Working group	*Co-chair*	*CS Presenter*	*Keynote Speaker*	*Expert*	*Rapporteur*	*Attendance*

Reptiles and amphibians

Charlie Manolis	☑	☐	☐	☐	☐	NO
Peter Paul van Dijk	☑	☐	☐	☐	☐	YES
Mark Auliya	☐	☑	☐	☐	☐	NO
Paola Mosig	☐	☐	☐	☐	☑	YES
Robert W. G. Jenkins	☐	☐	☐	☑	☐	YES
Sabine Schoppe	☐	☑	☐	☐	☐	YES
Solomon Kyalo	☐	☑	☐	☐	☐	YES
Simon Nemtzov	☐	☑	☐	☐	☐	YES
Thomasina Oldfield	☐	☑	☐	☐	☐	YES
Victoria Lichtschein	☐	☐	☐	☐	☐	NO

Total Participants : 10

International Expert Workshop on CITES Non-Detriment Findings

Cancun, Mexico, November 2008

Working Group 7

Reptiles and Amphibians

Working Group Summary

List of Case Studies presented:
Crocodylus niloticus ranching in Kenya – KWS – Solomon Kyalo
Cuora amboinensis in Indonesia – TRAFFIC – Sabine Schoppe
Malacochersus tornieri in Kenya – KWS – Solomon Kyalo
Ptyas mucosa in Indonesia – TRAFFIC – Thomasina Oldfield
Uromastyx lizards in Israel – Simon Nemtzov
Cuora amboinensis in Malaysia – TRAFFIC – Sabine Schoppe

Main points of the outcome
The Reptile and Amphibian WG highlighted that these species exhibit a wide variety of characteristics of biology and life history, and are subject to a wide variety of production and utilization systems and practices; these are summarized in the Appendix.

The R&A WG considered that the NDF process needs to be practical and also have various degrees of rigour as appropriate. The NDF process needs to begin with a risk assessment process, to guide the different degrees of subsequent analysis of information. The group felt it was important to produce a proposed decision tree to guide a SA to making a NDF or rejecting the proposal.

The proposed decision tree developed by the WG consists of a two-step process, described in detail in the Appendix. **First**, a **Provisional Risk Assessment** (PRA) considers the intrinsic vulnerability of the species or population, the general threats acting upon the (National) population, and the potential impact of the proposal, and leads to categorization of a proposal to export as low, medium or high risk. A proposal ranked as 'High Risk' is rejected as detrimental. A proposal emerging as 'Low Risk' requires documentation of the elements supporting the low risk evaluation, and low-level monitoring of utilization and trade of the species. Proposals emerging from the PRA as 'Medium Risk' progress to the second step of the process. **Step Two** of the process involves **rigorous analyses of available data** to determine impact of past harvest and potential impact of proposed export, and determination of the extent and appropriateness of monitoring in place. Depending on the results of this analysis, and the rigour of the data available, an evaluation as non-detrimental or detrimental is arrived at and documented.

The WG concluded by highlighting general issues to improve implementation of the NDF process:

- The need to develop practical, scientifically acceptable monitoring programs, and to avoid incompatible methodologies which prevent consistent long-term assessment.
- The need to summarize and distribute field research methodologies.
- The desirability of establishing a repository of NDFs that have been made, so that they can be consulted by others for comparison and capacity building.

The desirability of setting up web-based tools and information management systems where SAs can easily access pertinent information.

International Expert Workshop on CITES Non-Detriment Findings

Working Group 7

Reptiles and Amphibians

FINAL REPORT

WG Members:
Peter Paul Van Dijk – Co-chair – IUCN Tortoise and Freshwater Turtle SG; Thomasina Oldfield – Co-chair – TRAFFIC International; Hank Jenkins - Species Management Specialists, Inc.; Solomon Kyalo – Kenya CITES MA/SA; Simon Nemtzov – Israel CITES SA; Sabine Schoppe – TRAFFIC consultant.

Additional Occasional Participants:
Hesiquio Benitez – Conabio; David Morgan – CITES Secretariat; Colman Ó Criodain – WWF International; Yolanda Barrios and Paola Mosig – Rapporteurs

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- The desirability of setting up web-based tools and information management systems where SAs can easily access pertinent information.

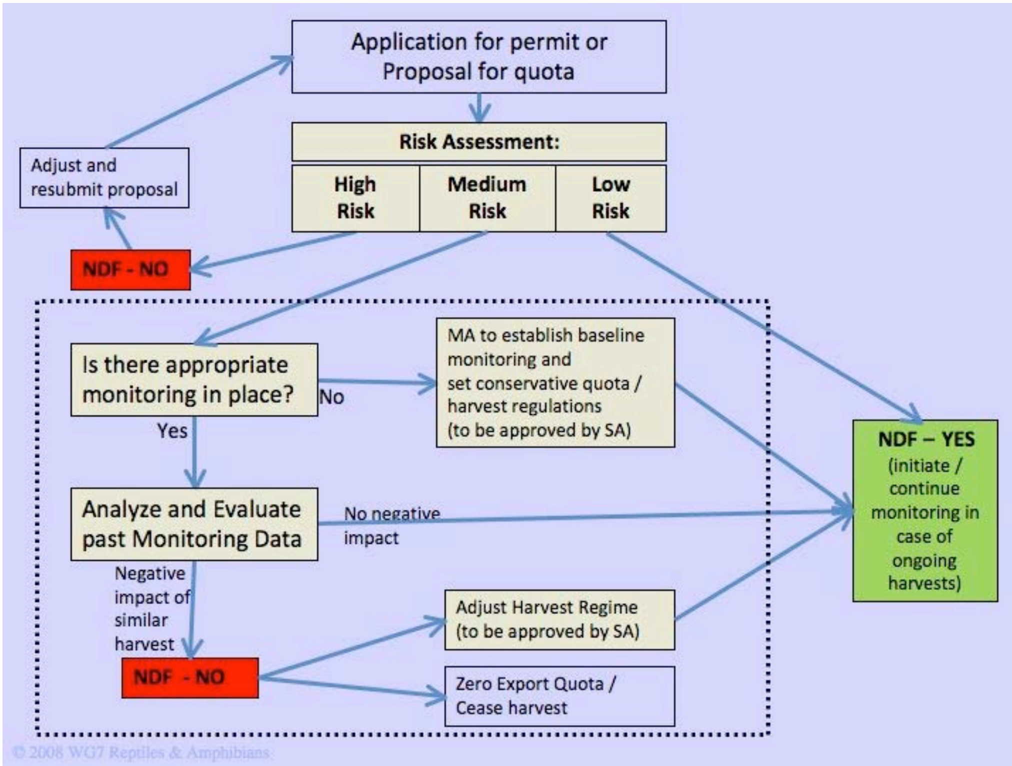


Figure 1. Outline flow chart of NDF process as developed by WG7 – Reptiles & Amphibians.

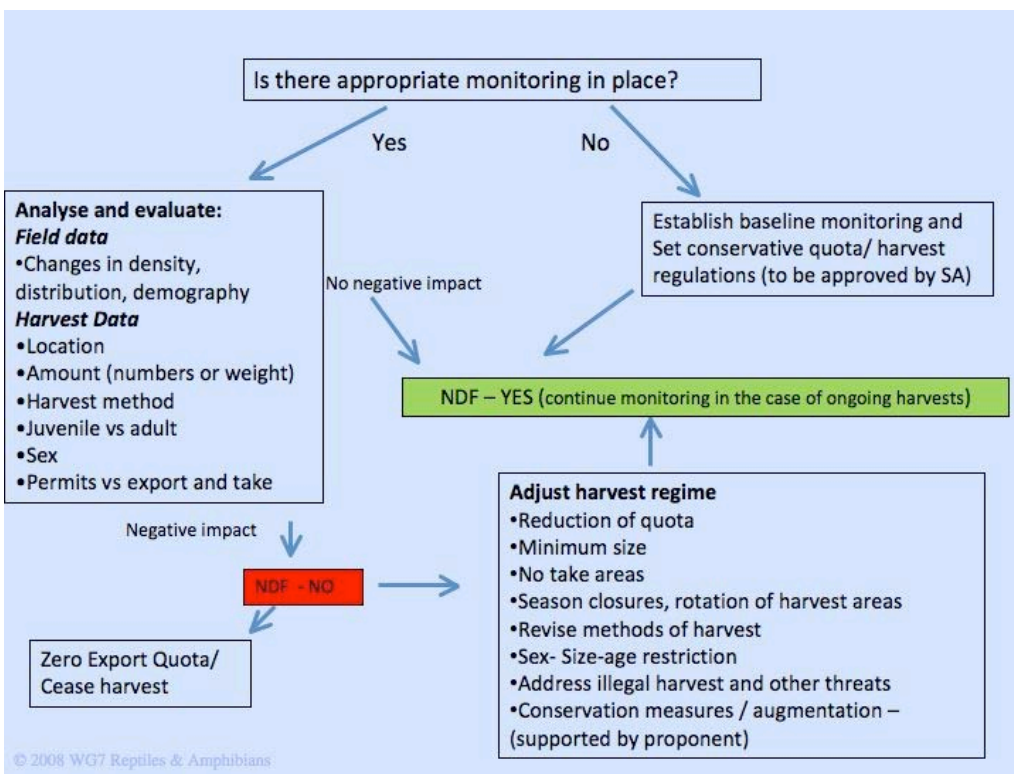


Figure 2. Flow chart of 2nd step of NDF process as developed by WG7 – Reptiles & Amphibians.

APPENDIX

Special considerations for NDFs for Reptiles and Amphibians

Reptiles and Amphibians exhibit a wide range of life history aspects, including species with characters that make them particularly susceptible to negative impacts from utilization, such as late maturity, long life span, and limited re-productive output (K-selected, slow), and habitat specialization. Other species display life history traits allowing them to recover from reasonable l.evels of utilization, such as high natural mortality at early life stages, high fecundity, and adaptability to human-altered biotopes. Most species have limited dispersal.

Extensive experience of production exists through ranching of crocodilian species and aquaculture of a few turtle and frog species. There is also an extensive history of reptile and amphibian populations and species that have been over-exploited, and/or subjected to the Review of Significant Trade process.

The WG considered that an NDF for reptile or amphibian species should consider the following biological and status elements: distribution and geographical variation; population size / density; vulnerability at the stage of harvest; size distribution, population structure; life history traits / reproductive capacity; ecological adaptability; dispersal capability; role in ecosystem; possible status of pest or invasive species.

The NDF should also consider the following data on utilization: Utilized population segment or life history stage (eggs/juveniles/adults, males/females) (size and weight limits); Production systems; Captive breeding / ranching; Nuisance animals; Legal and illegal trade issues; Utilization quantities; Collection methodology; Collection location; Tenure (exclusivity of utilization, jurisdiction over utilization, resource ownership); Closure periods; Effect of utilization. Finally, the WG considered that an appropriate monitoring program for a utilized reptile or amphibian population should evaluate one or more of the following elements:

Changes in Distribution; Changes in density; Changes in population structure; Collection areas (Proportion of total distribution, and change of areas); Catch per unit effort; Legal issues; and Other threats (habitat loss, climate change, pollution, etc.).

The WG recognized that reptiles and amphibians are subject to a variety of export proposals requiring NDFs, including ad-hoc / once-off permit applications and annual quotas. In addition, a number of Crocodile populations are subject to ranching systems following CoP approvals of proposals for downlisting populations from Appendix I to II for purposes of ranching. Trade in specimens from these systems is governed by Res.Conf. 11.16. The acceptance by the CoP of a proposal to downlist a population from Appendix I to II represents an NDF, and impacts and conservation benefits are monitored through the reporting requirements of Res.Conf. 11.16.

While much of the WG's deliberations were informed by the reptile case studies, consideration of some amphibian test cases indicate that our process and conclusions are applicable to amphibians as well.

The NDF Process as Developed by the Reptiles and Amphibians Working Group"

Step 1 – Provisional Risk Assessment.

A 'quick and dirty' process to allow SA to make early assessment of the proposal.

The Provisional Risk Assessment examines three major areas:

- o The intrinsic vulnerability of the species or population.
- o General threats acting upon the (National) population.
- o The potential impact of the proposal.

The Intrinsic Vulnerability of the species or population examines its distribution, dispersal, population size / density, reproductive capacity, niche width, and role in the ecosystem.

General Threats acting on population that should be considered are levels of domestic use, illegal trade, human-induced impacts (such as habitat loss, pollution, human-animal conflict), invasives, diseases, and any other relevant threats.

The potential impact of the proposal to export includes consideration of the quantity or proportion of population targeted, the life stage targeted, the harvest method, harvest purpose, harvest area, effectiveness of regulation and management, and consideration of monitoring data.

The Provisional Risk Assessment leads to categorization of a proposal to export as low, medium or high risk. This categorization is made through a simple scoring system, detailed in the full working group report. This scoring system requires further consideration, refinement and evaluation, but the WG felt it was important to demonstrate the concept. We felt that quantifying the initial risk was important as guidance to the SA to indicate those proposals that could be relatively easily processed, and not require the resources inherent in a rigorous NDF analysis. **Low Risk** – Non-detriment finding made. SA ensures that low level monitoring programme is instituted, comprising monitoring of permits vs. actual take, accumulation of permits, and a 'low-key' harvest impact monitoring program (trader interviews, casual field observations). These data should be evaluated for subsequent requests in future years.

High Risk – Unacceptable risk, leading to rejection of proposal; any amended proposal requires re-evaluation from the beginning of the provisional risk assessment process.

Medium Risk – goes into step 2 of the process.

Step 2 – Analysis of available monitoring data and management

This part of the process involves determination of the extent and appropriateness of monitoring in place and rigorous analyses of available data to determine impact of past harvest and potential impact of proposed export. For reptile and amphibian species, an appropriate monitoring

program is considered to collect, analyse and evaluate data on parameters such as: changes in density, distribution, and demography of the harvested population, harvest location, harvest amount (number and/or weight), harvest method, demographic segments subject to harvest (age, gender), monitoring of permits vs. actual take, and accumulation of permits.
If appropriate monitoring is in place, the SA should analyze and evaluate past monitoring data to determine whether previous similar harvests have had negative or no negative impact; if no negative impacts are apparent, a positive NDF can be made for ongoing harvest at a comparable level.
If appropriate monitoring is not in place, the MA should ensure that an appropriate monitoring program is established. Once such a monitoring program is committed to, and subject to establishing a precautionary level of permitted harvest or quota, and subject to approval of these measures by the SA, a positive NDF can be made.
Once monitoring is in place for an appropriate length of time, the results of the monitoring program should guide/inform the decision process for ongoing or subsequent applications for trade in the species. In cases where the monitoring program documents a negative impact from harvest, the harvest regime must be adjusted by, for example: reduction of quota, imposing or changing minimum or maximum size or other restrictions on size, age or gender of individuals exploited, season closures, closed areas, rotation of harvest areas or other time/area restrictions, revising methods of harvest, measures to address illegal trade and/or other threats, and/or other conservation measures to protect and/or augment populations; support by the proponent for such measures is recommended. A (temporary) zero export quota or cessation of harvest is the other option. A subsequent NDF can only be made when the SA is satisfied that the adjusted harvest regime will represent no threat to the survival of the species in the wild and to recovery of the population to its pre-harvest level.

Sources of information on Reptile and Amphibian status, biological research and monitoring methodologies.

IUCN Red List of Threatened Species: http://www.iucnredlist.org

Crocodile information: http://www.flmnh.ufl.edu/cnhc/cbd.html

Turtle taxonomy, plus conservation biology accounts for selected species: http://www.iucn-tftsg.org/checklist/

Reptilian taxonomy and distribution: http://www.reptile-database.org/

Amphibian taxonomy and biology: http://www.globalamphibians.org/

Measuring and Monitoring Biological Diversity - Standard Methods for Amphibians. Edited by W. Ronald Heyer, Maureen A. Donnelly, Roy W. McDiarmid, Lee-Ann C. Hayek, and Mercedes S. Foster. 1994. Smithsonian Institution Press. 384 pages. ISBN 1-56098-284-5.

Sampling Rare or Elusive Species: Concepts, Designs, and Techniques for Estimating Population Parameters. William L. Thompson. 2004. Island Press. 429 pages. ISBN 1559634510, 9781559634519

Occupancy Estimation and Modeling: Inferring Patterns and Dynamics of Species Occurrence. Darryl I. MacKenzie, James D. Nichols, J. Andrew Royle, Kenneth H. Pollock, Larissa L. Bailey, James E. Hines. 2006. Academic Press. 324 pages. ISBN 0120887665, 9780120887668

Handbook of Capture-Recapture Analysis. Edited by Steven C. Amstrup, Trent L. McDonald, Bryan F. J. Manly. 2005. Princeton University Press. 313 pages. ISBN 069108968X, 9780691089683



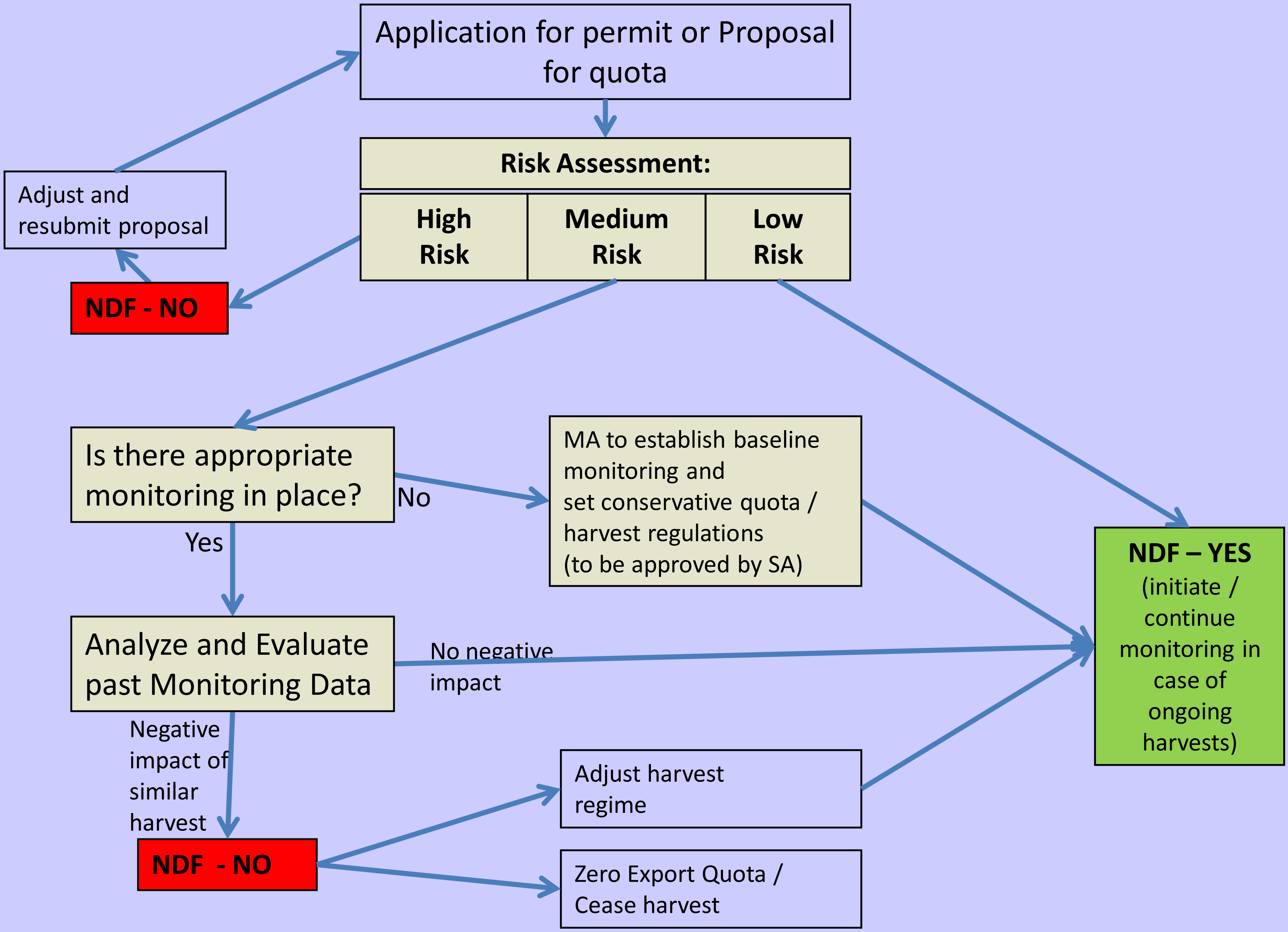

Working Group 7
Reptiles and Amphibians

Proposed harvest subject to NDF:

- Ad-hoc once-off permit applications
- Annual quota setting
- Ranching systems

  subject to Res Conf 11.16 :

  NDF is represented by acceptance of proposal by CoP and monitored by reporting requirements


Application for permit or Proposal for quota
Risk Assessment:
High Risk
Medium Risk
Low Risk
Adjust and resubmit proposal
NDF - NO
Is there appropriate monitoring in place?
No
MA to establish baseline monitoring and set conservative quota / harvest regulations (to be approved by SA)
Yes
NDF – YES (initiate / continue monitoring in case of ongoing harvests)
Analyze and Evaluate past Monitoring Data
No negative impact
Negative impact of similar harvest
NDF - NO
Adjust harvest regime
Zero Export Quota / Cease harvest

Risk Assessment of proposed harvest

Intrinsic vulnerability of species [population]

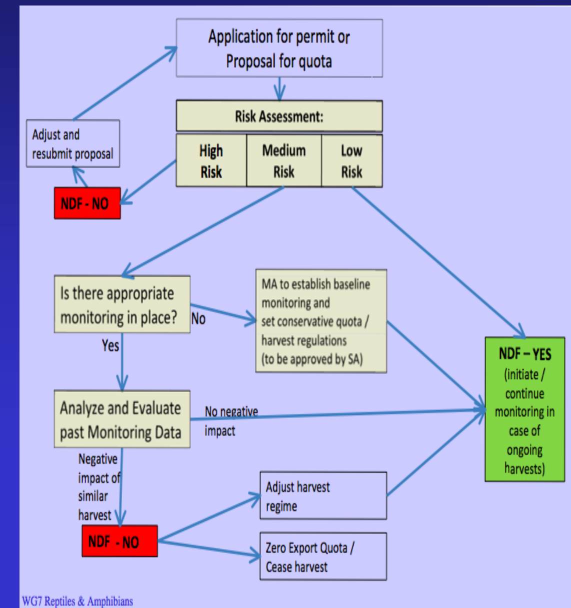
- Distribution, dispersal
- Population size / density
- Reproductive capacity
- Niche width
- Role in Ecosystem

General Threats acting on population

- Illegal trade
- Invasives, diseases, etc.
- Human-induced impacts (habitat loss, pollution)
- Domestic use

Potential Impact of Proposed Harvest

- Quantity or proportion of population
- Life stage targeted
- Harvest method
- Harvest purpose
- Harvest area
- Effectiveness of regulation and management



Broad categorization as Low, Medium, or High Risk

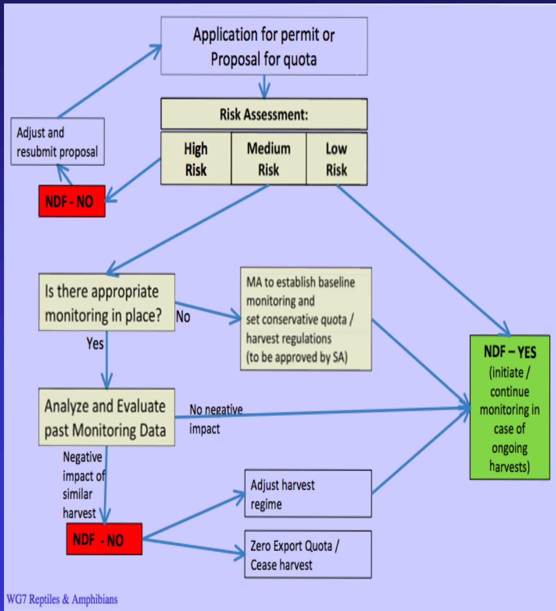
PRE-NDF RISK SCORE		*Croc.*	*Cuora*	*U.or.*	*U. aeg.*	*Ptyas*	*Mala.*	*Rana*	MIN	MAX
1. Intrinsic vulnerability of the species	**Low =1, High = 5**	2	2.5	5	4	1	5	1	1	5
Weight	Distribution, dispersal									
2	Population size / density									
	Reproductive capacity									
	Niche width									
2. General threats on the population	**Low =1, High = 5**	2.5	4	3	4	3	4	2.5	1	5
Weight	Illegal trade									
1	Invasives, diseases, etc.									
	Human-induced impacts (habitat loss, pollution)									
	Domestic use									
3. Potential impact of proposed harvest	**Low =1, High = 5**	1.5	4	5	3	4	4	3.5	1	5
Weight	Quantity or proportion of population									
2	Life stage targeted									
	Harvest method									
	Harvest purpose							Pts.:	5.0	25.0
	Harvest area									
	Effectiveness of regulation and management									
	Weighted "Pre-NDF Risk Score"	1.9	3.4	4.6	3.6	2.6	4.4	2.3	1.0	5.0
		Low	Med	High	High	Med	High	Med	Low	High

0		
2	**0 - 2.0**	**Low**
3.5	**2.1 - 3.5**	**Med**
5	**3.6 - 5.0**	**High**

Low risk of proposed harvest event

Examples: Ad hoc ‘small’ one-off exports

Annual small harvest of ‘disposable’ life stage



Likely positive NDF:

Document the data used to arrive at evaluation as ‘low risk’

Implement ‘casual’ monitoring program:

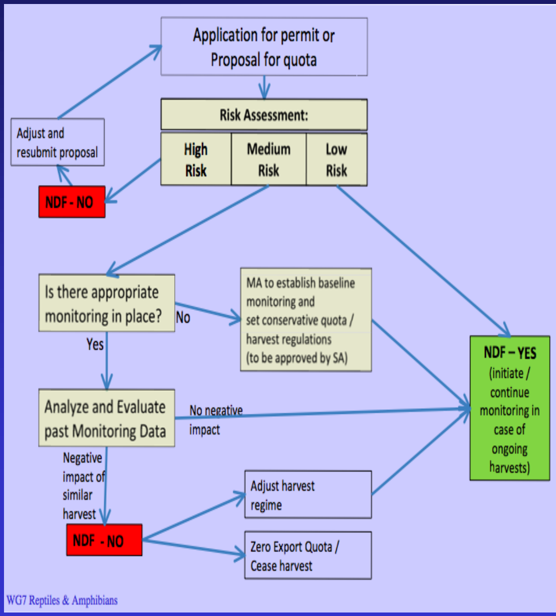
- Monitor permits vs. actual take & accumulation of permits
- Implement ‘low-key’ harvest impact monitoring program

High risk of proposed harvest event

Examples: high quantity of rare threatened species

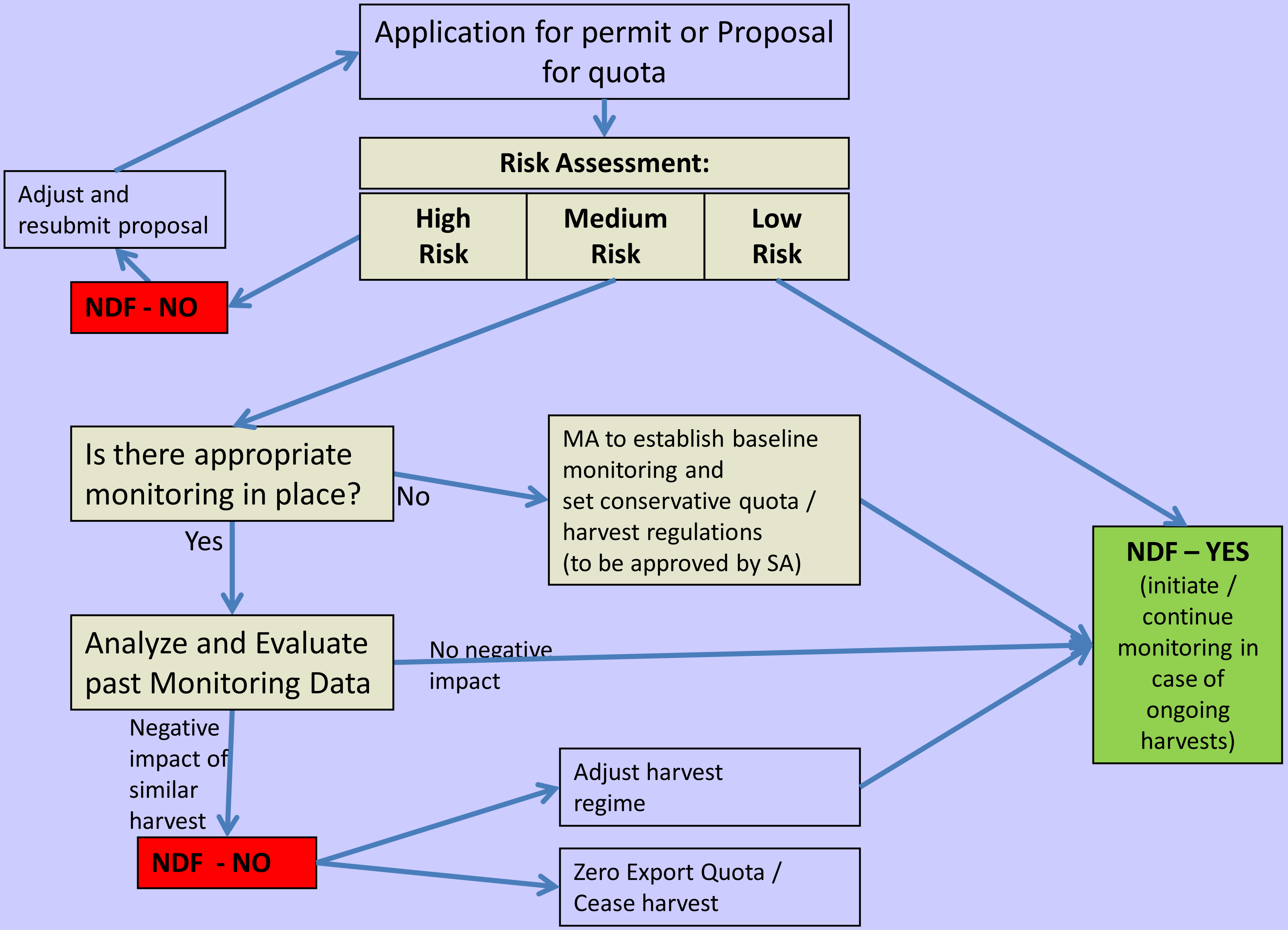
large annual quota of adults of vulnerable species

Reject application



Encourage actions to address the factors that caused evaluation as 'high risk'

- Other threats
- Adjust proposed harvest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MA to establish baseline monitoring and set conservative quota / harvest regulations (to be approved by SA)
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Analyze and Evaluate past Monitoring Data
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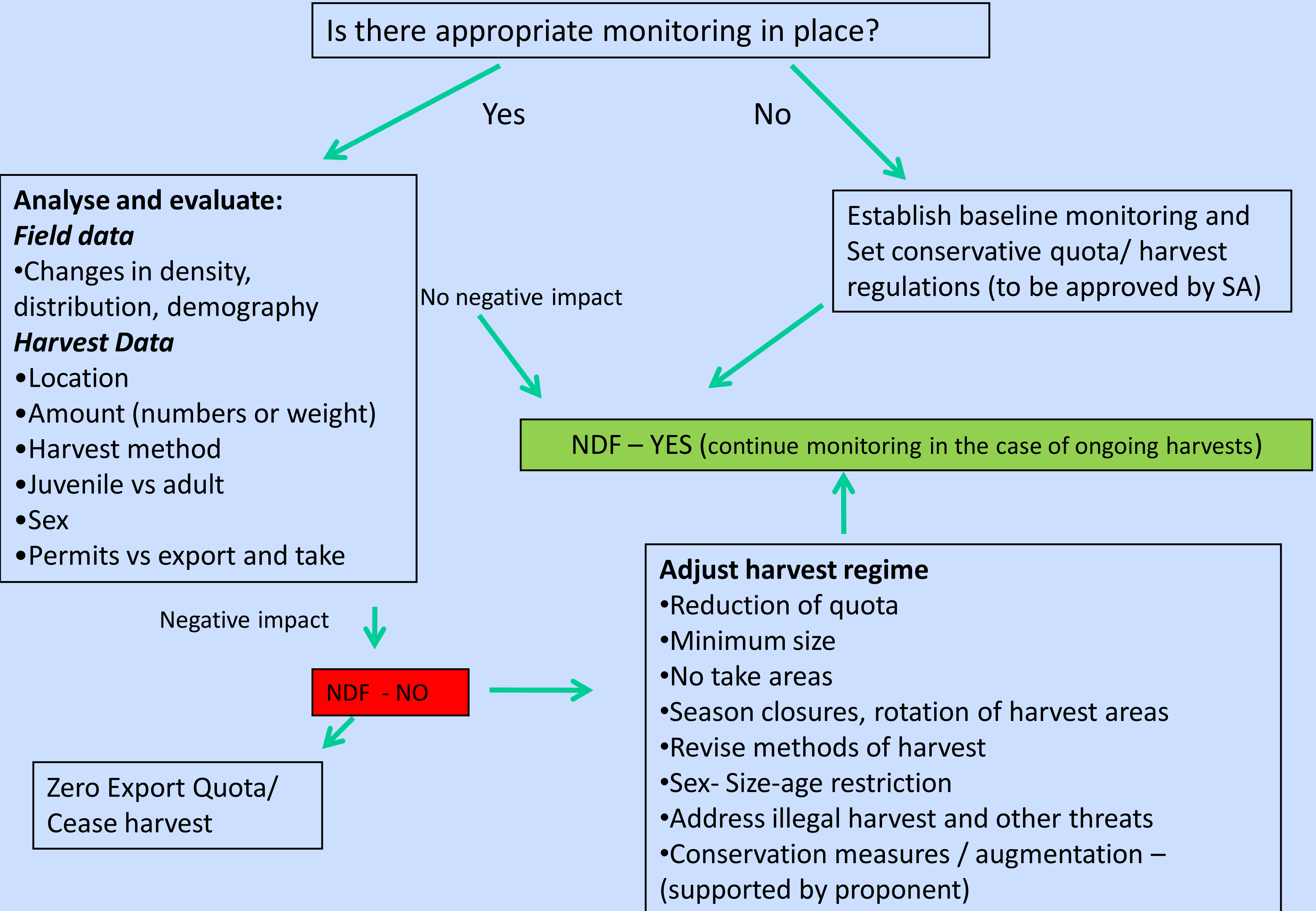
Negative impact of similar harvest
NDF - NO
Adjust harvest regime
Zero Export Quota / Cease harvest


Is there appropriate monitoring in place?
Yes
No
Analyse and evaluate:
Field data
•Changes in density, distribution, demography
Harvest Data
•Location
•Amount (numbers or weight)
•Harvest method
•Juvenile vs adult
•Sex
•Permits vs export and take
Establish baseline monitoring and Set conservative quota/ harvest regulations (to be approved by SA)
No negative impact
NDF – YES (continue monitoring in the case of ongoing harvests)
Negative impact
NDF - NO
Zero Export Quota/ Cease harvest
Adjust harvest regime
•Reduction of quota
•Minimum size
•No take areas
•Season closures, rotation of harvest areas
•Revise methods of harvest
•Sex- Size-age restriction
•Address illegal harvest and other threats
•Conservation measures / augmentation – (supported by proponent)

NON-DETRIMENT FINDING STUDIES ON NILE CROCODILE (*CROCODYLUS NILOTICUS*): THE STATUS OF AND TRADE IN THE NILE CROCODILE IN KENYA,

AUTHOR:
Solomon Kyalo
Kenya Wildlife Service, Kenya

I. Background information on the taxa

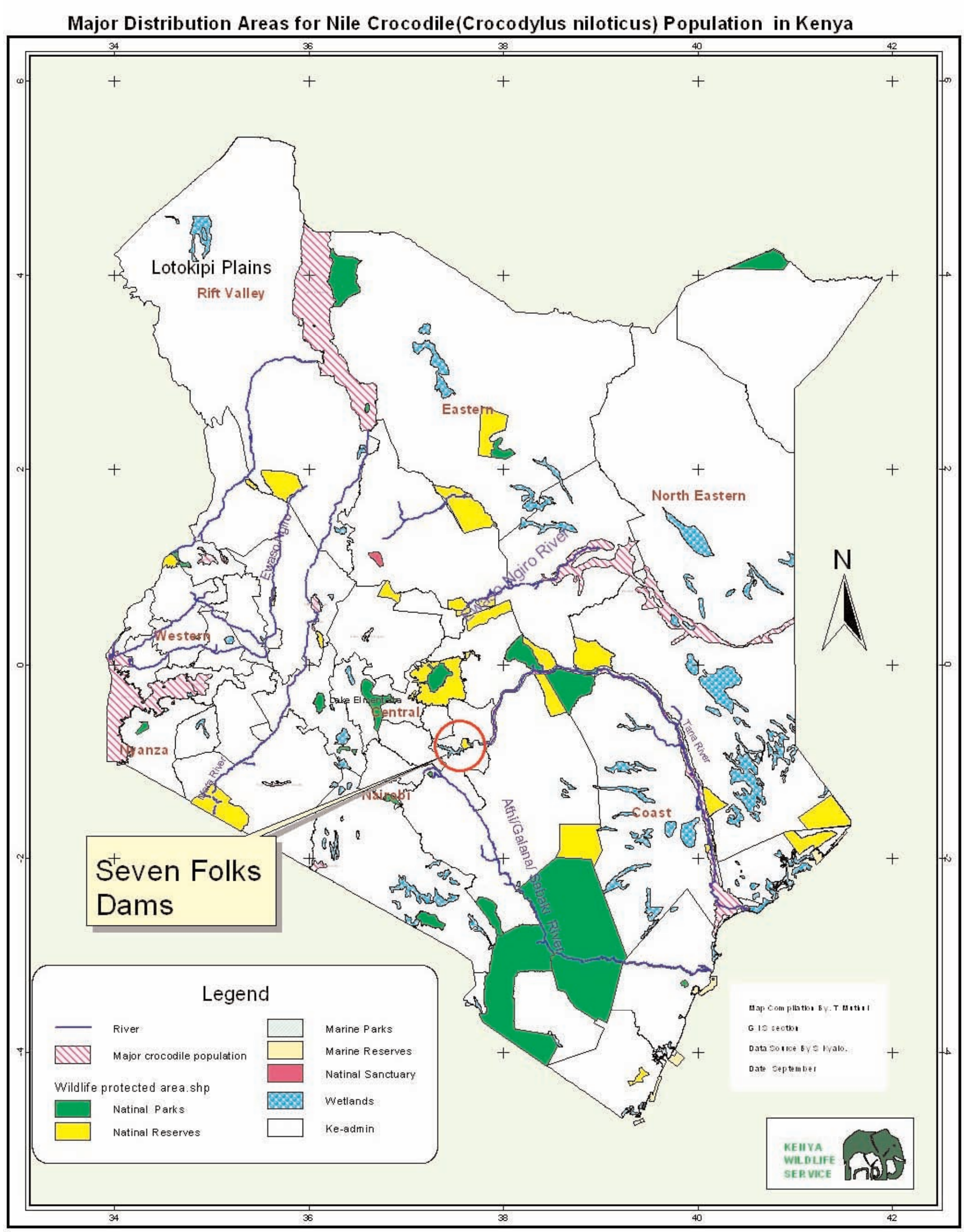
1. BIOLOGICAL DATA

1.1 Scientific and common names:

Class:	Reptilia
Order:	Crocodylia
Family:	Crocodylidae
Scientific name:	Crocodylus niloticus (Laurenti, 1768)
Common names:	English: Nile crocodile
	Swahili: Mamba

1.2 Distribution

Several sub-populations of Nile crocodile exist in Kenya. Generally all the fresh water systems both fresh water lakes and rivers in the country have crocodiles. Some of the major ones include Lake Turkana, Lake Baringo, Lake Victoria, Mara River, Ewaso Nyiro River and Lorian Swamp, Tana River and Athi/Galana/Sabaki River and Ramisi River. (See map with distribution of fresh water masses being habitats for major populations of Nile crocodile in Kenya) These populations are considered healthy and are inferred to be increasing in numbers based on reports from the communities in these areas. The species habitat range has however shrunk as a result of encroachment by human activities resulting from increased human population.



1.3 Biological characteristics

1.3.1 *General biological and life history characteristics*

Nile crocodile (*Crocodylus niloticus*) is an egg laying reptilian species. Eggs are laid between August and March in nests with clutch sizes of between 20 -60 eggs. The eggs weigh between 70-110 Grams and length between 65-80 cm and width between 40-45 cm. The Nile crocodile is sexually dimorphic with growing upto 30% larger than the females. Males regularly grow to 5m and can weigh more than 500 kg.

1.3.2 *Habitat types*

The species occurs in fresh water wetlands, in lakes, rivers, marshes and dams. The dry stream beds, river banks and sandy shores of the wetlands provide preferred nesting sites where eggs are deposited during laying season usually between September and January.

1.3.3 *Role of the species in its ecosystem*

Nile crocodile is a predator species whose diet is very broad and includes aquatic invertebrates, fish, amphibians, birds and other reptiles. Hatchlings eat insects and small aquatic invertebrates. Adults can take a wide range of large vertebrates. The species plays a significant role in the ecosystem and is responsible for checking populations of other aquatic species such as the barbell catfish.

The species is a problem animal, killing people and their livestock more than any other wild animal in many areas where they co-habit. It probably causes more human deaths than any other wild animal in Africa (Hirschoff *et al* 1996).

1.4 Population:

1.4.1 *Global population size*

Global population of Nile crocodile in the wild is estimated between 250,000-500,000. This population is distributed throughout Africa and Madagascar in suitable habitats. Its distribution extends from Senegal river, Lake Chad, Wadai and Sudan to the Kunene and the Okavango delta. In Madagascar, the species occurs in the Western and Southern parts from Sembrirano to Port Dauphin

1.4.2. *Current Global population trends*

_X_increasing ___decreasing ___stable ____unknown

The general trend for the global population of Nile crocodile is increasing although in most cases its range is shrinking as a result of increasing human population hence pressure demand for land in the species habitats

1.5 Conservation status

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

___Critically endangered	___Near Threatened
___Endangered	_X_Least concern
___Vulnerable	___Data deficient

The species was listed under IUCN as Vulnerable in 1990 (Baillie & Groombridge, 1990) and later in 1996 as species of Lower Risk but was not subsequently listed in 2000, and 2003.

The species is listed in Appendix I of CITES (threatened with extinction) in most of its range except populations of Botswana, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Namibia, South Africa, Uganda, The United Republic of Tanzania (subject to an annual export quota of no more than 1600 wild specimens including hunting quotas, in addition to ranched specimens), Zambia and Zimbabwe that are in Appendix II (not threatened but trade must be controlled) for purposes of ranching in accordance with Resolution Conf. 11.16.

1.5.2 *National conservation status for the case study country*

The Tana River has the biggest living population of Nile crocodile (*Crocodylus niloticus*) in Kenya. The Tana River is the longest river in Kenya stretching over a total length of 1,000 km and has the largest catchments area of about 95,000 km square ; an approximately 17% of the Kenya land mass. It flows for most of its course across semi-arid and arid regions meandering through alluvial floodplain of varying width from 2km in the middle to 40km in the lower delta region. It enters the Indian Ocean through the Ozi River being the main channel near Kipini. The river has been the source of crocodile eggs for breeding operations registered with KWS and CITES in accordance with the provisions of CITES Resolution Conf. 11.16 on Ranching and Trade in Ranched specimens of species transferred from Appendix I to II for ranching purposes. Kenya population of *Crocodylus niloticus* is listed in CITES Appendix II following its transfer from Appendix I in 1995 for ranching purposes. CITES ranching requirements stipulate the need for frequent assessment of crocodile numbers within areas of their exploitation to ensure sustainability.

Several crocodile population surveys and assessments have been done in Kenya however only populations of the lower reaches of Tana River have been significantly studied. The objectives of the surveys are fourfold:

- Conduct a crocodile count to determine the species population size within designated section of the water system delineated for the species utilization program;

- Determine the suitability and viability of the crocodile population for ranching purposes,
- Recommend conservation and management strategies for this crocodile population,
- Recommend possible utilization quotas that are sustainable

Crocodile census is an exercise that requires specialized herpetological training skills and resources. There are no up-to date comparative studies done to estimate the population of the Nile crocodile in the country. The latest census conducted in Kenya was in 1995 and involved Kenya Wildlife Service, the CITES Management Authority and National Museums of Kenya (NMK), the Scientific Authority for Kenya. The surveys covered the lower reaches of Tana River system. There are few recent data based on the species monitoring through egg collection for ranching operations but it is evident that Kenya has a large population of the Nile crocodile not under any immediate threat. Planning for a survey of the Nile crocodile in its major distribution areas is underway and data to be generated will be used to update the national conservation of the species.

1.5.3 *Main threats within the case study country*

___No Threats
_X_Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
_X_Harvesting [hunting/gathering]
___Accidental mortality (e.g. Bycatch)
_X_Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
___Other_______________

Threat to Nile crocodile in Kenya include loss of its habitat as a result of human population encroachment, erosion and loss of nesting areas and riparian habitats as rivers change their courses due to land degradation upstream, persecution as a result of human-wildlife conflict and in a limited way egg collection for ranching operations for commercial trade. During drought in some of the arid and semi-arid land, people and crocodiles increasingly come into contact within the rivers/lakes that are sources of water and fish thus causing resource use conflicts. Results of such conflicts are normally human and livestock deaths caused by the crocodiles and or persecution of the crocodiles by human beings. As a result of such conflicts, Nile crocodile populations have been reduced in specific areas of high human population in Kenya. However, due to the species resilience, Nile crocodiles are able to co-exist successfully in areas with human disturbances.

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

2.1 Management Measures

2.1.1 *Management history*

The Nile crocodile (*Crocodylus niloticus*) was listed in CITES Appendix I at the plenipotentiary conference (Washington D.C, 1973) where CITES was adopted and signed. It is still included in Appendix I as a species while a number of national populations have been transferred to Appendix II including the Kenya population. All populations of *Crocodylus niloticus* are therefore in Appendix I except the populations of Botswana, Ethiopia, Kenya , Madagascar, Namibia, South Africa, Uganda, the United Republic of Tanzania(subject to an annual export quota of no more than 1,600 wild specimens including hunting trophies in addition to ranched specimens), Zambia and Zimbabwe.

Kenya did make a successful proposal to transfer its population of Nile crocodile (*Crocodylus niloticus*) from Appendix I to Appendix II for ranching purpose at the Eighth Meeting of the Conference of the Parties (CoP8) in 1992. Trade in the species is only with ranching operation specimens. Eggs for the ranching operations are collected in areas outside protected areas and therefore all populations inside protected areas are fully protected from harvesting.

2.1.2 *Purpose of the management plan in place*

A management plan for Kenya population of Nile crocodile was developed in 1990 to provide for a code of ranching practice and guidelines. In accordance with CITES Resolution Conf. 11.16 on *ranching and trade in ranched specimens of species transferred from Appendix I to Appendix II*, each Party that has made successful proposal to transfer a population of a species in Appendix I to Appendix II for ranching purposes should submit to the CITES Secretariat annual reports on all relevant aspects of each approved ranching operation to include the following:

a) Status of the wild population of the species concerned
b) Number of specimens(eggs, young or adults) taken annually from the wild
c) An estimate percentage of the production of the wild population that is taken for the ranching operation
d) Number of animals released back to the wild and their survival rates estimated on the basis of survey and tagging program if any
e) Mortality rates in captivity and causes of such mortality

f) Production sales and exports of the products and
g) Conservation programs and scientific experiments carried out in relation to the ranching operation or the wild population concerned

There is currently a strong focus by the MA towards ensuring there is improved compliance and enforcement of the code of practice and production standards.

2.1.3 *General elements of the management plan*

The following procedures are being required of all potential and registered operations:

a) The potential rancher submits a short feasibility study with a management plan of proposed ranching operation to the MA.
b) Upon acceptance/approval by the MA, the applicant submits a detailed project proposal detailing the following:

   - Location of the proposed ranching operation
   - Water supply
   - Food supply – evidence of secure food supply to feed a stated and projected number of crocodiles and a detailed plan of the operation.
   - Financial capital – the applicant will have to show proof of sufficient financial resources to cover at least four years of operation without expected income from the ranching operations.
   - Expertise on crocodile handling and husbandry
   - Ranch/Farm business plan with projected expansion and production
   - Full Environmental Impact Assessment Report

c) The MA reviews and responds to the feasibility studies and the completed project proposals upon which a competent team from the MA and the SA does physical inspection of the facilities
d) A letter of authority to ranch/farm is issued and can be revoked on failing to maintain standards required. The letter of authority stipulates conditions and standards to be met which include:

   - Procedures, formats and frequency of submitting farm returns
   - Standards of the facilities

2.1.4 *Restoration or alleviation measures* (see 2.1.2)

2.2 Monitoring system

This case study presents the status of the crocodile population in Kenya as guided my a Management Plan for the species' ranching operations based on scientific information generated from population assessments, regular returns by the ranchers and routine inspections of the operations as a monitoring system for the species population.

The information presented in this case study is an analysis of population surveys, returns of the ranching operations and data collected through physical inspections of the same by a team from the CITES Management and Scientific Authorities. Valuable information is received through the Crocodile Producers Association of Kenya (CPAK) and directly from individual ranchers/producers.

