

**STATUS, TRADE
DYNAMICS AND
MANAGEMENT OF THE
SOUTHEAST ASIAN
BOX TURTLE
CUORA AMBOINENSIS
IN INDONESIA**

SABINE SCHOPPE

A TRAFFIC SOUTHEAST ASIA REPORT



Published by TRAFFIC Southeast Asia,
Petaling Jaya, Selangor, Malaysia

© 2009 TRAFFIC Southeast Asia
All rights reserved.

All material appearing in this publication is copyrighted and may be reproduced with permission. Any reproduction in full or in part of this publication must credit TRAFFIC Southeast Asia as the copyright owner.

The views of the authors expressed in this publication do not necessarily reflect those of the TRAFFIC Network, WWF or IUCN.

The designations of geographical entities in this publication, and the presentation of the material, do not imply the expression of any opinion whatsoever on the part of TRAFFIC or its supporting organizations concerning the legal status of any country, territory, or area, or its authorities, or concerning the delimitation of its frontiers or boundaries.

The TRAFFIC symbol copyright and Registered Trademark ownership is held by WWF. TRAFFIC is a joint programme of WWF and IUCN.

Layout by Noorainie Awang Anak,
TRAFFIC Southeast Asia

Suggested citation: Sabine Schoppe (2009). *Status, trade dynamics and management of the Southeast Asian Box Turtle *Cuora amboinensis* in Indonesia*
TRAFFIC Southeast Asia,
Petaling Jaya, Selangor, Malaysia

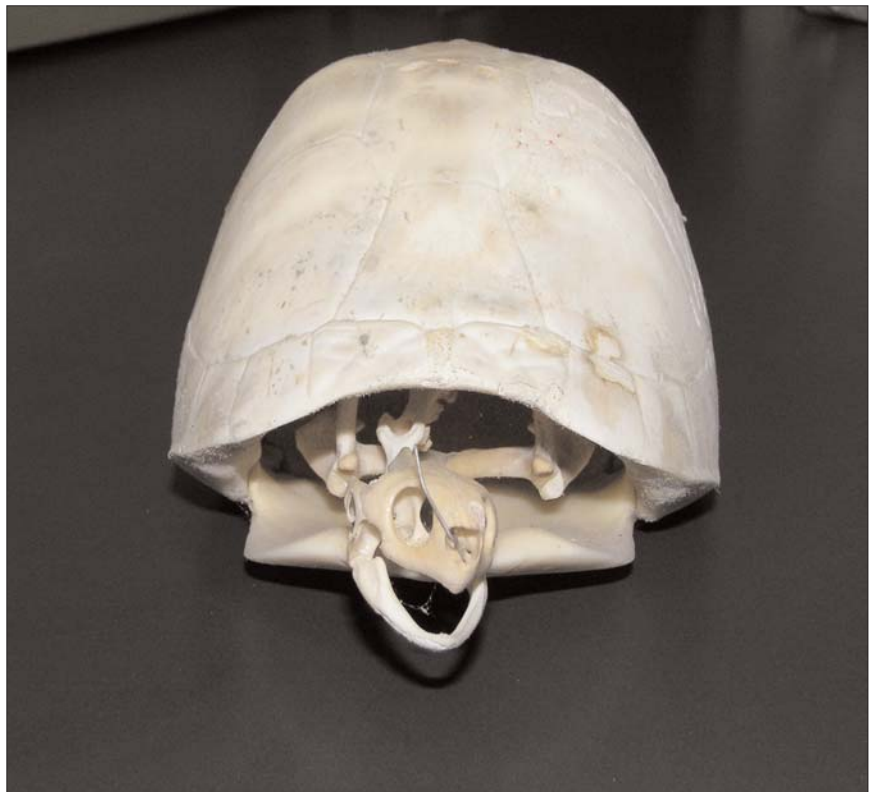
ISBN 9789833393213

Cover: Southeast Asian Box Turtle *Cuora amboinensis*

Photograph credit: Chris R. Shepherd/TRAFFIC Southeast Asia

STATUS, TRADE DYNAMICS AND MANAGEMENT OF THE SOUTHEAST ASIAN BOX TURTLE *CUORA AMBOINENSIS* IN INDONESIA

Sabine Schoppe



Sabine Schoppe/TRAFFIC Southeast Asia

Shell and skeleton of museum specimen of the Southeast Asian Box Turtle at the Zoological Museum in Cibinong, Java

CONTENTS

Acknowledgements	iii
Glossary and acronyms	iv
Executive summary	viii
Introduction	1
Methodology	5
Biology and ecology of the Southeast Asian Box Turtle	5
Conservation status	5
Laws and regulations for the conservation of freshwater turtles in Indonesia	5
Quantity and quality of trade of the Southeast Asian Box Turtle	6
<i>Past trade levels</i>	6
<i>Trade surveys</i>	6
Alternative production systems	8
Population studies and abundance	8
<i>Population survey</i>	8
<i>Harvest survey</i>	12
<i>Harvest impact surveys</i>	15
Results and discussion	16
Habitat	16
Role in the ecosystem	18
Morphology	18
Growth and reproduction	21
Conservation status of the Southeast Asian Box Turtle	22
Laws and regulations for the conservation of freshwater turtles in Indonesia	22
<i>The quota system</i>	23
<i>Purpose of export</i>	27
<i>Permits and procedures</i>	28
Quantity and quality of trade of the Southeast Asian Box Turtle	34
<i>Past trade levels</i>	34
<i>Current trade levels</i>	39
Alternative production systems	62
Abundance of the Southeast Asian Box Turtle in the wild	66
<i>Population survey</i>	66
<i>Harvest survey</i>	68
<i>Harvest impact</i>	71
Conclusions	74
Recommendations	76
References	80

ACKNOWLEDGEMENTS

Most and foremost the researcher would like to acknowledge the donor agencies such as the British High Commission in Kuala Lumpur, Malaysia and the US State Department who financed this study as part of the projects “The Use of Science in CITES Decision Making” and “Putting Science into CITES - Enhanced Scientific Rigour in Wildlife Trade Management Decision Making”.

She also would like to thank her local counterparts, research assistants, guides and translators, especially Ir. Mumpuni and Awal Riyanto of LIPI, Nuryani Widagti and Dian Oktaviani of IPB/UI, and Nenny, Harry, Hari, Daud, Agus, and Emy.

Thanks also to all government and non-government organizations, the academe and private persons who in one or another way contributed to this report, especially to Pak Sancoyo Atmosoekarto, and Pak Ruben Silitonga of LIPI; Pak Adi Susmianto, Head PHKA-KKH, Samedi and Ibu Faustina Hardjanti of PHKA-KKH; Pak Djati Witjaksono Hadi, Head BKSDA Sumut I and his staff; Pak Luhut, Head BKSDA Sumut II and his staff; Pak Sugiman, Head of Fish Quarantine in Medan; Ir. Abdul Wahid, Head of Fish Quarantine Bajarmasin; Dr. Ir. Mas Tri Djok Sunarno, Head of Fish Quarantine Palembang; WWF Indonesia, Conservation International Indonesia, Sumatran Orangutan Conservation Programme, Leiser International Foundation, Cikananga Animal Rescue Centre, and Ibu Mirza and Ibu Ani of IPB. Thank you to all traders, most especially to George Saputra, Chairman of IRATA. Thanks also the staff of TNRAW, especially to Puto Sutarya, park ranger in Aopa. Thanks to Olaf Neussner of INVENT, Philippines for assisting in the early map design.

Thanks to Peter Paul van Dijk, Edward O. Moll and many other members of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group who shared information. Thanks also to friends and colleagues at TRAFFIC SEA for their valuable inputs, reviews, assistance in layout and map design most especially to Chris Shepherd, James Compton, Azrina Abdullah, Mark Auliya, Julia Ng, Sandrine Pantel, and Noorainie Anak. The researcher would like to express her particular thanks to all peer reviewers, especially Peter-Paul van Dijk of Conservation International, Kate Sanders of University of Adelaide, Australia, and Steve Broad and Julie Gray of TRAFFIC International.

GLOSSARY AND ACRONYMS

- Adult – The life history stage that comprises sexually mature individuals that express external sexual dimorphism.
- Anon. – Anonymous.
- ANOVA – Acronym for the statistical analysis called ‘Analysis of Variance’, whereas variance is the square of standard deviation.
- Article IV – Under the Convention text of CITES (see below) concerning the regulation of trade in specimens of species included in Appendix II. The export of any specimen of a species included in Appendix II shall require the prior grant and presentation of an export permit. An export permit shall only be granted when the following conditions have been met: (a) a Scientific Authority of the State of export has advised that such export will not be detrimental to the survival of that species; (b) a Management Authority of the State of export is satisfied that the specimen was not obtained in contravention of the laws of that State for the protection of fauna and flora; and (c) a Management Authority of the State of export is satisfied that any living specimen will be so prepared and shipped as to minimize the risk of injury, damage to health or cruel treatment.
- Assurance population – Here referring to those populations of the Southeast Asian Box Turtle that are protected and that live under conditions that provide nutrition, mates and an environment that allows population growth.
- Barat* – Bahasa Indonesia meaning “west”.
- BKSDA – *Balai Konservasi Sumber Daya Alam*, the provincial offices of the PHKA (see below).
- By-catch – Here referring to species or specimens caught in a catch intended to target another species, as well as reproductively-immature juveniles of the target species.
- By-pack – Here referring to adding specimens of a non-target species to a shipment of a target species if there is still available space.
- Category I – One of three categories for species under Review of Significant Trade. A Category I species is considered a species of urgent concern and shall include species for which the available information indicates that the provisions of Article IV, paragraph 2 (a), 3 or 6 (a), are not being implemented.
- CITES – Convention on International Trade in Endangered Species of Wild Fauna and Flora.
- Commensal – Here referring to turtle species that are commensals of man, meaning turtles that inhabit anthropogenically disturbed habitats.
- Consumption trade – Here trade in the Southeast Asian Box Turtle for food.
- Direktorat Jenderal* – Indonesian term for Directorate General.
- DKP – *Departemen Kelautan Dan Perikanan*, the Indonesian Department of Marine Affairs and Fisheries.
- Export quota – Annual limit on the number or quantity of specimens of a particular species that may be exported from the country concerned within a 12-month period.
- F1 – First-generation offspring, the progeny produced in a controlled environment from parents at least one of which was conceived in or taken from the wild.
- F2 – Second-generation offspring, the progeny produced in a controlled environment from parents that were both also produced in a controlled environment.
- Femorals – Second to the last plates on the turtle plastron.
- Hatchling – A life history stage. Here for the Southeast Asian Box Turtle defined as the stage from hatching until the egg tooth is lost, which is usually 10-19 days after hatching.
- IATA – International Air Transport Association, which has created standards for the transport of live animals by air.

ID – Indonesia

Ikan – Bahasa Indonesia meaning “fish”.

Ind. – Individual.

Indonesian Box Turtle – English name of the subspecies *C. amboinensis couro* that occurs on Java and Sumatra. Here the term Indonesian Box Turtle will be used if the statement is only valid for the subspecies *C. amboinensis couro*.

Introduction from the sea – Transportation into a State of specimens of any species which were taken in the marine environment not under the jurisdiction of any State.

IPB – Bogor Agricultural University.

IRATA – Indonesian Reptile and Amphibian Trade Association. Members of this organisation are allowed to trade the Southeast Asian Box Turtle for the international pet trade only.

IUCN – The World Conservation Union.

Jabar – Java Barat (*Bahasa*), West Java.

Jateng – Java Tengah (*Bahasa*), Central Java.

Jl. = *Jalan* – Bahasa Indonesia meaning “street”.

Juvenile – The life history stage after hatchling and before subadult when external sexual dimorphism is not yet established.

Kabupaten – Bahasa Indonesia for “district”

Kalbar – Kalimantan Barat, West Kalimantan.

Kalsel – Kalimantan Selatan, South Kalimantan.

Kalteng – Kalimantan Tengah, Central Kalimantan.

Kaltim – Kalimantan Timur, East Kalimantan.

Karantina Hewan – Animal Quarantine.

Karantina Ikan – Fish Quarantine.

KKH – *Konservasi Keanekaragaman Hayati*, the division within the Department of Forestry that has, among other functions, the responsibility for operational implementation of Indonesia’s CITES Management Authority.

Kura Kura – Bahasa Indonesia, the general term for “hard-shelled turtles”.

Labi Labi – Bahasa Indonesia, the general Indonesian term for “softshell turtles”.

LAR – Live Animals Regulations for IATA.

LEMIS – Law Enforcement Management Information System

LIPI – *Lembaga Ilmu Pengetahuan Indonesia*, the Indonesian Institute of Sciences.

Location – If not otherwise indicated ‘location’ refers to the designated collection area within one province.

MA – CITES Management Authority. A national management body designated in accordance with Article IX of the Convention. The Management Authority is responsible for implementing the Convention in its country. In particular, it is the only body competent to grant import and export permits and re-export certificates on behalf of that CITES Member Party. Even though a Party may designate more than one Management Authority, one must be designated as the Management Authority responsible for coordinating the implementation of CITES with other Parties and the CITES Secretariat.

Malayan Box Turtle – English name of the subspecies *C. amboinensis kamaroma* that occurs on Borneo. In the following the term Malayan Box Turtle will be used if the statement is only valid for the subspecies *C. amboinensis kamaroma*.

MeCL – Median carapace length, measured in straight carapace length.

NDF – Non-detrimental or non-detriment finding. A conclusion by a CITES Scientific Authority that the export of specimens of a particular species will not negatively affect the survival of a species in the

- wild. The non-detriment finding by a Scientific Authority is a prerequisite for the issue of an export or import permit or a certificate for an introduction from the sea for a specimen of an Appendix-I species, and for an export permit or a certificate for an introduction from the sea for a specimen of an Appendix-II species.
- NGO – Non-government organisation.
- Normal distribution – In statistics a function that represents the probability or frequency distribution of many random variables as a symmetrical bell-shaped graph.
- Pet trade – Here referring to the trade of the Southeast Asian Box Turtle for the purpose of keeping it as pet.
- PHKA – *Perlindungan Hutan dan Konservasi Alam, Directorate General of Forest Protection and Nature Conservation* under the Ministry of Forestry of the Republic of Indonesia.
- Population – In accordance with CITES, the total number of individuals of a species.
- Precautionary Principle – A rule according to which pre-emptive conservation measures to avoid or minimize a threat to a population of a species may be taken even when there is a lack of full scientific certainty as to the threat.
- Protected species – Here referring to species that are protected under Indonesian law.
- Release – Here referring to the Chinese tradition of releasing one or several turtles to a temple or to the wild believing that this will bring long life to the person performing the action.
- Review of Significant Trade – A CITES-mandated process in cases, where export levels for Appendix II species are significant and/or considered to be of concern for conservation measures. Resolution Conf. 8.9 (Rev.) provides a mechanism whereby the CITES Animals or Plants Committee can review the situation and formulate recommendations to ensure that the export is not detrimental to the survival of wild populations of the species under review.
- SA – CITES Scientific Authority. A national scientific advisory body designated in accordance with Article IX of the Convention. A Scientific Authority is responsible for providing technical and scientific advice to its Management Authority, in particular as to whether the export or introduction from the sea of a specimen will be detrimental to the survival in the wild of the species involved. A Party may designate more than one Scientific Authority.
- SEA – Southeast Asia.
- Selatan* – Bahasa Indonesia meaning “south”.
- Southeast Asian Box Turtle – English name for the species *Cuora amboinensis* that comprises four subspecies. Here the term Southeast Asian Box Turtle will be used when referring to the species *C. amboinensis* in general.
- Subadult – A life history stage used to classify immature individuals, which are sometimes also referred to as large juveniles or late juvenile. Subadults already express external sexual dimorphism.
- Sulsel – Sulawesi Selatan (*Bahasa*), South Sulawesi.
- Sumatera – Indonesian spelling for the island of Sumatra.
- Sumsel – Sumatra Selatan (*Bahasa*), South Sumatra.
- Sumut – Sumatra Utara (*Bahasa*), North Sumatra.
- Sungai* – Bahasa Indonesia meaning “river”.
- TCM – Traditional Chinese Medicine; this is one of the major reasons for trading the Southeast Asian Box Turtle.
- Tengah* – Bahasa Indonesia meaning “central”.
- Testudines – A taxon, expressing the “order” of all extinct and extant turtles, terrapins and tortoises.
- Timur* – Bahasa Indonesia meaning “east”.
- TNRAW – *Taman Nasional Rawa Aopa Watomohai*, a national park in Southeast Sulawesi.

Tortoise – Term commonly used for terrestrial turtles not associated with wetland habitats.

TRAFFIC – The wildlife trade monitoring network, a joint program of WWF and IUCN.

Turtle – In this report applied to all Indonesian freshwater turtles and tortoises.

UN – United Nations.

USFWS – US Fish and Wildlife Service

UNEP – United Nations Environment Program.

Unprotected – Here referring to nationally unprotected species.

Utara – Bahasa Indonesia meaning “north”.

VES – Visual Encounter Survey, a method used to estimate densities of wild populations.

Wallacean Box Turtle – English name of the subspecies *C. amboinensis amboinensis* that occurs on Ambon, Buru, Batjan, Halmahera and Sulawesi. Here the term Wallacean Box Turtle will be used if the statement is only applicable to subspecies *C. amboinensis amboinensis*.

WCMC – World Conservation Monitoring Centre, now known as UNEP-WCMC.

WCS – Wildlife Conservation Society.

Wet market – Here referring to daily or weekly markets that sell fresh products such as fish, meat and vegetables.

Wild population – In accordance with CITES: the total number of free-living individuals of a species within its area of distribution.

WWF – The global conservation organisation, also known as World Wide Fund for Nature and World Wildlife Fund.

EXECUTIVE SUMMARY

The Southeast Asian Box Turtle *Cuora amboinensis* - one of 29 native freshwater turtles in Indonesia - is a globally vulnerable species and the survival of substantial populations in general is particularly threatened by the extensive international trade for consumption and Traditional Chinese Medicine (TCM) to East Asian countries. In order to control the trade, the species and its congeners were included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 2000. Prior to the export of Appendix II species from a country of origin, a so-called non-detriment finding (NDF) should be conducted to determine the number of individuals that can be harvested without a negative impact on the survival of wild populations. Such a finding should be the basis for any annual harvest and export quota of the species. An NDF however requires knowledge on socio-economic factors and of species' life history, distribution, population densities and threats.

Indonesia is the main supplier of *Cuora amboinensis* to the international meat, TCM and pet markets but no scientifically-based assessment has formed the basis for a NDF and the current national harvest quota of 20 000 individuals per year is based on the export realisation of previous years rather than on the results of comprehensive scientific surveys. Considering the above, TRAFFIC Southeast Asia identified the Southeast Asian Box Turtle as a heavily traded species to be used as a case study for science-based management, which could serve as a model for other CITES Appendix II species (particularly reptiles) in trade. The present study therefore aimed to review information on the biology and ecology of the Southeast Asian Box Turtle, assess the legislation in place to regulate trade in wildlife especially in freshwater turtles and tortoises, identify past and current harvest and trade levels, and determine whether the abundance of the species has changed over time.

The literature review revealed that the Southeast Asian Box Turtle plays an undefined but likely important role in food webs of wetland ecosystems, and serves as seed disperser. Therefore, its temporary or permanent removal from its natural habitats leads to an imbalance of the ecosystem structure, the significance and consequences of which currently cannot be determined. The species has a low and relatively slow growth. The Southeast Asian Box Turtle has a low reproductive rate: in captivity, it might reach maturity in four years and five months; in the wild it will take about 5½-6 years to attain maturity, and one female produces an average of only six eggs per year, three of which might reach juvenile stage.

The species is adaptable to man-made habitats which makes it very accessible for harvest. There are only very few if any properly protected areas in Indonesia, whose turtle populations could serve as assurance colonies. Despite being a commensal species, it is nowadays difficult to find a Southeast Asian Box Turtle in the wild near residential or agricultural areas in Indonesia. Its life cycle combined with continuous harvest for the food and TCM trade has led to over-exploitation of the Southeast Asian Box Turtle in Indonesia and to local extinction around trade centres.

The present study concentrated on harvest and trade centres in Java, Sulawesi, Sumatra and Kalimantan was conducted from March to July 2006 and indicated a decline in the mean size of the Southeast Asian Box Turtle as a result of long-term over-exploitation of adults. In Indonesia, local utilization of the species is negligible but international trade for consumption and TCM is extensive and represents the major threat to the survival of the species. Illegal trade is extensive and includes all levels and kinds of traders such as collectors, middlemen, suppliers and exporters of registered and unregistered companies. Also alarming is

the extent of plastrons and carapaces illegally traded, which mostly remain undetected due to easy concealment.

The population size of the species in two hectare of a peat swamp forest in a protected area, the Taman Nasional Rawa Aopa Watomohai in the south-east of the island of Sulawesi was estimated to be 120 individuals or 60 individual/ha. The population composition in terms of immature to mature ratio was almost 1:1 (54.9% immature and 45.1% mature). Harvest surveys of the species in an openly accessible area in East Kalimantan have shown that four middlemen alone easily assemble more than half of the nation's annual quota in one year. The composition of harvested individuals in the study site in Kota Bangun, East Kalimantan was significantly in favour of large adults (95.8%) and contained only 4.2% immature individuals.

Most of the Indonesian registered pet traders stated that nowadays it is more difficult to get a certain number of individuals compared to some 5-10 years ago. Generally, populations of the Southeast Asian Box Turtle near centres of trade are over-exploited and in many cases, even locally extinct.

The main ports of illegal exports are Jakarta, Banjarmasin, Makassar, Tembilahan, Medan and Pekanbaru. Major international destinations are Hong Kong SAR, mainland China, Singapore and Malaysia. Illegal export in the species is believed to far exceed the number of individuals that can be legally exported (18 000 individuals). The most conservative estimate is that illegal trade amounts to 10 times the volume of legal trade, but probably it is rather 100 times the volume of legal trade. A total trade ban is not expected to solve the problem of unsustainable harvest but illegal trade has to be eradicated to allow sustainable management of this and other wildlife species.

Tortoises and freshwater turtles including the Southeast Asian Box Turtle may only be exported live from Indonesia. The export of dead animals, parts (carapace or plastron) or derivatives is illegal under the Indonesian quota system. Some members of the CITES MA, especially at the provincial level are not aware of this. Export of dead specimens, parts and derivatives of the Southeast Asian Box Turtle from Indonesia has increased since the species became listed in Appendix II. This trend seems to apply also to other freshwater turtle species that recently became CITES-listed. Furthermore, increased control of live shipments has led to an increased volume of illegally traded shells. Many of the illegal shipments have forged CITES export permits. Enforcement officers are insufficiently trained and/or do not check CITES permits thoroughly. Illegal export of the Southeast Asian Box Turtle and other freshwater turtles from Indonesia is possible because many shipments are not inspected, many law enforcement officers do not know the conservation status of the different freshwater turtle species, and still cannot distinguish between the different species.

Indonesia has a substantive enough legislative framework in place to govern the management of wildlife harvest and trade, and it is comparatively stronger than that of many neighbouring countries. Unfortunately, the enforcement of these laws is very weak. None of the establishments that sold the Southeast Asian Box Turtle for local utilization obtained the specimens from licensed collectors nor were these outlets licensed to sell. The Indonesian CITES MA has a very detailed, complex and difficult licensing and permit system.

The quota setting in Indonesia is not science-based but driven by the demand from traders to supply importing countries especially those in East Asia where large volumes are consumed for food and traditional medicines. The distribution of the national quota among provinces is not related to local

abundance nor to sustainability of trade but to the presence of a trader. Locations for harvest or capture are not carefully selected based on biological and ecological assessments, but rather in accordance with the preferred collection sites of the trader.

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 weakness in law enforcement.

Results of this study have shown that the exploitation of the Southeast Asian Box Turtle in Indonesia has reached a level that requires immediate action. Harvest needs to be regulated and illegal trade to be eradicated. For the sustainable management of the species in Indonesia, TRAFFIC recommends the following:

- The Indonesian CITES MA should strictly monitor export volumes / quantities, and enforce the existing prohibition of the export of turtle shells and other derivatives.
- Quarantine, customs, police and PHKA personnel at air and seaports should make more efforts in inspecting shipments especially those with destinations in East Asian countries, and especially those declared ‘fish’, ‘seafood’, ‘snake skin or meat’, and ‘Red-eared-sliders’. Law enforcement agencies should consider giving incentives in the form of awards or leave credits to enforcement agents for seizures.
- Makassar, Medan, Pekanbaru, Tembilahan and Banjarmasin are the ports of exports with the highest frequency and the highest volumes of illegally traded Southeast Asian Box Turtle. Tembilahan and Banjarmasin are not even designated ports of export for CITES-listed species thus all export of such species from those ports is illegal. These ports and their shipments should receive special attention and be thoroughly and regularly inspected by BKSDA, police, customs, port authorities and quarantine officers.
- Instead of banning trade in the Southeast Asian Box Turtle, which would only negatively affect legal traders, activities should focus on eradicating illegal trade through stricter law enforcement on the Indonesian side, and thorough control of CITES documents and origin of specimens on side of the importing countries. The cooperation with the CITES MA in China needs to be intensified to lower and finally eradicate illegal trans-border trade. These kinds of focused activities would also have greater chances of success if formalised under the existing co-operation between China and the ASEAN Wildlife Enforcement Network (ASEAN-WEN).
- The Indonesian CITES MA should officially seek assistance from the CITES MA of Asian importing countries especially those of Hong Kong SAR, mainland China, Singapore and Malaysia. Indonesia should share details on ports of export, frequency of shipments, methods in concealing illegal shipment etc. with the other CITES authorities, police, customs and quarantine. As part of the ASEAN-WEN, Indonesia is encouraged to set up a multi-agency task force.
- The Indonesian CITES MA should revise and simplify its licensing and permit system. From capture to export there should be less permits involved, and those that are required should be thoroughly and regularly inspected and compared with the content of the shipment by the various law enforcement and customs agents. Particularly, the provincial quotas from across the country allocated to each individual pet trader are nonsense and should be rescinded.

- The Indonesia annual reports to the CITES Secretariat should reflect the actual number of exported specimens rather than the number for which permits were issued. This requires comparing permits issued at PHKA (CITES MA) with those used and filed at port of exits (BKSDS).
- Continual training of enforcement officers in species identification, conservation status of the different species and outline of CITES permits and legal loopholes in the management of CITES Appendix II listed species should be conducted through the efforts of interagency co-operation involving the CITES authorities, NGOs, the academe.
- Skills to enforce the laws should be strengthened on all levels of all concerned agencies (PHKA, BKSDA, DKP, fish and animal quarantine, Customs, airport and seaport cargo personnel, police). Lack of skills can easily be addressed through trainings, while the motivation and willingness to enforce needs encouragement from within the agencies concerned. Incentives in the form of awards, press-releases and leave credits should be considered as rewards for successful work of law enforcement officers.
- PHKA and DKP should work closely together in the management of CITES Appendix II-listed and look-alike species. Awareness campaigns should not only target officers of all agencies involved in trade (PHKA, BKSDA, quarantine, Customs, sea and airport cargo personnel etc.) but also the public, providing information about rules and regulations, trade procedure, responsibility of the various offices. As a basis for sustainable management of all traded wildlife species whether under PHKA or DKP, trade volumes should be recorded on the species level.
- The CITES Authorities should discourage captive breeding of the Southeast Asian Box Turtles and other freshwater turtles and tortoises with a similar low reproductive output for the large-scale consumption and TCM market.
- The establishment of assurance colonies should be considered by the Indonesian CITES Authorities. These could be established at governmental or private rescue centres, zoological gardens, or areas that are effectively protected from harvesting and other human impacts.
- The CITES SA should seek assistance from local universities in conducting field studies to assess population sizes and composition in man-made versus natural habitats. Such analyses are needed for the proper management of the species. The method of such surveys/field studies could follow the methodology used in the present study.
- In making non-detriment findings, the particular biology of tortoises and freshwater turtles should be taken into consideration. The harvesting of wild adults should be limited and precautionary because the removal of slow growing, mature animals may have significant impacts on the viability of the population that is targeted. Although it may generally be perceived as preferable to harvest small (juvenile) individuals, it was noted that unlike in tortoises, the offtake of juveniles in wild populations of freshwater turtles is relatively easy, that the removal of certain age classes may negatively impact wild populations, and that in practice, all age classes are often harvested. Also, juveniles do not necessarily or readily meet the demand for turtles and tortoises in the food and medicinal markets.
- 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 and monitored to enable sustainable trade.

- Indicators of change are (Schoppe, 2008a):
 1. If collection areas are getting increasingly further away from urban trade centres.
 2. If catch-per-unit-effort (CPUE) is decreasing.
 3. If threats other than trade are getting more severe.
 4. If the State/provincial/regional annual harvest quota is far from being realized.
 5. If harvest and export quotas are always realized (actual recorded volumes) to the maximum volume.
 6. If average size of individuals is reduced.
 7. If traded specimens are mainly adults.
 8. If the population structure of traded individuals is significantly in favour of one life history stage.
 9. If the sex ratio of any population is significantly different from 1:1 trends should be carefully monitored.

- In addition, potential indicators of illegal trade should be monitored:
 - If collection of the species is a fulltime business for collectors/trappers the probability that the demand for the species is higher than the national quota is relatively high.
 - 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 undercut market prices.

- 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.

- Monitoring results should provide the basis for the establishment of provincial and national harvest and export quotas.

INTRODUCTION

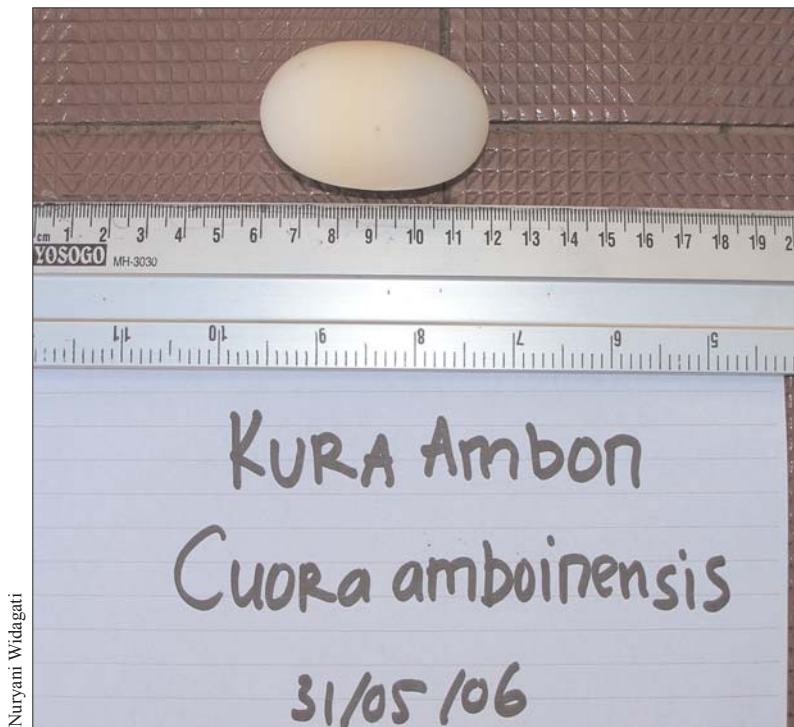
The study focused on the Southeast Asian Box Turtle *Cuora amboinensis* (Daudin, 1802) in the family Geoemydidae, subfamily Geoemydinae (Spinks *et al.*, 2004). In Indonesia, the Southeast Asian Box Turtle is one of 29 freshwater turtles and tortoises (Wibowo, 1999). The species occurs from the Nicobar Islands, Bangladesh (Khan, 1982), and Assam (Moll and Vijaya, 1986), south through Myanmar, Thailand, Cambodia, Viet Nam, and Malaysia, and east to Sulawesi, Ambon and the Philippines (Ernst *et al.*, 2000). It is the most common turtle in Peninsular Malaysia, Singapore and on the island of Borneo (Lim and Das, 1999). 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* 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. All except the latter occur in Indonesia (Figure 1).

The Wallacean Box Turtle is found on the islands of Ambon, Buru, Ceram, Batjan, Halmahera and Sulawesi (Gaulke and Fritz, 1998; Nietzke, 1998). The Malayan Box Turtle occurs in Kalimantan and the Indonesian Box Turtle is found on Java, Sumatra and their small offshore islands (Rummler and Fritz, 1991). According to Rummler and Fritz (1991), morphometric values such as the body ratios carapace length : body height and carapace width : body height distinguish the subspecies. There are also believed to be subtle colour differences in the pattern of head stripes, the carapace colour, the extent of plastron blotches, and the expression of vertebral and lateral / costal keels.

Aside from habitat loss, illegal trade and over-exploitation are the main threats for many freshwater turtles. The Southeast Asian Box Turtle *Cuora amboinensis* is globally red-listed as vulnerable (IUCN, 2007).

