

The Southeast Asian Box Turtle *Cuora amboinensis* (Daudin, 1802)

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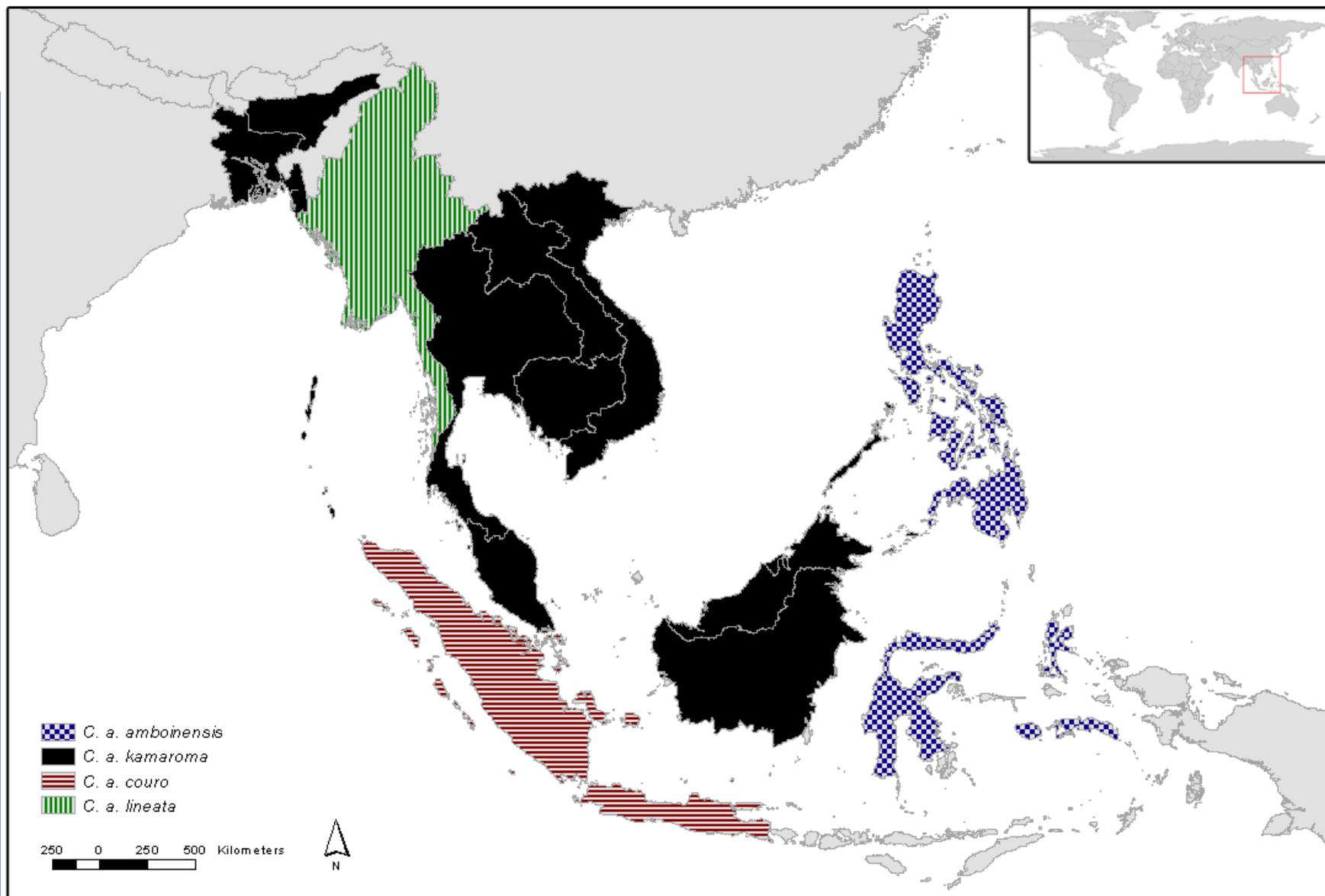
Outline

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 Banyan*, *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

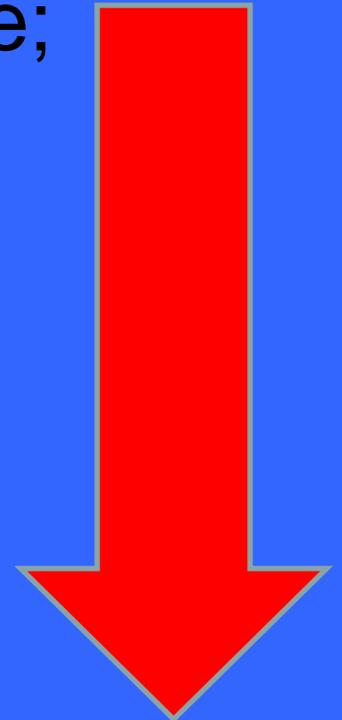
- Semi-aquatic;
- Natural and man-made wetlands:
 - Swamp and peat swamp forests, *Melaleuca* swamps, permanent or temporary wetlands, and shallow lakes.
 - Flooded rice fields, oil palm and rubber plantations, irrigation ditches, canals, orchards, vegetated drainage systems, ponds and pools;
- Habitat generalist, adaptable to man-made habitats, tolerant.