2.2.1 *Methods used to monitor harvest*

Currently there are six Nile crocodile ranching operations in Kenya most of them along the Kenyan coast and one in Kirinyaga district within the proximity of the five hydroelectric dams along the Tana River system. Currently, most of the eggs collected for the ranching operations are sourced from the Tana River system. Only a small percentage is currently being collected in Lake Turkana estimated to have a population of 12,000 crocodiles. To ensure continued sustainable exploitation of crocodile resources within the country, the species population in the Tana River especially the lower reaches has been regularly assessed and monitored using basic egg collection data and community reporting on incidences of community-crocodile interactions in the major species distribution areas. The areas of egg collections are zoned to allow for appropriate levels of monitoring the population, its protection and utilization. Data on the number of eggs per nest and the egg collection efforts (number of egg nests identified and collected within the open season for egg collection) is used to provide information on relative size of the crocodile population within a given segment of the egg collection zone. The sizes of the eggs collected are also used to provide general information on the relative age, sizes and structure of the reproductive female population of the crocodile in the egg collection zones. Based on data on egg sizes collected and analysed at the Nile crocodile ranching operation, it indicates the size of the eggs positively correlates with the size of the female crocodile laying the eggs. The data on the number of nests collected is used to estimate the population of female crocodiles that have reached reproductive age at each collection season. This data does not however aid to estimate the population of the males and also the reproductive immature population of the crocodiles in the designated egg collection zones. However, better censuses of the various segments of the crocodile population and especially the adults are certainly necessary. A national survey of the Nile crocodile population was scheduled for early this year but due to budget constraints, it has been rescheduled to early 2009. Currently, the designation of specific zones in the lower reaches of Tana river and also the Lake Turkana for egg collection focuses on reducing the Nile crocodile population to mitigate against crocodile-human conflicts. Approvals on the number of eggs for collection by each ranching operation are based on projected farm capacity for production. Once the egg collection permit is issued for specified number of eggs in specified identified collection zone, the collection of the eggs is monitored followed by inspection of the facilities in the ranching operation to ensure the facility can manage the number collected and taking cognizant of the existing stock and the projected trade. These multiple factors are considered and used to determine quotas for crocodile egg collection allocated to each of the registered ranchers and breeders. The total quotas allocated to all the ranching operations therefore vary year –on-year as determined by the capacities of the operations to produce. The quota allocated to each operation is reviewed in the course of the collection season against the respective facility expansion. To effectively ensure this review, the egg collection is closely monitored through use of the collection permits and filing of returns. The annual egg collection is used to monitor relative crocodile population abundance in the designated zones and identify trend and problem areas.

Crocodile ranches and farms in Kenya (2008)

S No.	Ranch/farm Name	Location	Ranching/Captive breeding
1	Nile Crocodiles	Mombasa	R
2	Kenya Crocodile Farm (Mamba Village)	Mombasa	CB
3	Baobab Crocodile Farms[1]	Mombasa	R,CB
4	Larfarge Ecosystem[2]	Mombasa	R, CB
5	MarkEast Brook Crocodile Farm	Malindi	CB
6	Galaxy Crocodile Farm	Sagana	R, CB

[1] Stock for this farm was obtained from the former Baobab Farm Ltd. now relocated to a new site.

[2] This is the new name for the former Baobab Farm Ltd. with a shift from commercial operation to eco-tourism.

Crocodile stocks on farms (2005/2006)

Age Class/category	Farm/Ranch Name Nile Crocodiles	Kenya Crocodile (Mamba Village)	Baobab Croc. Farms	MarkEast Brook Crocodile Farm	Larfarge Ecosystems	Galaxy Crocodile Ltd.	Totals
Less 1 year	7,835	2,777	3,229	194	—	823	14,858
I yr. 9 months	5,110	1,881		165	—	—	7,156
2 yr. 9 months	4,026	—	—	330	—	—	4,356
Mixed ages	311	1,204	1,335	34	189	—-	3,073
On treatment	490	—	—	-	—	—	490
Breeders	—	238	94	40	28	—	400
Totals	**17, 772**	**6,100**	**4,658**	**763**	**217**	**823**	**30,333**

Egg collection Quotas allocated and numbers taken from the wild from 2002/2003 to 2007/2008 collection seasons

Name of Farm	Collection locality	2002-3 Quotas allocated	Eggs collected	2003-4 Quotas allocated	Eggs collected	2004-5 quotas allocated	Eggs Collected	2005-6 Quotas allocated	Eggs collected	2006-7 Quotas	Eggs collected	07/08 Quota	Eggs collected
Nile Crocodiles Ltd	Lower Tana	12,000	8,360	16,000	10,300	20,000	14,119	25,000	19,589	25,000	15,701	30,000	30,000
Galaxy Crocodile Farm**	Lower — Tana	—	—	—	—	—	15,000	2, 096	15,000	2,300	20,000	2,000	
Baobab Crocodile Frams	Lower Tana	12,000	6,243	12,000	6,292	5,000	—	5,000	—-	—	—-	—	
Kenya Crocodiles	Lower — Tana	—	—	—	4,000	—	4,000	—	—	—	—	—	
Total Quota allocated /eggs collected		24,000	14,603	28,000	16,592	29,000	14,119	49,000	21,685	40,000	18,001	50,000	32,000

The lower Tana River is a long stretch divided into three- (3) distinct collection zones namely Mbalambala-Garissa, Baomo-Kipini and Garissa -Wenje and the community egg collection programmes do not overlap.
** Farm was established in late 2005.

Estimate of the hatchability success rates of eggs collected for commercial production in the ranching operations

The following table summarizes the egg hatchability success for the various farms during the 2005/2006-egg collection season.

Name of Farm	Eggs collected from farm	Eggs collected from wild	Hatchlings realized	% Success hatching rate
Nile Crocodiles Ltd.		19,589	12,303	62.81
Galaxy Crocodile Farm		2, 096	823	39.27
Lafarge Ecosystem	1124		449	39.95
Baobab Crocodile Farms	503		287	57.06
Kenya Crocodile Farm	4979		3169	63.65
MarkEast Brook Crocodile Farm	366		183	50.00
Totals	6972	21685	17214	
Average %success on farm				52.67
Average %success from Wild				51.04
Overall Average %success				60.01

Lack of or inadequate experience in egg handling by newly recruited community egg collectors contributed to low levels of egg hatchability for eggs collected from the wild. Galaxy Crocodile Farm, which recorded the lowest hatchability success, suffered from this problem and also the fact that this was their first operation in the farm. Some of the eggs, however, were not fertile (Dan Haller, Manager Nile Crocodiles, Pers. Comm.) in the lower reaches of Tana River the following are the eggs collection areas: Ozi, Kau, Riketa, Chalaluma, Didewaride, Moa, Kibusu, Biliasa, Matomba, Mikameni, Bubesa, Mnazini and Baomo.

The mortality rate in captivity and causes of such mortality
Loss is more common at the egg collection and hatchling stage hatchlings and sometimes juveniles are susceptible to skin infections. Such cases are successfully reversed in treatment ponds at the ranching facilities.

2.2.2 *Confidence in the use of Monitoring*
The MA is responsible for issuance of all permits in accordance with the provisions of the Wildlife Act CAP 376 of Kenya. Permits for egg collection are issued to the ranching operations and the authority communicated to the local authorities and officers of the management Authority under which the egg collection areas fall to supervise the collection and file parallel reports. The resource is communally owned and harvesting is managed and controlled jointly with the community.

2.3 Legal framework and law enforcement

Hunting and dealership in wildlife and wildlife products have been outlawed in Kenya by an Act of Parliament since 1977 and 1978 respectively. However, Section 67 of the Wildlife Act allows the Minister in charge of wildlife to make regulations for the better management of wildlife farming. Collection of crocodile eggs is treated as hunting. Crocodile eggs and or products are trophies in accordance with the National law and therefore requires prior permit to collect the eggs or deal in crocodile trophies such as meat and skins.

Nile Crocodiles are gazetted as prohibited exports unless authorized by the Minister in charge of wildlife. Exports of crocodiles and their products are therefore subject to approval by the minister responsible for wildlife.

Internationally, trade in Nile crocodile and its products is regulated under CITES. The MA reports annually numbers of export permits issued and quantities of products to the CITES secretariat. Producers make requests to the MA for tags annually and the MA assigns the tag numbers and advises the Secretariat. The Secretariat links up the tag supplier with the producer for the tag supplies and payments.

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

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

Utilization of Nile crocodile in Kenya is commercial based on ranched specimens in accordance with CITES Res. Conf. 11.16. The parts utilized include meat for food that is utilized locally and sold through outlets authorized and regulated by the Management authority and the skin that is solely for export markets for leather industry.

3.2 Harvest:

3.2.1 *Harvesting regime*

Only eggs are collected from the wild under authority, incubated and reared in authorized ranches to reach commercial maturity size of approximately 1.2 meteres at average age of 3 years. The egg collection is carried out under a community egg collection programme.

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

Egg collection from the wild by registered operations requires a separate collection permit and returns are filed with the Management Authority immediately at the close of the collection. Egg collection is regulated using open and closed collection seasons. Egg collection season is between September and March. In the course of the open season, the eggs collected for each ranching operation is reviewed based on filed returns and physical inspections at the facility and also assessment of the capacity of the facility to accommodate and manage the projected production levels. In order to reduce probable mortalities as a result of disturbance in the nests if some eggs were left uncollected during egg collection, all eggs in the identified and selected nests are collected. At least 33% of identified nests are left undisturbed and uncollected for the population recruitment.

Egg collection involves local communities in the designated zones of collection currently in the lower reaches of Tana River and Lake Turkana. The MA recommends that the ranchers identify and train community members on methods of egg collection and handling for maximum production and minimal wastage/loss. Community members are paid on the number and viability upon hatching of collected eggs. Approximately 85% of the crocodile eggs collected are collected by grass root community members and communities benefit directly from the resource. Collectors are trained on egg handling as the eggs are sensitive. The integration of local communities in the egg collection programme has proved to be of positive value to conservation of wild populations.

In some instances, the ranchers have introduced extra incentives in the form of bonus payments dependable on percentage hatchability. Each collector is paid Ksh.10 per egg collected plus a bonus of up to a maximum Ksh.25 on hatching as an incentive. Overall, community crocodile egg collection programme has helped to turn the human crocodile conflict problem into a sustainable socio-ecological and economic opportunity, which supports conservation of the resource.

Selectively and based on area assessments, identified adult problematic animals are captured and used as breeding stock in selected authorized ranches. In return the operations support community development projects in the source of breeders as further incentives for insitu conservation of the crocodile population. The capture of adult rogue crocodiles for ranching purposes is provided for in the crocodile management plan. The objective of this element is human-crocodile conflict management.

3.3 Legal and illegal trade levels

The table below shows crocodile skin exports authorized by Kenya MA for the year 2001- 2005.

Export of Crocodile skins from Kenya 2001-2007

Farm/Ranch	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Kenya Crocodiles (Mamba village)	1,500	700	—	—	2,500	2,500	—
Nile Crocodiles	1,650	1050	1,050	1,200	4,700	6,210	10,645
Baobab Crocodile Farms (Ex-Baobab Ltd.)	1,500	650	1,300	1,700	2700	-—	—
MarkeastBrook Croc. Farm	—	62	87	150	150	—	—
Totals as per permits	4,650	2,462	2,437	3,050	10, 050	7,000	10,645

Exports of Crocodile products other than Skins from Kenya 2001-2007

Year	**Product exported**	**Quantities in permits issued**	**Farm Name exporting**
2001	-		
2002	-		
	-		
2003	Live hatchlings	3,300	Kenya Crocodiles(Mamba village)
	Heads	144	Kenya Crocodiles (Mamba Village
2004	-		
2005			
Total Animals		3,444	

The exports are mainly destined to Singapore.
No cases of illegal trade in crocodiles and their products have been reported in the recent past.

II. Non-detriment finding procedure (NDFs)

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

_X__yes ___no

Methodology used in doing NDF studies on Nile crocodile is systematically followed based on the IUCN checklist for NDFs. Details especially on quantitative information where possible is generated to back up the qualitative assessment. The checklist is extensively referred to during the process.

2. CRITERIA, PARAMETERS AND INDICATORS USED

The concepts in the checklist are referred to when carrying out the NDF process and applied in combination with information on the following elements:

The species characteristics:

- Distribution
- Tolerance to human disturbance
- Mortality rate based on hatchability success rate of the collected eggs as determined by methods of the egg collection and handling

3. MAIN SOURCES OF DATA, INCLUIDING FIELD EVALUATIONS OR SAMPLING METHODOLOGIES AND ANALYSIS USED

The following are the sources of data for making NDF on Nile crocodile in Kenya

- Field assessment of population abundance. Regular assessments of the Nile crocodile population are conducted especially in the lower reaches of Tana River system and Lake Turkana which are the major two areas where egg collection is authorized to feed the six registered Nile crocodile ranching operations.
- Kenya Wildlife Service Stations daily Occurrence Book recording incidences of human-crocodile conflicts and returns on egg collection.
- Applications for egg collection quotas and collection sites from the ranching operations
- Egg collection permits and filed returns by local communities, Kenya Wildlife service Wardens and the ranching operations
- Export permits issued for export of skins to the ranching operations
- Reporting by the ranching operations on the performance of the facilities and physical inspections of the ranching facilities by the Wildlife Authorities to assess the production capacities in relation to applications for egg collection permits
- Routine inspection of the ranching operations by the Management and Scientific authorities.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

Data obtained from the sources in c above is analyzed to determine approvals for levels of harvesting from the wild, areas to be designated for harvesting and compare with applications for exports and levels of compliance with management plans for the management of the species. Data generated from detailed reporting by the ranching operations on number of eggs collected against the number of nests removed in the wild and those left to maintain the wild population is evaluated and analysed to provide information on the species population dynamics the targeted crocodile utilization zones and guide in the review of the management of the species. The performances of the ranching operations especially on the egg hatchability success rates and the production capacity in terms of infrastructure are assessed to determine approval for egg collection quotas for the succeeding year and if need to increase the quotas, identify new areas for designation as egg collection zones.

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

Major challenge in the elaboration of NDF studies on the Nile crocodile has been to get the definite population size of the Nile crocodile especially in the areas zoned for egg collection in the Tana River system and lately Lake Turkana to be able to understand the population structure. Censusing Nile crocodile is a relative expensive affair and also requires highly skilled herpetologists. Limited resources both capital and human on this aspect pose a big challenge to the understanding of the Kenyan population structure of the Nile crocodile

6. RECOMMENDATIONS

The use of the IUCN Checklist for NDF is quite applicable to the Nile crocodile species. The checklist is therefore a practical tool for making NDF on the Nile crocodile (*Crocodylus niloticus*); however it is important that quantitative data on the species is generated to provide informed assessment of the status of the species especially where the checklist calls for qualitative information. Efforts must therefore be made to generate the quantitative information as much as possible. Such elements that need this quantitative data include the biological status to inform on the approximate population size, structure, sex ratio and nesting ecology.

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INTERNATIONAL EXPERT WORKSHOP ON CITES NON- DETRIMENT FINDINGS

Cancun (México), 17-22 Nov. 2008

PRESENTATION ON

NDF Studies: The Status of and Trade in Nile Crocodile (*Crocodylus niloticus)* in Kenya

BY
Solomon N. Kyalo

KENYA

KENYA WILDLIFE SERVICE

The Status of and Trade in Nile crocodile (*Crocodylus niloticus*) in Kenya- Non –Detriment Findings process

A Case Study presented at the International Expert Workshop on CITES Non-Detriment Findings, Cancun (Mexico), 17-22 November 2008

BACKGROUND

The Species- Nile Crocodile (*Crocodylus niloticus*)

•Include 3 sub-species

Taxonomy:

Class: REPTILIA

Order: Crocodylia

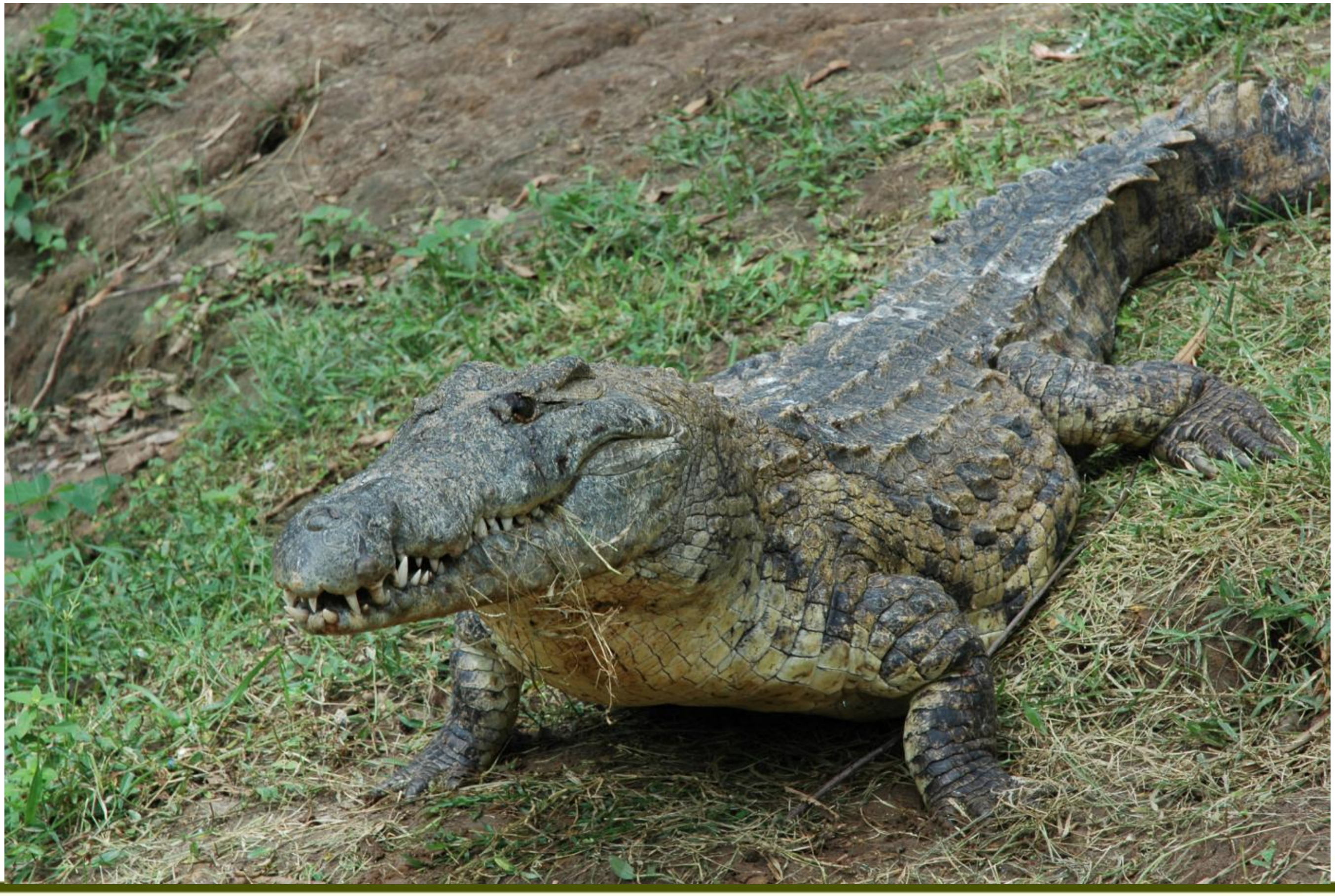
Family: Crocodylidae

Scientific Name: *Crocodylus niloticus* (Laurenti, 1768)

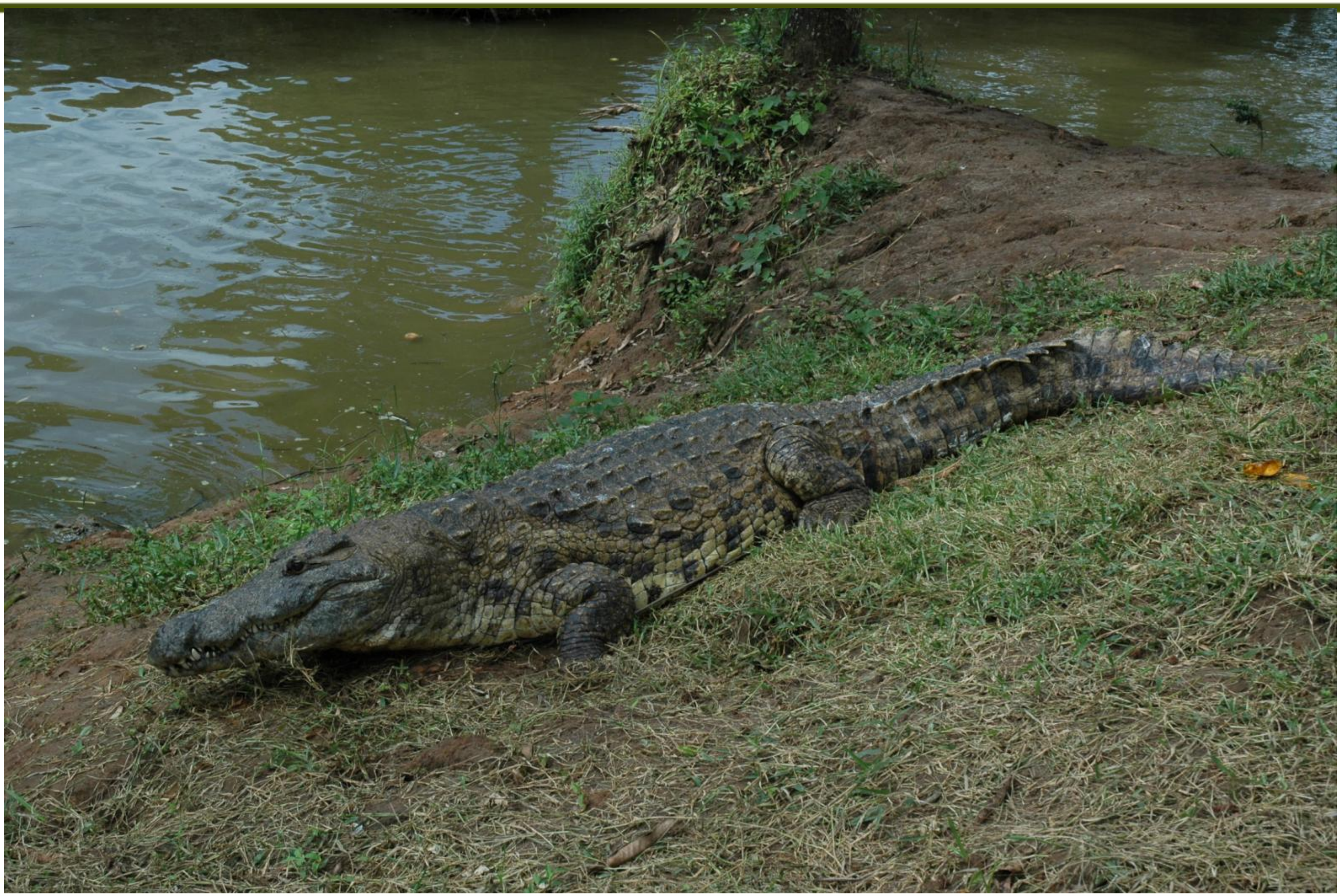
Common Names	: English:	Nile Crocodile
	: Swahili:	Mamba

Nile Crocodile-The Species

Crocodylus niloticus



Species Habitat



CONSERVATION STATUS

- Current IUCN Classification: Least Concern

1990 : Vulnerable (Baillie & Groombridge, 1990). In 1994 review, it was not listed (Groombridge, 1993),
1996: Lower Risk (IUCN, 1996), 2000 (Hilton-Taylor, 2000), & 2003 (IUCN, 2003).

- CITES Listing: Appendix I except populations of Botswana, Ethiopia, Kenya, Madagascar, Malawi, Mozambique,Namibia, South Africa, Uganda, the United Republic of Tanzania [subject to an annual export quota of no more than 1600 wild specimens including hunting trophies, in addition to ranched specimens], Zambia and Zimbabwe that are in Appendix II

Species distribution-Global overview

- The Nile crocodile is distributed in suitable habitats throughout Africa and Madagascar
- Wild Population estimated at 250-500,000 specimens
- General population trend: increasing but habitat shrinking

National status- The reason for NDF Process

Purpose:

Determining harvesting levels of specimens of Nile crocodile (*Crocodylus niloticus*) from the wild for commercial ranching and if the harvesting is detrimental to the survival of the species

Methodology

Data source/references

- Species population surveys
- Assessments of species abundance in different areas designated as harvesting zones-Egg collection returns
- Reported performance of licensed ranching operations
- Trade levels
- Human-crocodile conflict data

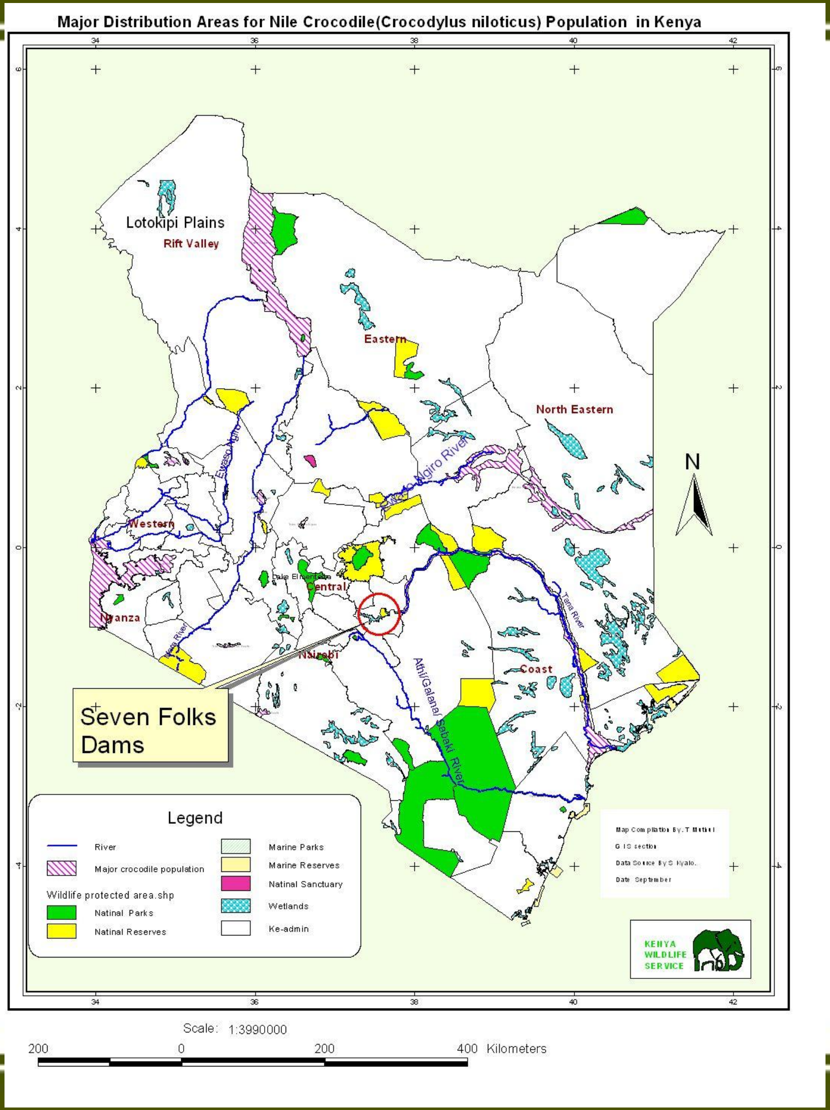
METHODOLOGY-Species distribution

Distribution mapping

- Mapping of the species' habitats

(all fresh water systems with a special focus on the major water bodies including: L.Turkana, L. Baringo, L.Victoria, Mara river, Ewaso nyiro river, Lorian Swamp, Tana River , Athi/Galana/Sabaki river & Ramisi river.

Species distribution Mapping



Methodology: Population estimates

•Regular aerial and nightlight surveys on both the general and specific population and nest sites, especially in areas of interest (collection for utilization and conflict)

Spotlight censusing method

•Counting using nocturnal spot –light count method

(***most accurate compared to aerial and day counts***)

•Latest count conducted in 1995 for Tana River system (Tana river basin covers 20% of Kenya's land mass)

Population estimates

Spotlight census of the Nile crocodile (*Crocodylus niloticus*) along the Tana River, from Garissa to Kipini April 1993. A report for KWS research Department Nairobi, Kenya. **Chira R.M. (1993).**

Crocodile egg collection along the Tana River. A report for KWS Research Department Nairobi, Kenya. **Chira R.M. (1994).**

Spotlight census of the Nile crocodile (*Crocodylus niloticus*) along the Tana River, from Garissa to Kipini, August 1995. A report for KWS Research Department Nairobi, Kenya. **Chira R.M. (1996).**

Spotlight census of the Nile crocodile (*Crocodylus niloticus*) in five Tana River Dams. A report to Kenya Wildlife Service, Nairobi. **Chira R.M. (1997).**

Population estimates

Nightlight surveys on both the general and specific population and nest sites, especially in areas of interest (collection for utilization and conflict)

- Population numbers unknown

Lower reaches of Tana River system & L.Turkana areas of utilization

❖Tana river system has the biggest living population
❖L.Turkana population estimated at 12,000 adult specimens

Methodology -Population estimates

- Records submitted by those collecting eggs, using standard forms

- Records supplied by the Wildlife Staff on Problematic Animal Control throughout the country.

Population estimates

NILE CROCODILES LTD
TANA RIVER CROCODILE EGG COLLECTION
2007 TO 2008 SEASON

COLLECTOR ID	NEST NO:	BOX NO:	NO.OF EGGS	WEIGHT RANGE	AV. WEIGHT	AV. WIDTH	AV. LENGTH	COLLECTION DATE	HATCHLING DATE	UNFERT.	ROTTEN	DEAD SHELL	NO. HATCHED	HATCHING %	HEAD LENGTH	TOTAL LENGTH	WEIGHT	REMARKS
RK 6	1	T 1	11	60 - 70	66	40.8	65.4	15.11.07	29.12.2007	0	0	1	10	90.9	4.06	25.74	53	
M2	2	T2	23	80 - 85	83	41.6	75.0	15.11.07	29.12.2007	0	5	13	4	17.4	4.04	26.68	60	
M1	3	T3	25	75 - 85	81	45	70.2	15.11.07	29.12.2008	0	4	13	8	32.0	4	26.06	54	
T1	4	T4	42	60 - 70	64	42.8	67.8	15.11.07	22/12/2007	4	1	5	32	76.2	3.88	25.64	50	
T3	5	T5	20	70 - 70	70	43.2	66.0	15.11.07	20/12/2007	0	6	3	11	55.0	3.96	26.32	48	
RK2	6	T6	16	70 - 80	75	43.8	67.6	15.11.07	26.12.2007	0	2	4	10	62.5	3.94	25.68	45	
RK1	7	T7	23	75 - 85	80	42	71.2	15.11.07	29..12.2007	0	3	6	14	60.9	4.04	26.04	55	
B1	8	T8	26	75 - 75	75	41.4	70.0	15.11.07	29.12.2007	0	2	12	12	46.2	4	26.04	51	
T2	9	T9	25	80 - 95	89	45.6	71.0	15.11.07	29.12.2007	1	0	4	19	76.0	4.06	27.4	65	
CH3	10	T10	21	70 - 90	80	44.4	72.0	15.11.07	02.04.2008	0	3	0	18	85.7	4	28.1	55	
CH4	11	T11	30	75 - 80	76	43.8	66.2	15.11.07	02.01.2008	0	25	0	5	16.7	3.96	28.32	56	
M3	12	T12	35	90 - 105	96	46	74.2	25.11.07	28.01.2008	1	20	1	13	37.1	4.02	29.76	58	
MGA1	13	T13	44	90 - 95	91	46	70.4	25.11.07	02.01.2008	0	6	0	38	86.4	4	28.9	56	
MAH6	14	T14	43	85 - 90	88	45.8	67.6	25.11.07	20/12/2007	4	2	0	37	86.0	4.08	29.18	55	
M3	15	T15	33	80 - 90	88	45.2	71.4	25.11.07	17.12.2007	0	0	0	33	100.0	4.06	28.3	58	
T6	16	T16	31	90 - 95	94	45.4	76.2	25.11.07	19.01.2008	2	6	1	22	71.0	4.02	28.46	61	
T7	17	T17	26	75 - 80	76	43.6	68.4	25.11.07	01/12/2007	2	0	0	24	92.3	4	27.28	49	
GAK10	18	T18	32	70 - 75	72	44.4	67.8	25.11.07	02.01.2008	3	2	0	27	84.4	3.98	28.5	54	
MH3	19	T19	20	100 - 105	101	46	68.2	26.12.2007	17.03.2008	0	0	1	19	95.0	4.22	29.6	60	
BA2	20	T20	21	100 - 100	100	45	73.8	26.12.2007	15.03.2008	0	2	0	20	95.2	4.08	29.38	70	
BA1	21	T21	33	95 - 110	99	46	73.8	26.12.2007	10.03.2008	0	26	4	3	9.1	4.1	28.4	66.6	
MAH7	22	T22	26	43 - 46		42.2	71.0	26.12.2007	10.03.2008	1	4	2	19	73.1	4.04	28.02	63	
MAH8	23	T23	37	90 - 91	91	45	71.0	26.12.2007	10.03.2008	1	2	0	32	86.5	4.04	28.06	63	
CB1	24	T24	29	95 - 100	97	45	74.8	26.12.2007	10.03.2008	0	2	0	26	89.7	4.04	29.18	73	
BH4	25	T25	46	80 - 95	87	44.2	72.2	26.12.2007	12/01/2008	0	2	4	36	78.3	4.2	29.04	67	
RK6	26	T26	36	100 - 100	100	48	70.0	26.12.2007	10.03.2008	0	2	1	33	91.7	4.06	28.92	70	
RK7	27	T27	11	90 - 100	95	44.4	74.0	26.12.2007	16.03.2008	0	2	0	9	81.8	4.14	27.74	60	
MH2	28	T28	10	90 - 95	92	44.6	73.6	26.12.2007	13.03.2008	0	1	0	9	90.0	4	27.94	67	
B2	29	T29	11	85 - 95	90	44.4	72.6	26.12.2007	16.03.2008	0	1	0	10	90.9	4.04	28.18	62	
RK3	30	T30	17	100 - 110	104	47.6	76.4	26.12.2007	06.03.2008	0	6	2	9	52.9	4.1	29.4	58	
RK4	31	T31	43	100 - 100	100	46.2	74.4	26.12.2007	07.03.2008	3	2	1	37	86.0	4.06	29.24	75	
MH1	32	T32	42	100 - 110	104	46.4	75.5	26.12.2007	07.03.2009	0	6	3	33	78.6	4.04	29.6	75	
SM1	33	T33	31	100 - 105	104	44.8	78.8	26.12.2007	15.03.2008	0	5	4	22	71.0	4.16	28.54	73	
AB1	34	T34	42	75 - 90	81	44.6	70.2	26.12.2007	28.01.2008	0	3	15	17	40.5	3.92	26.72	50	
CH6	35	T35	35	95 - 95	95	44.2	74.2	26.12.2007	14.03.2008	1	1	0	33	94.3	4.02	28.32	62	
A1	36	T36	39	80 - 85	83	43.2	72.0	26.12.2007	12.03.2008	6	0	0	33	84.6	4	28.1	56	
A2	37	T37	33	95 - 100	96	45.4	70.8	26.12.2007	26.02.2008	3	2	1	27	81.8	4.04	28.2	62	
T-10	38	T38	46	85-95	89	46.2	67.4	26.12.2007	14.03.2008	5	1	0	40	87.0	4	28	62	
T11	39	T39	24	90 - 90	90	43	71.2	26.12.2007	17.03.2008	1	2	1	20	83.3	4.14	27.7	53	
CH5	40	T40	36	102 - 102	102	45.2	77.6	26.12.2007	13.03.2008	3	2	1	31	86.1	4.06	29.24	69	
T9	41	T41	32	100 - 100	100	45.4	74.8	26.12.2007	15.03.2008	0	2	0	30	93.8	4.14	28.84	69	
HMK1	42	T42	25	100 - 105	100	45.8	72.8	26.12.2007	13.03.2008	0	15	4	6	24.0	4.2	29.9	75	

Population estimates

CH-39	875	T1001	42	100-115	104	48.2	76.6	05.02.2008	19.04.2008	0	9	3	30	71.4	4.14	29.44	70
SM-68	876	T1002	53	100-110	107	48	77.8	05.02.2008	14.04.2008	0	10	0	43	81.1	4.1	29.82	70
GMK-26	877	T1003	30	90-95	93	43.4	77.2	05.02.2008	10.04.2008	0	14	2	14	46.7	4.18	29.04	60
AO-12	878	T1005	52	95-105	97	46	72.2	05.02.2008	30.03.2008	0	12	0	40	76.9	4.08	29.14	63
CH-38	879	T1006	49	100-110	105	48	73.8	05.02.2008	19.04.2008	0	4	4	40	81.6	4.08	28.66	68
GMK-11	880	T1008	51	95-115	102	47.2	71.2	05.02.2008	11.04.2008	0	27	4	20	39.2	4.06	29.04	60
T-12	881	T1009	19	90-105	100	46	74.2	05.02.2008	12.03.2008	0	1	0	18	94.7	4	28.5	70
BH-17	882	T1010	20	0	0	0	0	29.03.2008	25.03.2008	2	0	1	17	85.0	4.18	30.22	56
MAH-50	883	T1011	34	0	0	0	0	29.03.2008	27.03.2008	0	2	0	32	94.1	4	28.98	49
D.H.S-14	884	T1012	21	90-105	96	47..8	77.6	29.03.2008	27.04.2008	0	3	0	18	85.7	4.1	28.78	71
BH-12	885	T1013	25	70-80	78	42.6	73.4	29.03.2008	06.05.2008	0	1	2	22	88.0	4	28	55
BH-13	886	T1014	26	70-75	72	42.4	65.8	29.03.2008	13.05.2008	0	9	0	17	65.4	4.02	27.3	50
D.H.S-13	887	T1015	31	105-115	110	49.6	79.4	29.03.2008	26.04.2008	0	5	1	25	80.6	4.32	30.54	77
D.H.S-12	888	T1016	14	80-100	93	45	75.6	29.03.2008	25.04.2008	0	1	0	13	92.9	4.06	29.18	68
BH-14	889	T1017	34	70-80	77	43.8	69.6	29.03.2008	07.04.2008	0	3	0	31	91.2	4.16	28.32	65
D.H.S-11	890	T1018	39	100-100	100	47	75	29.03.2008	26.04.2008	0	0	0	35	89.7	4.2	31	75
S-31	891	T1019	20	80-80	80	44.6	71	29.03.2008	21.04.2008	0	0	1	19	95.0	4.2	29	64
BH-15	892	T1021	38	80-85	84	44.8	71.8	29.03.2008	27.04.2008	0	2	0	36	94.7	4.2	29.96	70
MB-1	893	T1023	24	90-100	98	45.6	78.2	29.03.2008	24.04.2008	0	6	0	18	75.0	4.2	29.6	71
GK-25	894	T1024	26	65-75	69	42.2	64.4	29.03.2008	13.05.2008	0	9	1	16	61.5	4	26.96	47
AAB-6	895	T1025	14	80-100	90	45.2	76.8	29.03.2008	21.04.2008	4	3	0	7	50.0	4.2	29.28	70
SM-70	896	T1026	43	90-100	94	47.8	71.6	29.03.2008	23.04.2008	0	7	0	36	83.7	4.2	30.72	73
SM-78	897	T1027	37	80-90	85	45.2	71.6	29.03.2008	21.04.2008	0	2	3	32	86.5	4.2	28.9	66
SM-72	898	T1028	24	65-80	72	42.6	69.2	29.03.2008	28.04.2008	0	1	0	23	95.8	4.2	28.6	60
SM-73	899	T1029	20	75-80	76	44.4	67.8	29.03.2008	28.04.2008	0	2	0	18	90.0	4.2	29.2	58
MOD-4	900	T1030	21	80-100	85	45.8	69	29.03.2008	15.05.2008	0	0	1	20	95.2	4	28.32	57
MOD-5	901	T1032	26	80-85	82	44.4	75	29.03.2008	30.04.2008	0	9	1	16	61.5	4	28.14	63
ABAR-3	902	T1033	13	60-65	64	40	71.2	29.03.2008	15.05.2008	0	4	0	9	69.2	4	27.82	58
SM-75	903	T1034	36	80-90	82	46	69.6	29.03.2008	01.05.2008	0	0	0	36	100.0	4.12	29.08	65
AB-23	904	T1035	5	90-100	96	46.6	72.6	29.03.2008	28.04.2008	0	0	2	3	60.0	4.2	29.63	70
AB-24	905	T1036	16	85-90	89	46	71.2	29.03.2008	19.04.2008	0	4	4	8	50.0	4.06	27.78	61
SM-74	906	T1037	19	70-70	70	41.6	68.4	29.03.2008	01.05.2008	0	4	0	15	78.9	4.12	28.2	60
SM-76	907	T1038	16	65-70	68	40.2	71.6	29.03.2008	02.05.2008	0	6	0	10	62.5	4	27.88	50
GK-24	908	T1039	42	90-110	98	46.6	77	29.03.2008	10.05.2008	2	3	2	35	83.3	4.16	29.84	72
SM-71	909	T1040	48	100-105	101	49.2	71.2	29.03.2008	16.04.2008	0	4	0	44	91.7	4.2	29.96	70
GK-26	910	T1041	33	80-85	81	45.4	71.2	29.03.2008	10.05.2008	0	5	1	26	78.8	4	27.52	55
MAH-49	911	T1042	27	70-75	74	42.4	67	29.03.2008	21.04.2008	0	2	2	23	85.2	4.1	28.62	60
AB-26	912	T1043	20	90-90	90	45.8	75	29.03.2008	13.05.2008	0	6	4	9	45.0	4	28.2	63
MAH-48	913	T1044	36	75-100	84	45.8	70.6	29.03.2008	18.04.2008	2	0	0	34	94.4	4.1	29.54	64
			30000										21759	72.53			

Threats to Nile crocodile population

- **Habitat loss**
  - Human population encroachment,
  - erosion and loss of nesting areas
- **Targeted harvesting for international trade**
  - Egg collection for ranching)
- **Persecution**
  - Human-crocodile conflict)

Nile crocodile Management

- 1973- Population listed in CITES Appendix I

- 1992-Proposal for Appendix II listing for ranching

- Current: Population in Appendix II for purposes of ranching in accordance with Res. Conf. 11.16

Nile Crocodile Management Plan

- maintaining or increasing the species' overall numbers (protection);

- Producing a sustainable harvest (utilization);

(***Based on 0.5 total adults x 40 x 10% formula***)

- Regulating their numbers where appropriate (control);

- Managing the crocodiles where appropriate for the benefit of local communities (community benefit).

Policy & Legislation on Nile Crocodiles

Wildlife Act CAP 376: Nile crocodiles from the wild may be hunted or otherwise utilized under a license issued by the Wildlife Authority.

Policy : Crocodiles are conserved and encouraged where they do not conflict with legitimate human interests.

Conservation may include utilization that provides benefits to local communities.

Challenge: With wide spread population of crocodiles, and expanding population of humans, there are an increasing cases of human- crocodile conflicts.

Management Plan for Nile Crocodile

Aims to encourage:

•The management of crocodile populations on a scientific basis through PAC and ranching;

• The protection of crocodiles within the wild;

•The controlled utilization of crocodiles on ranches in accordance with CITES Res.Conf. 11.16

All export of products to be in accordance with CITES and the Wildlife Conservation Act.

Population segment harvested for trade

- Eggs
- Under special authority, rogue Crocodiles as a measure to reduce crocodile-Human conflict

Eggs harvested for ranching -2002-2007

Year	Egg collection Quota	No. of eggs collected	Area of collection	No of Ranches
2002-3	24,000	14,603	Lower Tana	2
2003-4	28,000	16,592	Lower Tana	3
2004-5	29,000	14,119	Lower Tana	3
2005-6	49,000	21,685	Lower Tana	2
2006-7	40,000	18,001	Lower Tana	2
2007-8	50,000	32,000	Lower tana &L.Turkana	2

Monitoring System

Wildlife Authority sets minimum standards and code of practice for all aspects of crocodile production to be observed by the ranchers.

Quotas for egg collection and areas for collection are scientifically determined at the start of each season.

Authority for ranching carry the following terms and conditions:

a) Locality of egg collection is specified on a map;

b) Period of collection is specified;

c) Number and type of specimens specified, with numbers allocated limited by farm capacity;

d) The status of each specimen (clutch of eggs and hatchlings) are recorded in the ranchers/trapper’s register and returns filed with Wildlife Authority.

e) Ranchers must report to the appropriate KWS Officer of the area before collection;

f) A bi-annual summary of the success of harvesting and ranching operations must be submitted by the rancher to the Wildlife Authority

•bi-annual inspections of all ranch operations is conducted by the Wildlife Authorities during the closed season (May and July) and during open season (December and January). Additional inspections may also be carried out anytime considered appropriate

International Trade volumes –Skin Exports

(2001-2007)-Legal Trade using CITES Permits

Year	Quantities	Type/part	Importing country
2001	4,650	Belly skin	Singapore,Italy,France
2002	2,462	Belly skin	Singapore, France
2003	2,437	Belly skin	Singapore,Germany
2004	3,050	Belly skin	Singapore, Germany
2005	10,000	Belly skin	Singapore,Germany
2006	7,000	Belly skin	Singapore
2007	10,645	Belly skin	Singapore

Monitoring and controls-Evaluation of data

Conditions tied to harvesting crocodile resources for ranching

•feasibility study to the Wildlife Authority

Prepared detailed project proposal with information on:
a) locality;
b) water supply;
c) food supply;
d) financial resources;
e) expertise;
f) Markets for meat & skin
g) ranch plans.
h) Environmental Impact Assessment (NEMA)

Strategies for species Conservation management

- Use of Problematic/Rogue crocodiles as breeding stock as an innovative means of control as opposed to elimination for managing human –crocodile conflicts

- Opening up more egg collection areas in the various species distribution range to reduce collection pressure in the traditionally known egg collection zones

- Regular rapid population assessments for purposes of monitoring change in the species dynamics

CONCLUSION

- Trade in ranched specimens of Nile crocodile should be encouraged as incentives for in-situ conservation of the species
- Trade in Nile crocodile specimens should be limited to skins for exports and meat for local markets under controlled licensing system
- Use of universal identification tags

THANK YOU

KENYA WILDLIFE SERVICE

THE SOUTHEAST ASIAN BOX TURTLE *CUORA AMBOINENSIS* (DAUDIN, 1802) IN INDONESIA

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I. Background information on the taxa

1. BIOLOGICAL DATA

1.1. Scientific and common names:

Southeast Asian Box Turtle *Cuora amboinensis* (Daudin, 1802)
Wallacean Box Turtle *C. a. amboinensis* (Daudin, 1802)
Malayan Box Turtle *C. a. kamaroma* Rummler and Fritz 1991
Indonesian Box Turtle *C. a. couro* (Schweigger, 1812)
Burmese Box Turtle *C. a. lineata* McCord and Philippen, 1998
In Indonesia freshwater turtles are generally called 'Kura Kura'. Specifically depending of province: *Kura Kura ambon*, *Kura Kura kuning*, *Kura Kura batok*, *Kura Kura PD, Baning Banya, Kura Kura katup, Kura kura tangkop, Kangkop*.

1.2. Distribution

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

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

Turtle, the Malayan Box Turtle *C. a. kamaroma* Rummler and Fritz 1991, the Indonesian Box Turtle *C. a. couro* (Schweigger, 1812), and the Burmese Box Turtle *C. a. lineata* McCord and Philippen, 1998.

