



NDF WORKSHOP CASE STUDIES
WG 7 – Reptiles and Amphibians
CASE STUDY 2
Cuora amboinensis
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THE SOUTHEAST ASIAN BOX TURTLE *CUORA AMBOINENSIS* (DAUDIN, 1802) IN INDONESIA

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I. BACKGROUND INFORMATION ON THE TAXA

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 Indonesia freshwater turtles are generally called 'Kura Kura'. Specifically depending of province: *Kura Kura ambon*, *Kura Kura kuning*, *Kura Kura batok*, *Kura Kura PD*, *Baning Banyas*, *Kura Kura katup*, *Kura kura tangkop*, *Kangkop*.

1.2. Distribution

From northeastern India and Bangladesh through southeastern Asia to Malay Peninsula; Nicobar Islands, Borneo, Sumatra, Java, Sumbawa and small satellite islands thereof; Moluccas, Sulawesi, Philippines (Fritz and Havas, 2007).

Four subspecies are currently recognized (Rummler and Fritz, 1991; McCord and Philippen, 1998): the Wallacean Box Turtle *C. amboinensis amboinensis* (Daudin, 1802) often referred to as East Indian Box

Turtle, the Malayan Box Turtle *C. a. kamaroma* Rummel 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 Wallacean Box Turtle *C. a. amboinensis* occurs on the Moluccas, Sulawesi, Philippines (except Sulu Archipelago and perhaps Palawan Island group) (Fritz and Havas, 2007).

The Malayan Box Turtle *Cuora a. kamaroma* occurs from northeastern India and Bangladesh through southeastern Asia to Malay Peninsula; Nicobar Islands, Borneo, Sulu Archipelago and perhaps Palawan Island group, Philippines (Fritz and Havas, 2007).

The Indonesian Box Turtle *C. a. couro* occurs on Sumatra, Java, Sumbawa and small satellite islands thereof (Fritz and Havas, 2007).

The Burmese Box Turtle *Cuora a. lineata* is restricted to Myanmar, and confirmed only from Kachin Province (Fritz and Havas, 2007).

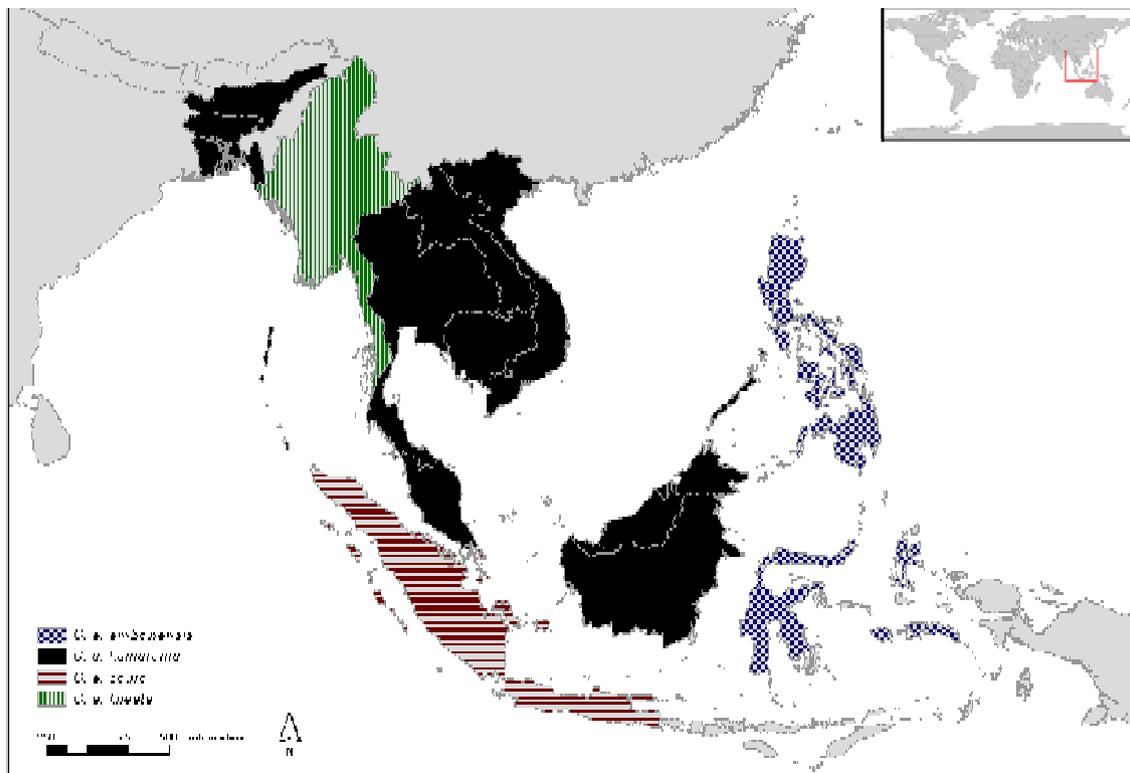


Figure 1: Distribution of the four subspecies of *Cuora amboinensis*.

Generally, the species is widely distributed in lowland freshwater habitats from sea level to about 500 m a.s.l., but locally extinct around trade centres.

