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WG 7 – Reptiles and Amphibians
CASE STUDY 6
Cuora amboinensis
Country – **MALAYSIA**
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THE SOUTHEAST ASIAN BOX TURTLE *CUORA AMBOINENSIS* (DAUDIN, 1802) IN MALAYSIA

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I. BACKGROUND INFORMATION ON THE TAXON

1. BIOLOGICAL DATA

1.1. Scientific and common names:

Southeast Asian Box Turtle *Cuora amboinensis* (Daudin, 1802)
Wallacean Box Turtle *C. a. amboinensis* (Daudin, 1802)
Malayan Box Turtle *C. a. kamaroma* (Rummler and Fritz, 1991)
Indonesian Box Turtle *C. a. couro* (Schweigger, 1812)
Burmese Box Turtle *C. a. lineata* (McCord and Philippen, 1998)
In Malay the species is called Kura Katap, Kura Kura, or Kura kura patah.

1.2. Distribution.

From northeastern India and Bangladesh through southeastern Asia to the Malay Peninsula; on the Nicobar Islands (India); Borneo, Sumatra, Java, Sumbawa and small satellite islands thereof, the Moluccas, and Sulawesi (Indonesia); and the Philippines (Fritz and Havas, 2007).
Four subspecies are currently recognized (Rummler and Fritz, 1991; McCord and Philippen, 1998): the Wallacean Box Turtle *Cuora amboinensis amboinensis* (Daudin, 1802) often referred to as East Indian Box Turtle; the Malayan Box Turtle *C. a. kamaroma* (Rummler and Fritz 1991); the Indonesian Box Turtle *C. a. couro* (Schweigger, 1812); and the Burmese Box Turtle *C. a. lineata* (McCord and Philippen, 1998).
The Malayan Box Turtle *Cuora a. kamaroma* occurs from northeastern India and Bangladesh, through southeastern Asia to the Malay Peninsula; on the Nicobar Islands; Borneo; and Sulu Archipelago and perhaps the Palawan Island group (Philippines) (Fritz and Havas, 2007). This is the only subspecies that occurs in Malaysia. (Figure 1).

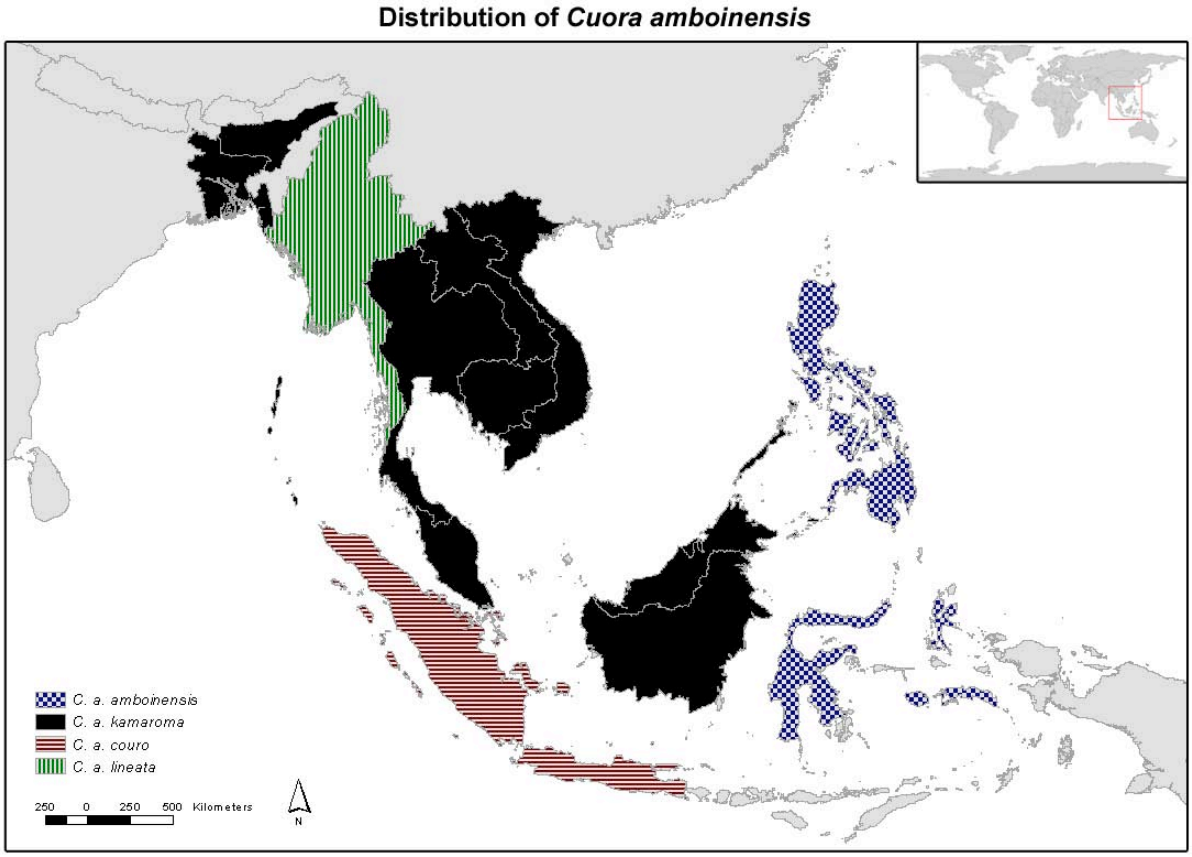

Figure 1: Distribution of *Cuora amboinensis*.

Generally, the species is widely distributed in lowland freshwater habitats from sea level to about 500 m above sea level.