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

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

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

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

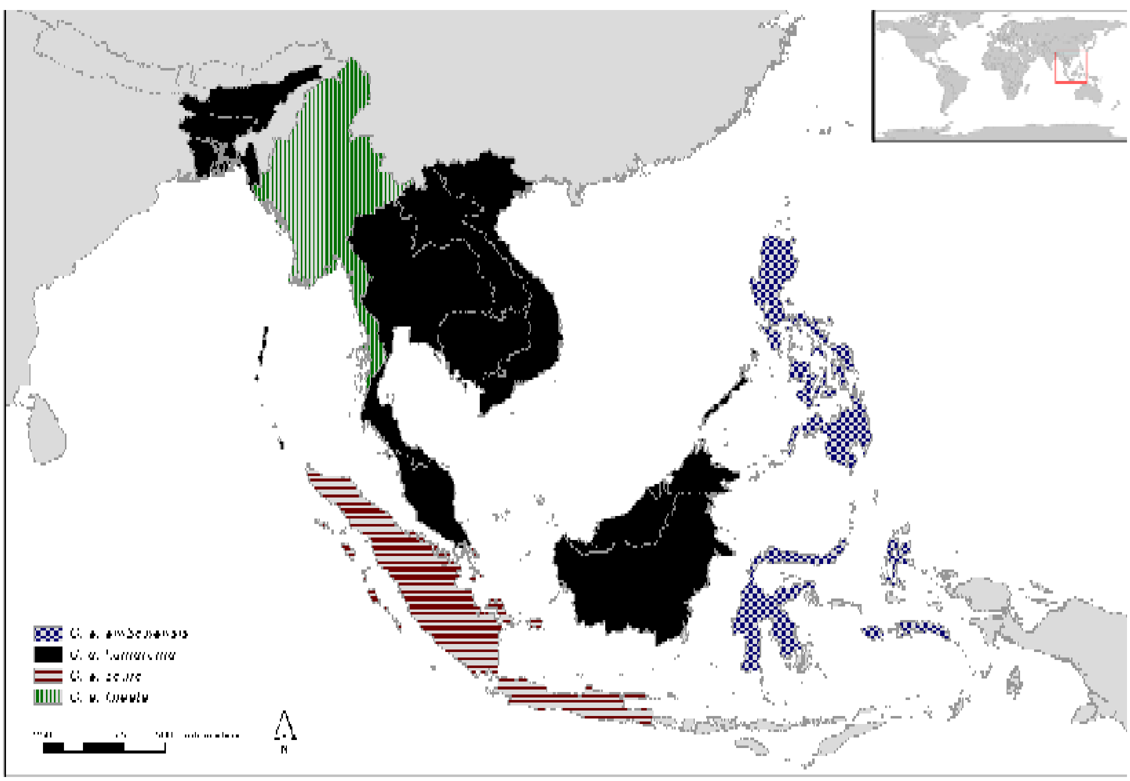

Figure 1: Distribution of the four subspecies of *Cuora amboinensis.*

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

1.3. Biological characteristics

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

- Sex ratio: 1:1 or slightly in favour of females (Schoppe, 2008; Schoppe, *in prep*.).
- Low reproductive rate. Mean of 15 months to reach subadult hood. Maturity in captivity might be reached after 4 years and 5 months, and in the wild probably in 51/2-6 years (Schoppe, 2008).
- Mean of three clutches with two eggs each resulting in a total of six eggs per female per year (Schoppe, 2008).
- Incubation period is 67-77 days in the wild and 76-77 days in captivity (Whitaker and Andrews, 1997). In captivity under outdoor conditions (26-30°C) without artificial incubation a range of 60-120 days (n=22, mean 88.8±12.5) was encountered; a prolonged incubation seems to be related to unfeasible weather conditions (S.Schoppe, unpubl. data).
- Hatching success is about 50% in captivity under outdoor conditions (S.Schoppe, unpubl. data).
- Survival rate of eggs and hatchlings in the wild is not known. [For the North American Painted Turtle *Chrysemys picta* 92% (Wilbur, 1975) and 54% mortality, (Mitchell, 1988) were recorded.]
- Life expectancy 25-30 years; a maximum age of 38.2 years was recorded for an animal in captivity (Bowler, 1977).
- Generation time can be approximated by taking the median or midpoint between age at maturity and age at mortality. In the case of the Southeast Asian Box Turtle, that would be 6 [=age at maturity] + 1/2 *(30 – 6) [half of reproductive life-span] = 6 + 1/2 * 24 = 6 + 12 = 18 years generation time (Schoppe, 2008).
- Individuals of *Cuora amboinensis* may wander substantial distances over the course of a lifetime, but the species does not migrate seasonally or to any geographically significant extent.
- Habitat generalist, adaptable to man-made habitats, tolerant (Moll, 1997; Schoppe, 2008).

1.3.2. *Habitat types*

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

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

1.3.3. *Role of the species in its ecosystem*

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

1.4. Population:

1.4.1. *Global Population size:*
Within its global range, no quantitative information on the abundance of Southeast Asian Box Turtle population is available.

1.4.2. *Current global population trends:*
___increasing __X_decreasing ____stable ____unknown

1.5. Conservation status

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

___Critically endangered ___Near Threatened
___Endangered ___Least concern
_X_Vulnerable ___Data deficient

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

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

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

1.5.3. *Main threats within the case study country*

___No Threats
___Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
_X_Harvesting [hunting/gathering]
___Accidental mortality (e.g. Bycatch)
___Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
___Other_______________
___Unknown

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

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

2.1. Management measures

2.1.1. *Management history*

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

2.1.2. *Purpose of the management plan in place*

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

2.1.3. *General elements of the management plan*

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

2.1.4. *Restoration or alleviation measures*

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

2.2. Monitoring system

2.2.1. *Methods used to monitor harvest*

National monitoring of exports based on issued export permits.

2.2.2. *Confidence in the use of monitoring*

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

2.3. Legal framework and law enforcement:

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

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

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

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

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

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

All specimens for domestic and international use are wild caught. The species is used for human food consumption, Traditional Chinese Medicine, merit release (a Chinese tradition of releasing one or several turtles to a temple or to the wild believing that this will bring long life to the person releasing) and as pet. As with other reptiles, about 10% of the total harvest quota, in the case of *C. amboinensis* 2000 individuals, are allotted for local uses annually, although local utilization is negligible.

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

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

3.2. Harvest

3.2.1. *Harvesting regime*

All extractive, year-around, disregarding size but larger (adult) individuals are preferred for the consumption / TCM trade, and smaller ones for the pet trade. Collection occurs all over the species range, disregarding designated collection areas and provincial quotas. Populations in national protected areas are exploited to lesser extent but since law enforcement is weak, exploitation also occurs in protected areas. Animals are either hand captured or collected with baited traps during darkness.

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

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

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

The basis for the quota setting of *C. amboinensis* is questionable. The distribution of the national quota among provinces is neither related to local abundance nor to sustainability of trade. Locations for harvest or capture are not carefully selected based on biological and ecological assessments.

3.3. Legal and illegal trade levels:

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

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

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

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

II. Non-detriment finding procedure (NDFs)

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

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

___partly_yes ___no

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

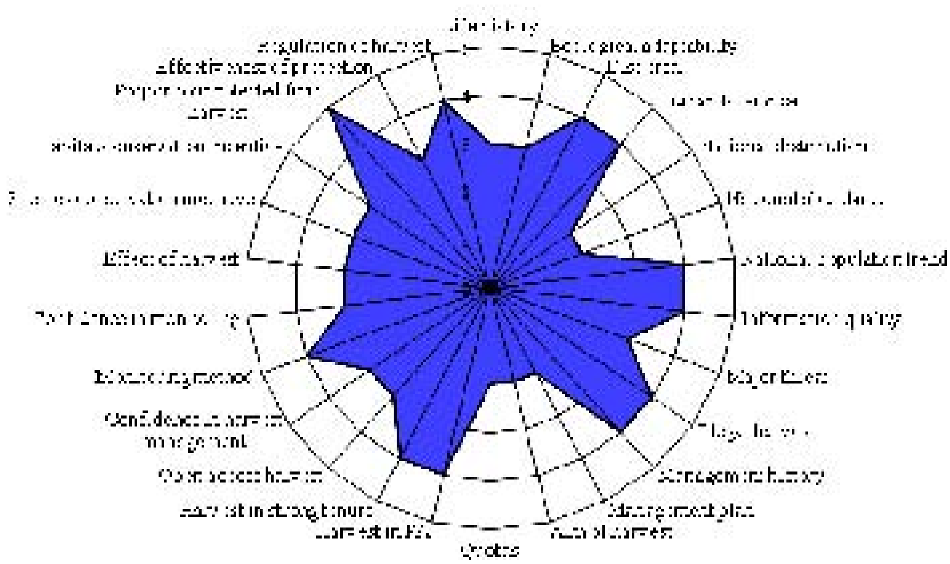

Figure 2: Risk-assessment of the Southeast Asian Box Turtle in Indonesia conducted by the Indonesia CITES SA in 2000 (Anon., 2002).

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

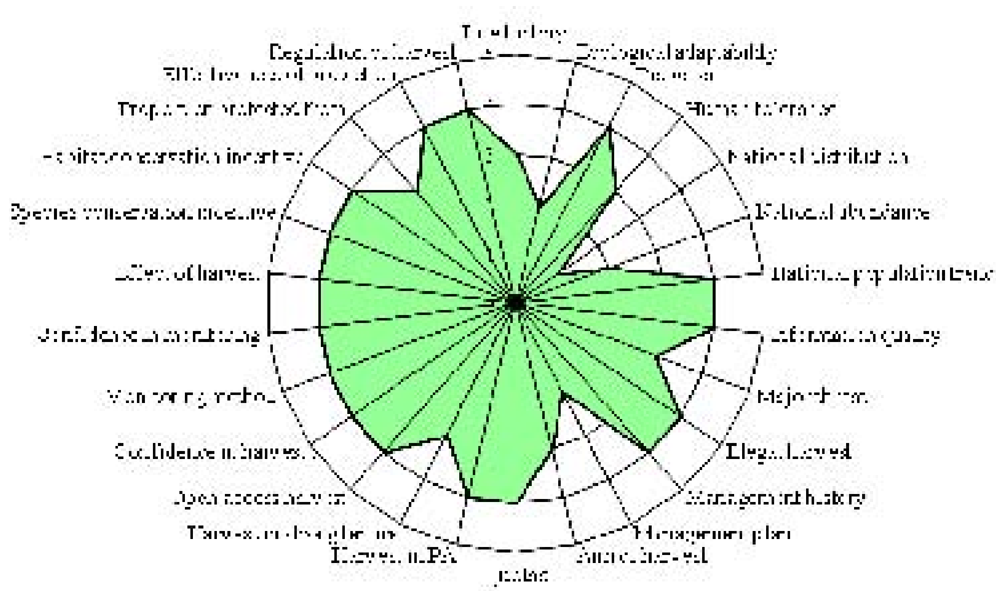

Figure 3: Risk-assessment of the Southeast Asian Box Turtle in Indonesia conducted by the TRAFFIC SEA in 2006.

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

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

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

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

Fieldwork was conducted in central trade areas: Java, Sulawesi, Sumatra and Kalimantan from March to July 2006. Published and unpublished material on the habitat, role in the ecosystems, reproduction and growth, and morphology of the Southeast Asian Box Turtle in general and on the three Indonesian subspecies specifically was compiled, enriched with observations during field surveys in Indonesia and analysed. Major findings are that the species has a low reproductive rate (age at maturity is 5.6 years, mean of six eggs per year with 50% hatching success), which makes it vulnerable for exploitation.

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

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

Subspecies	Wild
Cuora a. kamaroma	165.9±31.3 (65.5-215-0), n=678
Cuora a. amboinensis	134.5±44.6 (51.5-200.0), n=68
Cuora a. couro	Not available

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

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

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

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

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

Subspecies	**Trade**
Cuora a. kamaroma	171.7±28.3 (56.6-215.0), n=701
Cuora a. amboinensis	149.9±24.9 (121.5-190), n=20
Cuora a. couro	131.1±40.3 (55.6-214.0), n=200

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

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

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

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

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

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

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

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

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

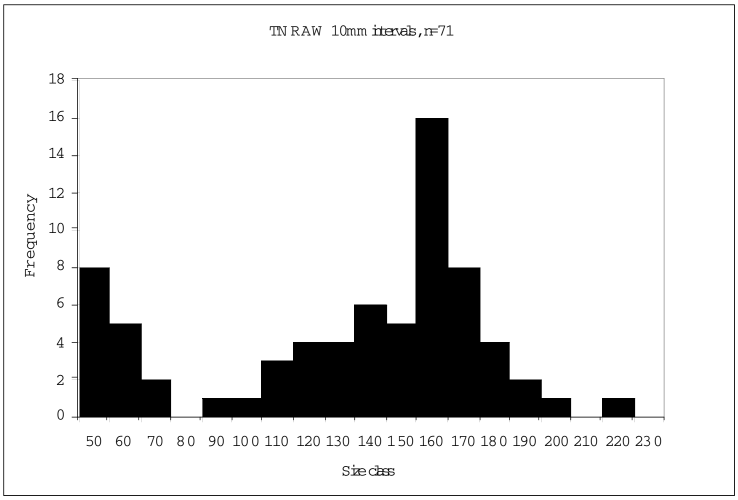

Figure 4: Size-frequency distribution of a population of the Wallacean Box Turtle in the TNRAW.

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

The composition of individuals caught in the wetland area in Kalimantan was dominated by mature adults (95.8%) and only 4.2% immature individuals had been caught. For a slow reproducing species like the Southeast Asian Box Turtle the removal of reproductive adults from one or a few small populations has significant effects on the population structure, recruitment and population genetics.

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

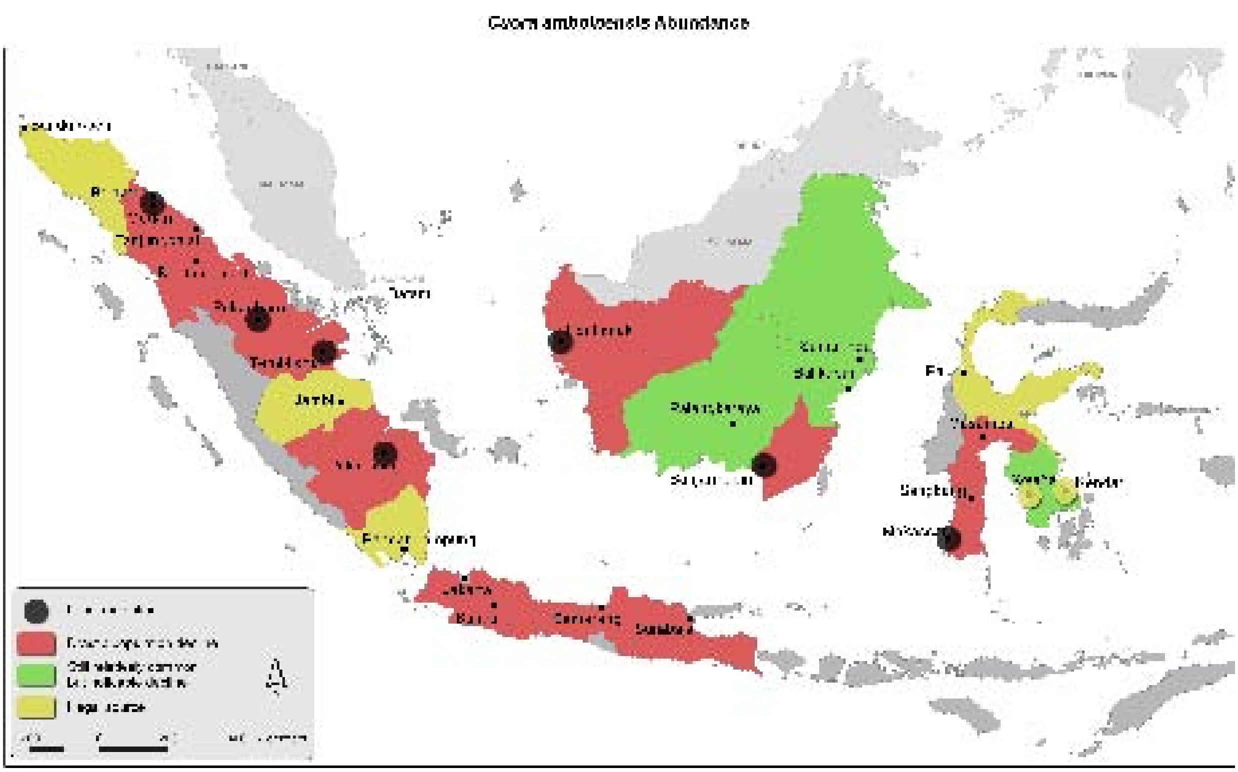

Figure 5: Map of Indonesia showing the abundance and exploitation of the Southeast Asian Box Turtle based on interviews and surveys conducted in Java, Sulawesi, Sumatra, and Kalimantan in 2006.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

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

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

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

6. RECOMMENDATIONS

- Illegal trade constitutes the main threat to the survival of the species and should be stopped before any other management schemes can take place.
- Surveys need to be conducted to determine the exact distribution of the species and its abundance in Indonesia.
- A NDF assessment without abundance data and population dynamics will remain a compromise unless further bolstered by subsequently available information incorporated into a monitoring system that supports an 'adaptive management' framework.
- In the absence of quantitative data on local populations of the Southeast Asian Box Turtle criteria that might indicate changes in the local abundance should be assessed. Indicators of change that were developed by TRAFFIC SEA after fieldwork in 2006 are (Schoppe, 2007):

  1. If collection areas are getting increasingly further away from urban trade centres.
  2. If catch-per-unit-effort (CPUE) has decreased.
  3. If collection of the species under investigation (and of other turtle species) is a fulltime business for collectors/trappers.
  4. If threats other than trade are getting more severe.

5. If there are frequent, periodical changes in the (international) market price.
6. If the State/provincial/regional annual harvest quota is far from being realized.
7. If harvest and export quotas are always realized (actual recorded volumes) to the maximum volume.
8. If average size of individuals is reduced.
9. If traded specimens are mainly adults.
10. If the population structure of traded individuals is significantly in favour of one life history stage.
11. If the sex ratio is significantly different from 1:1.

- The suggested abundance indicators are relatively easy to obtain. Potential sources of information are collectors, middlemen, suppliers, exporters, data from importing countries, the CITES Management and Scientific Authorities in the country of export, published or unpublished reports, and grey literature.
- The above indicators should be assessed on an annual basis at the same time of the year and at the same sites. Recommended are sites in trade centres such as Makassar, Medan, Pekanbaru, Tembilahan and Banjarmasin.

REFERENCES

ANON., 2002. Species Management Workshop funded by Environment Australia. Cibinong, Indonesia, 15-17 April 2002.

ANON., 2003. Administration directive of harvest or capture and distribution of specimens of wild plants and animal species. Decree of the Ministry of Forestry No. 447/Kpts-II/2003. Republik of Indonesia. Unofficial English Version.

ANON., 2006. Convention on International Trade in Endangered Species of Wild Fauna and Flora. Fifty-fourth meeting of the Standing Committee, Geneva (Switzerland), 2-6 October 2006. SC54 Doc. 42.

ANON., 2007. Kuota pengambilan tumbuhan alam dan penangkapan satwa liar untuk periode tahun 2007. Keputusan Direktur Jenderal Perlindungan Hutan Dan Konservasi Alam.

ASIAN Turtle Working Group, 2000. *Cuora amboinensis*. In: IUCN 2006. 2006 IUCN Red List of Threatened Species. www.iucnredlist.org. Downloaded on 10 January 2007.

BAILLIE, J. and Groombridge, B., 1996. *1996 IUCN Red List of Threatened Animals*. IUCN, Gland, Switzerland.

BOWLER, J.K., 1977. Longevity of reptiles and amphibians in North American collections as of 1 November, 1975. Society for the Study of Amphibians and Reptiles, Miscellaneous Publications, Herpetological Circular 6: 1-32.

CHEN, T.-H., J.-C. Lin, an H.-C. Chang, 2000. Current status and utilization of Chelonians in Taiwan. *In* van Dijk, P.P., Stuart, B.L. and A.G.J. Rhodin (eds.). Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. Chelonian Research Monographs, 2: 45-51.

FRITZ, U. and P. Havas, 2007. Checklist of Chelonians of the World. Vertebrate Zoology 57: 149-368.

HILTON-TAYLOR, C., 2000. 2000 IUCN Red List of Threatened Species. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN 2008. 2008 IUCN Red List of Threatened Species. <http://www.iucnredlist.org/>. Downloaded on 11 October 2008. Jenkins M.D., 1995. Tortoises and Freshwater Turtles: The trade in Southeast Asia. TRAFFIC International, United Kingdom, 48 pp.

JENKINS M.D., 1995. Tortoises and Freshwater Turtles: The trade in Southeast Asia. TRAFFIC International, United Kingdom, 48 pp.

KREBS, C.J., 1998, *Ecological Methodology*, 2nd edition. (New York: Harper Collins), 654pp.

LAU, M., Chan, B., Crow, P. and G. Ades, 2000. Trade and conservation of turtles and tortoises in the Hong Kong Special Administrative Region, People's Republic of China. *In* van Dijk, P.P., Stuart, B.L. and A.G.J. Rhodin (eds.). Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. Chelonian Research Monographs, 2: 39-44.

LIM, B.L. and I. Das, 1999. Turtles of Borneo and Peninsular Malaysia. Natural History Publications, Borneo, 151pp.

MCCORD, W.P. and H.-D. Philippen, 1998. A new subspecies of box turtle, *Cuora amboinensis* lineata, from Northern Myanmar (Burma), with remarks on the distribution and geographic variation of the species. Reptile Hobbyist, p. 51-58.

Mitchell, J.C., 1988. Population ecology and life histories of the freshwater turtles *Chrysemys picta* and Sternotherus odoratus in an urban lake. Herpetological Monograph, 2: 40-61.

MOLL, D. and E.O. Moll, 2004. The Ecology, Exploitation, and Conservation o River Turtles. Oxford University Press, 393pp.

MOLL, E.O., and J. Vijaya, 1986. Distributional records for some Indian turtles. J. Bombay Natur. Hist. Soc., 83: 57-62.

MOLL, E.O., 1997. Effects of habitat alteration on river turtles of tropical Asia with emphasis on sand mining and dams. *In* J. Van Abbema (ed.), Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles - An International Conference, pp. 37–41. July 1993, State University of New York, Purchase. New York Turtle and Tortoise Society, New York, 494 pp.

ROGNER, M., 1996. Schildkröten, Vol. 1 and 2. Heiro-Verlag, Hürtgenwald, Germany, 49 pp.

RUMMLER, H.-J. and U. Fritz, 1991. Geographische Variabilitaet der Amboina-Scharnierschildkroete *Cuora amboinensis* (Daudin, 1802), mit Beschreibung einer neuen Unterart, *C. a. kamaroma* subsp. nov. Salamandra, 27(1): 17-45.

SCHOPPE, S., *in prep*., Status, trade dynamics and management of the Southeast Asian Box Turtle *Cuora amboinensis* in Indonesia. TRAFFIC Southeast Asia, Technical Report, Kuala Lumpur, Malaysia.

SCHOPPE, S., 2008, Science in CITES: The biology and ecology of the South East Asian Box Turtle *Cuora amboinensis* and its local uses and trade in Malaysia. TRAFFIC Southeast Asia, Technical Report, Kuala Lumpur, Malaysia.

SCHOPPE, S., 2007, Non-Detrimental Finding Methodology for the Trade of Southeast Asian Freshwater Turtles and Tortoises (Fam. Geoemydidae). Unpublished Report for TRAFFIC Southeast Asia, Kuala Lumpur, Malaysia, 19 pp.

VAN DIJK, P.P., 2000. The Status of Turtles in Asia. *In* van Dijk, P.P., Stuart, B.L. and A.G.J. Rhodin (eds.). Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. Chelonian Research Monographs, 2: 15-18.

VAN DIJK, P.P., Iskandar, D.T., Palasuwan, T, Rhodin, A.G.J., Samedi, Sharma, D.S.K., Shepherd, C.R., Tisen, O.B. and V.R. Genorupa, 2000. Turtle trade in Southeast Asia: Regional Summary (Indonesia, Malaysia, Papua New Guinea, and Thailand). *In* van Dijk, P.P., Stuart, B.L. and A.G.J. Rhodin (eds.). Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. Chelonian Research Monographs, 2: 145-147.

WHITAKER, R. and H.V. Andrews, 1997. Captive breeding of Indian turtles and tortoises at the Centre for Herpetology/Madras Crocodile Bank. *In* J. Van Abbema (ed.), Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles - An International Conference, pp. 166–170. July 1993, State University of New York, Purchase. New York Turtle and Tortoise Society, New York, 494 pp.

WILBUR, H.M., 1975. The evolutionary and mathematical demography of the turtles *Chrysemys picta*. Ecology, 56: 64-77.

NDF WORKSHOP
WG 7 – Reptiles and Amphibians
CASE STUDY 2 SUMMARY
Cuora amboinensis
Country – **Indonesia**
Original language – English

THE SOUTHEAST ASIAN BOX TURTLE *CUORA AMBOINENSIS* (DAUDIN, 1802) IN INDONESIA

AUTHOR:
Sabine Schoppe

The Southeast Asian Box Turtle *Cuora amboinensis* is a widely distributed freshwater turtle native to Southeast Asia. The species occurs in natural and man-made wetlands. The global and national conservation status of the species is "Vulnerable". Since 2000 export has been managed through a quota system with the purpose of population management and sustainable use.

TRAFFIC South East Asia (SEA) proposes a NDF methodology using criteria that were assessed during fieldwork in 2006: legislation and enforcement; trade levels; extent of illegal trade; reproduction biology; composition of wild populations and individuals in trade; abundance in a protected area; and abundance in harvest in an exploited area. Results show that Indonesia has a substantive legislative framework in place to govern the management of wildlife harvest and trade. Law enforcement is however rather weak. The species remains among the most abundantly traded freshwater turtles in Asia. The species is used for human food consumption, Traditional Chinese Medicine, merit release and as pet. In Indonesia it has the highest harvest quota (20 000) of all hard-shelled turtles. All specimens are wild caught, year around. Ten percent (2000 individuals) are allotted for local utilization but local use is negligible with ethnic Chinese as the main user group. The export quota of 18 000 individuals is divided among 14 pet exporters (1/3 of quota, preferably large adults) and four meat/TCM exporters (2/3 of quota, preferably small individuals). Destinations for the meat and the shell trade are East Asian countries, mainly Hong Kong SAR and mainland China and Singapore. Pet importing countries are Europe, Japan and the United States of America. A conservative estimate is that illegal trade amounts to 10 times the volume of legal trade. The slow reproductive rate of the species makes it very vulnerable for exploitation and at the same time makes captive breeding an unfeasible endeavour, which is therefore not practiced in the country.

Individuals encountered in the wild and in trade were measured and means calculated. These data may serve as baseline data for further comparative studies. Since larger size classes are targeted for the large-scale consumption trade a smaller mean size of individuals in trade compare to the mean size in the wild may be related to over-exploitation of larger size classes. A survey to assess the abundance of the species in a protected area, revealed an estimated density of 60 ind./ha. These data may serve as baseline data, and lower density in a similar natural habitat might indicate over-exploitation. If off-take is sustainable population density will be lower but stable. A continual decline in density would indicate over-exploitation. The wild population was composed of 54.9% immature versus 45.1% mature individuals; sex ratio was M1:F1.2. A size frequency histogram of the population in the protected area is bell-shaped indicating normal distribution. A deviation from the above might indicate over-exploitation. For example, in a natural wetland with long exploitation history in East Kalimantan, 95.8% of the catch were adults, and sex ratio was 1M:1.03F. To determine the abundance in the exploited natural wetland a 43-day lasting harvest survey was conducted. Results indicate that one middleman can trade a conservative mean of 3350.9 individual/year. If catch per unit effort (CPUE) can be sustained over the years, exploitation might be sustainable, if CPUE decreases over the years, over-exploitation is taking place. The assessment of the harvest impact on the species all over Java, Sulawesi, Sumatra and Kalimantan showed over-exploitation and even local extinction near and in trade centres, acquisition of individuals from provinces without quota, and that the species is more common in remote areas that were exploited to lesser extent in the recent past.

Major problems found in the elaboration of the NDF are the lack of past density / population size data to compare present results with; the enormous amount of illegally traded individuals and the long chain of people involved in the illegal business. In the absence of quantitative data on local populations of the Southeast Asian Box Turtle criteria that might indicate changes in the local abundance that should be assessed on a regular basis are recommended.

NDF WORKSHOP CASE STUDIES
WG 7 – Reptiles and Amphibians
CASE STUDY 3
Malacochersus tornieri
Country – **KENYA**
Original language – English

CONSERVATION, MANAGEMENT AND CONTROL OF TRADE IN PANCAKE TORTOISE *MALACOCHERSUS TORNIERI* (SIEBENROCK, 1903) IN KENYA: THE NON-DETRIMENT FINDING STUDIES CASE STUDY

AUHTOR.
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I. Background information on the taxa

1. BIOLOGICAL DATA

1.1. Taxonomy

Class:	Reptilia
Order:	Testudinata
Family:	Testudinidae
Scientific name:	*Maalacochersus tornieri* (Siebenrock, 1903)
Common names:	English: Pancake tortoise
	Swahili: Kobe

1.2. Distribution of Pancake tortoise (*Malacochersus tornieri*) population in Kenya

Pancake tortoise is a rock crevice-dwellinsg tortoise and inhabits patchy microhabitats of rock outcrops and kopjes discontinuously distributed throughout the drylands of Kenya. Its distribution overlaps with that of Precambrian rocks of the basement complex system mainly in agro-climatic zone V. The distribution ranges from south-eastern to northern parts of the country and covers seven districts namely: – Kitui and Mwingi (Greater Kitui), Tharaka,(greater Meru), Mbeere (greater Embu), Samburu, Isiolo and Marsabit.

The species distribution range is characterized mostly by thorn —bush land, thickets, Acacia— *Commiphora* woodland and grassland. Altitude influences distribution of optimal microhabitats for the species. The distribution is therefore patchy with aggregated populations.

The populations are discontinuously scattered from southeastern to northern parts of the country from Kitui to Samburu districts respectively with Kiasa and Ithumba hills within Tsavo East National Park north of Galana river as the southern limit and Ngurunit area on the eastern slopes of Ndotto Mountains with a small spill over population in Marsabit district as the northern limit of the species distribution. Pancake tortoise prefers well-sheltered rock crevices with the inhabited rock crevices orientation varying from horizontal to vertical inclination. This accounts for the species patchy and discontinuous distribution. The limited suitable rock crevices regulate population size and distribution.

The species occurs in both protected and non-protected areas within its range. However the population in protected areas is proportionally very small (less than 5%) in comparison with that outside estimated to account for over 95% of the country's species population.

Generally, Pancake tortoise population distribution in Kenya can therefore be grouped into two; southern sub-population whose distribution covers Kitui, Mwingi, Tharaka and Mbeere and the northern sub- population covering Samburu, Isiolo and Marsabit districts.

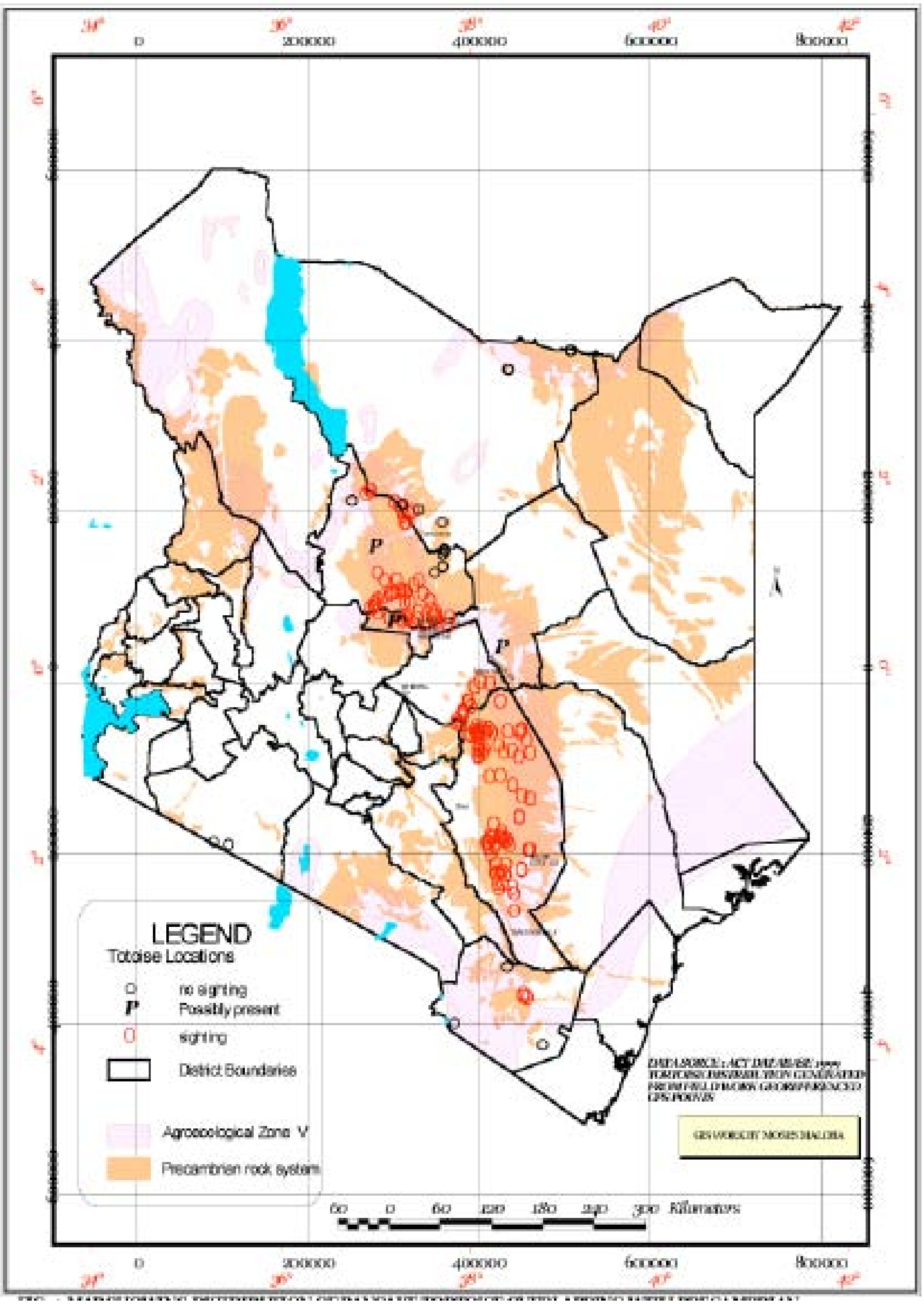


FIG. 2 Map Showing Distribution of pancake tortoise overlapping with precambrian rocks and agroecological zone V in Kenya 2002.

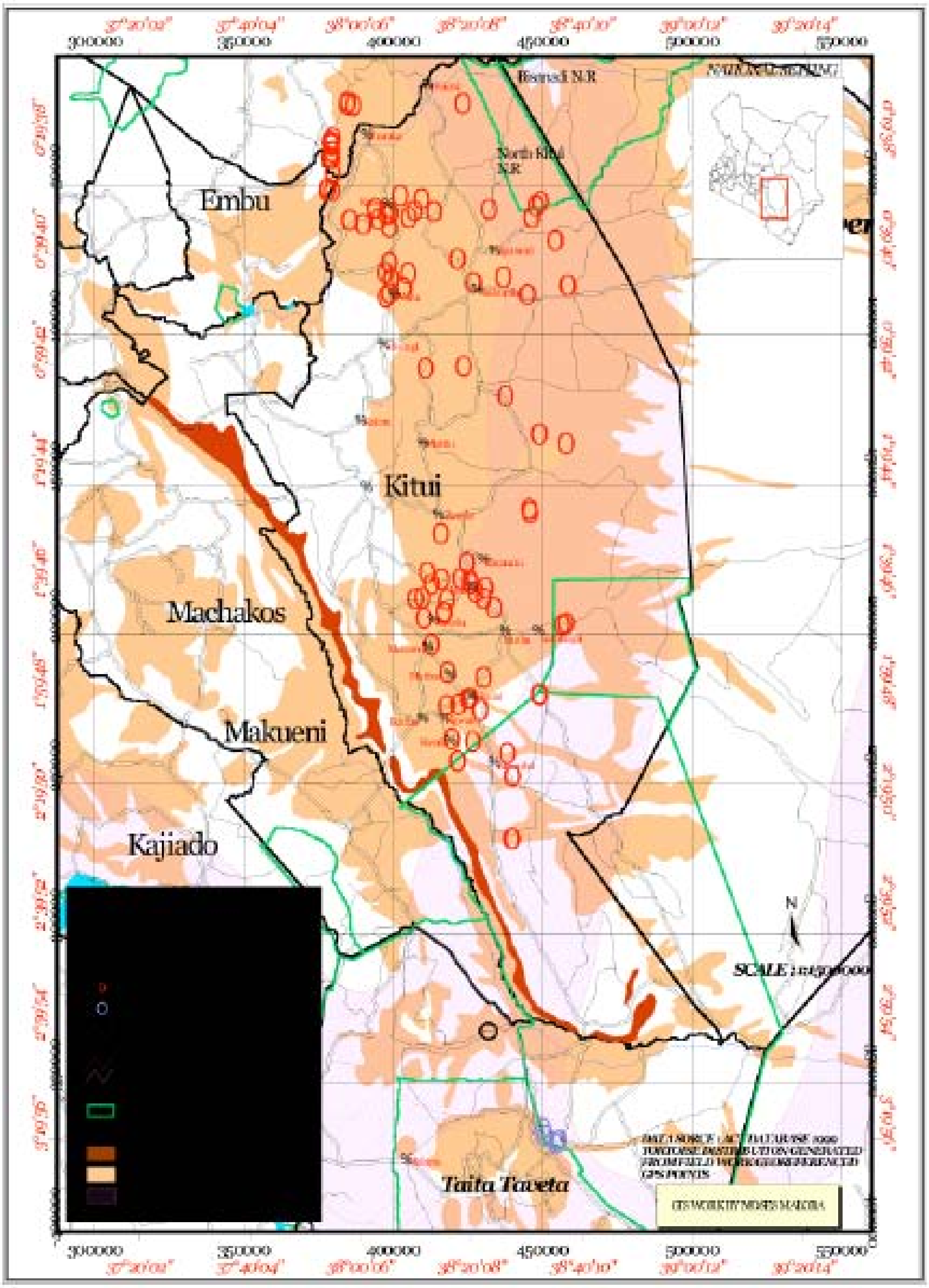


FIG. 3 Map Showing Distribution of pancake tortoise inkitui & Mwingi (greater kitui) districts 2002.

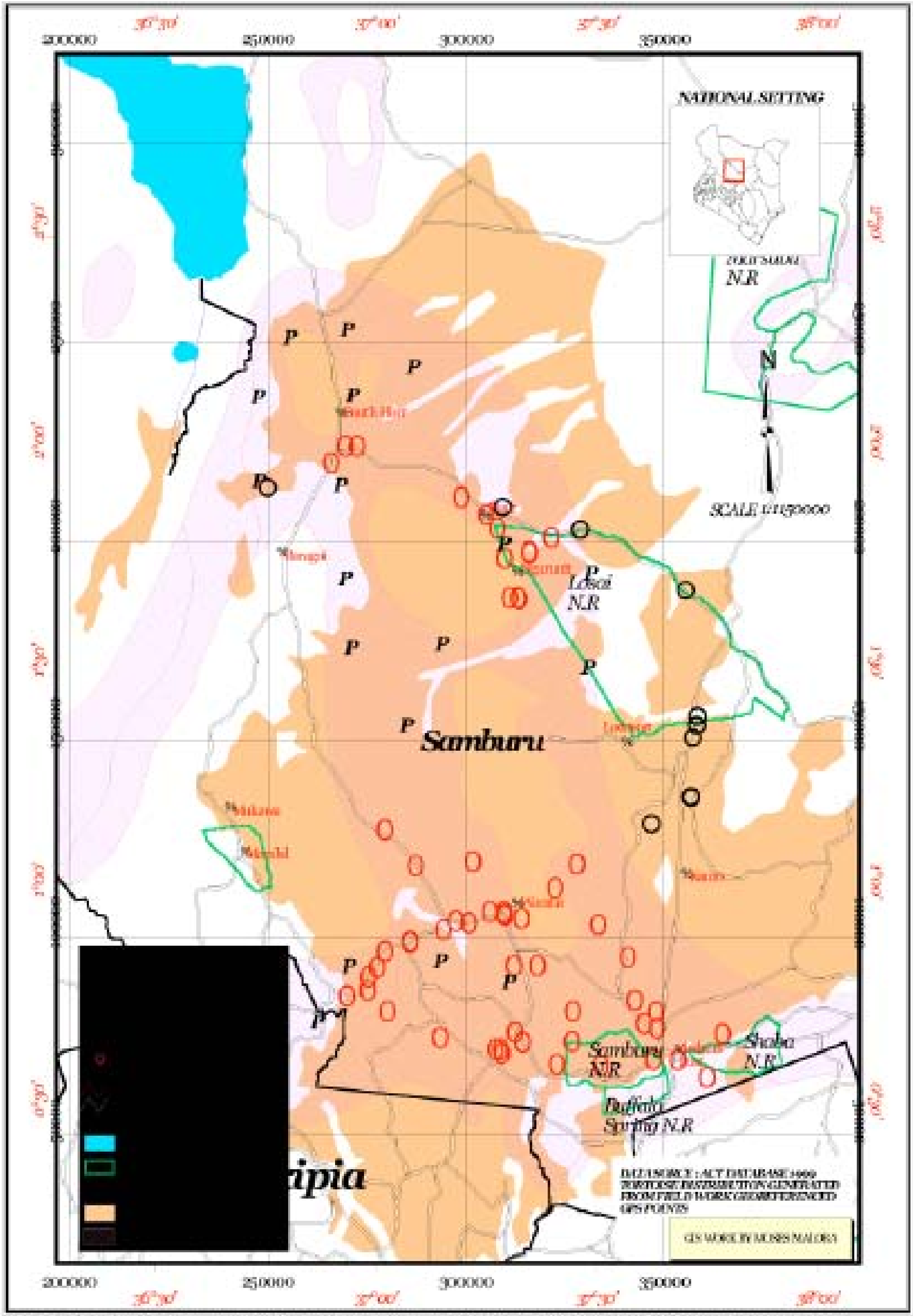


FIG. 5 Map Showing Distribution of pancake tortoise in isiolo marsabit and samburu districts 2002.

1.3 Biological characteristics

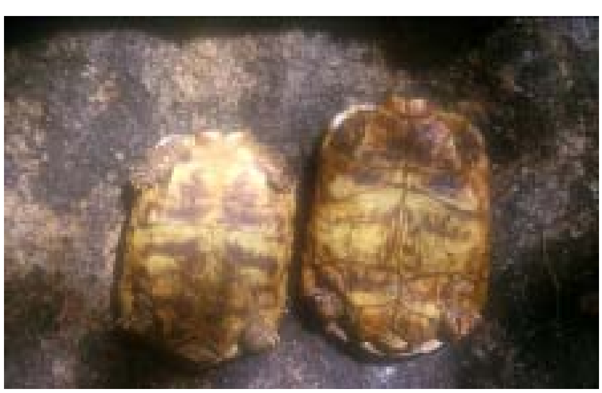
1.2.1. *Life History*

Pancake tortoise, *Malacochersus tornieri* is a small soft shelled dorso-ventrally flattened rock crevice inhabitant. The shell is flattened and flexible and enables it to push and wedge itself in rock crevices. This unique appearance and behavior makes the species popular in the international pet trade.

Body structure (morphology) of Pancake tortoise

Horn colored adult specimen (With carapace geometric pattern lost)

Carapace abnormality ((4th vertebral scute divided into three)



Plastron segment showing “V” shaped caudal/ posterior scute

Normal carapace with geometric pattern abnormal carapace

Maximum body weight of 560g and a straight-line carapace length of 171mm for an average adult specimen has been recorded (Kyalo et al., 2001)

Measurements of 228 tortoises showing mean and range of body weight in grams and length in millimeters.

Measurement	Females (n=130)	Males (n=98)
Mean Carapace Length ± 1SD	141.98± 15.35	135.21±29.84
Range	82.65-157.33	105.37-165.05
Mean Body weight ± 1SD	355.88±93.32	310.16±128.72
Range	262.56-449.20	181.44-438.88

Other available recorded field data gives the maximum body length (Straight Carapace Length) of an average adult Pancake tortoise as 180mm and body weight of 500g (Moll & Klemens 1996). Malonza (1999) recorded maximum body weight of 510 g and Straight Carapace Length of 175mm for average adult specimens.

In captivity, females may lay eggs up to five times per year (Schmalz & Stein, 1994; Vinke & Vinke, 2000); usually only a single egg is laid each time, but two or even three eggs have occasionally been reported (Ernst *et al*., 2002; Ewert *et al*., 2004). In captive animals, the period between nesting may be from 21 to 71 days.

The reported age at first reproduction of captive animals ranges from about 5 to 9 years (Riener, 1999; Schmidt, 2004). Reproductive data from the wild are scarce; they indicate that females lay only a single egg at a time, and show that not all mature females reproduce each year (Malonza, 2003).

1.2.2. *Habitat types*

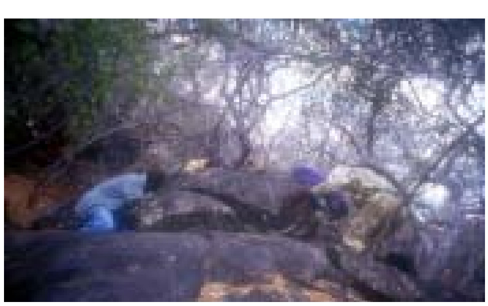
Habitat requirements for Pancake tortoise are very specific. The optimal habitat is a function of geology, climate, vegetation and altitude (Kyalo 2002, Malonza 1999). Pancake tortoise lives only where rock crevices of suitable dimensions are found in thorn scrub and savannah of the Somalia-Masai floristic region characterized with Acacia-*Commiphora*, vegetation. Common plant species in the species habitat range include *Starcular rhynchocaprus*, *Starcular stenocarpus*, *Commiphora boiviana*, *Commiphora edulis*, *C. bildbraedii*, *C.baluensis*, *Boscia vascular*, *Euphorbia spinaceous*, *Barchenia neglecta*, *Terminalia spp, and Delonyx elata*. This vegetation and therefore the Pancake tortoise habitat occur within altitudes of 400-1600 M above sea level.

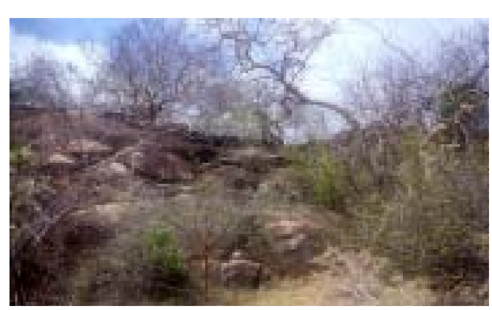
Pancake tortoises occur only in rock crevices of specific dimensions in exfoliating granite rock outcrops. The high temperatures experienced in the arid and semi arid lands influence development of the suitable crevices. The orientation of the optimal crevices varies from horizontal through diagonal to vertical with all degrees of inclination between the extremes (Wood &Mackay 1993, Moll and Klemens 1996, Malonza 1999).

The most suitable crevices are quite deep and have uncluttered rock floors to give grip to the tortoise during movements inside. The crevices are near a convenient route to the ground and are usually tapered to a height of between 3-8 centimeters to allow the tortoise a place to wedge itself for protection. Depending on the availability of the optimal crevice in any rock outcrop and the presence of a suitable route to the ground, the Pancake tortoise can occupy a crevice at a height of up to 1.5 meters or even higher from the ground. The crevices are normally found in exfoliating outcrops forming rock slabs or boulders that overlay each other forming the crevice at some point of the convergence.

The suitable crevices and therefore microhabitats for the Pancake tortoise are often a small proportion of the crevices in any given species range area. Large areas of unsuitable habitats separate the suitable habitats. The species microhabitats are sparse and few consequently accounting for low species population densities.

Natural habitats for Pancake tortoise





Orientation of rock crevices inhabited by Pancake tortoises

a) Horizontally inclined crevice (Ndulani area, Kitui district)

b) Diagonally inclined crevice (Namunyak conservancy area, Samburu district)

c) vertically inclined crevice, (Nokowarak area, Samburu district)

1.2.3. *Role of the species in its ecosystem*

Pancake tortoises feed predominantly on a variety of herbs and succulent plants, but also consume some beetles and other animal matter. The species occur micro-sympatrically with tawny plated lizard , *Gerrhosaurus major*, white throated savanna monitor, *Veranus albigularis*, Puff – adder, *Bitis arietans*, black –necked spitting cobra, *Naja nigricollis* , five –lined skink, *Mabuya quinquetaeniata* and red –headed rock agama, *Agama agama lionotus*.

1.3. Population

1.3.1. *Global population size*

The global population of Pancake tortoise in the wild is not known. This species occurs in fragmented populations in Kenya, Tanzania and recently in 2004 established to occur in North-eastern Zambia.

1.3.2. *Current Global population trends*

___increasing ____decreasing _X__stable ____unknown

The current global population is reduced but stable

1.4. Conservation status

1.4.1. *Global conservation status*

___Critically endangered ___Near Threatened
___Endangered ___Least concern
_X_Vulnerable ___Data deficient

M.tornieri is listed under IUCN as Vulnerable species (IUCN 1996). All wild populations of *Malacochersus tornieri* were first listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) on July 1975 calling for controlled trade of the species through use of permits.

Currently, there is a trade moratorium on specimens collected from the wild and therefore legal trade in the species only involves specimens bred in captivity.

1.4.2. *National conservation status*

The Pancake tortoise is uncommon considering that the population is restricted to only areas with optimal habitat characteristics it specifically requires. The species abundance and density is a function of the habitat quality. Well-oriented rock crevices, high vegetation cover over the rock outcrop and less human habitat destruction are characteristics of high quality habitat for the species.

The abundance of Pancake tortoise qualitatively varies from area to area depending on the availability and number of suitable microhabitats. The species population densities differ from one site to the other. This change in densities is a function of habitat preference. Suitable crevices accommodate solitary, pair as well as multiple assemblages of Pancake tortoise.

In undisturbed habitats with well-vegetated rock outcrops, frequency of encounter and occurrence of multiple assemblages and therefore relative high population densities are recorded. The frequency of optimal habitat for the species and level of its disturbance determine the abundance and distribution of the species.

Establishment of the species population size in its entire range in Kenya has not been done. However, determination of the species density in selected sampling sites has been crucial to give an indication of the species abundance and distribution in the country.