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, 2008; Schoppe, *in prep.*).
- Low reproductive rate. Mean of 15 months to reach subadult hood. Maturity in captivity might be reached after 4 years and 5 months, and in the wild probably in 5 1/2-6 years (Schoppe, 2008).
- Mean of three clutches with two eggs each resulting in a total of six eggs per female per year (Schoppe, 2008).
- Incubation period is 67-77 days in the wild and 76-77 days in captivity (Whitaker and Andrews, 1997). 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 unfeasible 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* 92% (Wilbur, 1975) and 54% mortality, (Mitchell, 1988) were recorded.]
- Life expectancy 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. In the case of the Southeast Asian Box Turtle, that would be 6 [=age at maturity] + 1/2 *(30 – 6) [half of reproductive life-span] = 6 + 1/2 * 24 = 6 + 12 = 18 years generation time (Schoppe, 2008).
- 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 man-made habitats, tolerant (Moll, 1997; Schoppe, 2008).

1.3.2. Habitat types

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

- Natural: swamp and peat swamp forests, marshes, permanent or temporary wetlands, and shallow lakes.
- Man-made: 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*

- 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).
- 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).
- Seed disperser of at least five important trees e.g., fig trees *Ficus* sp., Indian Mulberry *Morinda citrifolia* are consumed (Peter Widmann, Scientific Consultant, Katala Foundation Inc., Palawan, Philippines, *in litt.*, 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 decreasing stable unknown

1.5. **Conservation status**

1.5.1. *Global conservation status* (according to IUCN Red List):

Critically endangered Near Threatened
 Endangered Least concern
 Vulnerable Data deficient

- 'Lower Risk: Near Threatened' (Baillie and Groombridge, 1996)
- 'Vulnerable' (Hilton-Taylor, 2000)
 - o 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).

1.5.2. *National conservation status for the case study country (Indonesia)*

- 'Vulnerable' (Asian Turtle Working Group, 2000; IUCN, 2008).
- Common and widespread in the western part of the country and abundant in most areas with natural or man-made wetlands (Anon., 2006).
- Indonesian populations are reduced and still decreasing (Anon., 2002; Schoppe, *in prep.*)

1.5.3. *Main threats within the case study country*

- No Threats
- Habitat Loss/Degradation (human induced)
- Invasive alien species (directly affecting the species)
- Harvesting [hunting/gathering]
- Accidental mortality (e.g. Bycatch)
- Persecution (e.g. Pest control)
- Pollution (affecting habitat and/or species)
- Other _____
- Unknown

Unregulated illegal trade constitutes the main threat. Indonesia is main supplier of the species for the international meat, Traditional Chinese Medicine (TCM) and pet markets.

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

2.1. Management measures

2.1.1. *Management history*

Unlimited exploitation until 1990, followed by an annual export allotment of 10 000 individuals for the years 1991 to 1994 (Jenkins, 1995). Actual exports are estimated at about 1 million individuals annually before Appendix II listing (van Dijk *et al.*, 2000). Among the 10 most heavily traded chelonians during 1998-1999 (Lau *et al.*, 2000). There is a national management plan in accordance with CITES listing since 2000.

2.1.2. *Purpose of the management plan in place*

Population management and sustainable use (Anon., 2002).
Maximise economic yield (Schoppe, *in prep.*).

2.1.3. *General elements of the management plan*

Quota system to regulate harvest for local and international use and to regulate export.

2.1.4. *Restoration or alleviation measures*

Recommended for large-scale captive breeding for consumption trade by the CITES MA, but neither implemented nor further developed. Captive breeding of the Southeast Asian Box Turtle for commercial profit is at present not economically feasible in a country of export, where captive bred animals incur high air freight rates (Schoppe, *in prep.*). The feasibility of captive breeding for the pet trade should be assessed.

2.2. **Monitoring system**

2.2.1. *Methods used to monitor harvest*

National monitoring of exports based on issued export permits.

2.2.2. *Confidence in the use of monitoring*

Low (Anon., 2002) to no confidence (Schoppe, 2007; *in prep.*).

2.3. **Legal framework and law enforcement:**

The species is not protected under Indonesian wildlife laws. Harvest and export became regulated with the listing of the species in CITES Appendix II in the year 2000. Before CITES listing export was unregulated and enormous.

The species may only be exported live. The export of dead animals, parts (carapace or plastron) or derivatives is illegal under the Indonesian Ministry Decree 447 (Anon., 2003) and the Indonesian quota (Anon., 2007).

Indonesia has a substantive enough legislative framework in place to govern the management of wildlife harvest and trade. The Indonesian CITES MA has a very detailed, complex and difficult licensing and permit system. Unfortunately, the enforcement of these laws and regulations is very weak.

The fact that some freshwater turtle species fall under the jurisdiction of the PHKA (Directorate General of Forest Protection and Nature Conservation under the Ministry of Forestry of the Republic of Indonesia) while others are under the management of the DKP (Indonesian Department of Marine Affairs and Fisheries), has led to considerable confusion and resulting weakness in law enforcement.

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

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

All specimens for domestic and international use are wild caught. The species is used for human food consumption, Traditional Chinese Medicine, merit release (a Chinese tradition of releasing one or seve-

ral turtles to a temple or to the wild believing that this will bring long life to the person releasing) and as pet. As with other reptiles, about 10% of the total harvest quota, in the case of *C. amboinensis* 2000 individuals, are allotted for local uses annually, although local utilization is negligible.