1.3. Biological characteristics

1.3.1. *General biological and life history characteristics of the species*

- Sex ratio: 1:1 or slightly in favour of females (Schoppe, in press; Schoppe, in prep.). Males are generally slightly smaller and lighter than females (Rummler and Fritz, 1991; Schoppe, in press; Schoppe, in prep.).
- Low reproductive rate. Mean of 15 months to reach subadulthood. Maturity in captivity might be reached after four years and five months, and in the wild probably after five-and-a-half to six years (Schoppe, in press).
- Mean of three clutches with two eggs each, per year, resulting in a total of six eggs per female, per year (Schoppe, in press).
- Incubation period is 67–77 days in the wild and 76–77 days in captivity (Whitaker and Andrews, 1997). At 25–30°C, Lim and Das (1999) recorded incubation periods of 70–100 days. In captivity under outdoor conditions (26–30°C) without artificial incubation, a range of 60–120 days (n=22, mean 88.8±12.5) was encountered; a prolonged incubation seems to be related to unsuitable weather conditions (S. Schoppe, unpubl. data).
- Hatching success is about 50% in captivity under outdoor conditions (S. Schoppe, unpubl. data).
- Survival rate of eggs and hatchlings in the wild is not known. [For the North American Painted Turtle *Chrysemys picta*, which has a similar life

history, 92% (Wilbur, 1975) and 54% mortality (Mitchell, 1988) were recorded.]

- Life expectancy is 25–30 years; a maximum age of 38.2 years was recorded for an animal in captivity (Bowler, 1977).
- Generation time can be approximated by taking the median or mid-point between age at maturity and age at mortality. Accordingly, generation time of the Southeast Asian Box Turtle is approximately 18 years (Schoppe, in press).
- Individuals of *Cuora amboinensis* may wander substantial distances over the course of a lifetime, but the species does not migrate seasonally or to any geographically significant extent.
- Habitat generalist, adaptable to human-modified habitats, tolerant (Moll, 1997; Schoppe, in press).

1.3.2. *Habitat types*

The species is semi-aquatic and inhabits various natural and man-made wetland habitats with soft substrates and slow or no current (Ernst *et al*., 2000).

- Natural habitats: swamp and peat swamp forests, *Melaleuca* swamps, marshes, permanent or temporary wetlands, and shallow lakes.
- Human-modified habitats: flooded rice fields, oil palm and rubber plantations that are either partly flooded or that have an extensive drainage system as well as in irrigation ditches, canals, orchards, vegetated drainage systems, ponds and pools near houses.

1.3.3. *Role of the species in its ecosystem*

- Omnivorous but primarily vegetarian diet (Rogner, 1996). Forages on aquatic plants, aquatic insects, molluscs and crustaceans in the water and on plants, fungi, and worms on land (Lim and Das, 1999). Predator of various invertebrates. Might help to stem occurrence of invertebrate-borne diseases (van Dijk, 2000).
- Eggs as well as a significant proportion of hatchlings are an important source of food for monitor lizards, crocodiles, herons and other wetland/riverine birds, and small mammalian predators, such as civets (Moll and Moll, 2004).
- Seed disperser of at least five important trees, e.g. fig trees Ficus spp. and Indian Mulberry Morinda citrifolia, are consumed (P. Widmann, Scientific Consultant, Katala Foundation Inc., Palawan, Philippines, in litt. to S. Schoppe, 18 Aug. 2006).

1.4. Population

1.4.1. *Global Population size*

Within its global range, no quantitative information on the abundance of Southeast Asian Box Turtle population is available.

1.4.2. *Current global population trends*

___increasing _x_ decreasing (IUCN, 2008) ____stable
___unknown

1.5. Conservation status

1.5.1. *Global conservation status (according to IUCN, 2008)*

___Critically endangered
___Endangered
_x__Vulnerable
___Near Threatened
___Least concern
___ Data deficient

- Vulnerable since 2000 (Hilton-Taylor, 2000): A1d+2d of version 2.3 (IUCN, 2008): "a taxon is classified Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by an observed, estimated, inferred or suspected reduction of at least 20% over the last 10 years or three generations, whichever is the longer, based on actual or potential levels of exploitation" (A1d) and because "a reduction of at least 20%, is projected or suspected to be met within the next 10 years or three generations, whichever is the longer, based on actual or potential levels of exploitation" (A2d).
- Previously assessed as Lower Risk: Near Threatened (Baillie and Groombridge, 1996)

1.5.2. *National conservation status for Malaysia, the case study country*

- The most common turtle in the wild and in markets in Borneo and in Peninsular Malaysia (Lim and Das, 1999).
- Abundant in States that still have swamps and man-made wetlands (Sharma and Tisen, 2000).
- Reduced in multiple locations (Sharma, 1999; Sharma and Tisen, 2000)
- Common and vulnerable in Selangor (Azrina and Lim, 1999).
- Vulnerable (Asian Turtle Working Group, 2000; IUCN, 2008).
- Reduced and still decreasing (Schoppe, 2007).
- Extremely vulnerable to over-exploitation owing to lack of specific legislation regulating exploitation (Jenkins, 1995; Gregory and Sharma, 1997; Azrina and Lim, 1999; Sharma, 1999; Shepherd et al., 2004).

1.5.3. *Main threats within the case study country*

___No threats
__x_Habitat loss/degradation (human-induced)
___Invasive alien species (directly affecting the species)
__x_Harvesting [hunting/gathering]
___Accidental mortality (e.g. by-catch)
___Persecution (e.g. pest control)
__x_Pollution (affecting habitat and/or species)
___Other_____
___Unknown

Over-exploitation and pollution of water ways (Lim and Das, 1999). Over-exploitation for local use and international trade, and the continuous clearing of *Melaleuca* swamps on the east coast to give way for costal development projects (Sharma and Tisen, 2000).

2. SPECIES MANAGEMENT WITHIN THE COUNTRY FOR WHICH CASE STUDY IS BEING PRESENTED

2.1. Management measures

2.1.1. *Management history*

- Unregulated international trade before 2000.
- Listed in CITES Appendix II in 2000.

- Quota-regulated, 2000–2004 (see 2.1.2).
- Unregulated harvest for local use and trade in Peninsular Malaysia (Schoppe, in press). In Sabah and Sarawak, collection for local use requires permits.