The species densities range from 8.86 specimens/ Km^2 in Voo, Kitui as the highest, 6.60 in Katse,Mwingi, 2.95 in Endau Kitui, 2.61 in Wamba, Samburu, 1.73 in Ishiara,Mbeere, 1.72 in Chiakariga, Tharaka and 1.20 in Nguni, Mwingi

Representative Pancake tortoise sample count site-Voo in Kitui(2002)

Transect Route Name	**Transect size (Km^2)**	**No. of specimens Counted**	**Density Specimens/ Km^2**
Voo-Kalalani	1.0	33	33
Voo-Kemwaa	3.5	13	3.71
Voo-Kyaango-Kithanake	9.50	31	3.26
Voo-Kinakoni	8.0	25	3.125
Kyaango-Kinakoni	5.0	6	1.20
Mean Density			8.86

1.4.3. *Main threats to Pancake tortoise in Kenya*

___No Threats
_X_Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
_X_Harvesting [hunting/gathering]
___Accidental mortality (e.g. Bycatch)
___Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
___Other_______________
___Unknown

Habitat alteration and destruction as a result of slash-and-burn shifting cultivation, charcoal burning, rock slab and ballast extraction and collection for international trade are the threats to Pancake tortoise population in the wild.

Commercial charcoal burning as well as commercial ballast and rock slabs extraction and slash-and-burn shifting cultivation are the common threats to the southern subpopulation of the Pancake tortoise.

Exploitation of the Pancake Tortoise for international trade is the only significant human utilization of the species. Pancake tortoises have been popular display animals in zoos and among private hobbyists. Trade in the species has been significant in recent decades such that when compounded with the threat of habitat alteration and loss, the species is now rated "vulnerable" on the IUCN Red List. Collection of specimens of the species for international trade has been identified as a major threat to the species population in areas around Nguni, Mataka and Katse in Mwingi district and in Kianjeru, Mbeere district

In Samburu, Isiolo and Marsabit districts where the local people are nomadic pastoralist, the species is not threatened per se as there is little habitat destruction caused by livestock grazing; a land use practice which has insignificant threat to the species survival.

2. MANAGEMENT OF PANCAKE TORTOISE IN KENYA

2.1. Management Measures

2.1.1. *Management history*

International trade in the species has been regulated under CITES Appendix II since 1975. In Kenya, trade in specimens of the species is restricted to those from breeding operations. No collection of the species from the wild for commercial trade is currently allowed.

In 2000, Kenya put forward to the CITES 11th Conference of the Parties a proposal for inclusion of the species in CITES Appendix I. This proposal was however withdrawn following results of findings of the CITES Animals Committee mission to Tanzania in 1998 and further due to recommendations for development of strict management measures for captive breeding and trade of the species. These strict management measures complement the CITES trade regulation and management with the aim to meet legitimate demand for the species with animals produced in a manner that minimizes impact on wild populations and provides financial returns to the species range State.

At the 12th Conference of the Parties in 2002, and based on information generated through a national survey in 2001-2002 of the species population distribution in Kenya, Kenya proposed introduction of a CITES resolution that would direct the Animals Committee to:

1) review the biology, genetic variability, conservation status and distribution of this species in the wild;
2) assess the current production systems of this species with the aim of advising on adequate control, management and monitoring practices;

3) consider appropriate identification and marking systems for specimens in trade and for breeding stocks in captivity in the range States; and
4) advise on training and capacity-building needs to manage and control trade in this species.

Most of the Pancake tortoise populations occur in the south eastern Kenya where habitat alteration is a major problem. Efforts are being enhanced towards generation of the best scientific information about the species to elaborate on its conservation management plan including establishment of a system of publicly and /or privately owned nature reserves as a process towards providing for strictly controlled sustainable harvesting from the system to allow for incentives for conservation and management of the species in-situ.

2.1.2. *Species Management Plan & its purpose*

One of the recommendations put forward based on the results of the Non- detriment finding studies was

Through adoption of a decision by the CITES Conference of the Parties,

a) only specimens of not more than 8cm and from the breeding operations should be allowed into the trade in order to control illegal collection of juveniles of the species from the wild.
a) considering that Pancake tortoise occupies a very specific type of habitat, the breeding operations should replicate as much as possible the natural habitat of the species
b) the ratio of hatchlings to adult females in a breeding operation should reflect the known reproduction rate of the species in its natural habitat unless manipulation of conditions in the breeding operations scientifically prove otherwise.

AT NATIONAL LEVEL:

- Efforts should be made to have community programmes planned and initiated to create awareness on Pancake tortoise and threats to the species, promote the importance of the species to the local people and help to counteract the already identified threats to the survival of the species in the non-protected areas.
- Establishment and promotion of Pancake tortoise conservancy areas/sanctuaries/nature reserves that may be private or community based managed as the preferred option to that of breeding in captivity considering the biology of the species. Recommended areas for pilot projects include Voo and Endau in Kitui, Katse in Mwingi and Ciangera in Mbeere districts.

- Research studies should be promoted, guided and supported to generate more scientific information on Pancake tortoise. The research mainly to focus on the species ecology/and or behavior should be highly applied with strong implications for the species conservation and management. Data on population dynamics, social and reproductive behavior, home range size, movement patterns or on reproduction growth and mortality rates should be generated as much as possible as this information is important for Population Viability Analysis, population modeling and to conservation planning.
- Research work to generate Genetic baseline information on Pancake tortoise should be initiated and promoted to help in species identification, individual identity, parent offspring relationship establishment and population identification. Different populations of the same species of animal can be genetically distinct and these differences can be exploited to determine the geographic origin of the individual. DNA samples of Pancake tortoises to be collected through this research will help build the database needed to make DNA typing possible and use it to unravel wildlife crimes involving illegal trade in Pancake tortoise.
- Research and Monitoring programmes should be supported to monitor trends of the natural and introduced populations of Pancake tortoise.
- More and long-term surveys should be supported to determine the population size of Pancake tortoise in the identified distribution areas both in the protected and non-protected.
- More research work should be supported to establish whether a population of the species exists in the inaccessed areas of Bisanadi National Reserve, Garbatula and Shaba hills in Isiolo district that could link the species population in the south with that in the north.
- range States for the Pancake tortoise should initiate and promote joint surveys and monitoring of the species in an effort to determine the species' population status across its entire range and develop common management programmes for the species.

2.1.3. *General elements of the Management Plan*

Apart from the recommended management measures (see 2.1.2), no specific management plan for the species has been prepared. However, there are procedures for authorizing wildlife captive breeding operations in Kenya and these procedures also apply in regard to the Pancake tortoise.

2.2. Monitoring system

All the authorized wildlife breeding operations are routinely inspected to ensure enforcement and compliance. The breeding operations are required as a matter of procedure to file with the management Authority quarterly returns on the performances of the operations.

2.2.1. *Methods used to monitor harvest*

Except removal of specimens of Pancake tortoise as breeding stock upon authorization of a breeding operation to breed the species, removal from the wild of specimens of Pancake tortoise is prohibited. Upon authorization and licensing of the breeding operations, routine inspections of the breeding facilities are conducted by the Wildlife Authorities

2.2.2. *Confidence in the use of Monitoring*

The MA is responsible for issuance of all authorities and permits for wildlife breeding and trade in accordance with the provisions of the Wildlife Act CAP 376 of Kenya. Authority for establishment of a breeding operation for Pancake tortoise and capture of the initial breeding stock is issued by the Management Authority. The authorization to capture the breeding stock is issued only when the Management Authority is satisfied that the applicant for a breeding operation has put in place appropriate breeding facility that replicates the natural habitat of the species for its success in captivity.

2.3. Legal framework and law enforcement

Hunting and dealership in wildlife and wildlife products have been outlawed in Kenya by an Act of Parliament since 1977 and 1978 respectively. However, Section 67 of the Wildlife Act allows the Minister in charge of wildlife to make regulations for the better management of wildlife farming.

Within the provisions of Section 67 of the Wildlife Act, trade in specimens of Pancake tortoise bred in captivity is allowed. Trade in wild collected specimens of Pancake tortoise is therefore prohibited by law.

3. UTILIZATION OF AND TRADE IN PANCAKE TORTOISE IN KENYA

3.1. Type of utilization

Utilization of Pancake tortoise in Kenya is for international live pet trade mainly to Asia and America. Traded specimens are sourced from authorized breeding operations.

3.2. Harvest

3.2.1. *Harvesting regime*

Removal from the wild of Pancake tortoise is allowed only for breeding stock in authorized and licensed breeding operations. Consequently, limited number of adult specimens in the ratio 1:3 males and females is collected from the wild.

3.2.2. *Harvest Management/Control*

International trade is likely to occur at unsustainable levels if there is no adequately functioning mechanism to advise on the matter of detriment, the "non-detriment" finding is incorrect as a result of insufficient information on the species, or export permits are issued contrary to the advice on matter of detriment.

Kenya banned all trade in wild caught specimens of the species in 1981. This saw increased exports of specimens of the species from Tanzania. A moratorium on exports of *M.tornieri* for Tanzania was placed in 1992 pending results of an assessment on significant trade in the species. The assessment followed a seizure of several shipments of the species. The trade assessment found out there was extensive collection of Pancake tortoise in its entire range in Tanzania and that the species had been severely threatened (Klemens & Moll 1995)

Following the moratorium, Tanzania allowed operations to breed specimens of the species for trade. This followed in 1993 establishment of tortoise breeding farms to breed Pancake tortoise among other tortoise species for commercial purposes (Kyalo &Malonza 2001)

In 1995 Kenya licensed establishment of one breeding operation and later in 2005 another both in the known Pancake tortoise range. A third breeding operation but outside the species natural range was established in 1998 to breed the species for trade. The three operations are regulated and monitored by the wildlife authority to ensure compliance.

3.3. Legal and illegal trade levels

Between 1996-2005 the licensed breeding operations have legally exporting using CITES Permits approximately 1,300 live specimens of Pancake tortoise from Kenya.

Despite the moratorium on trade in wild collected specimens of Pancake tortoise and the permit system to control trade in the species, there have been illegal trafficking of specimens of Pancake tortoise for international market. The trafficking has been from both range and non -range States.

Cases of illegal trade in the species have been reported and seizures of live specimens made. Confiscation of a consignment of 209 specimens in Uganda in 2001 and another of 36 from Tanzania in 2007 is a clear indication that there is demand for specimens of the species in the international market.

The aims of the Convention on International Trade in Endangered Species of wild Fauna and Flora –CITES are to protect species from the detrimental effects of over exploitation for international trade and ensure sustainable utilization of others. Determining when international trade is likely to prove non -detrimental to the survival of the species is essential.

Inadequate application of stricter measures to control the trade especially exports of Pancake tortoise specimens from the breeding operations across the species range can easily render efforts to control illegal trade in specimens of the species from the wild futile.

II. NON-DETRIMENT FINDING PROCEDURE (NDFS)

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

_X_yes ___no

Methodology used in doing NDF studies on Pancake tortoise has been basically undertaking of a national survey in 2001-2002 to establish the species population distribution and status using the IUCN checklist for NDFs. The checklist was extensively referred to during the process.

2. CRITERIA, PARAMETERS AND INDICATORS USED

The concepts in the checklist were referred to when carrying out the NDF process and applied in combination with information on the following elements:

The species characteristics:

- Distribution
- Tolerance to human disturbance such as habitat alteration and conversion into agriculture and destruction of the habitat as a result of rock ballast harvesting
- Ease with which to breed in captivity
- Species habitat requirements

3. MAIN SOURCES OF DATA

The following are the sources of data for making NDF on Pancake tortoise in Kenya

- Field assessment of population abundance. Regular assessments of the identified and mapped fragmented populations as established during the national survey in 2001-2002
- Applications to breed and for exports of live specimens by the breeding operations
- Authorities to capture breeding stocks and the returns filed by the breeders with Kenya Wildlife Service
- Export permits issued for export of live specimens of Pancake tortoise
- Reporting by the breeding operations on the performance of the facilities and physical inspections of the breeding facilities by the Wildlife Authorities to assess the levels of production
- Routine inspection of the breeding operations by the Management and Scientific authorities.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

Data generated from detailed reporting by the breeding operations on levels of successful recruitment in the breeding operations against the number of specimens approved for removal from the wild as breeding stocks is evaluated and analyzed to provide information on the species population dynamics. The information is also used to monitor compliance.

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

Major challenge in the elaboration of NDF studies on the Pancake tortoise has been to get the definite population size of the species considering its biology, behavior, habitat characteristics and remoteness of its distribution range.

6. RECOMMENDATIONS

The use of the IUCN Checklist for NDF is quite applicable to the Pancake tortoise species. The checklist is therefore a practical tool for making NDF on the species however, it is important that quantitative data on the species is generated to provide informed assessment of the status of the species especially where the checklist calls for qualitative information and also assist in making decision on possible alternative management system such as allowing limited off-take from the wild especially as incentives to communities supporting the in-situ conservation of the species by foregoing other land use systems. Efforts must therefore be made to generate the quantitative information as much as possible. Such elements that need this quantitative data include the biological status to inform on the approximate population size, structure, sex ratio and nesting ecology.

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INTERNATIONAL EXPERTS WORKSHOP ON CITES NON- DETRIMENT FINDINGS

Cancun (México), 17-22 Nov. 2008

PRESENTATION ON

Kenya Case Study on Pancake tortoise (*Malacochersus tornieri*)

BY
Solomon N. Kyalo

KENYA

KENYA WILDLIFE SERVICE

Conservation Status and Management of Pancake Tortoise (*Malacochersus tornieri*, (SiebenRock, 1903) in Kenya- Non –Detriment Finding Studies process

A Case Study presented at the International Expert Workshop on CITES Non-Detriment Findings, Cancun (Mexico), 17-22 November 2008

BACKGROUND

The Species- Pancake tortoise (*Malacochersus tornieri*)

•Land tortoise

Taxonomy:

Class: REPTILIA

Order: Testudinata

Family: Testudinidae

Geographical Distribution

Kenya, Tanzania & **Zambia *(2003)**

CONSERVATION STATUS

- IUCN Classification: Vulnerable
- CITES Listing: Appendix II

Objectives

Understanding the Factors affecting Conservation and Management of ***Malacochersus tornieri*** in Kenya: **The NDF Studies**

Data source/references

- Species distribution maps
- Assessments of species abundance in different areas of distribution
- Assessments of threats to the species population
- Trade levels
- Recommended management strategies and practical options for Mitigating threats to the species

METHODOLOGY FOR NDF

Distribution mapping

•Administrative blocks(districts) under Agro-climate Zone V overlapping with Precambrian rock system

(Habitats are a function of interplay of exfoliating granite rocks of Precambrian rock type in Arid and semi-arid climate) and characterized by rock outcrops &kopjes with crevices

•Information from collectors

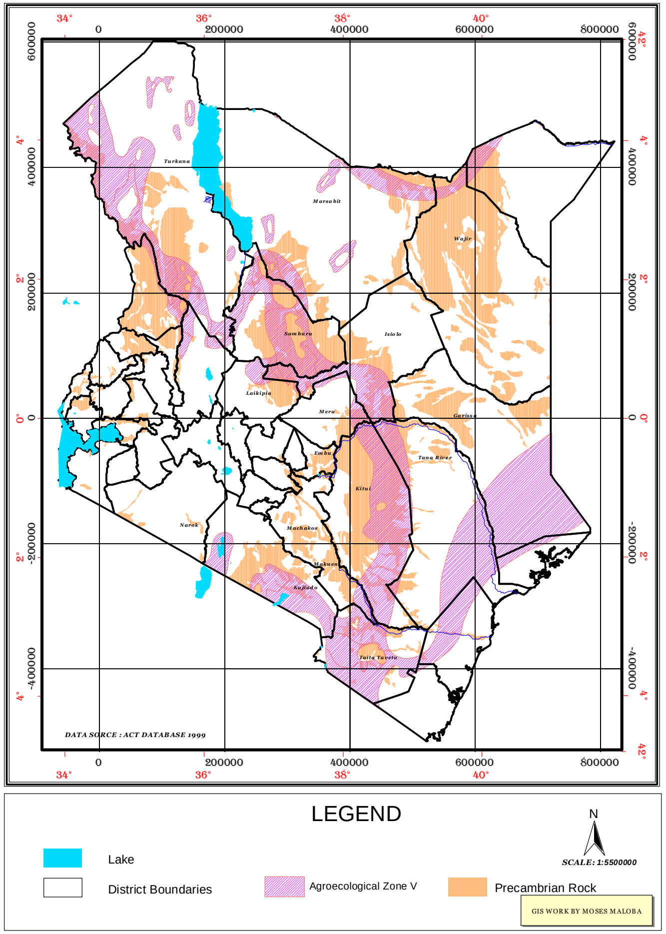

FIG: 1 MAP SHOWING OVERLAPPING DISTRIBUTION OF PRECAMBRIAN ROCKS AND AGROECOLOGICAL ZONE V IN KENYA

Map of Kenya showing overlapping distribution of Precambrian rocks & Agro ecological Zone V

Extent of Distribution

- From known species' range (Nguni & Nuu, Mwingi) to unknown
- 4 Disjointed field surveys to 10 districts undertaken
- **Occurrence or non occurrence confirmed with the following**:

➢Search for Live specimens

➢Search for feacal materials at entrance of crevices

➢Interviews with locals

➢GPS Germin 12 x used to record locality coordinates and altitude

Population estimates

•Counting using systematic search and seize sampling method (Karns 1986) and Hayer et al (1994)

•Strip transects used (varying lengths between 2-20 km and 0.5 width) depending on distribution of patchy microhabitats.

Body measurements- Straight Carapace Length (SCL)

Materials/Equipment

- Global positioning System –GPS Germin 12 x for recording distribution areas and altitude
- 2 m long strong and flexible hooked wire for retrieving in humane way specimens from crevices
- Vernier Calipers for measuring SCL along the midline
- 1000g spring balance calibrated into 10g intervals for measuring live specimen weight
- Trade data from UNEP-WCMC to determine volumes of trade & trends for the period 1975 to 2001

Results- Area of Species distribution

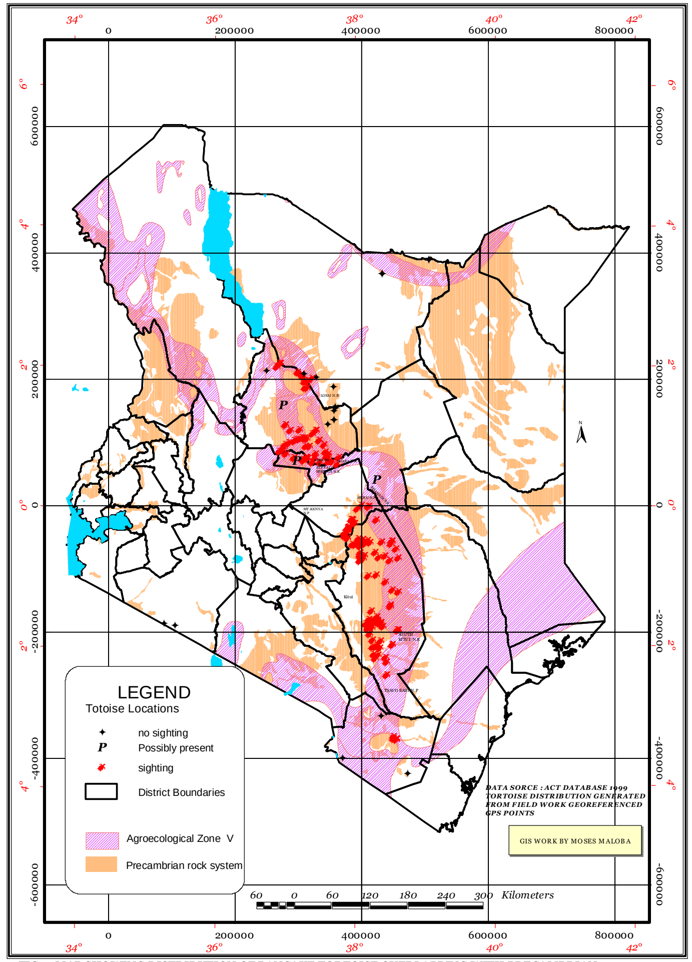

FIG: 2 MAP SHOWING DISTRIBUTION OF PANCAKE TORTOISE OVERLAPPING WITH PRECAMBRIAN ROCKS AND AGROECOLOGICAL ZONE V IN KENYA 2002

KENYA WILDLIFE SERVICE

Species distribution

Two disjointedly sub-populations exit in Kenya:

- Northern sub-population (North of Nyambene Hills, Meru)
- Southern Sub-population (South of Nyambene Hills, Meru)

Results- Area of Species distribution

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Distribution in Kitui & Mwingi Districts

Key areas:

Voo, Kalalani, Kemwaa, Kyaango,Kinakoni, Endau, Malalani, Koi, Katumbi, Kinanie

Katse, Kamwerini, Gankanga, Kanzinwa, Ciampiu,Nguni, Mathyaka, Maai, Kalanga, Ivuusya,

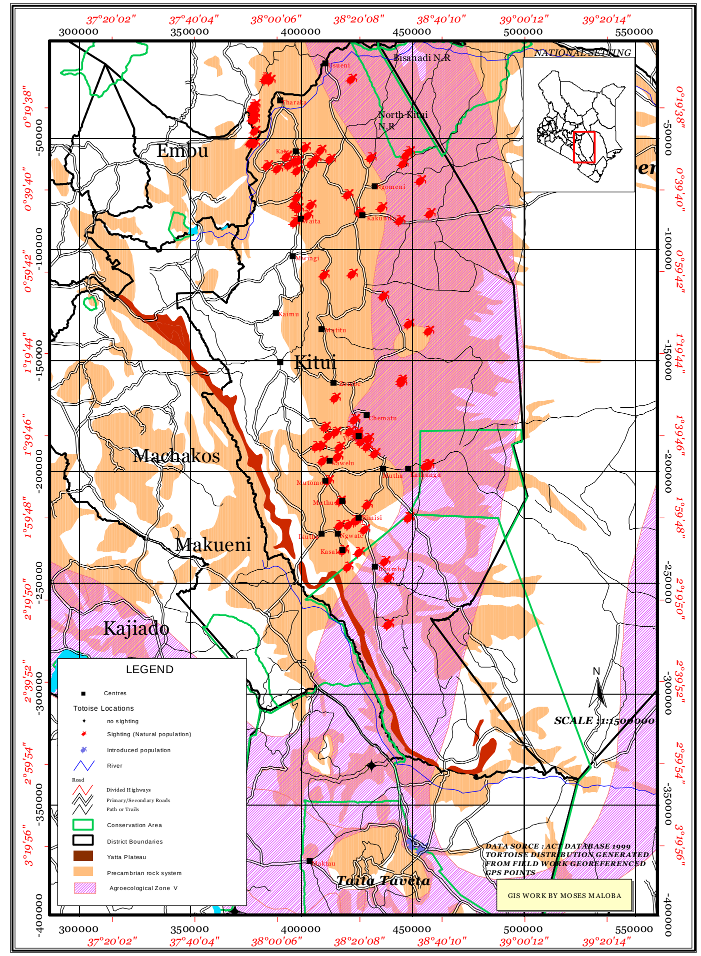


FIG:3 MAP SHOWING DISTRIBUTION OF PANCAKE TORTOISE IN KITUI & MWINGI (GREATER KITUI) DISTRICTS 2002

Results- Area of Species distribution

Distribution in Isiolo, Marsabit & Samburu districts

Areas:

Wamba, Sware, Archers Post, Namunyak conservancy,

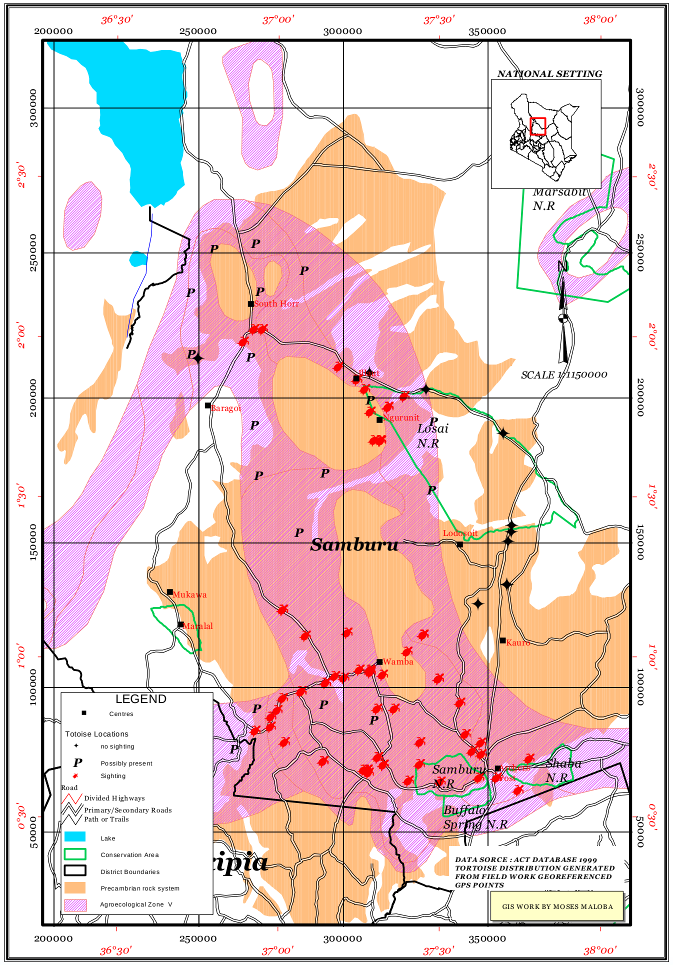


FIG: 5 MAP SHOWING DISTRIBUTION OF PANCAKE TORTOISE IN ISIOLO MARSABIT AND SAMBURU DISTRICTS 2002

Results- Area of Species distribution

Distribution in Mbeere & Tharaka Districts

Areas:

Kianjeru, Ciangera, Irira

Chiakariga, Kamanyaki, Rwakinanga

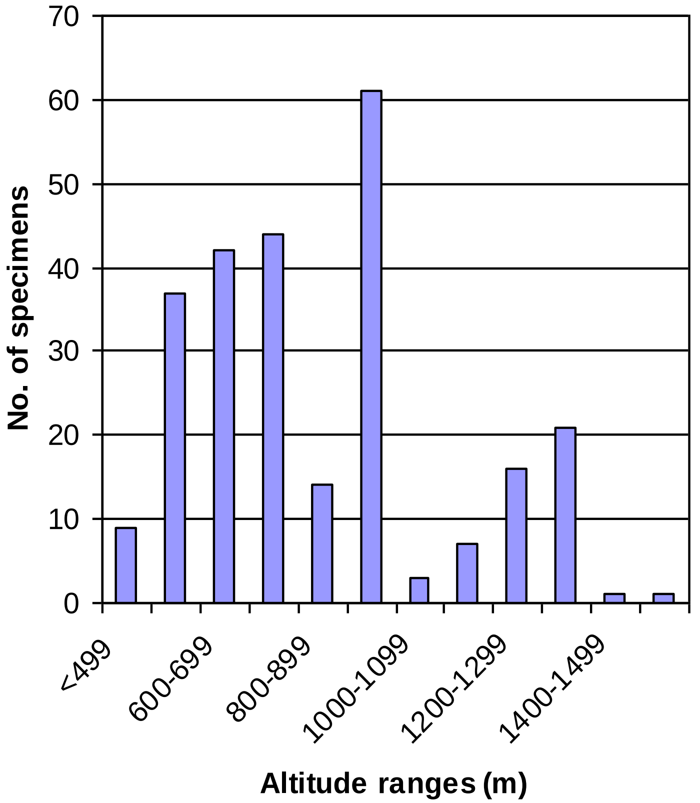
Distribution: Protected Area Vs. Non-Protected Area

- Species population in Protected Area is estimated 5% of total population
- 95% of total population in the wild is in Non-Protected Areas

District	**Protected Area & level of protection**
Kitui	Tsavo East N.P (North of Galana river South Kitui N.R
Isiolo	Buffalo Springs N.R, Shaba N.R
Samburu	Samburu N.R
Marsabit	Losai N.R

Species distribution Vs. Altitude

Based on sightings of 256 live specimens



Species population Abundance &Density

Species abundance and density is a function of habitat quality.

- Well oriented rock crevices, high vegetation cover over the rock outcrop and less human habitat destruction are indicators of high quality habitat
- 7 sites in 4 districts sampled on densities giving the following results

Species population density variation

Transect Name & District	Transect area size in KM sq.	No. of specimens counted	Mean Density Specimens/area
Wamba, Samburu	20	49	**2.61**
Chiakariga, Tharaka	17.5	32	**1.72**
Ishiara, Mbeere	7.5	13	**1.73**
Katse, Mwingi	20	132	**6.6**
Nguni, Mwingi	15	29	**1.2**
Endau, Kitui	10.5	27	**2.95**
Voo, Kitui	27	108	**8.86**

Analysis on population density

There was significant difference (t-test for dependent samples, one tailed; $n=8$, $t=114.06$, $d.f=7$, $P=<0.05$)

High abundance and density is attributed to high density of rock outcrops and kopjes with suitable crevices.

Low density especially in Nguni is as a result of past collection for commercial purposes.

Species body measurements (weight &Length)

www.kws.go.ke

Measurement	Females (n=130)	Males (n=98)
Mean Carapace Length 1SD	141.98 15.35	135.21 29.84
Range	82.65-157.33	105.37-165.05
Mean Body weight 1SD	355.88 93.32	310.16 128.72
Range	262.56-449.20	181.44-438.88

- **No significant difference in mean body weight &SCL between sexes**
- **There is significant positive linear correlation between SCL &Body weight (r=0.9196 , df= 226, two tailed n1=228,n2=228,P<0.01)**

KENYA WILDLIFE SERVICE

Habitat characteristics, selection & preference

- Pancake tortoise specimens only found in suitable rock crevices in rock outcrops and kopjes in Arid and semi arid areas dominated by *Acacia-Commiphora* vegetation
- Granitic outcrops with shelter underneath exfoliating rock slabs provide the best habitats
- Frequency and location of the suitable habitats determine abundance and distribution of the species

Threats to Pancake Tortoise Conservation

Habitat alteration and destruction

- Slash and burn shifting cultivation (around rock outcrops and kopjes)
- Charcoal burning
- Rock slab and ballast harvesting

Predation

International trade for pet industry

- Illegal trade

Southern sub-population is the most threatened population

International Trade volumes Kenya & Tanzania Exports (1975-2001)-Legal Trade using CITES Permits

Country of Import	No.of specimens reported imported	No. of specimens reported exported
Kenya	3,016	928
United Republic of Tanzania	11,458	6,683

Illegal Trade in Pancake tortoise specimens

Several seizures of shipments reported :

•**1992-** seizure of specimens of Pancake tortoise illegally traded prompted placement of a moratorium on exports of specimens of the species

•**2001**- 209 specimens seized in Kampala, Uganda

Specimens repatriated to Kenya & released into Tsavo N.P (Monitored population)

•**2007(August)** -36 specimens seized at JKIA coming from TZ . Specimens kept in rescue centre in Kenya for Education

NDF STUDIES RECOMMENDATIONS

- Trade in wild collected specimens of Pancake tortoise should be prohibited however, captive breeding for commercial purposes should be encouraged as incentives for insitu conservation

- Trade in specimens from captive breeding operations should be limited to a maximum of Straight carapace length of 8 cm

(Decision of the CoP12 in 2002) based on proposal by Kenya following the NDF studies)

Strategies for species Conservation management

- In-situ conservation (refuge/nature reserves either publicly or privately owned), the case of Voo Reptiles Sanctuary
- Moratorium on trade in wild specimens in force
- Ex-situ conservation (captive breeding operations) e.g Mathemba tortoise farm, Voo Reptiles farm and Nguni Kalanga C Tortoise Farm
- Any sustainable harvesting from the wild for commercial purposes to be based on scientifically determined quotas.

THANK YOU

CASE STUDY ON *PTYAS MUCOSUS* – A PROPOSED NDF METHOD FOR INDONESIA (JAVA)

AUTHOR:
TRAFFIC

This case study has been prepared by TRAFFIC and is based on a study funded by the CITES Secretariat and carried out by the IUCN Species Programme - Species Trade and Use Unit and TRAFFIC Southeast Asia. Information was collected from harvesters and those involved in sale of the species, which supplements information from previous studies on the species.

I. BACKGROUND INFORMATION ON THE TAXA

1. BIOLOGICAL DATA

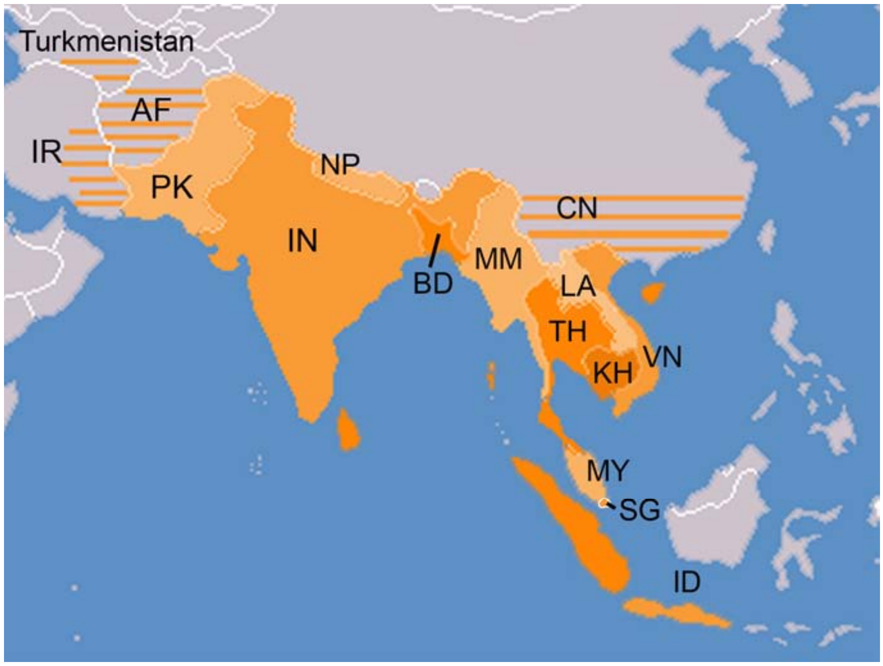
1.1. Scientific and common names

Oriental Rat Snake *Ptyas mucosus* (listed in the CITES Appendices as Ptyas mucosus but recent comments by David and Das (2004) highlighted the fact that the gender of the genus Ptyas is feminine while the name mucosus is masculine. In accordance with the International Code of Zoological Nomenclature (ICZN) the species name should be corrected to *Ptyas mucosa*).

1.2. Distribution

The Oriental Rat Snake has an extensive geographical distribution in Asia. From west to east, it occurs in Iran, Turkmenistan, Afghanistan, Pakistan, India (incl. Andaman Isl.), Sri Lanka, Nepal, Bangladesh, Myanmar, China (incl. Hainan and Hong Kong), Thailand, Lao PDR, Cambodia, Viet Nam, Malaysia, Singapore and Indonesia (Manthey and Grossmann, 1997). See figure 1. All range states except Turkmenistan are Parties to CITES.

Figure 1: Geographical distribution of the Oriental Rat Snake.



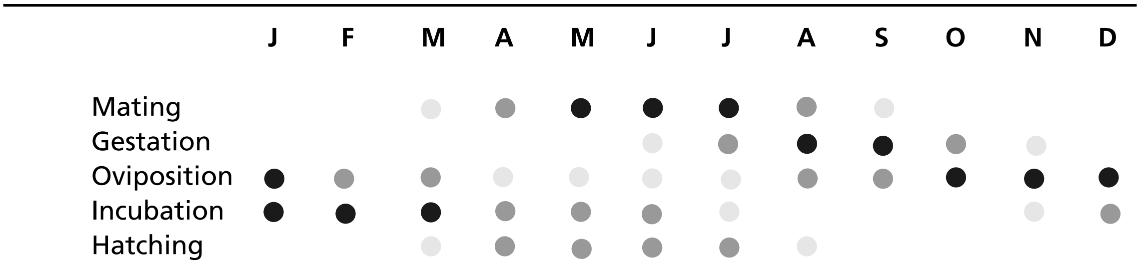
1.3. Biological characteristics:

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

The Oriental Rat Snake is a medium-sized, active, non-venomous, diurnal snake associated with open habitats including agricultural systems; much of the diet consists of commensal rodents and amphibians. The species has a wide distribution through much of Asia, from Iran to China and Southeast Asia.

- Medium sized snake, reaching about 2.5 m in length and 5-10 cm in girth. Males grow longer than females, and have larger heads, longer tails and greater body mass than females of the same length
- Reaches maturity at ~ 9 months ~120 cm for females
- Clutch size average 13
- May lay 2 clutches per year.
- Widespread generalist – thrives in human modified environment
- Unknown density and population trends
- No major threats known.

Figure 2: Reproduction cycle of the Oriental Rat Snake in Central and East Java. The emphasis of the reproductive behavioural traits is marked where each colour is brightest.



1.3.2. *Habitat types*

Oriental Rat Snakes are predominantly terrestrial and diurnal and occur in a variety of agro-ecosystems (Manthey and Grossmann, 1997). In general, the species is found in open terrain adjacent to forested areas. Arboreal behaviour is believed to be largely associated with resting.

Parts of the range of the Oriental Rat Snake overlaps with the Indo-Chinese Rat Snake (*Ptyas korros*) and where they overlap both species may share the same habitat. Both species search paddy fields for prey and hide beneath dense vegetation along river banks (van Hoesel, 1959). However, the Indo-Chinese Rat Snake is more closely associated with habitats along water courses than the Oriental Rat Snake (Herklots, 1934).

The Oriental Rat Snake is not strongly associated with wetland habitats. In the wet season, the species shifts to drier areas that do not flood. Traders in the southern part of Central Java stated that the species utilizes dry rocky and shrubby habitat in open landscapes. Traders from northern Central Java reported that the species is found in stony and shrubby habitat systems (with black soil), and according to other traders it occurs in dry rice fields, plantations and bamboo.

1.3.3. *Role of the species in its ecosystem*

This species is a predator of rodents and amphibians, and also to a lesser extent lizards and insects. Rodents are reportedly the favoured food but a recent study showed that amphibians (Bufonidae and Ranidae) were the predominant prey of Oriental Rat Snake populations surveyed in Central Java (Sidik, 2006). The same study revealed that in addition to amphibians and rodents, lizards, birds and even insects were also consumed. Of the 85 specimens examined, the alimentary tracts 65 contained prey items. In another study 71% of alimentary tracts contained the remains of frogs, and 14% mammalian fur, presumed to be that of rats (Boeadi *et al.*, 1998). Juveniles prey on frogs and smaller reptiles, and shift to mammalian prey as they grow larger (Lim and Lee Tat-Mong, 1989).

1.4. Population:

1.4.1. *Global Population size*

No quantitative population information is available for the species globally. No IUCN Red List assessment has been carried out for this species.

1.4.2. *Current global population trends*

___increasing   __possibly decreasing   ____ stable   _X__unknown

1.5. Conservation status

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

Not assessed

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

Little is known about the population status of the species in Java or other Indonesian islands. No quantitative data on the change in Oriental Rat Snake populations in Java appear to be available, nor any evidence of population increase during the period of the trade suspension recommended by the CITES Standing Committee between 1993 and 2005 (see Section 2.1.1), possibly in part because significant collection for illegal export continued.

According to CITES SC53 Inf Doc. 3, Sustainability of Rat Snake (*Ptyas mucosus*) Harvests in Indonesia: A Discussion of Issues, submitted to the CITES Standing Committee by the CITES Management Authority of Indonesia for review to consider the lifting of the trade suspension, harvesting has largely been restricted to Java, and there was no evidence to suggest that its abundance has been reduced significantly, with snakes still being readily caught by villagers.

However differing opinions were expressed during this study; some traders considered that the species is now less common than in the recent past, whereas others claimed that the Oriental Rat Snake is just as common now as in previous years. One trader said he had been unable to purchase any Oriental Rat Snakes since the beginning of 2007, as none was available in the market due to a decline of the species in the wild. One trader in southern central Java, who has been an active snake trader for around 30 years, stated that he could previously buy 300 specimens/day in the main harvesting area, but presently only buys about 25 specimens/day from within a 10km radius; he attributes this decline to the increase of snake harvesters in the region. According to eight small-scale harvesters and collectors, who have been active between seven and 35 years, the local abundance of Oriental Rat Snakes, particularly in Central Java, has decreased noticeably. In contrast, five collectors reported that the species is still common in "in the wild" owing to a good market price, remarking that "when the price is good, there are many snakes".

1.5.3. *Main threats within the case study country*

_X_No Threats
___Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
_X_Harvesting [hunting/gathering]
___Accidental mortality (e.g. Bycatch)
___Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
___Other_______________
_X_Unknown

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

(Indonesia, specifically Java)

2.1. Management measures

2.1.1. *Management history*

- Commercial harvesting of *P. mucosus* began in the late 1970s.
- *Ptyas mucosus* was listed in Appendix III of CITES by India in 1984.
- In 1986, Indonesia banned the export of raw *P. mucosus* skins, in favour of tanned skins
- In January 1990, *P. mucosus* was listed in Appendix II of CITES.
- Annual exports of *P. mucosus* from Indonesia declined from around 1.8 million skins in 1986, to around 581,000 in 1989.
- In March 1992, the CITES "Review of Significant Trade" reported that the collection for trade was the major suspected cause of decline in some populations of *P. mucosus* (globally), although given the lack of comprehensive data, particularly from Indonesia, there was no way of ascertaining if current levels of trade were having a substantial impact (WCMC and IUCN/SSC Trade Specialist Group,1992). The Indonesian CITES Management Authority was requested by the CITES Animals Committee to advise the Secretariat of the scientific basis for its harvest quotas and should introduce a system to ensure that the number of skins permitted for export does not exceed those quotas.

- In November 1992, the Indonesian CITES Management Authority was advised by the CITES Secretariat that the information received was not sufficient, and additional information was requested
- In July 1993, the Indonesian CITES Management Authority indicated that quotas were based on previous trade data, and that increasing amounts of habitat were being made available to *P. mucosus* through regional development. However, this was not considered by the CITES Secretariat to be a scientific basis for the quotas.
- In August 1993 this latter view was supported by the Chairman of the CITES Animals Committee, who also pointed out that import statistics for *P. mucosus* from Indonesia exceeded exports reported by Indonesia.
- In November 1993, the CITES Standing Committee recommended to all Parties that they suspend imports of P. mucosus from Indonesia until the relevant recommendations of the CITES Animals Committee had been implemented (CITES Notification 775).
- The suspension of imports from Indonesia was withdrawn at SC53 (2005) after the Secretariat and Standing Committee were satisfied with the control measures proposed by the CITES Management Authority in SC53 Inf3.

2.1.2. *Purpose of the management plan in place*

No formal management plan is in place other than setting of export quotas and imposing a ceiling on exploitation.

2.1.3. *General elements of the management plan*

No formal management plan is in place other than setting of export quotas. Quotas are allocated between West Central and East Java (see Table 1).

2.1.4. *Restoration or alleviation measures*

None reported in detail; the Indonesian CITES Management Authority indicated in 1993 that increasing amounts of habitat were being made available to P. mucosus through regional development.

2.2. Monitoring system

2.2.1. *Methods used to monitor harvest*

Numbers of specimens exported.

2.2.2. *Confidence in the use of monitoring*

Little confidence in export permits issued as a measure of total harvest pressure as any illegal trade is not captured. The extent of illegal trade is not known.

2.3. Legal framework and law enforcement

Listed in Appendix II in January 1990.

Under Indonesian legislation, trade of all nationally non-protected species native to Indonesia, whether listed by CITES or not, is regulated by a harvest quota system. The 2007 annual quota for Oriental Rat Snake in Java was 500 specimens for the live animal trade, and 99,500 specimens for the skin trade, and for 2008 this was reduced to 89,500 skins and 450 live specimens. The annual quota represents the total number of animals which can be caught irrespective of whether these are exported or not (Nash 1993). Harvest quotas are set at the levels of district and province (see Table 1) and are based on requests submitted by the BKSDA. These quotas are established each year during the quota meeting attended by LIPI, PHKA, traders, non-government organizations and other stakeholders. Requests for annual quotas are usually forwarded by traders to regional BKSDA offices. Of the entire harvest quota, only approximately 10% may be used for domestic purposes. Animals are not allowed to be harvested for purposes other than what is stated in the annual quotas. Table 1 shows how the annual quota was allotted to the provinces/districts in Java in 2007.

Table 1: The regional quotas for the Oriental Rat Snake from Java for 2007.

	West Java (JaBar I)	West Java (JaBar II)	Central Java (JaTeng)	East Java (JaTim I)	East Java (JaTim II)
Skins	5,000	5,000	40,500	24,000	25,000
Pets	100	100	100	100	100

The harvest or capture and distribution of wild plant and animal specimens in Indonesia can only be done under a licence, issued by Directorate General of Forest Protection and Nature Conservation (PHKA) (Decree of Ministry of Forestry No. 447/Kpts-11/2003, revised from Decree of the Ministry of Forestry No. 62/Kpts-II/1998). The legal transport of protected or non-protected species within Indonesia is permitted according to Article 42, Chapter X of the Regulations of the Government of the Republic of Indonesia No. 8, 1999. Harvesters and collectors must be registered by the provincial Natural Resources Conservation Agency (Balai Konservasi Sumber Daya Alam, BKSDA) offices, who report the annual volumes harvested to PHKA. All exporters are registered with PHKA and must be members of the Indonesian Reptile and Amphibian Trade Association (IRATA) if they are to be allotted an annual quota and permission to export. *No list of registered harvesters, collectors and exporters was available to the researcher at the time of the study*.

Although appropriate national legislation to control the trade in Indonesian wildlife is in place, it appears that this legislation is not being effectively enforced. There was a lack of knowledge of quotas at the harvester and trader level, suggesting that setting of quotas has little influence on the quantity of specimens harvested.

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

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

Wild harvest for legal trade in skins and illegal meat and gall bladder trade, which may be partially a by-product of the skin trade. The main markets for skins are Europe, Singapore Hong Kong and Taiwan PoC. Singapore is also a re-exporter of skins and processed skins e.g. leather products, handbags, wallets, pairs of shoes etc to various destinations. China is believed to be the main market for snake meat (Saputra, 2008).

3.2. Harvest:

3.2.1. *Harvesting regime*

All specimens in trade from Indonesia are wild-caught. Snakes are either captured by experienced harvesters or opportunistically by seasonal rice farmers. Snake capture is secondary to farming activities and appears to be carried out in an ad hoc manner. Probably in no case does harvest of this species provide full time annual employment. In very rare cases, Oriental Rat Snakes are killed for local consumption, or simply out of fear.

Skins are to be exported allowed under quotas as are a small amount of live specimens for the pet trade, although there seems to be little demand for the latter and the quota has generally not been met. Currently there is no export quota for dead specimens or meat, but it appears that there has been substantial demand for and illegal export of meat, which started during the ban on skin export and apparently continues (Saputra, 2007/8).

Adult snakes are harvested for their skins. One trader said that smaller specimens are traded as the non-CITES listed lookalike species *Ptyas korros* (Saputra, 2008).

REPORTED HARVEST SEASONS

The Oriental Rat Snake is most commonly encountered during the wet season and capture rates are highest during this period. According to several traders, activity levels increase with the onset of the wet season (the first heavy rains after the dry season). In East Java the wet season typically occurs between December and April, and in Central Java between October and December and February to April, depending on the geographical location. Other traders also reported that the species is common in the field in the transition from the wet to the dry season (May and June). Higher activity levels in snakes were reported either when rainy days change to bright days or on cloudy days after several bright and hot days. Traders said that during the dry season (May to August) the species is extremely scarce, and another collector estimated that the capture of the Oriental Rat Snake decreases by 50-60% in the dry season. During the dry season the people work in the rice fields so that less manpower is available to capture snakes during the rice harvest, and so the study species is less common in trade during the dry season. Farmers harvest out of the crop growing season – mainly November to January. The number of snakes caught by dedicated harvesters vs farmers is not known.

3.2.2. *Harvest management/ control* (quotas, seasons, permits, etc.)
See section 2.3 above for quota information.

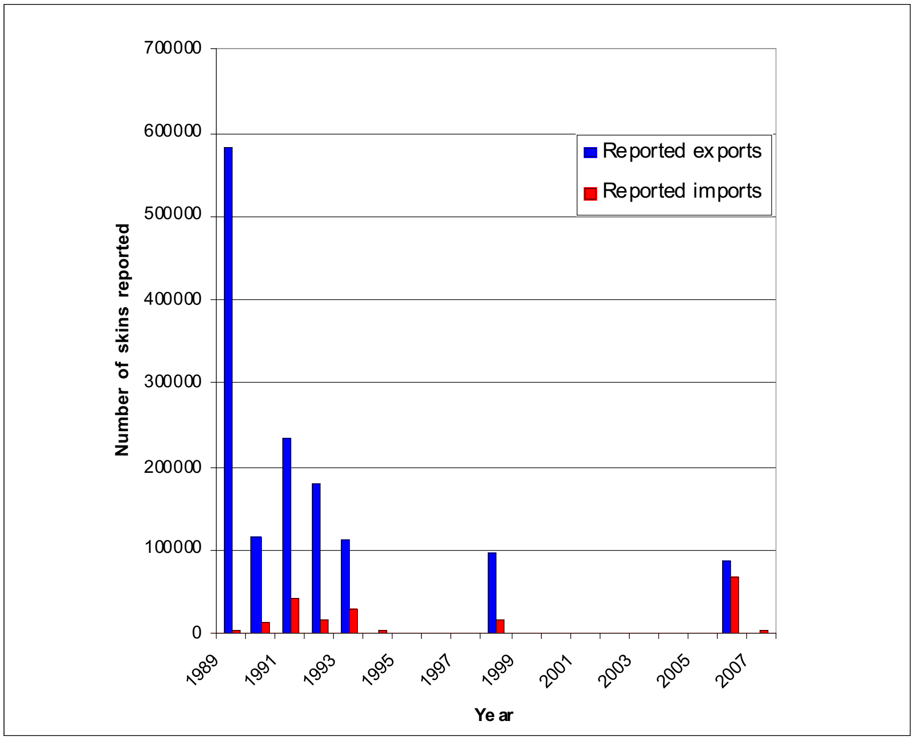
All harvesters and collectors must be registered by the regional BKSDA offices and require a license issued by PHKA. However, the study shows that most harvesters collect rat snakes and other reptiles as a side business and hence do not possess a license. One major trader who illegally exports frozen meat of Oriental Rat Snakes stated that LIPI gives a low quota for many species even though Indonesia has so many species; such statements indicates lack of understanding of the potential impact of trade and of the need to manage use and trade to ensure sustainability.

