

Occurrence and Trade of the Golden Turtle, *Cuora trifasciata*, in Laos

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ABSTRACT. – The first evidence of *Cuora trifasciata* occurring in Laos is described from rural village interviews and captive animals. Locally known as the golden turtle (*tau kham*), its central and southern Lao distribution is probably restricted to the Annamite mountains bordering Vietnam. The species is under considerable threat from commercial exploitation, mostly through collection by local people who sell it to Vietnamese traders for approximately US\$ 100–500 per turtle. Several reports suggest that the species has declined substantially in the wild since commercial collection began. Its greatest protection in Laos is the presence of remote forest areas within its range, but international measures are required to secure its long-term future.

KEY WORDS. – Reptilia; Testudines; Bataguridae; *Cuora trifasciata*; turtle; conservation; trade; distribution; status; Laos; Vietnam

Until recently the status of wildlife, particularly chelonians, in Laos was poorly known. But the situation has begun to change with the recent development of a national protected area system (see Berkmüller et al., 1995), and the distribution and status of many species are now being revealed through extensive wildlife surveys (e.g., Salter, 1993; Duckworth et al., 1994; Thewlis et al., 1996; Duckworth, 1997; Duckworth et al., in press). Although Laos retains extensive areas of forest, many species have declined considerably and some are now on the brink of extinction (e.g., Thewlis and Timmins, 1996; Thewlis et al., 1998; Timmins, in press).

Both Lorenz (1984) and Zhang et al. (1998) included Laos in the distribution of *Cuora trifasciata*, but gave no basis for this, while the reviews of Smith (1931), Pope (1935), and Bourret (1941) did not make any mention of the species from Laos. *Cuora trifasciata* has not been specifically documented from Laos, although Iverson (1992) mapped its possible occurrence there along with the only other 5 chelonian species previously recorded for the country. Recent wildlife surveys have revealed at least 13 chelonian species in Laos (Stuart in Duckworth et al., in press).

The status of *C. trifasciata* warrants particular consideration within the conservation community. The species is known in Laos as *tau kham* (literally, golden turtle), from the color of its limbs, tail, lower marginal scutes, and plastral margin. The name is now also becoming increasingly appropriate for the high prices paid for the species in the wildlife trade market.

Methods

In the period from 1992 to 1996 a series of broad baseline wildlife surveys were carried out in Laos, focusing on areas of high conservation importance, mainly National

Biodiversity Conservation Areas (NBCAs). Sixteen areas were covered, mainly south of 19°N (Fig. 1; see Thewlis et al. [1998] for more details). Further surveys since 1996 have covered several new areas, particularly in the north, as well as revisiting several previously surveyed areas (Duckworth et al., in press; B.L. Stuart, *in litt.*). The earlier surveys focused on field observation techniques, but over the course of the surveys informal interview techniques were developed to gather data on species not easily detected in the field and to gauge exploitation of natural resources. The interviews began with broad neutral questions like “are there turtles in the forest?” “how many kinds of turtles are there?” and “can you describe the different types of turtle?” and progressed to questions like “do any of the turtles have a hinged plastron?” In 1994, after it had become apparent that there was a turtle which had a high value in the wildlife trade, questions such as “are there any turtles which you can sell for money?” were included in the interviews.

After a possible identity was established for the golden turtle, the settlements of Ban Tongphe, Ban Namkata, and Ban Lak (20) (Fig. 2), from which the golden turtle had been previously reported, were visited in September 1995. An effort was made to question local people who had had recent first-hand contact with the species. These informants were first asked to give detailed descriptions of the golden turtle, then were asked to pick out the species from photographs of most of the region's turtle species. A set of 40 photographs of 22 species, including three photographs of *C. trifasciata* (photographs of an animal at the Vientiane Inter Zoo), was used. The photographs also included multiple photographs of three distinctive species, *Cuora galbinifrons*, *Manouria impressa*, and *Platysternon megacephalum*, which were known to be present in the area based on field sightings and live animals or remains in villages. Informants were then asked to identify each photograph with the locally-used

