

The softshell turtles and their exploitation at the upper Chindwin River, Myanmar: range extensions for *Amyda cartilaginea*, *Chitra vandijki*, and *Nilssonina formosa*

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Abstract

We provide new records of the softshell turtles *Amyda cartilaginea*, *Chitra vandijki* and *Nilssonina formosa* for the upper Chindwin River, extending their known ranges by about 190 km to the northwest. According to reports by fishermen the relative abundance of the three species is highest for *C. vandijki*, in between for *N. formosa* and lowest for *A. cartilaginea* in the main river channel, whereas in the side streams it is equally high for *C. vandijki* and *A. cartilaginea* and lower for *N. formosa*. The softshell turtles and their eggs are heavily exploited at the upper Chindwin. Turtles are sold live to traders, who channel them illegally to China, or they are eaten locally and only the shells are sold to traders. Because of the increasing human population all sandbanks, the nesting areas of the riverine turtles, are now temporarily colonised by fishermen and their families during the dry season. Because this is also the nesting season the majority of turtle nests is likely to be found by humans or their dogs and pigs. Turtle eggs are consumed in the villages or sold at the markets in Khamti and Homelin.

Key words: Reptilia: Testudines: Trionychidae: *Amyda cartilaginea*, *Nilssonina formosa*, *Chitra vandijki*; Chindwin River; Myanmar; wildlife trade.

1 Introduction

The chelonian fauna of Myanmar is one of the least known in Asia, even though Myanmar has the highest chelonian diversity (27 native non-marine species: WIN MAUNG & WIN KO KO 2002) and the highest chelonian endemism (seven endemic species) of any Southeast Asian country. Several turtle surveys have taken place in Myanmar over the last few years (VAN DIJK 1997, PLATT et al. in press, KUCHLING et al. in press), but little is still known of the chelonian fauna of the major rivers, in particular regarding the large softshell turtles. For example, the giant softshell turtle *Chitra vandijki*, endemic to Myanmar, was only recently described from specimens found at Chinese markets (McCORD & PRITCHARD 2002). Only one specimen of *C. vandijki* was ever reliably recorded and photographically documented in Myanmar, but not in the field, only at the premises of a turtle trader north of Mandalay at the Ayeyarwady River (PLATT et al. in press). Although the large, endemic softshell turtle *Nilssonina formosa* is slightly better known, even basic data on its distribution are still scarce. Most chelonian distribution data in Myanmar originated prior to 1900 (VAN DIJK 1997).

Most turtle populations in Myanmar are declining, heavily depleted, or locally extirpated through overexploitation as food and for trade into China (VAN DIJK 1997, PRASCHAG 2002a, b, PLATT et al. in press, KUCHLING et al. in press). Large numbers of turtles from Myanmar are offered for sale at Chinese food and medicine markets, despite the fact that this extensive trade is illegal under Myanmar law (KUCHLING 1995, PLATT et al. 2000). Since a number of traded species are protected by CITES, of which both China and Myanmar are now signatories, the majority of the trade is also illegal under international law. The riverine softshell turtles are particularly targeted for trade to Chinese food markets (KUCHLING et al. in press). The lack of basic field data on the

current distribution and population status of the heavily exploited turtles is a major impediment for conservation planning.

A cultural and religious use of turtles and fish in Myanmar is their frequent release into pagoda (paya) ponds by Buddhists (VAN DIJK 1997). Freeing an animal or saving the live of an animal destined to be killed is a good deed allowing the person to accrue merit. As a further good deed the turtles and fish in the pagoda ponds are also offered food by the pilgrims. Thus, although it is very difficult to find turtles in the wild in Myanmar, many (including non-native species) can be observed in pagoda ponds in Yangon, Mandalay and other cities (PRASCHAG 2002a, b). Since many of these turtles are acquired from traders for rescue and release into the pagoda ponds they may not have been locally collected and do not provide reliable information on the distribution of species.

A major river which has been largely left out even from the early chelonian studies in Myanmar is the Chindwin, the largest tributary of the Ayeyarwady. No softshell turtles were recorded from the Chindwin (IVERSON 1992) until PLATT et al. (in press) recently obtained a small carapace of *N. formosa* from a fisherman near Monywa at the lower Chindwin. A preliminary interview based survey in 2002 suggested that several large softshell turtles may occur and are heavily exploited in the upper Chindwin between Homelin and Kaung Hein village, but no voucher specimens could be collected (KUCHLING et al. in press). Here we present data on softshell turtles collected at the upper Chindwin River in early 2004 and results of interviews of local fishermen regarding their exploitation.