2.1.2. *Purpose of the management plan in place*
Population management and sustainable use before trade ban.

2.1.3. *General elements of the management plan*
Quota system to regulate harvest for international trade from 2000 to 2004. The basis for the establishment of export quotas was the realized export of the previous year and observed stocks in collection centres (Anon., 2003). A harvest ban was declared in 2004 and an export ban in 2005.

2.1.4. *Restoration or alleviation measures*
When the Malaysian CITES Management Authority (MA) suspended harvest for export in 2004, it urged traders to set up breeding operations and to replace wild-caught supply (Anon., 2004). Considering, however, the life history of the Southeast Asian Box Turtle, the species does not meet the qualifications needed for breeding wildlife for commercial trade that were set by the MA (PERHILITAN, 1992). Captive breeding of the Southeast Asian Box Turtle for commercial purposes is at present not economically feasible (Schoppe, in press).

2.2. Monitoring system

2.2.1. *Methods used to monitor harvest*
National monitoring of exports based on export permits issued (Schoppe, 2007).

2.2.2. *Confidence in the use of monitoring*
Low (Schoppe, 2007).

2.3. Legal framework and law enforcement

Management of freshwater turtles and tortoises for local use is the responsibility of the State and without State regulations the federal government has no jurisdiction over the turtles. None of the 11 Malaysian States regulates in any way the exploitation of the Southeast Asian Box Turtle (Gregory and Sharma, 1997; Sharma and Tisen, 2000).
Export became regulated with the listing of the species in CITES Appendix II in 2000. Peninsular Malaysia has no specific CITES implementation legislation, but an amendment of the *Protection of Wildlife Act 1972* in 1991 added CITES Appendix I, II and III animals to the schedules of protected animals whose export should be regulated (Anon., 1991). The *Wildlife Conservation Enactment 1997* in Sabah (Anon., 1997) and the *Wildlife Protection Ordinance 1998* in Sarawak (Anon., 1998) on the other hand include Appendix II-listed species like the Southeast Asian Box Turtle under their respective schedules of protected species and therewith disallow hunting, killing and trading without a licence.

3. UTILIZATION AND TRADE FOR RANGE STATE FOR WHICH CASE STUDY IS BEING PRESENTED

3.1. Type of use (origin) and destinations (purposes).

- Origin of specimens: all are wild-caught. Captive breeding has not been established.
- Type of local use: human food, traditional Chinese medicine (TCM) and merit release. In TCM, the heads, as well as the shells, are used as a tonic after childbirth. Flesh is believed to cure nocturnal urination in bed by children. Eating the flesh or using the flesh and/or parts of the dry plastron (rarely the carapace) is believed to cure asthma and cancer. Merit release is a tradition of releasing one or several turtles to a temple or to the wild, believing that this will bring long life to the person releasing. Use is also by zoos, for parks, and as pets (Lim and Das, 1999; Sharma and Tisen, 2000; Schoppe, in press).
- Extent of local use: in Malaysia, the main users are indigenous groups (Orang Asli in Peninsular Malaysia, Bedayuh and Iban in Sarawak), Thai communities along the Malaysian-Thai border, and ethnic Chinese (Schoppe, in press). The first two groups mainly use the species for food consumption while ethnic Chinese use it mainly for merit release. These ethnic groups make together about 35% (11% indigenous and 24% ethnic Chinese) of the Malayan populace of approximately 25 million (CIA, 2007). The species has always been intensively captured for the local meat trade (Sharma and Tisen, 2000). In the 1990s, turtle meat traders in northern Peninsular Malaysia (Kelantan and Perlis) used to buy hundreds of individuals from trappers weekly (Sharma and Tisen, 2000). Trappers could bring in an average of 14 individuals per trapper, per day.
- Destinations, purpose, and extent of international trade: mainly East Asian countries, and to much lesser extent Europe and the USA.

1. <u>As tonic food and TCM</u> (Hong Kong SAR, mainland China, Singapore, Viet Nam, Taiwan POC) (Lim and Das, 1999; Sharma and Tisen, 2000; Schoppe, in press). Exported turtles may pass through several countries (Thailand, Myanmar, Lao PDR) there are few main final destinations for turtles traded for consumption from Malaysia: China, Hong Kong and Singapore (Schoppe, in press).
   In the years before the species was listed in Appendix II of CITES, international trade was unregulated and poorly documented. In 1995, Hong Kong reported the import of 25 196 individuals and, from January to August 1996, there are records for 15 818 live turtles from Malaysia (S.K.H. Lee *in litt.* to German CITES Scientific Authority, 1996). Records from PERHILITAN, the Malaysian MA, indicate that the Southeast Asian Box Turtle contributed 18.49% or 456 541 wild-caught individuals to the total number of freshwater turtles exported, January–October 1999 (Sharma and Tisen, 2000). In September 1999, one exporter in Perak reported buying more than 800 Southeast Asian Box Turtles daily from middlemen for export to Shenzhen, China (Sharma and Tisen, 2000). Exact numbers of exporters are not known for those years, but nine exporters were identified in 2006 when export was banned.
   CITES annual report data from the UNEP-WCMC CITES Trade Database (2008) have records from importing East Asian (Hong Kong, China and Singapore) countries and territories amounting to 330 099 individuals and 390 kg, 2000–2006 (Table 1).

Table 1: Reported imports of Southeast Asian Box Turtles from Malaysia by Hong Kong, China and Singapore.

Year	2000	2001	2002	2003	2004	2005	2006	Total 2000-06
No. of individuals	40 800	31 900	22 200	127 922	73 308	33 969	0	330 099
Kg	0	0	0	0	0	390	0	390

In 2006, approximately 70-80% of all illegally traded Southeast Asian Box Turtles were exported to China and the remainder to Singapore, but exact volumes are not known (Schoppe, in press).

2. Pet trade to Japan, the USA and Europe. The relative amount that can be inferred to have been traded for the pet industry was 5–10% of the total number of individuals reported as exported from Malaysia in CITES annual report data. A total of 12 785 individuals were reported as imports from Malaysia, 2000–2004, and it appears from CITES annual reports that these countries stopped importing after Malaysia's export ban (Table 2).

