° 13.16'	96° 30.41'
Wacheck Village	21° 55.17'	96° 00.44'
Yee Village	21° 41.30'	96° 23.14'

Table 2. Summary of interviews conducted with villagers along the Ayeyarwady River during 2000–01 concerning the current population status of the Burmese roofed turtle (*Kachuga trivittata*).

Location	Comments
Hti Chaing	Single turtle and two nests found in 2000, but villagers considered <i>K. trivittata</i> extremely rare; local wildlife trader had seen no specimens since 1990.
Khayansat Kone Village	Last captured <i>K. trivittata</i> "about 35 years ago".
Kyauk Myaung	Fishermen unfamiliar with <i>K. trivittata</i> .
Letpangon Village	Single <i>K. trivittata</i> captured in 1998, but this was the first one taken in about 5 years.
Male Village	Common 25 years ago; single turtle captured in 1997; one to five were taken annually during the early 1990s; eggs formerly collected for local consumption and sale; last clutch collected in either 1993 or 1994.
Mandalay	Single <i>K. trivittata</i> captured in 1997; most fishermen had never encountered <i>K. trivittata</i> and considered it locally extinct.
Mau Village	<i>K. trivittata</i> not encountered in "many years".
Myinthar-Kyarnyut Village	Single <i>K. trivittata</i> taken in fishing net in 2000, but this was first one captured in past 20 years; last clutch was unearthed "about 10 years ago".
Nandaw Kyun	<i>K. trivittata</i> was common when fishermen were boys (ca. 40 years ago) and eggs were collected from sandbars; single turtle captured ca. 1995.
Pakokku	<i>K. trivittata</i> last captured "many years ago"; regarded as locally extinct.
Pyay	Fishermen have not encountered <i>K. trivittata</i> in recent years.
Singkaing Village	Villagers formerly collected eggs; turtles not encountered since late 1960s.
Thapaybin	Single turtle captured in 1995 and villagers regarded <i>K. trivittata</i> as locally extinct.

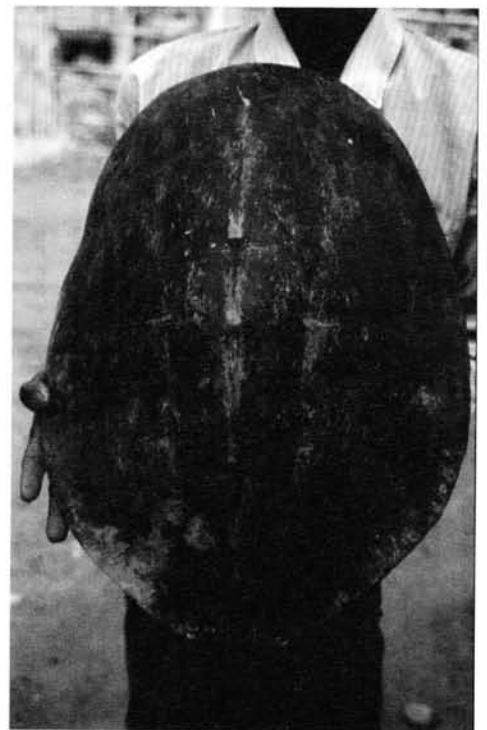
Thai border. *Kachuga trivittata* is currently listed as Endangered by the IUCN (2004), but IUCN/SSC TFTSG and ATTWG (2000) recommended a change in status to Critically Endangered or Extinct because no specimens had been collected since 1935. However, in 2002 a single living *K. trivittata* was obtained from a turtle market in southern China (H.D. Philippen, *in litt.*) indicating that at least a few individuals survived.

We found nothing to suggest that viable populations of *K. trivittata* remain in the reaches of the Ayeyarwady or Chindwin rivers that we investigated. *Kachuga trivittata* is known locally as *teik leik* (= fighting turtle; a name also applied to *Batagur baska* in coastal regions; Thorbjarnarson et al., 2000) or *yengyii leik* (= algae-covered turtle). Fishermen stated that *K. trivittata* formerly nested on sandbars along the Ayeyarwady River during the dry season and estimates of clutch size varied from 50 to 70. Eggs were collected in March and consumed locally or sold, and adult *K. trivittata* were taken incidental to fishing activities. Our interview data were consistent (Table 2); *K. trivittata* was common 30 to 40 years ago and although occasional turtles continue to be captured, the species is probably ecologically extinct in much of the Ayeyarwady River. Likewise, *K. trivittata* appears to be extirpated in the lower reaches of the Chindwin River. Most individuals we interviewed along the Chindwin had never encountered the species, although one fisherman in Letpadon Village stated that *K. trivittata* was common "many years ago", but had not been encountered recently.