3.3. Legal and illegal trade levels

Commercial harvesting of *P. mucosus* began in the late 1970s.

Reported legal trade according to the CITES trade database is summarised in figure 2. Most trade from Indonesia has been in skins. According to Indonesian regulations skins must be tanned before export.

Figure 2: CITES reported imports and exports of Ptyas mucosus skins from Indonesia (1989 – 2007). Leather products and small numbers of live individuals have been omitted from this graph. Reports for 2007 were not complete at the time this graph was produced.



ILLEGAL TRADE

Southeast Asian snake species are commonly found in Chinese food markets, and the cross-border trade of wildlife in general is currently on a dramatic scale (Lee et al., 2004). During winter the level of snake meat consumption in China increases as many consumers believe it to have a warming effect. The demand in China for snake meat exceeds local supply during the cold season, and so additional sources of snakes, including Oriental Rat Snakes are required. Indonesia is one of the major sources supplying the demand from China for Oriental Rat Snakes and other species (Saputra, 2008).

According to Saputra (2008), the 12 year suspension of trade in skins from Indonesian populations of the Oriental Rat Snake triggered the illegal export of meat with some other traders claiming that during this time skins were stockpiled. He estimated that 50,000 to 100,000 snakes were exported annually, the equivalent of 30 to 60 tons or tonnes of meat per year and about 50,000 to 100,000 gall bladders. According to traders interviewed, illegal export of meat and gall bladders has continued since the ban on skin and live specimens was lifted. It is believed that those involved in the meat trade may declare smaller specimens of the Oriental Rat Snake as the Indo-Chinese Rat Snake, a species not listed under CITES (Saputra, 2008); the frozen, coiled-up, skinned or whole specimens cannot be easily identified by the local authorities. As it is reported that some export of snakes is of whole (un-skinned specimens), the estimated annual volume of these illegal exports suggests that this is not solely a spin-off from the skin trade, but is a distinct branch of trade, which could have a significant impact on wild populations. Saputra (2007) stated that whole frozen snakes are sometimes declared as frozen fish.

II. Non-detriment finding procedure (NDFs)

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

__yes ___no

During the study the elements of the IUCN checklist were considered and a risk assessment carried out using the list. These elements and the relative importance of these in making a non-detriment finding have been considered further in the proposed method.

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

Species biology & ecology (Species resilience)

- Medium sized snake
- Reaches maturity at ~ 9 months ~120 cm for females
- Clutch size average 13
- May lay 2 clutches per year.
- No correlation between body size and clutch size and frequency has been found.
- Widespread – probably most common in Central and East Java, areas with lower rainfall.
- Generalist – thrives in human modified environment
- Unknown density and population trends; further data is required.
- No major additional threats known.

Current conclusion: It is likely that due to its biology and ecology that the species has a fairly high resilience to harvesting.

Managing harvest

Ability to set correct quotas and adaptively manage harvest

- No quantitative data are available for domestic demand therefore the total offtake is unknown, although domestic demand is believed to be low. Quotas currently allow for 10% of quota as domestic use.
- Export quotas could be set for all products in demand based on the harvest quota for number of specimens. It appears that the species is not in demand for the pet trade, therefore a live trade quota is not necessary.
- Size restrictions to ensure specimens have reached maturity and reproduced could be set for export (eg minimum 140 cm total snake length). Snake skins are stretched when drying and would not be a reliable measure of snake length or maturity.
- Seasonal restrictions are not appropriate as there may be two breeding seasons and harvest takes place around agricultural activities.
- Due to lack of reliable population estimates it is essential that any harvest or export quota systems is adaptively managed based on monitoring of the species and harvest.

Conditions of harvest and ability to change these

- Widespread harvest in natural and agricultural habitat,
- Some harvesting is done by dedicated harvesters and some harvesting is done by farmers
- Farmers harvest out of crop growing season – mainly November to January. Snake capture is secondary to farming activities and appears to be carried out in an ad hoc manner.
- Dedicated snake harvesters mainly harvest the Oriental Rat Snake during the wet season when snakes are most commonly encountered.
- Cost of harvesting – low but may be increasing as there is some evidence catch per unit effort (CPUE) is decreasing. Very low for ad hoc harvesting by farm workers
- Species is effectively an open-access resource.
- Little is known on the areas subject to harvest and intensity of harvest in different areas. Intensity of collection in different areas should be mapped and monitored to show shifting patterns in harvesting, which could indicate localised depletion.

Capacity to control harvest/ trade

- Widespread harvesting in natural habitat and farmland makes it almost impossible to enforce harvesting restrictions; establishing a harvest permit system (see SC53 Inf3) would be unlikely to be effective.

- Not all products in demand are legally exported and there seems to be no effective control measure in place to combat this. There are allegations that illegal meat trade was substantial during the trade ban on skins. This is believed to have continued and currently levels of illegal international trade in meat are thought to be high. Enforcement is hampered by inability to easily distinguish meat of small *P. mucosus* from *P. korros*. Results of this study suggest that illegal trade may result in some additional harvest of the snakes rather that as a by-product of the skin trade. Some meat may be being traded as *P. korros*, which is not controlled under CITES. It is possible, although difficult, to differentiate between skins of the two species. Shipments of *P. korros* are of skinned, semi-skinned or whole specimens, usually frozen. The appearance of a skinned *P. mucosus* would be difficult to distinguish from a skinned P. korros. Increased enforcement is needed to reduce illegal trade.
- It appears that harvest quotas are currently not communicated through the trade chain so a reduction in export quota is unlikely to result in a reduction in harvesting. There is no evidence that there is implementation of a system of harvest permits issued by the Head of BKSDA and this is unlikely to be implementable given many of the harvesters are farmers.

Current conclusion: Currently insufficient data is available on distribution, population and harvest areas to be sure that a quota is set at a non-detrimental level; quotas should be set and adaptively managed based on field and harvest monitoring. Currently there is little knowledge about quotas at harvester and small scale collector level showing poor communication. Setting export or harvest quotas is unlikely to reduce harvest given the low cost and ad hoc nature of some harvesting (farmers) and apparent illegal trade. Without baseline and ongoing field monitoring data it would be extremely difficult to determine whether harvest is non-detrimental. However, such data would be time consuming and expensive to collect given the widespread nature of the species and differences in activity through the year. Domestic and illegal trade levels are currently unknown. If quotas were enforceable suggest revising (export quota was reduced by 10,000 for year 2008) until baseline monitoring has taken place.

MONITORING IMPACT

Species monitoring

- Ongoing field studies should be established in a sample of harvested and unharvested populations to monitor density changes through surveys for catch per unit effort (CPUE), sex ratio, size. To date there are no reliable baselines from which to monitor change as data to date are from harvested specimens rather than field surveys:

— Density estimates – monitoring snake species through trapping or catching – may not give accurate measures, however ongoing monitoring should identify changes. Continuing decline in density would indicate detrimental harvest and lack of recruitment.
— Catch per unit effort (CPUE) estimates from Sugardjito et al. (1998) are for harvesters and there is no indication as to whether this represents all snakes encountered or only harvested snakes, which may have been a sub-set of the former if specimens were taken selectively. Decreasing CPUE would indicate harvest is likely to be detrimental.
— Size estimates from Sugardjito *et al.* (1998), Boeadi (2007) and this study are from different times of the year. Declining average size in the wild could be one possible indication of unsustainable harvest. Particular attention should be paid to proportion of individuals above the size of maturity and to identify problems with recruitment.
— Sex ratio changes at sites from a baseline and for times of year (so far according to Kopstein (1938) hatching ratio (m: f) = 1: 1.7 but capture ratio 1:1.4 which may be a result of differences in sex survival naturally or preference for capture of (larger) males. Further information on natural sex ratio and reproductive success/ recruitment under altered conditions of altered sex ratio would be beneficial in adaptively managing the harvest.

HARVEST MONITORING

- Harvest monitoring - a year's baseline should be established from which to monitor change for each of the following measures ensuring regular and standard monitoring systems are in place:
  — Catch per unit effort for harvesters (difficult for casual harvesters e.g. farmers). Continuing decline would indicate that the population was reducing.
  — Sex ratio changes (so far according to Kopstein (1938) hatching ratio = 1: 1.7 in captivity but wild captures 1:1.4, Sugurdjito *et al*. (1998) found sex ratio of harvested specimens 1: 0.6, which may reflect harvesters preferentially harvesting males, which are on average larger). An increase in female to male ratio might indicate a reduction in average male size and reduction in differentiation between size of females and males. However, caution should be taken when comparing sex ratios for different times of year as it is likely that there are differences in activity levels for each sex through the year.

— Size differences should be compared by sex against monthly averages. Ptyas mucosus growth is rapid
— Size should be well above size of mature females i.e. above120 cm (the size at which females first reproduce according to traders interviewed). As a precaution a minimum total length could be set at 140 cm (although according to Kopstein (1938) this would still represent immature specimens). Ongoing reduction in size of harvested specimens would indicate that the population was reducing.
— Harvesting area and pressure should be mapped in order to monitor shifting patterns in exploitation which could indicate localise depletion.

Current conclusion: According to this study the average size for both male and female (ratio unknown) = 189.51 cm (n= 60) and therefore likely to be above the age of maturity according to trader's knowledge and Kopstein's estimations. If this measure was based on a much larger sample of harvested specimens from a representative sample of traders (including illegal traders) it could be concluded that offtake currently allows individuals to grow to maturity and to reproduce before harvest takes place. However given that legal export is in the order of a hundred thousand specimens and there is thought to be considerable illegal harvest and export a much larger sample would be necessary to determine non-detriment with any confidence. A much more representative sample along with additional information on CPUE would be necessary to make this finding with any confidence. Although sampling would not monitor the illegally traded specimens, sampling of size and CPUE (including harvesting area changes) should demonstrate declining population if this is the case.

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

Field monitoring and harvest monitoring would be essential for making a non-detriment finding and for adaptive management of harvest of the species. See Section 2 for data to be collected through species and harvest monitoring.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

Currently there is insufficient data or data collection to set robust quotas, monitor harvest or impact of harvest on the wild population. Because of the apparently large illegal trade in the species, monitoring legal harvest and use of proxy indicators such as changes in average size of harvested specimens might mask any unsustainable harvesting practices by illegal traders, although average size in conjunction with CPUE would give a better indication of sustainability of harvesting.

Data necessary to make a robust non-detriment finding would be time consuming and expensive but there is potential to involve Indonesian higher degree students working in collaboration with overseas students on long-term studies of biology and population.

Given the difficulties in setting and enforcing quotas, management needs to be adaptive and the impact of harvest through monitoring field populations, harvesting patterns and harvested individuals should guide future management and quota setting.

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

The lack of data available on the species and current/ past population make it difficult to assess impact of harvest in the past and to assess impact in the future. Harvest areas are poorly known.

The above proposed method of making a non-detriment finding for *Ptyas mucosus* has focused on Java, the main, or possibly only, exporting island of Indonesia. It is likely, although surveys would be necessary to confirm this, that the species occurs on other islands. In effect therefore a large proportion of the species' range in Indonesia is not subject to harvest, although these areas cannot without human intervention act as a source if Java were to be acting as a sink.

6. RECOMMENDATIONS

- Studies of the species' biology should be carried out throughout the year. Further investigation of reproductive size and reproductive status of harvested specimens would help in confirming the age of maturity to ensure that any minimum catch size is appropriate.
- Meat and gall bladder quotas could be set to the equivalent (or less for precaution) of the number of skins allowed for harvest with no additional capture. This may also increase the value to the harvester. Alternatively harvest quota for specimens could be set with no stipulations on export products.
- Increased enforcement is needed to reduce illegal trade.
- Field and harvest monitoring should be established including mapping of harvest pressure. IRATA has suggested that obtaining sound biological and monitoring data may be enabled through international cooperation, possibly with Indonesian higher degree students working in collaboration with overseas students on long-term studies.
- Consider; listing P. korros as a lookalike species to aid the control of the meat trade, legalising the meat trade, and trade in gall bladders

as a by-products of the skin trade. Quotas equivalent of lower than the skin trade could be set. Minimum size (length for skins and weight for meat) could be set, if there was capacity to enforce these.

Conclusions

The Indonesia Management Authority (in SC53 Inf 3) proposed a thorough method to assess harvesting and adaptively manage export quotas and harvesting in order to ensure that *Ptyas mucosus* export is not detrimental to the species on Java. In reality the harvesting and trade chain may not be conducive to the approach of export/ trade quota setting to control the harvest; the present system for allocation of quotas does not seem to be resulting in any harvest control with little knowledge of quotas at the field level. It seems that enforcement of harvest quotas and prevention of illegal trade is currently not working and may be very difficult to manage. However, the species is likely to be fairly resilient and therefore despite high levels of illegal trade it is feasible that the current level of harvesting is not detrimental to the species, although only further research can confirm whether current exploitation levels are sustainable or not. From the limited survey of snake length it would seem that snakes are harvested at sizes well after females mature. However this could be a result of harvesters travelling further to collect larger sized snakes having over-harvested in areas more easily accessible; this could be ascertained through a better understanding of collection pressure, the spatial location of collection areas, and the timing of collection. Monitoring of changes in these is necessary in conjunction with monitoring of harvested specimens.

This study has shown that monitoring (field and harvest) would be crucial in adaptively managing the species' harvest and in allowing a determination that harvest was not detrimental. Much information has come from collectors and traders and a strong collaboration with them should help facilitate monitoring as could collaboration with universities.

The above proposed method of making a non-detriment finding for *Ptyas mucosus* has focused on Java, the main, or possibly only, exporting island of Indonesia. The species occurs on other Indonesian islands, including Sumatra and Sulawesi. However, as the harvest quota is established and split between regions of Java, in effect a large proportion of the species' range in Indonesia presumably not subject to harvest, although these areas cannot, without human intervention, act as a source if Java were to be acting as a sink.

REFERENCES

SAPUTRA G. (2007 and 2008) Chair IRATA *in litt*. to Mark Auliya, TRAFFIC Southeast Asia, Malaysia.

BOEADI, Shine, R. Sugardjito, J., Amir, M., & Sinaga, M.H. (1998): Biology of the Commercially-Harvested Rat Snake (*Ptyas mucosus*) and Cobra (*Naja sputatrix*) in Central Java. – *Mertensiella* 9: 99-104.

BOEADI (2007) *in litt*. to Mark Auliya, TRAFFIC Southeast Asia, Malaysia.

DAVID, P. and Das I. (2004): On the grammar of the gender of *Ptyas* Fitzinger, 1843 (Serpentes: Colubridae). – *Hamadryad* 28: 113-116.

HERKLOTS, G.A.C. (1934): Land snakes of Hong Kong. PART II. - *The Hong Kong Naturalist*, pp. 23-30.

KOPSTEIN, F. (1938): Ein Beitrag zur Eierkunde und zur Fortpflanzung der Malaiischen Reptilien. – *Raffles Bull. Mus*. 14: 81-167.

LEE, K.S., Lau, M.W.N. & Chan B.P.L. (2004): *Wild Animal Trade Monitoring In Selected Markets in Guangzhou and Shenzhen, South China 2000-2003*. - AJL Design Ltd., Hong Kong.

LIM, F.L.K. & Lee Tat-Mong, M. (1989). Fascinating Snakes of Southeast Asia – An Introduction. – Tropical Press, Kuala Lumpur, 124 pp.

MANTHEY, U. and Grossmann W. (1997). Amphibien und Reptilien Südostasiens. – *Natur und Tier Verlag, Münster*, 512 pp.

SIDIK, I. (2006) Analisis Isi Perut Dan Ukuran Tubuh Ular Jali (*Ptyas mucosus*). *Zoo Indonesia. Jurnal Fauna Tropika*. Vol.15(2):121-127.

SUGARDJITO, J., Boeadi, Amir M. & Sinaga M. H. (1998): Assessment of Harvest Levels and Status of the Spitting Cobra (*Naja sputatrix*) and the Rat Snake (*Ptyas mucosus*) in Central Java. – *Mertensiella* 9: 105-110.

VAN HOESEL, J.K.P. (1959): *Ophidia Javanica*. – Museum Zoologicum Bogoriense, Pertjetakan Archipel, Bogor, 188 pp.

WCMC and IUCN/SSC Trade Specialist Group (1992) Review of significant trade in animal species included in CITES Appendix II: Detailed reviews of 24 priority species.

Ptyas mucosus – *a proposed NDF method for Indonesia (Java)*

Prepared by
TRAFFIC

Presented by
Thomasina Oldfield

Acknowledgements

This case study is based on a study funded by the CITES Secretariat.

Study carried out by TRAFFIC Southeast Asia with the IUCN Species Programme.

Data from trader interviews and from samples of harvested specimens supplements literature on this species.

Oriental Rat Snake *Ptyas mucosus*

Distribution

Iran to Indonesia.

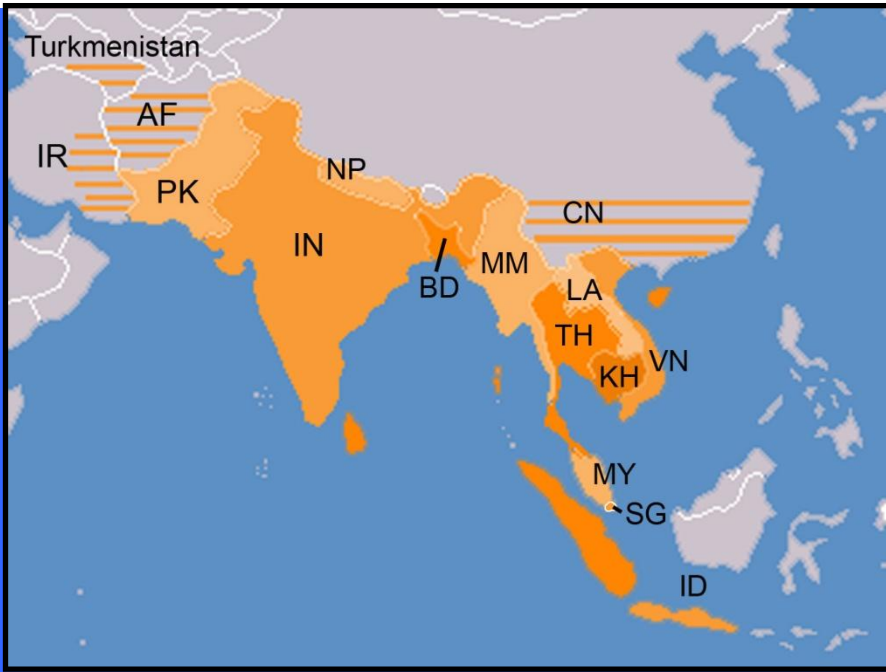
All range States except Turkmenistan are Parties to CITES.

Population status and threats

Global population – not known

Java or other Indonesian islands – little known about population status, no quantitative data on population changes in Java.

Traders had differing opinions on population status



Geographical distribution of the Oriental Rat Snake.

Management history

- Commercial harvesting of *P. mucosus* began in the late 1970s.
- Listed in Appendix III by India in 1984.
- 1986, Indonesia banned the export of raw *P. mucosus* skins
- Exports declined from ~ 1.9 m skins in 1986 to ~ 600,000 in 1989.
- 1990, *P. mucosus* was listed in Appendix II of CITES.
- 1992, CITES RST - lack of data to ascertain impact of trade. Indonesian MA requested to advise on the scientific basis for harvest quotas and introduce a system to ensure quotas are not exceeded.
- July 1993, the MA indicated that quotas were based on previous trade data and increasing amounts of habitat available through regional development. Not considered to be a scientific basis for the quotas.
- In August 1993 AC Chairman also noted import statistics for *P. mucosus* from Indonesia exceeded exports reported by Indonesia.
- November 1993 Standing Committee recommended import suspension until AC recommendations had been implemented.
- 2005 – SC withdrew import suspension recommendation. Secretariat and SC satisfied with the control measures proposed by the CITES MA.

UTILIZATION AND TRADE

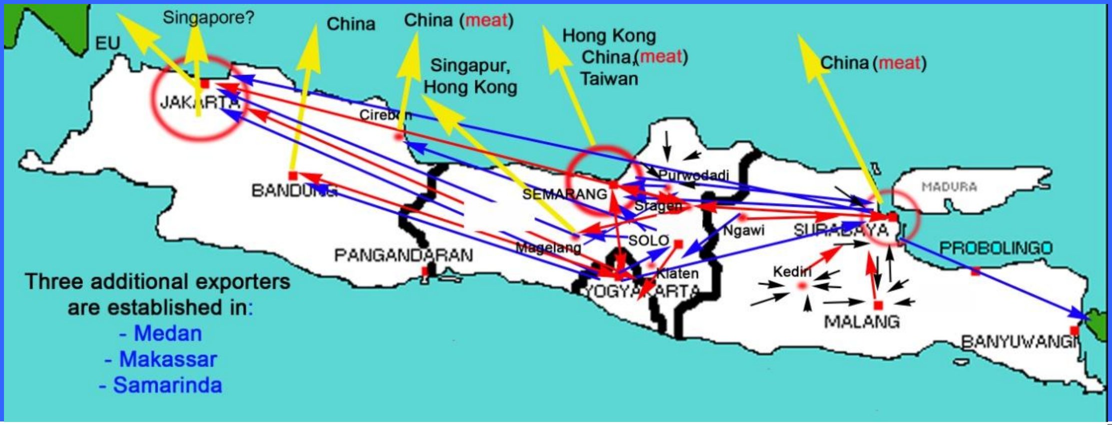
Indonesian harvest and export from Java only.

Harvest quotas set for skin and pet trade for Java.

Wild harvest for legal trade in skins and illegal meat and gall bladder trade, which may be partially a by-product of the skin trade.

Main markets for skins; Europe, Singapore, Hong Kong & Taiwan PoC. Singapore also a re-exporter of skins and processed skins

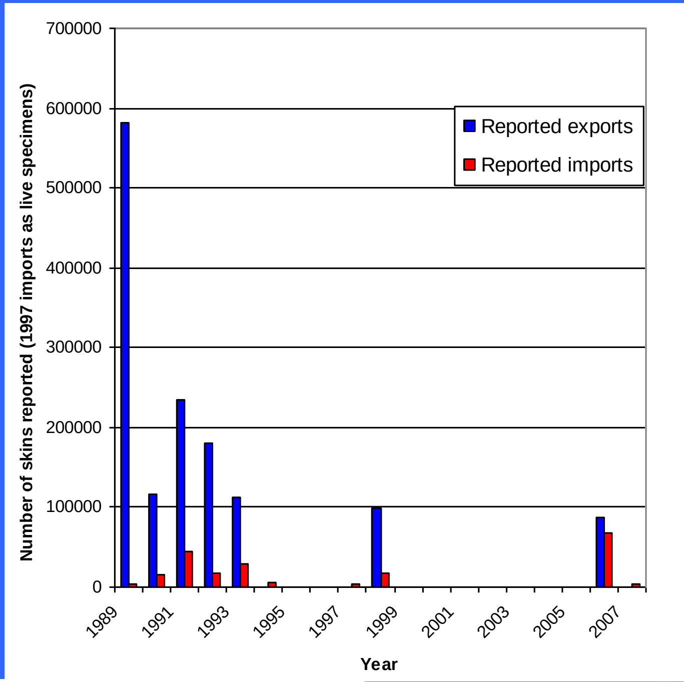
China is believed to be the main market for snake meat.



Legal trade levels

- Commercial harvesting of *P. mucosus* began in the late 1970s.
- Reported legal trade according to the CITES trade database is summarised in figure.
- Most trade from Indonesia has been in skins.
- 1886 ~1.9m, 1989 ~600,000,1999 – stockpiled, 2006 below the quota.
- According to Indonesian regulations skins must be tanned before export.

Figure: CITES reported imports and exports of *Ptyas mucosus* skins from Indonesia (1989 – 2007). Leather products and small numbers of live individuals have been omitted from this graph.



TRAFFIC is a joint programme of WWF and IUCN

TRAFFIC the wildlife trade monitoring network

Illegal trade

Southeast Asian snake species are commonly found in Chinese food markets

Demand for snake meat in China exceeds local supply during the cold season; additional sources of snakes are required.

Indonesia is one of the major sources supplying the demand from China for Oriental Rat Snakes and other species.

12 year suspension of skins trade triggered the illegal export of meat. Estimates of 50,000 to 100,000 snakes exported annually, (equivalent of 30 to 60 tons meat yr^{-1}, 50,000 to 100,000 gall bladders).

According to traders interviewed illegal export of meat and gall has continued since the ban lifted.

Specimens of Oriental Rat Snake traded as the Indo-Chinese Rat Snake *Ptyas korros* (not CITES-listed). Some export of whole (un-skinned specimens), meat trade not solely a by-product from the skin trade. Whole frozen snakes are sometimes declared as frozen fish.

Proposed NDF method

- SPECIES BIOLOGY & ECOLOGY (Species resilience to harvest)
- MANAGING HARVEST
  - Ability to set correct quotas and adaptively manage harvest
  - Conditions of harvest and ability to change these
  - Capacity to control harvest/ trade
- MONITORING IMPACT
  - Species monitoring
  - Harvest monitoring

SPECIES BIOLOGY & ECOLOGY (Species resilience to harvest)

- Medium sized snake reaching about 2.5 m in length and 5-10 cm in girth
- Males longer than females
- Reaches maturity at ~ 9 months ~120 cm for females
- Clutch size average 13
- May lay 2 clutches per year.
- No correlation between body size and clutch size and frequency.
- Widespread – probably most common in Central and East Java, areas with lower rainfall.
- Generalist – thrives in human modified environment
- Unknown density and population trends
- No major additional threats known.

Current conclusion: It is likely that due to its biology and ecology that the species has a fairly high resilience to harvesting.

MANAGING HARVEST

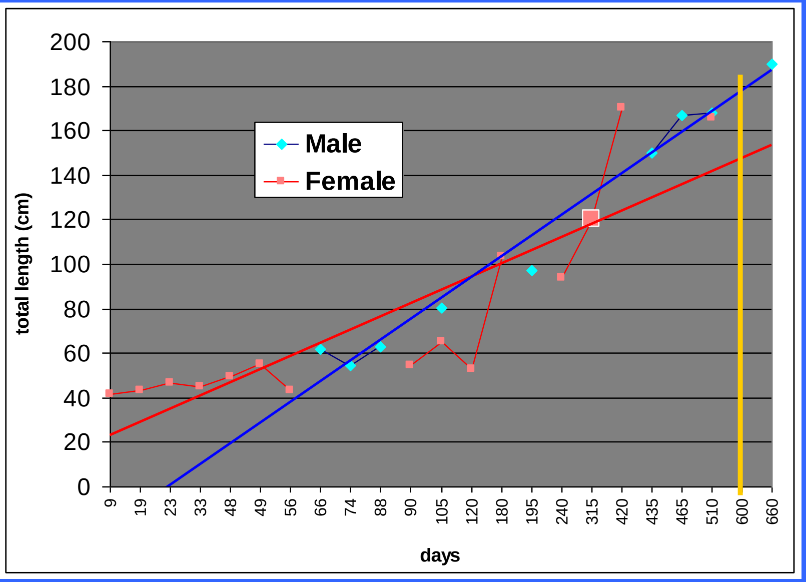
Ability to set correct quotas and adaptively manage harvest

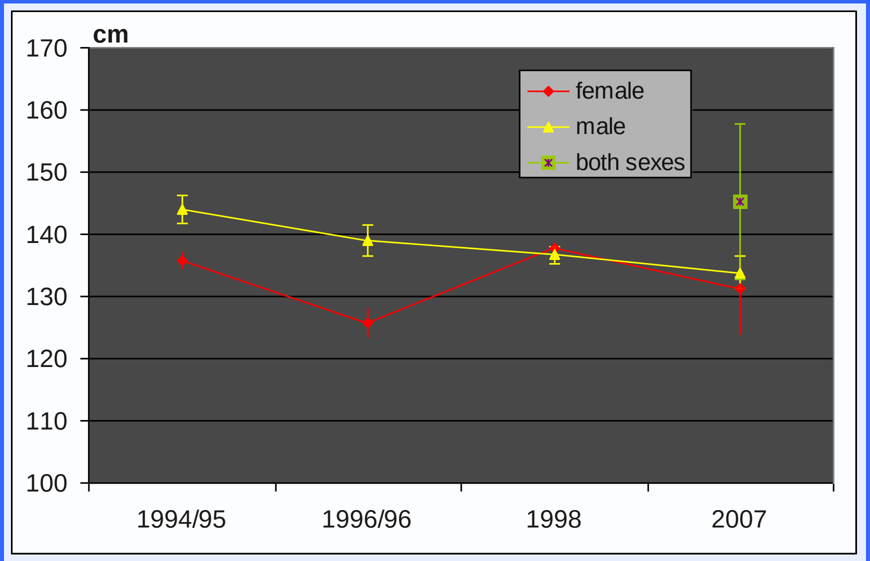
- Total offtake is unknown
- No quantitative data available for domestic demand but believed to be low. Quotas currently allow for 10% of quota as domestic use.
- Lack of reliable population estimates therefore adaptive management of harvest/export quota systems essential, based on species and harvest monitoring.
- No demand for pet trade; quota not necessary.
- *Export quotas could be set for all products in demand based on the harvest quota for number of specimens.*
- Seasonal restrictions not appropriate - possibly two breeding seasons, harvest takes place around agricultural activities.

MANAGING HARVEST

Ability to set correct quotas and adaptively manage harvest

- *Size restrictions to ensure specimens have reached maturity and reproduced could be set for export* (e.g. minimum 140 cm total snake length).





Conditions of harvest and ability to control/change these

- Widespread harvest in natural and agricultural habitat.
- Some dedicated harvesters and some harvesting by farmers
- Dedicated snake harvesters mainly harvest the Oriental Rat Snake during the wet season when snakes are most commonly encountered.
- Farmers harvest out of crop growing season – mainly November to January. Snake capture secondary to farming activities and appears to be carried out in an ad hoc manner.
- Cost of harvesting – low but may be increasing as there is some evidence catch per unit effort (CPUE) is decreasing. Very low for ad hoc harvesting by farm workers
- Species is effectively an open-access resource.
- **Difficult to enforce harvesting restrictions; harvest permit system unlikely to be effective.**

Capacity to control harvest/ trade

- Not all products in demand are legally exported. Believed illegal meat trade was substantial during the trade ban on skins. Current levels of illegal international trade thought to be high. No effective control measure in place to combat this.

- Difficult, to differentiate between skins and meat of *P. mucosus* and *P. korros* (not controlled under CITES) are of skinned, semi-skinned or whole specimens, usually frozen. Believed some additional harvest of the snakes rather that as a by-product of the skin trade. Increased enforcement is needed to reduce illegal trade.

- Harvest quotas are currently not communicated through the trade chain so a reduction in export quota is unlikely to result in a reduction in harvesting.

- Little is known on harvest areas. *Intensity of collection in different areas should be mapped and monitored to show shifting patterns in harvesting, which could indicate localised depletion.*

MANAGING HARVEST

Current conclusion:

- Currently insufficient data is available on distribution, population and harvest areas to be sure that a quota is set at a non-detrimental level.
- Quotas should be set and adaptively managed based on field and harvest monitoring.
- Setting export or harvest quotas is unlikely to reduce harvest given the low cost and ad hoc nature of some harvesting (farmers) and apparent illegal trade. But currently there is little knowledge about quotas at harvester and small scale collector level showing poor communication.
- Suggest revising quotas (export quota was reduced by 10,000 for year 2008) until baseline surveys taken place (If quotas were enforceable).

MONITORING IMPACT - Species

Species monitoring

Establish ongoing field studies in a sample of harvested and unharvested populations. Currently no reliable baselines from which to monitor change as existing data are from harvested specimens rather than field surveys

— Density estimates and ongoing monitoring should identify changes. ***Continuing decline in density would indicate detrimental harvest and lack of recruitment.***

— Catch per unit effort (CPUE). **Decreasing CPUE would indicate harvest is likely to be detrimental.**

— Size estimates. **Declining average size in the wild could be one possible indication of unsustainable harvest.** Particular attention should be paid to proportion of individuals above the size of maturity and to identify problems with recruitment.

— Sex ratio changes - at sampled sites for times of year. Further information on natural sex ratio and reproductive success/ recruitment under altered conditions of altered sex ratio would be beneficial in adaptively managing the harvest.

MONITORING IMPACT - Harvest

Harvest monitoring

Establish harvest monitoring. A year's baseline needed from which to monitor change for the following measures ensuring regular and standard monitoring systems are in place:

- Catch per unit effort (difficult for casual harvesters e.g. farmers). **Continuing decline would indicate that the population was reducing.**
- Sex ratio changes. **An increase in female to male ratio might indicate a reduction in average male size and reduction in differentiation between size of females and males.** *Caution should be taken when comparing sex ratios for different times of year in case of differences in activity levels for each sex through the year.*
- Size differences should be compared by sex against monthly averages.
- Size should be well above size of mature females i.e. above 120 cm. **Ongoing reduction in size of harvested specimens would indicate that the population was reducing.**
- *Harvesting area and pressure should be mapped in order to monitor* **shifting patterns in exploitation which could indicate localised depletion**.

MONITORING IMPACT

Current conclusion:

Currently no reliable baselines from the field or harvested specimens from which to monitor change.

Sample average size for both male and female (ratio unknown) = 189.51 cm (n= 60), therefore likely to be above the age of maturity. ***If*** this measure was based on a much larger sample of harvested specimens from a representative sample of traders (including illegal traders) it could be concluded that offtake currently allows individuals to grow to maturity and to reproduce before harvest takes place. **A *much larger sample would be necessary to determine non-detriment with any confidence.***

Sampling of size and CPUE (including harvesting area changes) should demonstrate declining population if this is the case.

RECOMMENDATIONS

- Studies of the species' biology should be carried out throughout the year. Further investigation of reproductive size and reproductive status of harvested specimens would help in confirming the age of maturity to ensure that any minimum catch size is appropriate.
- Establish field and harvest monitoring, including mapping of harvest pressure.
- Consider
  - listing *P. korros* as a lookalike species to aid the control of the meat trade,
  - legalising the meat trade, and trade in gall bladders as a by-products of the skin trade. Quotas equivalent of lower than the skin trade could be set. This may also increase the value to the harvester. Alternatively harvest quota for specimens could be set with no stipulations on export products.
  - Setting minimum size (length for skins and weight for meat) *if there was capacity to enforce these* (TSEA and IRATA concerns).

Conclusions

Monitoring (field and harvest) crucial in adaptively managing the species' harvest and in allowing a determination that harvesting is not detrimental.

Much information has come from collectors and traders and a strong collaboration with them should help facilitate monitoring as could collaboration with universities.

Proposed method of making a NDF for *Ptyas mucosus* has focused on Java, the main, or possibly only, exporting island of Indonesia. The species occurs on other Indonesian islands, including Sumatra and Sulawesi. In effect a large proportion of the species' range in Indonesia presumably not subject to harvest, although these areas cannot, without human intervention, act as a source if Java were to be acting as a sink.

NDF WORKSHOP CASE STUDIES
WG 7 – Reptiles and Amphibians
CASE STUDY 5
Uromastyx
Country – **ISRAEL**
Original language – English

UROMASTYX LIZARDS IN ISRAEL

AUTHOR:
Dr. Simon C. Nemtzov

Uromastyx ornata
Photo by Shahar Alterman

Uromastyx aegyptia
Photo by Gili Eliyahu

I. Background information on the taxa

Two species of *Uromastyx* lizards occur in Israel. The Egyptian mastigure (*U. aegyptia*), and the Ornate mastigure (*U. ornata*)[1]. In the early 2000's some Israeli entrepreneurs approached the Israeli government agency responsible for wildlife management and enforcement, the Israel Nature and Parks Authority (INPA), requesting permits for collection and/or breeding of *Uromastyx* lizards in Israel for commercial purposes, i.e. to export live individuals for the international pet trade.

The INPA conducted a study to see if an NDF could be made for either or both of the species of *Uromastyx*. The final result was a rejection of the proposals for both species because the scale of collection requested would have been detrimental to these species; in other words a finding of non-detriment could not be made.

This case study will cover how the determination was made for each of the two species separately, but first some general information on the genus *Uromastyx*.

The taxonomy of the genus has been somewhat confused over the years, with subspecies being promoted and new species or subspecies being described (Knapp, 2004). In this paper I use the scientific names as they appear in the CITES standard reference for this genus: Wilms (2001), which was designated for the first time in 2002 at CoP 12 [see: CoP12 Doc. 10.3 (Rev.)]. According to this standard reference, there are 16 species in this genus, including *U. ornata* as a separate species. Most authors consider *ornata* as a subspecies of *U. ocellata*, so usually specimens of *ornata* were apparently traded as *U. ocellata*. Therefore, there are almost no data in the UNEP-WCMC trade database for trade in *U. ornata*.

Due to the confusion about the species' names before a standard nomenclature reference for the genus was established in 2002, there was (and still is) some confusion about whether a particular species occurs in a particular range state or not. For example, Egypt is not listed as a range state for *U. acanthinura*, however the country has reported exports for this species, and in October 1991 the Egyptian government declared an export ban on *U. acanthinura, U. aegyptia, U. ocellata and U. ornata* from its country (CITES Notification No. 662, dated 16 January 1992).

[1] Alternative common names in English for *Uromastyx* lizards are: Dabb or Dhabb lizards or Spiny-tailed lizards. In the literature, one can also find alternative spellings of the scientific specific names, such as *aegyptius* or *ornatus*. Here I follow the scientific names in the CITES standard reference for the genus *Uromastyx* (Wilms, 2001).

Little is known about this genus in the wild and there are far more publications concerning husbandry and captive breeding of *Uromastyx* than concerning their ecology and behavior in the wild (Highfield & Slimani, 1998). *Uromastyx* are generalist herbivores, they are diurnal and usually live in groups of several individuals occupying very extensive territories (Zug, 1993). Typical populations range from about 1 to 10 animals per ha (Highfield & Slimani, 1998) depending on the species and habitat. *Uromastyx* are generally very colorful lizards whose size varies with species and can reach up to about 75 cm (including the tail) in the largest individuals. They can live over 20 years in the wild (Bouskila & Amitai, 2001), reach sexual maturity around four years old, and lay between 10 and 40 eggs per year, depending on the individual's size and species.

In most places, the habitats of *Uromastyx* are not directly threatened, as they mainly comprise desert which is usually of no commercial value (but this is not the case in Israel, see below). *Uromastyx* lizards have been in international trade for several decades and collecting is considered the major threat to many of the populations in the wild (Highfield & Slimani, 1998; Knapp, 2004). The scale of exploitation, including domestic utilization for food and traditional medicine (e.g., Walls, 1996) can lead to local depletions.

Concern about the sustainability of trade in these species led to the inclusion of all Uromastyx species in Appendix II of CITES in 1977. In addition, a number of trade restrictions specific to certain species or countries, have been applied to *Uromastyx* since then.

The Animals Committee has discussed concerns about the trade in *Uromastyx* a number of times, especially as part of the Significant Trade Review process, most recently at AC 15 in 1999 and AC 22 in 2006.

IUCN's Red List (IUCN 2007) currently contains only one Uromastyx species (i.e., the newly described species *U. alfredschmidti*, which is listed as Near Threatened), however a new IUCN Global Reptile Assessment will apparently be released in the next year or two.

1. BIOLOGICAL DATA

1.1 Scientific and common names

Scientific name: *Uromastyx aegyptia*; English common names: Egyptian mastigure, Egyptian dabb-lizard, Egyptian spiny tailed lizard. In Hebrew: *Chardon-zav mazui*.

1.2. Distribution

The global distribution of *U. aegyptia* includes Sudan, Egypt (including the Sinai Peninsula), Saudi Arabia, Jordan, Israel and Iraq. The species' range in Israel (see map on page 4) includes: the eastern Judean Desert (Nahal Hever alluvial fan), the Arava Valley, and the central and southern Negev Desert (Bouskila & Amitai, 2001). An isolated population, in the western Negev Desert, is separated from all other populations in Israel by the unsuitable area of the Negev highlands. This small population is thus connected only to other conspecific populations across the border in the Sinai Peninsula of Egypt. The total area of the species' habitat in Israel is approx. 4,000 km^2, but much of this is marginal habitat with few individuals.

1.3 Biological characteristics

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

U. aegyptia is the largest species in the genus with adults weighing up to 2 kg and reaching up to 75 cm in total length. They live in deep burrows (up to 10 m in length, and 1.8 m in depth) that are in use for many years. These burrows require heavy investments for their construction, and the survival of the lizards depends on them as shelter from predators and from the extreme conditions in the desert (Bouskila, 1983, 1986). They hibernate in these burrows during December and January (Mendelssohn & Bouskila, 1989).

Juveniles and adults are predominantly herbivorous, feeding mainly on leaves, buds, fruits, seeds and flowers of plants. Annuals are eaten during the spring, if winter rains were enough to support germination. During dry years and during the summer (when no rain occurs), the lizards depend on perennial plants; in the wadis in the Arava Valley, Acacia trees comprise the main summer food source (Bouskila, 1984; Bouskila, 1987; Foley *et al.*, 1992; Mendelssohn & Bouskila, 1989). In other areas that lack *Acacia* trees, they feed on perennial shrubs. They tend to use burrows that are close to summer sources of food, apparently because foraging far from their burrow exposes them to predation (Bouskila & Molco, 2002). They are mostly solitary and spend most of their time during the day near the burrow.

Robinson (1995) found population densities of *U. aegyptia* of 4.4-6.3 individuals per ha in an arid but productive environment in Kuwait. Bouskila (1984) reported an average of 3.4 adult individuals per ha in the northern part of the Arava Valley of Israel. Bouskila & Molco (2002) reported 10 individuals per ha near Eilat in the southern part of the Arava Valley. Gottleib & Vidan (2007) found an average density of 18.5 *U. aegyptia* burrows per ha in the central part of the Arava Valley, with an average of 51% of them in active use.

U. aegyptia reaches sexual maturity at the age of 4-6 years (Mendelssohn & Bouskila, 1989). Longevity in nature is more than 20

years (Bouskila & Amitai, 2001). Bouskila (1984) observed mating during May; the females lay one clutch of eggs (clutch size: 17- 41 eggs) in May or June in deep burrows (up to 3 m long) that they dug; the eggs hatch at the end of August. Females did not lay eggs every year (Bouskila, 1984).

Juveniles are very susceptible to predation, and many of them are killed during their first year by birds (e.g., shrikes), by varanid lizards and by snakes. The predators of adults are mainly raptors, but also wolves, dogs and humans (Bouskila, 1984).

1.3.2 *Habitat types*

U. aegyptia is a large herbivorous lizard active all year round, especially during the summer, which in Israel is the dry season, and they are thus limited in their distribution to those areas that provide some green vegetation during the summer (Arbel, 1984; Bouskila, 1984; Bouskila & Amitai, 2001; Mendelssohn & Bouskila, 1989). The typical habitat for this species is alluvial fans, gravel plains, and wide wadis in desert areas. Most of their habitat has < 80 mm mean annual rainfall, and they are always found in areas with < 150 mm mean annual rainfall.

1.3.3 *Role of the species in its ecosystem*

U. aegyptia has a central role in the desert plains as a physical ecosystem engineer in that the lizard modifies in a substantial way the physical characteristics of its habitat, and the modification has important implications on other organisms in the ecological system (Bouskila & Molco, 2002). The large burrows of *U. aegyptia* provide shelter for many organisms that would not be able to dig through the hard desert crust to escape the harsh conditions in the desert. These include snakes, geckos, spiders and many arthropods. In addition, the accumulation of soil from deep layers near the entrance of the burrow provides an ameliorated substrate for plants that normally may suffer from the high concentration of salt near the ground surface. In addition to the role as an ecosystem engineer, *U. aegyptia* serves as prey to variety of predators and acts as an herbivore in the ecosystem (Bouskila, 1984, 1986). The species was the principal prey of the golden eagle (*Aquila chrysaetos*) when three pairs of this endangered raptor established breeding territories in the Arava Valley in the 1970's (B. Shalmon, pers. comm.).

1.4 Population

1.4.1 *Global Population size*

There are no reliable estimates of global population size, and population densities apparently differ greatly among the different range states.

Israel contains less than 20% of the world population of this species (Dolev & Perevelotsky, 2004), but there is no reliable population estimate for the whole country. As stated above, the species range in Israel covers up to about 4,000 kmÇ, but their density is rather low in most of this area which is apparently only marginal habitat. By extrapolating and estimating densities the country's population of this species may be as low as a few thousand adults.

1.4.2 *Current global population trends*

___increasing _X_decreasing ____ stable ____unknown

The world population is apparently decreasing due to unsustainable collection from the wild (IUCN, in prep.). There are currently no export quotas for this species (CITES, 2008).

1.5 Conservation status

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

___Critically endangered ___Near Threatened
___Endangered ___Least concern
___Vulnerable ___Data deficient

The species is not listed in the IUCN Red List 2008 (as of October 2008), but a new assessment by IUCN of many reptile groups is expected to be released next year.

1.5.2 *National conservation status for the case study country*
The Red Book of Vertebrates in Israel (Dolev & Perevelotsky, 2004) lists the Regional Threat Category of U. aegyptia as Near Threatened.

1.5.3 *Main threats within the case study country*

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

Threat and Disturbance factors

a. Habitat destruction: in particular by the expansion of low-water use agriculture and of military training in desert areas (Bouskila & Amitai, 2001; Bouskila & Molco, 2002). In addition to reducing the habitat available for the species, these factors cause fragmentation of the existing populations.
b. Poaching: They are illegally trapped and eaten in the Arava Valley by foreign agricultural laborers, mostly those from Thailand (Hawlena, 2000; Bouskila & Molco, 2002; Yom-Tov, 2003; Nemtzov, 2007; Leader & Boldo, 2008) (see photo on page 9).

c. They are illegally trapped and eaten by local Bedouins, who traditionally used the skin as water canteens (Arbel, 1984; Bouskila & Amitai, 2001).
d. All-terrain vehicles and off-road vehicles used by agriculture workers and also for recreation, damage the burrows and their surroundings, and can cause diversion of flood waters into some of the burrows.
e. They are killed by cars on roads, particularly males during the mating season (Bouskila & Amitai, 2001).

In Israel, *U. aegyptia* habitat has been greatly reduced by the spread of modern agriculture into desert regions, relying on innovative low-water-use agricultural techniques. Large regions of arid areas and *U. aegyptia* habitat in the Arava Valley have now been converted to agriculture, with much of the land being covered with plastic hothouses (Hawlena, 2000) (see photo on page 9). Plans are progressing also to convert *U. aegyptia* habitat in the western Negev Desert to agricultural land.

Until the mid 1990's *U. aegyptia* were sometimes reported as an agricultural pest causing damage to crops in the Arava Valley (Moran & Keidar, 1993), but such damage no longer occurs (Nemtzov, 2002) since the population in that area has been greatly reduced and most of the crops there are no longer grown outdoors.

Two studies of *U. aegyptia* in the northern (Hawlena, 2000) and the central Arava Valley (Gottleib & Vidam, 2007) have shown marked reductions in the sub-populations of this species in Israel as a function of distance to agricultural regions. This is due mainly to negative impact of poaching by agricultural workers, and by loss of habitat from construction of structures for low-water use agriculture in closed hothouses.

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

2.1 Management measures

2.1.1 *Management history*

Until the early 1990's there were reports of agricultural damage by *U. aegyptia* in the Arava Valley. Problem animals were sometimes trapped and translocated further away from the agricultural areas. The species has never been "managed" but rather its habitat is protected as a way to encourage its survival in the wild.

2.1.2 *Purpose of the management plan in place*
The current efforts on behalf of this species are directed at preventing poaching and further loss of habitat.

2.1.3 *General elements of the management plan*
The current "management" program related to conservation of this species is to try to prevent further loss of habitat, as well as education and enforcement against poaching by Thai agricultural workers.

2.1.4 *Restoration or alleviation measures*
N/A

2.2 Monitoring system

2.2.1 *Methods used to monitor harvest*
There is no legal harvest, so no monitoring of harvest is done.

2.2.2 *Confidence in the use of monitoring*

2.3 Legal framework and law enforcement: Provide details of national and international legislation relating to the conservation of the species

The species is fully protected in Israel under a variety of laws and regulations. The species is listed as "protected wildlife" under the Wildlife Protection Law of 1955 (and its regulations of 1994) and as a "protected natural asset" under the National Parks, Nature Reserves and National Monuments Law of 1998 (and its regulations of 2002 and 2005). Specimens (including live individuals as well as all parts and derivatives) may not be disturbed, harmed, captured, held, bred in captivity, moved, or traded without a written permit from the Israel Nature and Parks Authority. In addition, much of the habitat of this species in Israel is in protected areas (nature reserves) where no fauna or flora may be disturbed or collected.