2 Materials and Methods

Surveys based on interviews of local fishermen were conducted at the upper Chindwin River between Yat Nar village (25°36'78N, 95°26'70E) and Kin Taw village (25°59'51N, 95°42'35E) just to the east of Khamti (26°00'15N, 95°41'70E) from 28 January to 07 February 2004 (Fig. 1). A set of standard questions was asked (for details of the method see KUCHLING et al. in press). All questions were asked by the senior author and translated by the co-authors who also back-translated the answers. The identity of turtles was confirmed by presenting black and white photographs of the different turtle species (carapace and head) to the fishermen. Live turtles in the possession of fishermen were acquired, measured with callipers, weighted, photographed, skin scraps were preserved in ethanol as DNA samples and the turtles were either released or transferred to Yadanabon Zoo at Mandalay. One freshly dead *Chitra vandijki* was found floating close to the shore in the Chindwin and was collected and preserved in alcohol (field number 6, will be deposited at Myanmar Biodiversity Museum at Hlawga Wildlife Park). Turtle remains (dry carapaces and/or plastrons) in the possession of fishermen were also measured and, if possible, acquired. All collected specimens will be deposited in the Myanmar Biodiversity Museum at the Hlawga Wildlife Park (part of the Nature and Wildlife Conservation Division, Ministry of Forestry).

We mainly interviewed two different groups of fishermen: local fishermen from Shan villages who have lived in the area for all their life and professional fishermen from the dry zone of lower Myanmar who moved to the upper Chindwin (sometimes on a seasonal basis, only during the dry season) because fish populations have declined in their home regions. These are the main groups fishing in the main channel of the upper Chindwin and exploiting riverine turtles. Other groups exploit softshell turtles in the upper Chindwin area, but mainly in the smaller side streams, belong to

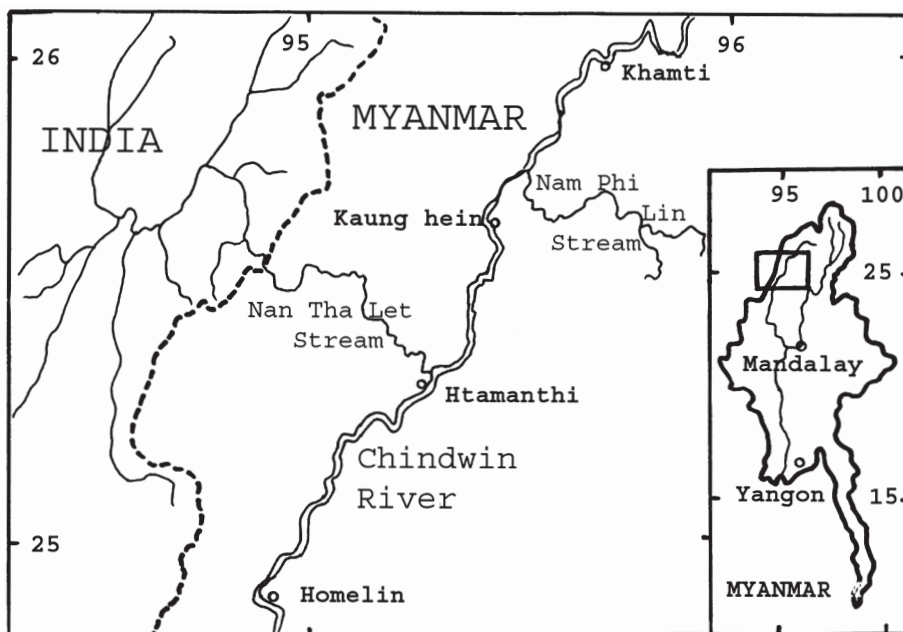


Fig. 1. Map of Myanmar (insert) and of the study area at the upper Chindwin.

Karte von Myanmar (Kasten) und vom Studiengebiet am oberen Chindwin.

the Naga, Lisu and Kachin tribes, but we could not get reliable information from these groups.