A remnant population of *K. trivittata* may still occur in the Dokhtawady River. Boatmen who regularly travel the river reported occasional sightings of large hardshell turtles basking on logs in the river. The large size of these turtles is consistent with the body size of adult *K. trivittata*, and there are no other similar-sized hard-shelled aquatic turtles in the region. While basking behavior is poorly documented among *K. trivittata*, gravid females were reported to bask on nesting beaches (Theobald, 1868; Maxwell, 1911), and other spe-

cies of *Kachuga* bask on logs, rocks, and riverbanks (Minton, 1966; Ernst and Barbour, 1989). Additionally, a wildlife trader in Mandalay stated that *K. trivittata* was still present in the headwaters of the Dokhtawady, a region outside of the scope of our investigation.

We obtained a single *Kachuga* shell from a fisherman in Yee Village on 18 March 2001 (Fig. 2). The shell appears to be that of an old individual, and based on its carapace length, most likely a female (Ernst and Barbour, 1989). Dimensions of the shell were: midline carapace length, 473 mm; maxi-

**Figure 2.** A shell of *Kachuga* (probably *K. trivittata*) obtained from a fisherman in Yee Village on 18 March 2001. The turtle was collected in the upper Dokhtawady River during February 2001. Note the faint median vertebral and lateral stripes on the carapace.

mum carapace width, 375 mm; midline plastron length, 439 mm; maximum plastron width, 261 mm; maximum shell depth, 217 mm. Both plastron and carapace are extremely worn and deeply pitted, annuli are no longer discernible, and plastral scute seams barely so. The turtle was reportedly collected on 10 February 2001 as it crawled across a sandbar in the upper Dokhtawady River. The turtle was later killed and eaten, but said to contain no oviductal eggs or noticeably enlarged follicles. The fisherman, a lifelong resident of the area, stated this was the only specimen of *Kachuga* that he had ever captured.

The shell had characteristics of both *K. trivittata* and *K. dhongoka*. According to Ernst and Barbour (1989), both sexes of *K. dhongoka* exhibit a median vertebral stripe and two poorly defined lateral stripes on the carapace, while in *K. trivittata* these stripes are present in males only; females have a uniformly brown carapace. Our specimen appears to have both a median vertebral stripe and lateral stripes, and is larger than the carapace length reported for male *K. trivittata* (46 cm). Moreover, the posterior border of the second vertebral is pointed posteriorly in *K. dhongoka*, a characteristic obvious in our specimen (Table 3), but not reported for *K. trivittata* (Ernst and Barbour, 1989). Also, the length of the second vertebral is greater than the width, and the third vertebral is wider than long in *K. dhongoka*, but these measurements are approximately equal or the scute is slightly wider than long in *K. trivittata* (Ernst and Barbour, 1989). Interestingly, the second vertebral of the specimen is longer than wide, and the third vertebral is wider than long (Table 3), a description consistent with *K. dhongoka*. However, the specimen has an obvious median keel with prominent projections on the second and third vertebrae and a reduced projection on the fourth vertebral (Table 3) as reported for *K. trivittata* (Ernst and Barbour, 1989). *Kachuga dhongoka* has a median keel, but this is reduced to a posterior projection on the second and third vertebral scutes of adults (Ernst and Barbour, 1989). Finally, the plastral formula of the specimen (abd > fem > hum > pect > an > gul) agrees with that reported for *K. trivittata*, rather than *K. dhongoka* (abd > fem > pect > hum > an < gul) (Smith, 1931; Ernst and Barbour, 1989).

Despite the inconsistent morphological characteristics, the specimen is most likely *K. trivittata*, the only species of *Kachuga* confirmed from Myanmar (Iverson, 1992). *Kachuga dhongoka* occurs only in the Ganges and Brahmaputra drainage of Nepal, Bangladesh, and northeastern India (Ernst and Barbour, 1989; Iverson, 1992) and is unlikely to be

found in Myanmar. Myint Maung (1976) reportedly obtained a single specimen of *K. dhongoka* in the early 1970s near Mandalay; however, this specimen has since been lost (Myint Maung, *pers. comm.*) and may have been misidentified.