Internationally, all *Uromastyx* species have been listed in Appendix II of the CITES Convention since 1977.

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

3.1 Type of use (origin) and destinations (purposes) (e.g. commercial, medicinal, subsistence hunting, sport hunting, trophies, pet, food). Specify the types and extent of all known uses of

the species. Indicate the extent to which utilization is from captive-bred, artificially propagated, or wild specimens
Outside of Israel, the species has been trapped and sold for the international pet trade, and is also grown in captivity. There are records in the past of domestic use of the species for traditional medicine and for food and leather by local Bedouins before the establishment of the State of Israel in 1948 and the enactment of Israel's Wildlife Protection Law in 1955. There has never been any legal trapping or collecting allowed in Israel. There are many records of illegal poaching for food in recent years by farm workers from Thailand.

3.2. Harvest

3.2.1 *Harvesting regime (extractive versus non extractive harvesting, demographic segment harvested, harvesting effort, harvesting method, harvest season)*
The species is not legally harvested.

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

3.3 Legal and illegal trade levels: To the extent possible, quantify the level of legal and illegal use nationally and export and describe its nature.

Although *U. aegyptia* are fully protected by Israeli law and may not be captured or harmed without a permit, there is apparently much illegal poaching, mainly by snare traps set by agricultural workers from Thailand (photo, right) who are employed in the Arava Valley (Harel Ben Shahar, pers. comm.; Yom-Tov, 2003; Nemtzov, 2007; Leader & Boldo, 2008). Close to agricultural areas their population has been locally decimated, but the extent of the poaching has not been quantified.

During the years when there was an export quota from Egypt for this species, there may have been small amounts of smuggling of wild caught specimens out of Israel and into Egypt. If this occurred it was apparently not on a large commercial scale.

Photo: Agricultural workers from Thailand building a new hothouse in the desert habitat near Hazeva in the northern Arava Valley. The photo shows the two major threats to *U. aegyptia* in Israel: loss of habitat and poaching by foreign agricultural workers. Photo by Roni Ostreicher

II. Non-detriment finding procedure (NDFs)

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

____ yes _X_ √ no

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

Field observations of the species in the northern Arava Valley (Bouskila, 1984; Hawlena, 2000) were conducted by counts of active burrows and repeat observations of activity levels in specific transects. Comparisons of the surveys in 2000 of the same area studied in 1984, using aerial photographs and ground-truthing, showed the population to be clearly in decline due mainly to loss of habitat and high levels of poaching, especially in the vicinity of settlements and agricultural areas.

Because there were no reliable demographic data available to conduct a detailed MSY study, the evaluation was based on a determination of the general state of the country's population of this species. The life history characteristics of this species show that it relies on long adult longevity coupled with low juvenile survivorship (*r* strategy). Collecting adults from the wild from a species employing such a strategy is not generally conducive to sustainable harvest (Schlaepfer *et al*., 2005).

Because the policy of the INPA is to employ an extremely low level of tolerance to risk of extinction, the agency uses a precautionary approach in all areas of evaluation of the exploitation of wildlife (see: Milner-Gulland & Akcakaya, 2001).

Based on this precautionary approach the agency could not set a minimum number of animals that could be collected from the wild with no detrimental effect on the population. There was therefore no justification in allowing any collecting, since sustainable harvest can only be done on a population at steady-state or one that is increasing but not on one in decline.

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

Multiyear comparison of field observations and surveys were conducted in transects.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

The quality of the data was determined to be reliable as it was collected only by authorized and experiences scientists and rangers.

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

There were no demographic data available on birth or death rates, or on immigration that would have allowed us to use even a simple population model to determine population trends. All results were based on comparison of survey data.

6. RECOMMENDATIONS

There does not appear to be any level of collection of individuals from the wild that could be deemed sustainable, as the wild population is in decline and their *r* strategy makes them poor candidates for exploitation. This determination was not made on the basis of a sound scientific analysis of the population's demographics or on any kind of arithmetic algorithm. But even a simple algorithm, such as Robinson and Roberts (1991), which is based on only four parameters, to estimate of the possibility of sustainable harvest, has many problems (Milner-Gulland & Akcakaya, 2001).

If the INPA were to wish to determine whether the decision not to issue an NDF was correct, they should conduct a more comprehensive survey of the species including collection of demographic data and use an appropriate model, such as suggested by Milner-Gulland & Akcakaya (2001). Also, repeat surveys every three to five years of the same area will allow multi-year comparisons of the population's status.

I. BACKGROUND INFORMATION ON THE TAXA

1. BIOLOGICAL DATA

1.1 Scientific and common names: *Uromastyx ornata* In English: Ornate Mastigure. In Hebrew: *Chardon-zav hadur*

1.2 Distribution (Specify the currently known range of the species. If possible, provide information to indicate whether or not the distribution of the species is continuous, or to what degree it is fragmented. If possible, include a map)

The species *U. ornata* is endemic to the Arabo-Sinaian region: southern Israel, the Sinai Peninsula (Egypt), and north-west Saudi-Arabia (Bouskila & Amitai, 2001). Its range in Israel includes the Eilat Mountains and Mt. Timna. The total area of the species' habitat in Israel is approx. 270 km^2.

1.3 Biological characteristics

1.3.1 *Provide a summary of general biological and life history characteristics of the species (e.g. reproduction, recruitment, survival rate, migration, sex ratio, regeneration or reproductive strategies, tolerance toward humans)*

Very little has been published about the ecology and behavior of *U. ornata* in the wild, and most of what is known is from unpublished surveys and internal reports of the Israel Nature and Parks Authority.

This species is much smaller than *U. aegyptia* with adults reaching up to 40 cm and weighing up to 300g (Mendelssohn & Bouskila, 1989). *U. ornata* lives in very dry areas (with < 20 mm mean annual rainfall) in rocky habitats rich in holes and crevices. They are active all year-round, but most activity is in the hottest part of the day during the hottest months. Most activity is on the rocky slopes of the wadis, with descents to the floor of the wadi only for chasing invaders for feeding or for reproduction (including courtship and nesting), and also for an unusual and unexplained behaviour wherein the male flips the female onto her back (Molco & Ben-David, 2000).

U. ornata may be solitary or live in small groups, but never with more than one adult male (Mendelssohn & Bouskila, 1989). Dominant males attack and chase other males from their home range, but they do not maintain exclusive territories. Often a dominant male occupies a segment of the slope in a wadi, where several females, and even a subordinate male, may use the same area. From spring to the beginning of winter, the dominant male often approaches a female, turns her over on her back, and walks in circles on its belly. The meaning of this unique behavior is not clear yet, but it is likely to be related to the bond between the dominant male and the females in his home range (Bouskila & Molco, pers. comm.; Molco & Ben-David, 2000). The female digs a burrow in the floor of the wadi, where she lays on e clutch of 7-17 eggs in June. The eggs hatch after about 60 days in the beginning of August. Juveniles disperse within 4 days after hatching. Juveniles reach sexual maturity at the age of 2 years (Mendelssohn & Bouskila 1989).

The food of *U. ornata* is mainly composed of flowers, fruits and leaves of *Ochradenus baccatus* and other bushes; they shelter in rock crevices on steep slopes of wadis, but they descend the slopes for feeding in the wadi (Bouskila & Amitai 2001; Molco & Ben-David, 2000; Bouskila & Molco, pers. comm.).

1.3.2 *Habitat types: Specify the types of habitats occupied by the species and, when relevant, the degree of habitat specificity*

The species is specific to extreme desert (<20 mm mean annual rainfall), in steep, rocky, hot wadis that hold Acacia trees and *O. baccatus* bushes (Mendelssohn & Bouskila, 1989; Bouskila & Amitai 2001, Molco & Ben-David 2000).

1.3.3 *Role of the species in its ecosystem*

The role of this species in its ecosystem has not been studied directly, but it is reasonable to view it as similar to that of other *Uromastyx* species (above); it is probably less of an ecosystem engineer in that does not create burrows in the hard desert floor, but it does dig nesting burrows for laying eggs and it clears burrows in rocky crevices that are apparently exploited by many other species.

1.4 Population

1.4.1 *Global Population size: (Population size may be estimated by reference to population density, having due regard to habitat type and other methodological considerations, or simply inferred from anecdotic data)*
Unknown

1.4.2 *Current global population trends*
___increasing ____decreasing ____stable _X_unknown

During four field trips in the eastern Sinai Peninsula of Egypt during 1998-1999 by experienced investigators during the activity season in appropriate habitats, only very few individuals were observed, far lower than in the nearby Eilat Mountains Nature Reserve on the Israeli side of the border (Molco & Ben-David, 2000).

The low density may have been caused by over-collection subsequent to Israel turning this area over to Egypt in 1983 (as part of the 1979 peace treaty between these countries). In addition, all wadis that contained the appropriate habitats and plants were heavily grazed by livestock. The impact of such heavy grazing has not been evaluated yet, but it is likely that it contributed to reduction in the population.

1.5 Conservation status

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

___Critically endangered ___Near Threatened
___Endangered ___Least concern
___Vulnerable ___ Data deficient

The species is not listed in the IUCN Red List 2008 (as of October 2008), but a new assessment by IUCN of many reptile groups is expected to be released next year.

1.5.2 *National conservation status for the case study country*
The Red Book of Vertebrates in Israel (Dolev & Perevelotsky, 2004) lists the regional threat status for *U. ornata* as endangered EN (B, C2a). This classification code means the area of the species' habitat in Israel is <5,000 km^2 and the population is estimated to be less than 2,500 mature individuals, and a continued decline is projected in the form of severely fragmented populations, and no subpopulation has more than 250 mature individuals in it.

1.5.3 *Main threats within the case study country*

___No Threats
_X Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
___Harvesting [hunting/gathering]
___Accidental mortality (e.g. Bycatch)
___Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
___Other_______________
___Unknown

Threat and Disturbance factors

a. Potential trade impact: Despite protection in Israel and in Egypt, *U. ornata* has a great demand in the international pet trade and they may be collected by illegal traders and reptile collectors (Bouskila & Molco, 2002). No illegal collection in Israel has been recorded, but the potential is certainly there.
b. Habitat loss: The global population is apparently small, and sub-populations can be easily fragmented by mountain ranges which are not used by the species or by utilization of their habitat by humans for recreational or other activities (Bouskila & Molco, 2002). This is not a severe threat in Israel, as most of their habitat is protected and is also unsuitable for most uses by people (e.g. agriculture or real estate).
c. All-terrain vehicles and off-road vehicles that are driven in the wadis in Southern Israel disturb the animals and cause damage to bushes and trees which are their main food sources. This is a localized threat and likely to increase, but it is not severe as most of the habitat is protected and such activities are concentrated in a few designated 4X4 routes.

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

2.1 Management measures

2.1.1 *Management history*

A survey of the species in the Eilat Mountains in the late 1970's showed apparently very low population numbers. Subsequently, 162 individuals were translocated during 1980 and 1981 from the southern Sinai Peninsula to the Eilat Mountains to augment the population there[2]. More recent studies suggest that the survey may have produced erroneous low numbers due to inappropriate survey methods, and the Eilat Mountains population was probably not as depleted as was thought. There have been no subsequent translocations.

2.1.2 *Purpose of the management plan in place*

Current management measures for this species in Israel involve protection of the habitat in which the species occurs. The habitat is part of the Eilat Mountains Nature Reserve, a fully protected area.

2.1.3 *General elements of the management plan*

In order to reduce the impact of hikers and off-road vehicles on the *U. ornata* habitat and on the entire nature reserve, specific walking trails and 4X4 routes were marked in parts of the nature reserve, since totally closing the reserve to people was deemed as not feasible. Although these are almost all in the wadis (which form part of the habitat of *U. ornata*), there only a few such trails, in an attempt to reduce human impact on all the fauna and flora in this fragile desert habitat.

2.1.4 *Restoration or alleviation measures*

Besides the translocations during 1980 and 1981 (see section 2.1.1., above) no other restoration or alleviation measures have been enacted.

2.2 Monitoring system

2.2.1 *Methods used to monitor harvest*

The species is not legally harvested, so no harvest monitoring occurs. The species is monitored in the wild annually by an experienced ranger along preset transects to establish multi-year comparisons and to establish population trends.

2.2.2 *Confidence in the use of monitoring*

There is no monitoring of harvest, but there is a high level of confidence in the population monitoring in the wild which is considered reliable and accurate.

[2] The Sinai Peninsula was turned over from Israel to Egypt in the early 1980's (after the *Uromastyx* translocation project) as part of the peace treaty between these countries.

2.3 Legal framework and law enforcement: Provide details of national and international legislation relating to the conservation of the species.

The species is fully protected in Israel under a variety of laws and regulations. The species is listed as "protected wildlife" under the Wildlife Protection Law of 1955 (and its regulations of 1994) and as a "protected natural asset" under the National Parks, Nature Reserves and National Monuments Law of 1998 (and its regulations of 2002 and 2005).

Specimens (including live individuals as well as all parts and derivatives) may not be disturbed, harmed, captured, held, bred in captivity, moved, nor bought or sold, nor offered for sale (without a written permit from the Israel Nature and Parks Authority). In addition, all the habitat of this species in Israel is in protected areas (nature reserves) where all fauna and flora are fully protected and may not be disturbed or collected.

Internationally, all *Uromastyx* species are listed in Appendix II of the CITES Convention since 1977.

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

There is no legal use of *U. ornata* individuals or parts and derivatives in Israel. No specimens may be taken from the wild, and there is no legal captive breeding or trade (domestic or international).

Because the species' natural habitat is small and away from agricultural areas, and because the animals are relatively rare, there is apparently no poaching by farm workers, and there is apparently no illegal trade. As stated above, *U. ornata* has a great demand in the international pet trade so the potential for illegal collection and smuggling exists. There have been few if any cases of poachers or reptile collectors taking *U. ornata* in Israel.

3.1 Type of use (origin) and destinations (purposes) (e.g. commercial, medicinal, subsistence hunting, sport hunting, trophies, pet, food). Specify the types and extent of all known uses of the species. Indicate the extent to which utilization is from captive-bred, artificially propagated, or wild specimens

A very limited number of permits have been issued in the past for a very few individuals to be held in Israel in mini-zoos in non-commercial educational institutions.

3.2 Harvest

The species is not legally harvested in Israel.

3.2.1 *Harvesting regime (extractive versus non extractive harvesting, demographic segment harvested, harvesting effort, harvesting method, harvest season)*
N/A

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

3.3 Legal and illegal trade levels: To the extent possible, quantify the level of legal and illegal use nationally and export and describe its nature

There is no legal trade, domestic or international. There is apparently very little illegal trade if at all, as poachers of this species have never been caught and the population is apparently mostly stable.

II. Non-detriment finding procedure (NDFs)

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

__yes _X_no

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

The status of the population as determined by a field study conducted in the species habitat over a number of years, based on repeated counts along transects and visual observations (Bouskila & Molco, 2002).

Individually recognized territorial adults were photographed to determine population size.

The limited world distribution, the low numbers found in the survey in Egypt's eastern Sinai, and the small range in Israel suggest that there is a severe risk of decline if they are exploited for trade.

The overall status of this species in Israel shows a population that is apparently small (a few hundred individuals) but apparently stable. Some sub-populations might have declined drastically, as was observed in a survey of Mt. Timna by Nature & Parks Authority in 1998, in which no *U. ornata* were seen in areas where they have been observed several years earlier (Bouskila & Molco, 2002). Moreover, in that 1998 survey, no fresh feces were found in the surveyed region, although old feces (apparently several years old) were quite abundant. This survey indicated a local decline, but its reason has not been determined yet. No recent follow-up surveys have been conducted.

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

Transect surveys were used to look for live individuals and for spoor (feces) and by spot observations of identified individuals at fixed sites in *U. ornata* habitats in the Eilat Mountains and Mt. Timna Nature Reserves in southern Israel. These were evaluated to determine the relative status of the population in multiyear comparisons.

Table: Summary of observations of *U. ornata* from the Nahal Shlomo Valley (translated by the author from Molco & Ben-David, 2000).

Year	Transects		Direct observations		No of individually recognized individuals
	Hours	Days	Hours	Days	
1996	170	106	65	75	90
1997	250	140	240	135	150
1998	160	126	160	126	160
1999	110	100	110	100	170
Total	**690**	**462**	**575**	**436**	**170**

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

The quality of the data was deemed excellent as the observer was very experienced.

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

As was the case with *U. aegyptia*, there were no reliable demographic data available, so determination of the population's state had to be made using other parameters.

Because the population in Israel is connected with the population in eastern Sinai, the decline in the eastern Sinai population that was observed there, may affect the population in the nearby Eilat Mountains.

6. RECOMMENDATIONS

A NDF could not be made, and no collection has been authorized.

The INPA needs to publish the survey data. In addition, survey methods need to be improved so that better population assessment can be made in other regions. Repeat surveys of the population need to be done every few years for making multi-year comparisons on population trends.

REFERENCES

ARBEL A. (1984). Vol. 5: Reptiles and Amphibians. *In*: Alon A. (ed.) *Plants and Animals of the Land of Israel: An Illustrated Encyclopedia*. Ministry of Defence & the Society for Protection of Nature in Israel [in Hebrew].

BOUSKILA, A.(1983). The burrows of the dabb-lizard *Uromastyx aegyptius. Israel Journal of Zoology* 32:151-152.

BOUSKILA A.(1984). *Habitat selection, in particular burrow location, in the dabb-lizard Uromastyx aegyptius, near Hazeva*. M.Sc. Thesis, Hebrew University of Jerusalem [in Hebrew].

BOUSKILA A.(1986). Habitat selection in the desert lizard *Uromastyx aegyptius* and its relation to the autecological hypothesis, pp. 119-128 in: Z. Dubinsky and Y. Steinberger (eds.), *Environmental Quality and Ecosystem Stability*, Volume III A/B, Bar-Ilan University Press, Ramat-Gan, Israel.

BOUSKILA A.(1987). Feeding in the herbivorous lizard Uromastyx aegyptius near Hazeva. *Israel Journal of Zoology* 33:122.

BOUSKILA A. & P. Amitai (2001). *Handbook of Amphibians & Reptiles of Israel*. Keter Publishing, Jerusalem, Israel [in Hebrew].

BOUSKILA A. & D. Molco (2002). *Status of Spiny-tailed lizards* (*Uromastyx* spp.) in Israel. Unpublished report for the Israel Nature and Parks Authority.

CITES (2008). *Export quotas for specimens of species included in the CITES Appendices for 2008 (Last updated 16/09/08)*. Downloaded from the CITES website (www.cites.org).

DOLEV, A. & A. Perevelotsky (2004). *The Red Book of Vertebrate Species in Israel*. Israel Nature and Parks Authority and the Society for the Protection of Nature in Israel, Jerusalem.

FOLEY W. J., A. Bouskila, A. Shkolnik & I. Choshniak (1992). Microbial digestion in the herbivorous lizard *Uromastyx aegyptius* (Agamidae). *Journal of Zoology* 226: 387-398.

FRANKE J. & Telecky T.M. (2001). *Reptiles as Pets: An Examination of the Trade in Live Reptiles in the United States*. Humane Society of the United States, Washington, DC.

GOTTLEIB, A. & E. Vidan (2007). *Survey of Egyptian mastigure burrows in the Arava region in regards to edge effects of agriculture on the population*. Unpublished report of the Israel Nature and Parks Authority [in Hebrew].

HAWLENA, D. (2000). *Status of U. aegyptius burrows near Hazeva in the northern Arava Valley*. Unpublished report of the Israel Nature and Parks Authority [in Hebrew].

HIGHFIELD, A.C. & T. Slimani (1998). The Spiny-Tailed Lizard at home – *Uromastyx acanthinurus* in southern Morocco. *Reptiles Magazine*, 6&7.

IUCN (2007). *Red List of Endangered Species* (accessed on the internet on 14 September 2008).

IUCN (in prep.). Global Reptile Assessment species accounts.

KNAPP, A. (2004). *An Assessment of the International Trade in Spiny-Tailed Lizards Uromastyx with a Focus on the Role of the European Union*. TRAFFIC – Europe.

LEADER, N. & A. Boldo (2008). *Damage to Nature Caused by Poaching by Thai Workers: Data from Thai Trap Surveys for the Years 2002-2007*. Unpublished report of the Israel Nature and Parks Authority [in Hebrew].

MENDELSSOHN, H. & A. Bouskila. (1989). Comparative ecology of *Uromastyx aegyptius* and *Uromastyx ornatus* in Southern Israel and Southern Sinai. First World Congress of Herpetology, Univ. of Kent, Canterbury, UK. [Abstract].

MILNER-GULLAND, E.J. & H. R. Akcakaya (2001). Sustainability indices for exploited populations under uncertainty. *Trends in Ecology and Evolution* 16: 686-692.

MOLCO, D. & Ben-David, O. (2000). *The ecology and biology of Uromastyx ornatus, summing-up 4 years of observations (1996 - 1999)*. Unpublished report of the Israel Nature and Parks Authority [in Hebrew].

MORAN, S. & Keidar, H. (1993). Checklist of vertebrate damage to agriculture in Israel. *Crop Protection* 12:173-182.

NEMTZOV, S.C. 2002. Management of wildlife-human conflicts in Israel: a wide variety of vertebrate pest problems in a difficult and compact environment. Pp. 348-353 *in*: R.M. Timm & R.H. Schmidt, eds., *Proceedings of the 20th Vertebrate Pest Conference*, University of California: Davis.

NEMTZOV, S.C. (2007). *Status of Poaching by Workers from Thailand*. [in Hebrew].

ROBINSON, M.D. (1995). Food plants and energetics of the herbivorous lizard, *Uromastyx aegyptius microlepis*, *in* Kuwait. *Journal of the University of Kuwait (Science)* 22: 255-261.

ROSSER, A.R. & Haywood, M.J. (Compilers). (2002). *Guidance for CITES Scientific Authorities: Checklist to assist in making non-detriment findings for Appendix II exports*. IUCN, Gland, Switzerland and Cambridge, UK.

SCHLAEPFER, M.A., C. Hoover & C.K. Dodd Jr. (2005). Challenges in Evaluating the Impact of the Trade in Amphibians and Reptiles on Wild Populations. *Bioscience* 55: 256-264.

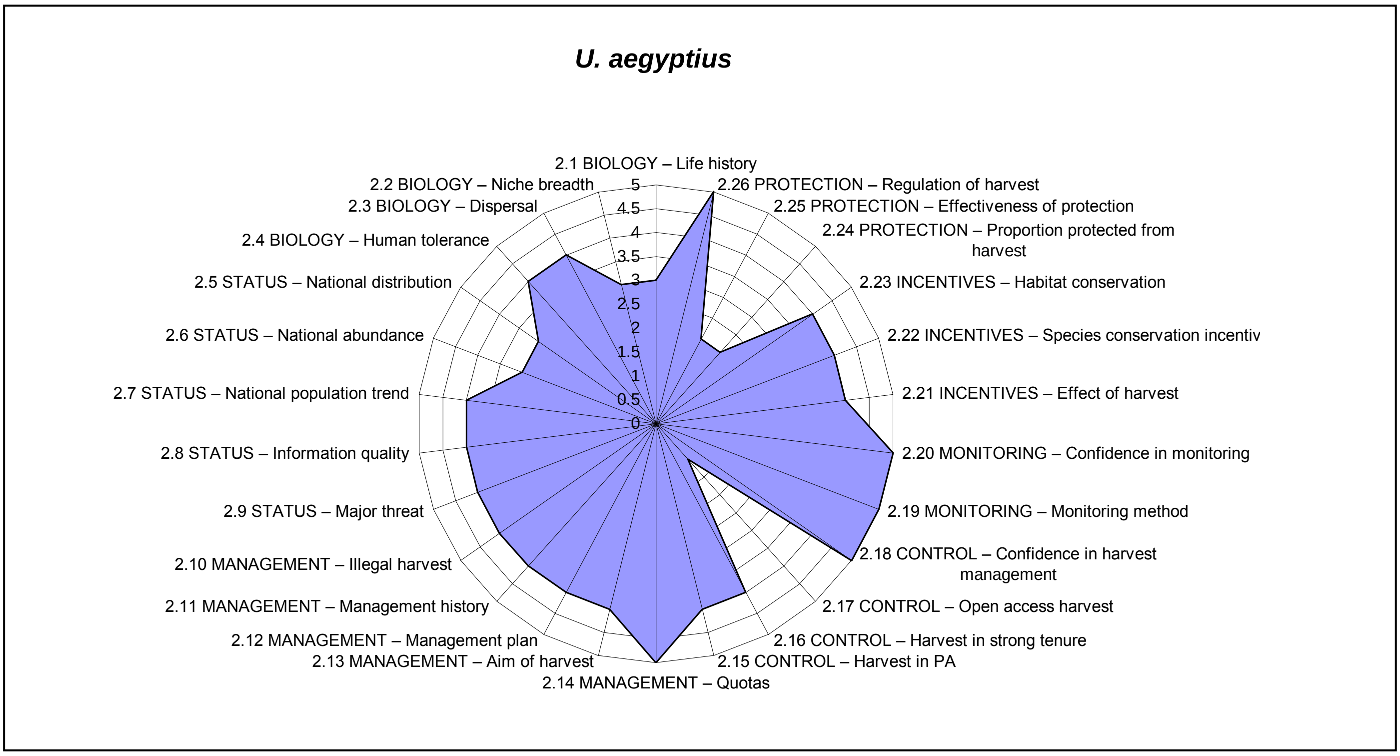
WALLS, J.G. (1996). *Uromastyx and Butterfly Agamids*. TFH Publications.

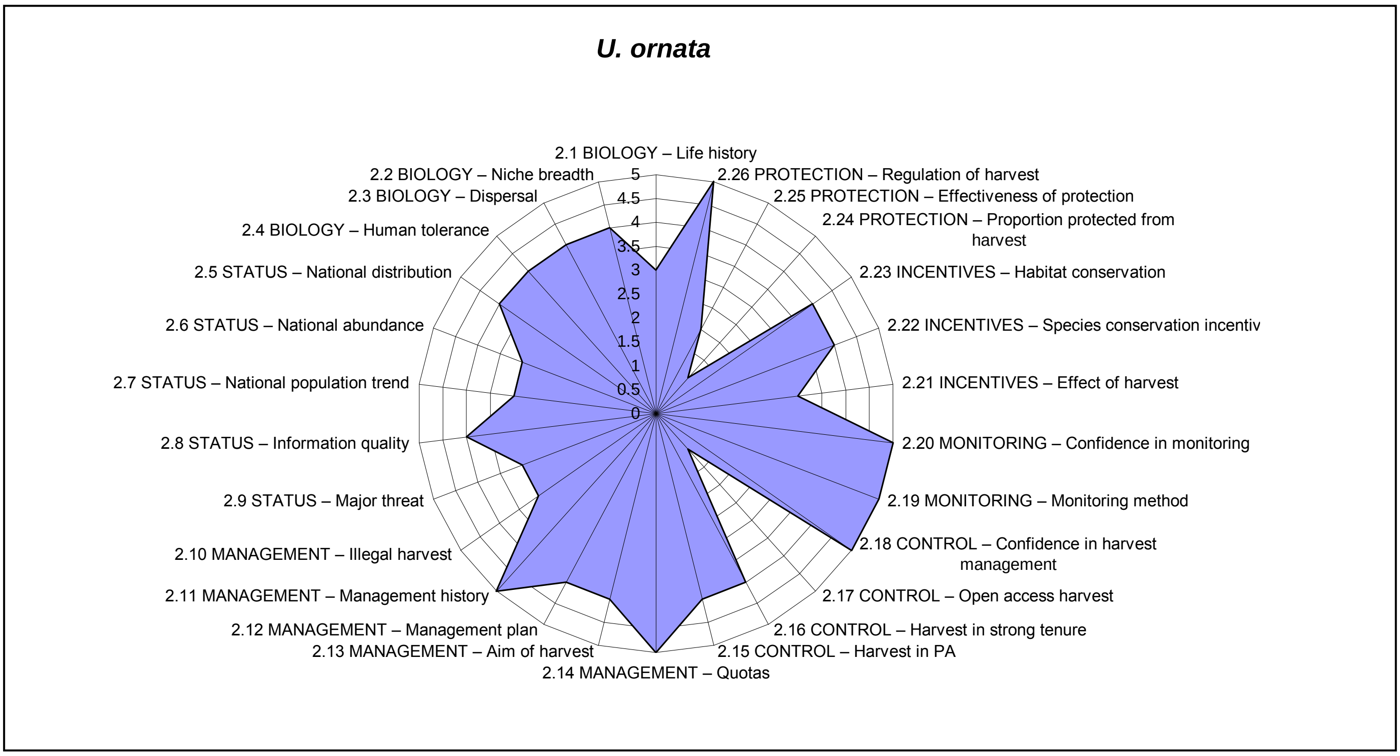
WILMS, T. (2001). *Dornschwanzagamen: Lebensweise, Pflege und Zucht*. Herpeton, Verlag Elke Köhler, Offenbach.

YOM-TOV, Y. (2003). Poaching of Israeli wildlife by guest workers. *Biological Conservation* 110: 11–20.

ZUG, G.R. (1993). *Herpetology: An Introductory Biology of Amphibians and Reptiles*. Academic Press Inc, San Diego, California.

Appendix: Radar Plots for *U. aegyptia* and *U. ornata*, prepared by the author according to Table 2 in Rosser & Haywood (2002). These plots were not used in determining whether an NDF could be made but are presented here so that they may be compared with radar plots in other case studies.





Uromastyx lizards in Israel

Dr. Simon Nemtzov

Wildlife Ecologist and

Scientific Authority

Israel Nature & Parks Authority

Jerusalem, Israel

Where is Israel?

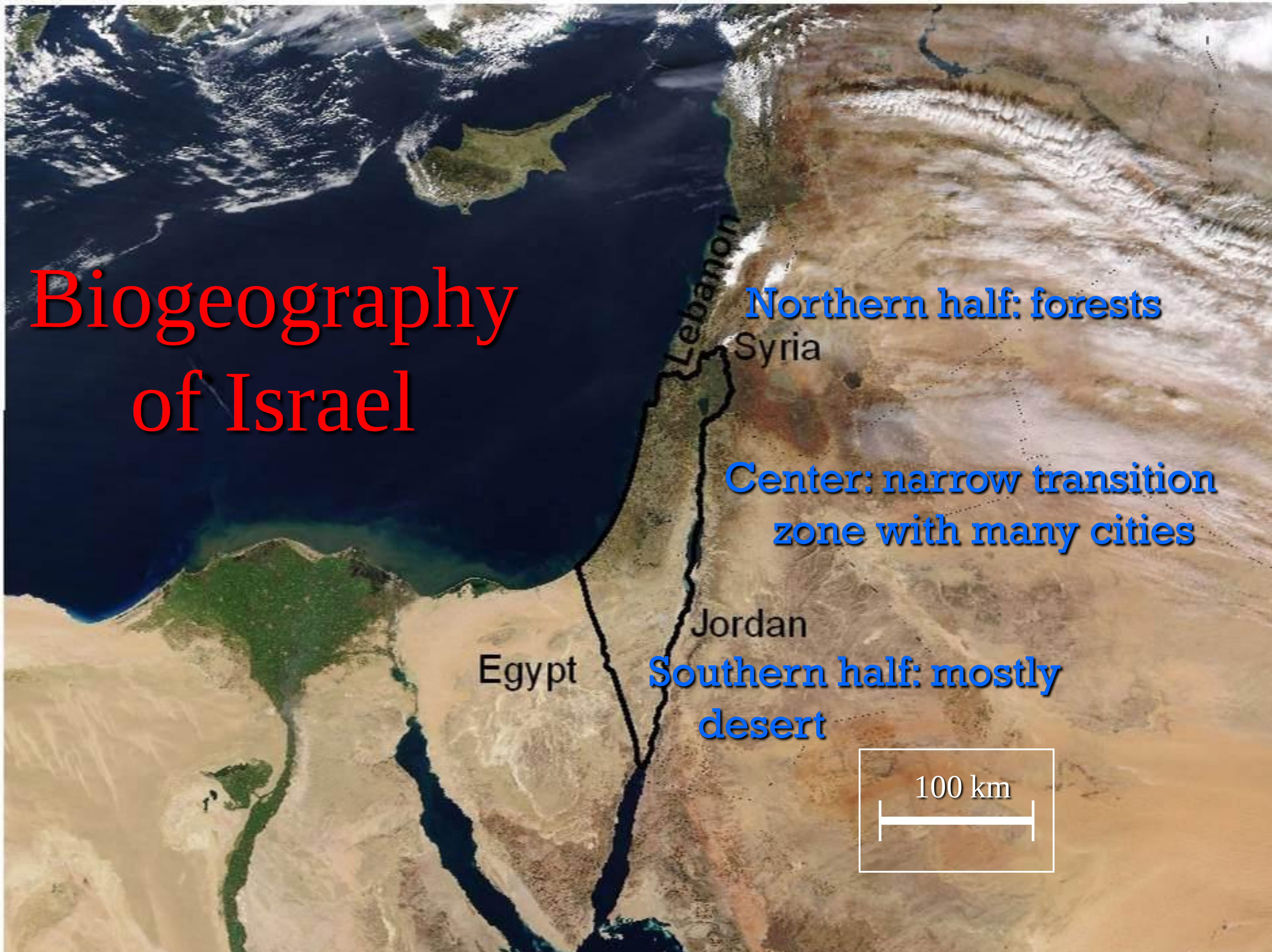
Israel

An extremely rich diversity of rich populations of wild fauna and flora

- Size: ~20,000 km² (smaller than the Netherlands)
- Population: < 7 million
- At the intersection of 3 continents (diverse ecotones)
- Strict laws for wildlife protection
- Very low hunting pressure

Sea of Galilee - Lake Kinneret

Biogeography of Israel



Wildlife biodiversity in Israel

16 species of Carnivores:

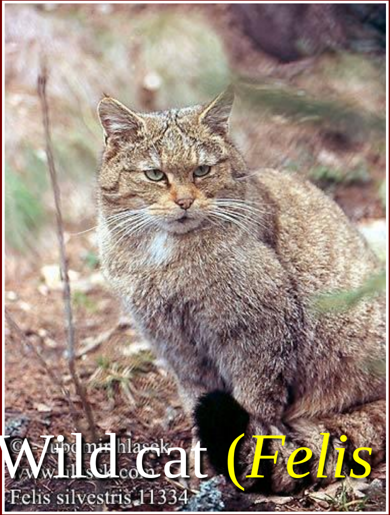
- Striped hyena (*Hyena hyena*)
- 5 species of canids: wolf (*Canis lupus*), 3 foxes, golden jackal (*C. aureus*)
- 5 sp. of mustelids: 2 badgers, beech marten, marbled polecat, otter (*Lutra lutra*)
- Egyptian mongoose (*Herpestes ichneumon*)
- 4 species of felids

Wildlife biodiversity in Israel

16 species of Carnivores

4 species of felids:

Leopard (*Panthera pardus*)



Wild cat (*Felis silvestris*)

Caracal (*Felis caracal*)

Jungle cat (*Felis chaus*)

(Sand cat *(Felis margarita)*)

Israel biodiversity
for example, 8 species of corvids

- *Garrulus glandarius*
- *Corvus monedula*
- *Pyrrhocorax graculus*
- *Corvus frugilegus*
- *Corvus corone*
- *Corvus corax*
- *Corvus ruficollis*
- *Corvus splendens*

Israel's Wildlife Trade Policy

1. Protect native wildlife
   - no invasive species allowed
   - limited exploitation of native species

White oryx reintroduced in Israel

2. Contribute to protection of wildlife overseas
   - import only captive-bred individuals
   - no import from range states
   - no trade in endangered species (those designated by IUCN as *Endangered* or *Vulnerable)*

Uromastyx

English names:

- mastigure, spiny-tailed lizard, dhabb lizard, uro

Taxonomy:

- Fam. Agamidae
- CITES standard ref.: Wilms (2001) – 16 species

CITES

- App. II since 1977

IUCN Red List:

- Only 1 sp. EN
- GRA not complete

Species of *Uromastyx* in Israel

- *U. aegyptia* - Egyptian mastigure
  - – Largest species in the genus (~ 75 cm)
  - – Distribution from Libya to Oman
  - – Lives in dry wadis and alluvial plains
  - – Important physical ecosystem engineer

Species of *Uromastyx* in Israel

- *U. ornata* - Ornate mastigure
  - Much smaller than U. aegyptia (~40 cm)
  - *Distribution*: Egypt, Israel, Saudi Arabia
  - Lives on rocky slopes in extreme desert with < 20 mm rainfall
  - Most active in > 40°C


Uromastyx distribution in Israel
ISRAEL NATURE AND PARKS AUTHORITY
Mediterranean Sea
Israel
Jordan
Negev Desert
U. aegyptia
Egypt
U. ornatus
Arava Valley
Sinai Peninsula
Saudi Arabia
Red Sea
Date 24/09/2008
Dr. Simon C. Nemtzov

Threats

U. aegyptia

- Loss of habitat: Desert converted to intense low-water-use agriculture
- Poaching by Thai farm workers

Threats

U. ornata

- Small range (~ 270 km²)
- Very small population (~200 individ's)
- Off-road vehicles 4X4 and ATV

NDF – *U. aegyptia*

- Comparative surveys in Arava Valley:
  1984, 2000 (2007)

- Methods:
  - Determine population density
  - Aerial photographs of burrows
  - Ground-truthing of activity using transects
  - Multi-year comparisons
  - No demography

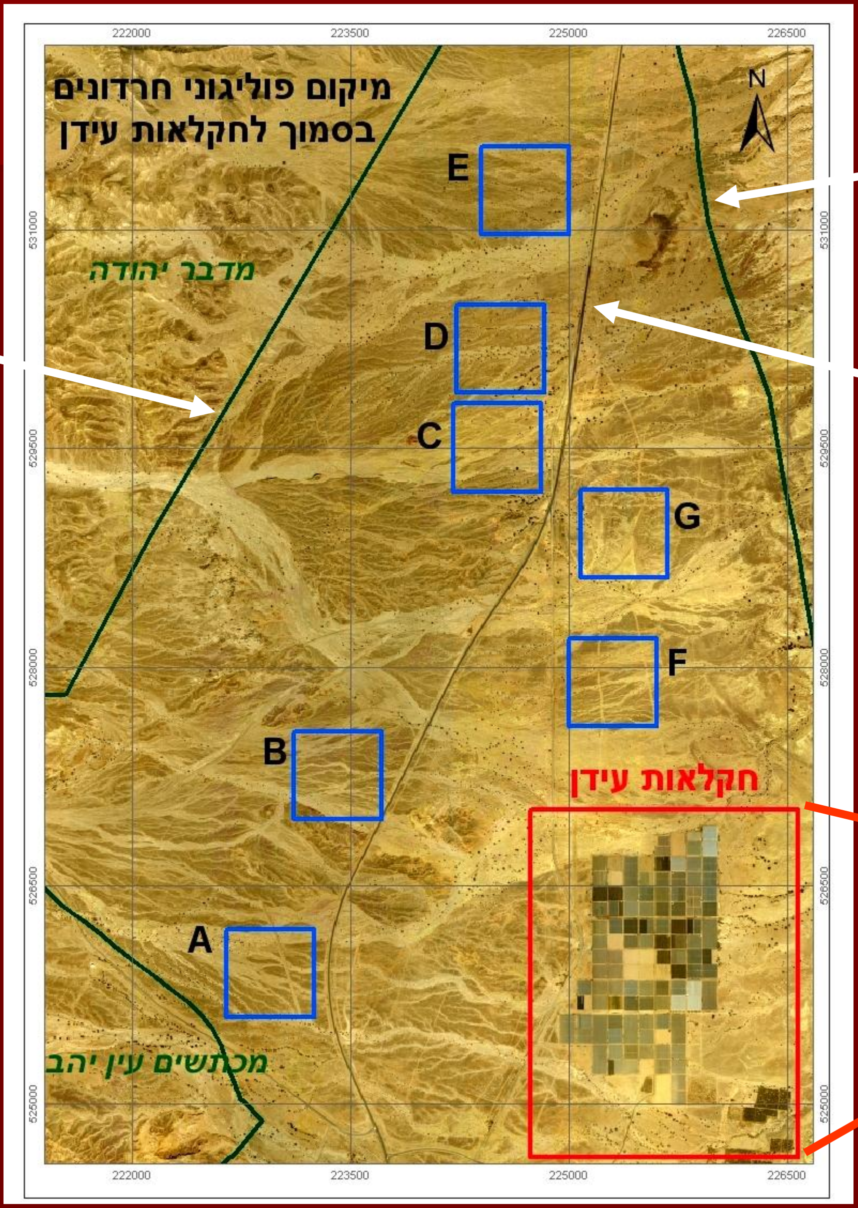
Aerial photography surveys

- Light dots = *Uromastyx* burrows
- Dark spots = *Acacia* trees and bushes

~500 m

Multi-year comparisons

Nature Reserve boundary



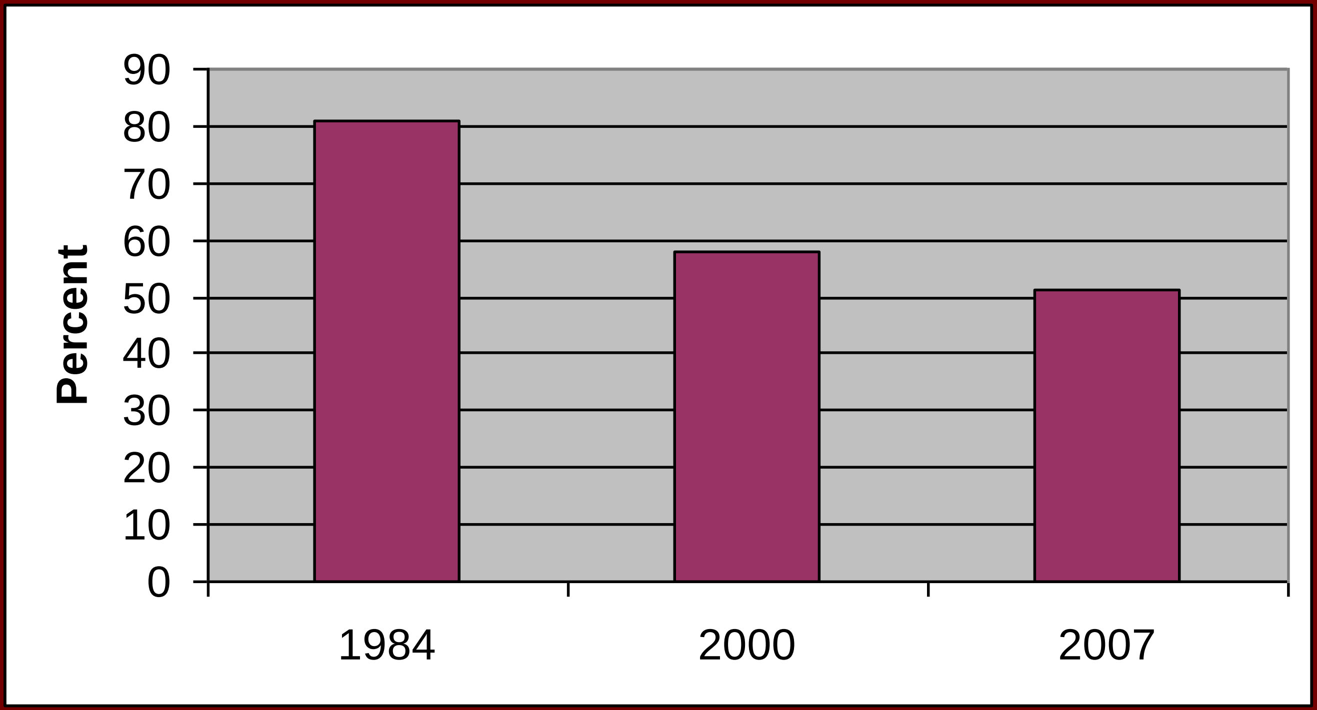
Nature Reserve boundary

Highway

Agricultural area

Multi-year comparisons

Percent of burrows that are active

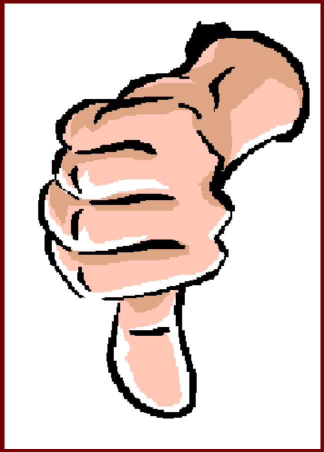


Effect of agr. on *Uromastyx*

- Results of surveys:
  - – Lower population density
  - – Loss of habitat - Smaller range
  - – Increase in poaching levels
  - – No complaints of agr. damage since 1997

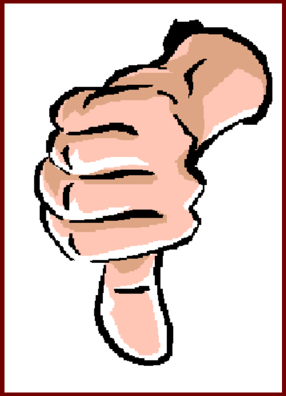
NDF – *U. aegyptia*

- Population is not increasing or stable, but is shrinking
- Further losses expected
- No safe level of exploitation could be assessed



U. ornata

- Total population ~ 200 individuals
- In 2000: Stable but small pop.
- No NDF possible
- Since 2000, population has shrunk even more, due to severe drought and diminished food sources



Conclusions

- No demographic data, or population modeling of harvest, or estimate of MSY.
- Non-scientific determination showed that the populations were "in trouble"
- Final ruling based on precautionary principle in keeping with wildlife conservation policy.

THE SOUTHEAST ASIAN BOX TURTLE *CUORA AMBOINENSIS* (DAUDIN, 1802) IN MALAYSIA

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I. BACKGROUND INFORMATION ON THE TAXON

1. BIOLOGICAL DATA

1.1. Scientific and common names:

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

1.2. Distribution.

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

Four subspecies are currently recognized (Rummler and Fritz, 1991; McCord and Philippen, 1998): the Wallacean Box Turtle *Cuora amboinensis amboinensis* (Daudin, 1802) often referred to as East Indian Box Turtle; the Malayan Box Turtle *C. a. kamaroma* (Rummler and Fritz 1991); the Indonesian Box Turtle *C. a. couro* (Schweigger, 1812); and the Burmese Box Turtle *C. a. lineata* (McCord and Philippen, 1998).

The Malayan Box Turtle *Cuora a. kamaroma* occurs from northeastern India and Bangladesh, through southeastern Asia to the Malay Peninsula; on the Nicobar Islands; Borneo; and Sulu Archipelago and perhaps the Palawan Island group (Philippines) (Fritz and Havas, 2007). This is the only subspecies that occurs in Malaysia. (Figure 1).

Distribution of *Cuora amboinensis*

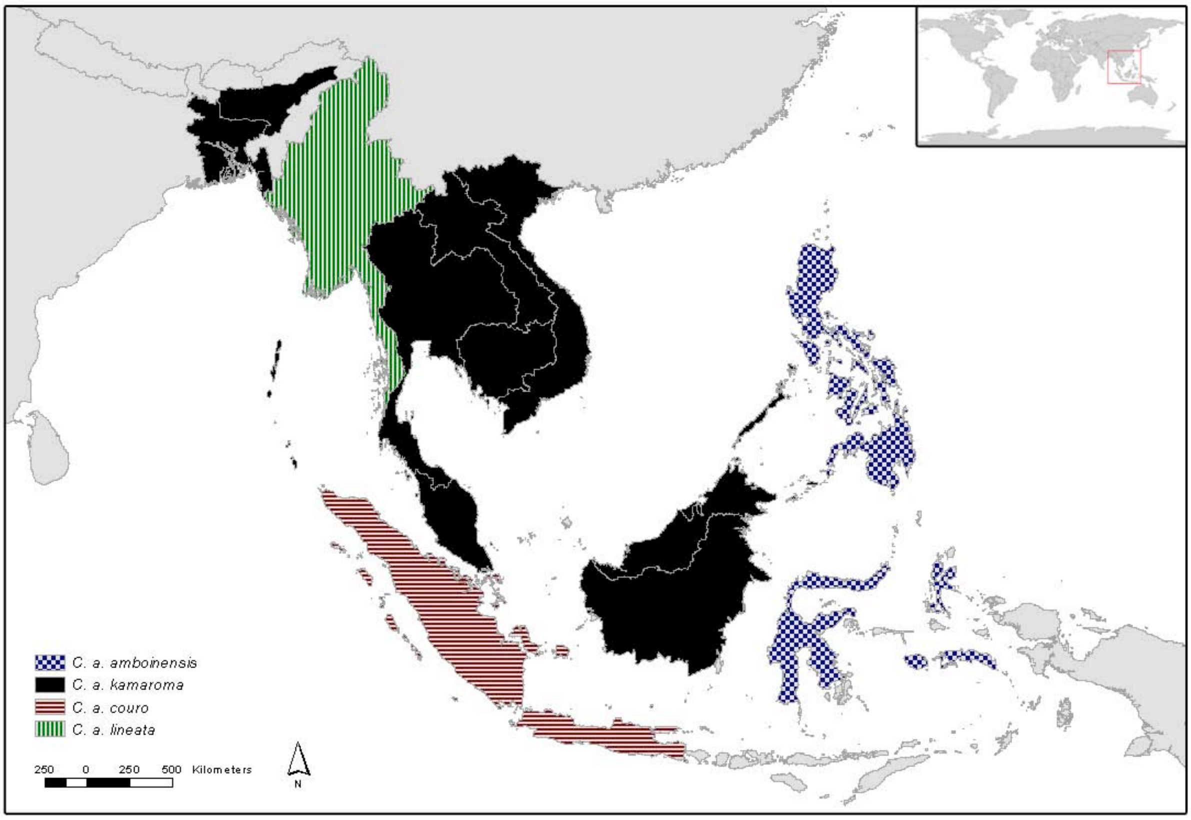

Figure 1: Distribution of *Cuora amboinensis*.