To compare the relative abundance of turtle species at particular sites we used the abundance scores 1 = rare, 2 = intermediate, 3 = most common and ranked the species according to their reported catch rate by fishermen. This is an ordinal scale which does not provide information on actual numbers captured. In the case of reported equal catch rates for two species, each was assigned the mean of the two possible neighbouring scores, either 1.5 or 2.5. The mean ranking scores (which do not represent true numerical abundance relationships) were used to provide the overall abundance score (again 1 = rare, 2 = intermediate, 3 = most common) for the species in the Chindwin and its side streams.

3 Results

3.1 Local knowledge and vernacular names of softshell turtles

Fishermen at the upper Chindwin readily identified *Amyda cartilaginea*, *Chitra vandijki*, and *Nilssonia formosa* from photographs. They claimed never having seen *Lissemys scutata*, *Pelochelys cantorii* and *Dogania subplana* in the upper Chindwin. The following vernacular names were used by the fishermen (depending on tribal and regional origin): *Amyda cartilaginea* – Leik Badee, Pan Leik, Phook Leik, Baty Leik, Anarpyawt Leik; *Chitra vandijki* – Kaba Leik, Anarpyaw Leik, Leik Ngan, Pona Leik; *Nilssonia formosa* – Lay Kwet Leik, Pann Leik.



Fig. 2. Live *Nilssonia formosa*, Yat Nar, February 2004, now live at Yadanabon Zoo.

Lebende *Nilssonia formosa*, Yat Nar, Februar 2004, jetzt im Yadanabon Zoo lebend.



Fig. 3. Head portrait of live *Nilssonia formosa*, Yat Nar, February 2004.

Kopfportrait der lebenden *Nilssonia formosa*, Yat Nar, Februar 2004.

3.2 Species identity of voucher specimens

Table 1 summarises locations and morphometric data of specimens which were acquired live or found freshly dead. Figures 2 and 3 show the live specimen of *N. formosa*, Figures 4 and 5 the live specimen of *C. vandijki*, Figures 6 to 8 the dead specimen of *C. vandijki*, and Figure 9 the live specimen of *A. cartilaginea*.

Nilssonia formosa of small and medium size can be readily identified by four carapacial ocelli. *Amyda cartilaginea* never shows ocelli on the carapace. Since the four carapace ocelli fade and disappear in large *N. formosa*, large live turtles of both species are sometimes not easy to distinguish. An external diagnostic character that remains visible in large specimens is the appearance of the tubercles at the front margin of the carapace, which are pearl-like and prominent in *A. cartilaginea* (Fig. 9, 10), but like longitudinal ridges in *N. formosa* (Fig. 3, 11). In addition, the head pattern of *A. cartilaginea* typically consists of light blotches on dark ground (Fig. 10), but in *N.*

Fig. 4. Live *Chitra vandijki*, Na Maine Taung, February 2004, now live at Yadanabon Zoo.

Lebende *Chitra vandijki*, Na Maine Taung, Februar 2004, jetzt im Yadanabon Zoo lebend.



Fig. 5. Head and neck of a live *Chitra vandijki*, Na Maine Taung, February 2004.

Kopf und Hals einer lebenden *Chitra vandijki*, Na Maine Taung, Februar 2004.



formosa of dark vermiculations on light background (Fig. 3, 11). However, the head pattern often fades in large specimens. We used the diagnostic characters as defined by McCORD & PRITCHARD (2002) to differentiate *C. vandijki* from *C. indica* (Table 2).

3.3 Abundance and exploitation of softshell turtles

Fishermen at the upper Chindwin fish with nets, hook and line, baited traps, and a few also with explosives or poisons. All fishermen also catch and eat softshell turtles or sell them to other villagers or traders.

The estimated relative abundance of the three species in the Chindwin according to the catch results reported by fishermen is presented in Table 3 and for two side streams of the Chindwin in Table 4. The relative abundance seems to vary among different sections of the river. All professional fishermen (who moved to the upper Chindwin from central Myanmar) who live on sandbanks and fish exclusively in the

Species	Village/Camp	body mass (g)	CL	BDL	CW	BDW	PL	SH
<i>N. formosa</i>	Yat Nar	2100	283	194	233	163	208	86
<i>C. vandijki</i>	Na Maine Taung	1530	256	161	234	165	202	56
<i>C. vandijki</i> *	Aung Tha	—	229	147	197	159	179	62
<i>A. cartilaginea</i>	Mine Naung	610	169	129				

Tab. 1. Locations (for latitudes/longitudes see Table 3) and morphometric data (mm) of live or freshly dead (*) softshell turtle specimens. CL = straight carapace length; BDL = bony disc length; CW = straight carapace width; BDW = bony disc width; PL = plastron length; SH = shell height.