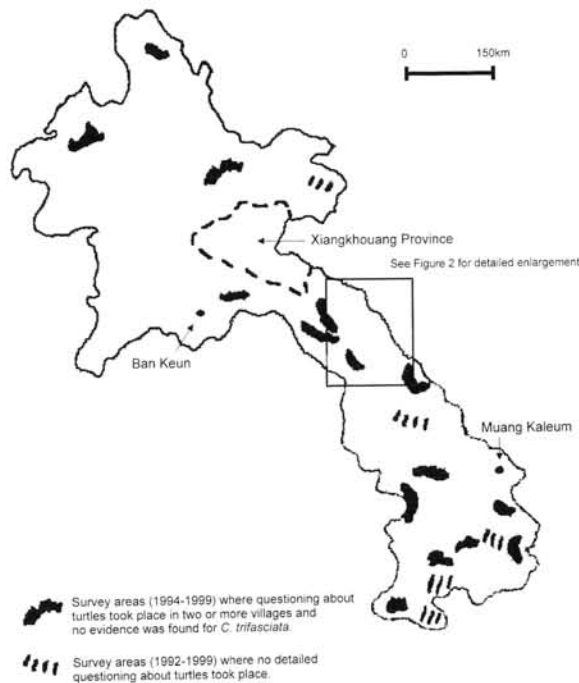


Figure 1. Areas of Laos surveyed between 1992 and 1999, and some other localities mentioned in the text.

name for the turtle depicted. The consistency with which multiple images of a species were identified by a local name was considered to be a reflection of the informant's familiarity with the species.

Verification

Reports of a golden turtle in Laos first came from the Nakay–Nam Theun National Biodiversity Conservation Area (NBCA) in 1994 (Fig. 2). In the three years that followed, further information on the golden turtle was gathered from the same area, but no evidence was found for the species in other survey areas. In the Nakay–Nam Theun NBCA and surrounding area, reports came from over 10 villages (all of the villages questioned). There was knowledge of the golden turtle in a number of villages further west, but informants from these villages said that the species was not present there.

Descriptions from local people in the Nakay–Nam Theun NBCA and surrounding area provided the first clues to the golden turtle's identity. These were often vague, but most mentioned a bright red-to-yellow color of the limbs and a movable plastron. Few people had recently seen them, and many had only second-hand accounts of the species. In July 1995, it was found that the Vientiane Inter Zoo at Ban Keun had at least five golden turtles, reportedly of Lao origin. A subsequent visit confirmed that these were *C. trifasciata*; carapace and plastron morphology, including the presence of a plastral hinge, and distinctive head, carapace, plastron, and limb coloration and pattern closely matched illustrations of live animals and descriptions in Pope (1935), Pritchard (1979), Karsen et al. (1986), Ernst and Barbour (1989), Zhao

and Adler (1993), and Patterson (1994). All the Vientiane Inter Zoo *C. trifasciata* were stolen in 1996 (zoo staff verbally to B.L. Stuart, *in litt.*). It was then learned that *C. trifasciata* had been found in trade in Vietnam for prices comparable to those quoted in Laos for the golden turtle (Le Dien Duc and Broad, 1995).

Final confirmation came from the September 1995 interviews with local people who had had recent first-hand contact with the species. Two informants gave very accurate descriptions (including limb and tail color, plastron and carapace color, a movable plastron, and indications of a complex head pattern). The five locals who claimed to have first-hand knowledge of the species from more than one occasion (and judging by their descriptions, a good knowledge of other turtle species), consistently picked out photographs of *C. trifasciata* as the golden turtle.

Twice a photograph identified as a young *Mauremys mutica* (by J. Iverson, *in litt.*) was erroneously picked out as the golden turtle by these knowledgeable informants. The head pattern was similar to that of *C. trifasciata*, but the plastral color and pattern (not visible on the photograph) of broad greenish yellow seams and darker greenish olive centers to the scutes does not correspond to descriptions of the golden turtle. Photographs of *C. galbinifrons*, *M. impressa*, and *P. megacephalum* were also consistently identified with the names *tau ngap*, *tau pheung*, and *tau poulou*, respectively (note, however, that local names of even distinctive species often apparently differ between different regions of Laos, different villages, and apparently even between different individuals in the same village). Photographs of other generally less distinctive species and species probably absent from the area were also inconsistently assigned these (and other) names. There remains the slight possibility (based solely on variation in local descriptions, rather than any suggestive evidence) that in addition to *C. trifasciata*, another species might be identified under the local name of golden turtle and have an equal value in trade.