Table 2: Reported imports of Southeast Asian Box Turtles from Malaysia by the USA, Japan and Europe.

Year	2000	2001	2002	2003	2004	2005	2006	Total 2000-06
No. of individuals	3181	4708	2256	1655	985	0	0	12 785

3.2. Harvest:

3.2.1. *Harvesting regime*

All extractive, year-around, disregarding size but larger (adult) individuals are preferred for the consumption / TCM trade (Schoppe, in press). Animals are either hand captured or collected with baited traps during darkness. Collection is opportunistic, part-time, or full-time, in relation to demand.

Collection for export seems to be limited to Peninsular Malaysia, while local use is the driver of harvest in Sabah and Sarawak.

Populations in national protected areas are exploited to a lesser extent, but only very few lowland swamp/marsh areas are protected—only 3% of the total protected areas in Malaysia, amounting to 1 563 181 ha, are peat swamp forests (PERHILITAN, 1992).

3.2.2. *Harvest* management/ control

From 1998 to 2002 export of Appendix II-listed turtle species had been regulated through national export quotas, which were replaced by administrative quotas in 2003 (Anon., 2004). Export quotas are ones that are communicated to the CITES Secretariat and are binding for export while administrative quotas are PERHILITAN's internal quotas (L.K. Seong, Assistant Director, Law and Enforcement Division, PERHILITAN, pers. comm. to NDF workshop participants, Kuala Lumpur, 20 August 2007).

The export quota for the species was 50 000 in 2001 and 2002, and an administrative quota was set at 15 000 in 2003 (Anon., 2002). In 2004, the administrative quota remained at 15 000 individuals but only wild-caught specimens from existing stocks that had been collected and inventoried in 2003 were allowed to be exported. Harvest from the wild for export was banned in 2004.

An export ban (zero quota) has been in place since 2005 (Anon., PERHILITAN, pers. comm. to S. Schoppe, 17 July 2006). According to the

Malaysian MA, the Southeast Asian Box Turtle will not be allowed to be exported legally again until it is protected under Malaysian federal law (Anon., PERHILITAN, pers. comm. to S. Schoppe, 17 July 2006).

3.3. Legal and illegal trade levels

Legal trade.
In 2000, 277 190 individuals were reported as exported according to Malaysia's CITES annual report data, in 2001, 35 036 individuals, in 2002, 38 746 individuals, in 2003, 13 957 individuals and in 2004, 33 835 individuals. Approximately five per cent of the internationally traded individuals were assumed to be exported to serve the pet market, based on the destinations of Japan, USA and Europe; the remainder were exported to the food and TCM markets of other East Asian countries. Export from Malaysia was banned in 2005.
National use is not regulated in Peninsular Malaysia; it occurs year around. It is difficult to quantify local use. One ethnic Chinese family may use 1–100 individuals in the weekly Sunday release ceremony depending on the wealth of the family (Schoppe, in press). In States with a high percentage of ethnic Chinese, such as Penang and Perak, merit release is the main reason for local trade.
Approximately three-quarters of the indigenous people on Peninsular Malaysia regularly catch and consume the species on a weekly basis (Schoppe, in press). Nowadays, a family can catch an average of two individuals in one day, while some five to 10 years ago they could get six to 10 individuals in a day. They consume up to 10 individuals in one meal.
In Sabah and Sarawak, collection for local use requires permits. Volumes of annual harvest for local use are not known.

Trade before the trade ban in 2005.
Illegal trade is documented through seizures. On 11 December 2001, Hong Kong Customs officials seized an illegal shipment of about 10 000 Asian turtles, of which about 2000 were already dead. Among the survivors were 1798 Southeast Asian Box Turtles (Ades and Crow, 2002). Six tonnes of wild-caught freshwater turtles were seized in Hanoi, Viet Nam, in March 2003 and had been exported by air using false permits from Malaysia (C. Shepherd, TRAFFIC Southeast Asia, *in litt.* to J. Thomson, September 2004). It is not known how many of these were Southeast Asian Box Turtles but usually this species constitutes the highest number of individuals within illegal shipments of freshwater turtles. In the same year Customs officers in Xiamen investigated two cases of illegal importation of Southeast Asian Box Turtle from Malaysia, resulting in the confiscation of over 5000 live specimens in 2003 (Anon., 2004).
CITES annual report data show 129 577 individuals and 600 kg of plastron of the Southeast Asian Box Turtles reported as imported from Malaysia in 2003, and 74 293 individuals and 200 kg of plastron in 2004. The records are at significant odds with Malaysia´s reported exports that indicate that quotas were respected. Discrepancies in reporting may have a wide range of explanations such as the time of reporting to the CITES Secretariat, the number of permits issued versus the actual trade or the accuracy of reporting. As of this point, it is not certain whether import data are misreported or miscoded since this cannot be checked by UNEP-WCMC.

Trade after the trade ban in 2005.

In 2005, no live specimens were exported according to records of the MA in Malaysia and in accordance with the ban on export, but importing countries (China and Singapore) reported the import of 33 969 individuals and 390 kg of plastron from Malaysia. In 2006, suppliers to the export market in Selangor could collect an annual mean of 1823.7 individuals; multiplying with the confirmed number of suppliers in Peninsular Malaysia (=12) arrives at an estimate of 21 884 illegally exported Southeast Asian Box Turtles, by the 12 suppliers, per year (Schoppe, in press).
Surveys in Indonesia indicate that among the six main routes for illegal international trade, three go to Malaysia: 1) Medan via Belawan (boat) to Hong Kong and Penang (consumption trade), Tanjung Balai (boat) to Hong Kong, China, and Malaysia (consumption trade); and Pekanbaru (boat) to Malaysia and Singapore (consumption trade) (Schoppe, in prep.). Based on interviews with 18 illegal Indonesian traders, a conservative mean of 19 160 kg or 23 950 individuals[1] of Southeast Asian Box Turtles are gathered weekly for the illegal export to Malaysia, China, Hong Kong and Singapore (Schoppe, in prep.). It is not known how many of these go to Malaysia. No trade has been reported between Malaysia and Indonesia within the CITES annual report data.
In Sabah and Sarawak the species is commonly encountered as pet and for local consumption, respectively but none of the people keeping or selling or purchasing the species had ever filed a harvest permit (Schoppe, in press).