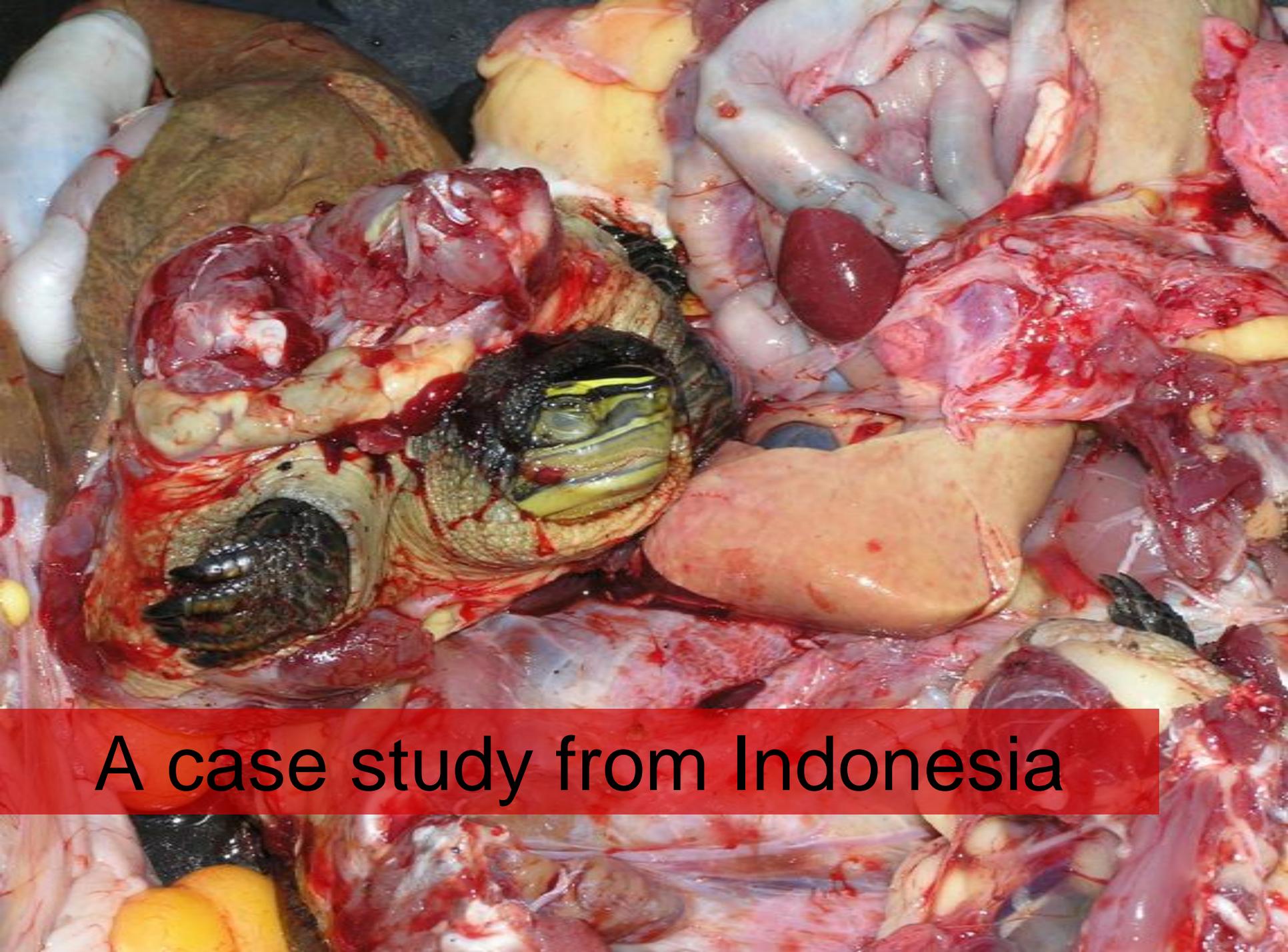
Role in the Ecosystem

- 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

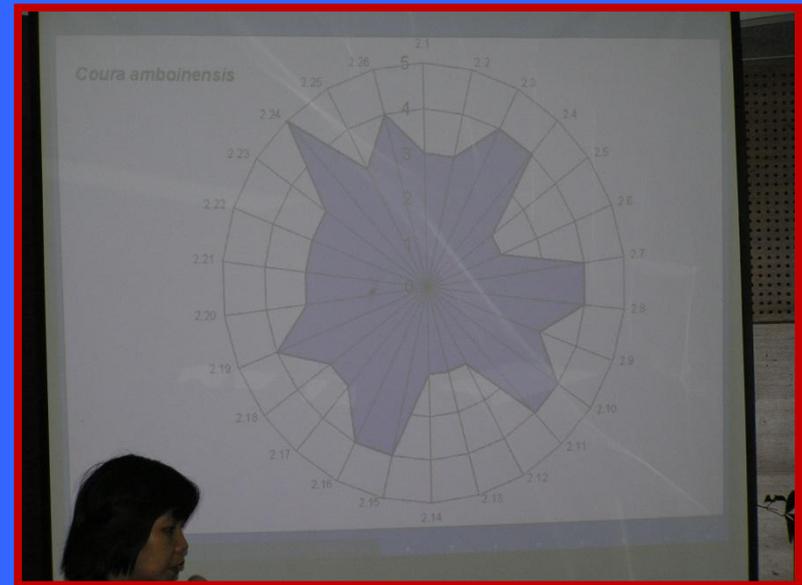
Non-detrimental Finding procedure



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

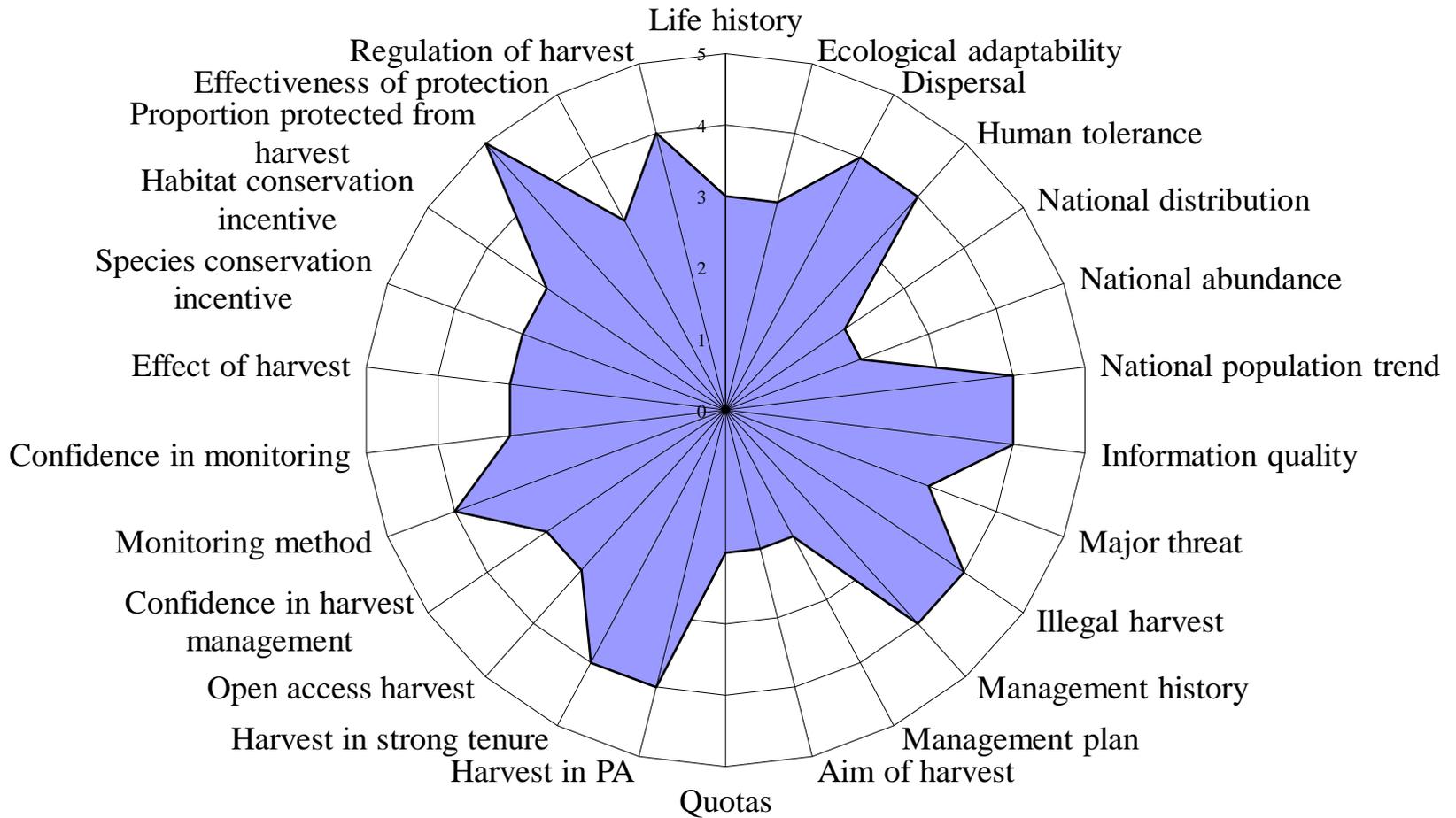
Risk-assessment checklist

- In April 2002, by members of the Indonesian CITES MA and SA (Anon., 2002).
- After fieldwork in 2006, by TRAFFIC SEA (Schoppe, 2007).