Distribution and Status

The relative rarity of *C. trifasciata*, its high monetary value, and the difficulty of locating chelonians in the field in Laos, have all hindered status assessment of this species. No live specimens or remains of *C. trifasciata* were found in the field or rural villages, making this one of the few species (bird, mammal, or chelonian) in Laos for which interviews with local people provided useful data.

Given that fewer than 10 identified turtles (of all species) were found in the field during the earlier surveys, the absence of field records of *C. trifasciata* is unsurprising. Subsequently, B.L. Stuart (*in litt.*), concentrating on herpetological surveys, has only encountered 7 chelonians in the field in over 150 field days. Identification of animals from the descriptions given by rural villagers is fraught with difficulty, and thus the lack of convincing descriptions of *C. trifasciata* away from the Nakay–Nam Theun NBCA and

surrounding area cannot by itself be taken as evidence for absence of the species.

The most compelling evidence for a restricted distribution of *C. trifasciata* was the lack of reports of a valuable turtle from other survey areas. Negative data come from seven survey areas, in which questioning was carried out in at least two villages. Questioning in another seven survey areas was less extensive. Knowledge of the high value of *C. trifasciata* in the wildlife trade is likely to have spread widely and quickly: by analogy, knowledge of an equally valuable natural resource, the resin from the forest tree *Aquilaria* spp., has led to ubiquitous exploitation in the areas surveyed. Exploitation of this resource, like that of *C. trifasciata*, appears to be relatively recent rather than historical. A lack of reports of a high value turtle species is therefore thought to indicate an absence or at least significant scarcity of *C. trifasciata*. Since 1996, suggestive negative evidence has been gathered from a further four areas, and six areas which had already been visited during the 1992–96 surveys (B.L. Stuart, *in litt.*; P. Davidson, *in litt.*; R.J. Tizard, *pers. comm.*). These and the earlier survey areas with negative data are shown on Fig. 1; further details of these areas can be found in Thewlis et al. (1998) and Duckworth et al. (*in press*).

The golden turtle was reported from villages throughout the Nakay—Nam Theun NBCA, the Nakay Plateau, and villages around a proposed northern extension to the NBCA (Fig. 2). These sites are all in the Annamite mountains (400–2000 m) in areas supporting extensive evergreen forests, or on the Nakay Plateau (500–600 m) which supports a mosaic

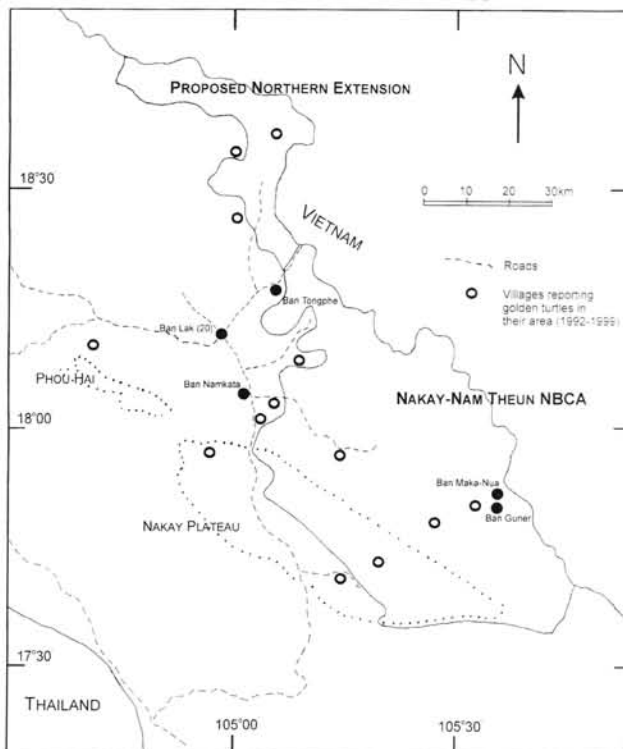


Figure 2. The Nakay—Nam Theun NBCA and surrounding areas, showing villages from which the golden turtle, *Cuora trifasciata*, was reported.