Fundorte (für die Breiten- und Längengrade siehe Tabelle 3) und morphologische Daten (mm) der lebenden und frisch toten (*) Weichschildkrötenexemplare. CL = Carapaxlänge (Stockmaß); BDL = Länge des knöchernen Carapax; CW = Carapaxbreite (Stockmaß); PL = Plastronlänge; SH = Panzerhöhe.

main river channel reported that *A. cartilaginea* is very rare compared to *N. formosa* and *C. vandijki*. For example, a trapper (using baited traps) on a sandbank (25°49'31N, 95°32'77E) reported he caught about 40 *N. formosa*, 20 *C. vandijki* and only one *A. cartilaginea* in the adjacent Chindwin section (Fig. 12) during 2003. Other fishermen on the Na Maine Taung Sandbank (25°38'19N, 95°25'71E) who fish with nets caught about 25 *C. vandijki*, 20 *N. formosa* and one *A. cartilaginea* in the Chindwin (Fig. 13) between September 2003 and February 2004. On the other hand, part time (subsistence) fishermen in the local Shan villages report catching *A. cartilaginea* more frequently. They are more likely to use hook and line and baited traps, in side streams as well as in the Chindwin, and often in more shallow areas than the professional fishermen. The smallest side stream which we explored, the Nam Phi Lin (Fig. 14), was the only location at the Chindwin where *A. cartilaginea* is reported to be the most frequently caught softshell turtle. The Nan Tha Let is a much larger side stream (Fig. 15) and *C. vandijki* was reported to be most common (Table 4).

All fishermen reported declines of the softshell turtle populations in the river over the last decades and attributed this decline mainly to the increasing number of

	<i>Chitra vandijki</i>	<i>Chitra indica</i>
Overall colouration	* chocolate brown	olive to deep olive green
Midline (vertebral) carapacial pattern	* moderately complex	very complex
Midline (vertebral) carapacial stripe	* absent	present
Radiating costal stripes	* simple	complex
Distinct third pair of neck stripes	* yes	no
Presence of dark speckling on light head and neck stripes	* no	yes
Distinct peri-orbital ocelli	* yes	no
Black dots on chin	* present	few, if any

Tab. 2. Differential diagnostic characters of *C. vandijki* and *C. indica* according to McCORD & PRITCHARD (2002); * indicates character state of the two *Chitra* specimens from the upper Chindwin.

Differentialdiagnostische Merkmale von *C. vandijki* und *C. indica* nach McCORD & PRITCHARD (2002); * zeigt die Merkmalsausprägung der zwei Exemplare vom oberen Chindwin an.

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Village/Camp	Latitude (N)	Longitude (E)	A. <i>cartilaginea</i>	C. <i>vandijki</i>	N. <i>formosa</i>
Yat Nar Sandbank	25°36'78	95°26'70	1	3	2
Na Maine Taung Sandbank	25°38'19	95°25'71	1	3	2
Kaung hein	25°40'45	95°24'92	1	2.5	2.5
Kauak Taung	25°43'78	95°26'87	2	1	3
Sandbank	25°47'03	95°31'50	2.5	2.5	1
Sandbank	25°49'31	95°32'77	1	2	3
Mine Naung	25°50'92	95°35'43	2.5	2.5	1
Sein Nan	25°56'56	95°36'09	1.5	3	1.5
Aung Tha	26°00'79	95°39'69	2	2	2
Kin Taw	25°59'48	95°42'22	2	2	2
(mean ranking score)			(1.65)	(2.35)	(2.00)
overall abundance score			1	3	2

Tab. 3. Scores of the relative abundance (ranks: 1 = rare, 2 = intermediate, 3 = most common) of the three softshell turtle species in the upper Chindwin River based on interviews of fishermen.