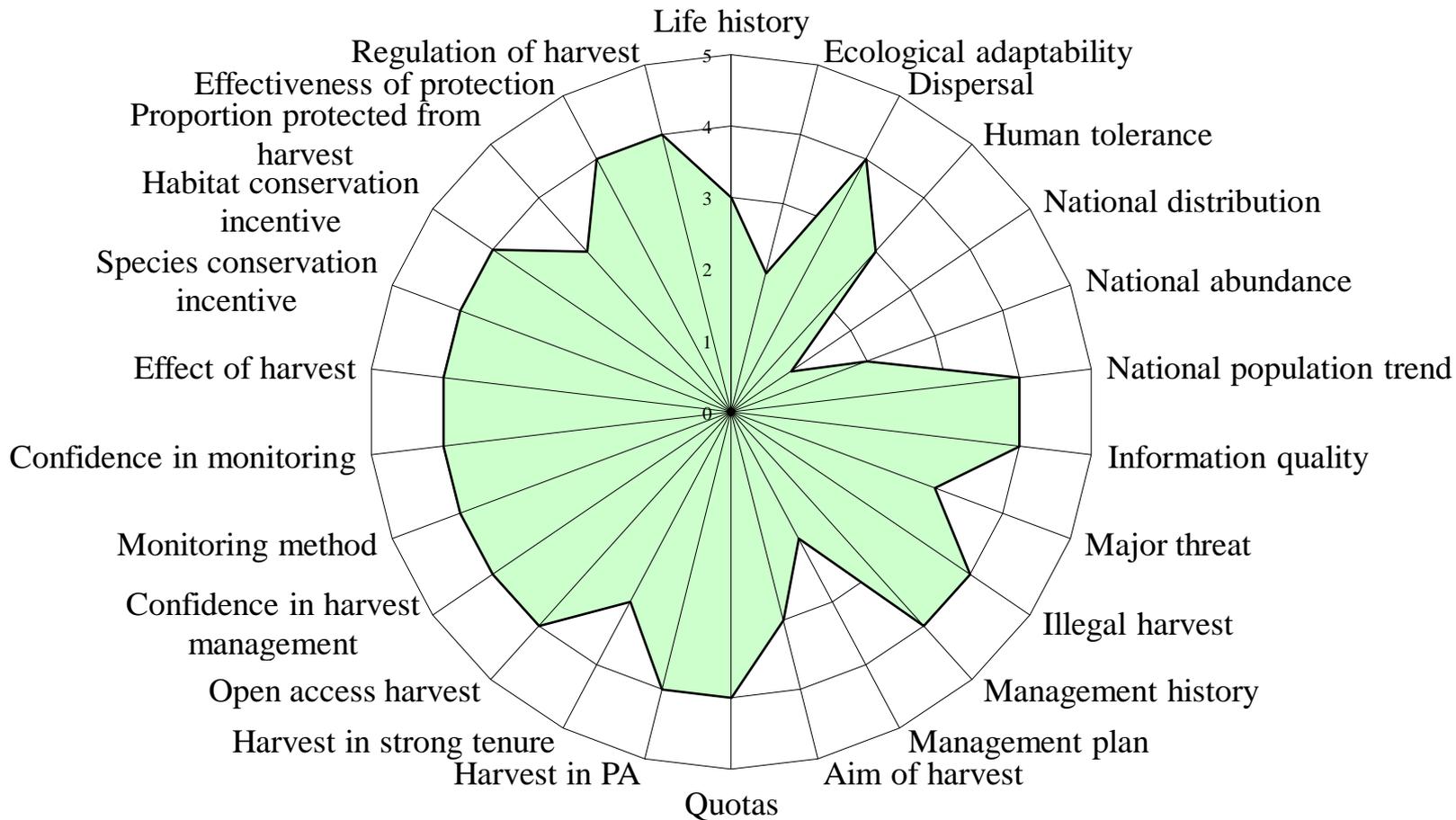


→ Low confidence in harvest management,
→ Data deficiency.

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.

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 ($\geq 100\text{mm}$ 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 ($\geq 160\text{mm}$ MeCL)

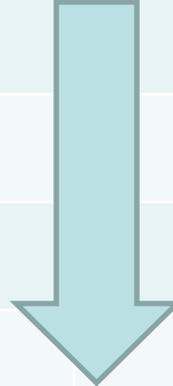


Illegal trade

Actual visits, assessment of stocks, interviews:

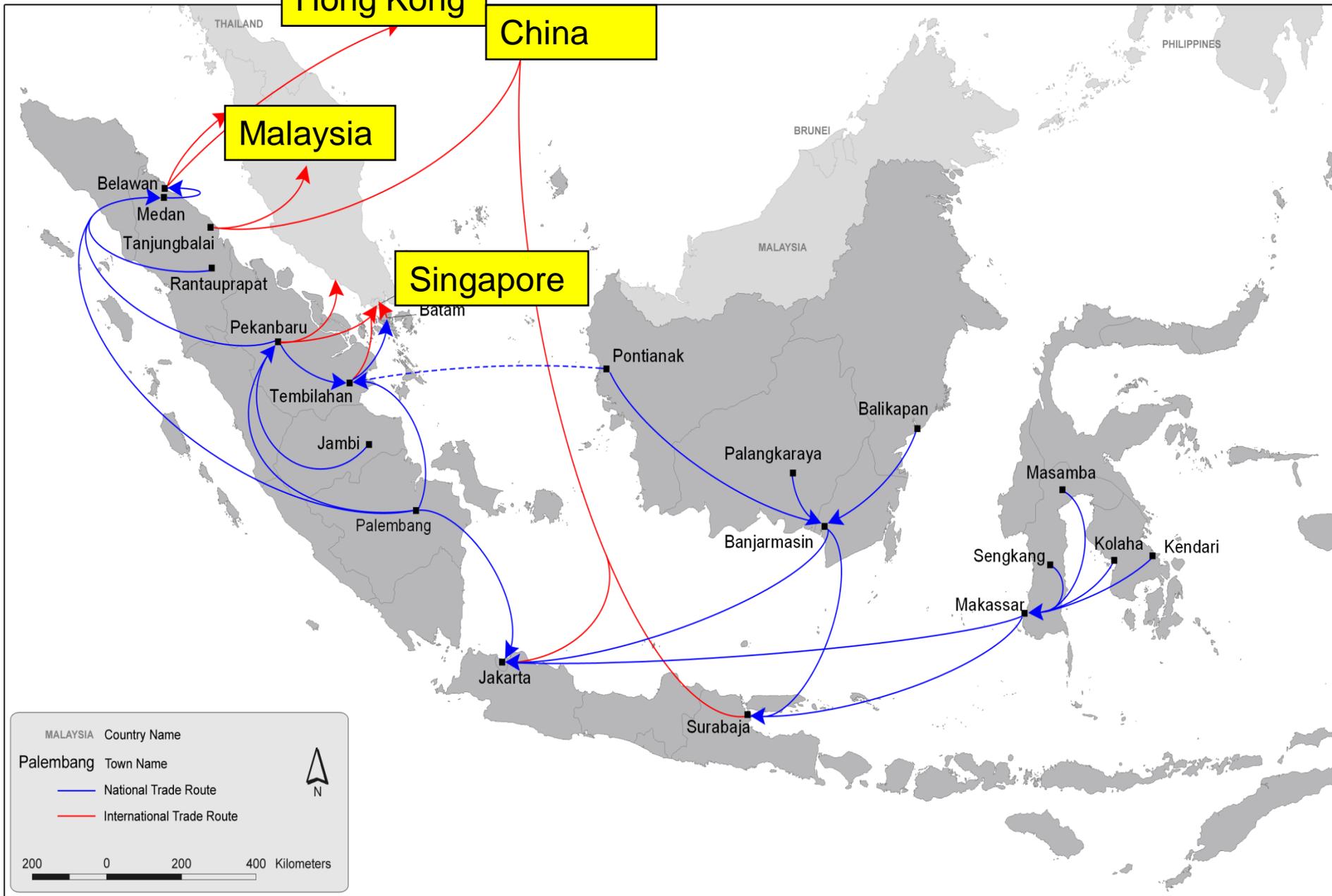
- 18 illegal traders;
- 50kg to 18 000kg week per trader;
- Together average of 19 160kg or 23 950 ind./week.

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



Hong Kong

China

Malaysia

Singapore

THAILAND

PHILIPPINES

BRUNEI

MALAYSIA

Belawan

Medan

Tanjungbalai

Rantauprapat

Pekanbaru

Tembilahan

Jambi

Palembang

Jakarta

Surabaya

Pontianak

Palangkaraya

Banjarmasin

Balikpapan

Masamba

Sengkang

Kolaha

Kendari

Makassar

Batam

Reproduction biology

- Published and unpublished material enriched with observations during field surveys:
 - 6 eggs/year \Rightarrow 3 hatchling \Rightarrow ? adults;
 - age at maturity 5-6 years