of pine and broad-leaved forest. The turtle was also reported from the Phou Hai area (evergreen forests at 400–1500 m) southwest of Ban Lak (20). All sites are within the Nam Theun drainage. Most of the recent reports are from the northernmost portion of Nakay—Nam Theun NBCA and its proposed northern extension. B.L. Stuart (*in litt.*) working in the Nakay—Nam Theun NBCA in late 1998, received a concentration of recent reports from around the villages of Ban Maka-Nua and Ban Guner, in the southeast of the protected area.

At all localities, it was difficult to judge the past and present natural status of the species in the surrounding areas. B.L. Stuart (*in litt.*) received a small number of reports, from the Muang Kaleum area of Xekong Province (16°00'N, 107°00'E; Xe Kong drainage; mid-June to mid-July 1999), of a turtle by the name *tau kham* which had been collected and sold to Vietnamese traders for high prices; reports were of small numbers of animals, the most recent capture having been 2–3 years previously, and the majority of people questioned did not report either *tau kham* or a valuable turtle as being present in the area. Lower survey coverage, and less emphasis on investigation of chelonians in the north, suggests that little can be said about the potential distribution of the species north of latitude 19°N.

Reports from at least four villages suggested that the golden turtle was once more common, and that extensive collection has caused a very noticeable decline (reportedly within the last 5–10 years) in the number of animals locals were able to find. B.L. Stuart (*in litt.*) was told by locals, in three villages visited in 1999 within the Nakay—Nam Theun NBCA, of dramatic declines in the numbers of golden turtles that could be found in the forest, while five other villages reported that golden turtles were not found in their areas. Locals in the three of these latter villages, visited previously during the 1994–95 interviews, had at that time reported at least previous presence of golden turtles over a wider area. In 1996, golden turtles were reportedly seen about once a month in Ban Tongphe, despite reportedly having been sighted much more frequently in previous years; in most other villages the last records were a year or more ago. In 1998 approximately 1–10 golden turtles were reported to come through Ban Guner and Ban Maka-Nua, despite approximately 300 being reportedly seen per year about five years previously, when demand first appeared (B.L. Stuart, *in litt.*).

The *C. trifasciata* in the Vientiane Inter Zoo reportedly came from a number of sources (former Zoo Director Nattakit Krathintong, *pers. comm.*). Most apparently originated in the Ban Lak (20) area, although specimens also came from Xiangkhouang, a province at approximately 19°00'–20°00'N, 102°30'–104°10'E. The precise locality of acquisition is unknown and there have been no wildlife surveys in this province. At least one of the turtles came from Vietnam (N. Krathintong, *pers. comm.*).

Seemingly little recent information is available on the status of *C. trifasciata* from anywhere within its relatively small previously known global range of southwestern coastal

China, Hainan, and northern Vietnam (Fang, 1930; Pope, 1935; Mell, 1938; Bourret, 1941; Felix, 1965; Iverson, 1992). Karsen et al. (1986) considered *C. trifasciata* to be a very uncommon species in the territory of Hong Kong, possibly because of its food and medicinal value. Pope (1935), describing his experience in Hainan, suggested *C. trifasciata* was relatively easy to find. Bourret (1941) collected only two specimens, both from Tam Dao in northern Vietnam (ca. 21°30'N, 105°30'E), suggesting perhaps that the species was scarce there. However, Felix (1965) suggested that in some areas of northern Vietnam *C. trifasciata* was a common species, occurring mainly in the mountains of Tam Dao, but that also in other areas, for instance Lang Son (ca. 22°00'N, 106°30'E), the species was also relatively common. An absence of previous records from Laos is unsurprising given the lack of historical work there. The accounts of Schnee (1899), Fang (1930), Pope (1935), Mell (1938), and Petzold (1963) all suggest that the species was relatively common at least in markets at the turn of and in the early part of the 20th century.