Rangfolge der relativen Häufigkeit (1 = selten, 2 = mittelhäufig, 3 = am häufigsten) der drei Weichschildkrötenarten im oberen Chindwin Fluss nach den Angaben von Fischern.

fishermen, to gold mining boats that alter the habitat and make explosives available for fishing, to the use of poisons for fishing, and to egg collection at the sandbanks. Traders from the area of Monywa Town (lower Chindwin) reportedly come through the upper Chindwin four to five times per month to buy turtles and turtle shells. Prices for turtles vary according to species and size, but are about US\$ 2.50 for a live softshell turtle, with *A. cartilaginea* reaching higher prices than *N. formosa* and *C. vandijki*. Interestingly traders prefer live turtles of about 0.5-3 kg and do not pay more for larger specimens. The large turtles are thus mainly eaten in the villages or their meat is sold at local markets and only their shells enter the trade to China. Dry shells are mainly bartered for Chinese made thermos flasks (to keep the tea hot). In general traders do not go further upriver than Khamti for security reasons – many areas inhabited by the Naga and Kachin tribes may be dangerous for people from central Myanmar (Burmese).

Stream	Latitude (N)	Longitude (E)	A. <i>cartilaginea</i>	C. <i>vandijki</i>	N. <i>formosa</i>
Nan Tha Let	25°22'54	95°16'25	2	3	1
Nam Phi Lin	25°43'67	95°30'48	3	2	1
(mean ranking score)			(2.50)	(2.50)	(1.00)
overall abundance score			2.5	2.5	1

Tab. 4. Scores of the relative abundance (ranks: 1 = rare, 2 = intermediate, 3 = most common) of the three softshell turtle species in side streams of the upper Chindwin River based on interviews of fishermen.

Rangfolge der relativen Häufigkeit (1 = selten, 2 = mittelhäufig, 3 = am häufigsten) der drei Weichschildkrötenarten in Nebenflüssen des oberen Chindwin Flusses nach den Angaben von Fischern.



Fig. 6. Head and neck of a freshly dead *Chitra vandijki*, Aung Tha, February 2004.

Kopf und Hals einer frisch toten *Chitra vandijki*, Aung Tha, Februar 2004.



Fig. 7. Plastron of a freshly dead *Chitra vandijki*, Aung Tha, February 2004.

Plastron einer frisch toten *Chitra vandijki*, Aung Tha, Februar 2004.



Fig. 8. Alcohol preserved *Chitra vandijki*, Aung Tha, February 2004; will be deposited in the Myanmar Biodiversity Museum at the Hlawga Wildlife Park.

In Alkohol konservierte *Chitra vandijki*, Aung Tha, Februar 2004; wird im Myanmar Biodiversität Museum im Hlawga Wildlife Park hinterlegt.

Fig. 9. Live *Amyda cartilaginea*, Mine Naung, February 2004; released in Chindwin.

Lebende *Amyda cartilaginea*, Mine Naung, Februar 2004; im Chindwin freigelassen.



Fig. 10. Live *Amyda cartilaginea*, CL 342mm, Dokhtawady River, February 2004; released in Dokhtawady River.

Lebende *Amyda cartilaginea*, CL 342mm, Dokhtawady Fluss, Februar 2004; im Dokhtawady freigelassen.



Fig. 11. Live, huge *Nilssonina formosa* (not measured), Mahamuni Pagoda pond, Mandalay, February 2004.

Lebende, riesige *Nilssonina formosa* (nicht vermessen), Mahamuni Pagoda Teich, Mandalay, Februar 2004.



4 Discussion

4.1 Biogeography

Until now the softshell turtle fauna of the upper Chindwin River has been largely unexplored and unrecognised. The only softshell turtle species alleged to occur in the upper Chindwin is *Chitra indica*: McCORD & JOSEPH-OUNI (2003) provide maps of the distributions of *C. indica* and *C. vandijki*. In these maps the upper Chindwin River is shown as part of the range of *C. indica* and excluded from the range of *C. vandijki*. We do not know the basis of or the reasoning for this assumption, but two *Chitra* specimens we collected at the upper Chindwin demonstrate that the concept of McCORD & JOSEPH-OUNI (2003) regarding the species identity of the *Chitra* population in the upper Chindwin is wrong. The character states of our specimens demonstrate that the *Chitra* population in the upper Chindwin belongs to the species *C. vandijki*. This is not surprising, since *C. indica* is known from Pakistan, the Indian subcontinent, the Brahmaputra River and Bangladesh, but the Chindwin is part of the Ayeyarwady River system and *C. vandijki* occurs in the Ayeyarwady (McCORD & PRITCHARD 2002). To our knowledge *C. indica* has not been recorded in Myanmar. In this respect it would be interesting to investigate if and which species of *Chitra* occurs in the May yu, Kaladan and Lemyo Rivers close to the border with Bangladesh.