- \rightarrow 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 \pm SD and range in MeCL of <i>C. amboinensis</i> from different sources		
Subspecies	Size	Remarks
<i>C. a. kamaroma</i>	165.9 \pm 31.3 (65.5-215.0), n=678	Flood plain, trade
<i>C. a. amboinensis</i>	134.5 \pm 44.6 (51.5-200.0), n=68	Peat swamp forest, protected, mark-recapture
<i>C. a. amboinensis</i>	149.9 \pm 24.9 (121.5-190), n=20	Natural wetlands (marsh), trade
<i>C. a. couro</i>	131.1 \pm 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

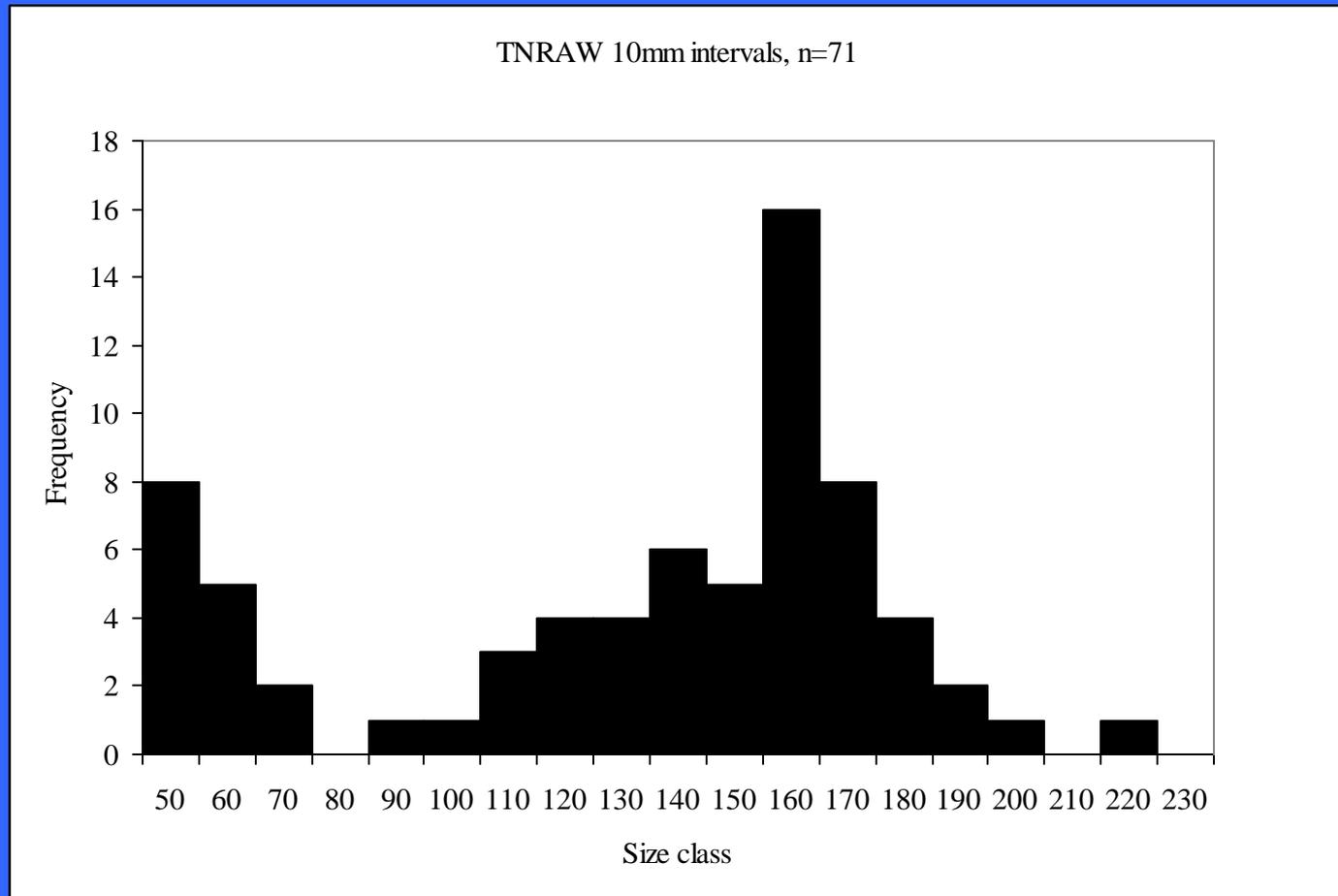
Mean \pm SD and range sizes (mm) and body weight (g) of specimens caught in 6-week mark-recapture survey in Sulawesi.