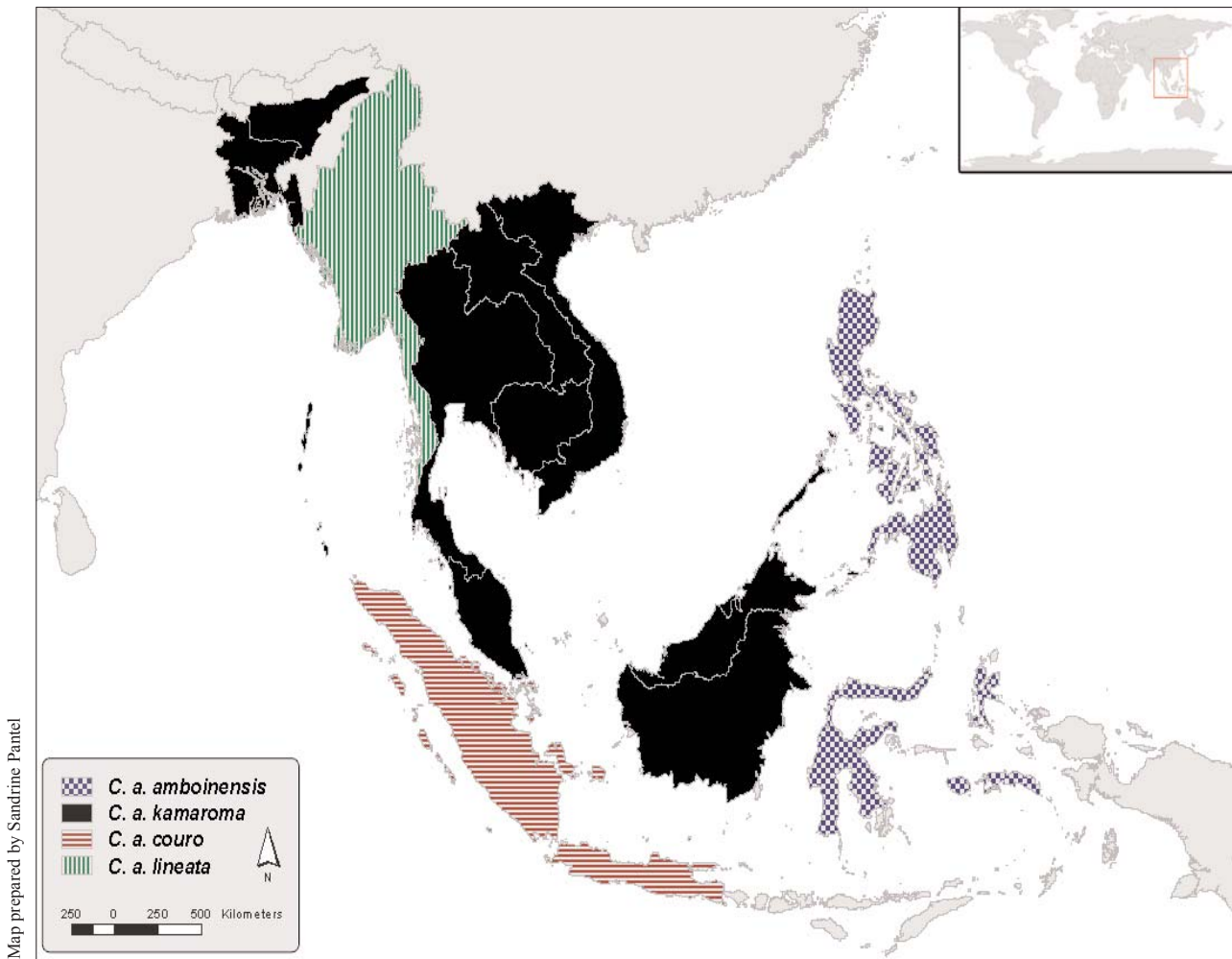
International trade for consumption as meat and Traditional Chinese Medicine (TCM) are the major threats which have been identified (van Dijk *et al.*, 2000; Ades *et al.*, 2000; Anon., 2002a; Cheung and Dudgeon, 2006; UNEP-WCMC CITES Trade Database, 2007) and it was feared that the species may become threatened with extinction unless trade is regulated. As a consequence, the species was included under Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 2000 (CITES, 2007).

Indonesia continues to be the main supplier of the species for the international meat, TCM and pet



An egg that was laid by a Southeast Asian Box Turtle while awaiting transport to foreign destination at a trader in South Sumatra

Figure 1:
Distribution of the three box turtle subspecies that occur in Indonesia



markets. Official records of legally exported specimens alone indicate an annual export of about 300 000 individuals in the 1990s (Jenkins, 1995; Lau *et al.*, 1995; Samedi and Iskandar, 2000; Anon., 2001b) and 20 000 annually after the CITES Appendix II listing (UNEP-WCMC CITES Trade Database, 2007).

These high exports are feared not to be sustainable as export quotas have been established without scientific evidence for sustainability but rather have been demand-oriented. In this case, Indonesia failed in its implementation of Article IV of CITES that requires a non-detriment finding (NDF) prior to the export of an Appendix II-listed species. Concern regarding quota setting and the implementation of Article IV in Indonesia has been repeatedly stated (e.g. Nash, 1993; Iskandar and Erdelen, 2006). Iskandar and Erdelen (2006) however acknowledge that the guideline of the Convention that export should not be detrimental to the survival of the species is not very helpful. This is because determining trade levels for a species that should not have short-term or long-term negative effects on natural populations is a very complex subject. The difficulty in collecting the relevant field data to estimate sustainability was shown by Erdelen (1998) in a study of three of the most heavily exploited reptiles in Indonesia (Water monitor *Varanus salvator*, Reticulated python *Python reticulatus*, and Blood python *Python curtus*); a finding that also applies to this study. The fact that high exploitative rates of some species do not necessary lead to

large-scale extinctions is partly a result of high reproductive rates of species such as the Water Monitor and the Reticulated Python (e.g. Shine *et al.* 1998a, 1998b). Local extinction might however be the destiny of species with low reproduction rate like the Southeast Asian Box Turtle. Hence, without profound knowledge of the species, its biology and ecology as well as on the legal and illegal trade levels, accurate quota setting is impossible.

Making a NDF is the designated responsibility of the CITES Scientific Authority in each exporting country as part of its advice to the CITES Management Authority (MA) on sustainable levels of harvest and export in CITES-listed species. Considering the complexity of a comprehensive NDF, the limited manpower, expertise and funding of the Indonesian CITES Scientific Authority (SA), and at the same time the vast number of Indonesian species that require an NDF, TRAFFIC Southeast Asia identified the Southeast Asian Box Turtle as a case study for science-based management. The case study could serve as a model for other CITES Appendix II species in trade, especially other Southeast Asian freshwater turtles and other reptiles with a similar life history.

In 2005, the 10 Member Countries of the Association of Southeast Asian Nations (ASEAN) agreed a Regional Action Plan on Trade in Wild Fauna and Flora 2005-2010 (Anon., 2005). The Regional Action Plan details five major objectives, including improved legislation, increased law enforcement co-operation, sharing of scientific information in order to improve management decision making, working with traders and the private sector, and creation of specialised task forces to address particular wildlife trade issues. Of particular relevance to this study is the role of Indonesia as designated “lead country” for Objectives 1, 4 and 5 of the Regional Action Plan:

Objective 1. To assist ASEAN Member Countries in adopting effective and enforceable legislation for CITES implementation by:

- encouraging all ASEAN countries to enact Category 1 CITES-implementing legislation in order to have the ability to meet evolving CITES requirements, and to address any policy loopholes that may be identified after enactment;
- incorporating in national legislation, where necessary, social and economic incentives to promote and regulate sustainable management as well as responsible trade of wild fauna and flora, and effective implementation and enforcement of CITES;
- promoting awareness programmes for the judiciary and other law enforcement agencies to enable adequate and timely responses to offences.

Objective 4. To encourage industry groups, trade associations/traders and local communities to comply with legality and sustainability requirements of CITES and national regulations on trade in wild fauna and flora, and to support research and capacity building on sustainable management of trade in wild fauna and flora by:

- increasing awareness of relevant industry groups about trade in wild fauna and flora and CITES;
- collaborating with industry groups as a source of information about aspects of trade in wild fauna and flora, *inter alia* harvest management, captive breeding/ranching, artificial propagation, and market demand; and - promoting the re-investment of revenue derived from trade in wild fauna and flora into conservation and associated research of species in trade.

Objective 5. To encourage greater regional cooperation on specific issues by:

- reviewing the current status of the relationship between CITES implementation and other biodiversity related conventions.
- establishing bilateral and multilateral taskforces to address shared concerns within ASEAN, related to the conservation and trade in particular species.

This study therefore aims to support Indonesia in its leadership role, and provide essential information towards the design and implementation of detailed NDF studies in order to set and manage annual quotas for harvest and trade thus ensuring legality and improving sustainability for CITES Appendix II exports. Indonesia's significance as a major exporting range State for *C. amboinensis* makes it an appropriate focus for a pilot study to develop a methodology for conducting a NDF (Schoppe, 2008a) based on research into the conservation status of the species relative to levels of trade. The present study aimed to accomplish the following objectives:

- To review information on the biology and ecology of the Southeast Asian Box Turtle;
- To assess the effectiveness and implementation of legislation pertaining to freshwater turtle conservation in Indonesia;
- To determine past and current trade levels and activities; and
- To assess the abundance of the species in the country.

METHODOLOGY

Fieldwork was conducted in Java, Sulawesi, Sumatra and Kalimantan (Annex 1). The total study period was from March to July 2006. All surveys were conducted in cooperation with local counterparts who assisted as guides and translators. Interviews were conducted in the local language. Local currency was converted into USD based on the mean exchange rate for the months of March to July 2006, whereas one USD = 9212.56 IDR.

Biology and ecology of the Southeast Asian Box Turtle

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 the present study and analysed. Information and references on general habitats and on protected areas with habitats for the species was compiled based on information from protected area management staff, relevant government institutions, NGOs, academics, references on protected areas, field surveys, and interviews. Almost nothing is known on the growth of the species; hence, most of the information presented here is based on studies of the author on the Southeast Asian Box Turtle from Palawan where growth of the local subspecies was monitored for a four-year period (Schoppe and Dolorosa, *in prep.*). Published morphological data were compared with values that were gathered during the present study. For the latter, specimens encountered in the wild and at traders were considered. A detailed description on how and what measurements were taken is provided in the chapter on trade surveys (see below).

Conservation status

The global conservation status of the species was assessed based on the latest Red List of Threatened Species published by the International Union for Conservation of Nature (IUCN, 2007) and the Convention on International Trade of Endangered Species of Wild Fauna and Flora, CITES (CITES, 2007). The national conservation status is based on the local legislation and on studies that provide information on abundance and trends.

Laws and regulations for the conservation of freshwater turtles in Indonesia

Information on management issues of CITES Appendix II-listed species was obtained from CITES online references (www.cites.org.com). 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 World 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.

Quantity and quality of trade of the Southeast Asian Box Turtle

Past trade levels

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. The trade review focuses on the time about 10 years before the inclusion of the Southeast Asian Box Turtle in Appendix II of CITES in 2000 through to 2006.

Trade surveys

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 are also included in the survey. A list of all exporters who are registered for the trade of the Southeast Asian Box Turtle was obtained from the Indonesian CITES MA. The ID CITES MA provided the researcher with a letter that endorsed the bearer to the exporters anticipating that some of them would not allow an researcher to enter the farm/warehouse. From the various provincial BKSDA offices, names of registered Southeast Asian Box Turtle suppliers were obtained. BKSDA officers also provided a list of dealers who were registered for other reptiles. Addresses of illegal reptile dealers were obtained by carefully interviewing collectors, pet shops staff, market vendors, registered traders or local residents. Specifically the following localities were surveyed in Java, Sulawesi, Sumatra and Kalimantan:

In Java, trade surveys were carried out at the holding facilities of pet traders in and around Jakarta, Bogor and Cibinong in March and April 2006 (Figure 2). Furthermore, the Barito Pet Market in Jakarta was visited on March 7 and on April 21, 2006. The Fancy Pets Centre, Blok M Plaza Lt. IV, Kebayoran Baru, Jakarta Selatan was visited thrice, once in March, once in April and once in June, 2006.

In South Sulawesi, traders were surveyed in the provincial capital Makassar (formerly Ujung Pandang), and in Masamba and Sengkang. In addition, the following aquarium shops and markets were visited in Makassar on May 11, 2006: a) Pasar Burung (Pasar Baru), Jl. Hasanuddin; b) Hobby Shop, Jl. Bn Buntu Terpedo 18 Ms.; c) Hoobie Aquarium, Jl. G. Lompobattang / Jl. Buntu Terpedo No. 30 (Baru); d) Fish Market, Jl. Hasanuddin; and e) Pasar Hobby.

In Sumatra, trade surveys were conducted in the provinces of North Sumatra, Riau, and South Sumatra (Figure 2). In 2006, the natural resources of North Sumatra were managed under two administrative districts: Sumatra Utara I (Sumut I) and Sumatra Utara II (Sumut II). In Sumut I trade surveys were conducted in Belawan, Medan, Binjai, and Tanjung Merawan, and in Sumut II in Indrapura, Tanjung Balai, and Rantauprapat. In Medan several pet/aquarium shops were visited. Along Jl. Thamrin are 10 aquarium shops and in the neighbouring street, Jl. Letjen MT Haryono, are five fish shops. A bird market that also sells other kind of wildlife is found in Jl. Bintang. In a small road parallel to Jl. Letjen Haryono are numerous stalls that sell mainly fighting fish. All of them were visited and observations recorded on 19 and 20 May 2006. In Riau, surveys were conducted in Pekanbaru, the Provincial capital. Here traders as well as several bird vendors, the bird market near Jl. Durian, and Pasar Bawa near Jl. Ir. H. Juanda and Jl. Sulaian were visited on June 5 and 6, 2006. Trade was further assessed

along the provincial highway throughout Kabupaten Pelalawan (e.g. Kerinci, Sorek, Ukui), and Kabupaten Indragiri Hulu (e.g. Lilik, Airmolek). In the south-eastern most Kabupaten, Indragiri Hilir trade surveys were conducted in the Kabupaten's capital Tembilahan. In South Sumatra, trade surveys were conducted in Palembang. Traders and a traditional wet market with an animal section at Pasar 16, Ilir were visited between 31 May to 2 June 2006.

In the Indonesian part of Borneo, trade surveys were conducted in Pontianak, the provincial capital of West Kalimantan; in Balikpapan in East Kalimantan, in Banjarmasin, the provincial capital of South Kalimantan and in the nearby town of Banjarbaru, and in Palangkaraya, the provincial capital of Central Kalimantan (Figure 2). Local utilization and trade were assessed at aquarium shops, pet shops and other potential reptile outlets in Banjarmasin and Pontianak. In Banjarmasin, six reptile vendors along Jl. Kapten P. Tendean were visited on June 30 and July 4, 2006, and several aquarium shops along Jl. H. Agus Salim, Jl. Diponegoro, Jl. Patimura, and Jl. A.R. Hakim were visited on 6 July 2006 in Pontianak.

Figure 2:
Study sites in Indonesia



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. Since traders often had high numbers of individuals, and some of the traders did not feel comfortable about the presence of researchers in their establishments, efforts were made to measure at least 10 individuals (5 female and 5 male) haphazardly selected, or if possible 10% of the stock. In some places where the species was illegally traded, measuring specimens was not carried out at all, if it was feared this might jeopardise the confidence of the trader. The researcher usually presented herself as a prospective buyer or an agent of a large exporter.

The following standard measurements were taken: median carapace length (MeCL), maximum carapace width (MaCW), median plastron length (MePL), plastron width 1 (PW1, at hinge), plastron width 2 (PW2, max. width at femorals), body height (BH), and body weight (Wt). Size and mass measurements were taken with callipers and kitchen scales, respectively. Notes were taken on the sex. Small individuals in which external sexual dimorphism had not yet established were categorized as juveniles. Furthermore, the body ratios MeCL/BH and MaCW/BH were calculated. These ratios are critical for the identification of the three Indonesian taxa. The body ratios were compared with ANOVA with the known ranges and means of the three subspecies as provided by Rummeler and Fritz (1991).

In addition, where possible, the pet exporters or their company managers were interviewed following a semi-structured questionnaire format (Box 1).

Box 1:

Guide questions designed to compile information on trade of the Southeast Asian Box Turtle from pet traders

1. What is your purchase price for the Southeast Asian Box Turtle?
2. What is your selling price for the Southeast Asian Box Turtle?
3. Does the Southeast Asian Box Turtle have a high commercial value in the pet trade?
4. What sizes do you buy?
5. Do you buy all sexes of the Southeast Asian Box Turtle?
6. From which Province do you get most the Southeast Asian Box Turtle?
7. Do you get the Southeast Asian Box Turtle from Kalimantan and Sulawesi?
8. Is it more difficult to get a certain number of the Southeast Asian Box Turtle now than 5/10 years ago?
9. Do you breed the Southeast Asian Box Turtle?
10. What are the (main) destination countries?
11. What port of export do you use?
12. What airlines do you normally use?
13. What is the size/amount of a usual shipment of the Southeast Asian Box Turtle?
14. What is the mortality rate?

Alternative production systems

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 PHKA and BKSDA offices. The likelihood of viable captive breeding for the Southeast Asian Box Turtle is discussed primarily on the basis of economical feasibility.

Population studies and abundance

Population survey

A survey of a wild population in a natural habitat was conducted in the National Park “Taman Nasional Rawa Aopa Watomohai” (TNRAW), Tinanggea, which is about 130 km southwest of Kendari, the provincial capital of Southeast Sulawesi from April 29 to June 10, 2006. The TNRAW (04°00’-04°36’S and 121°46’-122°09’E) covers submontane rain forest, mangrove forest, coastal forest, savannah, and

freshwater swamp forest ecosystems (Sriyanto *et al.*, 2003). The park was declared protected in 1989 and comprises a total of 96 804 ha at an altitude between 0-981 m with an annual rainfall of 1500-2000 mm. A peat swamp area in Lanuwulu, Tinangea near the office of the park management (04°27.677'S and 122°07.531'E) was selected for the survey (Figure 3).

Figure 3:
Map of the National Park Rawa Aopa Watomohai (TNRAW) in Southeast Sulawesi



The study area covered approximately 2 ha of that wetland area. The area fits the definition of a typical peat swamp forest with closed canopy. Most of the area is submerged by water of about 20-50 cm depth; some parts are even deeper, while others are only moist but not submerged. The following plants dominate the vegetation: Freshwater mangrove *Barringtonia racemosa*, Buri palm *Corypha utan*, Bamboo *Bambusa utan*, Rattan *Calamus* spp., Mangrove fern *Acrostichum aureum*. Among the aquatic macro fauna, the following were frequently encountered: Snakehead *Channa striata*, Climbing perch *Anabas testudineus*, Gouramis *Trichogaster* sp., Crab-eating frog *Fejervarya cancrivora* (Figure 4), Celebes or Sulawesi Toad *Bufo celebensis* (Figure 4), Apple snail *Pila ampullacea*, water striders, Fishing spider *Dolomedes* sp. Major terrestrial faunal elements encountered were Buton Macaque *Macaca ochreata*, fruitbats, Sulawesi Pig *Sus celebensis* cf. (trace), kingfishers, parrots, Green Imperial Pigeon *Ducula aenea*

cf., *Rhytecoros cassidex*, nightjars, Water Monitor *Varanus salvator*, Tokay Gecko *Gecko gecko*, Rough Mabuya *Eutropis rudis* (Figure 4), Reed Snake *Calamaria* sp. (Figure 4), Dusky Mock Viper *Psammodynastes pulverulentus pulverulentus*, Wagler's Pit-viper *Tropidolaemus wagleri*, Dog-faced Water Snake *Cerberus rynchops rynchops* and a Worm Snake *Typlops* sp.

Figure 4:
Herpetofauna found in the same ecosystem as the Southeast Asian Box Turtle: a). Crab-eating frog (02.05.06), b). Sulawesi Toad (03.05.06), c). Reed Snake (01.05.06), d). Rough Mabuya (04.05.06)



All photos by Sabine Schoppe/TRAFFIC Southeast Asia

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). A closed population does not change in size during the study period: that is, the effect of births, deaths, and movements are negligible. Thus, populations are typically closed over only a short period of time and this method is applicable for the proposed study. The method makes the following assumptions: the population size is constant without recruitment or losses, sampling is random, and all individuals have an equal chance of capture in any given sample. The major advantage of the multiple sampling in a Schnabel experiment is that it is easier to pick up violations of these assumptions. The assumption of dealing with a constant population size is justifiable considering that the study was conducted over a short period of time.

In the peat swamp forest in the TNRAW, mark-recapture survey was conducted daily for six consecutive weeks (Figure 5). Animals were collected using three methods: a) Visual Encounter Surveys (VES) around 5:30-9:00 am and 6:00-10:00 pm, b) pitfall traps checked during time of VES (Figure 6), and c) funnel traps checked during time of VES (Figure 7). VES were conducted in the entire study area. Pit fall traps were set at the southern margin of the study area since all other areas were too wet for this method. The funnel traps were baited with bananas and/or shrimps and set in water bodies. The type of funnel trap used in this study is locally used for trapping marine or estuarine crabs. A total of 10 funnel traps were distributed at localities that were deep enough for their establishment, such as pool or creek areas. All Wallacean Box Turtles encountered with either of the methods were marked by notching the marginal scutes of the carapace (Figure 8). The coding scheme for marking the turtles was modified from Sajwaj *et al.* (1998).



Figure 5: Part of study area in the peat swamp forest in TNRAW, Southeast Sulawesi (30.04.06)



Figure 6: Example for a site where pit fall traps were established (03.05.06)



Figure 7: Funnel traps used in Sulawesi (25.05.06)

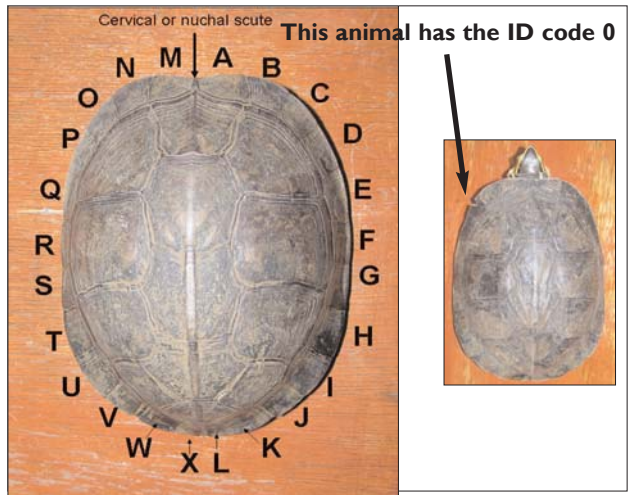


Figure 8: Notching system used to mark individual turtles

All photos by Sabine Schoppe/TRAFFIC Southeast Asia

For each individual, standard measurements were taken (see above). In addition, all individuals were weighed, and sexed or categorized as juveniles.

After measurements were taken, animals were released to the place of capture. Since it is unlikely that the whole population can be counted, a statistical method was used to estimate population size and density (Blomberg and Shine, 1996). Once the entire survey was finished the population size was estimated after Schumacher and Eschmeyer based on the compiled field records (Krebs, 1998):

$$N = \frac{\sum_{t=1}^s (C_t \times M_t^2)}{\sum_{t=1}^s (R_t \times M_t)}$$

The variance of the Schumacher estimate is obtained from linear regression theory as the variance of the slope of the regression. In terms of mark-recapture data,

$$\text{Variance } \frac{1}{N} = \frac{\sum (R_t^2 / C_t) - (\sum R_t \times M_t)^2 / \sum (C_t \times M_t^2)}{s - 2}$$

The standard error of the slope of the regression is obtained as follows:

$$\text{Standard error } \frac{1}{N} = \sqrt{\frac{\text{Variance } (1/N)}{\sum (C_t \times M_t^2)}}$$

Whereas:

C_t = total number of individuals caught in sample t

R_t = number of individuals already marked when caught in sample t

M_t = number of marked individuals in the population just before the sample t is taken

s = total number of samples

The mean size and standard deviation of adult males, adult females, and juveniles was computed based on the measurements of all individuals in each respective life history group. Morphometrics of male and female individuals were compared with One-way ANOVA for significant differences. The relative composition of the population in terms of the numbers of adult females, adult males and juveniles was also calculated and so was the sex ratio for adult individuals. The size frequency distribution of all individuals is illustrated in histograms using 10 mm intervals.

Harvest survey

The pre-selected site in Riau that was supposed to serve as a representative for an open accessible population of the Southeast Asian Box Turtle was not surveyed due to logistical and technical problems. As a replacement, a wetland area in Kota Bangun, west of Samarinda, East Kalimantan was picked based on known exploitation in the area. The area is located in the wetlands of Kutai Kartanegara between Muara Kelang in the south, Muara Pahu in the west, Kambangjanggut in the north and Kota Bangun in the east (116°E and 117°E and 00°50N and 00°50S) at approximately 100 km west of Samarinda the Provincial capital (Figure 9).

Figure 9:

Map of Eastern Kalimantan showing survey sites around Kota Bangun



The entire wetland encompasses about 320 000 ha at 20-60 m a.s.l. and comprises three major lakes, Danau Semayang (8937 ha), Danau Melintang (7063 ha) and Danau Jempang (10 875 ha), numerous small lakes, temporarily flooded grasslands and forests. Part of the area had been declared *important wetlands* by the ASEAN Regional Centre for Biodiversity Conservation, now known as the ASEAN Centre for Biodiversity. These important wetlands comprise the Muara Kaman Nature Reserve (0°25'N-0°07'S and 116°37'-116°48'E) and the proposed Perairan Sungai Mahakam Nature Reserve (0°07'N-0°29'S and 116°03'-116°52'E) (ARCBC, 2006). Dominant or principal vegetation is that of peat and freshwater swamp forests including Ramin *Gonystylus bancanus*. The exotic Water Hyacinth *Eichhornia crassipes* is a common aquatic weed in still waters. The area is a renowned collection area for snakes (Reticulated Python, Elephant's Trunk Snake *Acrochordus javanicus*) Water Monitors and freshwater turtles (especially the Malayan Giant Turtle *Orlitia borneensis*, the Southeast Asian Box Turtle, the Asian Leaf Turtle, Asian Softshell Turtle). About six years ago, 80-100% of the human population in Kota Bangun was engaged in turtle/reptile trade (Pak Amir, boatman at Lake Semayang, *pers. comm.* to the researcher, 23 June 2006). At that time, demand was so high and collectors and collections so numerous that companies from Banjarmasin, Lampung and Riau had "offices" in Kota Bangun.

Visual inspection of the area soon revealed that the physical conditions do not allow a mark-recapture survey (Figure 10). The assumptions for a mark recapture survey of a closed population were not met. Hence, the survey was delimited to quantifying the catch at premises of four middlemen in the area. The results do not allow an estimate of the population size but rather provide an indication of the abundance and catchability of the species.



Figure 10: Part of the survey area in the wetlands of Kota Bangun, East Kalimantan (21.06.06)

In East Kalimantan, the dry season usually initiates in May and extends to September, and the wet season typically ranges from October to April. According to local turtle collectors, the Malayan Box Turtle is best collected during the dry and peak wet season. Collection activities for the Malayan Box Turtle usually peak around January to May (Haji Uji and Haji Ijay, reptile middlemen in Kedang Murung, *pers. comm.* to the researcher, 21 June 2006). At the end of the wet season, the area is characterized by medium water levels and foul-smelling waters that are bad for the collection of turtles. With the seasons, the physical appearance of the area undergoes changes and therewith the Malayan Box Turtle occupies different habitats during the wet and dry season. At the peak of the dry season, handpicking is a common collection practice and during the peak wet season rattan or metal funnel traps are used. In 2006, the wet season extended further than usually, still bringing frequent rain in June. The time of the survey (24 June to 5 Aug. 2006) was therefore considered a lean collection period. The area is large, openly accessible, and without physical boundaries.

There were four local turtle dealers in the area. They all supplied the only turtle exporter in Eastern Kalimantan whose company is in Balikpapan. The area in which the four middlemen and their collectors operated comprises about one third or approximately 106 700 ha of the total wetland area. Middleman ‘A’ from Kedang Murung, Kota Bangun is supplied by 15 collectors who together cover 15 river systems (Annex 2). A second middleman (B) in Kota Bangun who resides in Liang Ilir is supplied by a total of seven collectors from around Muara Kaman, Kahala, Sabintulung and Tubuhan. Two other middlemen (C and D) who reside in Muara Muntai at about 25 km by boat from Kota Bangun only get turtles from places

near their residences. The residence of “A” (S 00°16.937” and E 116°35.720”) was the home and research station of the researcher for the duration of the study.

The Malayan Box Turtles encountered at these 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 (see above). A size frequency histogram was prepared for all measured individuals. The middlemen A and B were easily accessible for the researcher and hence checked on a daily basis. The other two middlemen (C and D) were visited only once on 19 July 2006. The collectors of these four middlemen mainly used funnel traps for catching the turtles. Visual encounter surveys when individuals are handpicked were rather rare during the time of the survey. Most used funnel traps made of rattan (Figure 11) but metal funnel traps are also commonly used (Figure 12).

Sabine Schoppe/TRAFFIC Southeast Asia



Figure 11: Rattan funnel trap are most commonly used to trap the Malayan Box Turtle in Kota Bangun area

Sabine Schoppe/TRAFFIC Southeast Asia



Figure 12: Metal funnel traps are a ‘modern’ alternative to the rattan traps (21.06.06)

Harvest impact surveys

The harvest impact on the Southeast Asian Box Turtle was assessed in selected sites in South Sulawesi, Sumatra and Kalimantan (Annex 1). 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.

In South Sulawesi, harvest impact surveys were conducted from the provincial capital Makassar (formerly Ujung Pandang) in the south along the west coast to Barru, Pare Pare, Makale, Palopo, to Masamba in the north (431 km north of Makassar) and back south via Sengkang, Watansoppeng, and Maros.

In Sumatra, harvest impact interview surveys were conducted along the provincial highway throughout Kabupaten Pelalawan (e.g. Kerinci, Sorek, Ukui), and Kabupaten Indragiri Hulu (e.g. Lilik, Airmolek). In the south-eastern most Kabupaten, Indragiri Hilir harvest surveys were conducted in and around Belantarya. Belantarya lies along River Gaung and can only be reached by boat in about 2.5 hours from Tembilahan. Tembilahan is four hours away from Batam by speedboat. From Batam, Singapore can be reached in 40 minutes. Ships travel in about 14 hours from Tembilahan to Singapore. Both Batam and Singapore have international sea- and airports.

RESULTS AND DISCUSSION

Habitat

The present study identified various natural and man-made habitats of the species in lowland areas in Indonesia. Among natural habitats, the researcher found the species in swamp and peat swamp forests, marshes, permanent or temporary wetlands, and shallow lakes. The species was observed in man-made habitats such as 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. In addition, the species was found foraging at dumpsites of houses in rural areas during the night. These findings agree with previous research on Indonesian freshwater turtle species. Samedi and Iskandar (2000) outlined the importance of wetlands to the Indonesian populations of the Southeast Asian Box Turtle and to other freshwater turtle and tortoise species. Ernst *et al.* (2000) and Lim and Das (1999) mentioned lowland water bodies with soft bottoms and slow currents, such as marshes, swamps, ponds, pools in streams, and also man-made flooded rice paddies, plantations such as those of oil palm, rubber, and orchards as habitats. Due to its ability to cope with environments altered by man better than most turtle species, Moll (1997) accurately described the species as a generalist. Nevertheless, loss and degradation of natural habitats impose environmental pressures on the species (Jenkins, 1995). The United Nations (1997) estimated the total area of degraded, denuded and wasteland in Indonesia at 30 million hectares, two thirds of it in Java. Natural habitats of the species have also decreased as a result of extensive human re-settlement programs in Indonesia (Anon., 1999c). About 61% of the Javanese human population was moved to Sumatra (Collins, 1990), which contributes large portions of the range of the Indonesian Box Turtle (Gaulke and Fritz, 1998). Java's populations of this subspecies, on the other hand, are assumed to be affected by the conversion of rice fields into non-agricultural land.

The World Bank estimated that by 2010, roughly 13% of Java's 3.4 million hectares of rice fields may be converted into non-agricultural land (United Nations, 1997). The effects of Indonesia's human resettlement programs has also extended to Sulawesi's subspecies. According to Manzke (1993) and Rummler and Fritz (1991), the Malayan Box Turtle has a more terrestrial lifestyle than the other subspecies. This subspecies is therefore more likely to be affected by the heavy forest fires in Borneo. Although there seems to be no study that looked into the effects of swampland fires on local reptile populations in Sumatra, it is evident that the species' range of natural habitats in Sumatra has been greatly reduced. Sumatra's wetlands cover 11 million hectares, equivalent to 23% of the total land surface (Anderson and Bowen, 2000). The four largest swamplands are found in the Sumatran provinces of Riau (4756 600 ha), South Sumatra (3159 700 ha), Jambi (976 100 ha) and North Sumatra (951 800 ha) (RePPPProT, 1988). Two million hectares of the total area were deliberately cleared by fire between

1985/1990 and 2000 (Anderson and Bowen, 2000). Reduction of swampland still continues. Cleared areas are planted with agricultural crops, mainly oil palm (Anderson and Bowen, 2000).

One might argue that oil palm plantations constitute a new man-made habitat for the Southeast Asian Box Turtle. It cannot be denied that the species can readily adapt to oil palm plantations, if the species' requirements for aquatic sources is accomplished. The major disadvantage of man-made versus natural habitats for the species is that individuals become much more accessible and easier to collect. Plantation workers, for example, collect the animals during their daily work. Hence, the adaptation of the species to human agricultural practices, once an advantage to the species' survival, now leads to a faster and more effective exploitation. This had been previously assumed by Gavino and Schoppe (2004) for the Palawan subspecies inhabiting man-made rice field habitats.