The animals' heads, as well as their shells are frequently sold as a tonic after childbirth. Flesh is believed to be a cure for nocturnal urination in bed by children. Eating the flesh or when using the flesh and/or parts of the dry plastron (rarely the carapace) in producing Traditional Chinese Medicine is believed to cure asthma and cancer.

In Indonesia, the main users are ethnic Chinese while the majority of Indonesians (75%) are Muslim and not allowed to consume or keep freshwater turtles. Destinations for the meat and the shell (in TCM) are East Asian countries, mainly Hong Kong SAR and mainland China and Singapore, Taiwan POC, and Viet Nam. Pet importing countries are Europe, Japan and the United States of America.

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, and smaller ones for the pet trade. Collection occurs all over the species range, disregarding designated collection areas and provincial quotas. Populations in national protected areas are exploited to lesser extent but since law enforcement is weak, exploitation also occurs in protected areas. Animals are either hand captured or collected with baited traps during darkness.

3.2.2. Harvest management/ control (quotas, seasons, permits, etc.)

Since 2000, harvest has been regulated through an export quota system. Export quota was 6000 in the year 2000, then increased to 18 000 (harvest quota is 20 000) in the following years until the present. The quota is cautious according to CITES SA (Anon., 2002).

According to the Ministry of Forestry " a quota system shall be based on scientific data or information from population inventories or monitoring". In the case of lack of data, information may be gathered based on: a) habitat and population condition of the said species; b) other scientific and technical information concerning population and habitat of the said species; c) actual harvest (realisation) of previous years; and d) traditional knowledge (Anon., 2003).

The basis for the quota setting of *C. amboinensis* is questionable. The distribution of the national quota among provinces is neither rela-

ted to local abundance nor to sustainability of trade. Locations for harvest or capture are not carefully selected based on biological and ecological assessments.

3.3. Legal and illegal trade levels:

Legal trade. Annually 18 000 individuals are allotted for export. Between 2000-2006, an annual average of 10 771 individuals were sent as pets to Europe (average 1604), Japan (average 1619), and the US (average 7547). The remainder, an annual average of 7228 individuals were exported to East Asia. Officially, this ratio 60% pet trade and 40 % meat trade is continued until today.

Illegal trade. A conservative estimate is that illegal trade amounts to 10 times the volume of legal trade (Schoppe, *in prep.*). This covers live specimens and the shell trade. Illegal trade is extensive and includes all levels and kinds of traders such as collectors, middlemen, suppliers and exporters of registered and unregistered companies. The international destinations of illegal shipments of the live Southeast Asian Box Turtle are Hong Kong SAR, mainland China, Singapore and Malaysia.

The import of plastron to East Asia is legal and does not need to be declared other than under CITES regulations (which may be ignored) if the plastron derives from CITES-listed species. Taiwan POC alone imported 403 583 kg of hard-shelled turtle shells between 1992 and 1998 from Indonesia (Chen *et. al.*, 2000). Among these, the Southeast Asian Box Turtle is the most common species and constitutes together with two other species more than 75% of the total amount (Chen *et. al.*, 2000). Between 2002 and 2006 exports of shell from Indonesia to Taiwan POC increased to an annual mean of 86 625 kg plastron or a total of 433 125 kg (Tien-Hsi Chen, Associate Researcher, National Museum of Marine Science and Technology, Keelung, Taiwan POC, *in litt.*, 8. April 2007). Indonesia is the main supplier of turtle to the TCM market in Taiwan POC, representing 42.1% and 35.7% of the shell imports to Taiwan POC in 1992-98 and 2002-06, respectively.

Export in dead specimens, parts and derivatives of the Southeast Asian Box Turtle from Indonesia has increased since the species became listed in Appendix II (Schoppe, *in prep.*). Live turtle trade quantity may have decreased but the volume of turtle shell traded increased (Tien-Hsi Chen, Associate Researcher, National Museum of Marine Science and Technology, Keelung, Taiwan POC, *in litt.*, 8. April 2007). Illegal trade represents the major threat to the survival of the Southeast Asian Box Turtle.

II. NON-DETRIMENT FINDING PROCEDURE (NDFs)

Based on surveys conducted in the main source and trade centres in Indonesia in 2006, TRAFFIC SEA proposes the following NDF methodology.

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

partly yes no

In April 2002, Environment Australia funded a species management workshop with members of the Indonesian CITES MA and SA. During this workshop the IUCN risk-assessment checklist was presented and members were trained on how to compile available information on certain species. The purpose was to evaluate the utility of the checklist in assisting the Scientific Authority of Indonesia in making non-detrimental findings in the future. One of the working groups came up with a radar graph for the Southeast Asian Box Turtle (Anon., 2002).