Sex	Median Carapace Length	Maximum Carapace Width	Median Plastron Length	Plastron Width	Body Height	Weight
Female (n=28)	159.6 \pm 23.0 (118-200)	121.8 \pm 10.2 (103-140)	148.7 \pm 22.7 (106-182.8)	75.3 \pm 9.2 (60-92.6)	64.1 \pm 10.0 (42-79.0)	630.8 \pm 238.9 (240-1080)
Male (n=24)	159.9 \pm 20.1 (110.5-177)	118.0 \pm 13.5 (97.0-158.5)	136.9 \pm 11.4 (103.5-152.5)	69.7 \pm 4.7 (58-79.5)	62.4 \pm 24.9 (46-70.0)	544.8 \pm 134.3 (220-840)
Juv. (n=19)	67.6 \pm 16.9 (51.5-110)	62.6 \pm 15.8 (48.6-100.9)	59.6 \pm 16.2 (47.4-102)	34.4 \pm 9.8 (27-62.0)	27.2 \pm 7.0 (22-24.0)	57.5 \pm 57.3 (20-220)

Baseline for comparison with other natural populations

Size-frequency in the wild

- 54.9% immature
- 45.1% mature
- Normal distribution

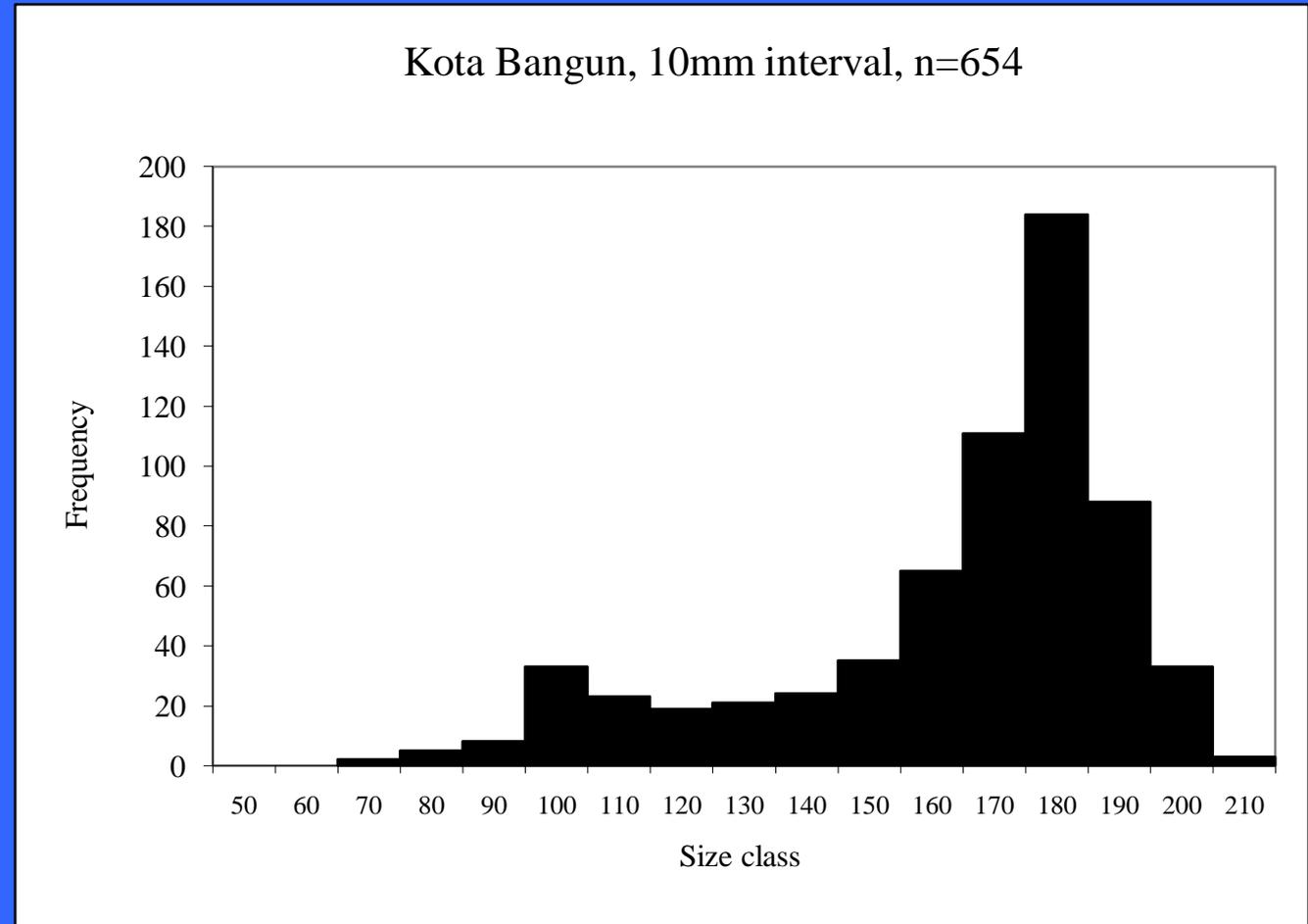


Composition in harvest

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

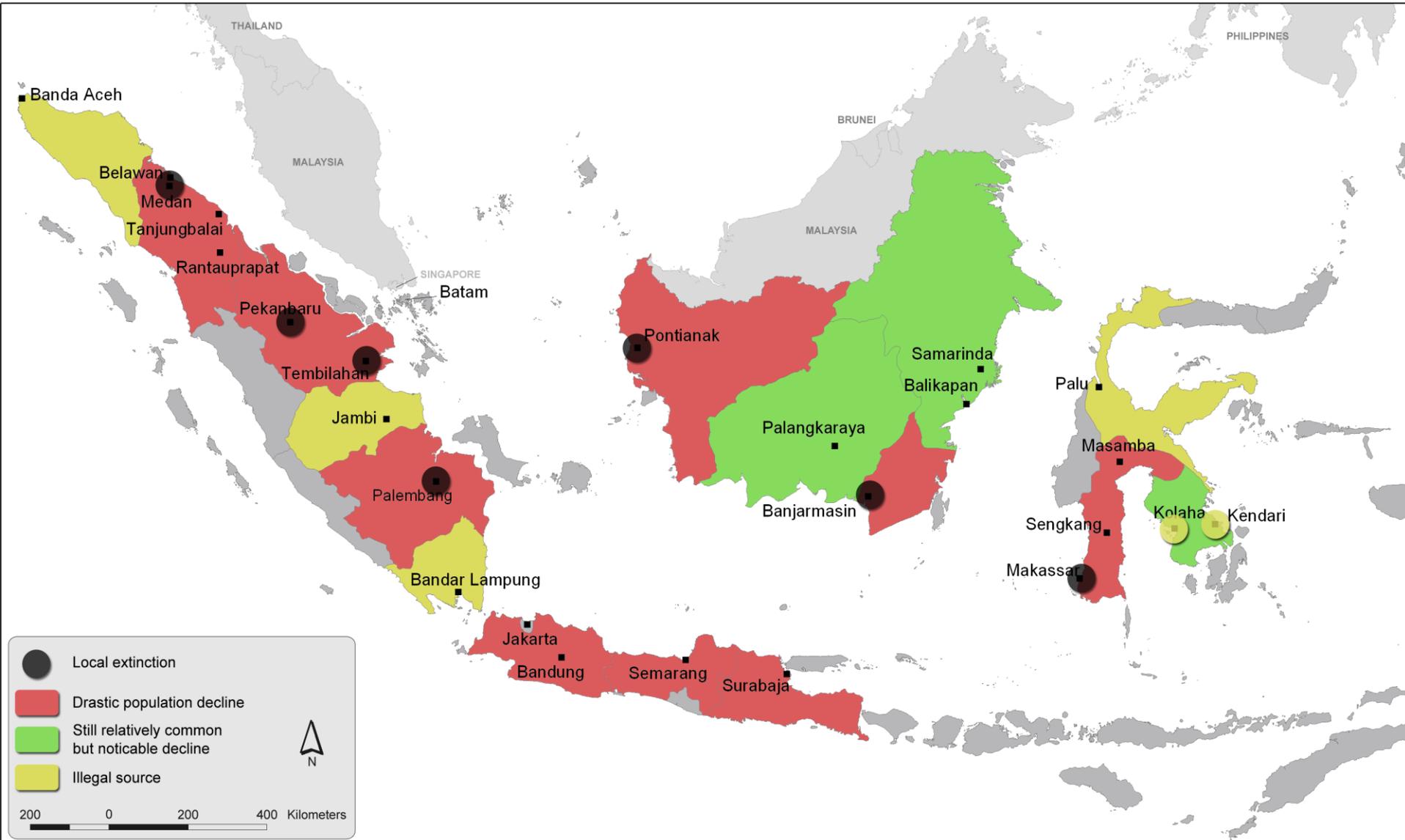
CPUE decreases

→ 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.