Our records of the three species of large, riverine softshell turtles in the upper Chindwin extend their known ranges by about 190 km to the northwest. The occurrence of *N. formosa* is not surprising, given that PLATT et al. (in press) already recorded the species in the lower Chindwin. The occurrence of *A. cartilaginea* is more surprising, given that this species has never before been recorded so far to the northwest, close to the Indian border. This species, as well as *C. vandijki*, seems to be relatively abundant in the Nan Tha Let Stream (Table 4), a relatively large side stream of the Chindwin which has its headwaters across the Indian boarder in Assam (see Fig. 1). According to our data and due to the habitat preferences of *A. cartilaginea* (smaller side streams rather than the main river channel, see below) we predict that this species, and possibly also *C. vandijki*, may occur near the border in north-western Assam, India, in streams draining from the Naga Hills to the east into the Chindwin.

PRITCHARD (2001) categorised all extant softshell turtles according to their body size into small, medium, large, and giant species. *Chitra vandijki* belongs into the giant group, *Amyda cartilaginea* and *Nilssonina formosa* both in the group of large species. PRITCHARD (2001) regarded *A. cartilaginea* and *N. formosa* as allopatric and hypothesised that gross sympatry between softshell turtle species almost always involves species in different size categories. VAN DIJK (1993) speculated that where *N. formosa* and *A. cartilaginea* occur in broad sympatry in Myanmar, the latter is restricted to hill streams and the former to large permanent rivers, possibly as a means of avoiding competition. However, PLATT et al. (in press) found no evidence of macrohabitat partitioning between *A. cartilaginea* and *N. formosa* in the Ayeyarwady River, with fishermen reporting to capture both species from the main river channel.

Although in this study fishermen also reported capturing both species in the main river channel of the upper Chindwin, the overall relative abundance score of the three species is highest for *C. vandijki*, intermediate for *N. formosa* and lowest for *A. cartilaginea* in the main river channel, whereas in the side streams it is equally high for *C. vandijki* and *A. cartilaginea* and lower for *N. formosa* (Tables 3, 4). Thus, although we found *N. formosa* and *A. cartilaginea* in actual sympatry as reported by PLATT et al. (in press), their relative abundance in the main channel of the Chindwin

and in side streams indicate different habitat preferences as suggested by VAN DIJK (1993). *Chitra vandijki* seems to be relatively abundant in both these habitats, supporting PRITCHARD's (2001) hypothesis that giant and large trionychids can generally occur in sympatry, with their ecological separation being mainly manifested in feeding specialisation (piscivory in *Chitra*). It would be interesting to study the ecological separation of the apparently closely related, more or less equally large bodied species *N. formosa* and *A. cartilaginea* which defy PRITCHARD's (2001) hypothesis by occurring sympatrically over much of upper Myanmar (see also PLATT et al. in press, KUCHLING et al. in press). Despite the fact that they represent different genera, the structural differences between the two species are minimal according to VAN DIJK (1992). PRITCHARD (2001) suggested that the two species may actually be congeneric and that *Nilssonina* may be a synonym of *Amyda*.

It is practically impossible to differentiate between *Amyda* and *Nilssonina* from the bony carapace alone, since all its diagnostic characters show variability which overlaps in both genera. Due to the variability of characters and due to the poor condition of many bony carapaces collected from fishermen (e. g., rib ends cut off) it is often even difficult to differentiate those two genera from *Chitra* and *Pelochelys* from the bony carapace alone, although the differences of the plastron and/or skull among these genera are quite pronounced. There are some subtle differences in the bony carapaces, like thickness, dome shape, patterns of surface pitting, more sinuous suture lines etc., but they change with size, show pronounced intraspecific variability, overlap between the genera and do not seem to be meristic or clear-cut characters that could be easily used for an identification key. Thus, we did not yet analyse the bony carapaces we collected, this will be done in a future study using technology of DNA analysis to verify species identity.

4.2 Exploitation and population trends

In the villages we generally discussed first the aims of our project with the village headman and asked him to identify people who are knowledgeable about turtles. We always emphasised that we were seeking cooperation for a conservation programme and were not authorised to enforce the law regarding exploitation. Some informants were very open in sharing their knowledge whereas others were reluctant to report the turtle numbers they catch, in which case we asked for capture rates for the whole village rather than for single persons. In some interviews the number of turtles captured may have been underreported, but this does not seem to have influenced their ranking of the ratio of captures (relative abundance) of the three species. For this reason we do not summarise in Table 3 and 4 the number of reported captures for the various villages and camps, but only the reported relative abundance of the species. This does not provide direct information on their actual population numbers or their conservation status.