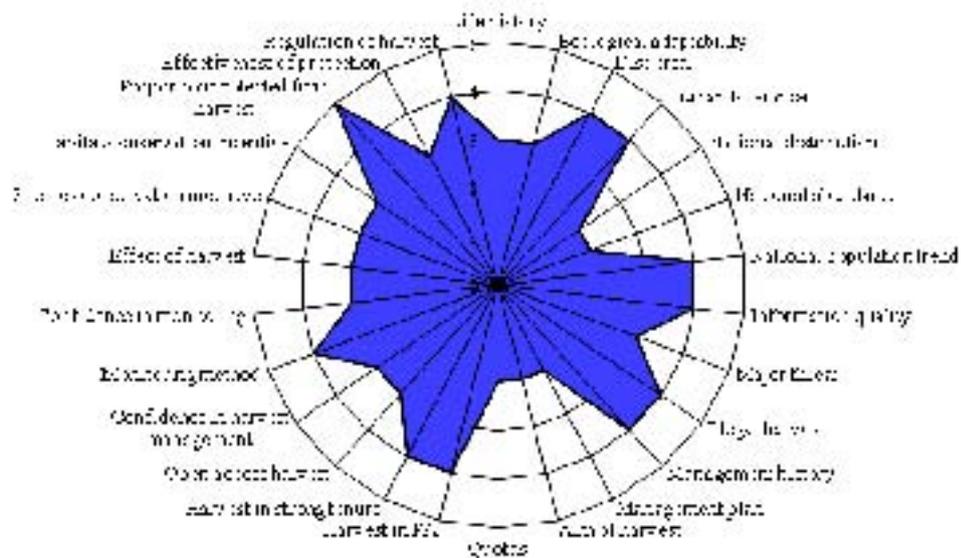


Figure 2: Risk-assessment of the Southeast Asian Box Turtle in Indonesia conducted by the Indonesia CITES SA in 2000 (Anon., 2002).

After extensive fieldwork in 2006, TRAFFIC Southeast Asia used the risk assessment checklist and came up with a radar graph too (Schoppe, 2007) (Figure 3).

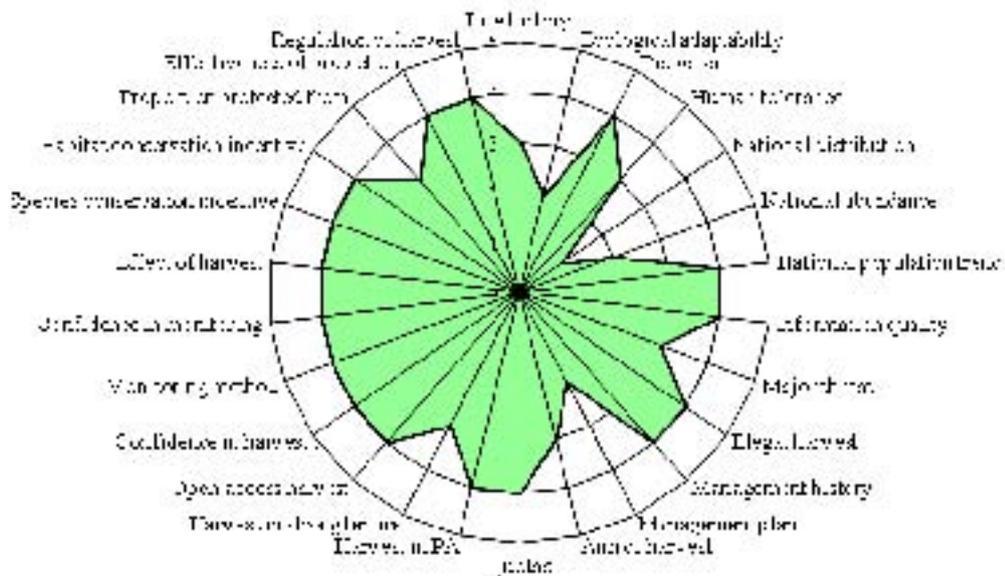


Figure 3: Risk-assessment of the Southeast Asian Box Turtle in Indonesia conducted by the TRAFFIC SEA in 2006.

Low confidence in the harvest management was identified as a major issue by both assessors.

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

- Reproduction biology of the species
- Past and current trade levels,
- Mean size of individuals and size-frequency distribution in the wild and in trade;
- Extent of illegal trade,
- Abundance of the species in an unexploited area in the wild,
- Abundance in harvest in an exploited area,
- Effectiveness and implementation of legislation pertaining to freshwater turtle conservation in Indonesia.

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

Fieldwork was conducted in central trade areas: Java, Sulawesi, Sumatra and Kalimantan from March to July 2006. Published and unpublished material on the habitat, role in the ecosystems, reproduction and growth, and morphology of the Southeast Asian Box Turtle in general and on the three Indonesian subspecies specifically was compiled, enriched with observations during field surveys in Indonesia and analysed. 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.

Individuals encountered in the wild were measured and means and standard deviation and range of median carapace length determined (Table 1). These data may serve as baseline data for further comparative studies. A smaller mean size of individuals in trade compared to the mean size in the wild is related to overexploitation of larger size classes.

Table 1: Mean \pm standard deviation and range in median carapace length (mm) of three subspecies of the Southeast Asian Box Turtle encountered in the wild in 2006.