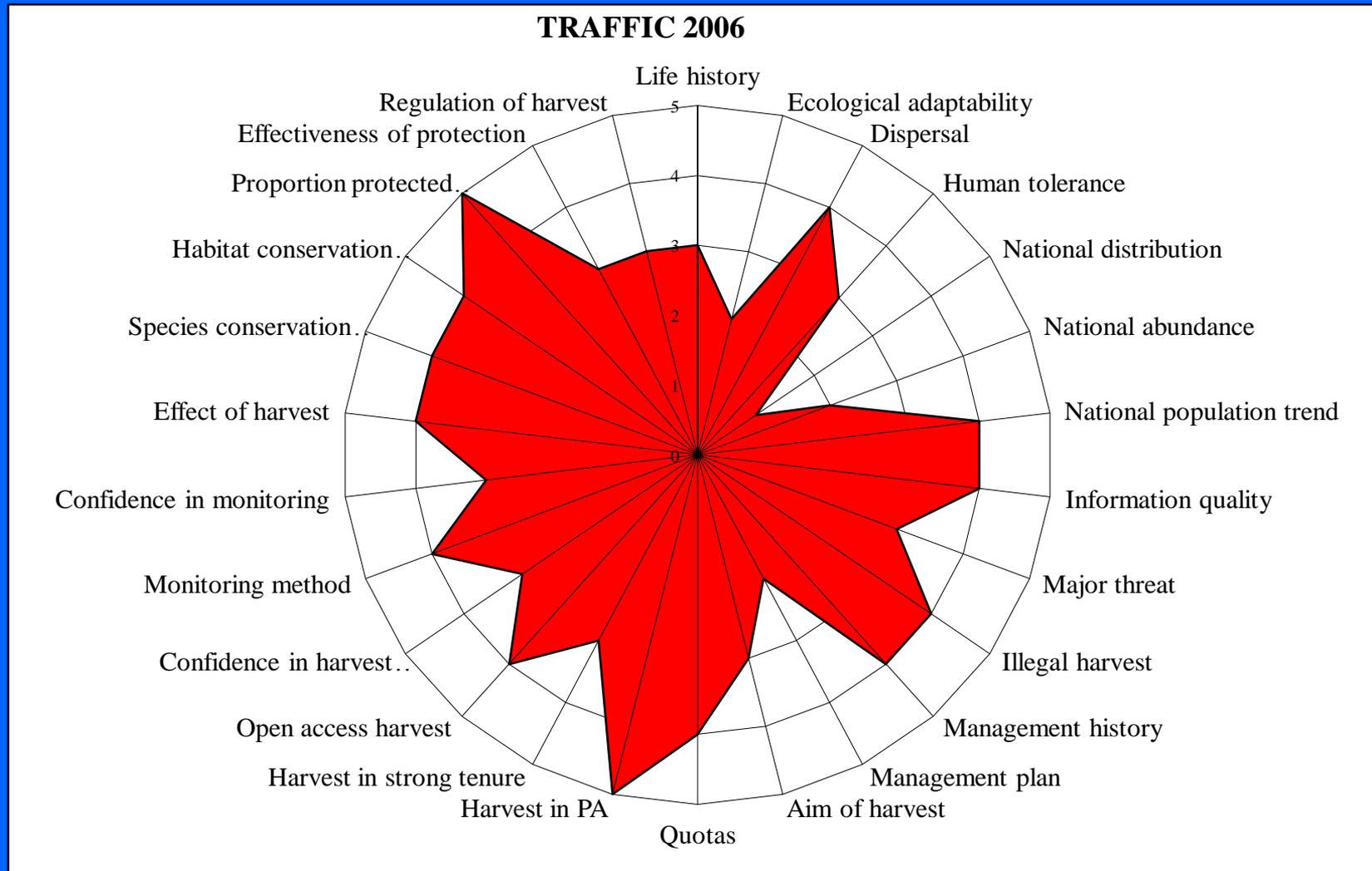


Non-detrimental Finding procedure



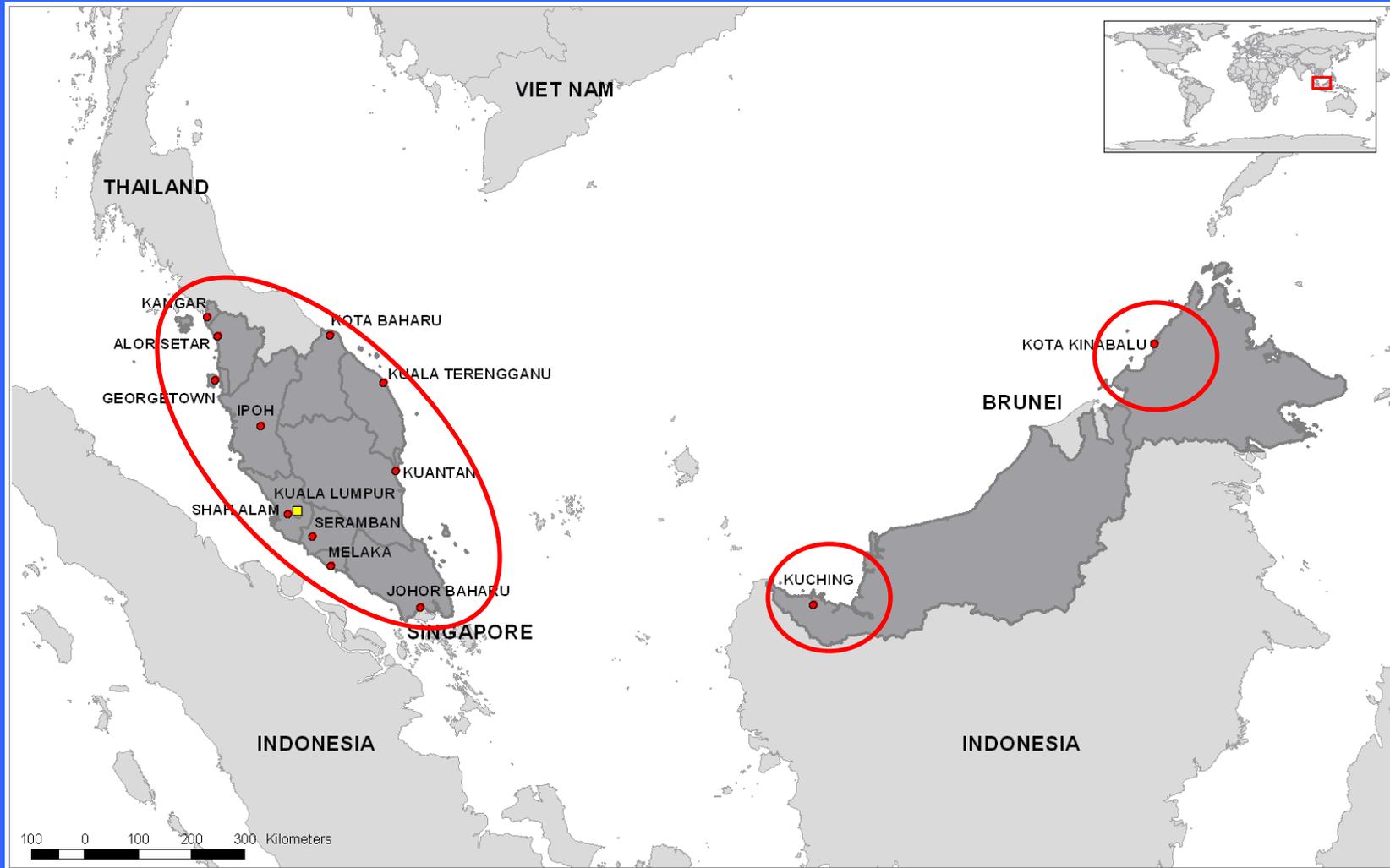
Based on surveys conducted in the main source and trade centres in Malaysia in 2006, TRAFFIC SEA proposes the following NDF methodology

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;