Pollution of waterways was identified by Lim and Das (1999) as another threat to the Southeast Asian Box Turtle and its habitats. In fact, pesticide use in agricultural lands such as rice fields and oil palm plantations was claimed to be one of the reasons of population reductions suggested by farmers and plantation workers in Sulawesi, Sumatra and Kalimantan. For example, in Malaysia, farmers hope to regulate or reduce plantation damage caused by wild pigs through poisoned baits. These baits also caused fatalities among Southeast Asian Box Turtles (Schoppe, *unpubl. data*). It remains unknown whether such practice is also carried out in some parts of Indonesia. Furthermore, there are no quantitative data on pollution and its impact on the species. If pollution constitutes a serious problem for the species, some of the man-made habitats that are provided through rice paddies and oil palm plantations are likely to be deadly traps for the species.

Box 2:

Protected areas may not necessarily constitute a safe habitat for assurance colonies.

Samedi and Iskandar (2000) noted that Wetlands International Indonesia had identified 24 out of 272 important Indonesian wetlands as especially important for 15 species of freshwater turtles including the Southeast Asian Box Turtle. However, being identified as important or declared as being protected does not guarantee that a natural resource is properly managed and conserved. The United Nations (1997) stressed that although Indonesia had 368 units of established protected areas in 1995, these did not assure biodiversity conservation because most of them had inadequate human resources for management and regulation of enforcement. It is expected that the situation remains similar today, and that the higher number of protected areas – as of 2003, Indonesia had 407 protected areas covering 23.1 million ha (Sriyanto *et al.*, 2003) – does not imply better protection. Park personal of the Taman Nasional Rawa Aupa Watomohai (TNRAW) in Sulawesi for example expressed concern that a lack of staff and vehicles hinders proper patrolling and prevention of illegal activities in the park (Puto Sutarya, park ranger, Aopa, TNRAW, *pers. comm.* to the researcher, 27 April 2006). Park rangers of TNRAW identified slash-and-burn farming practices, illegal logging, and hunting of wildlife as the major threats to the natural resources of the national park (Puto Sutarya, park ranger, Aopa, TNRAW, *pers. comm.* to the researcher, 27 April 2006). Berbak National Park in Jambi, Sumatra is described by Sriyanto *et al.* (2003) as the largest unexploited swamp forest in Southeast Asia and home among others to threatened freshwater turtles. Anderson and Bowen (2000) identified the Batanghari River wetland adjacent to Berbak National Park as one of seven major so-called fire zones that are under the pressure of continued fire clearings. Berbak National Park suffered fire damage in 1997 and is now under increasing threat from fire.

Role in the ecosystem

Little is known about the long-term or large-scale consequences of the loss of reptiles from freshwater ecosystems (Cheung and Dudgeon, 2006). Turtles play a role in their ecosystem's food chain both as predators of various invertebrates, and as prey species. 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). Although information on the scale of predation on eggs and hatchlings is not available for any Asian freshwater turtle, egg and hatchling survival of North American aquatic turtles is reported to be low with mortality mainly caused by predation. The common and widely distributed North American Painted Turtle *Chrysemys picta* and the Southeast Asian Box Turtle have some similarities in life history such as size, sex ratio and age at maturity. For the Painted Turtle 92% mortality was recorded between egg laying and arrival of hatchlings at pond (Wilbur, 1975). A later study on the same species estimated 54% mortality, mainly due to predation (Mitchell, 1988).

In the wild, the Southeast Asian Box Turtle has an omnivorous but primarily vegetarian diet (Rogner, 1996), but shows preference for a carnivorous diet in captivity (Schoppe, *unpubl. data*). The species forages on aquatic plants, aquatic insects, molluscs, and crustaceans in the water and on plants, fungi, and worms on land (Lim and Das, 1999). Because of its consumption of worms and molluscs, some of which might act as intermediate hosts for various human diseases, this species may help to stem invertebrate-borne diseases (van Dijk, 2000). In determining the importance of Southeast Asian Box Turtle as a seed disperser, it was noted that fruits of 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.* to the researcher, 18 Aug. 2006). Significant ecological impacts of the loss of turtles might include changes in energy flow, nutrient cycling and food-web structure, and heavily exploited species could be reduced to a level at which they become functionally extinct well before extirpation has taken place (Cheung and Dudgeon, 2006). Unfortunately, ecological studies of most Asian herpetofauna are extremely limited and, in this regard, Asian turtles have been described as 'truly forgotten and ignored creatures' (Thirakhupt and van Dijk, 1994; see also Moll and Moll, 2004).

Morphology

Within the course of this study, 1031 Southeast Asian Box Turtles composed of 91 Wallacean Box Turtles (Figure 13), 200 Indonesian Box Turtles (Figure 14), 740 Malayan Box Turtles (Figure 15), were measured and weighed. Among these three individuals had lacking data and were not included in the size analysis while size and weight of the remainder was compared among subspecies (Table 1).

The largest individual, a Malayan Box Turtle measured 215 mm in median carapace length (MeCL) and weighed 1300 g, followed by an Indonesian Box Turtle with 214 mm and a weight of 1520 g, and a Wallacean Box Turtle with 200 mm MeCL and 920 g Wt (Table 1). Male and female Malayan Box Turtles differed significantly in mean MeCL from the other two subspecies. It is assumed that results are representative for the subspecies and that the Malayan Box Turtles in fact is the largest of the three subspecies that occur in Indonesia. The largest Indonesian Box Turtle encountered by Rummeler and Fritz (1991) measured 217.5 mm and a MeCL of 230 mm is the maximum record for the Burmese Box Turtle (*C. amboinensis lineata*) from Myanmar (McCord and Philippen, 1998). Lim and Das (1999) stated that



Figure 13: The Wallacean Box Turtle *Cuora amboinensis amboinensis*



Figure 14: The Indonesian Box Turtle *Cuora amboinensis coura*



Figure 15: The Malayan Box Turtle *Cuora amboinensis kamaroma*

All pictures by Sabine Schoppe/TRAFFIC Southeast Asia

the Malayan subspecies can reach 250 mm. This supports the assumption that the Malayan Box Turtle is the largest of all subspecies. In accordance with larger MeCL, male and female Malayan Box Turtles also differ significantly in mean body weight (Wt) from the other two subspecies (Table 1). The maximum weight of 1650 g at a MeCL of 199 mm for a female and 1950 g at a MeCL of 172 mm for a male Malayan Box Turtle, respectively constitute the known weight record for the Southeast Asian Box Turtle. Published records on the same taxon indicate a maximum body mass of 1500 g (Lim and Das, 1999). Apparently, size and weight in combination with geographic distribution and abundance makes the Malayan Box Turtle the most favoured and most common species on the Chinese food markets. This is supported by statements of traders who assured that the Malayan Box Turtle is the preferred subspecies in the consumption trade because of its larger size and higher meat quality (Lim Hau Tiong, Medan, *pers. comm.* to the researcher, 20 May 2006, and Pak Ian, Virensa Anugrah, Medan, 25 May 2006). Females of all three subspecies are usually larger and heavier than males of the same subspecies (Table 1). This makes females more attractive for traders since payment is by body mass and not by individual.

Few studies have previously examined size classes of traded Southeast Asian Box Turtles. Accordingly, comparative data are negligible. Moll had measured Malayan Box Turtles between 1975 and 1989 (Edward O.

Moll., Professor Emeritus of Zoology at Eastern Illinois University, *in litt.* to the researcher, 12 January 2007, and 7 June 2007). The male individuals had a mean MeCL of 181.8 mm (n=17), and the females averaged 179.9 mm (n=21). Moll's females and males were 5.9 mm and 5.4 mm larger than the mean of those measured during the course of this study (Table 1). This might indicate that traded individuals declined in mean size over the years but comparative data are too few for a reliable analysis and final conclusion. A decline in size was noted though for the Malayan Giant Turtle and the Elongated Tortoise *Indotestudo elongata* at markets in South China (Lee *et al.*, 2004), for the Elongated Tortoise in western Thailand (Thirakhupt and van Dijk, 1994), for the Red-eared Slider *Trachemys scripta elegans* in

Table 1:

Recorded mean \pm standard deviation (SD) and range body sizes and weights of the three Southeast Asian Box Turtle subspecies distributed in Indonesia.

	Wallacean Box Turtle <i>C.a. amboinensis</i> (n=91)	Indonesian Box Turtle <i>C.a. couro</i> (n=200)	Malayan Box Turtle <i>C.a.</i> <i>kamaroma</i> (n=740)
No. female	35	56	320
MeCL (mm)	158.7 \pm 23.8	158.2 \pm 27.2	174.0 \pm 18.2
	(118.0-200.0) ^a	(114.0-214.0) ^a	(112.0-215.0) ^b
MaCW (mm)	122.1 \pm 12.2	122.6 \pm 15.2	131.7 \pm 11.8
	(95.5-142.0) ^a	(96.3-161.0) ^a	(91.0-159.0) ^b
BH (mm)	65.0 \pm 11.0	73.2 \pm 10.7	85.4 \pm 9.7
	(42.0-82.0) ^a	(53.0-99.0) ^b	(54.0-112.0) ^c
Wt (g)	636.7 \pm 254.3	740.5 \pm 336.9	1007.8 \pm 282.6
	(200-1080) ^a	(260-1520) ^a	(250-1650) ^b
No. male	35	57	337
MeCL (mm)	153.5 \pm 19.2	167.5 \pm 29.4	177.0 \pm 21.1
	(110.5-177.0) ^a	(109.9-213.0) ^b	(107.0-210.0) ^c
MaCW (mm)	116.0 \pm 12.7	125.2 \pm 14.5	128.3 \pm 11.8
	(97.0-158.5) ^a	(89.2-147.0) ^b	(77.0-168.0) ^b
BH (mm)	57.0 \pm 5.2	70.5 \pm 9.5	77.3 \pm 7.5
	(46.0-70.0) ^a	(49.0-87.0) ^b	(49.0-98.0) ^c
Wt (g)	506.1 \pm 162.3	760.9 \pm 294.9	925.4 \pm 263.4
	(220-840) ^a	(140-1300) ^b	(150-1950) ^c
No. juvenile	18	87	82
MeCL (mm)	67.6 \pm 16.9	96.7 \pm 13.4	100.0 \pm 14.1
	(51.5.0-110.0) ^a	(55.6-126.8) ^b	(66.3-119.0) ^b
MaCW (mm)	62.6 \pm 15.8	83.0 \pm 10.8	83.3 \pm 10.4
	(48.6-109.0) ^a	(49.6-105.4) ^b	(58.7-96.0) ^b
BH (mm)	27.2 \pm 7.0	44.8 \pm 6.6	48.0 \pm 7.6
	(22.0-44.0) ^a	(24.8-65.0) ^b	(28.9-60.0) ^c
Wt (g)	57.5 \pm 57.3	160.0 \pm 62.1	178.8 \pm 72.2
	(20-220) ^a	(28-340) ^b	(35-310) ^b
No. of individuals not included	3	0	1

MeCL = median carapace length, MaCW = maximum carapace width, BH = body height, Wt = body weight.

North America (Close and Seigel, 1997), and the Slider *T. callirostris* in Colombia (Bernal *et al.*, 2004; Vivian P. Paez, University of Antioquia, *in litt.* to the researcher, 12 January 2007). Thirakhupt and van

Dijk (1994) interpret the smaller mean size of traded Elongated Tortoises compared to those of individuals in protected areas as being caused by long-term removal of adults. The same trend is noticeable but not yet supported with data of the Asian Softshell Turtle traded in Thailand (Peter Paul van Dijk, Conservation International, *in litt.* to the researcher, 11 January 2007). This present research concurs with van Dijk in that a decrease in mean size of turtles in trade is probably the result of ongoing long-term exploitation at modest intensity, in contrast to intensive exploitation of a previously undisturbed population.

Growth and reproduction

There are very few published studies on the growth rate and size at maturity of the Southeast Asian Box Turtle. Most are from hobby breeders rather than scientists (e.g. Inskoop, 1984; Praedicow, 1985; Grychta, 1988; Danko, 1993; Saxena, 1994; Beil, 2005). Among these, only Praedicow (1985) provided some growth data for the first six months after hatching. His two hatchlings increased by a mean of 0.19 mm per day. Studies on captive Southeast Asian Box Turtles from Palawan revealed a similar growth rate of 0.24 mm/day (Schoppe and Dolorosa, *in prep.*). Two individuals raised from hatchling took between 14 and 16 or a mean of 15 months to grow to a median carapace length (MeCL) of ≥ 115 mm and therewith reached subadult hood (Schoppe and Dolorosa, *in prep.*). A mean growth rate of 0.06 mm/day for subadult animals until 24 months of age and a mean growth rate of 0.038 mm/day for adults was calculated, implying that an adult size of 160 mm MeCL¹ is reached in four years and five months in captivity (Schoppe and Dolorosa, *in prep.*). Praedicow (1985) observed sexual maturity of females at 5-6 years and of males at 8-9 years. In a sister species, the Chinese Three-striped Box Turtle *Cuora trifasciata*, it takes about 7-8 years until maturity is reached in semi-natural conditions (Meier, 2000). With enhanced feeding and high temperature of about 30°C maturity might be reached already at an age of 3 years (Meier, 2000). Moll observed a captive Malayan Box Turtle male that appeared to be mature in its fifth year (Edward O. Moll, Professor Emeritus of Zoology at Eastern Illinois University, *in litt.* to the researcher, 13 January 2007). Growth is usually slower in the wild than in captivity since a food supply enriched with vitamins and minerals in captive animals is given on a regular basis. It is therefore assumed that maturity in the wild is retarded by at least a year. It is presumed that it takes approx. 5½-6 years to attain maturity in the wild (Schoppe, *unpubl. data*). Growth data are very important for the consideration of captive breeding as an alternative to the harvest of wild populations.

Once maturity is reached, the species is known to lay one or two clutches of one to four eggs (Congdon, 2000), or two to four clutches of only two eggs (Ernst *et al.*, 2000). Lim and Das (1999) confirmed this but stated that a total of four to six eggs per clutch are an exception. An annual total of six eggs was repeatedly observed in captivity (Schoppe, *unpubl. data*). Mortality of eggs and juveniles is estimated to be roughly around 50% (see Wilbur, 1975; Mitchell, 1988), hence one female can probably only produce three juveniles in one year. Life expectancy is 25-30 years; a maximum age of 38.2 years was recorded for an animal in captivity (Bowler, 1977).

The relatively slow growth and the low reproductive rate of the Southeast Asian Box Turtle result in a slow turnover rate of breeding individuals in a population. Accordingly, generation length that can be defined

¹ Taking a size of 160 mm as a margin for adult hood is supported by observations of Edward O. Moll (*in litt.*, 13 January 2007).

as ‘the average age of reproducing animals’ or ‘the time it takes for an animal to be replaced by its offspring’ is extensive. 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 a generation time of 18 years.

Demographic studies on the North American Ornate Box Turtle *Terrapene ornata ornata* revealed an annual adult population growth rate (λ) of 1.006 (SE = 0.065); this would result in a 58% probability of a population decrease over a 20-year period (Converse *et al.*, 2005). Converse *et al.* (2005) conclude that significant human disturbance, such as commercial harvest or turtle mortality on roads, represents a potential risk to box turtle populations. No such studies are available for Asian freshwater turtles.

Conservation status of the Southeast Asian Box Turtle

After being recognized as potentially threatened in 1996, the Southeast Asian Box Turtle was first listed as ‘Lower Risk: Near Threatened’ in the IUCN Red List of Threatened Species (Baillie and Groombridge, 1996). When studies found that the global population continued to decline rapidly, the species was upgraded to ‘Vulnerable’ during the next IUCN Red List assessment in 2000 (Hilton-Taylor, 2000). This status is in line with the IUCN Red List of Threatened Species criteria A1d+2d of version 2.3: ‘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). Since 2000, the status has not been assessed again (IUCN, 2007). Considering that three generations of the Southeast Asian Box Turtle take about 54 years, this translates to a reduction of at least 20% that has occurred between 1946 and 2000, which was the year of assessment, and further expected reduction of at least 20% between 2000 and 2054.

Within its global range, no quantitative information on the abundance of Southeast Asian Box Turtle population is available. A range State evaluation of the status for the IUCN Red List classified the species ‘Vulnerable’ in Indonesia (Asian Turtle Working Group, 2000; IUCN, 2007). The Indonesian CITES MA however considers the species common, widespread in the western part of the country and abundant in most areas with natural or man-made wetlands, therefore justifying high harvest and export quota (Anon., 2006c).

Specific habitat requirements are little known, population sizes are unknown for virtually all freshwater turtle species, and consequently, recent trends in population sizes remain unknown too. Generally, most of the fundamental data on species biology and ecology are lacking.

Laws and regulations for the conservation of freshwater turtles in Indonesia

To the public in Indonesia, amphibians and reptiles are not considered groups that are in specific need of protection (Iskandar and Erdelen, 2006) hence most are not adequately considered by any national legislation and are exploited in enormous numbers. This particularly applies to the Southeast Asian Box Turtle and other freshwater turtle species.

In Indonesia, the species is not protected but its trade is regulated through a quota system. The Southeast Asian Box Turtle has the highest harvest and export quota among all hard-shelled species in Indonesia, followed by the non-CITES Asian Leaf Turtle *Cyclemys dentata*² and only outnumbered by the Asian Softshell Turtle *Amyda cartilaginea* (Anon., 1999a, 2001a, 2002a, 2003a, 2003d, 2004a, 2006a).

The quota system

Indonesia became Party to CITES on 28 March 1979 and therewith agreed to contribute to sustainable management of CITES-listed species. The trade of CITES Appendix II-listed species and the issuance of CITES export permits requires proof that the specimens have been acquired legally, and that the export is not detrimental to the survival of the species – the ‘non-detriment finding’ (NDF) under CITES Article IV. A well-managed annual export quota system can eliminate the need for a NDF for each individual shipment of CITES specimens, provide a basis for monitoring the trade, and may facilitate the issuance of export permits (Anon., 2006b). The setting of an export quota however is not an obligation under the Convention but it may meet the NDF requirement by establishing the maximum number of specimens of a species that may be exported over the course of a year without having a detrimental effect on its survival (www.cites.org).

The Indonesian CITES MA uses a quota system to regulate the harvest, trade and export of not only CITES-listed species but also nationally protected and non-protected wildlife. The quota system is determined within the framework of the Ministry Decree No. 447 (Anon., 2003b) that recognizes Republic Act No. 5 of 1990 (Anon., 1990) and the Government Regulation No. 8 of 1999 (Anon., 1999b). The quota system stipulates annual harvest levels, export levels, and the purpose of export. The setting of quotas and the management of quota species fall under the authority of the General Directorate of the Forest Protection and Nature Conservation under the Ministry of Forestry (PHKA) as the CITES Management Authority (MA), under the Ministry of Forestry (Samedi *et al.*, 2002). The Ministerial Decree No. 447 basically adopts the requirements of the Convention for the trade of Appendix II-listed species. The Decree declares that a quota is established by the Director General taking into account the recommendations of the CITES Scientific Authority (SA), the Indonesian Institute of Sciences (LIPI) as the basis of the establishment, and is valid for one calendar year period, January 1st through to December 31st (Anon., 2003b). LIPI finalises their quota recommendations after an annual meeting that is held every August but which might take place as late as December or the following January³, and to which other scientists, traders and NGOs are usually invited. The CITES MA shall inform the CITES Secretariat of the established export quotas and of revisions of such quota at least 30 days before the start of the period to which the export quota relates (Anon. 2006b). This is however never precisely the case. The CITES Secretariat was informed about the 2006, 2005 and 2004 quota on 14 February 2006, 03 March 2005 and 23 April 2004, respectively (<http://www.unep-wcmc.org/isdb/extra/results.cfm>).

According to Article 8 of the Ministry Decree 447, for CITES listed species “the recommendations of the SA shall be based on scientific data or information from population inventories or monitoring” (Anon.,

² Indonesian authorities treat *Cyclemys dentata* and *C. oldhami* and other hidden species in the *Cyclemys dentata* complex together under *Cyclemys dentata*.

³ In 2006 and 2007, the meetings were in November and December, respectively.

2003b). 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., 2003b). The CITES MA shall assess the recommendation of the SA and then finalise a harvest or capture quota for the species. Harvest or capture quota refers to the total number of individuals that can be harvested or captured within one calendar year. A certain number of these (about 10%) are usually for local use while the remainder constitutes the export quota. On the basis of technical management considerations, the CITES MA may establish a lower but not a higher quota than the one recommended by the SA (Anon., 2003b).

Quota setting for non-protected and non-CITES species does not require extensive surveys but limits on dimensions such as length, maximum or minimum weight, size/age class, sex, harvest or capture locations and the period of harvest or capture as recommended by the CITES Scientific Authority suffice (Anon., 2003b).

The export quota designates the quantity that can be exported in a certain calendar year. However, sometimes specimens which have been already obtained in one calendar year period were not exported in the year in which they were harvested. In such case, the Indonesian CITES MA allows the export until 31 March of the following year provided that the export permits are issued before 31 December of the year for which the quota was established (Djati Witjaksono Hadi, Head BKSDA Sumut I, *in litt.* to the researcher, 5 June 2006). The quota for the following calendar year remains unchanged in that instance. According to the CITES guidelines for *Management of Nationally Established Quotas* a Party should only exceptionally authorize the export of remaining quota in the following year (Anon., 2006b).

The national harvest quota for a species is further divided among the Indonesian provinces (Table 2). The provincial quotas are also based on recommendations from the SA, which shall technically consider the distribution and abundance of the species in the various provinces of the country. However, in case these data are lacking, the provincial quotas are set based on the realisation data of the previous year and on the trade activity in the area (PHKA-KKH personnel, *pers. comm.* to the researcher, March, 2006). They usually remain the same over the years but might be changed on a yearly basis.

In 2000, the trade of the Southeast Asian Box Turtle was regulated for the first time under CITES. The quota was first only 6000 individuals (Anon., 1999a) the minimum record compared to previous recommendations and later quotas. In 2001, after the inclusion of *Cuora* spp. in Appendix II on 19 July 2000, the harvest and export quotas of the Southeast Asian Box Turtle were increased to 20 000 and 18 000, respectively (Anon., 2001a). Persistent market demand and demand from traders to satisfy the market seem to have imposed pressure on the CITES SA and MA to increase the quota, possibly implying that because trade is now internationally regulated, demand has increased. From 2001 until 2006, the annual harvest and export quotas remained at the same level (Anon., 2001a, 2002a, 2003a, d, 2004a, 2006a). Among all Indonesia's Testudine species, this is the highest quota after the Asian Softshell Turtle, which has a quota of 28 000. In preparation for the annual quota-setting meeting in November 2006, the CITES MA had proposed to increase the quotas for these two species, the proposal was however not accepted

Observations during the framework of this study give reason to believe that the demand for certain freshwater turtle species increased after their conservation status was upgraded. This hypothesis is based

on the number of individuals encountered in trade and on the statements of traders that demand in the two species has increased over the past few years. For example, once the Asian Softshell Turtle became listed in Appendix II, its quota increased instead of being reduced. The same trend was apparent with the Southeast Asian Box Turtle; the demand for this species increased after its trade became regulated under CITES.

Table 2:
Provincial harvest quotas of the Southeast Asian Box Turtle in Indonesia in the period 2000-2006

Province	2000	2001	2002	2003	2004	2005	2006
Jabar I	-	2000	2000	2000	-	-	-
Jateng	-	1000	1000	1000	1000	1000	1000
Sulsel*	1900	10000	n.a.	n.a.	n.a.	n.a.	n.a.
Sulsel I	n.a.	n.a.	4000	4000	2000	2000	500
Sulsel II	n.a.	n.a.	3000	3000	1500	1500	500
Maluku	-	-	-	-	1500	1500	500
Sulut	-	1000	1000	1000	-	-	-
Sumut I	-	-	2000	2000	2000	2000	4000
Sumut II	-	-	1000	1000	-	-	-
Riau	100	2000	2000	2000	2500	2500	2500
Sumsel	3000	1000	1000	1000	2500	2500	1000
Kalbar	-	-	-	-	1000	1000	2000
Kalsel	-	3000	3000	3000	1000	1000	2000
Kalteng	-	-	-	-	2000	2000	1000
Kaltim	1000	-	-	-	3000	3000	5000
TOTAL	6000	20 000	20 000	20 000	20 000	20 000	20 000

*Until 2001 Southern Sulawesi was one administrative province. Only in 2002 the province was split into Sulsel I and II

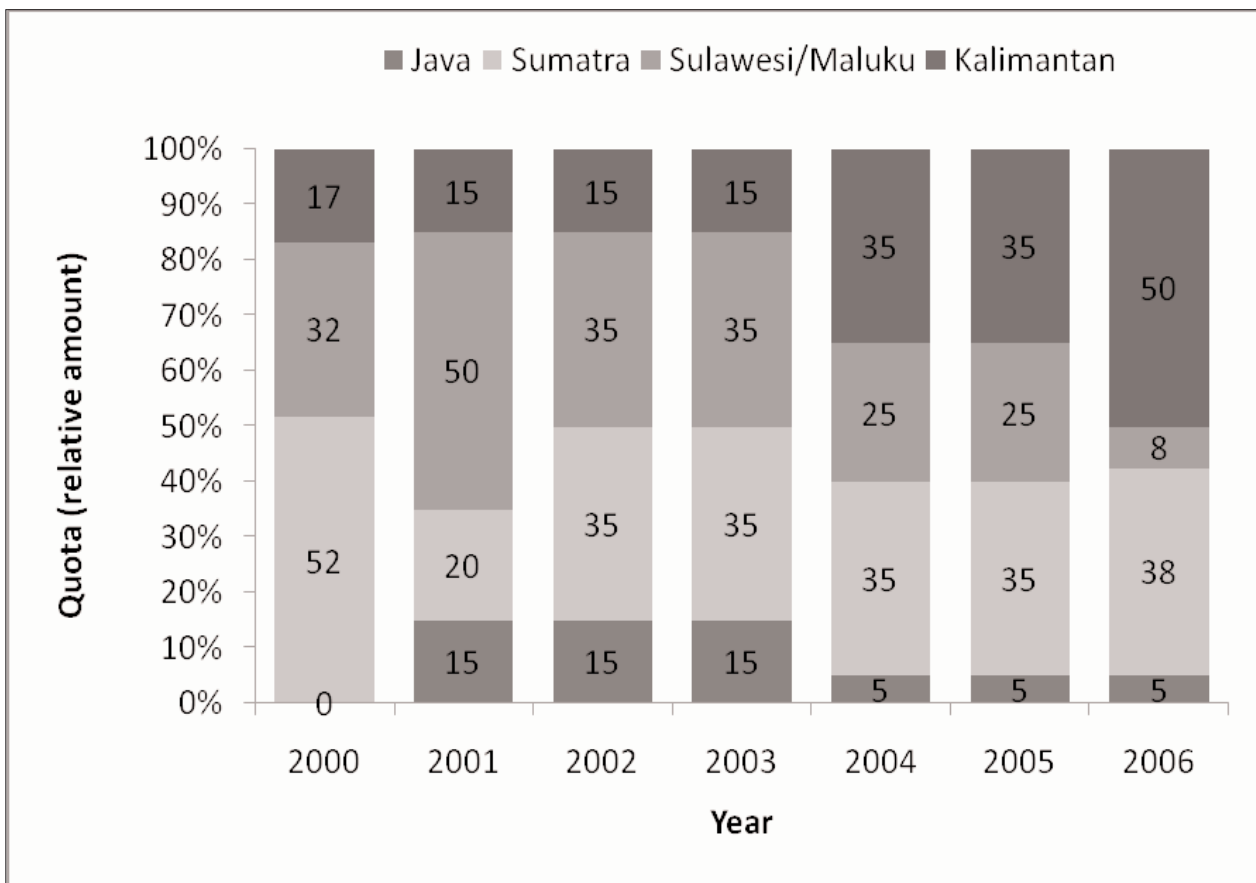
Samedi and Iskandar (2000) questioned the basis for establishing annual quotas, as the process depends on data availability. In many cases, there is little or no information on the species, its population status, ecology and distribution. LIPI lacks staff and financial support to conduct population studies. Hence, harvest and export quotas are usually set based on previous export realisation data (LIPI and PHKA staff, *pers. comm.* to the researcher, 2006). It is obvious that provincial quotas are also not based on scientific surveys. For example, in 1998, PHKA had recommended a harvest “quota”⁴ of 37 500 Southeast Asian Box Turtles for Papua (WWF Sahul Region, 1999), a Province not included in the geographic range of the species. It was already noticed by Samedi and Iskandar (2000) that the Southeast Asian Box Turtle as well as other reptile species that are not native to the Province of Papua were listed for trade. It is assumed that this was done to “legalize” shipments of protected species that had a high demand outside of Papua. Yet,

⁴ The Southeast Asian Box Turtle had no binding export quota then since it was not yet included in Appendix II of CITES.

at the same time, provinces that are renowned for the occurrence of the Southeast Asian Box Turtle such as Jambi and Lampung in Sumatra never had a harvest quota.

Kalimantan was only allocated a higher quota when consumption traders first registered with BKSDA and PHKA in 2004 and 2005, respectively (Table 2 and Figure 16). Java is over-populated by humans, and all of its natural resources including the Indonesian Box Turtle are heavily exploited; accordingly the quota has always been low. Indonesian Box Turtles from Sumatra have always been the main supply for the pet traders in Jakarta/Bogor, hence, Sumatra's quota has remained relatively stable over the years (Figure 16). Sulawesi is the second most important source for Indonesian Box Turtles offered as pets. All of the pet traders have suppliers in Sulawesi because the island is an important source of a number of endemic reptile species. Kalimantan on the other hand has never played a major role as source for pet species with a wide geographic range since logistics are not in place and transportation too expensive compared to Sumatra and Sulawesi. The Kalimantan quota was always kept at a minimum just enough to satisfy the needs for dividing the national quota among the provinces. This changed with the increase of the consumption trade.

Figure 16:
Relative distribution of the Indonesian harvest quota of the Southeast Asian Box Turtle among the four main island groups



Procedure guideline: Once the annual national and provincial quotas are set, the head of the CITES Management Authority informs the heads of the Regional Offices (BKSDA) and the Chairman of the Indonesian Reptile and Amphibian Trade Association (IRATA) about the allocated numbers. The Heads of BKSDA will designate locations of harvest or capture within the province taking into account the legal

status of the location, population abundance, habitat condition, land use plan and cultural aspects of the local community. The harvest or capture location as identified by the Head of BKSDA should mention at least village name, subdistrict name, district name, geographic or map coordinates. To ensure population sustainability, harvest or capture locations shall undertake a rotation whereby the rotation period depends on the population condition, habitat, biological characteristics, and the behavioural ecology of the species. The established quota and locations for the harvest or capture then constitutes the basis for the issuance of Permits for Harvest or Capture (*Izin Penangkapan Satwa Liar Yang Tidak Dilindungi Undang-Undang*).

Purpose of export

The quota system also stipulates the purpose of export. Under the Indonesian quota system, the Southeast Asian Box Turtle and other freshwater turtles and tortoises may only be exported live; the export of dead animals, parts (carapace or plastron) or derivatives is illegal.

There are two possible export purposes: “pet” or “live”. If the purpose is declared as ‘pet’, specimens can only be exported for the pet trade (George Saputra, IRATA Chairman, *pers. comm.* to the researcher, 6 March 2006). Pet Southeast Asian Box Turtles are usually exported to Europe, the US or Japan. Companies that trade reptile for the international pet trade must be members of IRATA. IRATA members deal with live reptiles for the pet trade or with reptile skins but they do not trade meat.

If the purpose is declared as “live”, it encompasses more than the pet trade since live specimens may be destined for the pet trade and/or for the meat trade that uses live animals. Destinations of the Southeast Asian Box Turtle for the meat or so-called “consumption” trade are Hong Kong SAR and mainland China (George Saputra, IRATA Chairman, *pers. comm.* to the researcher, 6 March 2006). The consumption trade is carried out by exporters who are not organized as an association but are directly registered with PHKA, the CITES MA.

From 2000 to 2005, the entire export quota of the species was intended for the pet trade to be handled exclusively by IRATA members. Towards the end of 2005, when IRATA members had so far realized exports of 11 327 individuals, the Indonesian MA permitted consumption traders to export the remaining individuals to food markets in East Asia. In 2006, the CITES MA allowed the Southeast Asian Box Turtle to be traded for consumption by changing the purpose from “pet” to “live”. Of the total 18 000 individuals, 6000 were allocated to the pet traders and 12 000 to the consumption traders. According to the MA, this division was made based on previous export realisation data of the pet traders who usually did not export more than 6000 individuals annually (Samedi, ID CITES MA, *pers. comm.* to the researcher, 6 March 2006). However, this statement contradicts the export statistics, which indicate that between 13 000 and 16 000 individuals were exported annually in 2001-2005 (George Saputra, IRATA Chairman, Jakarta, Indonesia, *in litt.* to the researcher, 14 Sept. 2006, Table 3).

Samedi (ID CITES MA, *pers. comm.* to the researcher, 6 March 2006) explained this change in purpose and the opening of the Southeast Asian Box Turtle for the consumption trade to China was due to the inability of the IRATA members to fulfil the annual export quota of 18 000 individuals. Instead of lowering the national quota or accepting that the quota would not be fulfilled, the Indonesian CITES Authorities decided to transfer it to the consumption trade (Samedi, ID CITES MA, *pers. comm.* to the researcher, 6 March 2006). However, as indicated in Doc 21 of the 54th CITES Standing Committee, an annual export quota is not a target and there is no need for a quota to be fully used (Anon., 2006b).