Subspecies	Wild
<i>Cuora a. kamaroma</i>	165.9 \pm 31.3 (65.5-215.0), n=678
<i>Cuora a. amboinensis</i>	134.5 \pm 44.6 (51.5-200.0), n=68
<i>Cuora a. couro</i>	Not available

Information on management issues of CITES Appendix II-listed species was obtained from CITES online references (www.cites.org). Information on national and provincial legislation in place to regulate the harvest and trade in the Southeast Asian Box Turtle was compiled from relevant offices such as the CITES Management Authority, concerned NGOs such as Wildlife Fund for Nature (WWF) – Indonesia, Wetland International Indonesia, 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.

To compare current trade levels with the past, trade data derived from CITES annual reports, CITES Trade Database maintained by UNEP-WCMC, herpetologists, traders, seizure records, and press releases were compiled and analyzed. Results show that the species remains among the most abundantly traded freshwater turtles. Such excessive exploitation over a large period of time cannot be sustainable.

Local utilization was assessed based on wet and pet market surveys, pet shops surveys and interviews with owners or labourers at reptile selling/keeping outlets. Exporting companies and suppliers to exporters who claimed to supply also the local market were also surveyed. Results revealed that local utilization is negligible. Local market price of juveniles ranged from USD 0.3-13.6 (mean USD 3.84); those of adults ranged from USD 2.7-10.9 (mean USD 5.33) per individual in 2006.

At all premises of turtle traders – whether legal or illegal – the stock of the Southeast Asian Box Turtle present at the day of visit was assessed in terms of abundance, size, weight and sex. Efforts were made to measure at least 10 individuals (5 female and 5 male) randomly selected, or if possible 10% of the stock. Results provide mean and standard deviation and range in median carapace length for all three subspecies (Table 2). Data should serve as baseline data for comparison with later studies. A significant decrease in mean median carapace length indicates unsustainable exploitation.

Table 2: Mean \pm standard deviation and range in median carapace length (mm) of three subspecies of the Southeast Asian Box Turtle encountered in trade in 2006.

Subspecies	Trade
<i>Cuora a. kamaroma</i>	171.7 \pm 28.3 (56.6-215.0), n=701
<i>Cuora a. amboinensis</i>	149.9 \pm 24.9 (121.5-190), n=20
<i>Cuora a. couro</i>	131.1 \pm 40.3 (55.6-214.0), n=200

Sex ratio of *C. amboinensis* should be 1:1 or slightly in favour of females (1:1.1-1.3). A skewed sex ratio can be related to over-exploitation.

Pet exporters or their company managers in Java were interviewed following a semi-structured questionnaire format, asking questions about prices, volumes, trends, etc. Results indicate a decrease in abundance and local extinction of the species around centres of trade. Pet traders paid between USD 1.74 and 2.17 per individual to poacher in 2006. The sold one individual for USD 3.5-8.0 to their foreign buyers.

Captive breeding was assessed based on surveys of companies that claimed to breed the Southeast Asian Box Turtle. Data were validated through the help of captive breeding reports obtained from provincial and national offices of the Ministry of Forestry. Results revealed that nobody currently breeds the species in Indonesia because it is not economically feasible for the consumption trade. If individuals declared as captive bred appear in trade, origin should be investigated since the probability is high that they are traded without valid permits.

A survey of a wild population in a natural habitat – a peat swamp forest - was conducted in the National Park “Taman National Rawa

Aopa Watomohai" (TNRAW), Tinanggea, Kendari, Southeast Sulawesi from April 29 to June 10, 2006. To obtain quantitative data on the abundance of the Southeast Asian Box Turtle from the wild, and in line with the time frame of the project, the mark-recapture method for closed population after Schnabel was selected (Krebs, 1998). Once the entire survey was finished the population size was estimated after Schumacher and Eschmeyer based on the compiled field records (Krebs, 1998). Results showed that the population density in this protected natural habitat was 60 individuals/ha. Lower density in a natural habitat might indicate (over-) exploitation.

The mean size and standard deviation of males, females, and juveniles caught in TNRAW was computed based on the measurements of all individuals in each respective life history group. Results (Table 3) can serve for comparison with other natural populations.

Table 3: Mean \pm SD and range sizes (mm) and body weight (g) of specimens caught during the population survey in TNRAW.

Sex	Median Carapace Length	Maximum Carapace Width	Median Plastron Length	Plastron Width	Body Height	Weight
Female (n=28)	159.6 \pm 23.0 (118.0-200.0)	121.8 \pm 10.2 (103.0-140.0)	148.7 \pm 22.7 (106.0-182.8)	75.3 \pm 9.2 (60.0-92.6)	64.1 \pm 10.0 (42.0-79.0)	630.8 \pm 238.9 (240-1080)
Male (n=24)	159.9 \pm 20.1 (110.5-177.0)	118.0 \pm 13.5 (97.0-158.5)	136.9 \pm 11.4 (103.5-12.5)	69.7 \pm 4.7 (58.0-79.5)	62.4 \pm 24.9 (46.0-70.0)	544.8 \pm 134.3 (220-840)
Juv. (n=19)	67.6 \pm 16.9 (51.5-110.0)	62.6 \pm 15.8 (48.6-100.9)	59.6 \pm 16.2 (47.4-102.0)	34.4 \pm 9.8 (27.0-62.0)	27.2 \pm 7.0 (22.0-24.0)	57.5 \pm 57.3 (20-220)

The population in TNRAW was composed of 54.9% immature versus 45.1% mature individuals which is believed to reflect a healthy population with enough adults for continuous reproductions as well as immature individuals in various size classes. Male to female ratio was 1:1.2. A size frequency histogram of the population in the protected area is bell-shaped indicating normal distribution (Figure 4). A derivation from the above might indicate over-exploitation.