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

1.3. Biological characteristics

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

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

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

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

1.3.2. *Habitat types*

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

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

1.3.3. *Role of the species in its ecosystem*

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

1.4. Population

1.4.1. *Global Population size*

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

1.4.2. *Current global population trends*

___increasing _x_ decreasing (IUCN, 2008) ____stable
___unknown

1.5. Conservation status

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

___Critically endangered
___Endangered
_x__Vulnerable

___Near Threatened
___Least concern
___ Data deficient

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

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

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

1.5.3. *Main threats within the case study country*

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

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

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

2.1. Management measures

2.1.1. *Management history*

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

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

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

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

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

2.2. Monitoring system

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

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

2.3. Legal framework and law enforcement

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

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

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

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

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

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

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

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

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

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

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

3.2. Harvest:

3.2.1. *Harvesting regime*

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

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

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

3.2.2. *Harvest* management/ control

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

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

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

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

3.3. Legal and illegal trade levels

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

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

Trade after the trade ban in 2005.

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

II. NON DETRIMENT FINDING PROCEDURE (NDFS)

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

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

_partly_yes ___no

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

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

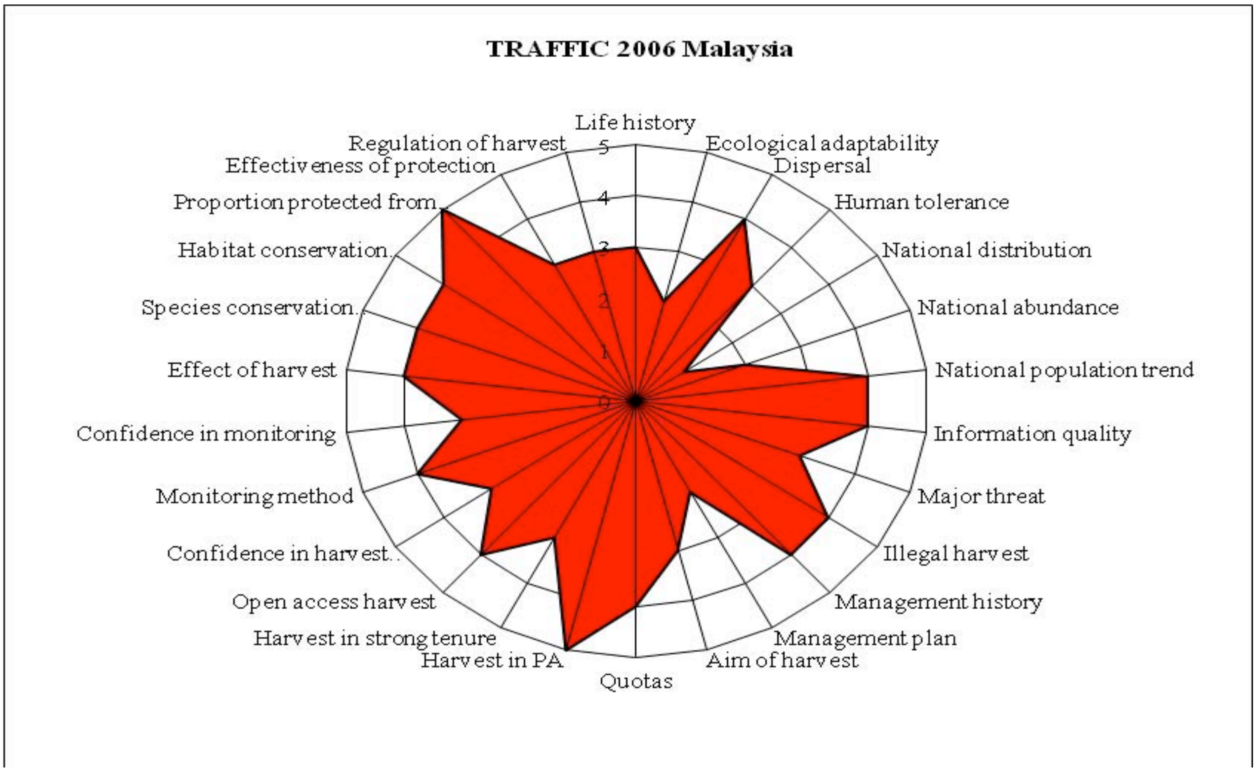

Figure 2: Risk-assessment of the Southeast Asian Box Turtle in Malaysia conducted by TRAFFIC Southeast Asia in 2006.

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED;

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

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

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

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

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

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

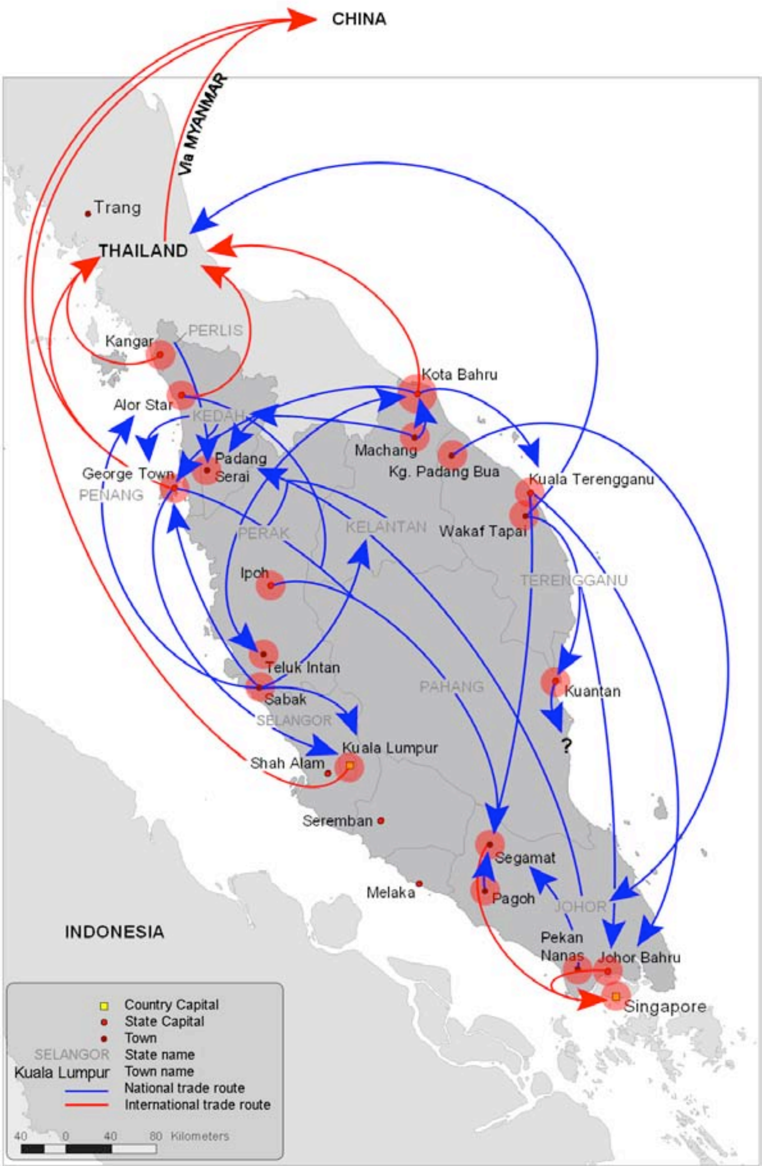

Figure 3: Map of Malaysia with the political boundaries of the States wherein national trade routes are indicated by blue arrows and international ones by red arrows.

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

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

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

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

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

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

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

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

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

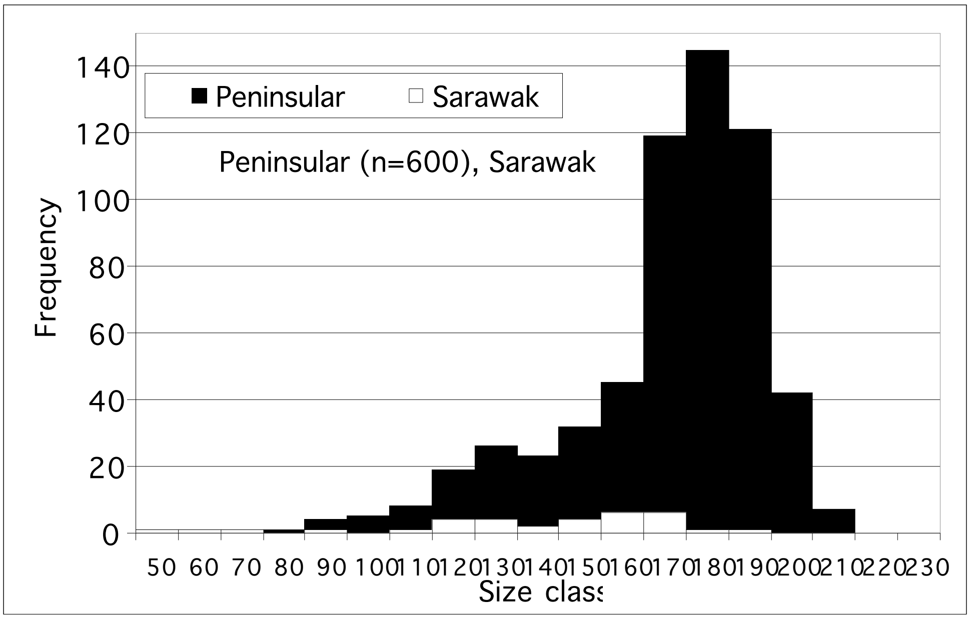

Figure 4: Size-frequency histograms for the Southeast Asian Box Turtle encountered in trade in Peninsular Malaysia and in Sarawak.

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

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

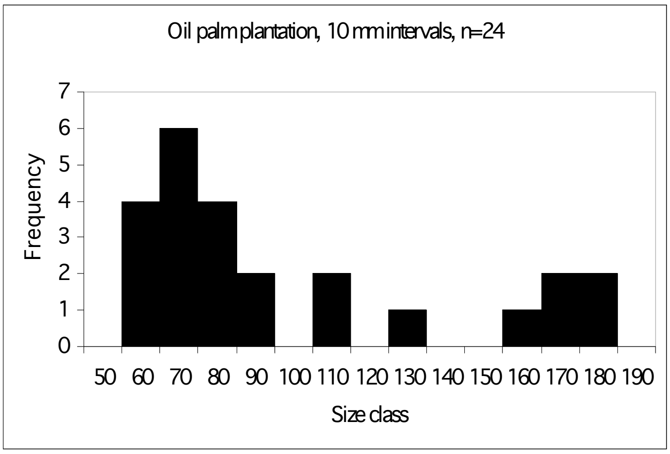

Figure 5: Size-frequency distribution of a population in an exploited plantation in Sabak Bernam, Selangor.

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

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

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

Abundance in harvest and impact

Abundance in harvest of the Southeast Asian Box Turtles at two out of 17 identified traders' premises in Peninsular Malaysia was monitored for five consecutive weeks from 21 November to 27 December 2006, in Sabak Bernam, Selangor. *During the 38 days of survey, 385 Southeast Asian Box Turtles were encountered at these two suppliers. It is assumed that these constitute 100% of the stock that was traded by the two suppliers. The total mean catch of* *the two suppliers was 10.1 individuals/day, or 303.9 individuals/months or 3647.4 individuals/year. Accordingly, one supplier would then collect a conservative mean of 1823.7 individuals/year. For comparison, traders who source specimens from a natural wetland area in East Kalimantan, can collect about twice the amount (3350.9 individuals/year/trader). Generally, data are believed to be comparable, because the traders in both areas stated that the survey period fell in a lean collection time, either due to seasonality, as in West Kalimantan, or due to low prices, as in Malaysia. Accordingly, exploitation will be even higher during peak seasons. The much lower catch in Malaysia might be related to habitat (most are collected from plantations) or to over-exploitation and should be closely monitored. If catch-per-unit-effort (CPUE) in the survey site in Malaysia can be sustained over the years, harvesting might be sustainable; decreasing CPUE over the years would indicate that over-exploitation is taking place.*

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

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

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

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

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

6. RECOMMENDATIONS

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

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

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

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

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

REFERENCES

Ades, G. and P. Crow, 2002. The Asian Turtle Rescue Operation: Temporary holding and placement at Kadoorie Farm and Botanic Garden, Hong Kong. *Turtle and Tortoise Newsletter 6*: 2–7.

Anon., 1991. Amendment to the Protection of Wild Life Act No. 76 of 1972. Law of Malaysia.

Anon., 1997. Wildlife Conservation Enactment 1997. Sabah

Anon., 1998. Laws of Sarawak, Chapter 26. Wildlife Protection Ordinance 1998. The Sarawak Government Gazette, 33 pp.

Anon., 2002. 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., 2003. 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., 2004. 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. 33, 10 pp.

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.

Azrina, L.A. and B.L. Lim, 1999. Legislative status of Chelonian species in Selangor, Peninsular Malaysia. *Malayan Nature Journal* 53(3): 253–261.

Baillie, J. and Groombridge, B., 1996. *1996 IUCN Red List of Threatened Animals*. IUCN, Gland, Switzerland.

Bowler, J.K., 1977. Longevity of reptiles and amphibians in North American collections as of 1 November, 1975. Society for the Study of Amphibians and Reptiles, Miscellaneous Publications, *Herpetological Circular 6*: 1-32.

CIA, 2007. CIA – The World Factbook – Malaysia. https://www.cia.gov/library/publications/the-world-factbook/print/my.html

Ernst, C.H., Altenburg, R.G.M. and R.W. Barbour, 2000 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

Fritz, U. and P. Havas, 2007. Checklist of Chelonians of the World. *Vertebrate Zoology 57*: 149-368.

Gregory, R. and D.S.K. Sharma, 1997. Review of legislation affecting marine and freshwater turtles, terrain, and tortoise conservation and management in Malaysia: recommendations for change. WWF Tabung Alam Malaysia Project Report, 45 pp.

Hilton-Taylor, C., 2000. *2000 IUCN Red List of Threatened Species*. IUCN, Gland, Switzerland and Cambridge, UK.

IUCN 2008. *2008 IUCN Red List of Threatened Species*. <http://www.iucnredlist.org/>. Downloaded on 11 October 2008.

Jenkins M.D., 1995. *Tortoises and Freshwater Turtles: The Trade in Southeast Asia*. TRAFFIC International, Cambridge, UK. Pp. 48.

Krebs, C.J., 1998. *Ecological Methodology*, 2nd edition. (New York: Harper Collins), 654 pp.

Lim, B.L. and I. Das, 1999. *Turtles of Borneo and Peninsular Malaysia*. Natural History Publications, Borneo, 151pp.

McCord, W.P. and H.-D. Philippen, 1998. A new subspecies of box turtle, *Cuora amboinensis* lineata, from Northern Myanmar (Burma), with remarks on the distribution and geographic variation of the species. *Reptile Hobbyist*. Pp. 51-58.

Mitchell, J.C., 1988. Population ecology and life histories of the freshwater turtles *Chrysemys picta* and Sternotherus odoratus in an urban lake. *Herpetological Monograph 2*: 40-61.

Moll, E.O., 1976. West Malaysian turtles: Utilization and conservation. *Herp. Review 7*: 163–166.

Moll, D. and E.O. Moll, 2004. *The Ecology, Exploitation, and Conservation of River Turtles*. Oxford University Press. Pp. 393.

PERHILITAN, 1992. Department of Wildlife and National Parks 1992. *Wildlife Plan for Peninsular Malaysia*. Department of Wildlife and National Parks, Kuala Lumpur, Malaysia, 66 pp.

Rogner, M., 1996. Schildkröten, Vol. 1 and 2. Heiro-Verlag, Hürtgenwald, Germany, 49 pp.

Rummler, H.-J. and U. Fritz, 1991. Geographische Variabilitaet der Amboina-Scharnierschildkroete *Cuora amboinensis* (Daudin, 1802), mit

Beschreibung einer neuen Unterart, *C. a. kamaroma* subsp. nov. Salamandra, 27(1): 17-45.
Schoppe, S., 2007. Non-detrimental finding methodology for the trade of Southeast Asian freshwater turtles and tortoises (Fam. Geoemydidae). Unpublished report for TRAFFIC Southeast Asia. Pp. 19.
Schoppe, S. (in prep.). Status, trade dynamics and management of the Southeast Asian Box Turtle *Cuora amboinensis* in Indonesia. A TRAFFIC Southeast Asia report.
Schoppe, S., (in press). *Science in CITES: The Biology and ecology of the Southeast Asian Box Turtle* Cuora amboinensis *and its local uses and trade in Malaysia*. A TRAFFIC Southeast Asia report.
Sharma, D.S.K., 1999. *Tortoise and Freshwater Turtle Trade and Utilisation in Peninsular Malaysia*. TRAFFIC Southeast Asia, Petaling Jaya, Selangor, Malaysia, 39 pp.
Sharma, D.S.K. and O.B. Tisen, 2000. Freshwater turtle and tortoise utilization and conservation status in Malaysia. In: van Dijk, P.P., Stuart, B.L. and A.G.J. Rhodin (Eds). Asian Turtle 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.
Shepherd, C.R., Burgess, E.A. and M. Loo, 2004. *Demand Driven: The trade of Indian Star Tortoises* Geochelone elegans *in Peninsular Malaysia.* TRAFFIC Southeast Asia, Kuala Lumpur, Malaysia. .
UNEP-WCMC CITES Trade Database, 2008. CITES trade statistics derived from the CITES Trade Database. UNEP World Conservation Monitoring Centre, Cambridge, UK. http://sea-bov.unep-wcmc.org/citestrade/
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.
Whitaker, R. and H.V. Andrews, 1997. Captive breeding of Indian turtles and tortoises at the Centre for Herpetology/Madras Crocodile Bank. In: J. Van Abbema (Ed.), *Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles - An International Conference*, pp. 166–170. July 1993, State University of New York, Purchase. New York Turtle and Tortoise Society, New York, 494 pp.
Wilbur, H.M., 1975. The evolutionary and mathematical demography of the turtles *Chrysemys picta*. *Ecology 56*: 64-77.

THE SOUTHEAST ASIAN BOX TURTLE *CUORA AMBOINENSIS* IN MALAYSIA

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The Southeast Asian Box Turtle *Cuora amboinensis* is a widely distributed freshwater turtle native to Southeast Asia. The species occurs in natural and man-made wetlands. The global and national conservation status of the species is "Vulnerable". From 1998-2004 export has been managed through a quota system with the purpose of population management and sustainable use. Malaysia used to be after Indonesia the second most important source of specimens to the international market, mainly to supply East Asian tonic food and TCM markets, but also European, Japanese and USA pet markets. In 2005, the CITES Managed Authority banned export.

TRAFFIC Southeast Asia (SEA) proposes a NDF methodology using criteria that were assessed during fieldwork in 2006: legislation and enforcement; trade levels; extent of illegal trade; reproduction biology; composition of wild populations and individuals in trade; abundance in an exploited man-made habitat; and abundance in harvest. Results show that the species is not covered by Malaysian State and consequently also not by federal legislation. All specimens are wild caught, year around and disregarding size but large individuals are preferred. Main local users are indigenous people and Thai along northern border towns who use the species for food, and ethnic Chinese who mainly use the species in religious ceremonies. Export is only regulated through CITES regulations, and awareness and law enforcement is rather weak, and illegal international trade a major issue. There are three main export routes with final destinations in China (70%) and Singapore (30%). Despite export ban since 2005, 19.5% of people in the possession of the species, supply the export market. Among 38 traders, 60.5% export, and only the remainder supply the local market. Most or all individuals for the international market are sourced out from Peninsular Malaysia only. The slow reproductive rate of the species makes it very vulnerable for exploitation and at the same time makes captive breeding an unfeasible endeavour, which is therefore not practiced in the country. Individuals encountered in the wild and in trade were measured and means calculated. These data may serve as baseline data for further comparative studies. Since larger size classes are targeted for the large-scale consumption trade a smaller mean size of individuals in trade compare to the mean size in the wild may be related to over-exploitation of larger size classes. A survey to assess the abundance of the species in an exploited man-made habitat revealed an estimated density of 0.82 ind./ha. These data may serve as baseline data. Generally, if off-take is sustainable population density will be lower but stable. The encountered low density cannot possibly be sustainable but indicates over-exploitation. The population was composed of 79.2% immature versus 20.8% mature individuals; sex ratio was M1:F1.5. The size-frequency distribution of the population is not normally distributed indicating most probably over-exploitation. To determine the abundance in harvest a 38-day lasting harvest survey was conducted at two middlemen in Selangor. Results indicate that one middleman can trade a conservative mean of 1823.7 individual/year. If catch per unit effort (CPUE) can be sustained over the years, exploitation might be sustainable, if CPUE decreases over the years, over-exploitation is taking place. Ninety-eight percent of the catch of those traders was composed of larger individuals; sex ratio was 1M:1.6F. Such dominance of adults and females in harvest should be closely monitored for potential over-exploitation. The assessment of the harvest impact on the species all over the country indicate that populations are over-exploited or even locally extinct in every State, especially around trade centres and near cities.

Major problems found in the elaboration of the NDF are the lack of past density / population size data to compare present results with; the enormous amount of illegally traded individuals and the long chain of people involved in the illegal business. In the absence of quantitative data on local populations of the Southeast Asian Box Turtle criteria that might indicate changes in the local abundance that should be assessed on a regular basis are recommended.

The Southeast Asian Box Turtle *Cuora amboinensis* (Daudin, 1802)

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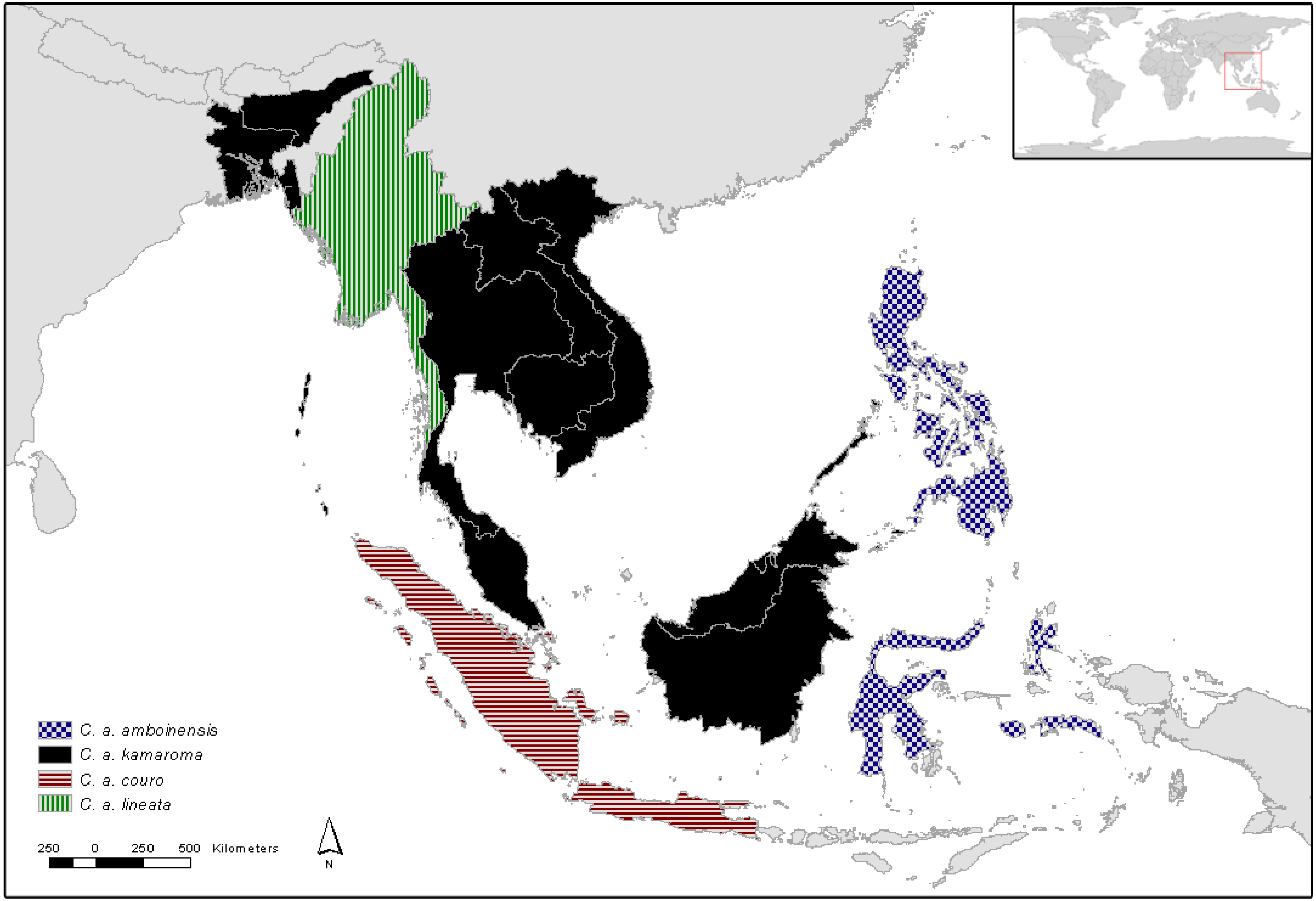
Outline

1. Names, Distribution, General Bio and Eco	
2. Case Study from ID	3. Case Study from MY
Species Management	Species Management
Utilization and Trade	Utilization and Trade
Non-detrimental finding procedure	Non-detrimental finding procedure
4. Evaluation of Data	
5. Problems and Challenges	
6. Recommendations	

Names

- Southeast Asian Box, Wallacean Box Turtle, Malayan Box Turtle, Indonesian Box Turtle, Burmese Box Turtle
  - In Indonesia: Kura Kura or *Kura Kura ambon, Kura Kura kuning, Kura Kura batok, Kura Kura PD, Baning Banya, Kura Kura katup, Kura kura tangkop, Kangkop.*
  - In Malaysia: Kura Kura, *Kura Katap, Kura kura patah*.

Distribution of *Cuora amboinensis*



Biological Characteristics

- Primary sex ratio about 1:1;
- Males slightly smaller/lighter than females;
- Low reproductive rate;
- Incubation 67-120 days;
- Hatching success ca. 50% in captivity;
- Survival rate not known;
- Life expectancy 25-30 years;
- Generation time is 18 years;
- Does not migrate seasonally or geographically.

Habitat

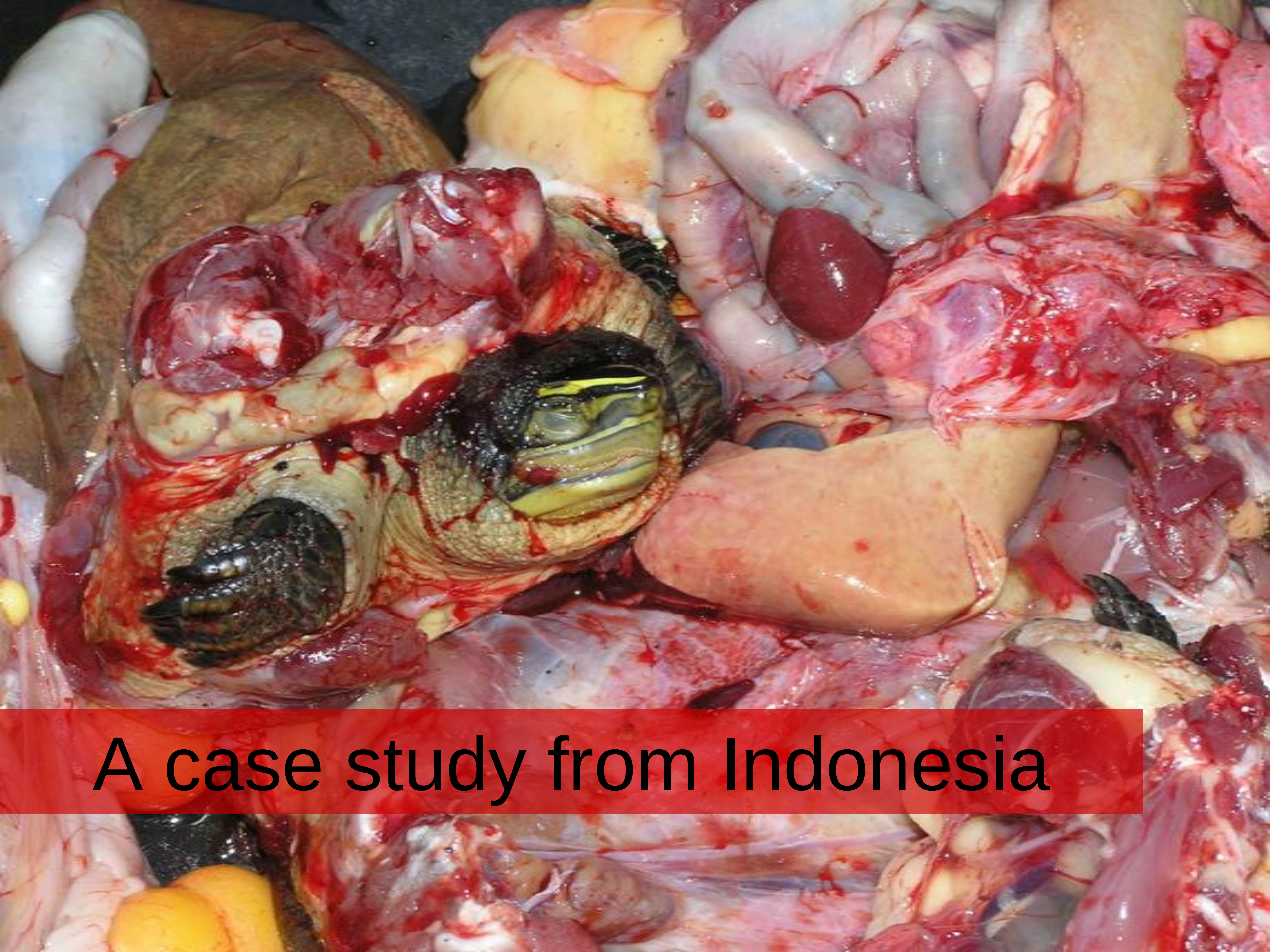
- Semi-aquatic;
- Natural and man-made wetlands:
  - Swamp and peat swamp forests, *Melaleuca* swamps, permanent or temporary wetlands, and shallow lakes.
  - Flooded rice fields, oil palm and rubber plantations, irrigation ditches, canals, orchards, vegetated drainage systems, ponds and pools;
- Habitat generalist, adaptable to man-made habitats, tolerant.

Role in the Ecosystem

- Omnivorous but primarily vegetarian;
- Forages on aquatic plants, aquatic insects, molluscs, and crustaceans in the water and on plants, fungi, and worms on land ;
- Being a predator of various invertebrates it might help to stem occurrence of invertebrate-borne diseases;
- Seed disperser;
- Eggs and hatchlings are an important source of food for vertebrates.

Global Population Size and Conservation Status

- No quantitative information available;
- Decreasing trend;
- Low risk / near threatened from 1996 to 1999;
- Vulnerable since 2000;
- CITES Appendix II in 2000.


A case study from Indonesia

National Conservation Status

- Vulnerable (IUCN, 2008);
- Common and widespread in the western part of the country and abundant in most areas with natural or man-made wetlands (Anon., 2006);
- Reduced and still decreasing (Anon., 2002; Schoppe, in prep.).

Main Threats

- Harvesting
- Unregulated illegal trade
- Main supplier for international meat & TCM, and pet markets.

Management

- Unlimited exploitation until 1990 (Jenkins,’95).
- 1991-94: annual export allotment of 10 000 ind. (Jenkins, ‘95).
- Among 10 most heavily traded turtles 1998-99 (Lau et al., 2000).
- Management plan in accordance with CITES listing.
  - Sustainable use (Anon., 2002).
- Quota system to regulate harvest and export.

Monitoring and Legal Framework

- Based on issued export permits.
- Low (Anon., 2002).
- Nationally not protected
- Quota for live individuals only (Anon., 2003).
- Basis for quota setting questionable.

Utilization and Trade

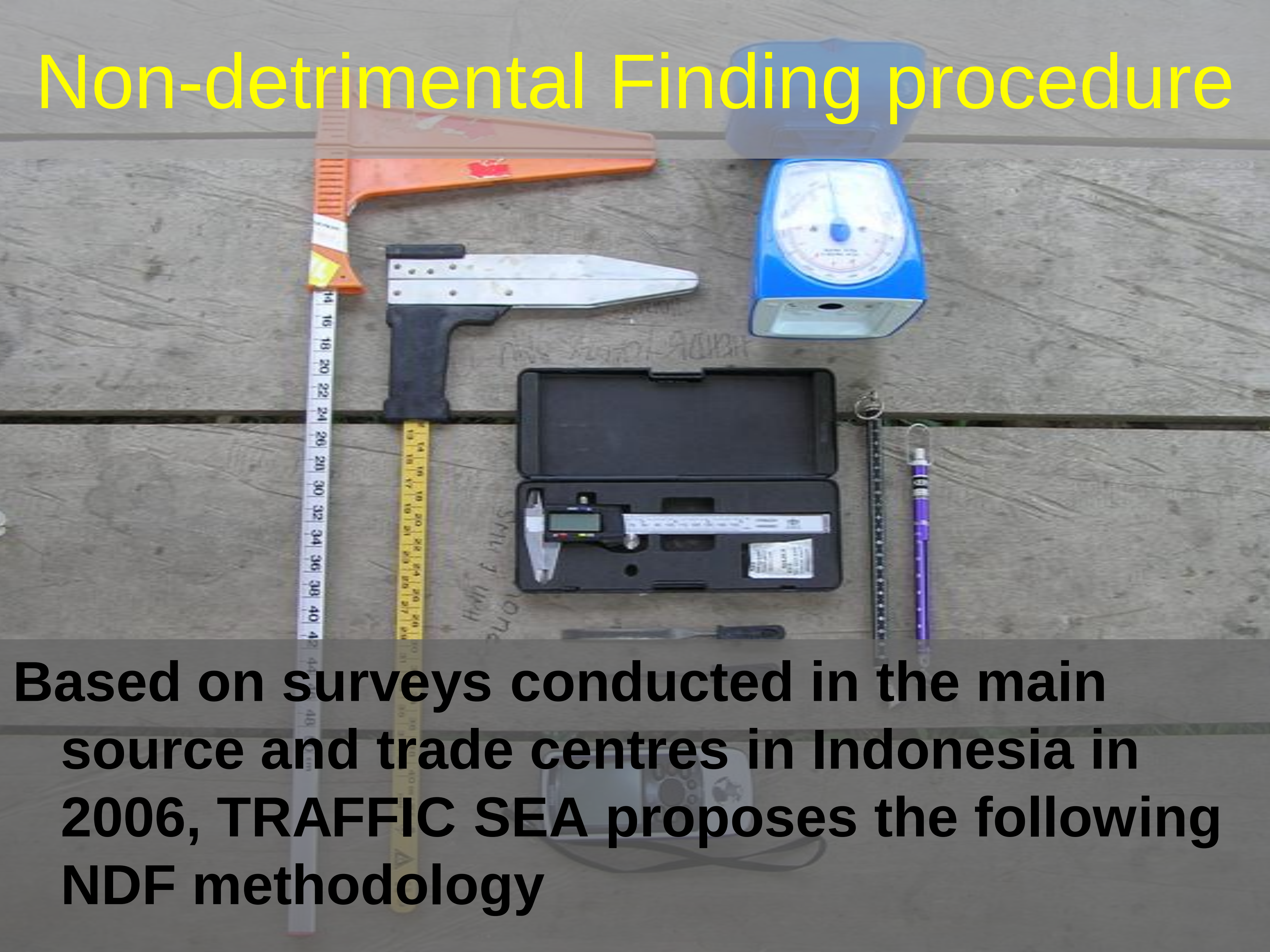
- All wild caught;
- Tonic food, TCM (childbirth, nocturnal urination, asthma, cancer), merit release, and as pet;
  - 10% of harvest quota for local use
    - Mainly ethnic Chinese;
  - 90% export: China, Hong Kong, Singapore, Taiwan, Viet Nam, Europe, Japan, USA
    - Tonic food and TCM,
    - Pet.

Harvest and Management

- All extractive, year-around, all sizes, preferably large;
- Country-wide, to lesser extent in protected areas;
- Hand captured or trapped.

Legal and illegal trade levels

- **Legal trade (20 000 live ind.)**
  - Annually 18 000 individuals for export
  - 30% pet trade and 70% meat/TCM trade
- **Illegal trade**
  - Hong Kong , China, Singapore and Malaysia
  - Live and shell, especially plastron
  - Increase in plastron trade since 2000

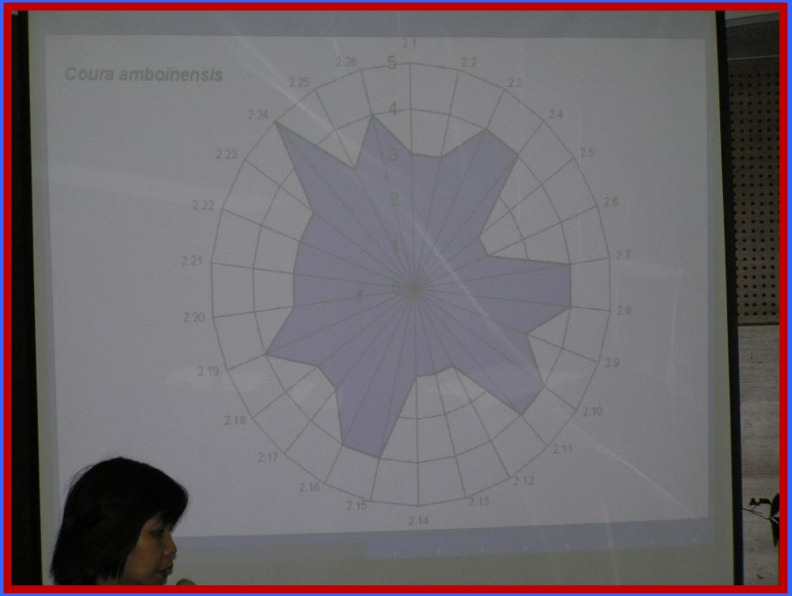


Non-detrimental Finding procedure

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

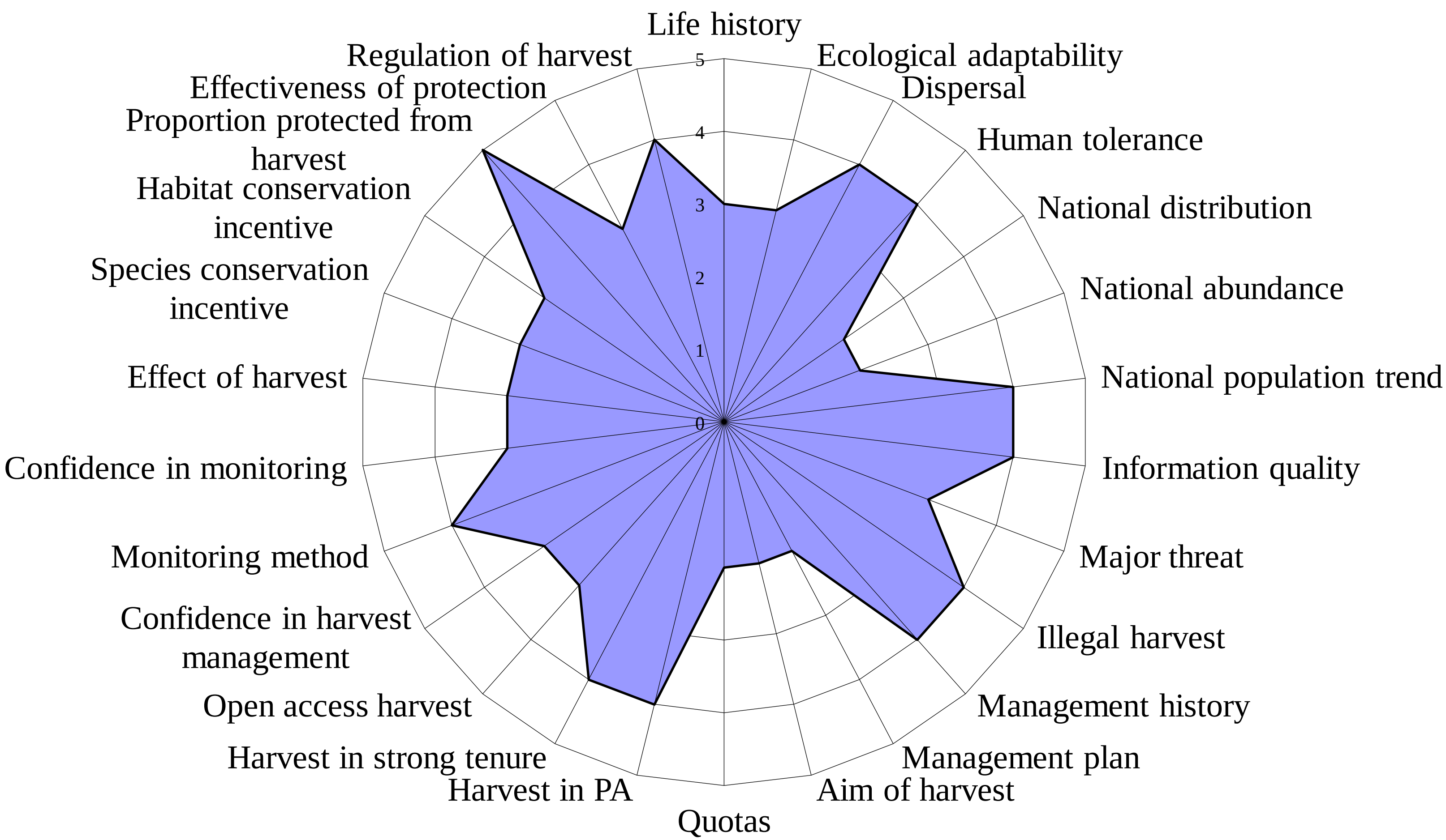
Risk-assessment checklist

- In April 2002, by members of the Indonesian CITES MA and SA (Anon., 2002).
- After fieldwork in 2006, by TRAFFIC SEA (Schoppe, 2007).

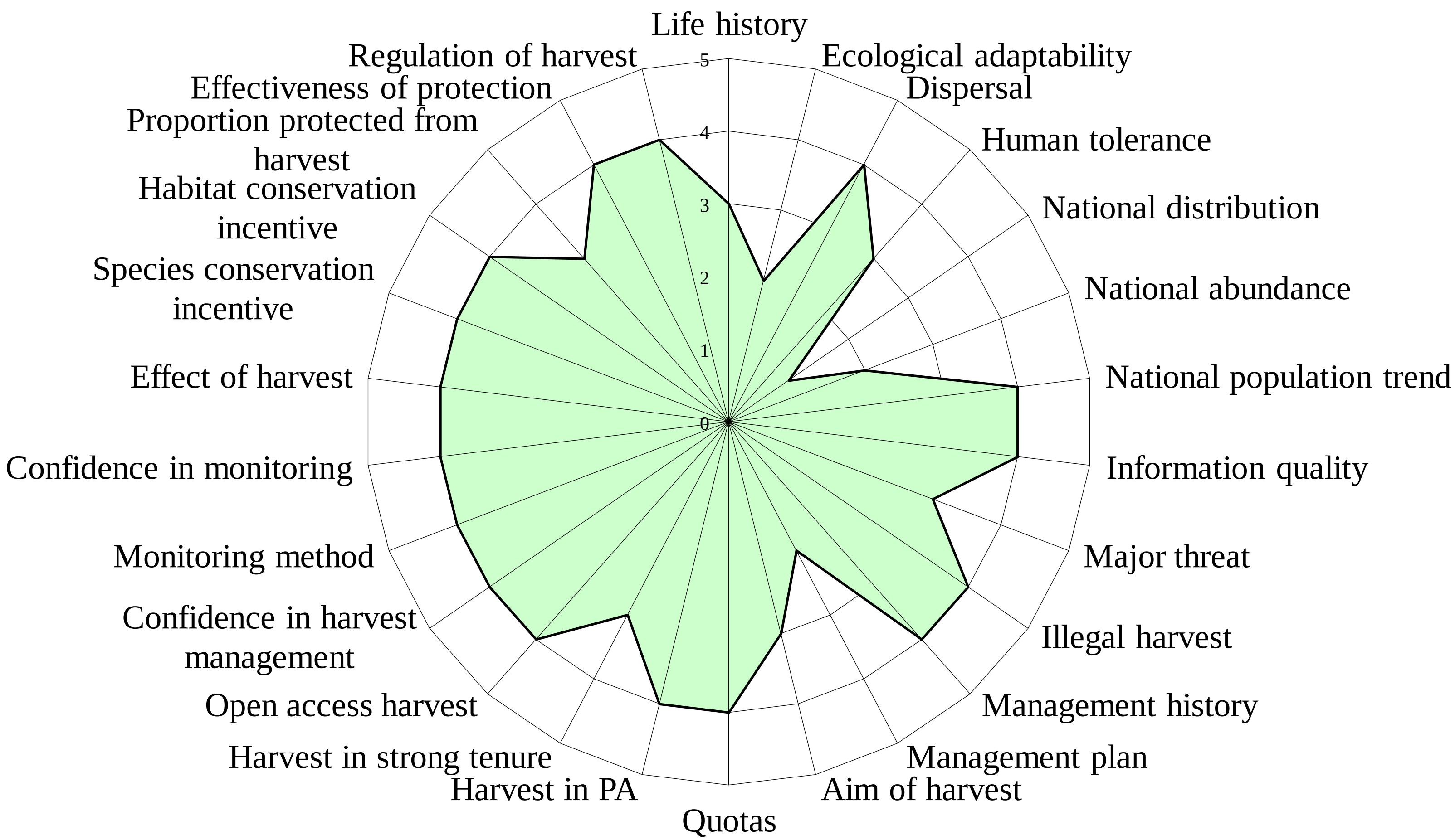


➔Low confidence in harvest management,
➔Data deficiency.

CITES MA & SA 2002



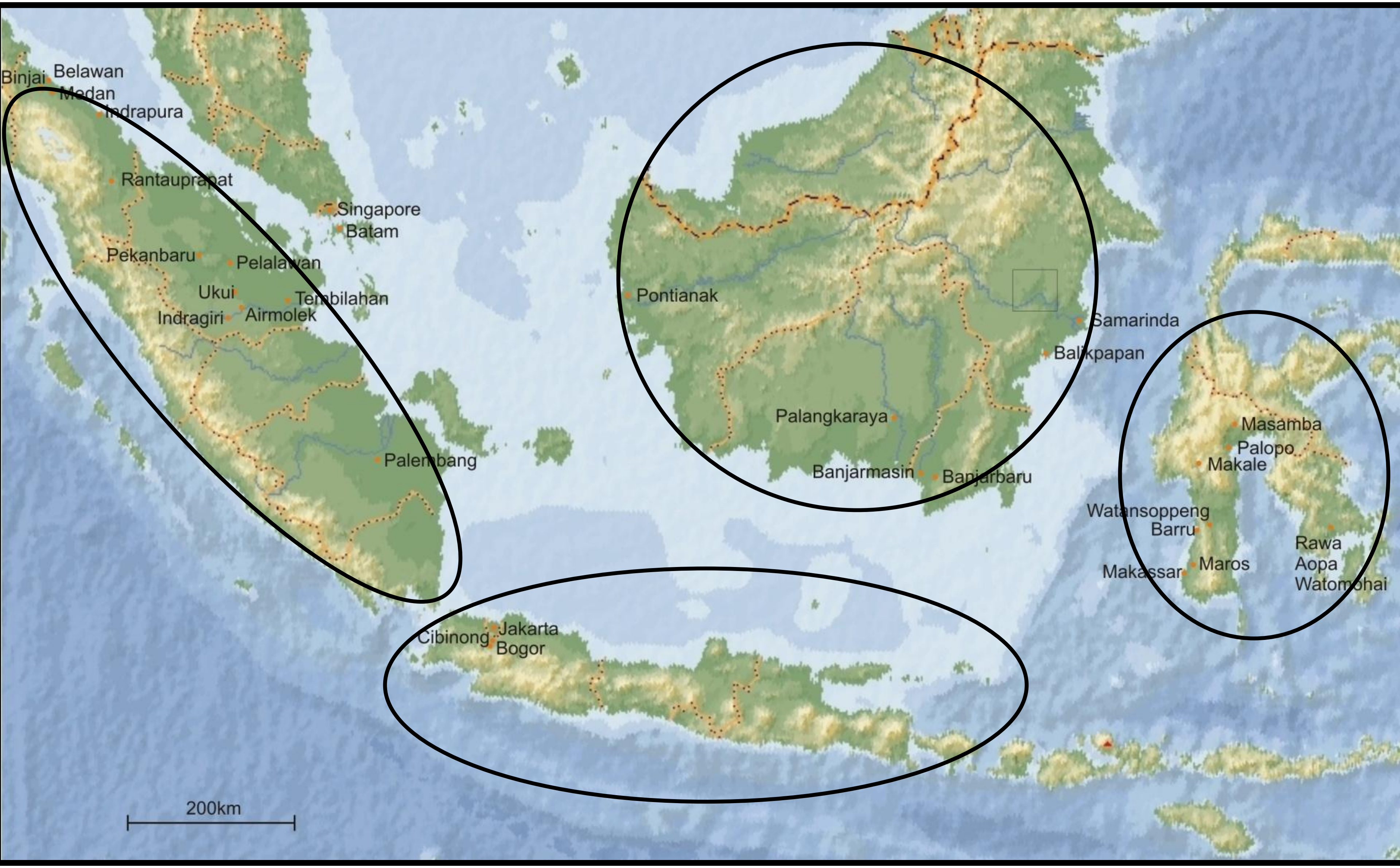
TRAFFIC SEA 2006



Criteria, parameters and/or indicators

1. Legislation and enforcement;
2. Trade levels;
3. Extent of illegal trade;
4. Reproduction biology;
5. Composition of wild populations and of individuals in trade;
6. Abundance in an unexploited area;
7. Abundance in harvest and impact.