Table 3:**Export realisation of the Southeast Asian Box Turtle by IRATA members from 2000-2005**

Year	No. of individuals
2000	5 990
2001	16 538
2002	14 655
2003	13 071
2004	17 353
2005	17 827

The change of the export purpose from “pet” to “live” and the concurrent opening of the trade for “consumption” managed by non-IRATA members is criticised by most IRATA members (George Saputra, IRATA Chairman, *pers. comm.* to the researcher, 6 March 2006). It is against previous agreements with PHKA and the policies of the Association, which state that the Southeast Asian Box Turtle exporters have to be members of the Association and therefore follow the rules and regulations of the Association. The consumption traders are not organized as an Association and the division of their quota solely depends on the discretion of the CITES MA. Furthermore, the consumption trade of the species is perceived as much more lucrative than the pet trade since it involves much higher volumes and different market destinations. The change in policy to allow exports of the Southeast Asian Box Turtle for the consumption trade therefore constitutes a conflict of interest and competition among the two trader groups. The conflict is compounded by the fact that the total quota of each pet trader is further divided among the various provinces and a pet trader with 200 individuals, for example, is required to collect some individuals in Sulawesi, some in Sumatra and some in Kalimantan. Since most pet exporters are located around Jakarta and Bogor, the collection of only few animals from distant provinces constitute financial and logistical problems (IRATA members, *pers. comm.* to the researcher, March-April 2006). Consumption traders, by comparison, receive their quota in the province of residence/registration of the company.

In an attempt to solve the conflict between IRATA members and consumption traders, the then Director of the CITES MA announced his intention to encourage consumption traders to become members of IRATA (Adi Susmianto, *in litt.* to TRAFFIC SEA, 10 Nov. 2006). Following that, the two trader groups met during the annual quota-setting meeting on 28 November 2006. However, interests of the two groups are too different and the meeting did not lead to closer cooperation or fusion of the two groups as intended by the CITES MA (Chris Shepherd, TRAFFIC SEA, *pers. comm.* to the researcher, 13 Aug. 2007). The only change that resulted was the official changing of the export purpose for the Southeast Asian Box Turtle from ‘live’ back to ‘pet’ (Anon., 2007). This is however contradictory to the definition of the *purpose of export* (*see above*) where ‘pet’ is delimited to the pet trade excluding consumption trade.

Permits and procedures

All Indonesian species of plants and animals are categorized as either nationally protected or unprotected. Unprotected and/or non-CITES turtle species are managed as a fisheries resource under the administration of the Department of Marine Affairs and Fisheries (*Departemen Kelautan dan Perikanan, DKP*) that issues capture and export permits. Nationally Protected and CITES-listed turtle species are under the

Table 4:
National and international protection / conservation status of Indonesian freshwater turtles and tortoises

No	Species	IUCN 2007 Status	National Legal Status	CITES Appendix	Quota
					2006
1	<i>Amyda cartilaginea</i>	VU	Not Protected	II	28 000
2	<i>Batagur baska</i>	CE	Protected	I	0
3	<i>Callagur borneoensis</i>	CE	Not Protected	II	0
4	<i>Carettochelys insculpta</i>	VU	Protected	-	0
5	<i>Chelodina mccordi</i>	CE	Not Protected	II	0
6	<i>Chelodina novaeguineae</i>	LR	Protected	-	0
7	<i>Chelodina parkeri</i>	VU	Not Protected	-	300
8	<i>Chelodina reimanni</i>	LR	Not Protected	-	200
9	<i>Chelodina siebenrocki</i>	LR	Not Protected	-	2000
10	<i>Chitra chitra</i>	CE	Protected	II	0
11	<i>Cuora amboinensis</i>	VU	Not Protected	II	20 000
12	<i>Cyclemys dentata</i>	LR	Not Protected	-	15 000
13	<i>Cyclemys oldhami</i>	LR	Not Protected	-	treated as <i>C. dentata</i>
14	<i>Dogania subplana</i>	LR	Not Protected	-	5000
15	<i>Elseya branderhorstii</i>	VU	Not protected	-	0
16	<i>Elseya novaeguineae</i>	LR	Protected	-	0
17	<i>Elseya schultzei</i>	not listed	Not Protected	-	1000
18	<i>Emydura subglobosa</i>	LR	Not Protected	-	1000
19	<i>Heosemys spinosa</i>	E	Not Protected	II	2000
20	<i>Indotestudo elongata</i>	VU	Protected	II	0
21	<i>Indotestudo forstenii</i>	E	Protected	II	500
22	<i>Leucocephalon yuwonoi</i>	CE	Not Protected	II	200
23	<i>Malayemys subtrijuga</i>	VU	Not Protected	II	500
24	<i>Manouria emys</i>	E	Protected	II	500
25	<i>Notochelys platynota</i>	VU	Not Protected	II	1500
26	<i>Orlitia borneensis</i>	E	Protected	II	0
27	<i>Pelochelys bibroni</i>	VU	Not Protected	II	100
28	<i>Pelochelys cantorii</i>	E	Not Protected	II	200
29	<i>Siebenrockiella crassicollis</i>	VU	Not Protected	II	5000

administration of the Department of Forestry that sets annual harvest and export quotas (Table 4). This distribution of species among authorities has led to considerable confusion. Lack of species identification skills among law enforcement officers is one of the reasons that shipments of ‘protected’ turtles that were declared ‘unprotected’ passed Customs inspection. Concern about the relative inability of staff of

enforcement bodies to identify the various turtle species was already expressed earlier by Shepherd (2000). Freshwater turtle species including the Southeast Asian Box Turtle that have recently changed conservation status and became listed in Appendix II of CITES have increased confusion. From being an unprotected species that could be exported without limitation, the species' export became regulated through a quota system which requires CITES export permits. Such change in conservation status also goes along with a change in management from the DKP to the Forestry Department. Species identification and an updated knowledge on CITES species is imperative for enforcement officers. In addition to the confusion that is caused among enforcement personnel, such a turnover of authority also implies that harvest and export statistics are incomplete and insufficient for species management since the DKP for example lumps turtles under either *Kura Kura* (hard-shelled turtles) or *Labi Labi* (softshell turtles) but does not distinguish between species.

The rules and regulations governing the collection, distribution and trade of wildlife are based on the Republic Act No 5 of 1990 *Concerning the Conservation of Living Resources and their Ecosystems* (Anon., 1990), the Government Regulations No. 8 of 1999 (Anon., 1999b), and the *Decree of the Ministry of Forestry No. 447/Kpts-II/2003* (Anon., 2003b). The latter clarifies that "Utilization of wild plants and animals species shall be based on the precautionary principle and non-detriment findings as set out in Article III, IV and V of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)". The trade of wild caught Southeast Asian Box Turtles (and other CITES Appendix II-listed species) requires at least the following permits (Box 3):

1. Permit for Domestic Distribution or Domestic Trade, where "distribution" is defined as any activity for distributing specimens, which may include transport, keeping, collection of specimens harvested or captured from the wild or from captive management. This is issued by the Head of BKSDA, granted for five years but only to registered business establishments. The permit is needed by suppliers and exporters.

2. Permit for Foreign Distribution, issued by Directorate General of CITES MA for the international trade in the species to registered business establishments, granted for five years and needed by exporters only.

3. Permit for Harvest or Capture (*Izin Penangkapan Satwa Liar Yang Tidak Dilindungi Undang-Undang*), issued by Head of BKSDA, granted for one year, allows in accordance with quota and designated location of harvest or capture, the harvest or capture from the wild. Designated harvest or capture locations should be either stated in the permit itself or in an attachment to the permit. Needed by any registered supplying or exporting company and their registered collectors.

4. Permit for Domestic Transportation of Wild Plants and Animals (*Surat Angkut Timbuan Dan Satwa Liar Dalam Negeri*, SATS-DN), needed for activities of distributing specimens within the country for the purpose of obtaining economic benefit, only provided to registered domestic distributors, issued by Head of BKSDA, valid for one shipment and maximum two months.

5. Permit for Foreign Transportation of Wild Plants and Animals (*Surat Angkut Timbuan Dan Satwa Liar Luar Negeri*, SATS-LN), needed for activities of distributing specimens from or to a foreign country for the purpose of obtaining economic benefit, only provided to registered foreign distributors. It

constitutes a CITES permit⁵ or certificate for CITES listed species and is issued by the Director General of MA, valid for the maximum period of six months. The CITES permit should stipulate the number of individuals for which the permit is issued over the total quota of the species for the year.

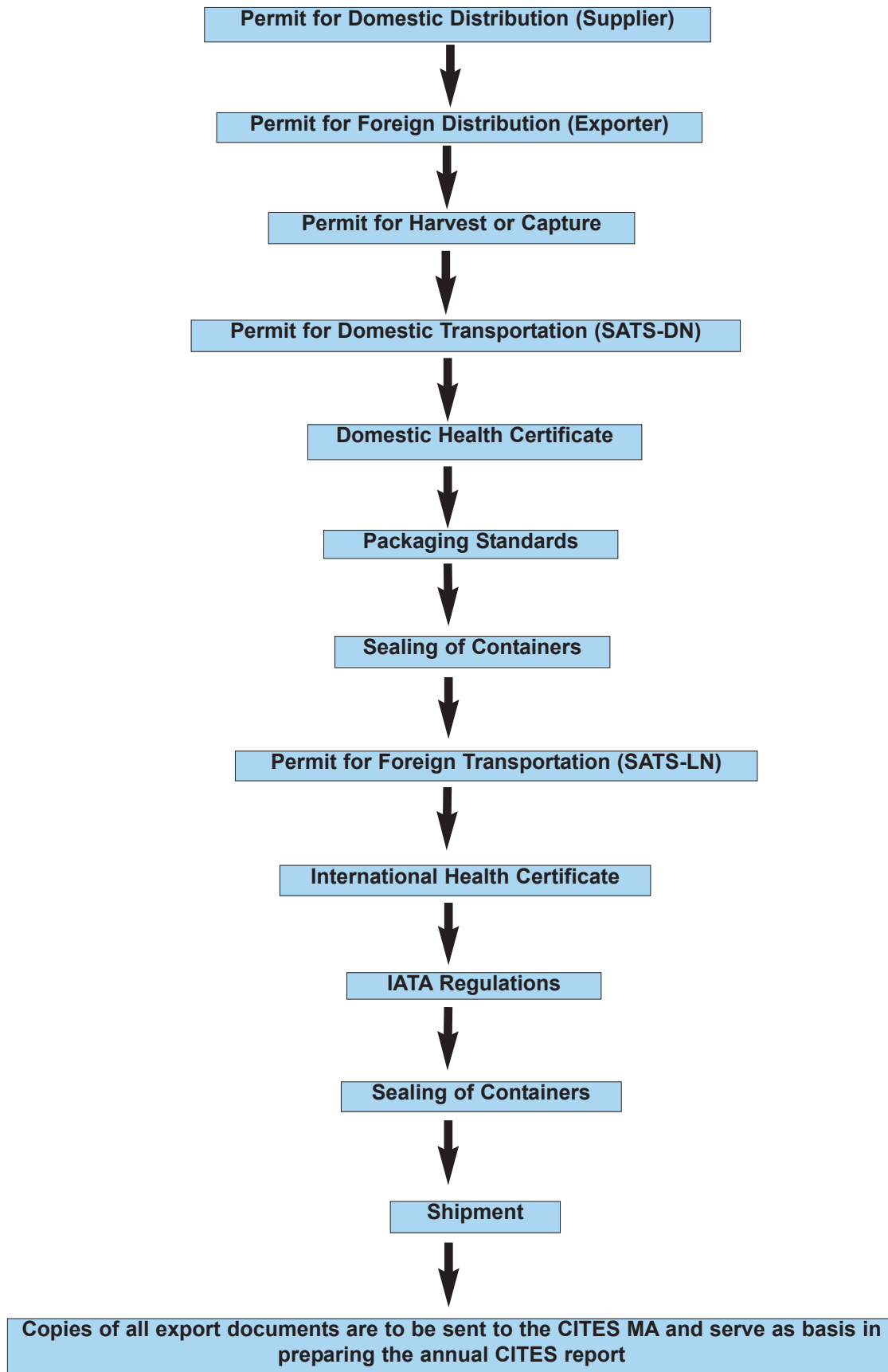
The Ministerial Decree 447 emphasises that harvest or captures should not exceed the quota, harvest or capture should be within the designated locations and regions, should not be detrimental to the wild population, and that harvested or captured animals should not receive any injuries due to mishandling (Anon., 2003b). The control should be exceeded by the heads of the regional offices as follows:

- The heads of BKSDA shall conduct inspection and control the trade of wild caught animals in animal markets and other places selling specimens, such as restaurants, traditional medicine shops and souvenir shops. Traders need authentic evidence that the specimens were legally acquired.
- Every holder of a Permit for Harvest or Capture for trade purposes shall make records and submit reports concerning the stockpile of wild plants or animals to the Head of BKSDA on a monthly basis. The Head of BKSDA shall cross check those reports and report to the Director General on all the permits he/she has granted.
- Head of Regional Office or authorized customs or quarantine officers shall verify SATS-LN permits in the place of packaging.
- Head of Regional Office or authorized customs or quarantine officers shall check whether the packaging follows the international standard for transport of animals by air of the International Air Transportation Association (IATA). After inspection, containers shall be sealed.

⁵ A non-CITES permit or certificate is required for non-CITES species.

Box 3:

Flow chart indicating the different steps procedures and permits needed for the trade of the Southeast Asian Box Turtle and other CITES II listed animals



Box 4:**Regulations for the transport of live animals by the International Air Transportation Association (IATA).**

The IATA Live Animals Regulations (LAR) outlines how to transport live animals safely so they arrive in good health. They specify the minimum requirements for the international transport of animals and wildlife, and indicate what precautions airlines, shippers, cargo agents and animal care professionals should take on the ground and in the air. European Union (EU) and many other countries enforce IATA LAR for the import and export of live animals. CITES has adopted these regulations as its official guidelines for transportation of live CITES-listed animal specimens and the World Organisation for Animal Health (OIE) has recommended these regulations for the air transport of live animals. LAR is annually revised. The shipment of live animals, including turtles, under LAR requires that each animal enclosed in the container must have enough space to turn about normally while standing, to stand and sit erect, and to lie in a natural position. Airlines that are full members of IATA, including Garuda Indonesia, require that transport of live animals (whether transported in cabin or cargo) adhere to the IATA LAR. Specific turtle regulations are provided under container requirement 43, which prohibits stacking of animals and requires sufficient space that animals can extend their head and limbs

Quarantine officers under the management of DKP are in charge of checking the health of freshwater turtles. The export of wildlife requires two quarantine checks: 1) at the quarantine office nearest to the place of collection in preparation of shipment to the place/port of export; and 2) at the quarantine office of the International Airport/Seaport to be used for shipment abroad (Anon., 2002d). The CITES MA in Indonesia has designated 21 ports in 16 cities on nine islands (Annex 3) for the entry and exit of specimens of species listed in the CITES Appendices (Anon., 1999d). The first inspection needs the issuance of a Domestic Health Certificate (*Sertifikat Kesehatan Ikan Domestik*) and the second an International Health Certificate. The health inspection should involve visual (species, number and size, and eventual morphologic disorder) and/or laboratory examination (Anon., 2002d). Upon issuance and payment of an administrative fee, the Health Certificate is accompanied by either a SATS-DN (domestic) or by a SATS-LN (international). Copies are to be sent to the General Director of the MA. Surveys and interviews during the present study have revealed that health certificates are usually issued without inspection of the animals. Furthermore, it was noted that the administration fee for health certificates is not standardized and varies among the different provinces. Often containers are sealed without any health and/or SATS-DN and SATS-LN inspection.

A major change of the animal, fish, and plant quarantine jurisdiction was made in July 2001. In line with the separation of the administration authorities in the agriculture, forestry, and fishery sectors into different ministries, the mandate to carry out animal, fish, and plant quarantine was divided between the different agencies. Accordingly, the former quarantine agency, the Centre for Agricultural Quarantine, which had been mandated to carry out animal, fish, and plant quarantine was dissolved. Today, the mandate is with the Centre for Fish Quarantine (CFQ) – an agency under the Ministry of Marine Affairs and Fisheries (Anon., 2002d). During the present survey though no CFQ was ever encountered, but rather the former old names are maintained: 1) Fish Quarantine (*Karantina Ikan*), 2) Animal Quarantine (*Karantina Hewan*), and 3) Plant Quarantine. It remains unclear which of the former offices is responsible for freshwater turtles. When the management of freshwater turtles was still handled by the Fisheries Department, Fish Quarantine conducted the inspection. With the switch of responsibility to the Forestry Department, there seems to be the belief that turtles should now be inspected by the Animal

Quarantine. According to Quarantine Officers in Jakarta, Animal Quarantine is in charge of the inspection of hard-shelled turtle species while Fish Quarantine is in charge of the inspection of softshell turtles and their by-products (Main Office of Karantina Hewan Besar, Jakarta, *pers. comm.* to the researcher, 12 July 2006). Pet exporters in Jakarta confirmed that turtles are usually inspected by the Animal Quarantine rather than by the Fish Quarantine (Anon. pet trader, Jakarta, *pers. comm.* to the researcher, 21 March 2006). In the provinces however, the Fish Quarantine seems to be in charge.

During the course of this research, all for this study requested health certificates were issued by Fish Quarantine offices. There were four shipments of the Southeast Asian Box Turtle from the provincial capitals of Pekanbaru, Balikpapan (twice), and Banjarmasin to Jakarta. It was observed that the animals were not properly identified and their health was not inspected. Based on the researcher's observations during the survey, health certificates are usually issued without inspection of the animals. If a shipment is examined, the health condition is usually not inspected but only the quantity and quality (species) of the shipment is noted.

The Director General of the CITES MA shall submit annual reports to the CITES Secretariat (the latest in October of the following year)⁶ based on the actual transaction of export, import, re-export and introduction from the sea. However, these do not reflect the number of actually exported individuals but rather the numbers for which SATS-LN were issued, which does not necessarily mean that the SATS-LN were realised or that the numbers in the SATS-LN coincide with the numbers that were exported.

Quantity and quality of trade of the Southeast Asian Box Turtle

Past trade levels

International trade, both legal and illegal, of the Southeast Asian Box Turtle was and is still significant in volume (van Dijk *et al.*, 2000; Cheung and Dudgeon, 2006). It is the most abundant species in trade in Southeast Asia, and Indonesia together with Malaysia are the two major range State exporters (Anon., 2002b). Indonesia has historically exported the species in enormous numbers mainly for food markets in Hong Kong and mainland China (Fritz and Gaulke, 1997; Artner and Hofer, 2000; Shepherd, 2000). The Southeast Asian Box Turtle has always been the major species for food and TCM trade (Ades *et al.*, 2000; Cheung and Dudgeon, 2006). Senneke and Tabaka (2002) however stated that the Southeast Asian Box Turtle only became the most common hard-shelled chelonian species found in food and medicine markets of Southern China after the Reeve's Turtle *Chinemys reevesii* had been over-collected. However, the latter cannot be supported with statistical data (UNEP-WCMC CITES Trade Database, 2007).

Information on the export volumes of the Southeast Asian Box Turtle from Indonesia for the period before the species was included in CITES Appendix II in 2000 is incomplete and not readily available. Until 2000, the species was managed in Indonesia as a fishery resource under DKP, which used to merge all Geoemydidae spp. (Asian freshwater turtles) together under the category "*kura kura*" or hard-shelled turtle. Available Indonesian data suggest unlimited exploitation in 1990, followed by an annual export allotment of 10 000 individuals for the years 1991 to 1994 (Jenkins, 1995). The Asian Turtle Trade

⁶ During the course of the study, the 2006 annual report was submitted on 28 November 2006.

Working Group estimated Indonesian exports in the species at about 1 million individuals annually (van Dijk *et al.*, 2000). In only one Chinese market (Qing Ping Market in Guangzhou), 1000 individuals were observed daily in 1995 (Altherr and Freyer, 2000), 1998 and 1999 (Anon., 1999c). In addition to mainland China, Hong Kong SAR is a consumer but also functions as an important transit centre for turtles due to its good port and airport facilities, free trade practice, and convertible currency (Lau *et al.*, 2000). The same authors observed the Southeast Asian Box Turtle among the 10 most heavily traded chelonians during 1998-1999. It was consistently present in the food (consumption) trade.

A survey of Artner and Hofer (2000) of the Qing Ping Free Market, the largest open-access Chinese market selling live turtles in November 2000, revealed that the species was still abundant in trade despite its listing as Appendix II species of CITES in the same year. Lee *et al.* (2004) who surveyed major wild animal markets and shops in Guangzhou and Shenzhen from 2000-2003 found the Southeast Asian Box Turtle as the most numerous turtle species in trade. The authors found the trade to involve many different species and the volume believed to be larger than during the 1993-1994 surveys by Lau *et al.* (1995).

Official export statistics show that 37 000 Southeast Asian Box Turtles were exported from Sumatra alone in 1988 (van de Bunt, 1990 as cited in Jenkins, 1995), and approximately 200 000 individuals from Southern Sulawesi alone in 1991 (Collins, 1998 as cited in Anon., 1999c). Between November 1993 and October 1994, 147 344 individuals were officially exported from Indonesia (Lau *et al.*, 1995). The Indonesian Fisheries Department recorded the export of 423 100 and 396 719 individuals of assorted freshwater turtles and tortoises in 1997 and 1998, respectively (Samedi and Iskandar, 2000). Unfortunately, they could not provide specific data for the Southeast Asian Box Turtle alone. During the same period, TRAFFIC had conducted surveys and concluded that the official records were underestimating actual exports and that about 5000 tonnes of freshwater turtles were exported annually during those years and further estimated that 61.3% of all traded freshwater turtles in 1998, and 47% of those traded in 1999 were Southeast Asian Box Turtles (Anon., 2001b). Adopting TRAFFIC's estimate, it can be extrapolated that 2 350 000 or 47% in 1999 and 3 065 000 or 61.3% in 1998 of the estimated total exports may have been Southeast Asian Box Turtles.

Since the listing of the species in CITES Appendix II, data are available from the UNEP-WCMC CITES Trade Database (2007); two data sets were extracted:

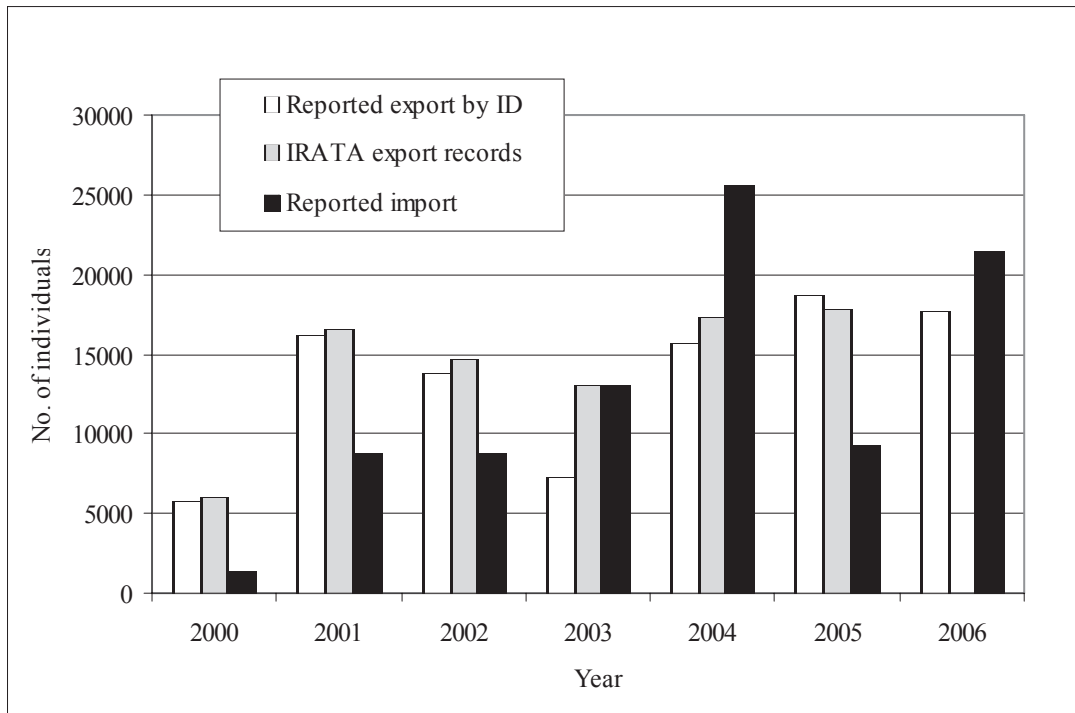
1. the export of the Southeast Asian Box Turtle as reported by Indonesia; and
2. the imports by importing countries.

In addition and for comparison, the export realisation records of the pet traders association are provided (George Saputra, IRATA Chairman, Jakarta, Indonesia, *in litt.* to the researcher, 14 Sept. 2006). The comparison between these three data sets reveals some discrepancies. First, the reported exports for the years 2003, 2004 and 2006 are lower than the reported imports and lower than the export realisation records of IRATA⁷ (Figure 17). The difference in reporting is largest in 2004, where Indonesia reported a total of 15 700 exports while importing countries report the sum of 25 577, of which 20 500 were imported by Malaysia alone (UNEP WCMC CITES Trade Database, 2007). For the years 2000, 2001, 2002, and 2005, the reported imports were lower than the reported exports which might be explained by the fact that non-

⁷ No IRATA export records for 2006 are available.

Figure 17:

Reported exports and reported imports of the Southeast Asian Box Turtle after its inclusion under Appendix II of CITES



CITES member countries do not have to report their imports. In all years, except 2005, IRATA's records are slightly higher than or even almost twice as high as the exports reported by the ID CITES MA.

Incidents of illegal trade of the Southeast Asian Box Turtle continue to be reported by the press until today. On 12 July 2002, Customs officials at Soekarno-Hatta International Airport in Jakarta foiled an attempt to export illegally 1526 live turtles, 1423 of which were Southeast Asian Box Turtles (Anon., 2002b). The turtles had arrived from Banjarmasin (South Kalimantan) and were reportedly bound for the food and medicine trade in Ghuangzou, China. In the first six months of 2006, two seizures of Southeast Asian Box Turtle shipments took place. On 14 January 2006, the Hong Kong Customs and Excise Department seized 602 kg of Southeast Asian Box Turtle plastrons and 35 kg of Malayan Giant Turtle plastrons, worth about USD 224 250 (Anon., 2006c). The plastrons were shipped from Indonesia to Hong Kong, reportedly for re-export to China. On 13 June 2006, 2520 Southeast Asian Box Turtles were seized in Singapore's Jurong Fishing Port from Tembilahan in Sumatra, Indonesia. The captain of the Indonesian ship pleaded guilty to illegally transporting the turtles, and was sentenced to a term of five months imprisonment and fined approximately USD 12 545. Many of the illegal shipments have forged CITES export permits.

The Southeast Asian Box Turtle had always commanded lower prices in pet markets than in consumption markets and the volumes traded for the pet market have always been of lesser economic value and importance compared to the food trade (Altherr and Freyer, 2000). Despite the above, the species has been popular in the US, Europe and Japan pet trade for many years. Yuwono (1998) and Altherr and Freyer (2000) stated the species was exported by hundreds or even thousands to western pet shops from Indonesia. Schlaepfer *et al.* (2005) who analysed import and export data based on records of the US Fish and Wildlife

Service (USFWS) Law Enforcement Management Information System (LEMIS) revealed that 48 335 live wild-caught Southeast Asian Box Turtles – most of which had originated from Indonesia - had been exported to the US between 1998 and 2002.

Box 5:

Review of Significant Trade

In 2002, during the 18th Meeting of the CITES Animals Committee (AC 18), the Southeast Asian Box Turtle was recommended under Decision 11.106 for inclusion in Category I on the basis of apparently high levels of unreported trade from a number of range States coupled with an apparent decline in the availability of individuals as evidenced by increasing prices (Anon., 2002b). During the said meeting the working group formulated questions to be posed to Indonesia (and Malaysia), for example what is the scientific basis for the quotas established by Indonesia and Malaysia (Anon., 2002b). Indonesia was requested to explain the basis for its quota and the distribution of the species in the country, especially since it was noted that Papua had been allocated a quota although the species does not occur in that Province. Indonesia was also questioned on the basis for the establishment of the quotas in compliance with Article IV and on the role of the different institutions (MA, SA and DKP) in this matter.

In the Summary Record of AC19, Indonesia claimed that distribution and habitat were ample and widespread for the species and that 18 000 individuals was a conservative quota (Anon., 2003c). The CITES Secretariat reported that there had never been a thorough study of the species, and no information was provided to the Secretariat on the basis of the quota or how it was set. There was also no evidence of an actual non-detriment finding (Anon., 2003c).

During the 13th Conference of the Parties held in Bangkok in 2004, it was reported that the trade of the Southeast Asian Box Turtle was still of 'urgent concern' under Review of Significant Trade (Anon., 2004b). Finally, in May 2005 the following recommendations were formulated for the CITES MA of Indonesia (Anon., 2005b), and sent on August 17, 2005:

The Indonesian CITES MA should review the annual export quota of the species, and commit to undertake a status assessment and field study of the species to be completed within 24 months, and to develop and implement an adaptive management program for the species on the basis of the subsequent results.

During the 54th Standing Committee held from 2-6 October 2006 in Geneva, in the document on the 'Review of Significant Trade' Indonesia's responses are presented (Anon., 2006c):

"In its response to the recommendations, Indonesia explained on what basis it established annual export quotas for this species in compliance with Article IV, paragraphs 2 (a) and 3. The species, Indonesia's most common freshwater turtle, was reportedly widespread in the western part of the country and abundant in most areas with natural or man-made wetlands, including rice fields and fish ponds. Catch and export quotas were reduced from 500,000 animals per year before its inclusion in Appendix II to 90,000 specimens in 1999 and 18,000 since 2001. Animals may only be exported for the pet trade, as export of the species for food consumption has temporarily been halted. The level of utilization in Indonesia is believed to be sustainable as numbers and sizes of animals that are harvested remains stable, and no declines in the abundance of wild populations has been observed. Starting in 2006, Indonesia planned to undertake a status assessment and field study of the species with support from TRAFFIC Southeast Asia."

Based on this explanation, the Secretariat in consultation with the Chairman of the AC determined that Indonesia had implemented the recommendations and, pending the agreement of the Chairman of the SC, would be notifying Indonesia that it had been removed from the Review of Significant Trade with respect to the Southeast Asian Box Turtle (Anon., 2006c).

Results of the present survey show however that Indonesia has not yet conducted any comprehensive field survey, and data needed for a non-detrimental finding on the Southeast Asian Box Turtle that could accurately gauge either the status of wild populations or determine that the current levels of exploitation are not detrimental to the survival of the species, are not available. Furthermore, the species was and is not only exported for the pet trade but since 2005, Indonesian consumption traders were allowed to export animals to the food markets of China. In 2006, they were officially allocated an export quota of 10 000 individuals while only 6000 remained for the pet export by registered IRATA members and 2000 for local utilisation. Indonesia further stated that it did not observe any decline in the abundance of wild populations. However, there has been no long-term study conducted to show that numbers and sizes of Southeast Asian Box Turtles harvested from Indonesia remain stable.

Contrary to Indonesia's response as given in SC54 Review of Significant Trade (Anon., 2006c, see above), the SC54 Summary Record reads as follows (Anon., 2006d):

“The Secretariat drew attention to paragraphs 36 and 38 of the document, summarizing the responses from Indonesia and Malaysia to recommendations formulated by the Animals Committee, and the determinations thereof by the Secretariat, in consultation with the Chairman of the Animals Committee, in paragraphs 37 and 39.

Indonesia clarified that it was undertaking status assessments and field studies with support from TRAFFIC Southeast Asia, and that its annual export quota of Cuora amboinensis (18,000 live specimens) comprised animals for both the pet and food trade.”

In effect, Indonesia presented the research for the present report as its NDF process.

The statement of Altherr and Freyer (2000) that the Southeast Asian Box Turtle and its congeners were under immense market pressure, which may result in extinction within the space of a few years, remains true. In addition to the Southeast Asian Box Turtle, all wild populations of *Cuora* species have declined within a single decade (Anon., 1999c; IUCN, 2007). The main reasons are unsustainable trade to meet the growing demand of Asian food markets and the low reproductive potential of these long-lived animals. For the Southeast Asian Box Turtle, the number of individuals collected from the wild is not compatible with what is known about the current distribution and biological characteristics (Schlaepfer *et al.*, 2005), including what has been observed by TRAFFIC during this research. Many turtle and tortoise species depend on high adult survivorship to offset high egg and juvenile mortality in the wild. Removing even a small fraction of adults can cause a population to decline or can delay population recovery (e.g., Congdon *et al.*, 1994; Heppell, 1998). Schlaepfer *et al.* (2005) argue that the status of the Southeast Asian Box Turtle – and that of other freshwater turtles and tortoise species – is so dire that the trade of wild-caught animals should be halted or severely reduced. The species, despite its CITES status, is not adequately protected against over-collection due to weak law enforcement and unsustainable levels of illegal trade. The volume of animals legally taken from the wild for the US market alone is large enough to potentially extirpate local populations or in the worst case the species itself. Lau *et al.* (2000) stated that for widespread and

presumably common Asian turtles like the Southeast Asian Box Turtle, the large scale exploitation for the food trade is most likely unsustainable and efforts should be directed towards detailed in-situ conservation measures and ecological studies of such species. Results of this study indicate that populations continue to decline in the selected study areas, suggesting harvest for legal trade should be strictly regulated, and illegal trade must be addressed seriously.