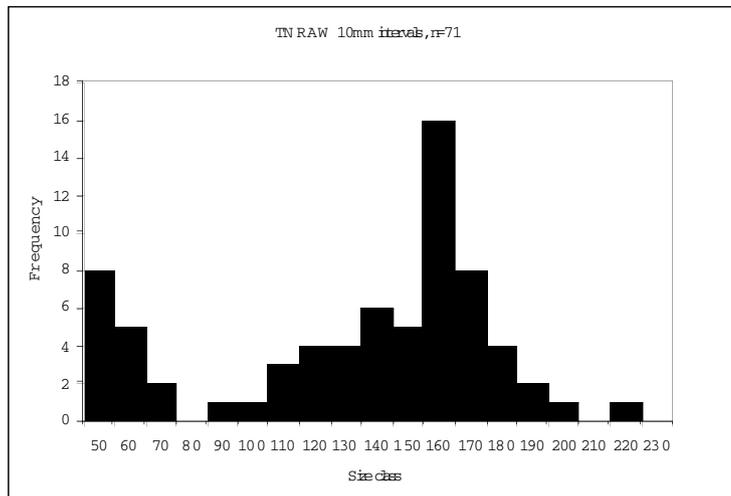


Figure 4:
Size-frequency
distribution of a
population of the
Wallacean Box
Turtle in the
TNRAW.

In a wetland area in Kota Bangun, Samarinda, East Kalimantan that is known for turtle exploitation due to the relative abundance of the species, a harvest survey was conducted from 24 June to 5 Aug. 2006. The survey intended to quantify the catch at premises of four middlemen in the area. The Malayan Box Turtles encountered at four middlemen (A-D) were monitored in terms of the total number individuals and the relative percentage of females, males and juveniles. In addition, 10% but at least 10 females, 10 males, 10 juveniles and all hatchlings brought in by every collector were measured following standard procedures. Results revealed that during the 43 days of harvest survey a total of 1547 Malayan Box Turtles were collected by four middlemen. This resulted in a total mean catch of 37.2 individual/day, or 1117 individual/months or 13 403.5 individual/year for all four middlemen combined. Accordingly, one middleman would then trade a conservative mean of 3350.9 individual/year. If these numbers can be sustained over the years, exploitation might be sustainable, if harvest decreases over the years, over-exploitation is taking place. For comparison, two Malaysian middlemen who got stocks mainly from oil palm plantations in trade centres of the species, gathered an annual mean of 3647.4 individuals, or a mean of 1823.7 individuals annually for each middleman in 2006. This is only about half what is collected by one middlemen in Kota Bangun. We do not know if lower catch in the Malaysian site is because of habitat conditions (man-made versus natural) or related to over-exploitation.

The composition of individuals caught in the wetland area in Kalimantan was dominated by mature adults (95.8%) and only 4.2% immature individuals had been caught. For a slow reproducing species like the Southeast Asian Box Turtle the removal of reproductive adults

from one or a few small populations has significant effects on the population structure, recruitment and population genetics.

The harvest impact on the Southeast Asian Box Turtle was assessed in selected sites in South Sulawesi, Sumatra and Kalimantan. Qualitative surveys on the impact harvesting has had or is having on the populations were carried out through interviews with local residents, store owners, market vendors, collectors, traders, farmers and recreational fishermen. Interviews were not systematic nor were questionnaires or lead questions used. Interviews were rather informal and semi-structured in nature, aimed at getting information on the local distribution, abundance now and five to 10 years ago, and threats. Results show generally over-exploitation and even local extinction near and in trade centres, acquisition of individuals from provinces without quota (illegal harvest), and that the species is more common in remote areas that were exploited to lesser extent in the recent past (Figure 5).