II. NON DETRIMENT FINDING PROCEDURE (NDFS)

Based on surveys conducted in the main source and trade centres in Malaysia in 2006 (Schoppe, in press), TRAFFIC Southeast Asia proposes the following NDF methodology.

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFS?

_partly_yes ___no

After extensive fieldwork in 2006, TRAFFIC Southeast Asia used the risk assessment checklist and came up with a radar graph (Schoppe, 2007) (Figure 2). The high number of outlying points in the radar graph can be interpreted as low confidence in the probability that the harvest in sustainable.

[1] Based on an average weight of 800g per individual.

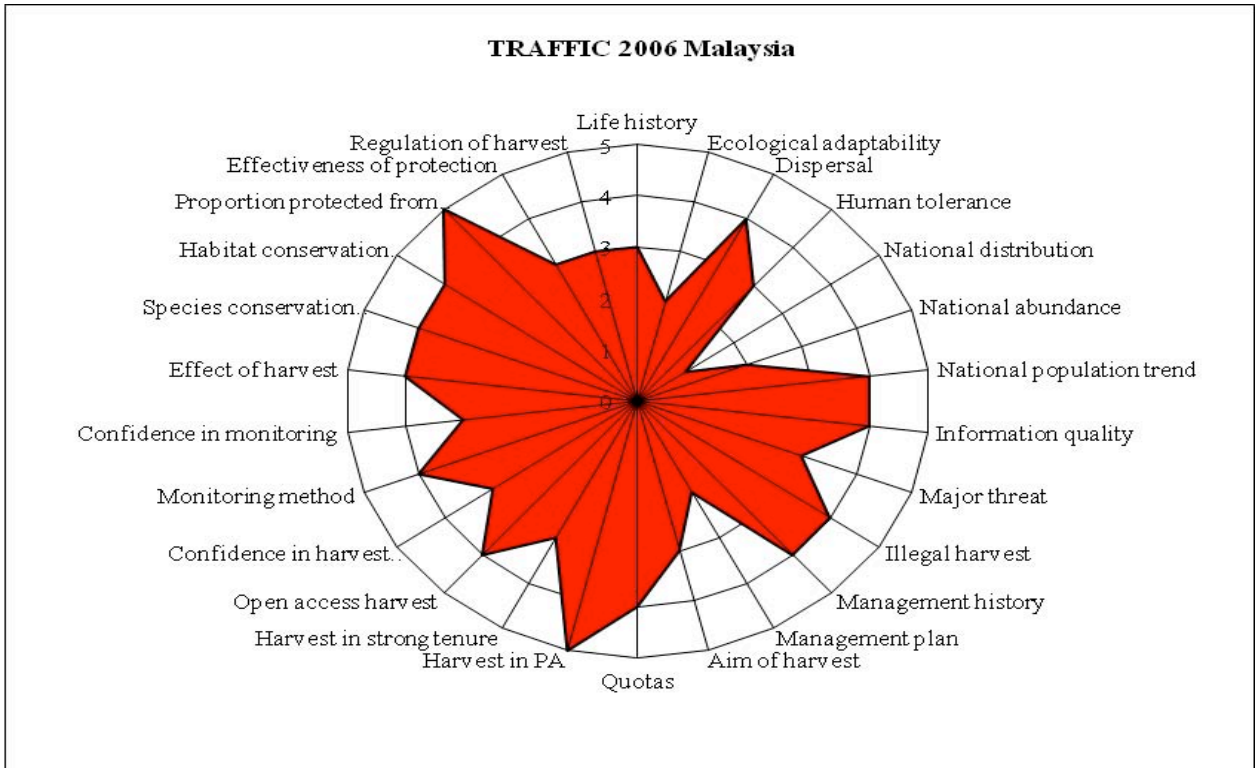

Figure 2: Risk-assessment of the Southeast Asian Box Turtle in Malaysia conducted by TRAFFIC Southeast Asia in 2006.

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED;

- Reproductive biology of the species
- Trade levels and extent of illegal trade
- Composition and size-frequency distribution in the wild and in trade
- Abundance of the species in an exploited man-made habitat
- Abundance in harvest and impact
- Effectiveness and implementation of legislation pertaining to freshwater turtle conservation in Malaysia

3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATION OR SAMPLING METHODOLOGIES AND ANALYSIS USED

The Southeast Asian Box Turtle was studied in all Malaysian States in July 2006 and from September to December 2006 (Schoppe, in press).

Reproductive biology of the species *(See also Chapter 1.3)*
Published and unpublished material on biology of the Southeast Asian Box Turtle was compiled, enriched with observations from the field, and analysed. *Results—major findings—are that the species has a low reproductive rate (age at maturity is 5.6 years, mean of six eggs per year with 50% hatching success), which makes it vulnerable for exploitation. At the same time, the slow reproductive rate makes captive breeding an economically unfeasible endeavour.*

Trade levels and extent of illegal trade (see also chapter 3.2.3)
Trade data derived from Malaysia's CITES annual reports, the CITES Trade Database maintained by UNEP-WCMC, herpetologists, traders, seizure records, and press releases were compiled and analysed. Results show that the species

remains among the most abundantly traded freshwater turtles. Despite the export ban, 19.5% of people interviewed that were in the possession of Southeast Asian Box Turtles in Peninsular Malaysia in 2006 admitted that they supplied the international turtle market. Among 38 traders (collectors, middlemen and suppliers), 60.5% (23) said that they supplied the international market. Among nine exporters, six said that they had stopped business after the ban, while three said that they had continued and usually exported once a week.
There are three main export routes for the illegal trade of Southeast Asian Box Turtles: by land via Thailand to China, by air from KL, and in some cases from Penang, to China, and by land via Johor Bahru to Singapore (Figure 3).