Current trade levels

Local utilization

During the two visits to Jakarta's Barito Market, a total of 52 and 71 Southeast Asian Box Turtles were encountered, respectively (Table 5). Among the 33 stalls, eight offered the species for sale. All sizes and life history stages ranging from small/juvenile, medium/subadult, to large/adult were for sale. The price for one individual ranged from USD 3.26 for a small individual to USD 10.85 for a large individual in March (Table 5), and from USD 3.26-6.51 in April. The vendors declared that the animals were mainly for local consumption. Palembang (Sumatra) was repeatedly mentioned as one of the major sources of the species for the Jakarta market. The Fancy Pets Centre at Blok M Plaza Lt. IV had, during all visits, numerous – mainly exotic – turtle species for sale. Only once in June, a Southeast Asian Box Turtles for USD 5.43/specimen was available for sale. Shepherd and Nijman (2007) had surveyed some of Jakarta's pet and animal markets from Aug.–Nov. 2004. Over the entire survey period, they counted a total of 395 individuals of the Southeast Asian Box Turtle.

In Makassar (Sulawesi), turtles were encountered in three premises (Hobbie Aquarium, Fish Market and Pasar Hobby). However, most of these stores only had American Red-eared Sliders. Hobbie Aquarium offered the Southeast Asian Box Turtle occasionally, and a store owner at the fish market said that he could get juveniles upon request and sell them for USD 13.57/individual (Table 5). He mentioned that the species was not common. According to several respondents, the species was consumed locally as food in Palopo.

Six of the 10 shops along Jl. Thamrin in Medan offered turtles for sale but only two were selling Southeast Asian Box Turtles (Table 5). KH. Aquarium, Jl. Thamrin No. 75A had five adult individuals that were sold for USD 2.71/individual, and CV Bonavide Aquarium Tetap Jaya, Jl. Thamrin No. 71 had two adults for USD 5.43 each. A survey in 2001 found the Southeast Asian Box Turtle in Golden Fish Aquarium and K.H. Aquarium (Chris Shepherd, TRAFFIC Southeast Asia, *in litt.* to the researcher, 17 Nov. 2006), counting eight and 12 juvenile individuals, respectively. They were sold for USD 1.07/individual, which is less than half the price quoted by KH. Aquarium in 2006. Shepherd noted that only juveniles were for local sale while adults were most likely exported for consumption.

The aquarium shops along Jl. Letjen MT Haryono did not sell native turtle species and only one of them sold Red-eared Sliders. In the bird market along Jl. Bintang, only one shop sold turtles at the time of the survey. They had nine adult Southeast Asian Box Turtles on sale for USD 5.43 each, and the store owner promised that she could get as many individuals as wanted including juveniles. Ethnic Chinese usually purchase the species in preparation of traditional medicine or for religious beliefs. Among the various small fish stalls along a small road parallel to Jl. Letjen Haryono were two no-name stores that also sold the Southeast Asian Box Turtle. The first shop sold adults for USD 5.43 per individual. The owner said that if requested he could get weekly regular supplies but not more (rather less) than 50 specimens/week. The owner of the second shop sold the species for USD 4.34 per individual. If large orders are placed he

could lower the price to USD 3.26/specimen. He further said that he could not promise getting 50 specimens/week because supplies were not that regular and animals were less common nowadays compared to some years ago.

In Pekanbaru (Sumatra), the local turtle market is supplied by at least two establishments (Table 5). At Pasar Bawa wet market one vendor sold the Southeast Asian Box Turtle and various other native turtle species to the ethnic Chinese community for local consumption. The vendor was not willing to give information on the prices. Some Chinese in Pekanbaru also buy juvenile Southeast Asian Box Turtles for release purposes (religious beliefs), while others believe in the medicinal values and buy the species in a private house whose ethnic Chinese owner is a well-known TCM practitioner. People in Pekanbaru repeatedly mentioned that members of the large ethnic Chinese community from adjacent Batam Island are regular consumers of the Southeast Asian Box Turtle.

Table 5:
Prices of locally used Southeast Asian Box Turtles

City, Locality	Price/individual (USD)	Purpose	Life history stage	Quantity at day of survey
Jakarta, Barito	3.26-10.85	Local consumption	all	52, 71
Jakarta, Fancy Pet's Shop	5.43	Pet	adult	
Makassar, Hobbie Aquarium	13.57	Pet	juvenile	No stock
Medan, KH Aquarium	2.71	Pet/release	adult	5
Medan, CV. Bonavide	5.43	Pet/release	adult	2
Medan, Jl. Bintang	5.43	TCM	adult	9
Medan, near Jl. L. Haryono, 1	5.43	Local consumption	adult	~10
Medan, near Jl. L. Haryono, 2	4.34	Local consumption	adult	~10
Pekanbaru, Pasar Bawa	?	Local consumption	adult	?
Pekanbaru, Jl. Karet	?	TCM	adult	?
Palembang, Pasar 16, Ilir	4.34	Pet	juvenile	12
Banjarmasin, Jl. Kapten P. Tendean (6 shops)	0.27, 0.33, 2.17, 2.71	Pet, consumption, TCM	juvenile	~400
Pontianak, Toko Ikan Hias	4.34-5.43	Pet	all	No stock
Pontianak, Toko Dwi Agung	5.43	Pet	all	4

In Palembang (South Sumatra), turtles were only encountered in four of the many pet and aquarium shops, but none of these stocked the Southeast Asian Box Turtle. However, a vendor at the town's wet market had 12 juvenile Southeast Asian Box Turtles and three Black Marsh Turtles *Siebenrockiella crassicollis* (Figure 18). Both species were sold for USD 4.34/specimen. The vendor explained that they were collected from nearby areas and that people usually bought them as pets.

Jalan Kapten P. Tendean in the heart of the city of Banjarmasin (Kalimantan) is famous for its shops that sell live and dead reptiles and their products and derivatives as well as other wildlife. Signboards announce the sale of hard-shelled (*kura kura*) and softshell (*Bidawang*) turtles (Figure 19). There were seven shops



Figure 18: At Pasar 16, Ilir in Palembang Southeast Asian Box Turtles and Black Marsh Turtles are regularly for sale (31.05.06)

almost side by side, six of which were visited (Table 5). Among the hard-shelled turtles, the Southeast Asian Box Turtle was the most abundant. The first shop had only few juvenile pet individuals, which they sold for USD 2.17/individual while the size of adult specimens was usually around 1 kg. Other shops also only had some juveniles, which were intended for the local pet market (USD 0.33-2.71/individual) (3rd shop see Figure 20). Shop owners said that juveniles were intended for the local pet market while adults were exported. Another shop had 350 juvenile Southeast Asian Box Turtles, which were reportedly to be sold for USD 0.27/individual to a buyer from Surabaya (Figure 21). It remains unknown whether they are intended for local utilization at or near Surabaya or whether they were supposed to be exported from Surabaya. Plastrons and carapaces of Southeast Asian Box Turtles



Figure 19: Signboard along Jalan Kapten P. Tendean in Banjarmasin announcing the sale of freshwater turtles (30.06.06)

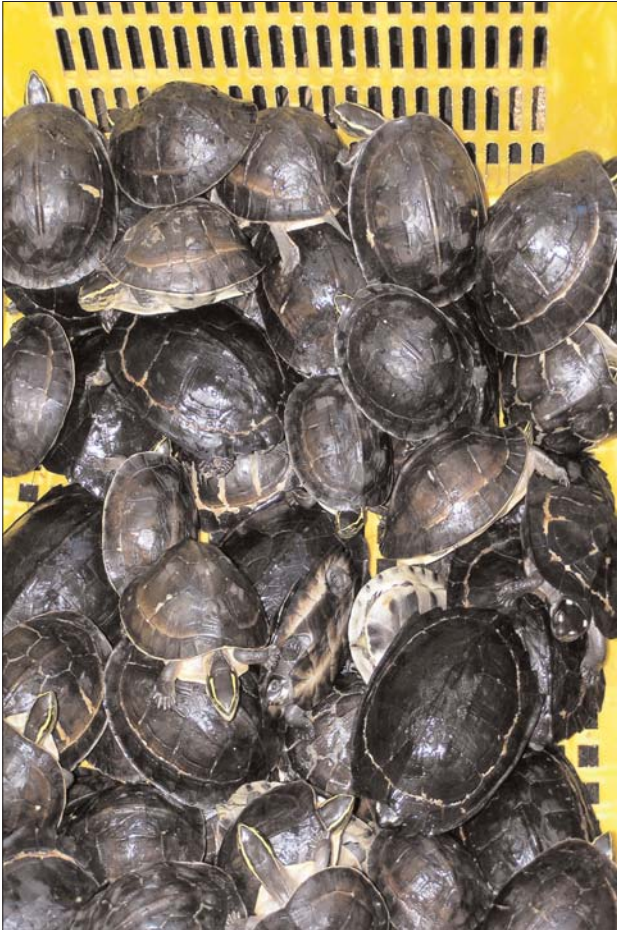


Figure 20: Juvenile Southeast Asian Box Turtles and Black Marsh Turtles that had been separated from the adults at a trader in Banjarmasin, South Kalimantan (30.06.06)



Figure 21: This shop in Banjarmasin first accumulates and then sells juvenile Southeast Asian Box Turtles to a buyer in Surabaya (30.06.06)

and other turtle species were stocked in another shop, and plastrons were viewed being sun-dried along the road in front of the shop (Figure 22). These are exported to China. According to the owner, the sale of plastron is more lucrative compared to live specimens; 1 kg plastron of the Southeast Asian Box Turtle sells for USD 7.60. Export of the Southeast Asian Box Turtle by these shops is illegal and details and extent of trade are discussed in the illegal trade chapter.

In Pontianak (West Kalimantan) two pet shops (Toko Ikan Hias, Indah, Jl. A.R. Hakim No 40/41, and Toko Dwi Agung) dealt with the Southeast Asian Box Turtle (Table 7). Toko Ikan can supply on order basis within three days. They sold one individual for USD 4.34-5.43/individual. The second shop had one small adult, one subadult, and two very small juveniles all sold for the same price of USD 5.43/individual. Mixed with other species (Black Marsh Turtle and Red-eared Slider) they usually sell about 50 individuals in four months.

Although the Southeast Asian Box Turtle was offered for sale in all of the cities that were surveyed, the number of shops/places per city, the abundance at the shops and the relatively low prices indicate that local utilization is rather uncommon and local sale is not a major business. Generally, prices are similar for local consumption and local pet trade. Jakarta, Medan and Banjarmasin can be classified as significant trade centres for local use in Indonesia based on the numbers of shops offering the Southeast Asian Box Turtle.



Figure 22: Plastrons of the Southeast Asian Box Turtle, the Black Marsh Turtle and the Malayan Giant Turtle (background), and two live Southeast Asian Box Turtle (foreground) at a trader in Jl. Kapten P. Tendean in Banjarmasin (30.06.06)

This is related to the fact that these cities are major exit points for international trade (legal and illegal) in the species. The few juveniles that are supplied by collectors are usually treated as by-catch since they have no or very low value for the consumer market in China, hence they are usually sold locally. Contrary to the low market value of the Southeast Asian Box Turtle and other native species at the local market, exotic turtle species command high prices. The Indian Star Tortoise *Geochelone elegans* for example sells for USD 25-55 depending on the size of the individual. These observations are in line with a statement of the IRATA Chairman saying that the local pet market for the Southeast Asian Box Turtle is very small in Indonesia (George Saputra, IRATA Chairman, *pers. comm.* to the researcher, 6 March 2006). A reason for

this is probably that Indonesians, the majority⁸ of which are Muslim, are not permitted by their religion to consume or even touch freshwater turtles. A more noteworthy reason is the high demand for the species in China that makes export much more lucrative than local sale.

Considering that the Southeast Asian Box Turtle together with other CITES Appendix II-listed species and nationally protected species are regularly found in Indonesian wet/pet markets, pet shops and even road-side food stalls and medicine shops, implies that BKSDA offices do not regularly inspect those places and licenses of the owners. Most shop owners frankly admitted that they do not possess permits for harvest or capture and trade. Permits for harvest or capture are usually only obtained by major suppliers and exporters but not by small-scale middlemen, collectors or local dealers. The latter collect without permits and without observing designated collection localities.



Sabine Schoppe/TRAFFIC Southeast Asia

Figure 23 a: Facilities for the Southeast Asian Box Turtle at three of the 14 companies that are registered for the pet trade of the species (March 2006)

International pet trade

A total of 14 IRATA-member companies were registered for the pet trade of the Southeast Asian Box Turtle in 2006, supplying the species to the international pet market in the US, Europe and Japan. Five claimed not to be operational at the time of the survey, the remaining nine were visited (Table 6). Only five of the nine active companies had significant stock, samples of which were measured (Figure 23).

The specimens of all five traders were identified as the Indonesian Box Turtle, the subspecies that naturally occurs in Java and Sumatra. Three exporters (No. 2, 4 & 5) had only juveniles with a maximum median carapace length (MeCL) of <160 mm

(Table 6). Two traders, No. 1 & 3 also had adults. Among the total stock of those two traders, five individuals (17%) were adults at trader No. 1 and 24 (15.5%) were adults at trader No. 3. The absolute number of individuals present at the day of survey as well as the relative amount of individual with respect

⁸ Of 234 Million people only 15% are non-Muslim (Anon., 2002c).



Figure 23 b: *Cuora amboinensis* tank



Figure 23 c: *Cuora* enclosure

to the quota of the trader was highest for trader No. 3. The 155 individuals that were encountered on the day of the survey constituted 64.6% of his annual quota. While it might have been a coincidence that the day of the visit to this trader was exactly the time he held most of his annual quota, it is more likely indicative that this trader was at risk of exceeding his quota throughout the year.

Semi-structured interviews were conducted with seven of the 14 pet traders. Two traders said that they bought the Southeast Asian Box Turtle for USD 1.74 and USD 2.17 per individual, while they sold specimens for USD 8.00 and USD 4.00, respectively. A third trader said he sold specimens for USD 3.50-4.00. In the pet trade, the Southeast Asian Box Turtle together with the Asian Leaf Turtle and the Black Marsh Turtle are the three lowest-priced species, as was indicated by four of the traders. Most of the respondents (60%) prefer smaller sizes of any gender. Individuals for the US market, however, should measure at least four inch (“four inch rule”) or an equivalent of about 10 cm. All of the seven respondents get most of their Southeast Asian Box Turtles from Sumatra, which agrees with the identification of the samples as *C. a. couro* (Table 6). Noteworthy is that some get supplies from provinces that have no quota (West Java, Bengkulu, Lampung, and Jambi). Two traders freely admitted that they never sourced individuals from Kalimantan or Sulawesi despite the geographic division of the quota that requires obtaining individuals from various

provinces. For a low-priced species like the Southeast Asian Box Turtle it is too cost intensive to source

Table 6:

Trader, date of survey, subspecies, stock relative to assigned quota, mean median carapace length \pm SD and range, and mean body weight \pm SD and range of the Indonesia Box Turtle encountered at storehouses of pet traders in Jakarta and Bogor area

Trader	Date of survey	Subspecies	Stock (% quota)	No. measured	Mean \pm SD (range) MeCL (mm)	Mean Wt \pm SD (range) (g)
1	18.03.06	<i>C. a. couro</i>	29 (7.3%)	29	109.3 \pm 33.7 (73.2-182.0)	271.8 \pm 277.1 (78-920)
2	26.03.06	<i>C. a. couro</i>	53 (3.8%)	24	117.1 \pm 20.5 (66.9-146.0)	292.9 \pm 157.1 (45-570)
3	21.03.06	<i>C. a. couro</i>	155 (64.6%)	32	126.3 \pm 34.1 (83.6-190.0)	429.1 \pm 341.6 (100-1100)
4	22.03.06	<i>C. a. couro</i>	32 (6.8%)	22	109.7 \pm 19.0 (55.6-139.0)	232.0 \pm 99.9 (28-430)
5	24.03.06	<i>C. a. couro</i>	52 (4.8%)	30	123.8 \pm 22.3 (77.9-156.0)	400.0 \pm 193.9 (80-700)
6	25.03.06	None	0	0	N/a	N/a
7	29.03.06	<i>C. a. couro</i>	4 (1.7%)	0	N/a	N/a
8	28.03.06	<i>C. a. couro</i>	4 (1.0%)	0	N/a	N/a
9	29.03.06	None	0	0	N/a	N/a

specimens from far provinces if the same can be found in nearby places. Such practices may change the stated place of origin in the SATS-DN which could then easily lead to manipulation of the quota system.

Most (41.7%) of the pet traders stated that nowadays it was more difficult to get a certain number of individuals than 5-10 years ago. None of the traders was engaged or plans to be engaged in captive breeding of the species due to its low market value in the pet trade and the high costs involved in breeding a slow-reproducing species under captive conditions. All traders use air cargo from Jakarta, with China Airlines and Japan Airlines being the common air carriers used in transportation. The main importing countries, according to interviewees, were the US and Japan, followed by Europe and the Republic of Korea. Most of the traders stated that they export shipments of amphibians and reptiles weekly but that the



Figure 24: Packing freshwater turtles following IATA standards (03.06.06)

Sabine Schoppe/TRAFFIC Southeast Asia

Box 6:**Economics of Export: Southeast Asian Box Turtle for the Pet trade.**

An exporter buys the Southeast Asian Box Turtle from his supplier for USD 1.73. He can sell it for USD 8.00 to his buyer in Europe. This price should cover the following:

1. Maintenance (food, cleaning) while keeping the animal for the time when it was received from supplier until it is exported.
2. Packaging materials and labour.
3. Freight cost from Jakarta to Europe. Shipments are usually FOB (free on board) which means that the exporter pays until airport while the rest of the transportation costs are charged to the buyer by adding these costs to the price of the specimen. The freight for e.g. 37 kg (= 54 specimens) is USD 955.26. This translates to a cost of USD 25.81/kg or USD 17.69/individual.

Hence, if the animals are large like in the example (approx. 600-700 g/individual), the shipment is not economically feasible. Only if an animal weighs 300 g or less and hence a shipment of 37 kg can accommodate 123 individuals freight becomes economically manageable. The cost for one animal would then be USD 7.76, which is basically the wholesale price that is paid for the animal in Europe. However, the exporter will still lose money because he has not paid the supplier yet nor the maintenance and packaging costs.

Southeast Asian Box Turtle is not frequently included in the cargo. Only one trader gave a more precise statement and explained that due to its low price the species is usually just a 'by-pack', which is shipped whenever additional space in a shipment is available. Mortality at the warehouses and during transportation was reported to range from 0-5%.

Indonesian pet exporters claim that the Southeast Asian Box Turtle is among the cheapest freshwater turtle species (sold for USD 3.50-8.00), and that trading the species for the pet trade is not commercially feasible (various IRATA members, *pers. comm.* to the researcher, March-April 2006). The species is treated as a "by-pack" to other more valuable turtle species and they continue trading it. Most of their Southeast Asian Box Turtles are sold to the US, Europe and Japan. Comparison of the records of the CITES Trade Database from 2000-2006 for these three regions revealed that over the years the US has always imported the highest numbers of the Southeast Asian Box Turtle from Indonesia, followed by Japan and Europe with almost equal import (Table 7). In the European pet market, the Southeast Asian Box Turtle plays a significant role (Bringsoe, 1991), and is a species of sustained popularity in the market since its entry in the 1970s from sources in Thailand and Borneo, and in the 1980s from Indonesia (Sulawesi, Moluccas) and the Philippines (Fritz and Obst, 1998). Following EU import restrictions on North American Box Turtles *Terrapene* spp., European pet keepers turned their interest to Asian box turtles (Anon., 1999c). Tens of thousands of the Southeast Asian Box Turtle were imported to Europe during the 1990s (Altherr and Freyer, 2000). Among the European countries, Germany, Spain and France are the main importers and end-users.

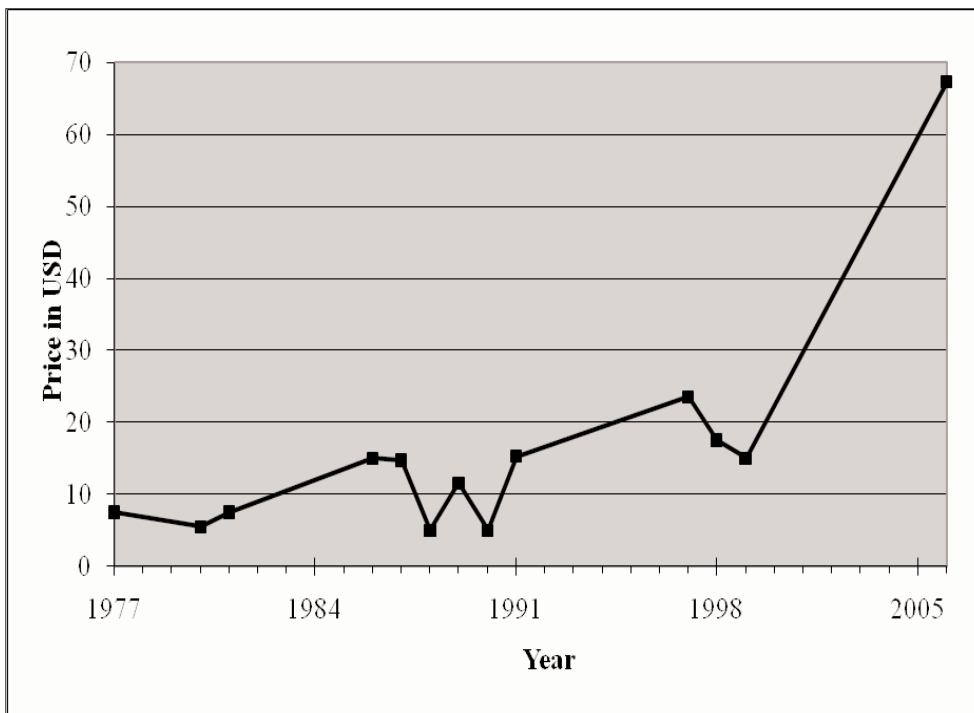
Table 7:

Reported exports of Southeast Asian Box Turtles to pet importing countries (UNEP-WCMC CITES Trade Database, 2007).

Country	2000	2001	2002	2003	2004	2005	2006	Annual average	Total
US	3956	10 167	8869	8825	10 791	8426	1798	7547.4	52 832
JP	592	2602	2449	1576	2133	1059	922	1619	11 333
Europe	969	2121	1438	2085	2731	1383	507	1604.9	11 234

Intensive market surveys by Auliya (2003) in Europe, showed that the price for the Southeast Asian Box Turtle ranged from a yearly mean of USD 5.00 to USD 23.50 in the years from 1977 to 1999 when the species was not yet CITES-listed (Figure 25). The overall mean price for this period was USD 11.90. Such comprehensive data are not available for the years following the species listing in CITES Appendix II in 2000. However, a web survey (www.southcosatexotics.com, www.steveno.nl/price_reptiles.html, www.reptilia.nl/, www.dhd24.com/, www.reptilica.de/) of retail prices in Europe, revealed that the value of the species had increased to a mean of USD 67.25 in 2006 (Figure 25).

Figure 25: Retail prices of the Southeast Asian Box Turtle in Europe (Various sources, see text)



According to web surveys by Salzberg (2000), the price for the Southeast Asian Box Turtle in the US was USD 20.00 in 2000. Current prices for the species in the US are much lower than in Europe and Japan. The present survey showed that the price in US ranged from about USD 20 to 79.99 (www.alligatoralley.com; www.fredspets.com/; www.eastbayvivarium.com/pricelist/turtleslist.html; www.abbottsturtlefarm.com; reptiledepot.com/turtles.html) in 2006. The mean for these values is USD 42.50, which is about one third cheaper than in Europe. A retail seller in Japan offered the species for a similar high price (USD 56.72) as in Europe (www.vampire-kashiwa.com).

Box 7:**Acquisition route.**

The pet traders acquire Southeast Asian Box Turtles and other reptiles from regular suppliers. Such suppliers are generally large middlemen registered with BKSDA in a respective province of Indonesia. A pet trader usually has one significant supplier in each province. The exporter's choice in provinces will definitely not depend on the abundance or occurrence of this or any other single species but rather on: 1) the diversity of the site in terms of high valuable and tradable species; 2) the economic feasibility of getting supplies from the province; and 3) the occurrence of a (reliable) supplier. Jakarta's pet traders usually have at least one supplier each in Java, Sulawesi, Sumatra, and Papua. Not all have a supplier in Kalimantan. For a species like the Southeast Asian Box Turtle that has a wide geographic distribution, the exporter will use the most economic source of supply. Logically this would be at the closest distance, Java, specifically West Java, but since Java is comparatively over-exploited most of the supply will come from Sumatra or provinces that are close to Jakarta such as Lampung, South Sumatra, Bengkulu and Jambi. However, none of these provinces has an allocated quota for the species. As a solution to this, the exporter registers its company in a certain province with quota, e.g. North Sumatra. Whether or not the specimens are collected from there is not important (and usually not checked): the company is legally registered in the province with quota, and is therefore able to obtain CITES permits wherein the origin "North Sumatra" is indicated.

International consumption and TCM trade

In Indonesia, four companies are registered for the consumption trade of the Southeast Asian Box Turtle and other freshwater turtles and tortoises (Table 8). They ship the animals live to East Asian consumer countries.

A fifth company whose export permit had expired in 2005 and which was undergoing licence renewal in 2006 used to export dead Southeast Asian Box Turtles instead of live. The company used to dry large adult Southeast Asian Box Turtle together with the Asian Softshell Turtle in ovens and grind them. The company owner said that they exclusively used large animals because small ones are more work-intensive. It is also possible that large adults are used because they are believed to have higher medicinal value. The ground animals were then packed in 10-kg-metal containers and exported about once a year to Malaysia and Singapore, a BKSDA official informed (Anon. BKSDA, *pers. comm.* to the researcher, 25 May 2006). At the day of the researcher's visit, the company still had about 1800 kg of "turtle flour" stocks waiting for the renewal of the export licence.

Of the four registered companies, one (No. IV) was registered in two provinces (South Kalimantan and West Kalimantan) but had only quota in one of these provinces in 2006. All companies were visited. They all had mainly or exclusively large (mean sizes ranging from 162-198 mm MeCL) and heavy (793-1156 g mean Wt) individuals (Table 8). It was noted that No. I had numerous individuals that – according to morphometrics – belonged to the Malayan subspecies. This subspecies, as mentioned earlier, occurs on Kalimantan but not on Sumatra. The manager of the company confirmed that they obtain individuals from Sumatra and Kalimantan (Anon., Medan, *pers. comm.* to the researcher, 20 May 2006), involving the acquisition of individuals from a geographic area for which the company had no quota and therefore no harvest and capture permits. Company No. IV from South Kalimantan (Kalsel) seems to collect in areas without quota as well. They informed that most of the stock (410 specimens) that was present during the visit was acquired from Bahaur in Central Kalimantan (Anon. Trader, Banjarmasin, *pers. comm.* to the researcher, 30 June 2006).

Table 8:

Trader, date of survey, province, subspecies, stock relative to assigned quota, mean median carapace length \pm SD and range, and mean body weight \pm SD and range of the Southeast Asian Box Turtle encountered at warehouse of consumption traders

No.	Date of survey	Province	Subspecies	Stock (% quota)	No. measured	Mean \pm SD (range) MeCL (mm)	Mean Wt \pm SD (range) (g)
I	20.05.06	Sumut I	<i>C. a. couro</i> , <i>C. a. kamaroma</i>	500 (33.3%)	20	198.3 \pm 9.8 (176.0-214.0)	1156.5 \pm 181.1 (820-1600)
II	25.05.06	Sumut I	<i>C. a. couro</i>	600 (40.0%)	10	(177.1 \pm 20.3) 144.5-213.0	902.0 \pm 290.5 (490-1300)
III	20.06.06	Kaltim	<i>C. a. kamaroma</i>	200 (3.6%)	15	168.6 \pm 45.2 (88.6-210.0)	868.0 \pm 494.4 (110-1350)
IV	30.06.06	Kalsel	<i>C. a. kamaroma</i>	410 (27.3%)	24	162.3 \pm 42.3 (66.3-193.0)	793.1 \pm 421.2 (35-1950)
	06.07.06	Kalbar	<i>C. a. kamaroma</i>	8 (no quota)	8	183.9 \pm 7.9 (169.0-196.0)	1078.8 \pm 128.3 (900-1180)

The manager further stated that Kuala Pembuang in Central Kalimantan is an important collection area for the species. The researcher observed the transfer of hundreds of rattan turtle traps from the company to Kuala Pembuang (Figure 26). Central Kalimantan has only a total quota of 1000 individuals but these are allocated to a supplier who is registered in Palangkaraya, Central Kalimantan. Therefore, the stock at the warehouse of company IV-Kalsel was not regulated by the quota, and therefore outside the legal trade structure.

It was further noted that about 27% of the total quota of company No. IV-Kalsel was delivered during the time of the research visit (3 hours). The company had received about 380 kg of assorted Southeast Asian

Box, Asian Leaf and Black Marsh Turtles, and the researcher was informed that this was just a small delivery and that occasionally 3000 kg of turtles are obtained (mainly Southeast Asian Box Turtles) in one day. This gives a reasonable assumption that this company exceeds its annual quota and most likely exports the surplus illegally. Another two companies (No. I and II) had a comparatively large stock of the species (Figure 27). Company No. I had about 500 individuals or 33% of its annual quota and company No. II had 600 individuals or 40% of its annual quota (Table 9).

Suppliers to these companies indicated that Medan's exporters use



Figure 26: Rattan funnel traps ready to be transported from a trader in South Kalimantan to his collectors in Central Kalimantan (30.06.06)



Figure 27: Storage tank of the Southeast Asian Box Turtle at one of the exporters in Sumatra Utara I (25.05.06)

to pick up the animals every two to three days (Anon. supplier *pers. comm.* to the researcher, 26 May 2006). In such a trip, one exporter can easily get 300-500 kg of the Southeast Asian Box Turtle, a supplier said. The supplier further explained that the exporters do not openly display all their stock and therefore a stock estimate based on the visible specimens usually underestimates the real situation. Medan's exporters ship cargo once a week (Anon. *pers. comm.* to the researcher, 26 May 2006). A conservative estimate based on the above information (300-500 kg/ trip, and 2-3 trips/week) indicates that 1000⁹ kg or 750 Southeast Asian Box Turtles are exported by one exporter in one week. Accordingly, the two Medan-registered exporters

are expected to export a total of 78 000 individuals in one year when the legal export quota is only 18 000 individuals divided among 4 meat exporters and 14 pet exporters (Table 9).

In summary, a total of 18 Indonesian companies are authorized by the CITES MA to trade the Southeast Asian Box Turtle internationally (Table 9). As of 19 June 2006, the pet traders had officially realized 31.1% (1825 individuals) and the consumption traders 92% (9200 individuals) of their total export quota (PHKA-KKH, *pers. comm.* to the researcher, 19 June 2006). "Realisation" by working definition of the ID CITES MA means that they had applied and were granted SATS-LN permits. Realisation does not necessary mean that the animals had already been exported.

⁹ Based on an average weight of 0.75 kg per individual *C. amboinensis couro* (please refer to Table 1).

Table 9:

Indonesia's Southeast Asian Box Turtle exporters and their 2006 quota and realisation as of 19 June 2006. (Source: PHKA-KKH)

Exporter	Quota 2006	Realisation	% of quota
		19-Jun-06	
Pet 1	398	220	55.3
Pet 2	1382	850	61.5
Pet 3	240	160	66.7
Pet 4	468	190	40.6
Pet 5	1078	300	27.8
Pet 6	240	70	29.2
Pet 7	390	0	0
Pet 8	240	0	0
Pet 9	240	0	0
Pet 10	240	0	0
Pet 11	240	35	14.6
Pet 12	240	0	0
Pet 13	240	0	0
Pet 14	240	0	0
Subtotal Pet	5876	1825	31.1
Meat 1	1500	1500	100
Meat 2	1500	700	46.7
Meat 3	1500	1500	100
Meat 4	5500	5500	100
Subtotal Meat	10 000	9200	92
Remaining balance not allocated to any trader	2124		
TOTAL	18 000	11 025	61.3

Suppliers

Most of the exporters depend on suppliers. Suppliers are defined as those companies that are registered under BKSDA at the provincial level. In this chapter, only suppliers who have a quota for the Southeast Asian Box Turtle are discussed. Unlike an export company that gets its supplies directly from collectors, every province with quota requires a registered supplier who organizes the collection of specimens ordered by an exporter. If neither an exporter nor a supplier is registered in a certain province, the allocated quota expires. In Sulse II for example neither an exporter nor a supplier was registered in 2006, hence the allocated quota of 500 individuals could not be realized.