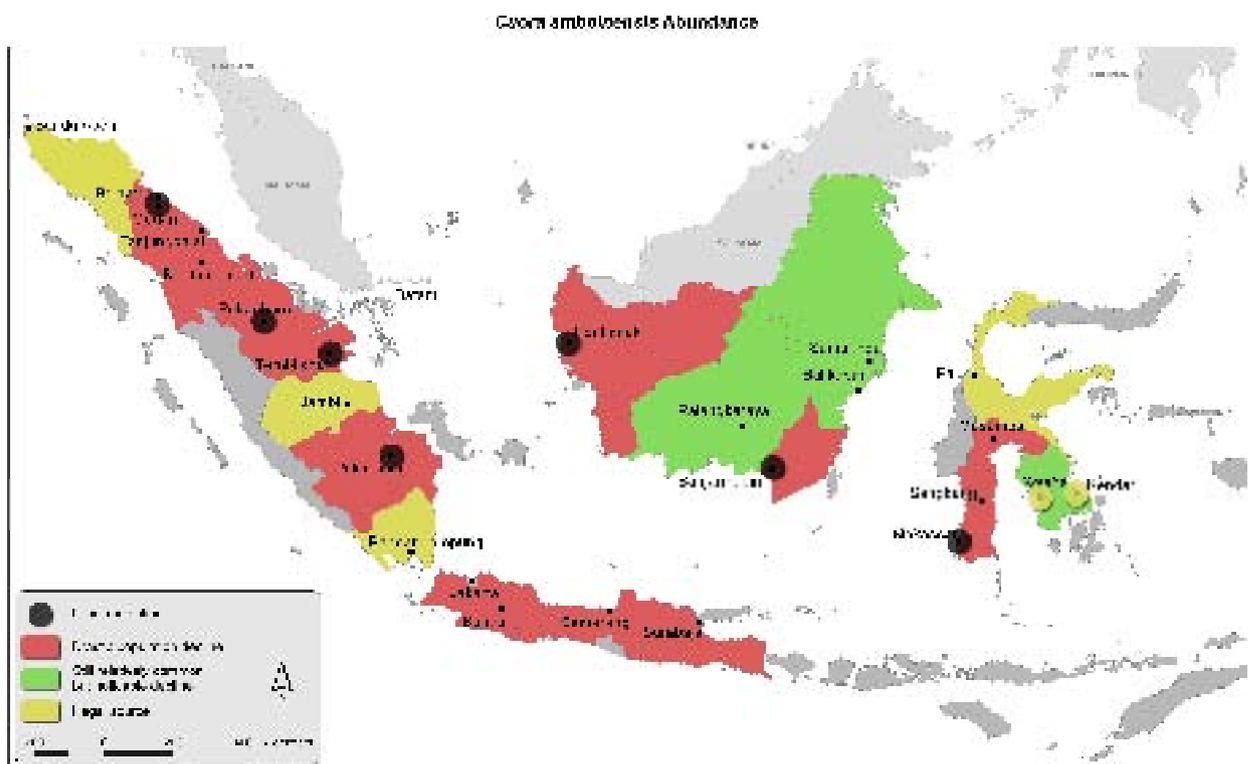


Figure 5: Map of Indonesia showing the abundance and exploitation of the Southeast Asian Box Turtle based on interviews and surveys conducted in Java, Sulawesi, Sumatra, and Kalimantan in 2006.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

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

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF

- The enormous amount of illegally traded individuals and the long chain of people involved in the illegal business.
- The degree of corruption.
- The large size of Indonesia and the wide range of distribution of the species.

6. RECOMMENDATIONS

- Illegal trade constitutes the main threat to the survival of the species and should be stopped before any other management schemes can take place.
- Surveys need to be conducted to determine the exact distribution of the species and its abundance in Indonesia.
- 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 SEA after fieldwork in 2006 are (Schoppe, 2007):
 1. If collection areas are getting increasingly further away from urban trade centres.
 2. If catch-per-unit-effort (CPUE) has decreased.
 3. If collection of the species under investigation (and of other turtle species) is a fulltime business for collectors/trappers.
 4. If threats other than trade are getting more severe.

5. If there are frequent, periodical changes in the (international) market price.
 6. If the State/provincial/regional annual harvest quota is far from being realized.
 7. If harvest and export quotas are always realized (actual recorded volumes) to the maximum volume.
 8. If average size of individuals is reduced.
 9. If traded specimens are mainly adults.
 10. If the population structure of traded individuals is significantly in favour of one life history stage.
 11. If the sex ratio is significantly different from 1:1.
- The suggested abundance indicators are relatively easy to obtain. Potential sources of information are collectors, middlemen, suppliers, exporters, 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 in trade centres such as Makassar, Medan, Pekanbaru, Tembilahan and Banjarmasin.