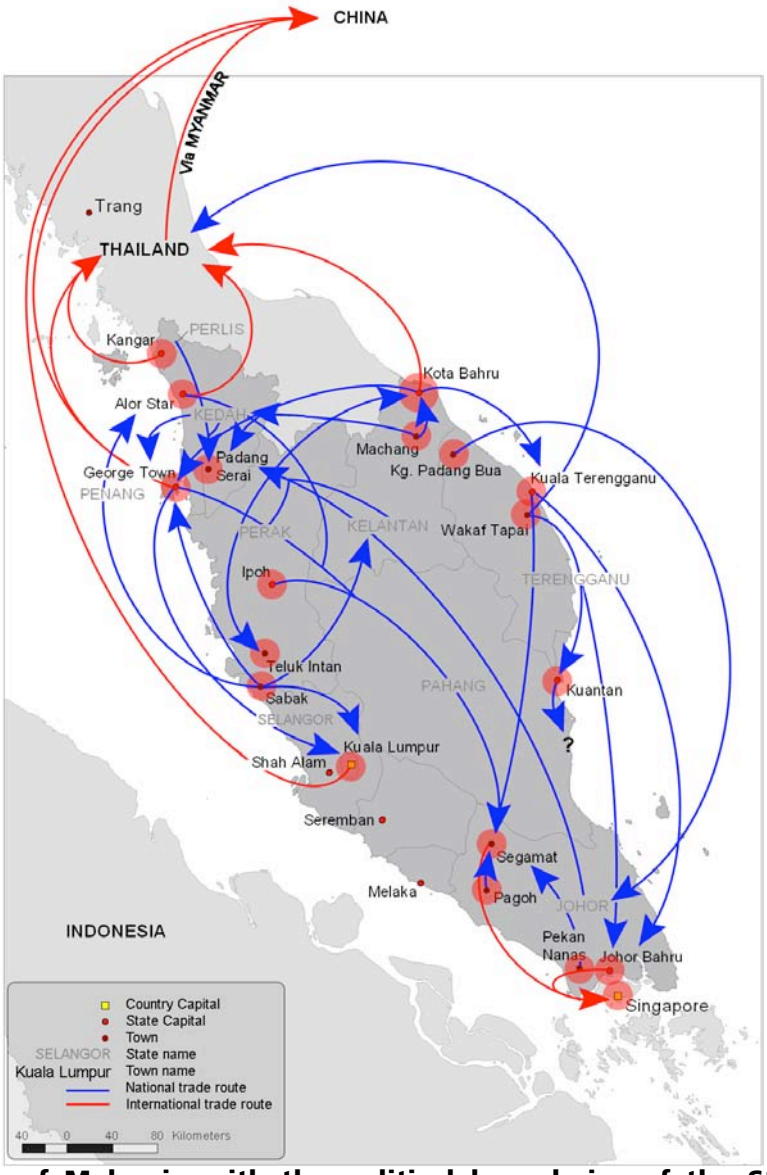

Figure 3: Map of Malaysia with the political boundaries of the States wherein national trade routes are indicated by blue arrows and international ones by red arrows.

Chinese pharmacies in Sabah purchase plastron of the Southeast Asian Box Turtle from China. According to shop owners, this is done because few turtles are left in Sabah and because collection of native species is illegal. They purchased plastron for USD10.9/kg in the early 2000s and for

USD45.6/kg in 2006 (Schoppe, in press). The increase in price is related to decreasing abundance and stricter trade regulations.
Mean purchase price for live individuals paid to collectors was USD1.62/kg in 2006. Suppliers to the export market sold the species for a mean of USD1.09/kg, while suppliers to the local market could avail higher prices (mean USD3.21/kg). One exporter sold for USD2.73/kg in 2006 compared to USD3.80/kg before the trade ban. Local mean price for one individual bought as pet or for "merit release" was USD3.82 in shops and USD2.92 in markets in Peninsular Malaysia. In Sabah and Sarawak, one specimen was sold for a mean of USD3.53 and USD6.15, respectively. According to traders, prices fluctuate with the availability, which is related to abundance in the wild, quotas and extent of illegal trade.
Surveys were conducted to find out whether anybody in the country breeds the species. Information on captive breeding success was compiled from primary and secondary resources including other countries. The positive and negative factors influencing captive breeding of the Southeast Asian Box Turtle are discussed in relation to its life history. *Results revealed that some have tried to breed but nobody currently breeds the species in Malaysia because it is not economically feasible for the consumption trade. The UNEP-WCMC CITES Trade Database (2008) records 4500 live specimens declared as captive-bred that were reported as exported by Malaysia to China and 3800 live specimens to Hong Kong, both in 2000. This appears to be an error as there were no captive breeding facilities for the species in Malaysia at the time.*

Composition and size-frequency distribution in the wild and in trade

To get information on sizes of individuals in natural and human-modified habitats, individuals encountered in the wild and in trade during surveys in 2006 were measured and means and standard deviation and range of median[2] carapace length determined. Three data sets are provided: 1) individuals caught during a mark-recapture study conducted in a mixed plantation known for the exploitation of the species in Sabak Bernam, Selangor; 2) individuals collected from natural and human-modified habitats that were encountered in trade or for local use in Peninsular Malaysia and Sarawak; and 3) for comparison, traded individuals that were collected from natural habitats in Kalimantan, Indonesia (Table 3).

Table 3: Mean ± standard deviation and range in median carapace length (mm) of Southeast Asian Box Turtle collected in Malaysia and Kalimantan, Indonesia in 2006.