In the various provinces that were surveyed (Sulse I, Sumut I and II, Riau, Sumsel, Kaltim, Kalteng, Kalbar, Kalsel), all except one BKSDA-registered suppliers were visited (Table 10). Based on the information obtained from the companies and the respective BKSDA offices, only one of the suppliers (No. 1) supplied pet exporters in Bogor/Jakarta. Two companies supplied other suppliers, while it appears all

Table 10:

Supplier, date of survey, province, subspecies, stock relative to assigned quota, mean median carapace length \pm SD and range, and mean body weight \pm SD and range of the Southeast Asian Box Turtle encountered at warehouse of registered suppliers

	Date of survey	Province	Sub-species	Stock (% quota)	No. measured	Mean MeCL (mm)	Mean Wt (g)	Origin	Remarks	
1	11.05.06	Sulsel	<i>C.a.a.</i>	many but not shown	10	126.8 \pm 7.95 (121.5-149.0)	302 \pm 138.1 (200-680)	Sulsel	Official pet supplier for Jakarta	
2	23.05.06	Sumut I	<i>C.a.c.</i>	~100 (~33.3%)	10	182.3 \pm 18.2 (155.0-214.0)	995.5 \pm 279.4 (580-1520)	Aceh, Sumsel, Sumut II	Exports himself	
3	31.05.06	Sumsel	Rather <i>C.a.k</i> than <i>C.a.c.</i>	~200 (~160%)	10	181.5 \pm 17.3 (158.0-214.0)	951 \pm 210.8 (600-1360)	Sumsel	Supplies No. 6	
4	01.06.06	Sumsel	<i>C.a.c.</i> & <i>C.a.k.</i> ?	~150	10	188.2 \pm 11.6 (167.0-204.0)	958 \pm 103.0 (740-1100)	Sumsel	no quota??	
5		Riau					Not visited		Supplies Medan	
6		Riau					No stock		Direct (illegal) export	
7	04.07.06	Kalsel	<i>C.a.k.</i>	3 (0.6%)	3	170.0 \pm 16.6 (151.0-177.0)	800.0 \pm 250.0 (550-1050)	Kalsel	Illegal export of body parts	
8		Kalteng					No stock		Illegal establishment	
9		Kalbar					No stock		Fake company	

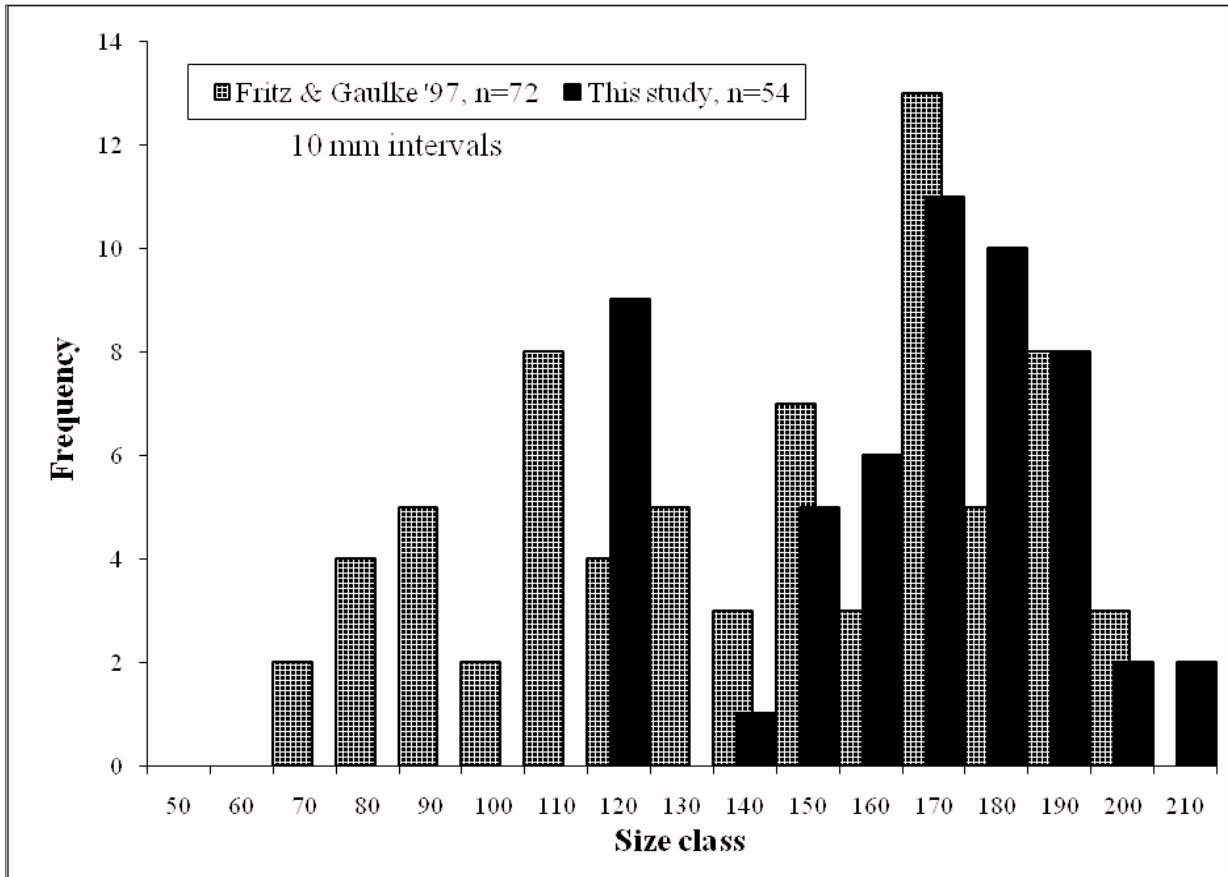
other companies were somehow involved in illegal transactions such as exporting without export license, trading without quota, dealing in plastron, running a government-owned company, or operating a fake company.

Of the eight registered Southeast Asian Box Turtle suppliers that were visited only five had stock. Of these, No. 2, 3, 4 and 7 had mainly large animals. No. 1 had mainly juveniles, and three companies had no stock at all at the day of visit (Table 10). All large individuals were intended for the meat trade. Generally, the companies had the locally available subspecies, only in the case of supplier No. 4 from Southern Sumatra, morphological data taken indicated that eventually the Bornean subspecies *C.a. kamaroma* was also present. This needs further confirmation.

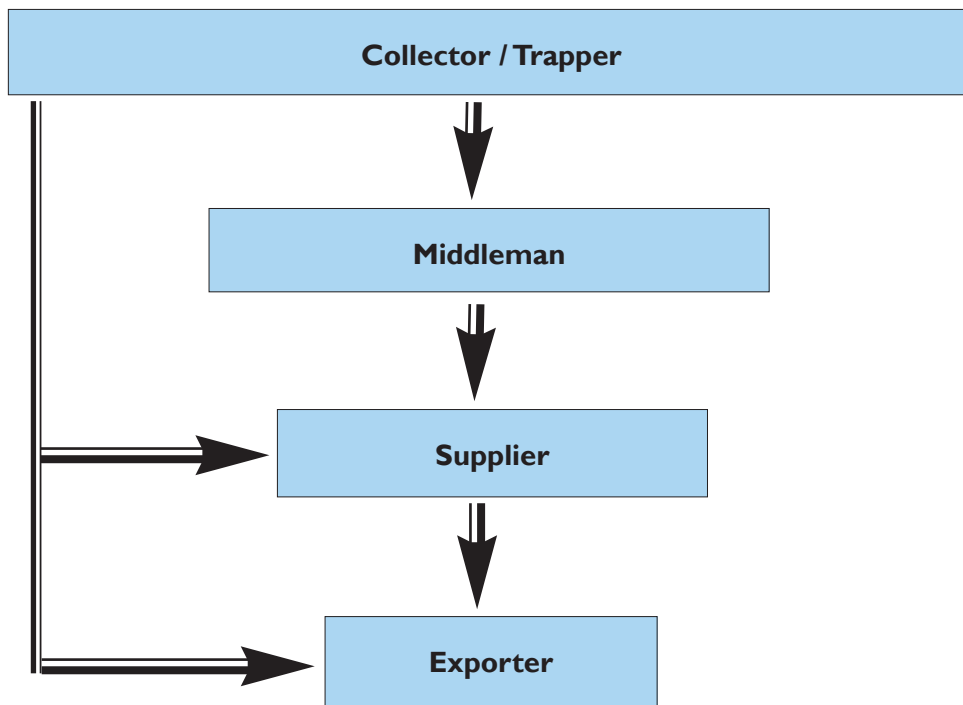
The size-frequency histogram clearly illustrates the absence of small individuals (Figure 28). No juveniles were traded and only a very small percentage of the traded animals were subadults (116 - 159 mm MeCL) while the rest were adults. A collector however usually collects all size classes. Since the supplier pays by kilogram, he would not bother to sort into size classes and reject the smaller ones but rather pay the whole delivery by kilogram. It is therefore assumed that the ratio of juveniles to adults as present at the suppliers represents the situation in the wild. Such over-representation of adults compared to juveniles can be assumed to reflect an imbalanced population in which mature individuals have been over-harvested, thus the remaining mature wild stock cannot reproduce fast enough to balance harvest, which is detrimental to the population. Therefore, juveniles are hard to find or absent. It is expected that such local populations could soon become extinct if exploitation continues at current levels. The survival of the population of the Southeast Asian Box Turtle depends on large reproductive adults, particularly mature females.

Fritz and Gaulke (1997) had assessed the size of the Southeast Asian Box Turtle present in warehouses of traders in North Sumatra in 1997. Comparing the size frequency distribution of individuals measured by Fritz and Gaulke in 1997 with those measured in this study in 2006 shows the absence of the juvenile life history stage at trader warehouses in 2006 compared to nine years ago (Figure 28).

Figure 28:
Size-frequency histogram for Southeast Asian Box Turtles encountered at warehouses of suppliers in Northern Sumatra in 1997 and in 2006



Hence not only are these suppliers responsible for the over-collection and soon local extinction of the Southeast Asian Box Turtle in their respective areas but more than half of them trade the species (and probably others) illegally.

Box 8:**Actors in trade.****Illegal trade**

In this section, only those companies/traders that were not registered for the trade of the Southeast Asian Box Turtle were examined. This was done to avoid repetition and double listing of companies that were already examined in the previous three sections (pet exporter, exporters for food and TCM, and suppliers). The present research found evidence for a minimum of 18 companies participating in illegal trade of the Southeast Asian Box Turtle (Table 11). At least one more company in North Sumatra also illegally trades the species but since this company was not visited it is not included in the analysis. Among the 18 companies, two each (11.1%) are in South Sulawesi and South Sumatra, four each (22.2%) are in North Sumatra, Riau and South Kalimantan, and one each (5.5%) in Central and West Kalimantan (Table 11). Basically, in every province that was visited illegal trade activity was encountered. Only in East Kalimantan no evidence was found (likely due to the survey being hampered by collusion).

Thirteen of the 18 illegal Southeast Asian Box Turtle traders were registered with the BKSDA in their respective provinces either for the live trade of certain other species of reptiles or for the reptile skin trade. The remaining five traders were middlemen traders or shop owners without any licence for the reptile/wildlife trade. BKSDA offices are not known to have ever reported illegal activities from the 13 registered companies despite BKSDA offices being required to regularly inspect the business of all registered traders.

Not all traders volunteered information regarding trade volumes and sales prices (Table 11). A minimum of 50 kg and a maximum of 18 000 kg or a mean of 1741.8 kg is a modest estimate for volumes of the Southeast Asian Box Turtle handled by each trader in a single week, whereas six working days per week were assumed. The 18 traders could then trade collectively between 900 kg and 324 000 kg in one week

or roughly 1 630 341 kg¹⁰ or 2 145 186¹¹ individuals of the Southeast Asian Box Turtle in one year. This constitutes about 100 times the legal harvest quota for the Southeast Asian Box Turtle. This estimate does not yet include the 78 000 individuals that are expected to be exported annually by the two Medan-registered exporters (see above).

The extent of illegal trade suggests reason enough to stop the entire trade in this species immediately. It is however expected that a trade ban would not bring any positive change but rather increase the levels of illegal trade. The Malayan Giant Turtle *Orlitia borneensis* for example is a totally protected species in Indonesia and no harvest and export is allowed (zero quota). The species is nationally and internationally categorised as Endangered (IUCN, 2007), and listed in Appendix II of CITES (CITES, 2005). Despite its legal protection the species is heavily exploited and exported in large quantities (IUCN, 2007; Schoppe, *unpubl. data*). It was traded in East Asian food markets in huge numbers of animals of all sizes (IUCN, 2007). *Orlitia* has however disappeared from visible trade in South China in recent years according to annual market visits; it may now be traded mainly in processed form or through channels that are difficult to survey (Peter Paul van Dijk, Conservation International, *in litt.* to the researcher, 12 September 2008).

Many traders deal solely with plastrons and carapaces of the Southeast Asian Box Turtle. Shell trade implies that exclusively adults are slaughtered to obtain their shells because the Chinese TCM practitioners believe that juveniles have not yet developed the healing power of older animals. The plastron is of especially high commercial value because it is an important ingredient in the preparation of TCM. The carapace is treated as a by-product with a much lower value despite the evidence that there is no difference in the utility and efficacy between plastron and carapace (Asian Turtle Trade Working Group, 2000). Plastron sale prices ranged from USD 4.34 to 7.60 per kilogram (mean USD 6.65/kg), followed by mixed shell with mean price of USD 3.06/kg, while carapace could be sold for only an average of USD 1.09/kg in 2006 (Table 11). The trade of these body parts is much easier to conceal than cargoes that contain live animals, and they are even more lucrative than the trade of live animals that require higher freight costs. Plastrons are often concealed under dry snakes, or other live species such as Red-eared Sliders (Customs and Excise Department, 2006). Live turtles were sold for a mean of a mean of USD 2.41/kg.

The import of plastron from non-CITES species to East Asia is completely legal and does not need to be declared. The product name is usually “Tortoise shell, Terrapin plastron (incl. for Chinese drugs)” and the importers do not have to declare the species as long as the exporting country does not require it (Tien-Hsi Chen, Associate Researcher, National Museum of Marine Science and Technology, Keelung, Taiwan, *in litt.* to the researcher, 8. April 2007). For the layman species identification based on the plastron is almost impossible, hence exporters either mix plastron from CITES with plastron from non-CITES species or they simply declare CITES species as being non-CITES species. Taiwan alone imported 403 583 kg of hard-shelled turtle shells between 1992 and 1998 from Indonesia (Chen *et. al.*, 2000). This is equivalent to an annual mean of 57 655 kg of turtle shell. Among these the Southeast Asian Box Turtle is the most common species and constitutes together with the Malayan Snail-eating Turtle *Malayemys subtrijuga* and the Black Marsh Turtle more than 75% of the total amount (Chen *et. al.*, 2000).

¹⁰ Based on the weekly mean of 1741 kg multiplied with 18 traders and the 52 weeks of one year.

¹¹ Based on an average weight of 0.76 kg per individual, whereas the average weight was computed for all three subspecies (refer to Table 1)

Table 11:

Origin, approximate trade volume (live), sales price, commodity (live, plastron or carapace) and primary destination of illegally traded Southeast Asian Box Turtles based on 18 illegal traders

No.	Province	Trade volume (kg/week)	Price (USD/kg)	Commodity	Primary destination
1	South Sulawesi	140	7.06	Plastron	Pare Pare
2	South Sulawesi		1) 0.76-0.87	1) Live	1) Makassar
			2) 5.43	2) Plastron	2) Makassar
			3)	3) Carapace	3) Sengkang
3	South Sumatra	?	1.09	live	Palembang
4	South Sumatra	200-500	1) 0.87	1) Live	1) Jakarta & Tembilahan
					2) Singapore & China
				2) plastron/carapace	
5	North Sumatra	3000-4000	3.80-4.34	Live	Belawan
6	North Sumatra	50-100	1.52	Live	Kisaran, Binjai Baru
7	North Sumatra	200-300		Live	Medan, Jakarta
8	North Sumatra	50-200	1.63	Live	Tanjug Morawa, Medan
9	Riau	? had 100	0.65	Live	Medan
10	Riau	? had 120 stock		Live	Mouth of Siak River, east coast
11	Riau	? a lot		Plastron/carapace	Tembilahan
12	Riau	1000	2.86??		Tembilahan
13	South Kalimantan	?	3.26	Plastron/carapace	
14	South Kalimantan			Live	Jakarta?
				Plastron/carapace??	
15	South Kalimantan	1800-6000	1) 7.60	1) Plastron	Banjarmasin
			2) 1.09	2) Carapace	Banjarmasin
			3) 0.27/ind	3) Juveniles	Surabaya
16	South Kalimantan		1) 7.60	1) Plastron	Surabaya
			2) 1.09	2) Carapace	
17	Central Kalimantan	1200-18 000	1) 4.34	1) Plastron	Banjarmasin and/or Tembilahan
			2) 1.09	2) Carapace	
			3) ?	3) Live (rarely)	

Between 2002 and 2006 exports of shell from Indonesia to Taiwan 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, *in litt.* to the researcher, 8. April 2007)¹². Indonesia is the main supplier of turtle to the TCM market in Taiwan, representing 42.1% and 35.7% of the shell imports to Taiwan in 1992-98 and 2002-06, respectively. Chen stated that the live turtle trade may have decreased but the volume of turtle shell trade increased (Tien-Hsi Chen, Associate Researcher, National Museum of Marine Science and Technology, Keelung, Taiwan, *in litt.* to the researcher, 8 April 2007).

¹² The average weight of a medium-sized turtle plastron is less than 100 g (Tien-Hsi Chen, Associate Researcher, National Museum of Marine Science and Technology, Keelung, Taiwan, *in litt.* to the researcher, 8. April 2007).



Figure 29: Illegal trade of the Giant Malayan Turtle *Orlitia borneensis* is extensive in Kalimantan. Animals are kept alive until certain numbers are reached and stocks are picked up by suppliers or exporters (22.06.06)

Another way of trading the species was observed in Medan where one company has specialized in drying and grinding turtles. Live Southeast Asian Box Turtles and Asian Softshell Turtles are dried in large ovens and then mixed and ground beyond recognition. Only an experienced eye will be capable of identifying the “flour” as turtles and only an expert or DNA analysis can tell the species, if at all (Figure 36). This creates problems for trade controls and enforcement and provides opportunities for mislabelling of the end product. This problem had earlier been recognized by van Dijk (2000). According to the IRATA Chairman (George Saputra, IRATA Chairman, *pers. comm.* to the researcher, 6 March 2006) Southeast Asian Box and other turtles are also often exported as frozen meat which is declared ‘fish’. Fish products are rarely inspected and often customs officers do not have the skill to differentiate between fish and reptile meat.



Figure 30: Evidence for plastron trade in South Sulawesi (15.05.06)



Figure 31: Sacks of Southeast Asian Box Turtle carapace are stored before traded to Sengkang (15.05.06)



Figure 32: The storage of turtles in sacks at this skin trader in South Sumatra speaks for a fast turnover (01.06.06)



Figure 33: Warehouse of a trader in Riau. Crates in the back are part of an illegal Southeast Asian Box Turtle shipment waiting to be loaded for its trip to Singapore (10.06.06).



Figure 34: Newly slaughtered and still alive: the Southeast Asian Box Turtle without its "box" at a trader in South Kalimantan (04.07.06)



Figure 35: Newly slaughtered Southeast Asian Box and Spiny Hill Turtles at a trader in Central Kalimantan (01.07.06)



Figure 36: Southeast Asian Box and Asian Softshell Turtles ground beyond recognition (25.05.06)

Trade routes

Information on trade routes was gathered through informal interviews with collectors, traders, exporters and labourers at reptile selling/keeping outlets in Java, Sulawesi, Sumatra and Kalimantan.

The trade centre in South Sulawesi is the provincial capital Makassar, which receives plastron and carapaces from the southern part of the province, and also live individuals, many of which are collected in areas without quota such as Kolaha and Kendari. From Makassar most of the illegal trade goes via Jakarta and Surabaya to Hong Kong SAR and mainland China.

In North Sumatra, live Southeast Asian Box Turtles are shipped from Medan via Belawan to Hong Kong and Penang. Illegal shipments are also regularly sent from Tanjung Balai to Hong Kong and to Malaysia.

In Riau, illegal plastron trade is encountered in Pekanbaru. Live turtles are illegally shipped from Pekanbaru via Siak River to Malaysia and Singapore. They are also illegally shipped from Pekanbaru via Tembilahan to Singapore. Other illegal shipments also originate in Tembilahan and are sent by boat either directly or via Batam to Singapore.

Jambi has no quota but illegally collected individuals are transported to Pekanbaru (Mumpuni, CITES SA, LIPI, *pers. comm.* to the researcher, 2006) and exported to Singapore. Live individuals are also illegally acquired from Kalimantan.

In South Sumatra, plastron/carapace trade was encountered in Palembang from where the shells are sent to China. Live individuals are illegally traded from Palembang via Pekanbaru and Tembilahan to Singapore. Another trade route connects Palembang with Medan.

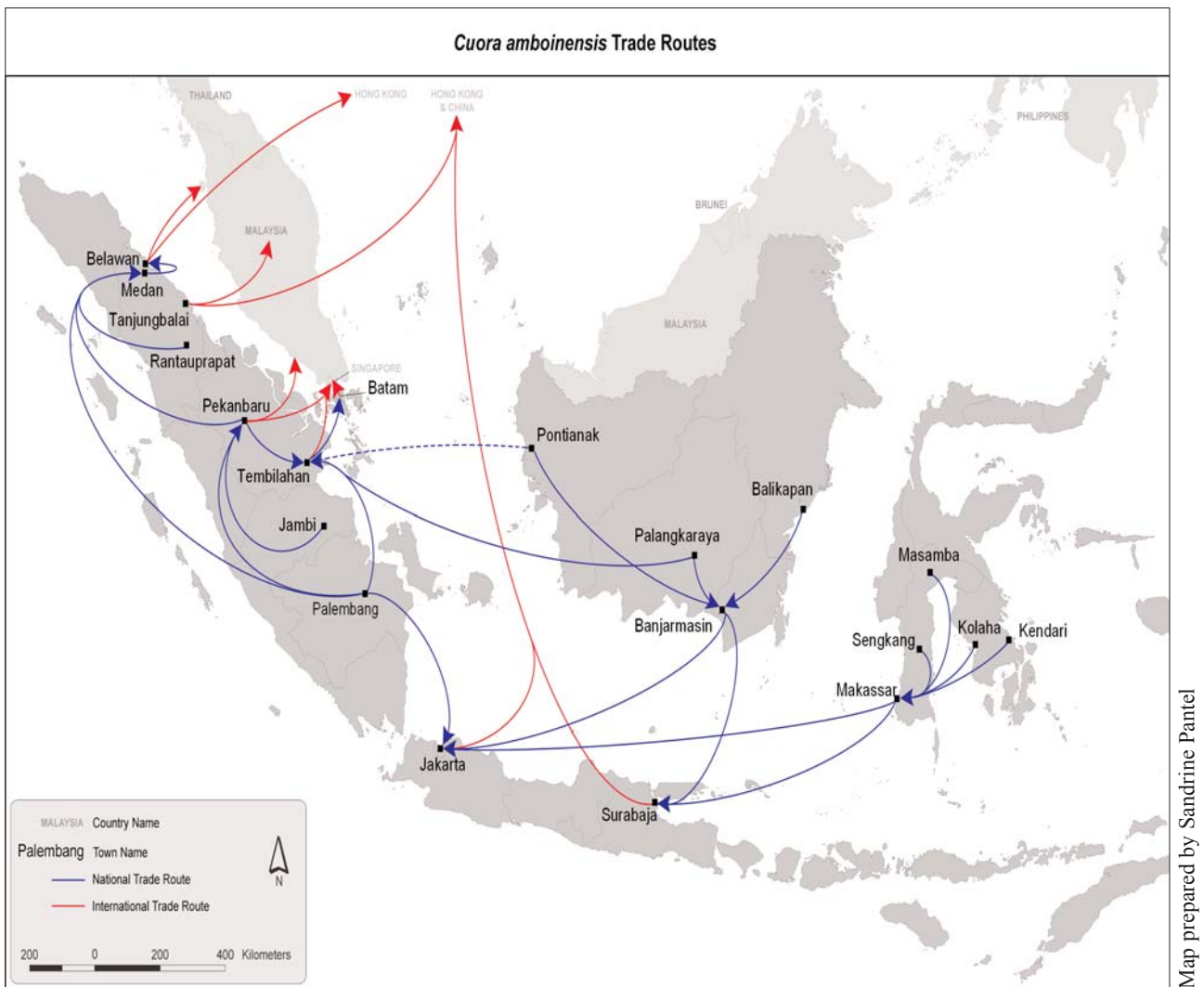
Illegal plastron and carapace trade is rampant in Kalimantan, especially in Central and South but some collectors in East Kalimantan are also engaged in this illegal business. All plastron/carapaces usually end up in Banjarmasin from where they are forwarded – among other destinations – to Surabaya. Illegal trade of live turtles occurs in Palangkaraya (Central Kalimantan) and Banjarmasin. Banjarmasin is a centre of the illegal reptile trade with protected and quota-regulated species (also turtles) sold along the road.

In summary, the following main ports of export in Indonesia and destinations abroad were identified (Figure 37):

1. Makassar via Jakarta and/or Surabaya (plane) to Hong Kong and China (consumption and plastron trade)
2. Medan via Belawan (boat) to Hong Kong and Penang (consumption trade)
3. Tanjung Balai (boat) to Hong Kong, China, and Malaysia (consumption trade)
4. Pekanbaru (boat) to Malaysia and Singapore (consumption trade)
5. Tembilahan (boat) via Batam to Singapore (consumption trade)
6. Banjarmasin via Surabaya and/or Jakarta (plane) to Hong Kong and China (consumption and plastron trade)

Among these, only Makassar (Ujung Padang), Medan, Jakarta and Surabaya have designated ports of entry and exit for CITES Appendix II-listed species (Annex 3).

Figure 37:
Map showing main trade routes within and out of Indonesia



Alternative production systems

In general, Indonesia currently allows for the export of first generation (F_1) individuals for CITES Appendix II-listed species as captive bred and therefore outside the quota that only applies to wild-caught individuals (Anon., 2005a). Before 2005, only animals of the second generation (F_2) were allowed to be exported (Anon., 1999b). Following the ongoing demand for the Southeast Asian Box Turtle from Hong Kong SAR and mainland China while at the same time – in line with the requirements as a CITES Party – being responsible for the sustainable management of wild populations, the CITES MA in Indonesia asserted pressure on several traders to breed the species. Some companies that previously had permits for harvest or capture from the wild are now only permitted to trade “captive-bred” individuals. In accordance with the Ministry Decree 447, companies that want to engage in captive breeding of the Southeast Asian Box Turtle need to apply for a Permit for Captive Management from the Head of BKSDA (Anon., 2003b). BKSDA decides within 14 days on whether a permit will be granted or not. A captive management permit is valid for five years after which it can be renewed. So far, there is no company in Indonesia or elsewhere in the range countries of the species, that breeds the species on a commercial scale. The species is bred in small numbers by private breeders outside countries of its origin (Kerlen, 2002, 2004, 2005; Struijk and

Woldring, 2005), and there are some indications that successful breeding at small but commercial scale is taking place in greenhouses in southern China (Peter-Paul van Dijk, Conservation International, *in litt.* to the researcher, 12 September 2008).

The UNEP-WCMC CITES trade database, however, indicates that the US imported 76 captive-bred specimens from Indonesia in 2003 (Table 12). Since the US only imports the species for the pet trade, these specimens might have originated from one or more of the IRATA members who export the species for the international pet trade. However, no IRATA member currently breeds, has ever bred, nor intends to breed the Southeast Asian Box Turtle. It is assumed that these 76 specimens imported by the US were falsely declared as captive bred following the increasing pressure from the CITES MA in Indonesia urging exporters to engage in captive breeding to limit the extraction from the wild. Samedi and Iskandar (2000) noted that among 40 exporters surveyed, five stated that they had initiated captive ranching or rearing of freshwater turtles in 1997/98; however there are no confirmed official records of such operations in Indonesia (Auliya, *in prep.*).

Table 12:
UNEP-WCMC CITES trade data on ex- and imported Southeast Asian Box Turtles declared as captive bred

Year	Importer	Exporter	Import Quantity	Import Purpose	Export Quantity
2000	CN	MY		Not indicated	4500
2000	HK	MY		Not indicated	3800
2003	US	ID	76	Trade	
2004	AE	CH	6	Zoos	

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. The species reaches maturity in captivity at about 4-5 years, and females lay 2-4 (mean 3) clutches of 1-5 (mean 2) eggs per clutch per year. These results – provided that legally obtained sexually mature specimens are at hand – imply an average of $3 \times 2 = 6$ eggs per mature female per year. Assuming a rather high survival of 50% from egg to juvenile, a mature female could produce three juveniles in one year. In the most favourable conditions, these could grow to 100 mm MeCL in one year (Schoppe and Dolorosa, *in prep.*), which is the minimum size for pet turtles traded to the US. To obtain such fast growing hatchlings the turtles have to be kept in enclosures that grant regular uptake of calcium and vitamin enriched food, clean water, shelter, exposure to sun, among other needs. Hatchlings and small juveniles are predominantly carnivorous, which does not only mean that feeding is more expensive than for herbivorous ones, but it also involves more maintenance of the tanks since rotten food items will easily deteriorate the water quality of the tank.

If conditions are less favourable, and feeding not appropriate or irregular a hatchling might take up to two years to reach a size that is marketable for the pet trade (Schoppe and Dolorosa, *in prep.*). Subadult hood (?116 mm MeCL) and therefore a marketable size for the consumption trade is reached at about 13-15 months depending on captive management conditions. Once the juveniles are aged about one year, they eat more vegetables and fruits, which lowers the maintenance costs. Nevertheless, keeping an animal for more than a year before it can be traded for consumption (which is the trade with the highest demand and the highest price) or for 4-5 years before it will breed is definitely commercially unfeasible, and nobody who depends on trading turtles for livelihood would engage in this practice.

The fact that companies that are pressurized by regulations to breed the Southeast Asian Box Turtle come up with breeding reports that are far from being realistic is therefore not surprising (Table 13). A company might continue getting stocks from the wild and report – as requested – the “breeding efforts” to the MA. It is not clear whether these breeding operations are regularly monitored by the authorities. This will give the company the legality to continue trading the species, and the necessary documentation that the animals are captive bred.

The situation is exemplified by a 2006 report for the period January to May of two companies in Central Kalimantan. One company (A) with a parent stock of 98 individuals bred 950 individuals in 2006 of which 900 were traded in the same year (Table 13). This implies – assuming that the female : male ratio of their parent stock was 3:1 – that each of the 73.5 females had produced 12.9 offspring in only five months. However, assuming best conditions, each of the 73.5 females could only have produced an average of 1.5 eggs x 2 clutches = 3 eggs in half a year or a total of 220.5 eggs during the months that are covered by the report.

The egg and early juvenile mortality is assumed to be about 50% similar to what is known for American freshwater turtles (see above), in absence of related references from Southeast Asian species. However, the company stated that 900 of the 950 offspring were traded – in other words – exported for the consumption trade. This would require a never-before recorded survival rate of the individuals. Another company (B) reported to breed 756 offspring from a parent stock of 40 individuals (Table 13). Again, the best scenario (3:1 female male ratio, 3 eggs per female, 100% egg survival) could only have provided 90 eggs.

Table 13:
Reported parent stock and captive bred Southeast Asian Box Turtles in Central Kalimantan as of early 2006

Company	Parent stock	Offspring stock	Total stock	Realisation	Remaining stock
A	98	950	1048	900	148
B	40	756	796	-	796

(Source: BKSDA Palangka Raya, Central Kalimantan, as of May 2006.)

Breeding the Southeast Asian Box Turtle for the consumption trade (i.e. rearing individuals to adult size) is not economically feasible and should not be encouraged by the CITES MA because it leads to misreporting and likely illegal activities. An economic analysis could be conducted to determine the feasibility of breeding the species for the pet trade i.e. juveniles. Lee *et al.* (2004) stated that breeding of endangered species for commercial use, other than the ones that are self-sustained now, should not be attempted as survival in the wild would be further threatened by the need for founding and supplementary stock. This current research concurs with Jenkins (1995) who stated that for Southeast Asian freshwater turtles, captive breeding operations may help to meet the demand for pets and for release animals. However, it is likely that in the majority of cases growth rates will be too slow to provide animals for the food and medicinal trader at an economic profit, at least while wild collected animals are still traded.

The only species of Asian Box Turtle that have recently been bred in considerable large numbers are the Chinese Three-striped Box Turtle *C. trifasciata* and the Vietnamese Three-striped Box Turtle *C. cyclornata* (Zhou *et al.*, 2007). The adult to offspring ratio which is 1:1 is only economically acceptable because the two species have high market prices of USD 1,500.00-1,625.00/individual.

The researcher observed that Indonesia's accredited rescue centres such as the one in Cikananga in West Java have numerous Southeast Asian Box Turtles. However, maintenance of the populations constitutes a problem, as financial and logistical limitations restrict breeding the species. Financial and technical assistance should be extended to those centres. If financially supported, breeding facilities could be provided, studies be conducted on reproduction and growth and as a result some assurance populations be created. In the long run, offspring could eventually supply the pet market, if ecologically and economically feasible, or be reintroduced to areas in the wild where harvest is banned or successfully regulated with the guidance of experts.

Abundance of the Southeast Asian Box Turtle in the wild

Population survey

During the course of the six-week population survey in a peat swamp forest area of the National Park Rawa Aopa, a total of 71 Wallacean Box Turtles were caught. The funnel traps set in water proved to be the most successful collection method under the environmental conditions at the time of the survey. Frequent rain resulted in flooding of the pitfall traps and visual encounter surveys were difficult due to dense vegetation. The Schumacher and Eschmeyer population size estimate resulted in a population size of 120 individuals in the study area. The area measured approximately 2 ha, hence, the population density estimate was approximately 60 individuals/ha (Table 14).