Ecology and Description

Most reports from Laos suggest that *C. trifasciata* is predominantly aquatic, found in mountain streams and rivers, or in dense damp bankside vegetation. Mell (1922) stated the species was found in clear streams of mountain and hill country from 50 to 400 m above sea level, and this information was seemingly used by Pritchard (1979) and Ernst and Barbour (1989) in their accounts of the species. However, in contrast, in a later publication Mell (1938) wrote that the species is found in slow-flowing large streams, natural shallow muddy lakes, and ricefields of the foothills, from sea level to 100 m and seldom up to 250 m. He also wrote that the species is seen basking on rocks besides water or resting in shallow water, and that it reportedly digs into the ground in November or early December and reappears between late March and April, behavior which he corroborated by observations of captive animals. Karsen et al. (1986) considered the species to be usually confined to mountain and hill streams; perhaps this is because of its high trade value. Fang (1930) simply reported the species as aquatic. The review of *C. trifasciata* by Pope (1935) recounted Schnee (1899) as describing captives as "relatively terrestrial." Bourret (1941) stated that the species lives in mountains, near fast flowing streams, especially at medium altitudes, however, this may have been largely based on the accounts of others.

Reports suggest that although most of the golden turtles that are found in Laos have a mass in the 1 kg range, some may reach several kg in weight with carapace sizes of approximately 30 cm in length. The *C. trifasciata* in the Vientiane Inter Zoo had estimated carapace lengths in the range of 17 to 22 cm. The largest *C. trifasciata* known to Mell (1938) had a straight carapace length of 20.8 cm. Karsen et al. (1986) reported that *C. trifasciata* can grow to 30 cm, although it is not clear whether this includes the head

and tail, while Ernst and Barbour (1989) reported carapace length to 20 cm.

All of the *C. trifasciata* seen in the Vientiane Inter Zoo were very similar to each other in pattern and coloration. The plastral edge, ventral marginals, and body skin were of a particularly bright light orange with darker, but equally bright, lower surfaces of the limbs and tail. In all cases, there were three blackish carapace stripes. However, there seems to be variability in the color of the body parts; Karsen et al. (1986) described the soft parts of the body as pink and pale areas on the plastron and marginals as orange pink; Ernst and Barbour (1989) described the pale areas of the plastron as yellow-edged and those of the marginals as bright orange to pinkish yellow to bright yellow, and the lower limb and body as bright orange to pinkish yellow; Pope (1935) mentioned the pale areas of the plastron as being yellow, but said nothing of the soft parts; and Jenkins (1995) discussed differences in trade value between gray and pink-skinned animals. Dorsal head color also seems to vary, the Vientiane Inter Zoo animals being toffee-brown; Ernst and Barbour (1989) described olive; Karsen et al. (1986) described lemon-yellow; Pope (1935) stated yellow; and that of the animal depicted in Zhao and Adler (1993) is pale orange-brown. Local reports suggest that there is variability in the limb and shell color of animals found in the Nakay—Nam Theun NBCA and surrounding areas, with many local people reporting that animals often lack the three dark carapacial stripes. Schmidt (1927) reported that immature animals lack the carapacial stripes, while a picture of an immature animal in Patterson (1994) is yellow, with at least the lateral carapacial stripes absent.

Collection and Trade

All reports of the golden turtle alluded to the lucrative trade in the species. Most villagers in the Nakay—Nam Theun NBCA and surrounding area stated that golden turtles were bought by Vietnamese dealers. Often it was reported that dealers travel to villages a few times per year to purchase wildlife products. Confiscation of several turtle species from Vietnamese traders is not uncommon, according to forestry officials in Ban Lak (20) and Carnivore Preservation Trust representatives (also based in Ban Lak (20)) who have been asked to care for confiscated turtles.

Lao villagers will also take captured turtles to staging posts, the most prominent of which seem to be in Ban Lak (20) and Ban Tongphe, where they sell to Vietnamese traders or middlemen (apparently often wealthy Lao residents). Both of these towns are strategically located for wildlife trading, as they are close to some of the most extensive mountain forests in Laos and are *en route* for the main border crossing to Vietnam (there are no other vehicle crossings for 200 km to the north and 250 km to the south). Ban Lak (20) is also central to several hydropower projects and high-value commercial conifer logging operation, which attract considerable traffic and commerce. Ban Tongphe is

probably the main staging post for turtles collected in the northern areas.