Results of the current and previous investigations (Thorbjarnarson et al., 2000; van Dijk, in press) indicate that viable populations of *K. trivittata* no longer occur in much of the Ayeyarwady River. Likewise, *K. trivittata* is probably extirpated from the lower Chindwin River. A remnant population may occur in the upper Dokhtawady River, and the situation in the headwaters warrants investigation. The possible occurrence of *K. trivittata* in the upper Chindwin, Sittang, and Salween rivers has yet to be investigated. However, with the exception of the latter, these rivers have been extensively degraded by a variety of ecological insults including gold mining, deforestation, agriculture, over-fishing, and siltation (Scott, 1989; Saw Tun Khaing, *pers. comm.*), and are unlikely to support significant numbers of *K. trivittata*. Consequently, we regard *K. trivittata* as Critically Endangered in Myanmar.

Melanochelys trijuga edeniana. — The distribution of this endemic subspecies is poorly known. Locality records are available from lower Myanmar, including Rakhine and Karen States, and Bago and Magwe Divisions (Theobald, 1868; Iverson, 1992; Platt et al., 2001a). We examined shells of locally collected turtles at Hti Chiang Town, Kathar, and Shwegu during March 2001.

Morenia ocellata. — This endemic species is generally thought to be restricted to the Ayeyarwady Delta, lower Sittang River, and coastal regions of the country (Ernst and Barbour, 1989; Iverson, 1992). However, Kuchling (1995) noted market specimens in southern China that appeared to have been collected nearby and speculated that *M. ocellata* may occur much farther north than suggested by previous records. On 7 March 2001 we examined a *M. ocellata* shell in Singkaing Village, approximately 20 km upstream from Mandalay. According to villagers, the turtle was captured in late December 2000 or early January 2001 in floodplain grassland near the village and deposited two eggs shortly thereafter. Villagers regarded *M. ocellata* as rare, and long-term residents stated they had encountered only one other specimen. This record extends the distribution of *M. ocellata* approximately 700 km upstream from previously reported populations in the Ayeyarwady Delta. Furthermore, fishermen at Wacheck Village and Pakokku claimed to occasionally catch *M. ocellata* in the Ayeyarwady River, but specimens were unavailable for our examination.

In November 2000 we also examined a large (800+) group of *M. ocellata* at Yadanabon Zoological Garden in Mandalay that had recently been confiscated from illegal wildlife traders. We selected several of the largest turtles for measurement; the midline carapace length (CL) of four females (CL = 222, 226, 235, 239 mm) exceeded the previously reported size maxima of 220 mm (Ernst and Barbour, 1989). The age of these individuals could not be estimated as *M. ocellata* lack conspicuous annuli.

Table 3. Measurements and description of vertebral scutes from a *Kachuga* shell (possibly *K. trivittata*) obtained at Yee Village along the Dokhtawady River, Myanmar, on 18 March 2001.

Vertebral	Midline length (mm)	Maximum width (mm)	Vertebral projection
1	70.0	82.0	Absent
2	99.1	88.6	Prominent
3	61.1	80.4	Prominent
4	110.6	76.5	Projection present, but considerably worn
5	85.0	113.5	Absent

Trionychidae

Amyda cartilaginea. — Although widely distributed in Southeast Asia, *A. cartilaginea* is considered rare and its distribution remains ill defined in Myanmar (Platt et al., 2000). According to Annandale (1912) *A. cartilaginea* occurs only in the Arakan (= Rakhine) Hills, and mountainous areas of eastern and peninsular Myanmar. However, we examined specimens from tributaries of the Ayeyarwady River in the lowlands bordering the western edge of the Rakhine Hills (Platt, 2000; Platt et al., 2000) and it is likely *A. cartilaginea* occurs throughout most of central Myanmar.

During March 2000 we found *A. cartilaginea* at a number of sites along the Ayeyarwady River; two living specimens were examined in Shwegu, and carapaces were obtained from fishermen in Hti Chaing Town (1), Tapyaybin Village (1), and temporary encampments near Bhamo (2) and on Nandaw Kyun (1). The latter consisted of bone covered in dried cartilage and were distinguished from the sympatric *Nilssonina formosa* based on vernacular names provided by our informants and the lack of any obvious carapacial markings. *Amyda cartilaginea* is known locally as *kabhar leik* (= Earth turtle) or *beinwin leik* (= cartwheel turtle) owing to the large body size attained by adults. The specimens of *A. cartilaginea* that we examined were all reportedly captured in the main channel of the Ayeyarwady River. Exploitation of softshell turtles is discussed in the *N. formosa* account (below).