To the knowledge of the researcher, this is likely to be the first time the population size of the Southeast Asian Box Turtle has been systematically assessed: no published data by other than the researcher are available to compare with this study's results. The only other available and readily comparable data for the same species are from Malaysia where the researcher conducted a similar survey but in an open-accessible and exploited area (Schoppe, 2008b). In Peninsular Malaysia, the population size of the Malayan Box Turtle was assessed in an oil palm plantation, which used to be a collection area for the species until recently. Although the study area in Malaysia was about 15 times larger than the one in Indonesia, only 24 individuals of the Malayan Box Turtle were collected in more than five weeks (Table 14). Also the Schumacher-Eschmeyer estimate resulted in 24 individuals, hence the density was calculated as 0.82 individual/ha as compared to 60 individual/ha in the protected area in Indonesia.

Table 14:
Comparison of two population surveys conducted on the Southeast Asian Box Turtle

	Protected area	Exploited area
Subspecies	Wallacean Box Turtle	Malayan Box Turtle
Habitat	Peat swamp forest	Oil palm plantation
Conservation status of habitat	Nationally protected park	Open accessible plantation
Size of study area (ha)	2	29.25
No of animals caught	71	24
Estimated population size	120	24
Population density (individual / ha)	60	0.82
Source	This study	Schoppe, 2008

Density data of the Southeast Asian Box Turtle that were obtained from Palawan, Philippines during a study that targeted the Philippine Forest Turtle *Siebenrockiella leytensis* and hence assessed forest streams and adjacent areas are lower than those in the protected area in Indonesia but much higher than in the exploited area in Malaysia. In Palawan densities of 7.2, 8.4, 11.6 and 21.9 individuals/ha were encountered in four different sites that were surveyed (Schoppe, *unpubl. data*). It is expected that density is much higher in habitats that perfectly suit the preferences of the Southeast Asian Box Turtle such as rice fields, marshes, and peat swamp forests.

This striking difference suggests that the population in the Malaysian plantation is either heavily over-exploited, or that natural habitats can support higher population densities. Furthermore, data indicate that one hectare of natural habitat can meet the biological requirements of at least 60 individuals. It remains unknown whether a density of 0.82 individual/ha is enough to sustain a population. Further studies are needed to compare population sizes and densities among sites and over time.

The morphological data that were taken for the specimens that were collected during the current population survey revealed that both sexes were similar in mean median carapace length, width and weight but differed significantly in mean median plastron length and width as well as in body height (Table 15).

Table 15:
Mean \pm SD and range sizes and body weight of specimens caught during the population survey in TNRAW.
(Sizes are in mm, weight is in grams)

Sex	MeCL	MaCW	MePL	PW1	PW2	BH	Wt
Female	159.6 \pm 23.0	121.8 \pm 10.2	148.7 \pm 22.7	75.3 \pm 9.2	82.3 \pm 10.2	64.1 \pm 10.0	630.8 \pm 238.9
(n=28)	(118.0-200.0)	(103.0-140.0)	(106.0-182.8)	(60.0-92.6)	(61.3-103.0)	(42.0-79.0)	(240-1080)
Male	159.9 \pm 20.1	118.0 \pm 13.5	136.9 \pm 11.4	69.7 \pm 4.7	77.6 \pm 6.0	62.4 \pm 24.9	544.8 \pm 134.3
(n=24)	(110.5-177.0)	(97.0-158.5)	(103.5-12.5)	(58.0-79.5)	(60.5-85.5)	(46.0-70.0)	(220-840)
Juvenile	67.6 \pm 16.9	62.6 \pm 15.8	59.6 \pm 16.2	34.4 \pm 9.8	35.3 \pm 10.4	27.2 \pm 7.0	57.5 \pm 57.3
(n=19)	(51.5-110.0)	(48.6-100.9)	(47.4-102.0)	(27.0-62.0)	(26.0-62.0)	(22.0-24.0)	(20-220)

Based on the median carapace length individuals were assigned to life-history stages. Results show that the population was composed of 0 hatchlings, 19 juveniles, 20 subadults and 32 adults (Table 16). For direct comparison with data that only distinguish between two general life history stages (immature and mature), these more general stages were also applied here. Accordingly, the population under study was composed of 54.9% immature and 45.1% mature individuals (Table 16). It is believed this composition reflects a healthy population with enough adults for continuous reproductions as well as immature individuals in various size classes. Again, only few comparative data are available. Alviola *et al.* (2003) examined a population of the Wallacean Box Turtle in the Philippines. They found eight juveniles (14.8%), 16 (29.6%) subadults and 30 (55.5%) adults, the relative composition of which is similar to the findings of the present study. The relative composition of the exploited population in the survey site in Malaysia was 20.8% mature versus 79.2% immature individuals, which indicates over-exploitation of the larger life history stages leading to an imbalanced population composition (Schoppe, 2008b), and suggests that over-exploitation at least partly explains the much lower densities estimated for this site.

Table 16:**Absolute and relative abundance per life history stage of the Southeast Asian Box Turtle collected in TNRAW**

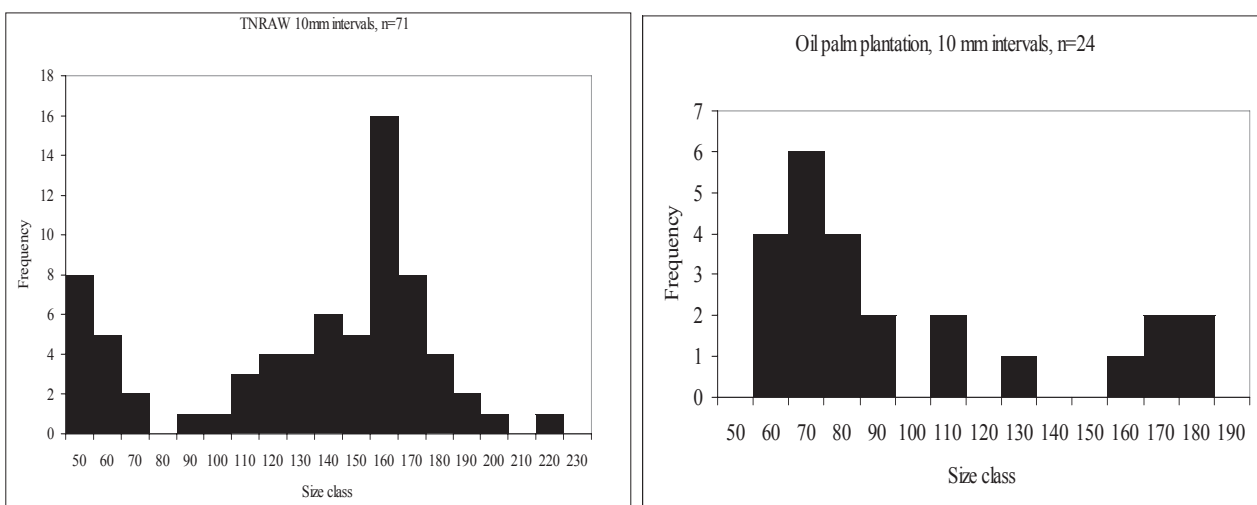
Size class	MeCL (mm)	Specific life history stage	n	%	General life history stage	n	%
I	<50	Hatchling	0	0			
II	51-115	Juvenile	19	26.8	Immature	39	54.9
III	116-159	Subadult	20	28.2			
IV	>160	Adult	32	45.1	Mature	32	45.1

However, not only the number of adults is significant, but also the male : female ratio. The sex ratio in *Aviola et al.* (2003) was 1:0.875 in favour of males. In the present study, females slightly dominated resulting in a male to female ratio of 1:1.2. Data from the study in Malaysia by Schoppe (2008b) indicate a ratio of male : female of 1:3. The harvest survey in Kota Bangun, West Kalimantan derived at a sex ratio of 1M:1.03F. Sex ratio varies among species and age groups. Ernst *et al.* (1994) noted based on American freshwater turtles that sex ratio should be 1:1 or slightly in favour of females to grant reproduction in the wild. This seems also to be true for marine turtles. For the Kemp's Ridley Sea Turtle *Lepidochelys kempii* it was found out that the greatest rate of reproductive return was achieved with a sex ratio of 1.28F:1.0M (56.2% female) (Coyne, 2000). According to Bury (1979) most freshwater turtles in fact have a 1:1 adult sex ratio. Ewert and Nelson (1991) however showed that sex bias was in favour of male in 31 cases and in favour of females in 15 cases. To determine whether harvest is exceeding sustainable limits the most important aspect is whether the sex ratio changes over time because of over-exploitation.

The size-frequency histogram shows a conspicuous separation into the two general life history stages (Figure 38, left). In the TNRAW population, the shape of the curve is bell-shaped and therefore reflects a normal distribution. Comparison to an over-exploited population in Malaysia shows clearly that the exploited population is under-represented by adults, frequency distribution is not bell-shaped and distribution therefore not normal representing an altered population structure (Figure 38, right).

Figure 38:

Size-frequency distribution of a population of the Wallacean Box Turtle in the TNRAW (left) and of the Malayan Box Turtle in an oil palm plantation in Peninsular Malaysia (right)



Harvest survey

During the 43 days of harvest survey in Kota Bangun, West Kalimantan a total of 1547 Malayan Box Turtles were collected by the four middlemen (A-D) who agreed to join the survey (Table 17). It is assumed that these constitute 100% of the stock that was traded by these middlemen. Most of these turtles were collected with funnel traps and only few were harvested by hand. To better understand the extent of exploitation, daily, monthly and yearly mean catches were extrapolated for the total of all four middlemen and as a mean for one middleman (Table 17). 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 (Table 17). It was not possible to calculate catch-per-unit-effort (CPUE) since the number of collectors supplying each middleman was not constant. Sometimes three, four or “several” delivered their catch to the middleman. The total mean catch of these four middlemen per year, as extrapolated, constitutes more than half of the annual national quota for the species. Collectors and middlemen interviewed insisted that the time of survey fell into a lean collection time and that normally more individuals per unit time can be collected. This gives reason to believe that East Kalimantan exceeds the allocated provincial harvest quota.

Table 17:
Catch of the Southeast Asian Box Turtle traded by four middlemen in Kota Bangun, West Kalimantan

Middleman	Total	Mean number /day	Mean number /month	Mean number /year
A	546	12.7	380.9	4571.2
B	844	19.6	588.8	7066
C	85	2.7	79.7	956.3
D	72	2.3	67.5	810
Total A-D	1547	37.2	1117	13 403.5
Mean A-D	386.8	9.3	279.2	3350.9

The site should be monitored to determine whether this rate of exploitation is sustainable. No similar study has ever been conducted or made public for any Southeast Asian freshwater turtle. A similar harvest study was conducted in Selangor, Malaysia where the catch of two middlemen was assessed (Schoppe, 2008b). Unlike in Kota Bangun, in Malaysia animals were collected mainly from oil palm plantations and the surrounding river and drainage systems. In 38 days, two Malaysian middlemen collected a total of 385 individuals (Table 18). Accordingly, total means per year for both middlemen and mean annual catch for one middleman were 3647.4 and 1823.7 individuals, respectively. This is only about half what is collected by one middleman in Kota Bangun.

Table 18:
Catch of the Southeast Asian Box Turtle traded by two middlemen in Sabak Bernam, Peninsular Malaysia

Middleman	Total	Mean number /day	Mean number /month	Mean number /year
I	208	5.5	164.2	1970.5
II	177	4.7	139.7	1676.8
Total I & II	385	10.1	303.9	3647.4
Mean I & II	192.5	5.1	152	1823.7

Generally, data are believed to be comparable in as much as the middlemen in both areas stated that the survey period fell into a lean collection time, either due to seasonality as in Kota Bangun or due to low prices as in Malaysia. Hence, catch and therewith abundance is higher in the Kota Bangun site than in the Malaysian site. This might be related to differences in habitat (man-made oil palm plantation *versus* natural wetland) or because turtles in the Malaysia site are more heavily exploited than those in the Indonesian site. As long as other comparative data are not available, the precautionary principle should apply, and catch and exploitation rate should be monitored on a regular basis.

Morphological data that were collected for 655 of the 1547 harvested individuals showed that data obtained for male and female differed significantly in all traits except PW2 from each other (Table 19). Females were relatively heavier, higher, wider at the hinge area (PW1), had larger plastrons and wider carapaces but were slightly shorter in median carapace length than males. Sex ratio was 1:1.03.

Table 19:
Mean \pm SD and range sizes and body weight of specimens caught during the harvest survey in Kota Bangun.
(Sizes are in millimetres, weight is in grams)

Sex	MeCL	MaCW	MePL	PW1	PW2	BH	Wt
Female	173.2 \pm 18.3	131.4 \pm 11.8	170.7 \pm 18.7	78.1 \pm 7.6	93.6 \pm 10.5	85.4 \pm 9.8	1008.7 \pm 283.7
(n=282)	(112.0-215.0)	(91.0-155.0)	(104.0-206.0)	(54.0-111.0)	(54.0-114.0)	(54.0-112.0)	(250-1650)
Male	176.9 \pm 20.8	128.4 \pm 11.7	163.1 \pm 18.3	74.8 \pm 9.5	93.6 \pm 10.9	77.4 \pm 7.4	928.5 \pm 255.2
(n=308)	(107.0-208.0)	(77.0-168.0)	(71.5-200.0)	(48.0-112.0)	(50.0-114.0)	(49.0-98.0)	(150-1470)
Juvenile	104.2 \pm 10.1	85.9 \pm 7.9	98.7 \pm 11.7	51.4 \pm 5.2	54.3 \pm 5.8	49.8 \pm 5.9	198.5 \pm 59.1
(n=65)	(70.0-119.0)	(60.0-96.0)	(64.5-124.0)	(36.0-61.0)	(36.0-64.0)	(31.5-60.0)	(60-310)

The assignment of general life history stages to all of the 1547 harvested individuals revealed a composition of 4.2% immature and 95.8% mature individuals (Table 20). Looking back into the morphological data (Table 20) will show that mean size of both male and females is rather large. This shows a clear preference of collectors and traders for large adults.

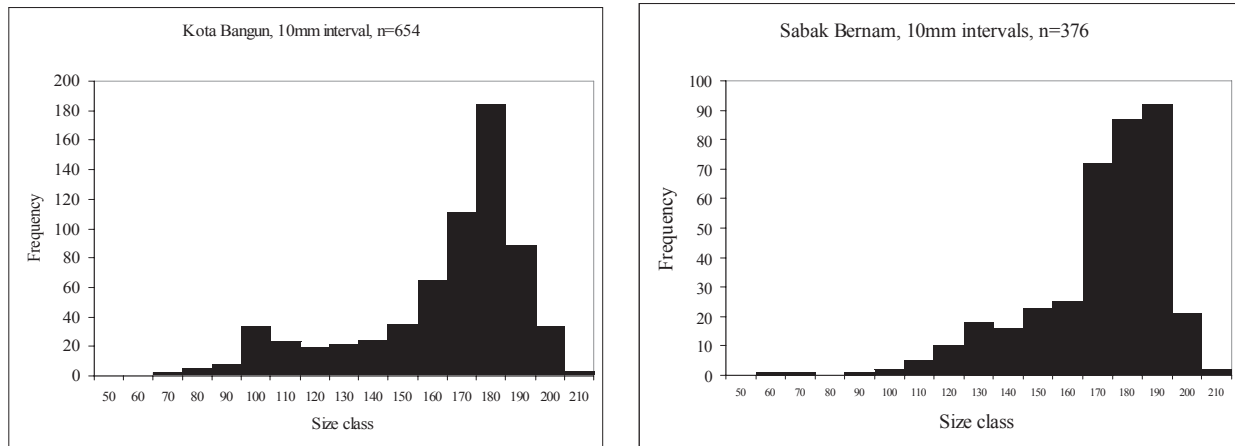
Table 20:
Absolute and relative abundance per life history stage of the Southeast Asian Box Turtle collected in Kota Bangun

Size class	MeCL (mm)	General life history stage	n	%
I	<50			
II	51-115	Immature	65	4.2
III	116-159			
IV	>160	Mature	1482	95.8

The high percentage of harvested adults is illustrated in the size-frequency histogram (Figure 39, left). Comparative data from Malaysian traders (Schoppe, 2008b) show the same pattern (Figure 39, right).

Figure 39:

Size frequency distribution of the Southeast Asian Box Turtle harvested in Kota Bangun (left) and in Sabak Bernam, Peninsular Malaysia (right)



For the Southeast Asian Box Turtle, as for most of the freshwater turtles, any removal of reproductive adults, and to a lesser extent of juveniles, from one or a few small populations of animals with a limited annual reproductive potential and late maturity, would have significant effects on the population structure, recruitment and population genetics. Wild populations of tortoises and freshwater turtles are generally vulnerable to over-exploitation, because of biological characteristics such as late maturity, limited annual reproductive output, and high juvenile mortality, as well as habitat degradation and loss. McCord and Philippen (1998) suggest that although the Burmese Box Turtle (*Cuora amboinensis lineata*) might have been and still is locally numerous, the population dynamics of the species, and especially the very low clutch size of only 1 or 2 eggs, suggests that continuous exploitation will lead to a collapse of a population.

Life history traits such as prolonged reproduction and increased longevity make turtles sensitive to relatively small decreases in adult survivorship (Congdon *et al.*, 1993), so that a small decrease in annual subadult or adult survival can negatively impact long-term population viability (Gamble and Simon, 2003). Reed *et al.* (2002) showed that an annual increase in adult mortality in female Alligator Snapping Turtles *Macrochelys temminckii* by less than 1% would result in population declines. Similarly, Congdon *et al.* (1994) found that Common Snapping Turtle *Chelydra serpentina* populations would be negatively affected by an annual harvest of 10% of the adult females. Results of Gamble and Simon (2003) indicate that Painted Turtles *Chrysemys picta* are susceptible to over-harvest with an annual removal of only 4-5% of the female population. This sensitivity to harvest is in line with the previously mentioned turtle species.

Harvest impact

For the provinces visited, it seems to be generally true – based on results from surveys and interviews – that populations of the Southeast Asian Box Turtle near centres of trade (cities with turtle traders) are over-exploited or even locally extinct. In Maros-Pangkajene at the west coast of South Sulawesi and north of Makassar rice farmers said that the species was formerly (‘many years ago’) common, but they are extinct there now. Further north in Barru, PJ Butung – an area famous for the collection of the Reticulated Python – one respondent said that the Southeast Asian Box Turtle can still be encountered in the area. Another respondent (rice farmer) stated that the species can sometimes be found during the rainy season and that five months ago he had seen one individual. In Desa Sagulemo, Masamba (Sulawesi) many people had

engaged in full-time turtle collection in the past. In 2000-2001, a middleman in the area could easily accumulate 500 kg of the Southeast Asian Box Turtle in one day. Some people still collect the species but rather on a sideline basis. On 15 May 2006, the researchers and three collectors surveyed some typical habitats / collection areas (marsh/swamp, rice field, stream, cacao plantation; water depth between 10-60 cm) from 1830-2000hrs. The collectors found one juvenile and one adult male during the 1.5 hours. According to the collectors, they can eventually collect 10-20 individuals in about four hours if they go out earlier in the afternoon, e.g. at 1600hrs. Low catch on that particular day was blamed on a late starting time. However, based on experience from Rawa Aopa (Sulawesi) and the Philippines, the Southeast Asian Box Turtle becomes active at sunset at about 1800hrs, and only during rainy or cloudy days the animals might emerge earlier from refuge sites (Schoppe, *unpubl. data*). Other collectors who were interviewed stated they could collect 1-10 individuals in one night. A middleman in Sengkang (Sulawesi) stated that there is a drastic population reduction of the species in the area, which was formerly famous among collectors for high abundances of the Southeast Asian Box Turtle. In ~2001/02 he could still get about 700 kg of live Southeast Asian Box Turtles in one day or 21 000 kg or about 36 778 individuals per month (assuming that the average weight is about 0.57 kg per individual *C. a. amboinensis*¹³). Nowadays, he does not deal with live individuals since he is not a registered supplier/exporter but he remains involved in trade of plastron. In 2006, he could get about 100 kg plastron per month, which – considering an average weight of 100 g for a medium-sized plastron – is equivalent to about 1000 live individuals per month.

Interviews with 20 residents from locations near the population size study in TNRAW indicated that they still consider the species common in the area (95% of all respondents). However, 70% of the respondents had noticed a population decrease. Five per cent stated that such decrease became noticeable 5-10 years ago; 30% noticed it 3-4 years ago and 40% just noticed a recent (2-3 years ago) decrease.

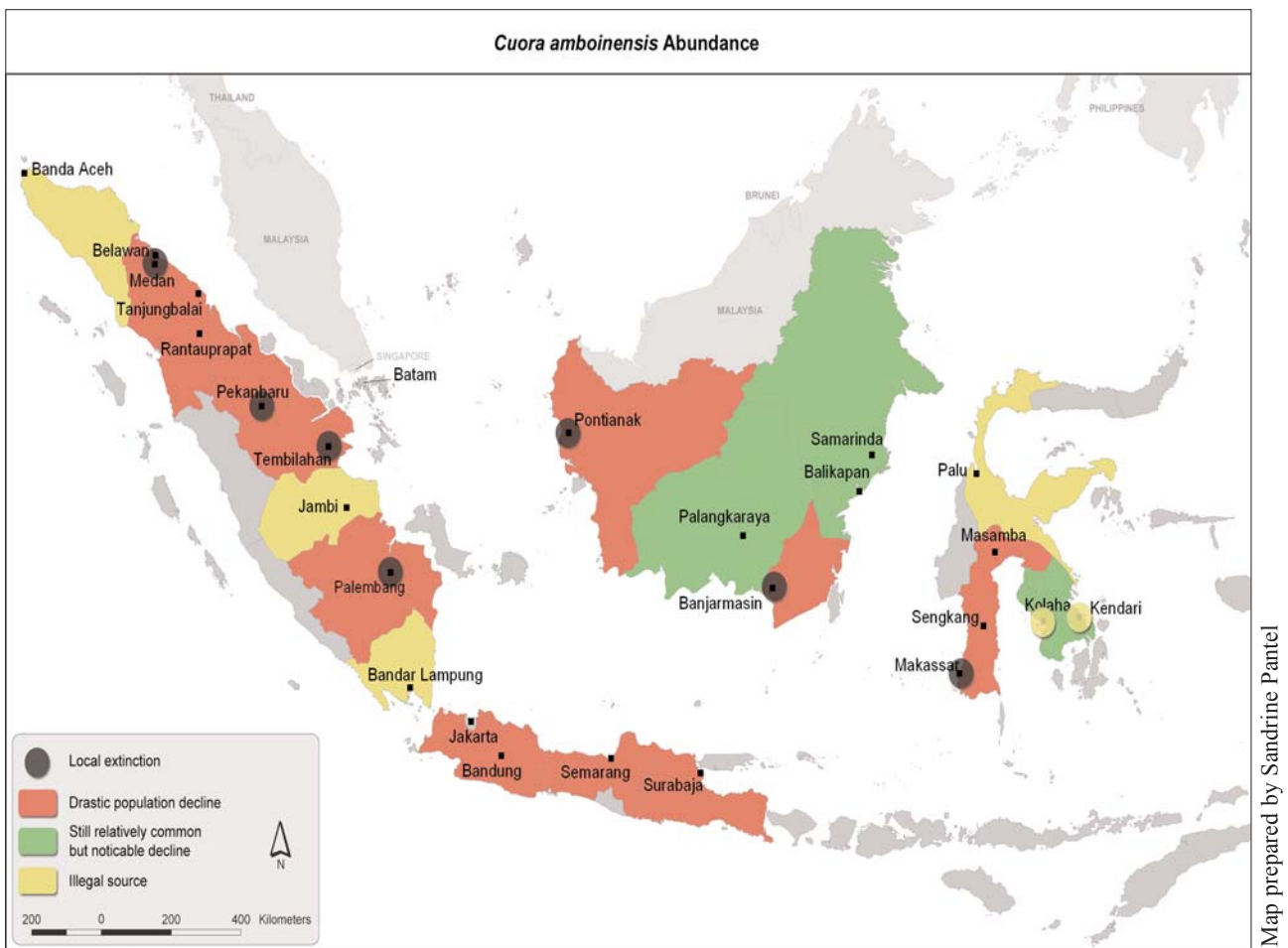
In Tembilahan, Riau (Sumatra), the Southeast Asian Box Turtle is no longer common. Collectors as well as members of the general public stated that some six years ago it could still be found in and near the city, but nowadays the species is not seen in the wild anymore. In Belanta Raya, about three hours by boat from Tembilahan, which is one of the major wildlife transit areas on the way to Tembilahan, the abundance of the species is said to have drastically decreased over the past few years. Nowadays, collectors can only get about three individuals of mixed Southeast Asian Box Turtle and Asian Leaf Turtle in one day. The author searched for the species at about one hour walking upstream of Belanta Raya and did not find any turtle species. Informants stated that further upstream (another three hours) turtles can still be found but even there a population decrease is noticeable. Other collection areas in Riau are in Kerinci, Sorek and Ukui. It was difficult to get clear statements on the abundance of the species from collectors in those areas. They usually stated that catch-per-unit-effort depends on the price. If they can get a high price, they can get up to 100 kg in one week. If the price is low, they collect less.

In East Kalimantan, a population decrease of the Malayan Box Turtle and other turtle species was observed by residents of Kota Bangun and the surrounding lakes. Ten years ago, turtles, especially the Malayan Box Turtle and the Malayan Giant Turtle were still so common that they entered the houses during floods (Pak Amir, boatman, *pers. comm.* to the researcher, 23 June 2006). Nowadays this does not happen anymore because both species have decreased in numbers over the past 10 years, he said. Some 10 years ago, people engaged in turtle collection could easily collect 10 tons per week (mixed Malayan Box Turtle, Malayan

¹³ Based on average weight of male and females, please refer to Table 1.

Giant Turtle, and Asian Softshell Turtle). In those days an exporter from Banjarmasin had “taken office” in Rimba Ayu. According to the informant, nowadays all turtles are sold to the only dealer in Balikpapan. Despite the noticeable decrease in the abundance of turtles in the area, many collectors and middlemen continue dealing with the Malayan Box Turtle and other turtle species, indicating the undiminished demand for the species. This could easily lead to severe over-exploitation. Collectors and middlemen in Banjarmasin in South Kalimantan stated that the Malayan Box Turtle is not as easy to obtain compared to some years ago. Therefore, they extend their collection activity to Central Kalimantan. The same is true in West Kalimantan. The Malayan Box Turtle is nowadays collected from sites further and further away from the trade centre in Pontianak. According to turtle traders, market and aquarium shop vendors, and local residents, the main collection area of the species is now Ketapang, seven hours north-west from Pontianak.

Figure 40:
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



According to the Asian Turtle Trade Group (2000), the Southeast Asian Box Turtle has experienced in Indonesia what is known as a “boom-and-bust” cycle: collection and export operations become established in a certain location, collection efforts and capture and export volumes increase rapidly, reach a peak, and then decline as accessible populations become depleted and collectors need to venture into new, more distant areas.

Although the Southeast Asian Box Turtle has been listed in Appendix II since 2000, it would appear that exploitation levels of Indonesia's populations have not changed much over the past six years. It was the most abundant freshwater turtle in trade before its listing, and 1350 individuals could easily be counted in one warehouse in North Sumatra in one day (Shepherd, 2000). In 2006, it remained the most abundant species observed in trade; warehouse counts revealed similar high numbers to seven years ago. Prices have also not changed considerably. Sumatra's exporters purchased one kilogram for USD 1.12-1.91 (mean USD 1.31) in 1999 (Shepherd, 2000) and in 2006 they paid USD 1.52-1.74/kg (mean USD 1.63). However, the total volume traded per unit time and the frequency of shipments have both changed. Previously, one exporter shipped about 3-5 t of freshwater turtles 2-3 times per week (Shepherd, 2000), and in 2006 one exporter shipped about 1 t of the Southeast Asian Box Turtle in one week. Furthermore, the catch-per-unit-effort had decreased in 2006 as indicated by most collectors.

CONCLUSIONS

The Southeast Asian Box Turtle plays an undefined but likely important role in food chains of wetland ecosystems, and it serves as seed disperser. The temporary or permanent removal of the species from its natural habitats leads to an imbalance of the ecosystem structure, the significance of which and the whole range of consequences currently cannot be determined.

The low reproductive rate of the Southeast Asian Box Turtle in combination with continuous harvest for the food and TCM trade which exceeds the allocated export quota and which focuses on large adults has led to local over-exploitation. This cannot be outbalanced through captive breeding. Captive breeding of the Southeast Asian Box Turtle for commercial purposes is economically unfeasible. Its' promotion appears to exacerbate illegal activity.

The adaptation of the Southeast Asian Box Turtle to man-made habitats makes it more accessible for harvest. The conservation of this and other species in so-called protected areas cannot be guaranteed, and no or only very few assurance populations of the species still exist in Indonesia, making the species even more susceptible to over-exploitation.

Populations around trade centres such as cities are already extinct. Despite being a commensal species, it is nowadays difficult to find a Southeast Asian Box Turtle in the wild near residential or agricultural areas.

Long-term studies that will provide comparative data are required to determine whether the Southeast Asian Box Turtle is decreasing in mean size over time. Significant human disturbance such as commercial harvest represents a risk to box turtle populations and can easily be detrimental to the survival of the species.

Indonesia has sufficiently comprehensive legislation in place to govern the management of wildlife species in trade. Its legislation is much better than in many neighbouring countries, for example Malaysia. Unfortunately, the enforcement of these laws is very weak or lacking at all.

Volumes of illegally exported individuals appear to be at least 10-fold - probably 100-fold - the legal export of 18 000 individuals. This excess of the legal export quota is detrimental to the survival of the species in Indonesia. The high export numbers are driven by the demand for the food and TCM markets in East Asia.

If export for the international pet trade was the only category of trade, it is believed that this could be managed sustainably. Furthermore, local utilization is negligible and poses no threat to the species. A total trade ban is not expected to solve the problem of illegal trade but illegal trade has to be eradicated to allow sustainable management of this and other wildlife species.

Appendix II listed freshwater turtle species including the Southeast Asian Box Turtle may only be exported live from Indonesia. The export of dead animals, parts (carapace or plastron) or derivatives is illegal since the quota is only allotted to live individuals. Some members of the CITES Management Authority especially at the provincial level are obviously not aware of this.

Export in parts and derivatives of the Southeast Asian Box Turtle from Indonesia has increased since the species was listed in CITES Appendix II. This seems to apply also to other Indonesian freshwater turtle species that have become CITES listed. Increased control of live shipments has led to an increased volume of illegally traded shells compared to live animals.

Many of the illegal shipments have forged CITES export permits. Enforcement officers are insufficiently trained and/or do not check CITES permits thoroughly.

Illegal export of the Southeast Asian Box Turtle and other freshwater turtles from Indonesia is possible because many shipments are not inspected, because many law enforcement officers do not know the conservation status of the different freshwater turtle species, and still cannot identify the different species, and because ports other than those designated for CITES-listed species are used by traders.

The main international destinations of illegal shipments of the Southeast Asian Box Turtle are Hong Kong SAR, mainland China, Singapore and Malaysia. The CITES Management Authorities of these countries are willing to assist Indonesia in curbing illegal wildlife trade provided that the Indonesian CITES MA officially seeks their assistance and shares intelligence on illegal wildlife trade.

Some exporters do not openly display all their stock in the warehouse. This easily leads to underestimation if abundance is based on visual inspection of openly displayed stocks. There is a high probability that these exporters exceed their annual quota beyond the allowed limit and ship the surplus illegally.

None of the establishments that sold the Southeast Asian Box Turtle for local utilization in Indonesia obtained the specimens from licensed collectors nor were these outlets licensed to sell.

The Indonesian CITES MA has a very detailed, complex and difficult-to-control licensing and permit system. Accordingly, permits at the lowest level, for example collection permits of collectors, and licences for local trade, are usually not inspected. Furthermore, holders of permits for harvest or capture do not report on the stockpile of wild-caught specimens to the Heads of BKSDA on a monthly basis, neither do the BKSDA offices feed back to the MA.

Annual CITES reports do not reflect the number of actually exported individuals but rather the numbers for which SATS-LN permits were issued and which does not mean that the SATS-LN permits were used for actual exports, or that the numbers on the SATS-LN coincide with the actual numbers that were exported. Furthermore, Indonesia – like most other Parties - commonly exports specimens which fall under

the quota of the previous year, which contributes to export statistics that do not represent the actual harvest and export of the calendar year.

The quota setting in Indonesia is currently not science-based but driven by the demand from traders to supply importing countries especially those in East Asia where large volumes are consumed for food and traditional medicines. The implementation of the current Indonesian quota system needs urgent remedial attention, both in the setting of quotas, the monitoring of harvest and trade, and the enforcement of regulations. Distribution of the national quota among provinces appears to be unrelated to local abundance, and neither to sustainability of harvest or trade. There is a link between the presence of a trader and the quota rather than between quota and local abundance of the species. Locations for harvest or capture are not carefully selected based on biological and ecological assessments, but rather in accordance with the preferred collection sites of the trader.

The fact that some freshwater turtle species fall under the jurisdiction of the PHKA while other are under the management of the DKP has led to considerable confusion and weakness in law enforcement. As basis for sustainable management of all traded wildlife species whether under PHKA or DKP, trade volumes should be recorded on the species level.

The demand for the Southeast Asian Box Turtle and the other species under the same genus in the East Asian consumer markets has not been reduced, but rather increased after the inclusion of all members of the genus *Cuora* in Appendix II of CITES.