It seems that the villages of Ban Maka-Nua and Ban Guner in the southeast of the Nakay—Nam Theun NBCA similarly act as trade nodes for golden turtles and other natural resources collected in surrounding areas, as although access to areas of Laos further west, north, or south is relatively difficult, good trails connect with Vietnam. Vietnamese traders apparently visit these villages on at least a weekly basis (T.D. Evans, *pers. comm.*; B.L. Stuart, *in litt.*).

Accounts given by local people of the collection methods for golden turtles (and other chelonians), were mostly of searching forest streams and rivers with a bright spotlight by night. Dogs were also apparently used for locating chelonians on land, but reports suggested golden turtles were most often found in water. Interviews in 1998 carried by B.L. Stuart (*in litt.*) suggested the few golden turtles that remain to be collected are usually now found by dogs, or caught in baited traps.

Excursions into forest areas by local people are seemingly carried out for a number of reasons and collection of valuable resources occurs whenever the opportunity arises. However, excursions into forest areas lasting several days are generally motivated by searches with an opportunistic focus on several valuable resources, such as golden turtles and *Aquilaria* spp. resin. Reports suggested that when the initial demand for golden turtles reached the Nakay—Nam Theun NBCA and surrounding area, golden turtles were a considerable motivation for such excursions; more recently golden turtles were still searched for when sites appearing suitable were found, but the primary focus on such excursions was often some other resource.

In most forested border areas it is evident that Vietnamese parties regularly cross over into Laos, reportedly in search of wildlife products and other valuable natural resources. The abundance of Vietnamese rubbish in campsites and prominence of Vietnamese graffiti in some border forest areas suggests that use by Vietnamese in these areas substantially outweighs that by the local Lao.

In March 1994, the price quoted for a 1 kg golden turtle in Ban Tongphe was approximately US\$ 95. In the same village in September 1995, the price then for a 1–2 kg golden turtle was approximately US\$ 130, with an approximate US\$ 22 increase for each additional kg. On 26 May 1996 in Ban Tongphe, a 1.5 kg turtle was apparently sold to a Vietnamese trader for US\$ 532 (from reports of several villagers present at the time of sale, including the seller). Prices quoted to several field workers from 1996 to 1998 have been in the ranges of US\$ 300–700 per kg and US\$ 250–375 per individual turtle (Tobias, 1997; B.L. Stuart, *in litt.*; W.G. Robichaud, *per B.L. Stuart, in litt.*).

This Lao trade in *C. trifasciata* accords well with the findings of Le Dien Duc and Broad (1995) in Vietnam, where turtles sold in markets in Hanoi and further south in 1993 had prices of US\$ 50–150. Some of these animals in trade reportedly originated in Laos (Jenkins, 1995). Le Dien Duc and Broad (1995) gave no figures on the volume of trade

observed in *C. trifasciata*, but did state that its occurrence in trade was quite common, although the trade volume was low. From 1997 to 1998 *C. trifasciata* was only once seen in the chelonian trade in Vietnam, suggesting perhaps both scarcity of the species and movement of the trade underground (D.B. Hendrie, Cuc Phuong Turtle Conservation Project, *pers. comm.*). Jenkins (1995) reported that animals of this species with soft, pink skin were more valuable than those with gray skin. Lao animals seem to have bright yellow to red skin, perhaps making them more valuable.