REFERENCES

- ANON., 2002. Species Management Workshop funded by Environment Australia. Cibinong, Indonesia, 15-17 April 2002.
- ANON., 2003. Administration directive of harvest or capture and distribution of specimens of wild plants and animal species. Decree of the Ministry of Forestry No. 447/Kpts-II/2003. Republik of Indonesia. Unofficial English Version.
- ANON., 2006. Convention on International Trade in Endangered Species of Wild Fauna and Flora. Fifty-fourth meeting of the Standing Committee, Geneva (Switzerland), 2-6 October 2006. SC54 Doc. 42.
- ANON., 2007. Kuota pengambilan tumbuhan alam dan penangkapan satwa liar untuk periode tahun 2007. Keputusan Direktur Jenderal Perlindungan Hutan Dan Konservasi Alam.
- ASIAN Turtle Working Group, 2000. *Cuora amboinensis*. In: IUCN 2006. 2006 IUCN Red List of Threatened Species. www.iucnredlist.org. Downloaded on 10 January 2007.
- BAILLIE, J. and Groombridge, B., 1996. *1996 IUCN Red List of Threatened Animals*. IUCN, Gland, Switzerland.
- BOWLER, J.K., 1977. Longevity of reptiles and amphibians in North American collections as of 1 November, 1975. Society for the Study of Amphibians and Reptiles, Miscellaneous Publications, Herpetological Circular 6: 1-32.
- CHEN, T.-H., J.-C. Lin, and H.-C. Chang, 2000. Current status and utilization of Chelonians in Taiwan. In van Dijk, P.P., Stuart, B.L. and A.G.J. Rhodin (eds.). Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. Chelonian Research Monographs, 2: 45-51.
- FRITZ, U. and P. Havas, 2007. Checklist of Chelonians of the World. *Vertebrate Zoology* 57: 149-368.
- HILTON-TAYLOR, C., 2000. 2000 IUCN Red List of Threatened Species. IUCN, Gland, Switzerland and Cambridge, UK.
- IUCN 2008. 2008 IUCN Red List of Threatened Species. <<http://www.iucnredlist.org/>>. Downloaded on 11 October 2008. Jenkins M.D., 1995. Tortoises and Freshwater Turtles: The trade in Southeast Asia. TRAFFIC International, United Kingdom, 48 pp.
- JENKINS M.D., 1995. Tortoises and Freshwater Turtles: The trade in Southeast Asia. TRAFFIC International, United Kingdom, 48 pp.
- KREBS, C.J., 1998, *Ecological Methodology*, 2nd edition. (New York: Harper Collins), 654pp.
- LAU, M., Chan, B., Crow, P. and G. Ades, 2000. Trade and conservation of turtles and tortoises in the Hong Kong Special Administrative Region, People's Republic of China. In van Dijk, P.P., Stuart, B.L. and A.G.J. Rhodin (eds.). Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. Chelonian Research Monographs, 2: 39-44.
- LIM, B.L. and I. Das, 1999. Turtles of Borneo and Peninsular Malaysia. Natural History Publications, Borneo, 151pp.
- MCCORD, W.P. and H.-D. Philippen, 1998. A new subspecies of box turtle, *Cuora amboinensis* lineata, from Northern Myanmar (Burma), with remarks on the distribution and geographic variation of the species. *Reptile Hobbyist*, p. 51-58.
- Mitchell, J.C., 1988. Population ecology and life histories of the freshwater turtles *Chrysemys picta* and *Sternotherus odoratus* in an urban lake. *Herpetological Monograph*, 2: 40-61.
- MOLL, D. and E.O. Moll, 2004. The Ecology, Exploitation, and Conservation of River Turtles. Oxford University Press, 393pp.

- MOLL, E.O., and J. Vijaya, 1986. Distributional records for some Indian turtles. *J. Bombay Natur. Hist. Soc.*, 83: 57-62.
- MOLL, E.O., 1997. Effects of habitat alteration on river turtles of tropical Asia with emphasis on sand mining and dams. *In* J. Van Abbema (ed.), *Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles - An International Conference*, pp. 37–41. July 1993, State University of New York, Purchase. New York Turtle and Tortoise Society, New York, 494 pp.
- ROGNER, M., 1996. *Schildkröten*, Vol. 1 and 2. Heiro-Verlag, Hürtgenwald, Germany, 49 pp.
- RUMMLER, H.-J. and U. Fritz, 1991. Geographische Variabilität der Amboina-Schneiderschildkröte *Cuora amboinensis* (Daudin, 1802), mit Beschreibung einer neuen Unterart, *C. a. kamaroma* subsp. nov. *Salamandra*, 27(1): 17-45.
- SCHOPPE, S., *in prep.*, Status, trade dynamics and management of the Southeast Asian Box Turtle *Cuora amboinensis* in Indonesia. TRAFFIC Southeast Asia, Technical Report, Kuala Lumpur, Malaysia.
- SCHOPPE, S., 2008, Science in CITES: The biology and ecology of the South East Asian Box Turtle *Cuora amboinensis* and its local uses and trade in Malaysia. TRAFFIC Southeast Asia, Technical Report, Kuala Lumpur, Malaysia.
- SCHOPPE, S., 2007, Non-Detrimental Finding Methodology for the Trade of Southeast Asian Freshwater Turtles and Tortoises (Fam. Geoemydidae). Unpublished Report for TRAFFIC Southeast Asia, Kuala Lumpur, Malaysia, 19 pp.
- VAN DIJK, P.P., 2000. The Status of Turtles in Asia. *In* van Dijk, P.P., Stuart, B.L. and A.G.J. Rhodin (eds.). *Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia*. Chelonian Research Monographs, 2: 15-18.
- VAN DIJK, P.P., Iskandar, D.T., Palasuwan, T, Rhodin, A.G.J., Samedi, Sharma, D.S.K., Shepherd, C.R., Tisen, O.B. and V.R. Genorupa, 2000. Turtle trade in Southeast Asia: Regional Summary (Indonesia, Malaysia, Papua New Guinea, and Thailand). *In* van Dijk, P.P., Stuart, B.L. and A.G.J. Rhodin (eds.). *Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia*. Chelonian Research Monographs, 2: 145-147.
- WHITAKER, R. and H.V. Andrews, 1997. Captive breeding of Indian turtles and tortoises at the Centre for Herpetology/Madras Crocodile Bank. *In* J. Van Abbema (ed.), *Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles - An International Conference*, pp. 166–170. July 1993, State University of New York, Purchase. New York Turtle and Tortoise Society, New York, 494 pp.
- WILBUR, H.M., 1975. The evolutionary and mathematical demography of the turtles *Chrysemys picta*. *Ecology*, 56: 64-77.