Source	Wild	Remarks
Peninsular Malaysia	104.8±41.7 (65.5-188.0), n=24	Human-modified habitat, mark-recapture study
Peninsular Malaysia and Sarawak	173.3±25.3 (56.6-215.0), n=616	Encountered in trade, presumably various habitats
Kalimantan, Indonesia	168.1±28.5 (70.0-215.0), n=654	Natural habitat, encountered in trade

The smaller mean size of individuals from the exploited human-modified habitat in Malaysia compared to the other two areas might indicate over-exploitation, although there may be other reasons for the differences between these size differences. Data such as these from sampled human-modified and natural habitats could serve as baseline data and ongoing surveys should be conducted to monitor change in mean size. A decrease in

[2] "Median carapace length" is a standard measurement in freshwater turtles and tortoises. It is taken at the median part of the carapace in straight line.

mean size of turtles in trade over time can be interpreted as result of ongoing long-term exploitation, and a smaller mean size in trade compared to the mean size in protected wild populations, is most probably the result of long-term removal of adults.

To provide information on the composition of traded individuals and wild populations, the stocks of Southeast Asian Box Turtles available at 18 collectors, suppliers and exporters in Peninsular Malaysia and at seven private houses, aquarium shops and temples in Sarawak were assessed in terms of numbers, sex ratio, size, and life history stages. *Results show that 98% of the traded individuals in Peninsular Malaysia and 88% of those in Sarawak were sub-adults or adults with median carapace lengths of >116mm (Figure 4).*

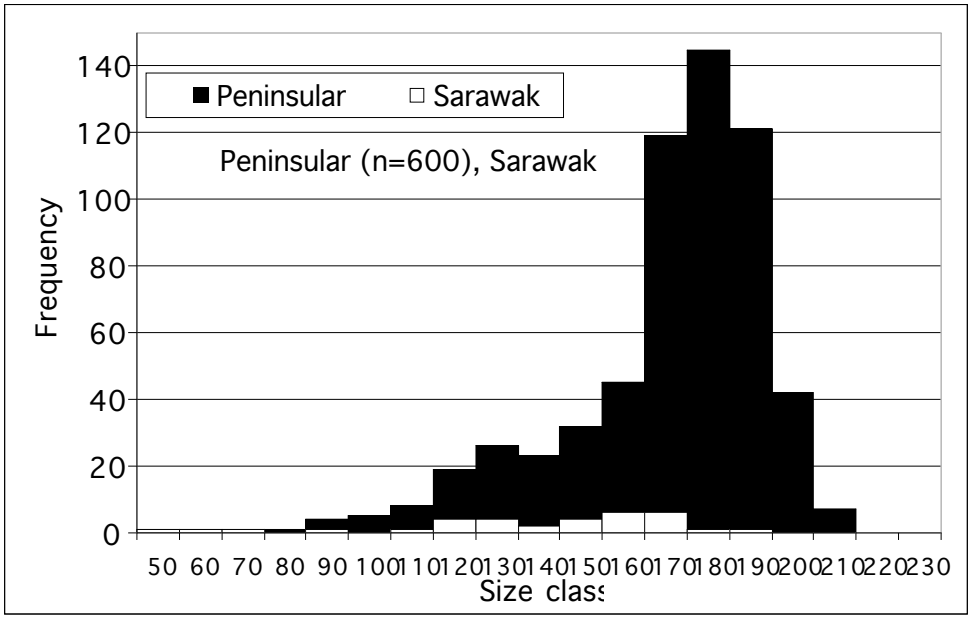

Figure 4: Size-frequency histograms for the Southeast Asian Box Turtle encountered in trade in Peninsular Malaysia and in Sarawak.

Females constituted 61% of the individuals in Peninsular Malaysia and 49% of the individuals in Sarawak. Accordingly, the ratio of male to females was 1:1.6 in Peninsular Malaysia and 1:1.2 in Sarawak. The primary sex ratio of C. amboinensis *should be 1:1 or slightly in favour of females (1:1.1-1.3). A biased sex ratio can be related to over-exploitation in general or to over-exploitation of one gender. Collectors however, target male and females equally since the difference in size among the genders is minor. The high representation of females compared to males traded in Peninsular Malaysia is alarming and should be monitored, it might be the result of long-term over-exploitation of one gender.*

The composition of a population in an exploited human-modified habitat was dominated by immature individuals (79.2%). The sex ratio was 1M:1.5F. The size-frequency histogram shows three clusters: juveniles, sub-adults and adults (from left to right) but none of the clusters shows normal distribution (bell-shaped form) (Figure 5). The juvenile cluster lacks hatchlings, indicating that there was no recent recruitment. The sub-adult cluster is negligible, and the adult cluster lacks individuals larger than 180 mm median carapace length This might indicate over-exploitation of these life history stages.

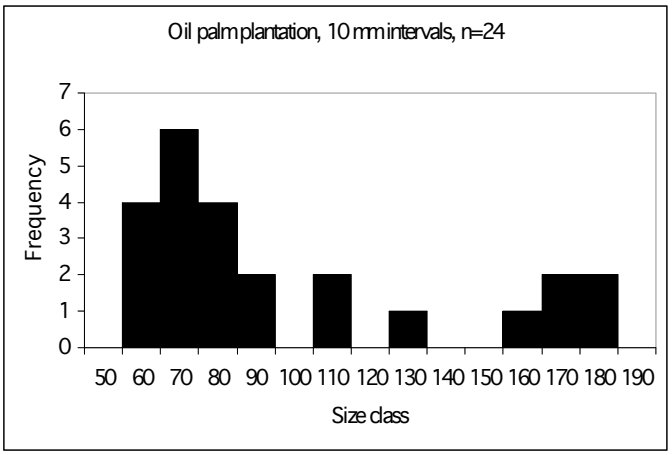

Figure 5: Size-frequency distribution of a population in an exploited plantation in Sabak Bernam, Selangor.