Karsen et al. (1986) stated that *C. trifasciata* is relished as food and as a medicinal item, and is commonly sold in markets. Le Dien Duc and Broad (1995) stated that the species was the favored chelonian by pharmacies on Lang Ong, a well-known Hanoi pharmaceutical street, because of its high value and relatively low overhead involved in keeping it. It might be concluded that this was because of perceived medicinal properties, however Le Dien Duc and Broad (1995) suggested that Lan Ong vendors also acted as middlemen in the trade of whole turtles to unspecified buyers, in addition to being end-users of turtles to produce medicines. Zhou and Zhou (1992) reported that the species has medicinal properties. Interestingly, the turtles pictured on the packages of turtle-based medicine illustrated in Jenkins (1995:27), bear a strong resemblance to *C. trifasciata* in the head pattern and the apparent depiction of three dark carapacial stripes. The review of *C. trifasciata* by Pope (1935) suggested (on the basis of the accounts by Schnee [1899] and Fang [1930]) that even early this century the species was commonly traded, but still remained reasonably common in at least some localities. Mell (1938) stated that *C. trifasciata* was the most commonly sold emydid turtle in the markets of Shanghai, Kanton, and Hong Kong, and that in Kanton it was available all year because it was the most favored emydid for food. Fang (1930) stated “these tortoises [*C. trifasciata*] are usually sold in the market and the flesh is very predaceous (sic).” Petzold (1963) reported that in Vietnam the consumption of *C. trifasciata* for food was less than that of soft-shelled turtles, but that the predominant part of the catch was probably exported.

A local villager in Nakay—Nam Theun NBCA reported to B.L. Stuart (*in litt.*), that prior to demand for *C. trifasciata* from Vietnam, the species was locally the most favored turtle for food because of its taste and fatty flesh. It seems perhaps that its value as a food delicacy has in the past and perhaps still presents a significant incentive for trade by comparison with the perceived medicinal properties of the species.

Conservation

The first inclusion of *C. trifasciata* in the IUCN Red Data book was in 1996 under the Endangered category (IUCN, 1996). Previously it had not been considered to be a species of conservation priority by the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group (1989), at which time the species was traded for only modest prices in the

exotic pet trade (P.P. van Dijk *in litt.*), and even in 1993–95 the price of animals in the USA was lower than that in Vietnam (Jenkins, 1995). However, after investigations of chelonian trade in southeast Asia, Jenkins (1995) identified *C. trifasciata* as one of six high priority species in southeast Asia for further study and conservation efforts. Lorenz (1984) noted (seemingly on the basis of Mell [1938] and Petzold [1963]) that *C. trifasciata* was valued above other emydid species for food and medicine, and as a result *C. trifasciata* was intensively hunted, and that given the species' small range, it was at greater risk than were most other chelonian species.

Wildlife conservation activity is developing within Laos, and a substantial protected area (NBCA) system was designated in 1993 (Berkmüller et al., 1995). Management and protection of these areas has only recently begun and is hampered by a lack of trained manpower, a government lacking prior conservation management experience and structure (Duckworth et al., *in press*), and the conflicts and lack of dialogue between nature conservation aims and development and cultural aspirations (Chape, 1996). Legislation which has no firm standing in practice is under revision (Duckworth et al., *in press*). Most species of commercially valuable wildlife are currently protected only by the vast remaining forest areas. The key factors are that remoteness reduces the potential encounter frequency by humans of wildlife, and that large area increases the potential reservoir of wildlife. In that the golden turtle is small, valuable, relatively easily found, and easily transported, it is difficult to foresee any effective protection for the species in the near future in Laos. Increasing management activities within the NBCAs, new legislation, and tighter border security would help in the long term (although the latter could also stimulate wildlife exploitation in remote areas), but would probably drive trade underground (see also Stuart *in* Duckworth et al., *in press*).

The most effective conservation measure in the near future will be protecting the remoteness of forest areas, threatened in particular by timber removal, agricultural encroachment, road building, hydro-electric power developments, and other changes leading to increased accessibility. Captive breeding has been proposed by Stuart (*in* Duckworth et al., *in press*), and such a measure is a necessary long-term safeguard for the species. However, procurement of individuals from known natural localities is likely to be difficult, and maintaining population diversity through this method will be problematic.

International measures such as CITES Appendix I listing and enforcement of CITES regulations, serious locally-mounted crack-downs on regional trade networks and regional public awareness lobbying of the effects of medicinal wildlife trade, although at present largely ineffective and/or without precedent for other trade-threatened species in the region (Duckworth et al., *in press*; Compton et al., *in press*), are necessary steps in the long term for stemming what is clearly rapid over-exploitation of this endangered species.

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