Chitra vandijki. — The existence of a species of narrow-headed softshell in the Ayeyarwady River has long been suspected (Iverson, 1992; van Dijk, 1993; McCord and Pritchard, 2002), but not verified until recently. On 10 March 2001 we examined a living (CL = 408 mm; weight = 5.6 kg) narrow-headed softshell in Myinthar-Kyarnyut Village along the Ayeyarwady River (Fig. 3). The turtle was collected a short distance upstream at Khayansat Kone Village several days prior to our visit. According to the



Figure 3. A *Chitra vandijki* in Myinthar-Kyarnyut Village, 10 March 2001. The turtle was captured by fishermen in the Ayeyarwady River a short distance upstream at Khayansat Kone Village.

fisherman who captured the turtle, it was taken on an unbaited hook set in shallow water along the shore. This observation constitutes the first field record of *Chitra* from Myanmar, although specimens reportedly collected in Myanmar have been purchased from turtle markets in Ruili, Yunnan Province, China (Engstrom et al., 2002; McCord and Pritchard, 2002). *Chitra* are apparently rare and fishermen in Khayansat Kone only capture about one per year. Fishermen at Letpangon Village were also familiar with *Chitra* and likewise regard it as rare. Fishermen we interviewed elsewhere along the river were unfamiliar with this species. We concur with Engstrom et al. (2002) who considered Myanmar *Chitra* as Critically Endangered. Analysis of mitochondrial DNA from market specimens indicates that Myanmar *Chitra* are distinct from other southeast Asian *Chitra* (Engstrom et al., 2002), and represent the new species recently described by McCord and Pritchard (2002) as *Chitra vandijki*. The description of this taxon as a distinct species brings the total of endemic turtle species in Myanmar to seven, further highlighting the extreme importance of this biologically rich nation to global biodiversity conservation (Engstrom et al., 2002; Stuart and Thorbjarnarson, 2003).

Nilssonina formosa. — This endemic species of softshell turtle is confined to the Ayeyarwady, Sittang, and Salween rivers (Ernst and Barbour, 1989; Iverson, 1992). The current conservation status of the species is poorly known, although Platt et al. (2000) noted a high demand for *N. formosa* by Chinese food markets. *Nilssonina formosa* is currently listed as Endangered by the IUCN (2004). Information gathered during our investigation suggests *N. formosa* is heavily exploited and populations appear to be declining. Along the Ayeyarwady River we examined four dried carapaces and a dead turtle at Wacheck Village, a carapace in Thapaybin, and living specimens in Myinthar-Kyarnyut (1), Taguang (1) and Hti Chaing Town (5); all were reportedly captured in the river nearby. Dried carapaces were readily identified by the presence of prominent carapacial ocelli. Likewise, villagers along the river refer to *N. formosa* as *gkyi leik* (= star turtle) or *kyi leik* (= spotted turtle) because of these markings.

Softshell turtles (both *N. formosa* and *A. cartilaginea*) are opportunistically taken in fishing nets and purposefully targeted using hooks baited with leeches. Villagers also collect eggs from December through March. Fishermen along the Ayeyarwady south of Bhamo estimated their current harvest to range from 6 to 20 turtles/person/year, but the consensus was that both species are becoming more difficult to find and catches have declined sharply. Fishermen near Mandalay reported that formerly about 50 softshells/person/year were harvested, but during the 1999–2000 dry season they were unable to catch a single turtle. Fishermen near Pyay were unfamiliar with *N. formosa* suggesting populations in the lower Ayeyarwady may already be extirpated. A complete carapace with obvious ocelli that we obtained from a fisherman near Monywa constitutes the first record of *N. formosa* from the Chindwin River (Iverson, 1992). We found no evidence for the occurrence of *N. formosa* in the Dokhtawady River.

Van Dijk (1993) speculated that where *N. formosa* and *A. cartilaginea* occur in broad sympatry, the latter is restricted to hillstreams and the former to large permanent rivers, possibly as a means of avoiding competition. However, we found no evidence of macrohabitat partitioning between *A. cartilaginea* and *N. formosa* in the Ayeyarwady River; fishermen report capturing both species from the main river channel, and at Hti Chaing Town we examined specimens of each that were taken in the same section of river.