KUCHLING et al. (in press) suggested that the massive exploitation pressure on the turtles in the upper Chindwin is relatively recent and that the organised turtle trade for the Chinese market only reached the upper Chindwin area 2-3 years ago, probably because turtle populations have declined heavily in areas closer to Mandalay, the reputed trade centre for the export to China. The upper Chindwin still seems to contain its complete, until now largely unrecorded, river turtle assemblage. The lower Chindwin and the Ayeyarwady already seem to have lost turtle species through overexploitation (PLATT et al. in press, KUCHLING et al. in press).



Fig. 12. Turtle traps at upper Chindwin, opposite Yat Nar, January 2004.

Schildkrötenfallen am oberen Chindwin, gegenüber Yat Nar, Januar 2004.



Fig. 13. Na Maine Taung Sandbank, upper Chindwin, February 2004.

Na Maine Taung Sandbank, oberer Chindwin, Februar 2004.



Fig. 14. Nam Phi Lin stream, February 2004.

Nam Phi Lin Fluss, Februar 2004.

Fig. 15. Nan Tha Let stream, February 2004.

Nan Tha Let Fluss, Februar 2004.



Fig. 16. Sandbank at upper Chindwin with temporary huts and free ranging pigs and dogs, near Yat Nar, February 2004.

Sandbank am oberen Chindwin mit temporären Hütten und frei laufenden Schweinen und Hunden in der Nähe von Yat Nar, Februar 2004.



Turtle subsistence exploitation at the upper Chindwin River may have been sustainable in the distant past, but our informants reported declines of turtle populations already over the last two to three decades. They mainly blamed the increasing human population and the increasing exploitation pressure for this decline. For example, 15 years ago about ten professional fishermen from Homelin went upriver to the Khamti area to fish. Five years ago, about 50 fishermen went up to the Khamti area for fishing. In 2002, an estimated 300-400 fishermen from Homelin were fishing in the Khamti area. In July 2002, traders from Monywa reportedly came up the Chindwin about once or twice a month to buy live turtles (KUCHLING et al. in press). One and a half years later, in January 2004, fishermen told us that traders arrive to buy turtles four to five times per month. The number of fishermen and turtle hunters in the

area is constantly increasing. Many professional fishermen from central Myanmar and the most efficient turtle trappers we interviewed in this study arrived at the upper Chindwin only in the last two or three years. Prices paid by traders for softshell turtles at the upper Chindwin are about US\$ 2.5 per live specimen, with *A. cartilaginea* reaching higher prices than *N. formosa* and *C. vandijki*. This price is lower than prices for softshell turtles at the Dokhtawady River during February 2004, where a small (1-2 kg) *A. cartilaginea* could be sold for about US\$ 11. Interestingly, prices for *C. vandijki* and *N. formosa* and large *A. cartilaginea* were lower at the Dokhtawady, about US\$5. Relatively small *A. cartilaginea* are the most sought after and highest priced turtles. The price difference between the upper Chindwin and the Dokhtawady reflects the closeness of the latter to Mandalay, where some restaurants specialise in wildlife and where the main traders who transport turtles into China are located. The turtle trade also reached the Dokhtawady much earlier and there turtle numbers have declined. In addition, electro fishing is rampant in the Dokhtawady and strips not only all fish from the river, but also softshell turtles. Prices rise due to their increasing rarity.

Apart from the direct exploitation of turtles at the upper Chindwin, driven mainly by the illegal trade to China, an additional problem is the exploitation of turtle eggs. Turtle egg exploitation has a long history at the upper Chindwin. Most eggs are eaten in the villages or sold at the markets in Khamti and Homelin. Over the last few years this local turtle egg exploitation became much more efficient, despite the decline of turtles. The reason for this is that all the recent migrants settle seasonally, during the dry season, on the sandbanks in the river, the main nesting habitat of riverine turtles. We did not see a single sandbank without human habitation at the upper Chindwin during January 2004. This means that, today, nearly all nests of sandbank nesting turtle species in the main river channel, like the Myanmar endemics *C. vandijki* and *N. formosa*, are likely to be found by humans, since humans live on the sandbank throughout the dry season when the turtles nest. People reported they find the turtle tracks in the morning and follow them to the nest. Nests overlooked by people will with a high probability be destroyed by their domestic dogs and pigs (Fig. 16).