An alternative interpretation is that the market demand for this and other turtle species has increased greatly in East Asia in the past decade [as evidenced by the great increase in supplies of farmed Chinese Softshell (*Pelodiscus sinensis*) and Red-eared Slider (*Trachemys scripta elegans*), species which are esteemed lower in the East Asian trade], and CITES inclusion has helped trade management but has not curbed trade volumes effectively enough.

The extent of exploitation observed at four middlemen in East Kalimantan and the trade volumes of exporters in Sumatra give reason to conclude that the allocated annual harvest quota is easily exceeded.

RECOMMENDATIONS

- The Indonesian CITES MA should strictly monitor export volumes / quantities, and enforce the existing prohibition of the export of turtle shells and other derivatives.
- Quarantine, customs, police and PHKA personnel at air and seaports should put more efforts in inspecting shipments especially those with destinations in East Asian countries, and especially those declared ‘fish’, ‘seafood’, ‘snake skin or meat’, and ‘Red-eared-sliders’. Law enforcement agencies should consider giving incentives in the form of awards or leave credits to enforcement agents for seizures.
- Makassar, Medan, Pekanbaru, Tembilahan and Banjarmasin are the ports of exports with the highest frequency and the highest volumes of illegally traded Southeast Asian Box Turtles. Tembilahan and Banjarmasin are not even designated ports of exports for CITES-listed species thus all export of such species from those ports is illegal. These ports and their shipments should receive special attention and be thoroughly and regularly inspected by BKSDA, police, customs, port authorities and quarantine officers.

- Instead of banning trade in the Southeast Asian Box Turtle which would only negatively affect legal traders, activities should focus on eradicating illegal trade through stricter law enforcement on the Indonesian side and thorough control of CITES documents and origin of specimens on side of the importing countries. The cooperation with the CITES MA in China needs to be intensified to lower and finally eradicate illegal trans-border trade. These kinds of focused activities would have greater chances of success if formalised under the existing co-operation between China and the ASEAN Wildlife Enforcement Network (ASEAN-WEN).
- The Indonesian CITES MA should officially seek assistance from the CITES MA of Asian importing countries especially of Hong Kong SAR, mainland China, Singapore and Malaysia. Indonesia should share details on ports of export, frequency of shipments, methods in concealing illegal shipment etc. with the other CITES authorities, police, customs and quarantine. Being part of the ASEAN-WEN it is encouraged to set up a multi-agency task force.
- The Indonesian CITES MA should revise and simplify its licensing and permit system. From capture to export there should be less permits involved, and those that are required should be thoroughly and regularly inspected and compared with the content of the shipment by the various law enforcement and customs agents. Particularly, the provincial quotas from across the country allocated to each individual pet trader are nonsense and should be rescinded.
- The Indonesia annual reports to the CITES Secretariat should reflect the actual number of exported specimens rather than the number for which permits were issued. This requires comparing permits issued at PHKA (CITES MA) with those used and filed at ports of exit (BKSDS).
- Continual training of enforcement officers in species identification, conservation status of the different species and outline of CITES permits and legal loopholes in the management of CITES Appendix II listed species should be conducted through the efforts of interagency co-operation involving the CITES authorities, NGOs, and the academe.
- Skills to enforce the laws should be strengthened on all levels of all concerned agencies (PHKA, BKSDA, DKP, fish and animal quarantine, Customs, airport and seaport cargo personnel, police). Lack of skills can easily be addressed through trainings, while the motivation and willingness to enforce needs encouragement from within the agencies concerned. Incentives in the form of awards, press-releases and leave credits should be considered as rewards for successful work of law enforcement officers.
- PHKA and DKP should work closely together in the management of CITES Appendix II-listed and look-alike species. Awareness campaigns should not only be conducted to officers of all agencies involved in trade (PHKA, BKSDA, quarantine, Customs, sea and airport cargo personnel etc.) but also to the public informing about rules and regulations, trade procedure, responsibility of the various offices. As basis for sustainable management of all traded wildlife species whether under PHKA or DKP, trade volumes should be recorded on the species level.
- The CITES Authorities should discourage captive breeding of the Southeast Asian Box Turtle and other freshwater turtles and tortoises with a similar low reproductive output for the large-scale consumption and TCM market.

- The establishment of assurance colonies should be considered by the Indonesian CITES Authorities. These could be established at governmental or private rescue centres, zoological gardens, or areas that are effectively protected from harvesting and other human impacts.
- The CITES SA should seek assistance from local universities in conducting field studies to assess population sizes and composition in man-made versus natural habitats. Such analyses are needed for the proper management of the species. The method of such surveys/field studies could be patterned from the methodology used in the present study.
- In making non-detriment findings, the particular biology of tortoises and freshwater turtles should be taken into consideration. The harvesting of wild adults should be limited and precautionary because the removal of slow growing, mature animals may have significant impacts on the viability of the population that is targeted. Although it may generally be perceived as preferable to harvest small (juvenile) individuals, it was noted that unlike in tortoises, the offtake of juveniles in wild populations of freshwater turtles is relatively easy, that the removal of certain age classes may negatively impact wild populations, and that in practice, all age classes are often harvested. Also, juveniles do not necessarily or readily meet the demand for turtles and tortoises in the food and medicinal markets.
- 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 and monitored to enable sustainable trade.
- Indicators of change are (Schoppe, 2008a):
 1. If collection areas are getting increasingly further away from urban trade centres.
 2. If catch-per-unit-effort (CPUE) is decreasing.
 3. If threats other than trade are getting more severe.
 4. If the State/provincial/regional annual harvest quota is far from being realized.
 5. If harvest and export quotas are always realized (actual recorded volumes) to the maximum volume.
 6. If average size of individuals is reduced.
 7. If traded specimens are mainly adults.
 8. If the population structure of traded individuals is significantly in favour of one life history stage.
 9. If the sex ratio of any population is significantly different from 1:1 trends should be carefully monitored.
- In addition, potential indicators of illegal trade should be monitored:
- If collection of the species is a fulltime business for collectors/trappers the probability that the demand for the species is higher than the national quota is relatively high.
- 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 undercut market prices.

- 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.
- Monitoring results should provide the basis for the establishment of provincial and national harvest and export quotas.

REFERENCES

- Ades, G., Banks, C.B., Buhlmann, K.A., Chan, B., Chang, H.-C., Chen, T.-H., Crow, P., Haupt, H., Kan, R., Lai, J.-Y., Lau, M., Lin, H.-C., and H. Shi, 2000. Turtle trade in Northeast Asia: Regional summary (China, Hong Kong, and 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: 52-54.
- Altherr, S. and D. Freyer, 2000. The decline of Asian turtles. Pro Wildlife, Munich, Germany, 23 pp.
- Alviola III, P.L., Cosico, E.A., and E.G. Eres, 2003. Determination of relative age, sex and sex ratio of the Malayan Box Turtle (*Cuora amboinensis* Daudin) in Pinaglubayan River, Polillo Island, Quezon, Philippines. *Asia Life Sciences*, 12(2): 111-121.
- Anderson, I.P. and M.R. Bowen, 2000. Fire zones and the threat to the wetlands of Sumatra, Indonesia. European Union and Ministry of Forestry, 46 pp.
- Anon., 1990. Act of the Republic of Indonesia No. 5 of 1990. Concerning conservation of living resources and their ecosystems. The President of the Republic of Indonesia.
- Anon., 1999a. Kuota pengambilan tumbuhan alam dan penangkapan satwa liar untuk periode tahun 2000. Keputusan Direktur Jenderal Perlindungan Hutan Dan Konservasi Alam.
- Anon., 1999b. Regulation of the Government of the Republic of Indonesia No. 8 of 1999 concerning the on the Utilization of wild plant and animal species. The President of the Republic of Indonesia.
- Anon., 1999c. Proposal Prop. 11.36. Inclusion of all species of the Genus *Cuora s.l.* in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), amended 30th November 1999. www.cites.org/eng/cop/11/prop/36.pdf
- Anon., 1999d. Indonesia. Ports of entry and exit of CITES specimens. Notification to the Parties No. 1999/79. Geneva, 5 November 1999.
- Anon., 2001a. Kuota pengambilan tumbuhan alam dan penangkapan satwa liar untuk periode tahun 2001. Keputusan Direktur Jenderal Perlindungan Hutan Dan Konservasi Alam.
- Anon., 2001b. An overview of the trade in live South-east Asian freshwater turtles. An Information paper for the 17th Meeting of the CITES Animal Committee, Hanoi, Viet Nam, 30 July to 3 August 2001. AC17 Inf. 7, 6 p.
- Anon., 2002a. Kuota pengambilan tumbuhan alam dan penangkapan satwa liar untuk periode tahun 2002. Keputusan Direktur Jenderal Perlindungan Hutan Dan Konservasi Alam.
- Anon., 2002b. Convention on International Trade in Endangered Species of Wild Fauna and Flora. Eighteenth meeting of the Animals Committee, San Jose (Costa Rica), 8-12 April 2002. AC18 Summary record.
- Anon., 2002c. Statistik Kesejahteraan Rakyat: Survey Sosial Ekonomi Nasional. Biro Pusat Statistik, Jakarta.
- Anon., 2002d. Service Information. Fish Quarantine Action. Brochure of the Ministry of Marine Affairs and Fisheries, Centre for Fish Quarantine.
- Anon., 2003a. Kuota pengambilan tumbuhan alam dan penangkapan satwa liar untuk periode tahun 2003. Keputusan Direktur Jenderal Perlindungan Hutan Dan Konservasi Alam, 23 and 40pp.
- Anon., 2003b. 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., 2003c. Convention on International Trade in Endangered Species of Wild Fauna and Flora. Nineteenth meeting of the Animals Committee, Geneva (Switzerland), 18-21 August 2003. AC19 Summary record.

- Anon., 2003d. Kuota pengambilan tumbuhan alam dan penangkapan satwa liar untuk periode tahun 2004. Keputusan Direktur Jenderal Perlindungan Hutan Dan Konservasi Alam, 26 and 69pp.
- Anon., 2004a. Kuota pengambilan tumbuhan alam dan penangkapan satwa liar untuk periode tahun 2005. Keputusan Direktur Jenderal Perlindungan Hutan Dan Konservasi Alam, 32 and 76pp.
- Anon., 2004b. Convention on International Trade in Endangered Species of Wild Fauna and Flora. Thirteenth meeting of the Conference of the Parties, Bangkok (Thailand), 2-14 October 2004. CoP13 Doc. 9.1.1
- Anon., 2005a. Reraturan Menteri Kehutanan, Nomor: P. 19/Menhut-II/2005. Tentang Penangkaran Tumbuhan dan Satwa Liar. Kehutanan Republik Indonesia, Menteri Biro Hukum Dan Organisasi, Jakarta, 41 pp.
- Anon., 2005b. Convention on International Trade in Endangered Species of Wild Fauna and Flora. Twenty-first meeting of the Animal Committee, Geneva (Switzerland), 20-25 May 2005. AC 21 WG2 Doc. 1 (Rev. 1).
- Anon., 2006a. Kuota pengambilan tumbuhan alam dan penangkapan satwa liar untuk periode tahun 2006. Keputusan Direktur Jenderal Perlindungan Hutan Dan Konservasi Alam, 31 and 65pp.
- Anon., 2006b. 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. 21 (Rev. 1).
- Anon., 2006c. 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., 2006d. 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 Summary Record.
- Anon., 2007. Kuota pengambilan tumbuhan alam dan penangkapan satwa liar untuk periode tahun 2007. Keputusan Direktur Jenderal Perlindungan Hutan Dan Konservasi Alam.
- Artner, H. and A. Hofer, 2000. Observations in the Quing Ping Free Market, Guangzhou, China, November 2000. Turtle and Tortoise Newsletter 3: 14.
- ARCBC, 2006. Asian Regional Centre for Biodiversity Conservation. Perairan Sungai Mahakam. http://www.arcbc.org.ph/wetlands/indonesia/idn_persunmah.htm
- 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.
- Auliya, M., 2003. Hot Trade in Cool Creatures – A Review of the Live Reptile Trade in the European Union in the 1990s with a focus on Germany. TRAFFIC Europe Report.
- Auliya, M., *in prep*. A controversial enterprise - Bridging commercial breeding operations of reptiles/parrots in Indonesia and EU pet markets. TRAFFIC SEA Technical Report, Kuala Lumpur, Malaysia.
- Baillie, J. and Groombridge, B., 1996. 1996 IUCN Red List of Threatened Animals. IUCN, Gland, Switzerland.
- Beil, J., 2005. Observations on keeping and reproduction of *Cuora amboinensis kamaroma* Rummler & Fritz, 1991. Radiata, 14(2): 61-63.
- Bernal Múnera, M., Daza, R.J.M. and V.P. Páez, 2004. Ecología reproductiva y cacería de la tortuga *Trachemys scripta* (Testudinata: Emydidae), en el área de la Depresión Momposina, norte de Colombia. Rev. Biol. Trop. 52(1): 229-238.
- Blomberg, S. and R. Shine, 1996. 7. Reptiles. In: W.J. Sutherland. Ecological Census Techniques. Cambridge University Press, 352pp.
- 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.
- Bringsoe, H., 1991. Indtryk fra et besøg i Hong Kong og på et skildpaddemarket i Guangzhou, sydlige Kina. Nordisk Herpetologisk Forening, 8: 154-162.
- Bury, R.B. (1979). Natural History, field ecology, conservation biology, and wildlife management: Time to connect the dots. Herpetological Conservation and Biology, 1(1): 56-61.
- 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.
- Cheung S.M. and D. Dudgeon, 2006. Quantifying the Asian turtle crisis: market surveys in southern China, 2000-2003. Aquatic Conservation: Marine and Freshwater Ecosystems, 16: 751-770.
- CITES, 2007. Appendices I, II and III. Valid from 3 May 2007. <http://www.cites.org/>
- CITES, 1979. Convention on International Trade in Endangered Species of Wild Fauna and Flora. Signed at Washington, D.C., on 3 March 1973, amended at Bonn, on 22 June 1979. www.cites.org.com
- Close, L.M. and R.A. Seigel, 1997. Differences in body size among populations of Red-eared sliders (*Trachemys scripta elegans*) subjected to different levels of harvesting. Chelonian Conservation Biology, 2(4): 563-566.
- Collins, M., 1990. Atlas of the rain forests. In The last Rain Forests, pp. 150.
- Congdon, J.D., 2000. Indicators of the decline of Asia's turtle fauna. In: Altherr, S. and D. Freyer, (eds.). The decline of Asian turtles. Pro Wildlife, Munich, Germany, 23 pp.
- Congdon, J.D., A.E. Dunham, and R.C. Van Loben Sels, 1994. Demographics of common snapping turtles (*Chelydra serpentina*): implications for conservation and management of long-lived organisms. American Zoologist, 34: 397-408.
- Converse, S.J., Iverson, J.B. and J.A. Savidge, 2005. Demographics of an Ornate Box Turtle population experiencing minimal human-induced disturbances. Ecological Applications, 15(6): 2171-2179.
- Coyne, M.S., 2000. Population sex ratio of the Kemp's Ridley sea turtle (*Lepidochelys kempii*): Problems in population modelling. Dissertation, Office of Graduate Studies of Texas A&M University, 124 pp.
- Customs and Excise Department, 2006. Customs sizes turtle plastron. The Government of the Hong Kong Special Administrative Region. http://www.customs.gov.hk/eng/new_release_20060118_turtle_plastrons_e.html
- Danko, S., 1993. Die Haltung und Zucht der Amboina-Schmiedschildkröte *Cuora amboinensis*. Jahrbuch fuer den Terrariarner, Vol. 1: 8-11.
- Erdelen, W., 1998. Trade in lizards and snakes in Indonesia – biogeography, ignorance and sustainability. Mertensiella, 9: 69-83.
- Ernst, C.H., Altenburg, R.G.M. and R.W. Barbour, 2000. Turtles of the World. World Biodiversity Series. Biodiversity Center of ETI, ETI/NLBIF, online version as of January 6, 2006, www.nlbif.eti.uva.nl/bis/turtles.php
- Ernst, C.H., J.E. Lovich, and R.W. Barbour, 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington D.C.
- Fritz, U. and F.J. Obst 1998. Neue Schildkröten aus Südostasien. Teil I. Platysternidae und Bataguridae (*Cuora*). Sauria, Berlin, 20(4): 9-22.
- Fritz, U. and Gaulke, M., 1997. Zur Herpetofauna Nord-Sumatras–Teil 1: Schildkröten. Herpetofauna 19(110): 12-22.
- Gamble and Simon, 2003. The commercial harvest of painted turtles in Minnesota. Complete entry

- Gaulke, M. and U. Fritz 1998. Distribution patterns of batagurid turtles in the Philippines (Testudines: Bataguridae: *Cuora*, *Cyclemys*, *Heosemys*). *Herpetozoa*, 11(1/2): 3-12.
- Gavino, C.M. and S. Schoppe, 2004. First information on the trade of freshwater turtles in Palawan. *Agham Mindanaw, Ateneo de Davao Journal of Science and Technology*, 2: 53-60.
- Grychta, U., 1988. *Cuora amboinensis* (Daudin 1802) – Die Amboina-Scharnierschildkroete. Ein Bericht ueber Haltung, Paarungsverhalten, Eiablage und gelungene Nachzucht. *SAURIA*, Berlin-W., 10(4): 27-29.
- Heppell, S.S., 1998. Application of life-history theory and population model analysis to turtle conservation. *Copeia*, Vol. 2(1): 367-375.
- Hilton-Taylor, C., 2000. 2000 IUCN Red List of Threatened Species. IUCN, Gland, Switzerland and Cambridge, UK.
- Inskip, R. 1984. A note on the captive breeding of the box turtle *Cuora amboinensis* (Daudin, 1802). *British J. Herpetol.*, 6: 383-384.
- IRATA, 2005. Bio diversity conservation and sustainable use. Unpublished Report.
- Ischak, 1994. Geografi 1 : Buku pelajaran untuk sekolah Menengah Umum. PT Intan Pawiwara, Pub. Klaten, Indonesia. 290 hal.
- Iskandar, D.T. and W.R. Erdelen, 2006. Conservation of amphibians and reptiles in Indonesia: issues and problems. *Amphibian and Reptile Conservation* 4(1): 60-87.
- IUCN, 2007. *2007 IUCN Red List of Threatened Species*. <www.iucnredlist.org>. Downloaded on 01 January 2007
- Jenkins M.D., 1995. Tortoises and Freshwater Turtles: The trade in Southeast Asia. TRAFFIC International, United Kingdom, 48 pp.
- Kerlen, M., 2002. Studbook Breeding Programme. *Cuora amboinensis* Malayan box turtle. European Studbook Foundation. Interim report 2002, September 2002. www.studbooks.org.
- Kerlen, M., 2004. Studbook Breeding Programme. *Cuora amboinensis* Malayan box turtle. Report September 2002 – April 2004. www.studbooks.org.
- Kerlen, M., 2005. Studbook Breeding Programme. *Cuora amboinensis* Malayan box turtle. Report April 2004 – December 2004. www.studbooks.org.
- Khan, M.A.R., 1982. Chelonians of Bangladesh and their conservation *J. Bombay Natur. Hist. SoC.* 79: 110-116.
- Krebs, C.J., 1998, *Ecological Methodology*, 2nd edition. (New York: Harper Collins), 654pp.
- Lau, M.W., Ades, G., Goodyer, N., Zou F., 1995. *Wildlife Trade in Southern China Including Hong Kong and Macao*. Kadoori Farm & Botanic Garden Cooperation.
- 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.
- Lee, K.S., M.W.N. Lau and B.P.L. Chan, 2004. Wild animal trade monitoring in selected markets in Guangzhou and Shenzhen, South China 2000-2003. Kadoorie Farm and Botanic Garden Corporation, Lam Kam Road, Tai Po, N.T., Hong Kong SAR.
- Lim, B.L. and I. Das, 1999. *Turtles of Borneo and Peninsular Malaysia*. Natural History Publications, Borneo, 151pp.
- Manzke, U., 1993. Schildkröten in Thailand, *DATZ* 46 (9), 594-599.
- 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.

- Meier, E., 2000. Eine Methode zur Zucht aggressiver und stressempfindlicher Wasserschildkroeten, exemplarisch dargestellt an der Moorschildkroete, *Clemmys muhlenbergii* (Schoepff, 1801) und der Dreistreifen-Scharnierschildkroete *Cuora trifasciata* (Bell, 1825) Grosses Schildkroetensymposium. 5. Jahrestagung der Schildkroetenfreunde Oesterreich, Salzburg, Natur und Tier Verlag, p. 53-68.
- 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., 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.
- Moll, E.O., and J. Vijaya, 1986. Distributional records for some Indian turtles. J. Bombay Natur. Hist. Soc., 83: 57-62.
- Nash., S.V., 1993. Problems with implementation of CITES Article IV in Southeast Asia. Review No. 1: Indonesia. TRAFFIC Southeast Asia, 34pp.
- Nietzke, G., 1998. Die Terrarientiere – Band 2: Schildkröten, Brückenechsen und Echsen, Ulmer-Verlag, Stuttgart.
- Oktaviani, D. 2007. Kajian Habitat, Biologi, dan Perdagangan Labi-labi (Famili: Trionychidae) di Sumatera Selatan serta Implikasinya terhadap Konservasi Labi-labi di Masa Datang. Unpublished MSc Thesis. Pascasarjana. Program Studi Biologi. Fakultas Matematika dan Ilmu Pengetahuan Alam. University of Indonesia, 125 pp.
- Oktaviani, D., S. Schoppe and M.D. Kusri. 2006. Kura-kura air tawar sebagai komoditas perikanan di Sumatera Selatan. Prosiding Seminar Nasional: Forum Perairan Umum Indonesia III, Palembang: 72-79.
- Praedicow, G., 1985. Langjaehrige Erfahrung bei der Pflege von *Cuora amboinensis* (Daudin). Herpetofauna 7(37): 6-14.
- Reed, R.N., J. Congdon, and J.W. Gibbons, 2002. The Alligator Snapping Turtle *Macrochelys (Macrochelys) temminckii*: A review of ecology, life history, and conservation, with demographic analyses of the sustainability of take from wild populations. Savannah River Ecology Laboratory, Drawer E, Aiken SC 29802 USA, unpublished report to Division of Scientific Authority United States Fish and Wildlife Service, 18 pp.
- RePPProT, 1988. A national overview from the regional Physical Planning Programme for Transmigration. UK Overseas Development Administration and Directorate BINA Programme, Ministry of Transmigration and Forest Squatters Resettlement, Jakarta, Indonesia.
- 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-Scharnierschildkroete *Cuora amboinensis* (Daudin, 1802), mit Beschreibung einer neuen Unterart, *C. a. kamaroma* subsp. nov. Salamandra, 27(1): 17-45.
- Sajwaj, T.D., S.A. Piepgrass, and J.W. Lang, 1998. Blanding's Turtle (*Emydoidea blandingii*) at Camp Ripley: Critical habitats, population status and management guidelines. Final Report to Nongame Wildlife Office, Minnesota DNR, Brainerd.
- Salzberg, A., 2000. Turtle for sale. Turtle and Tortoise Newsletter, 3: 22.
- Samedi and D.T. Iskandar, 2000. Freshwater turtle and tortoise conservation and utilization in Indonesia. 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: 106-111.
- Samedi, Rukyani, A., and Irvan, 2002. Utilization and trade in freshwater turtles and tortoises in Indonesia. Paper presented to the CITES Technical Workshop on Freshwater Turtles and Tortoises, Kunming, China, 25-28 March 2002.
- Saxena, A., 1994. Captive husbandry of the Malayan box turtle (*Cuora amboinensis*) from the Nicobar Islands. *Hamadryad* 19: 93-94.
- Schlaepfer, M.A., Hoover, C. and C.K. Dodd Jr., 2005. Challenges in evaluating the impact of the trade in amphibians and reptiles on wild populations. *BioScience*, 55(3): 256-264.
- Schoppe, S., 2008a. The Southeast Asian Box Turtle *Cuora amboinensis* (Daudin, 1802) in Indonesia. NDF workshop case studies, WG 7 – Reptiles and Amphibians, Case Study 2. http://www.conabio.gob.mx/institucion/cooperacion_internacional/TallerNDF/documents.html
- Schoppe, S., 2008b. Science in CITES: The Biology and Ecology of the Southeast Asian Box Turtle *Cuora amboinensis* and its Uses and Trade in Malaysia. TRAFFIC Southeast Asia, Petaling Jaya, Selangor, Malaysia, 56 pp.
- Schoppe, S. and R.G. Dolorosa, *in prep.* Growth of the Southeast Asian box turtle *Cuora amboinensis* from Palawan, Philippines.
- Senneke, D. and C. Tabaka, 2002. Malayan box turtle (*Cuora amboinensis*). World Chelonian Trust, online reference, www.chelonia.org
- Shepherd, C. 2000. Export of live freshwater turtles and tortoises from North Sumatra and Riau, Indonesia; A Case Study. *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: 112-119.
- Shepherd, C.R. and V. Nijman, 2007. An overview of the regulation of the freshwater turtle and tortoise pet trade in Jakarta, Indonesia. TRAFFIC Southeast Asia, Technical Report, Kuala Lumpur, Malaysia, 23 pp.
- Shine, R., P.S. Harlow, J.S. Keogh and Boeadi, 1998a. The allometry of life-history traits: insights from a study of giant snakes (*Python reticulatus*). *J. Zool.*, London, 244: 405-414.
- Shine, R., Ambariyanto, P.S. Harlow, and Mumpuni, 1998b. A school of ecological traits of commercially harvested water monitors, *Varanus salvator*, in northern Sumatra. *Wildlife Research*, 25: 437-447.
- Spinks, P.Q., H.B. Shaffer, J.B. Iverson, and W.P. McCord, 2004. Phylogenetic hypothesis for the turtle family Geoemydidae. *Molecular Phylogenetics and Evolution*, 32: 164-182.
- Sriyanto, A., S. Wellesley, D. Sugand, E. Widjanarti, and D. Sutryono, 2003. Guidebook of 41 National Parks in Indonesia. Directorate General of Forest Protection and Nature Conservation, The United Nations Educational, Scientific and Cultural Organization and The Centre for International Forestry Research, Jakarta, Indonesia, 168 pp.
- Struijk, R.P.J.H. and L.A. Woldring, 2005. *Cuora* studbooks, an overview. *Radiata*, 14(2): 64-73.
- Thirakhupt, K. and P.P. van Dijk, 1994. Species diversity and conservation of turtles of western Thailand. *Natural History Bulletin of the Siam Society*, 42: 207-259.
- UNEP-WCMC CITES Trade Database, 2007. CITES trade statistics derived from the *CITES Trade Database*. UNEP World Conservation Monitoring Centre, Cambridge, UK. <http://sea-bov.unep-wcmc.org/citestrade/>
- United Nations, 1997. Indonesia, Country Profile. Implementations of Agenda 21: Review of progress made since the United Nations conference on environment and development, 1992. United Nations Department for Policy Coordination and Sustainable Development Division for Sustainable Development. <http://www.un.org/dpcsd/earthsummit>

- 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.
- Wibowo, P., 1999. Indonesia freshwater turtles and tortoises: Data status in Wetland Database (WDB) in supporting the conservation. (in Indonesian language). Paper presented in the One Day Seminar of Reptile and Amphibian Diversity Conservation in Indonesia. Bogor, 4 November 1999.
- Wilbur, H.M., 1975. The evolutionary and mathematical demography of the turtles *Chrysemys picta*. *Ecology*, 56: 64-77.
- WWF Regional Sahul, 1999. The results of a survey on traded reptile species in Wamena, Sorong and Merauke, Irian Jaya in 1998. Unpublished Report, Species Monitoring Division, WWF Regional Sahus, Irian Jaya, Jayapura, June 1999, 30 pp.
- Yuwono, F.B., 1998. The trade of live reptiles in Indonesia. *Mertensiella*, 9: 9-15.
- Zhou, T., W. McCord, T. Blanck and P.-P. Li, 2007. *Cuora trifasciata* and *Cuora cyclornata* captive breeding in China. *Reptilia*, .p. 68-73.

Annex 1:

Dates and localities when and where surveys on the Southeast Asian Box Turtle were conducted in Indonesia

Locality	Date	Trade Survey	Population or Harvest Survey	Harvest Impact Survey
WEST JAVA	March/April 06			
Jakarta				
Reptile traders	March-06	X		
Pet Markets	7 March 06, 21 April 06	X		
Pet Shops	Twice in March, once in April and June 06	X		
Tangerang	March-06	X		
Bekasi	March-06	X		
Depok	March-06	X		
Parung	March-06	X		
Cibinong	March-06	X		
Bogor	March-06	X		
Cikananga	March-06	X		
SOUTH SULAWESI	10-17 May 06			
Makassar		X		
Traders		X		
Fish and pet markets	May-06	X		
Fish and aquarium shops	May-06	X		
Barru				X
Pare Pare				X
Makale				X
Palopo				X
Masamba		X		X
Sengkang		X		
Watansoppeng				X
Maros				X
SOUTHEAST SULAWESI	27 April to 10 June 06			
Taman Nasional Rawa Aopa Watomohai	29 April to 10 June 06		X	
NORTH SUMATRA	May-06			
Belawan	24 May-06	X		
Medan	18-24 May 06			

Annex I (continued) :

Dates and localities when and where surveys on the Southeast Asian Box Turtle were conducted in Indonesia

Locality	Date	Trade Survey	Population or Harvest Survey	Harvest Impact Survey
Pet and bird markets	19 & 20 May 06	X		
Aquarium and pet shops	19 & 20 May 06	X		
Reptile traders	19 & 20 May 06	X		
Binjai		X		
Tanjung Merawan		X		
Indrapura		X		
Tanjung Balai		X		
Rantauprapat		X		
RIAU	3-14 June 06	X		X
Pekanbaru				
Pet, bird and fish markets		X		
Aquarium and pet shops		X		
Reptile traders		X		
Kerinci		X		X
Sorek		X		X
Ukui		X		X
Lilik		X		X
Airmolek		X		X
Tembilahan		X		X
Belantaraya				X
SOUTH SUMATRA	31 May – 2 June 06			
Palembang				
Reptile traders		X		
Wet markets		X		
WEST KALIMANTAN	6-9 July 06			
Pontianak		X		
Reptile traders		X		
Aquarium and pet shops		X		
EAST KALIMANTAN	20 June to 5 August 06			
Balikpapan	20, 21, 27 & 28 June 06	X		
Kutai Kartanegara	24 June to 5 August 06		X	

Annex 1 (continued):**Dates and localities when and where surveys on the Southeast Asian Box Turtle were conducted in Indonesia**

Locality	Date	Trade Survey	Population or Harvest Survey
SOUTH KALIMANTAN	29-30 June, 3-6 July 06		
Banjarmasin	30 June, July 4 & 6, 06	X	
Reptile traders		X	
Aquarium and pet shops		X	
Banjarbaru		X	
CENTRAL KALIMANTAN	1-2 July 06		
Palangkaraya		X	

Annex 2:**River systems covered by collectors who supply middleman 'A' in Kedang Murung, Kota Bangun**

1. Siran, Sungai Siran, Muara Calong
2. Kampung Baru, Sungai Mahakam
3. Muara Wis, Sungai Mahakam
4. Muara Pahu, Sungai Mahakam
5. Muhuran, Sungai Belayan
6. Sebelimbingan, Sungai Belayan
7. Telu Muda, Sungai Belayan
8. Tuana Tua, Sungai Belayan
9. Mangkuliding, Sungai Kedang Rantau
10. Senambah, Sungai Kedang Rantau
11. Ngayan, Sungai Kedang Rantau
12. Kelingan, Sungai Muara Calong
13. Senyor, Sungai Muara Calong
14. Kampung Baru, Sungai Muara Calong
15. Benua Puhun, Sungai Mahakam.

Annex 3:**Designated ports of entry and exit for CITES Appendix II-listed species**

No.	Name of port	Location
1	Soekarno-Hatta International Airport	Jakarta
2	Juanda Airport	Surabaya
3	Polonia Airport	Medan
4	Hang Nadim Airport	Batam
5	Supadio Airport	Pontianak
6	Hasanudin Airport	Ujung Pandang/Makassar
7	Ngurah-Rai International Airport	Denpasar
8	Adi Sucipto Airport	Yogyakarta
9	Pattimura Airport	Ambon
10	Frans Kaiseipo Airport	Biak
11	Sentani Airport	Jayapura
12	Simpang Tiga Airport	Pekanbaru
13	Sam Ratulangi Airport	Manado
14	Tanjung Priok Seaport	Jakarta
15	Tanjung Perak Seaport	Surabaya
16	Tanjung Mas Seaport	Semarang
17	Belawan Seaport	Medan
18	Ujung Pandang Seaport	Ujung Pandang/Makassar
19	Adisumarno Airport	Solo
20	Sepingan Airport	Balikpapan
21	Jetty IP Seaport	Batam

TRAFFIC, the wildlife trade monitoring network, works to ensure that trade in wild plants and animals is not a threat to the conservation of nature. It has offices covering most parts of the world and works in close co-operation with the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

For further information contact:

The Director
TRAFFIC Southeast Asia
Unit 9-3A, 3rd Floor
Jalan SS23/11, Taman SEA
Petaling Jaya, Selangor
Malaysia
Telephone: (603) 7880 3940
Fax: (603) 7882 0171
Email: tsea@po.jaring.my

The Executive Director
TRAFFIC International
219a Huntingdon Road
Cambridge CB3 0DL
United Kingdom
Telephone: (44) 1223 277427
Fax: (44) 1223 277237
Email: traffic@traffic.org