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Distribution, Natural History, and Exploitation of *Leucocephalon yuwonoi* in Central Sulawesi, Indonesia

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ABSTRACT. – The Sulawesi forest turtle, *Leucocephalon yuwonoi*, is Critically Endangered and exploited for the food and pet trade, but little is known of its ecology. We accompanied a group of commercial turtle collectors into the wild and obtained preliminary data on habitat, diet, and exploitation.

The Sulawesi forest turtle (*Leucocephalon yuwonoi*) is a poorly known species from central and northwestern Sulawesi, Indonesia. Initially described and named *Geoemyda yuwonoi* (McCord et al., 1995), Fritz and Obst (1996) later placed both *G. yuwonoi* and *G. depressa* in the genus *Heosemys*, concluding that morphological characters shared with *Geoemyda* species arose via homoplasy. Based on mitochondrial gene sequence variation and distinctive morphological characters, McCord et al. (2000) reassigned *H. yuwonoi* to the new monotypic genus *Leucocephalon*, and reported a close relationship with *Notochelys platynota*. In spite of a clearer understanding of taxonomic relationships, observations in the wild remain scant and little is known of the Sulawesi forest turtle's natural history and ecology (Platt et al., 2001; Innis, 2003).

The Sulawesi forest turtle is listed by IUCN as Critically Endangered (IUCN, 2004, www.redlist.org) and is a species of conservation concern. While visiting central Sulawesi in February 2002 we were given the opportunity to accompany commercial turtle collectors on one of their forays into the turtle's natural habitat. We also visited three commercial turtle holding facilities. Here we report habitat descriptions, behavior, and morphology of *L. yuwonoi*, as well as some insights into local commercial trade and possible conservation measures.

Methods. — Data were collected from 23 to 26 February 2002 in Donggala County, central Sulawesi, Indonesia. On the evening of 24 February 2002 we were permitted to accompany four commercial turtle collectors into the lowland forest of the Santigi region (00°35'N, 120°54'E) on a nocturnal search for *L. yuwonoi*. We searched a small stream and tributaries near the Kanggol River for 4.5 hours (1930 to 2400 hrs) and surveyed approximately 4 km of the stream.

Turtles were located and captured by hand by wading and searching in the stream bed. Midline carapace lengths (CL) and maximum carapace widths (CW) were recorded, as well as water and air temperatures.

We also visited temporary holding and dealer facilities where turtles were examined. Also, reptile dealers and local turtle collectors were interviewed for anecdotal information concerning their knowledge of *L. yuwonoi*.

Study Site. — The stream and small tributaries that we surveyed were clear and shallow, allowing high visibility by day and easy flashlight viewing at night. The stream averaged about 30 cm deep and 4 to 5 m wide. The small tributaries were only about 1 m wide, very shallow (< 10 cm), and heavily shaded by vegetation. Water and air temperatures ranged from 25.2 to 26.9°C and 25.0 to 27.2°C, respectively. The substrate of the stream was pebbles, gravel, and cobble sized stones with large slabs of protruding rock. Intermittent rock pools were encountered along the stream, averaging about 0.5–1 m in depth and 1 m in width. The stream and tributaries also contained some woody debris from the surrounding secondary growth forest. Along the tributaries surveyed, the slope of the surrounding forest banks generally ranged between 60 to 80° inclination. The maximum elevation of the area does not exceed 300 m (Platt et al., 2001). Our guides indicated that this was typical habitat for *L. yuwonoi* within its local range.

Results. — We encountered 4 *L. yuwonoi* in the stream and small tributaries between 2030 and 2345 hrs. Three of the four were found sleeping/resting at the bottom of rock pools. According to our guides, they can also be found in the deeper (30–50 cm) still-water sections of the stream channel. A juvenile (CL = 70 mm, CW = 70 mm) was found along the main stream channel, at a water depth of 35 cm, within some deadfall at the surface against the bank (Fig. 1). An adult female (CL = 210 mm, CW = 170 mm) was encountered along a small (< 2 m wide) tributary sleeping/resting at the bottom of a solid rock pool that was 1.5 m wide at a depth of 45 cm (Fig. 2). In addition, another adult female and an adult male (no morphometric data recorded) were found