Methodology and Findings



Legislation and Enforcement

CITES online, CITES MA, NGOs, Academe

- ➔Substantive legislative framework;
- ➔Stronger than that of many neighbouring countries;
- ➔detailed, complex and difficult licensing and permit system.

Interviews: law enforcers, trappers, traders

- ➔Very weak enforcement;
- ➔Rampant illegal trade.

Trade Levels

CITES annual reports, UNEP-WCMC CITES Trade Database, traders, researchers, seizure records, and press releases:

➔Remains among the most abundantly traded freshwater turtles;

➔Highest harvest quota of all hard-shelled turtles: 20 000 (2001-today).

➔Such excessive exploitation over a large period of time cannot be sustainable.

Local Utilization

Interviews at markets, pet shops, traders:

- ➔10% allotted;
- ➔Negligible local use;
- ➔Price of juveniles ranged from USD 0.3-13.6 (mean USD 3.84) per individual;
- ➔Price of adults ranged from USD 2.7-10.9 (mean USD 5.33)/ind.

Legal international Trade

Pet Trade

- ➔14 companies;
- ➔2/3 of quota;
- ➔Preferably small (≥100mm MeCL);
- ➔Decrease & local extinction;
- ➔Purchase price: USD1.74-2.17/ind.;
- ➔Sales price: USD3.5-8.0/ind.

Meat & TCM Trade

- ➔4 companies;
- ➔1/3 of quota;
- ➔Large individuals, preferably adults (≥160mm MeCL)

Illegal trade

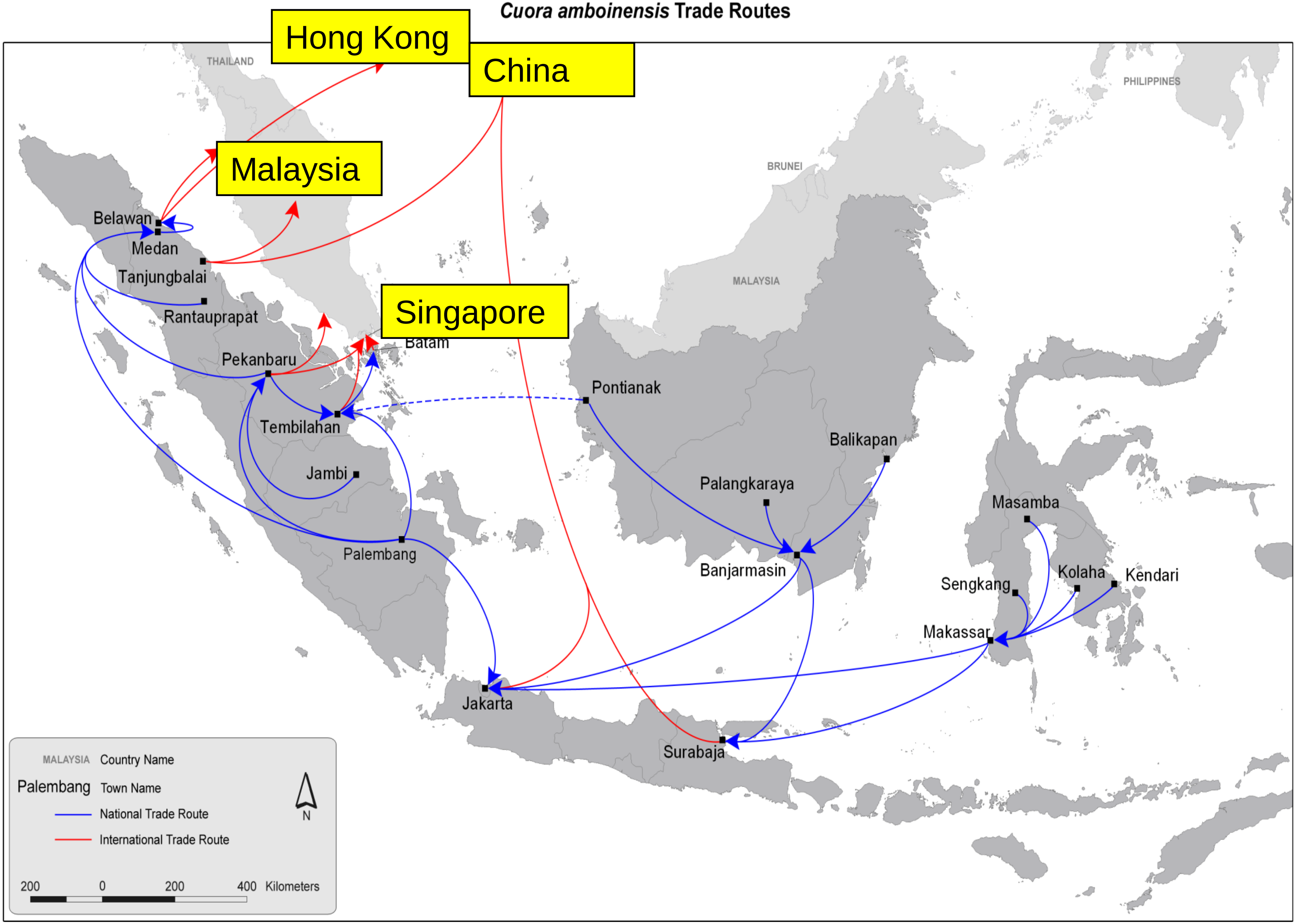
Actual visits, assessment of stocks, interviews:

- ➔18 illegal traders;
- ➔50kg to 18 000kg week per trader;
- ➔Together average of 19 160kg or 23 950 ind./week.

Commodity	Mean price (USD/kg)
Plastron	6.65
Mixed shell	3.06
Live	2.41
Carapace	1.09

➔Plus export excess of registered exporters (estimated 52 000kg/annually).

Cuora amboinensis Trade Routes



Reproduction biology

- Published and unpublished material enriched with observations during field surveys:
  - 6 eggs/year ⇨ 3 hatchling ⇨ ? adults;
  - age at maturity 5-6 years

  ➔ Vulnerable for exploitation




Captive breeding

Surveys of companies, and captive breeding reports

- ➔nobody currently breeds;
- ➔economically not feasible for consumption trade;
- ➔Individuals declared captive bred should be investigated.

Baseline data on size

Mean ± SD and range in MeCL of *C. amboinensis* from different sources		
Subspecies	**Size**	**Remarks**
C. a. kamaroma	165.9±31.3 (65.5-215-0), n=678	Flood plain, trade
C. a. amboinensis	134.5±44.6 (51.5-200.0), n=68	Peat swamp forest, protected, mark-recapture
C. a. amboinensis	149.9±24.9 (121.5-190), n=20	Natural wetlands (marsh), trade
C. a. couro	131.1±40.3 (55.6-214.0), n=200	Man-made habitats, plantations, trade

Monitor Trends in Size

- ➔ Larger size classes are targeted for the consumption trade.
- ➔ A smaller mean size in trade compare to the wild is related to over-exploitation of larger size classes.
- ➔ A significant decrease in mean size over time would indicate unsustainable exploitation considering that the larger individuals are mainly targeted for export.

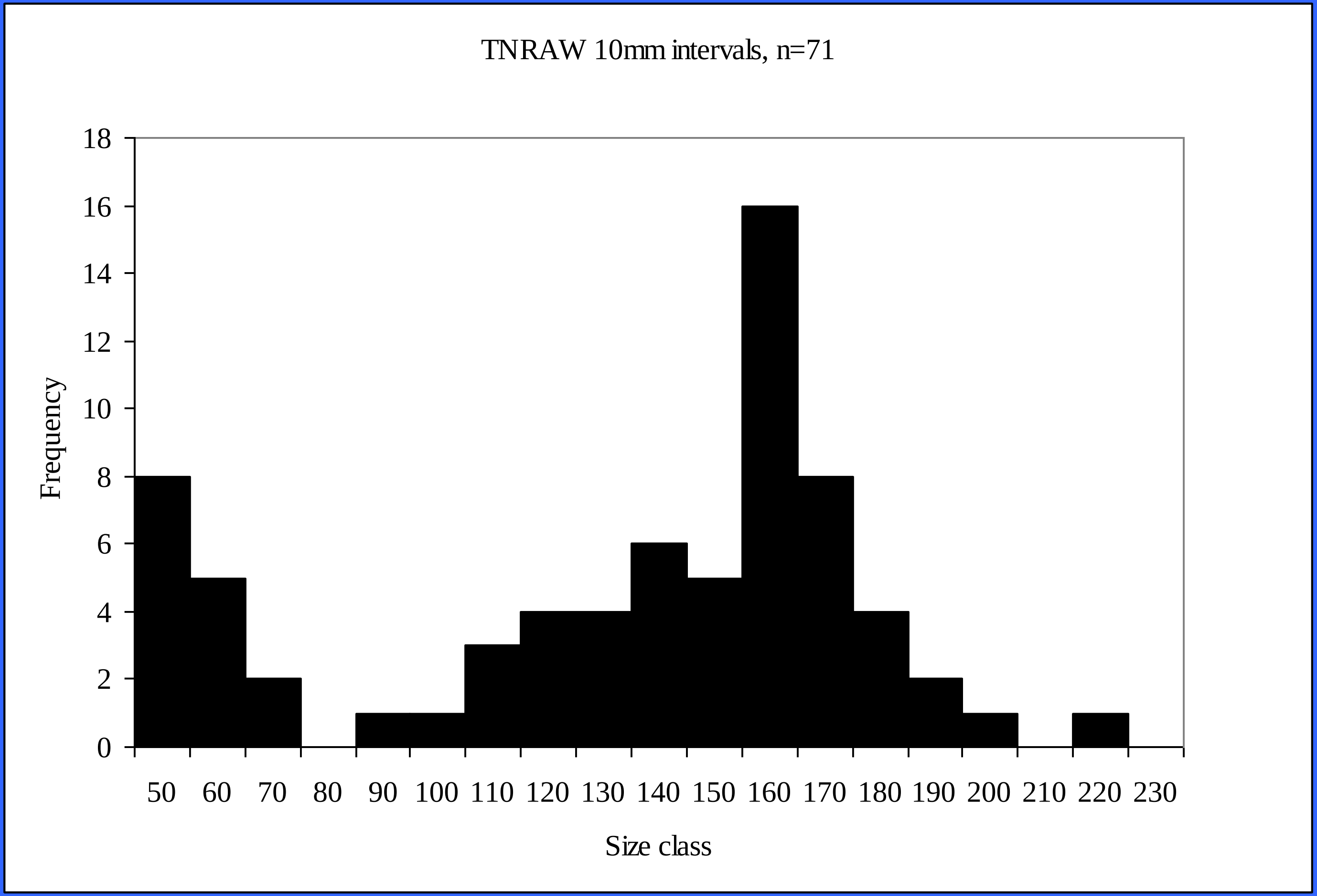
Composition of natural population

Mean ± SD and range sizes (mm) and body weight (g) of specimens caught in 6-week mark-recapture survey in Sulawesi.						
Sex	**Median Carapace Length**	**Maximum Carapace Width**	**Median Plastron Length**	**Plastron Width**	**Body Height**	**Weight**
Female (n=28)	159.6±23.0 (118-200)	121.8±10.2 (103-140)	148.7±22.7 (106-182.8)	75.3±9.2 (60-92.6)	64.1±10.0 (42-79.0)	630.8±238.9 (240-1080)
Male (n=24)	159.9±20.1 (110.5-177)	118.0±13.5 (97.0-158.5)	136.9±11.4 (103.5-12.5)	69.7±4.7 (58-79.5)	62.4±24.9 (46-70.0)	544.8±134.3 (220-840)
Juv. (n=19)	67.6±16.9 (51.5-110)	62.6±15.8 (48.6-100.9)	59.6±16.2 (47.4-102)	34.4±9.8 (27-62.0)	27.2±7.0 (22-24.0)	57.5±57.3 (20-220)

Baseline for comparison with other natural populations

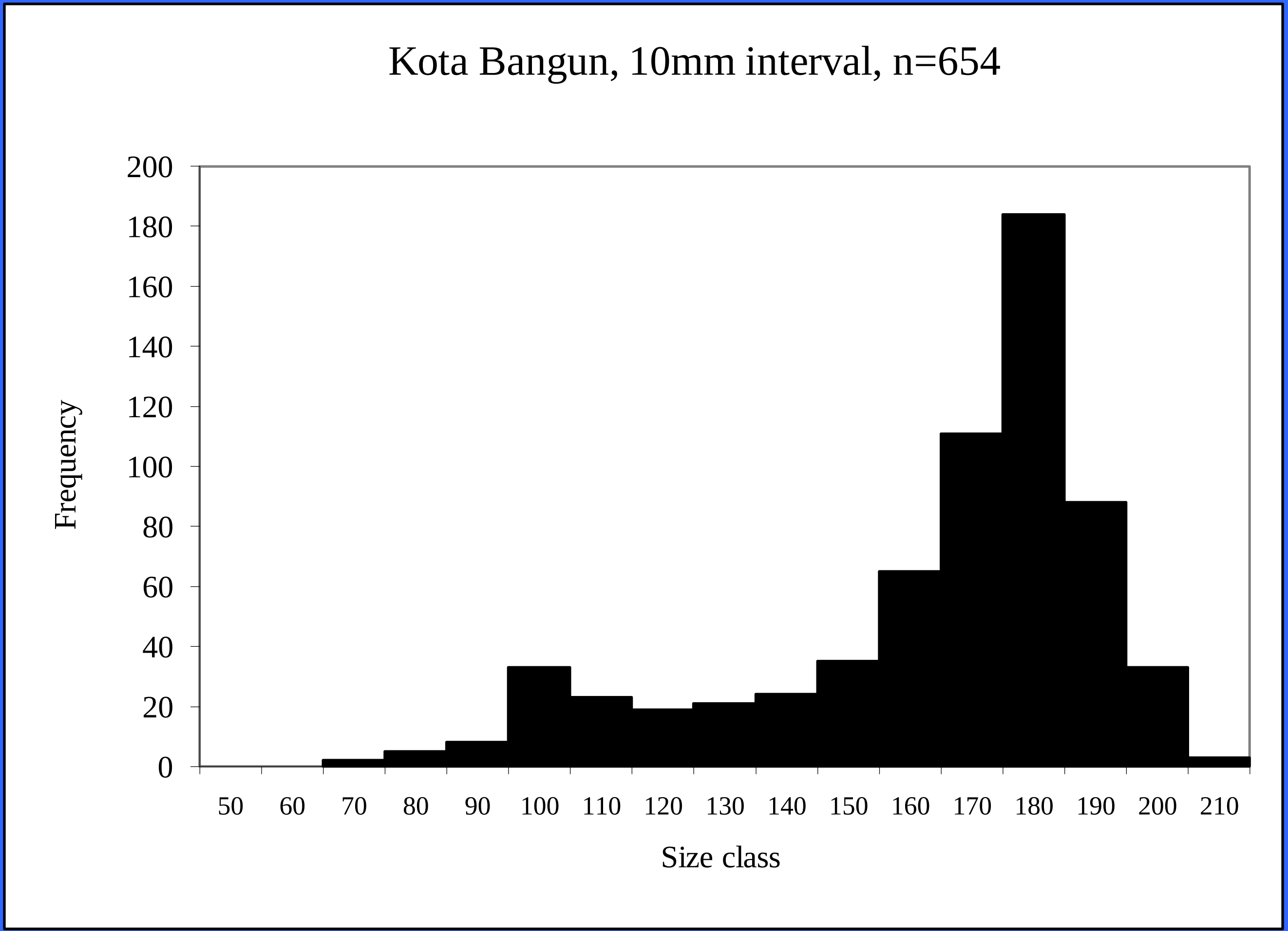
Size-frequency in the wild

- 54.9% immature
- 45.1% mature
- Normal distribution



Composition in harvest

- Of 1547 individuals 95.8% were mature and 4.2% immature.
- Of 654 measured, 74% were mature.
- Clear preference for large individuals



Sex ratio

Determined for individuals encountered in the wild and in trade

- 1M:1.2F in protected natural habitat (Sulawesi)
- 1M:1.03F in exploited natural habitat (Kalimantan)
- 1M:1.5F in exploited man-made habitat (Malaysia)

➔Primary sex ratio should be 1:1 or slightly in favour of females (1:1.1-1.3)

➔Collectors target male and females equally since the difference in size among the genders is minor.

➔A biased sex ratio can be related to over-exploitation in general or to over-exploitation of one gender.

Abundance in the wild

Mark-recapture survey in a peat swamp forest in National Park in Kendari, SE Sulawesi, from 29.04.-10.06.2006

Population size estimate after Schumacher and Eschmeyer (Krebs, 1998).

➔71 individuals caught

➔120 estimated population size

➔60 individuals/ha is estimated density

Abundance in harvest

- Natural wetland in Kalimantan, known for exploitation
- Stocks of 4 middlemen from 24.06-05.08.2006

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	7066.0
C	85	2.7	79.7	956.3
D	72	2.3	67.5	810.0
Total A-D	**1547**	**37.2**	**1117.0**	**13 403.5**
Mean A-D	**386.8**	**9.3**	**279.2**	**3350.9**

Assumptions

- ➔Only densities from similar habitats, and under similar seasonal conditions are directly comparable.
- ➔Lower density in a similar natural habitat might indicate over-exploitation;
- ➔If off-take is sustainable population density will be lower but stable;
- ➔A continual decline in density would indicate over-exploitation;

Monitoring of Trends

Exploited man-made habitat in Malaysia: annual mean of 1824 individuals

➔ man-made versus natural habitat ?

Catch (CPUE) stable

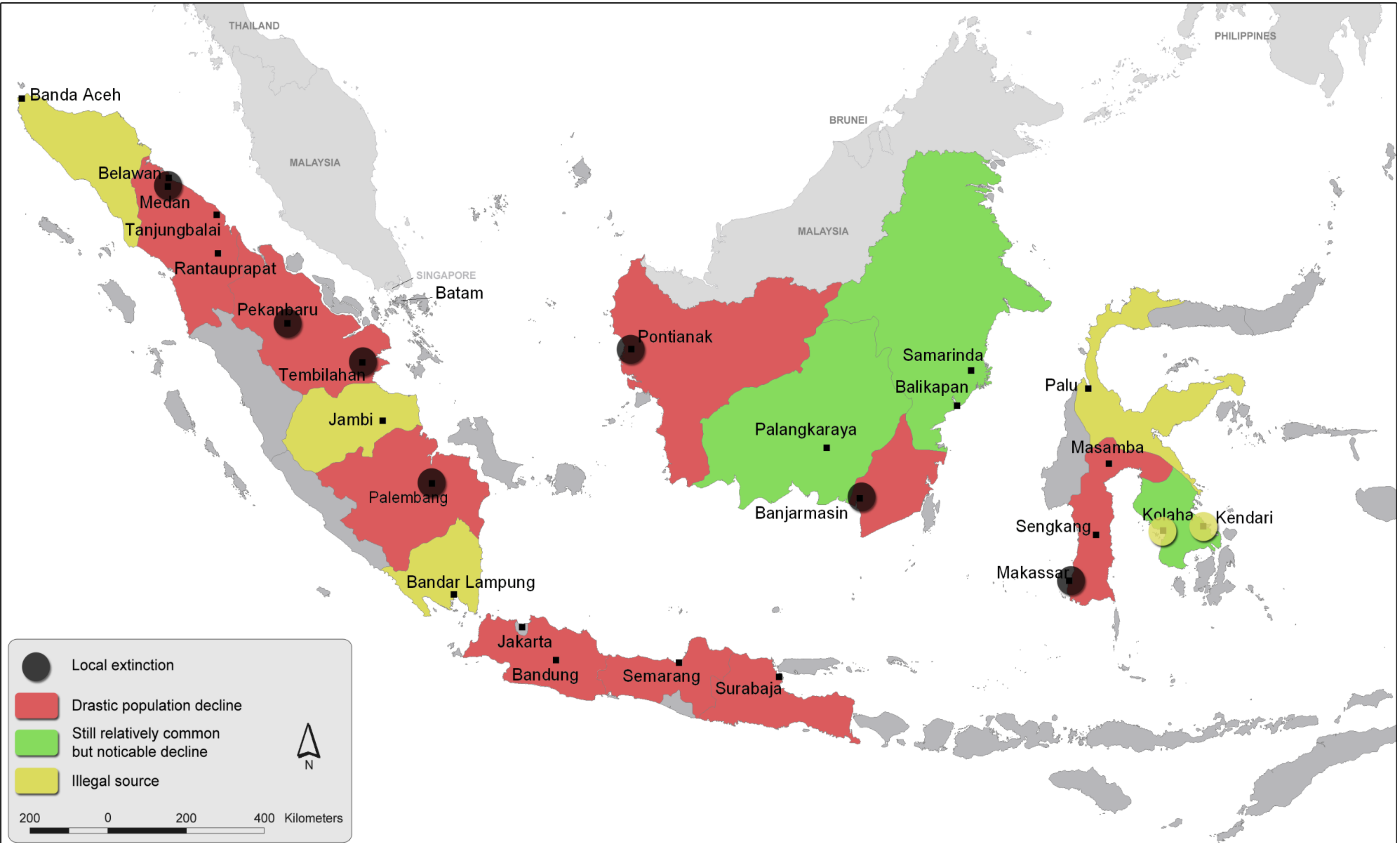
➔ sustainable

CPUE decreases

➔ over-exploitation

Abundance / Harvest impact

***Cuora amboinensis* Abundance**




A case study from Malaysia

National Conservation Status

- Vulnerable (IUCN, 2008);
- Most common turtle in the wild and in markets (Lim and Das, 1999);
- Abundant in States with wetlands (Sharma and Tisen, 2000);
- Reduced in multiple locations (Sharma, 1999; Sharma and Tisen, 2000);
- Common and vulnerable (Azrina and Lim, 1999);
- Reduced and still decreasing (Schoppe, 2007);
- Extremely vulnerable to over-exploitation (Jenkins, 1995, Gregory and Sharma, 1997; ...)

Main Threats

- Harvesting;
- Over-exploitation (Lim and Das, 1999; Sharma and Tisen, 2000);
- Habitat alteration (Sharma and Tisen, 2000);
- Pollution (Lim and Das, 1999).

Management History and Purpose

- Unregulated international trade before 2000;
- Ongoing unregulated harvest for local use in Peninsular; permit regulated in Sabah and Sarawak;
- Quota system to regulate harvest for international trade from 2000-2004;
- Population management and sustainable use.

Elements of Management Plan

- Based on realized export of previous year and stocks in collection centres;
- Harvest ban in 2004;
- Recommended for large-scale captive breeding;
- Export ban since 2005.

Monitoring and Legal Framework

- Low confidence;
- Not covered by State law → not by federal law;
- Export regulated under CITES;
- Peninsular: Amendment of Protection of Wildlife Act in 1991;
- Sabah: Wildlife Conservation Enactment 1997;
- Sarawak: Wildlife Protection Ordinance 1998.

Utilization and Trade

- All wild caught;
- Meat, TCM, merit release, pet;
- Extensive but unknown volumes for local use (11% indigenous people, Thai, 35% ethnic Chinese);
- Extensive export to East Asia
  - 456 541 exported in 1999,
  - 333 099 imported between 2000-2005.
- Pet trade to Europe, Japan and USA:
  - 12 785 imported between 2000-2004.

Harvest and Management

- All extractive, year-around, all sizes but preferably adults;
- Hand captured or trapped;
- Source of export limited to Peninsular;
- Country-wide but to lesser extent in protected areas.

Legal trade

Export

Year	Reported exports
2000	277 190
2001	35 036
2002	38 746
2003	13 957
2004	33 835
Tonic Food & TCM to East Asia; pet trade to Europe, Japan, USA (~5%)	

Local use

- Not regulated in Peninsular
  - Difficult to quantify;
  - 1-100 per religious ceremony;
  - 10 per meal;
- Permits required for Sabah and Sarawak
  - Consumption and pet

Illegal trade before ban in 2005

- Seizure records:
  - 11.12.2001: Hong Kong Customs seized 10 000 Asian turtles (Ades and Crow, 2002).
  - March 2003: 6t seized in Hanoi (C. Shepherd, TRAFFIC SEA, *in litt.* to J. Thomson, 09.'02).
  - 2003: Customs in Xiamen confiscated 5000 SEA Box Turtle from Malaysia (Anon., 2004).
- Reported imports (CN, HK, SG):
  - 2003: 129 577 ind. & 600kg
  - 2004: 74 293 ind. & 200kg (CITES trade statistics).

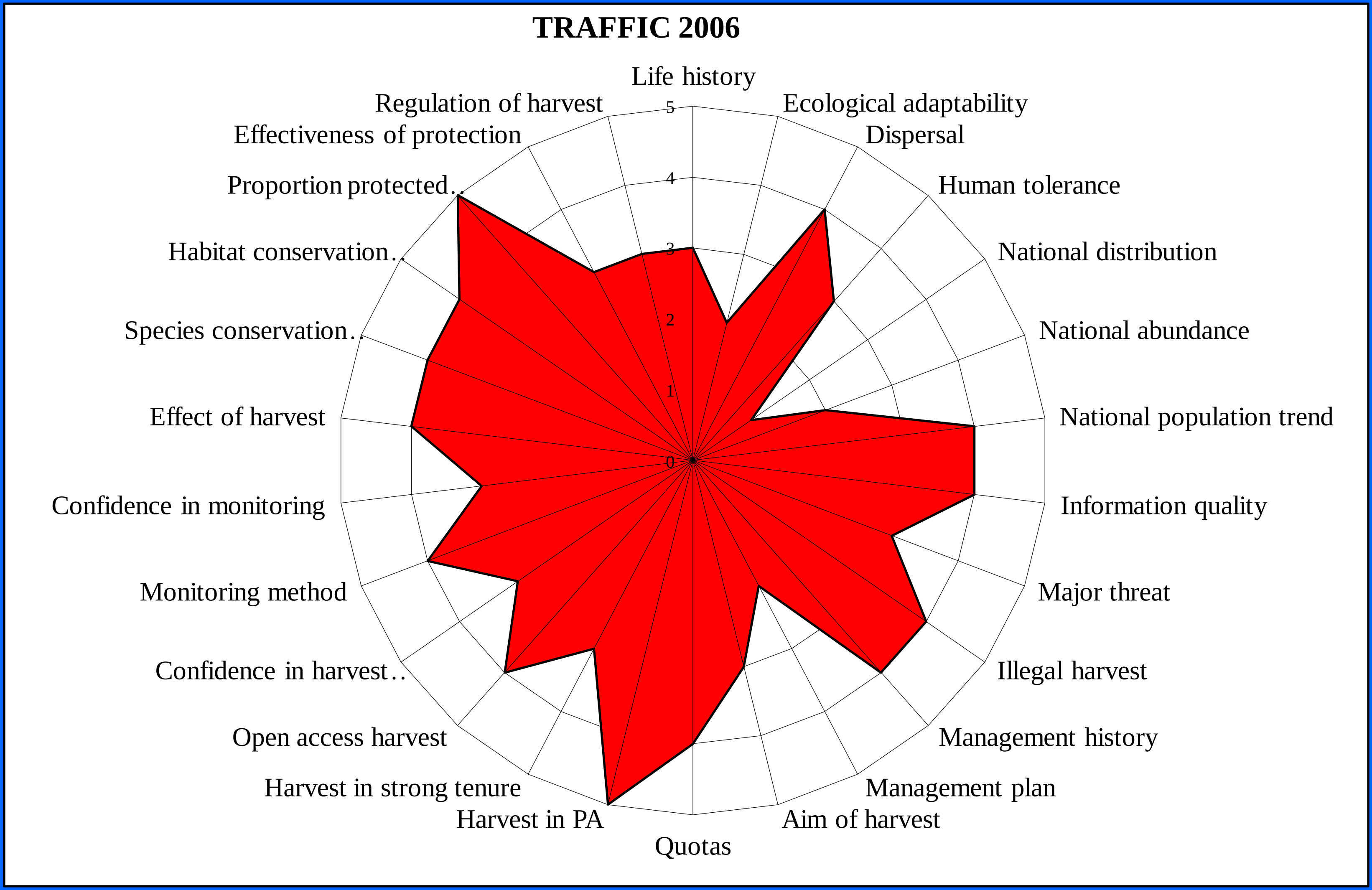
Illegal trade after ban in 2005

- In 2005, CN and SG reported imports of 33 969 ind. and 390 kg plastron from Malaysia.
- In 2006, an estimated 22 000 were exported by 12 suppliers.

Non-detrimental Finding procedure

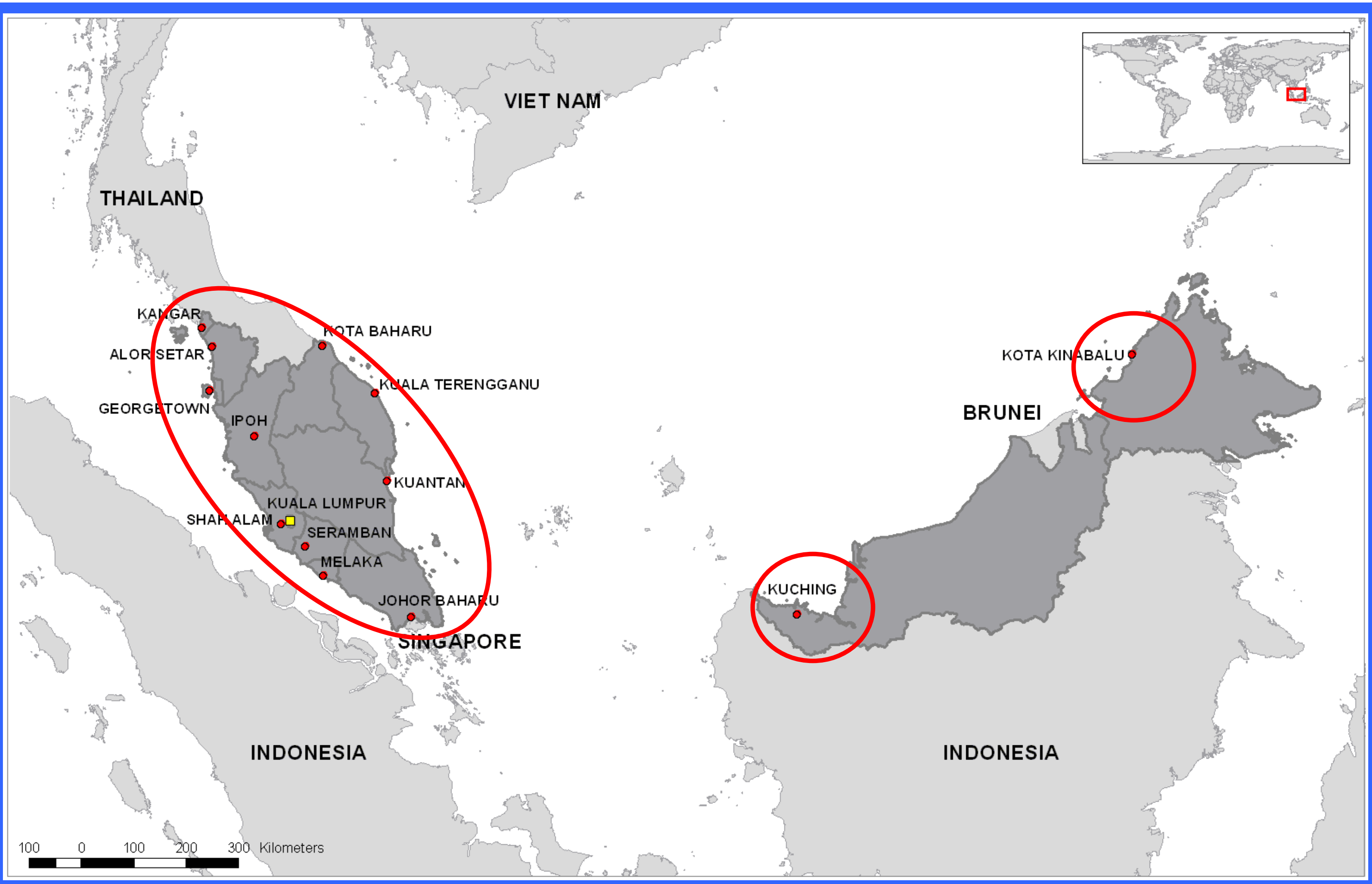
- Based on surveys conducted in the main source and trade centres in Malaysia in 2006, TRAFFIC SEA proposes the following NDF methodology

Risk-assessment checklist



Low confidence in the harvest management

Survey Sites



Criteria, parameters/indicators

1. Effectiveness and implementation of legislation;
2. Trade levels;
3. Extent of illegal trade;
4. Reproductive biology;
5. Composition and size-frequency distribution in the wild and in trade;
6. Abundance of the species in an exploited man-made habitat;
7. Abundance in harvest and impact.

Legislation / Enforcement / Trade levels

- CITES MA annual reports,
- CITES Trade Database,
- Herpetologists,
- Traders,
- Seizure records,
- Press releases, and
- Actual surveys.

Legislation and Enforcement

Weak enforcement;

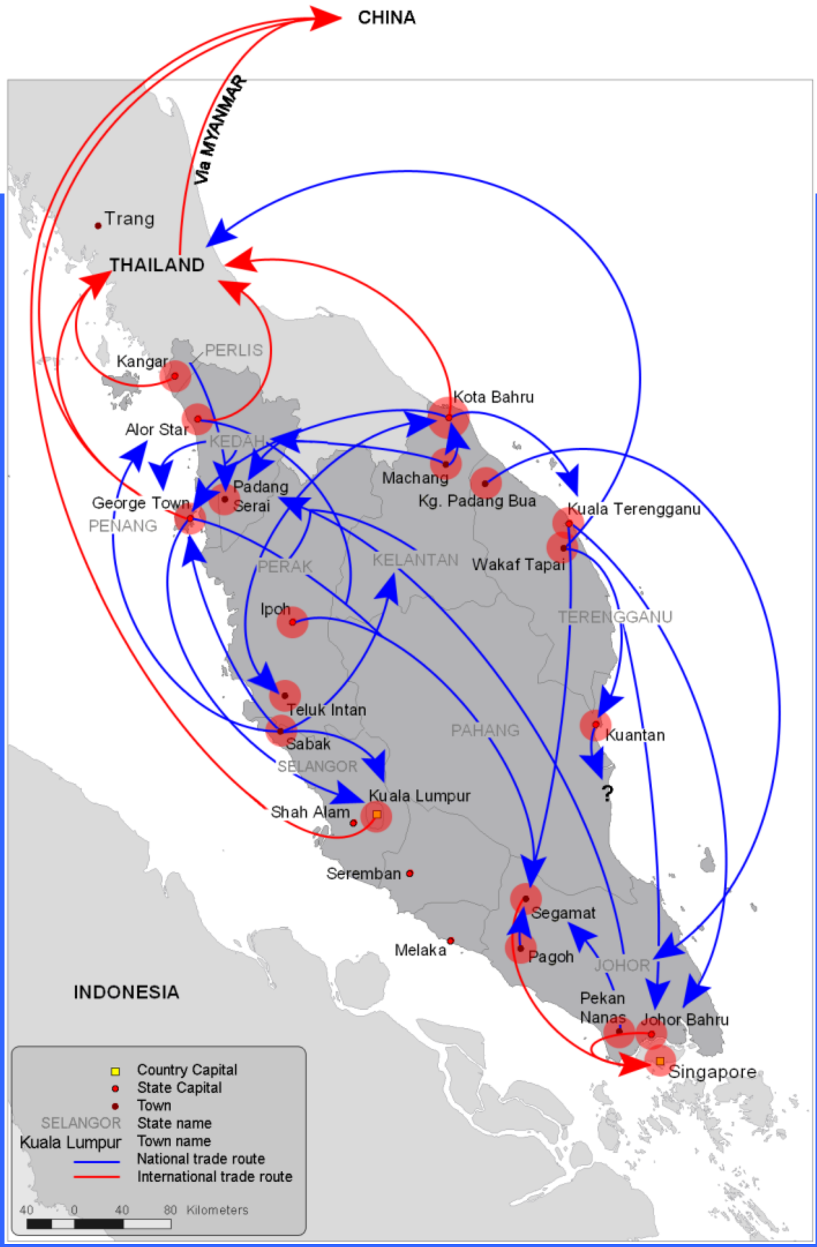
Illegal trade major issue:

- Among the 6 main routes for illegal international trade from Indonesia, 3 go to Malaysia (Schoppe, *in prep*.):
  1. Medan to Hong Kong and Penang,
  2. Tanjung Balai to Hong Kong, China, and Malaysia; and
  3. Pekanbaru to Malaysia and Singapore.

Export Routes

Three main export routes:

- Thailand to China (land),
- KL/Penang to China,
- Johor Bharu to Singapore



Trade levels

- Remains among most abundantly traded turtle species;
- 19.5% admitted that they are involved in international trade in Peninsular;
- 23 of 38 traders supply the international market;
- Among 9 exporters, 6 stopped and 3 continued after ban.

Reproduction biology / breeding

- Published and unpublished material enriched with observations during field surveys:

- Low reproductive rate:
  - ➔Vulnerable for exploitation;
  - ➔Captive breeding tried but not economically feasible;
  - ➔Reports of captive bred ind. must be erroneous.

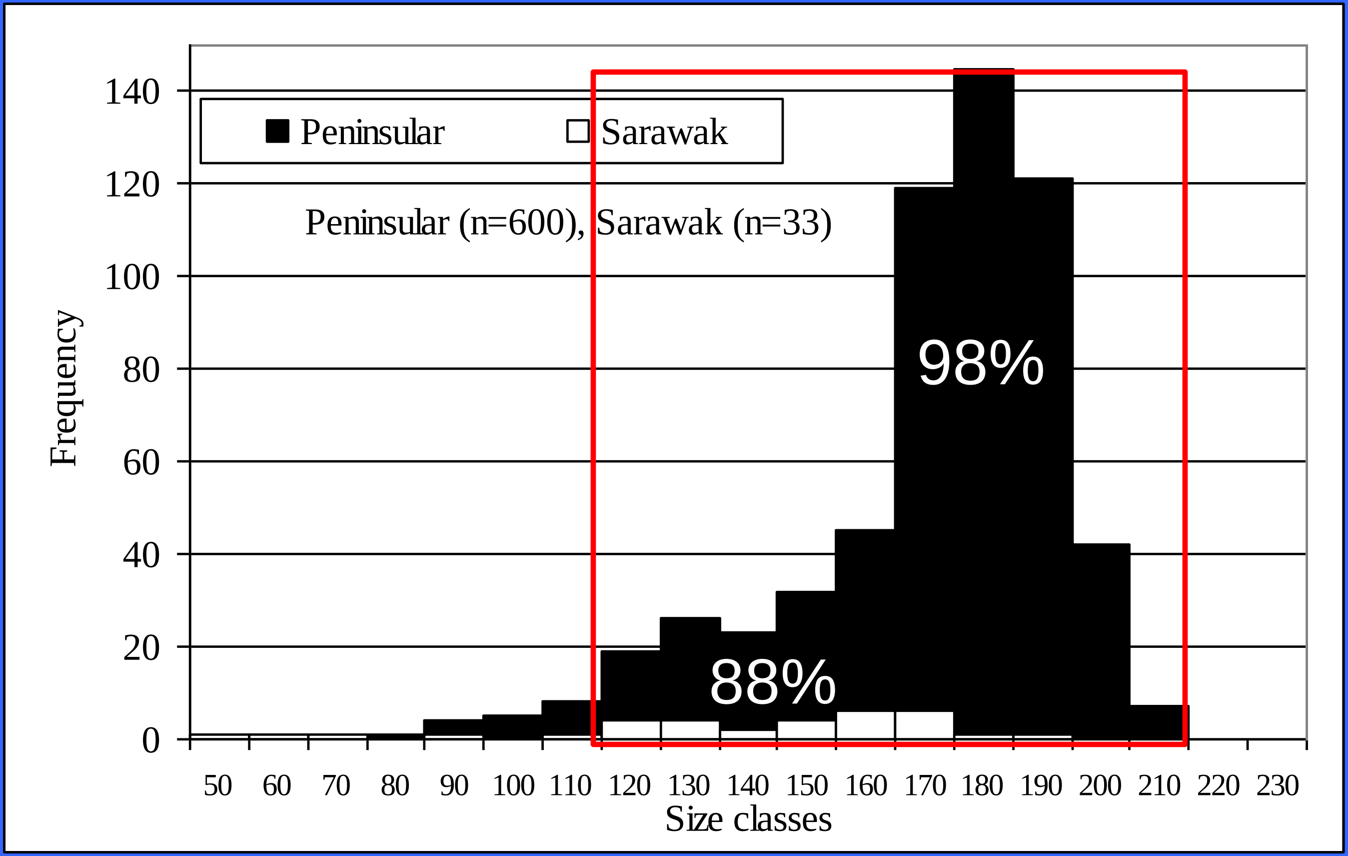
Baseline data on size

Mean ± SD and range in median carapace length (mm) of *C. amboinensis* collected in Malaysia and Indonesia in 2006.		
Source	**Wild**	**Remarks**
Peninsular	104.8±41.7 (65.5-188.0), n=24	Human-modified (plantation), mark-recapture study
Peninsular Malaysia and Sarawak	173.3±25.3 (56.6-215.0), n=616	Presumably various habitats, trade
Kalimantan, Indonesia	168.1±28.5 (70.0-215.0), n=654	Natural flood plain, trade

- A decrease in mean size in trade over time is probably result of ongoing long-term exploitation,
- Smaller mean size in trade compared to protected wild is probably results of long-term removal of adults.

Size-frequency in Trade

18 traders in PM, 7 private individuals, shops and temples in Sarawak

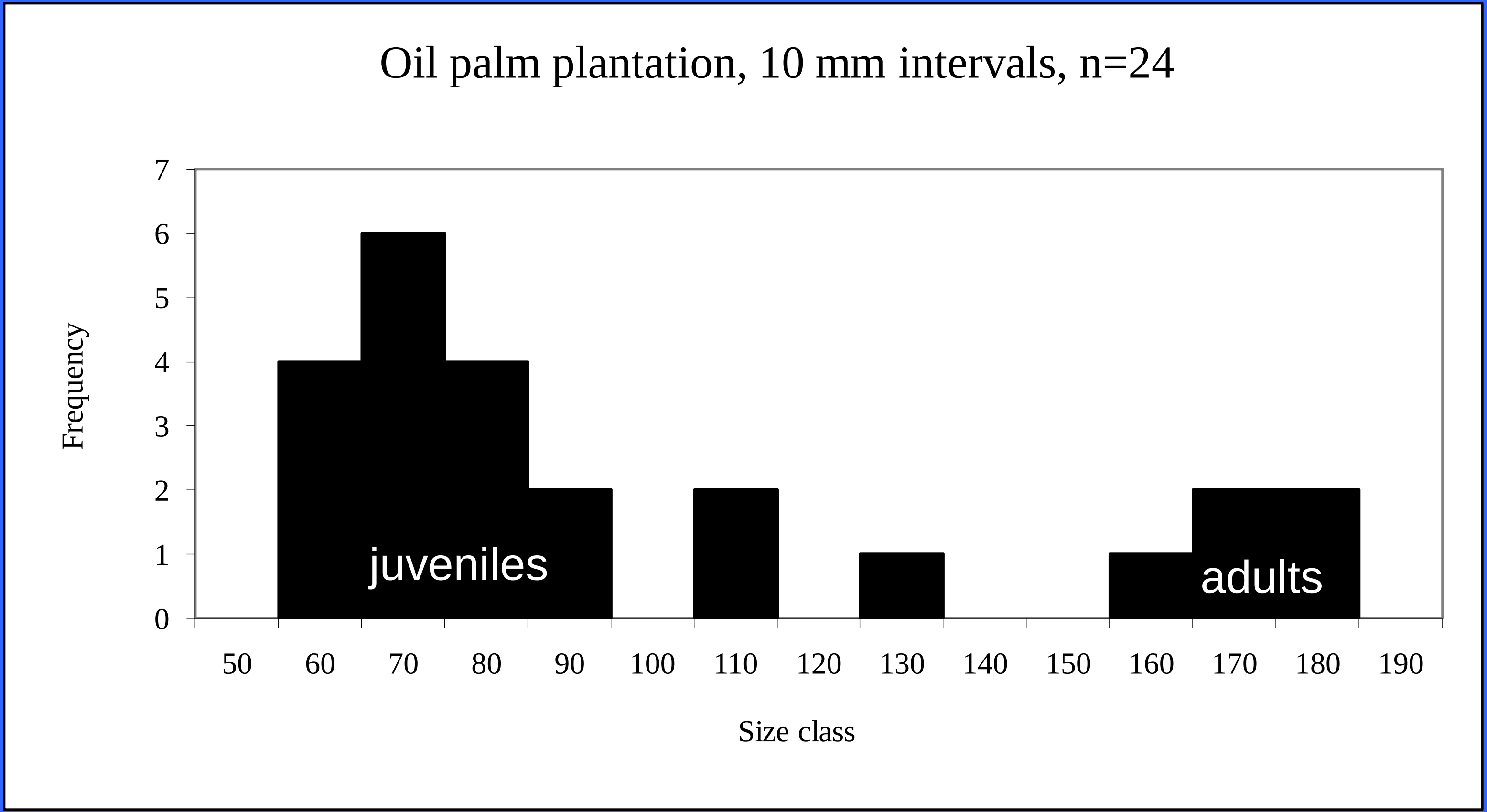


A joint programme of WWF and IUCN

TRAFFIC the wildlife trade monitoring network

Size-frequency in an exploited plantation

Mark recapture survey in Selangor



Sex ratio

- 1M:1.6F Peninsular Malaysia, trade;
- 1M:1.2F Sarawak, trade:
- 1M:1.5F Peninsular, mark-recapture, plantation.

Is harvest exceeding sustainable levels?

Does the sex ratio changes over time?

➔ monitor sex ratio!

Abundance in the wild

Mark-recapture survey in a 29ha plantation in Selangor for 38 days

Population size estimate after Schumacher and Eschmeyer (Krebs, 1998)

- 24 individuals caught
- 24 estimated population size
- 0.82 individuals/ha estimated density

➔ probably too low to sustain reproduction!

Abundance in harvest

- The purchase of 2 suppliers was assessed for 38 days in Selangor
- Mainly (all) from plantations

Supplier	Total	Mean/day	Mean/month	Mean/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**	**152.0**	**1823.7**

Catch per unit effort (CPUE)

- In an exploited but natural habitat in Indonesia one trader can collect about twice as many (3351 ind./year).
- Is catch lower due to habitat conditions?

  ➔ man-made versus natural habitat

- Catch per unit effort (CPUE) stable ➔ sustainable
- CPUE decreases ➔ over-exploitation

Abundance as result of harvest impact

- Interviews with residents, farmers, plantation workers, collectors, traders, etc.
  - ➔Populations are over-exploited or locally extinct in every State
  - ➔Most especially around trade centres / cities
  - ➔Less common than 5-10 years ago.

Evaluation, Problems and Recommendation

Indonesia and Malaysia

Evaluation

- Lack of density / population size
- Lack of abundance data from different habitats and under different exploitation pressure
- Current issues and problems were sufficiently indentified and quantified

Problems and Challenges

- Enormous extent of illegal trade
- Long chain of people involved in the illegal business
- Lack of exact distribution and abundance data
- Four distinct subspecies, but the NDF needs to be for the species level

Conclusions & Recommendations

- Stop illegal trade
- Surveys to determine the exact distribution and abundance
- NDF without abundance data and population dynamics remains a compromise unless further bolstered by subsequently available information incorporated into a monitoring system that supports an 'adaptive management' framework.

In the absence of quantitative data

Indicators of change should be assessed:

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.

Indicators of change (cont.)

4. If average size of individuals is reduced.
5. If the population structure of traded individuals is significantly in favour of one life history stage.
6. If the sex ratio of any population is significantly different from 1:1.

Potential indicators of illegal trade

- If collection of the species is fulltime business for collectors/trappers.
- Sudden changes in the international market prices are usually indicators of illegal activity.
  - Price paid to legal sources by main importing countries decreases once an illegal shipment has arrived and undercut market prices.

How, where and when?

- Potential sources of information:
  - collectors, middlemen, suppliers, exporters,
  - data from importing countries,
  - CITES MA and SA,
  - published or unpublished reports, and
  - grey literature.
- At trade centres, annually, at the same time of the year and at the same sites

Acknowledgement

- CITES Secretariat and Workshop Organizers
- Chairs of working group
- TRAFFIC International and Southeast Asia
- British High Commission in Kuala Lumpur, and the US State Department
- My colleagues at TSEA, local counterparts, research assistants, guides and translators, and traders
- GOs and NGOs, the academe and private persons
- IUCN/SSC Tortoise and Freshwater Turtle Specialist Group

Thank You!

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TRAFFIC the wildlife trade monitoring network