A mark-recapture survey after Schnabel (Krebs, 1998) to estimate population size was conducted in a mixed banana-oil palm plantation in Batu Dua Sepintas, Sabak Bernam, Selangor. The study was conducted daily for more than five consecutive weeks (38 days). Turtles were collected mainly with baited funnel traps that were checked every morning between 7-10:00 am. In addition, Visual Encounter Surveys were sporadically conducted in the early morning and in the late afternoon/ after dusk. A total of 42 funnel traps were set along the approximately 2200 m of drainage that surrounded the study site. All Southeast Asian Box Turtles encountered were marked, measured and released. *A total of 24 Southeast Asian Box Turtles were caught; the population density was 0.82 individuals/ha. It is highly probable that this number is too low to sustain reproduction and recruitment. Population size should be monitored over time. This is only the second known assessment of the population density of the Southeast Asian Box Turtle. The only other data from the same species are from Sulawesi, Indonesia. In Sulawesi, the population size of the species was assessed in a peat swamp forest, which is part of a national protected area. The study area in Sulawesi measured only two hectares and a total of 71 individuals were caught and the density was 60 individuals/ha (Schoppe, in prep.).*

Abundance of the species in harvested and un-harvested, natural and human-modified habitats

Information on the abundance of the Southeast Asian Box Turtle in the wild and therewith also on the impact the harvest has had was gathered through interviews conducted with local residents, store owners, market vendors, collectors, traders, farmers and recreational fishermen in all Malaysian states. *Results indicate that populations are over-exploited or even locally extinct in every State. This is especially true for populations around trade centres, such as cities. All interviewees indicated that the species was less common in 2006 compared to some five to 10 years ago (Schoppe, in press).*

Abundance in harvest and impact

Abundance in harvest of the Southeast Asian Box Turtles at two out of 17 identified traders' premises in Peninsular Malaysia was monitored for five consecutive weeks from 21 November to 27 December 2006, in Sabak Bernam, Selangor. *During the 38 days of survey, 385 Southeast Asian Box Turtles were encountered at these two suppliers. It is assumed that these constitute 100% of the stock that was traded by the two suppliers. The total mean catch of*

the two suppliers was 10.1 individuals/day, or 303.9 individuals/months or 3647.4 individuals/year. Accordingly, one supplier would then collect a conservative mean of 1823.7 individuals/year. For comparison, traders who source specimens from a natural wetland area in East Kalimantan, can collect about twice the amount (3350.9 individuals/year/trader). Generally, data are believed to be comparable, because the traders in both areas stated that the survey period fell in a lean collection time, either due to seasonality, as in West Kalimantan, or due to low prices, as in Malaysia. Accordingly, exploitation will be even higher during peak seasons. The much lower catch in Malaysia might be related to habitat (most are collected from plantations) or to over-exploitation and should be closely monitored. If catch-per-unit-effort (CPUE) in the survey site in Malaysia can be sustained over the years, harvesting might be sustainable; decreasing CPUE over the years would indicate that over-exploitation is taking place.

Effectiveness and implementation of legislation pertaining to freshwater turtle conservation in Malaysia

Information on management issues of CITES Appendix II-listed species was obtained from CITES online references (www.cites.org). Information on national and State legislation in place to regulate the harvest and trade in the Southeast Asian Box Turtle was compiled from relevant offices, such as the MAs of Peninsular Malaysia, Sarawak and Sabah and concerned NGOs, such as WWF Malaysia, Wetland International Malaysia, and academic institutions. The enforcement of these laws was examined and analysed, based on interviews with law enforcement officers as well as traders. *Results show that law enforcement is rather weak and illegal trade a major issue.*

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

- A major deficiency is the lack of past density/population size data with which to compare present results.
- Abundance data are needed from more areas, preferably from each major island, and preferably from a range of habitats (man-made habitat, exploited; man-made habitat, not exploited; natural habit, exploited; natural habitat, not exploited).
- The quantity and quality of trade data gathered during this survey is believed to be sufficient to identify current issues and problems correctly.

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND IN THE ELABORATION OF NDFS

- *Cuora amboinensis* has four morphologically and geographically distinct subspecies: the NDF process, however, needs to be at species level, since CITES does not distinguish taxa at subspecies level.

6. RECOMMENDATIONS

- It appears that the large illegal trade constitutes the main threat to the survival of the species.
- Surveys need to be conducted to determine the exact distribution of the species and its abundance in Malaysia. Population size should be monitored over time.
- Mean sizes of individual should be monitored over time. A significant decrease in mean median carapace length would indicate unsustainable exploitation considering that the larger individuals are mainly targeted for export

- A NDF assessment without abundance data and population dynamics will remain a compromise unless further bolstered by subsequently available information incorporated into a monitoring system that supports an 'adaptive management' framework.
- In the absence of quantitative data on local populations of the Southeast Asian Box Turtle, criteria that might indicate changes in the local abundance should be assessed. Indicators of change that were developed by TRAFFIC after fieldwork in 2006 are (Schoppe, 2007):

  1. collection areas getting increasingly far away from urban trade centres
  2. decreasing CPUE
  3. threats other than trade getting more severe.
  4. reduced average size of individuals
  5. traded specimens are mainly adults.
  6. the population structure of traded individuals is significantly in favour of one life history stage
  7. the sex ratio of any population significantly different from 1:1
  8. the State/provincial/regional annual harvest quota is far from being realized (provided that trade under a quota system is re-opened).

- In addition, potential indicators of illegal trade should be monitored:
  1. If collection of the species under investigation (and of other turtle species) is a full-time business for collectors/trappers, then there is probability that there is a high demand for the consumption trade.
  2. Sudden changes in the international market prices are usually indicators of illegal activity. The price paid to legal sources of the species by main importing countries decreases once an illegal shipment has arrived and undercuts market prices.

- The suggested abundance indicators are relatively easy to obtain. Potential sources of information are collectors, traders, data from importing countries, the CITES Management and Scientific Authorities in the country of export, published or unpublished reports, and grey literature.
- The above indicators should be assessed on an annual basis at the same time of the year and at the same sites. Recommended are sites that are significant trading centres around harvest locations such as Selangor, Johor, Kedah, Perak and Penang.

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