To conclude, the upper Chindwin still has an interesting softshell turtle community, but it is seriously threatened by overexploitation. Recent changes due to internal migration and an increasing human population seriously threaten the turtle populations. Assessment of the population status and population monitoring is urgently needed as a prerequisite for conservation actions to avoid the collapse of this interesting community of large and giant softshell turtles.

Currently, Myanmar has 15068 km² of protected area in 31 established national parks and wildlife sanctuaries covering 2.26 % of the total area of the country (RAO et al. 2002). The Chindwin is not part of the protected area system. The Htamanthi Wildlife Sanctuary is in the immediate vicinity of the upper Chindwin, but it does not even border the river, the river itself and a five kilometre strip along the river being excluded from protection. On the nation wide level the protection of river turtles is also hampered by the fact that all main rivers are outside protected zones (the protected areas generally focus on forests and stagnant wetlands). River turtles are thus poorly represented in the protected area system. Some protected areas do encompass smaller side streams, for example three side streams of the upper Chindwin in the Htamanthi Wildlife Sanctuary where *C. vandijki* and *A. cartilaginea* may find good habitat, but this does not apply to turtles that are restricted to the main river channels like *N. formosa*. In this respect it was a significant finding that the endemic, "riverine" softshell turtles *C. vandijki* and *N. formosa* (plus the non-endemic *A. cartilaginea*)

occur in Lake Indawgyi (KUCHLING et al. in press), a large permanent lake of the upper Ayeyarwady River system which was gazetted as wildlife sanctuary in 1999. However, three or four years ago turtle exploitation for trade into China also reached Lake Indawgyi and its turtles are reported to be declining. Even in protected areas turtles in practice are not automatically protected and wildlife staff has to be specifically educated and trained to include turtles in their law enforcement and conservation efforts (KUCHLING et al. in press). The persistence of the large endemic river turtles of Myanmar (and the survival of much of its other wildlife) will ultimately depend on the curtailing of their illegal exploitation and trade.

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Die Weichschildkröten und ihre Nutzung am oberen Chindwin Fluss, Myanmar: Arealerweiterungen für *Amyda cartilaginea*, *Chitra vandijki* und *Nilssonina formosa*

Wir weisen die Weichschildkröten *Amyda cartilaginea*, *Chitra vandijki* und *Nilssonina formosa* im oberen Chindwin Fluss nach, was das bekannte Verbreitungsareal der Arten um etwa 190 km nach Nordosten ausdehnt. Nach Angaben lokaler Fischer ist im Hauptflussbett des Chindwin *C. vandijki* relativ am häufigsten, *N. formosa* etwas weniger häufig und *A. cartilaginea* am seltensten, während in kleineren Nebenflüssen *C. vandijki* und *A. cartilaginea* gleich häufig sind und *N. formosa* am seltensten ist. Sowohl die Weichschildkröten als auch ihre Eier werden am oberen Chindwin stark ausgebeutet. Die Schildkröten werden entweder lebend an Händler verkauft, die sie illegal nach China exportieren, oder sie werden lokal gegessen und nur die getrockneten Panzer werden an Händler verkauft. Durch die zunehmende Bevölkerungsdichte werden jetzt alle Sandbänke, die Eiablageplätze der Flussschildkröten, während der Trockenzeit temporär von Fischern und ihren Familien besiedelt. Da die Trockenzeit auch die Eiablagezeit der Weichschildkröten ist, wird die Mehrzahl der Nester von Menschen oder ihren Haustieren wie Hunden und Schweinen gefunden und ausgeraubt. Schildkröteneier werden in den Dörfern gegessen oder auf den Märkten von Khamti und Homelin verkauft. Wie alle anderen großen Flüsse ist auch der Chindwin nicht Teil vom Naturschutzsystem in Myanmar. Weitere Bestandsaufnahmen und Überwachungen der Populationen sind als Voraussetzung für Schutzaktionen dringend nötig, um die Ausrottung dieser Artengemeinschaft von riesigen und großen Weichschildkröten zu verhindern.

Schlagwörter: Reptilia: Testudines: Trionychidae: *Amyda cartilaginea*, *Nilssonina formosa*, *Chitra vandijki*; Chindwin Fluss; Myanmar; Tierhandel.

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