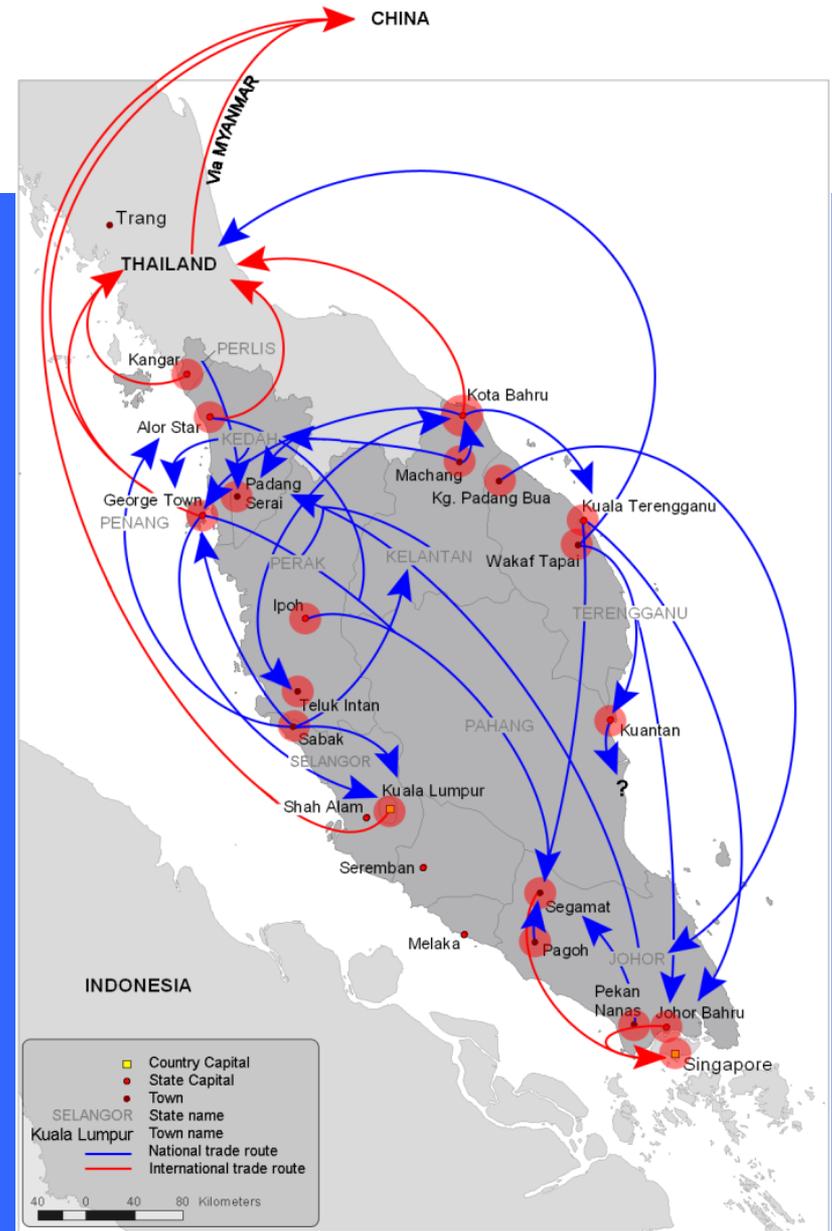
Illegal trade major issue:

- 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

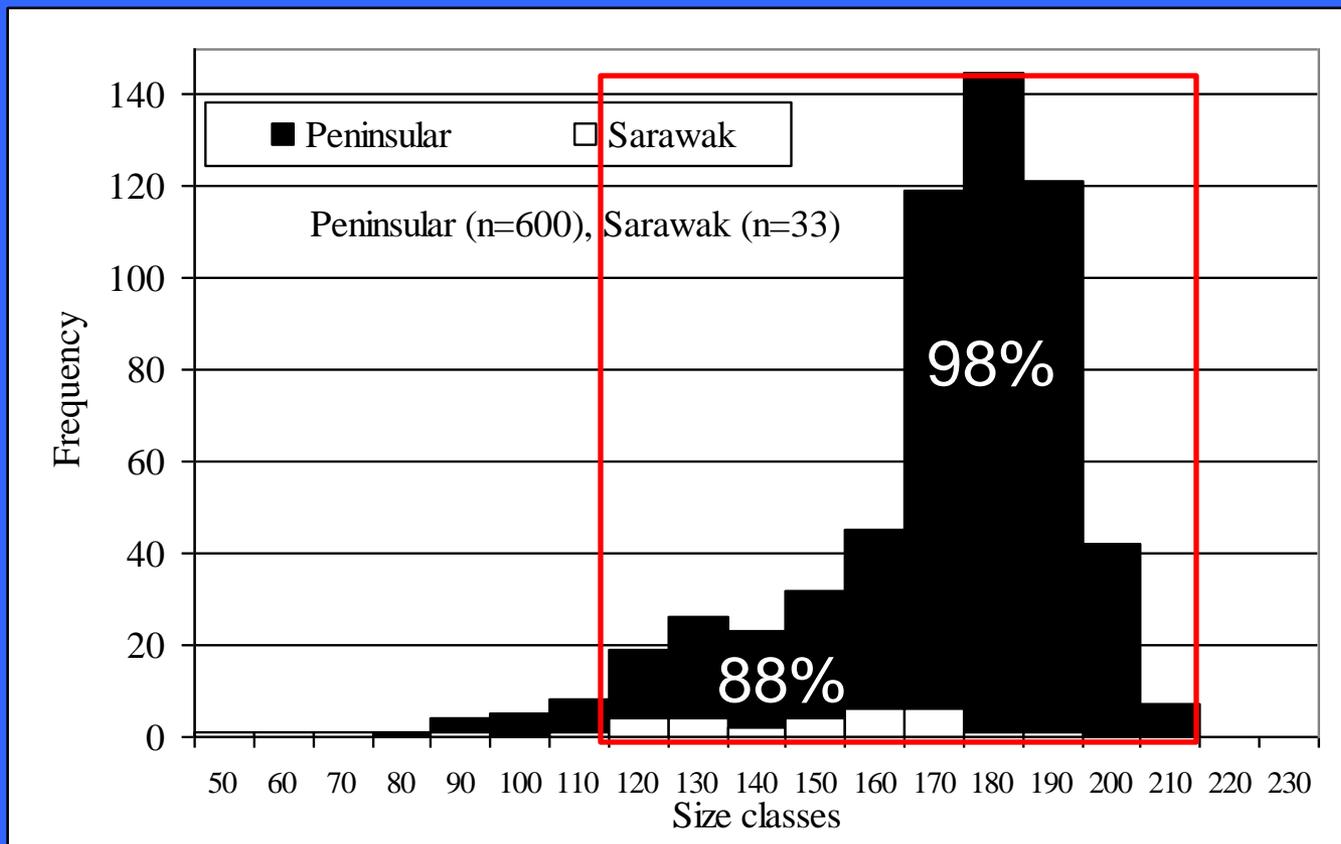
Mean \pm SD and range in median carapace length (mm) of *C. amboinensis* collected in Malaysia and Indonesia in 2006.

Source	Wild	Remarks
Peninsular	104.8 \pm 41.7 (65.5-188.0), n=24	Human-modified (plantation), mark-recapture study
Peninsular Malaysia and Sarawak	173.3 \pm 25.3 (56.6-215.0), n=616	Presumably various habitats, trade
Kalimantan, Indonesia	168.1 \pm 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.

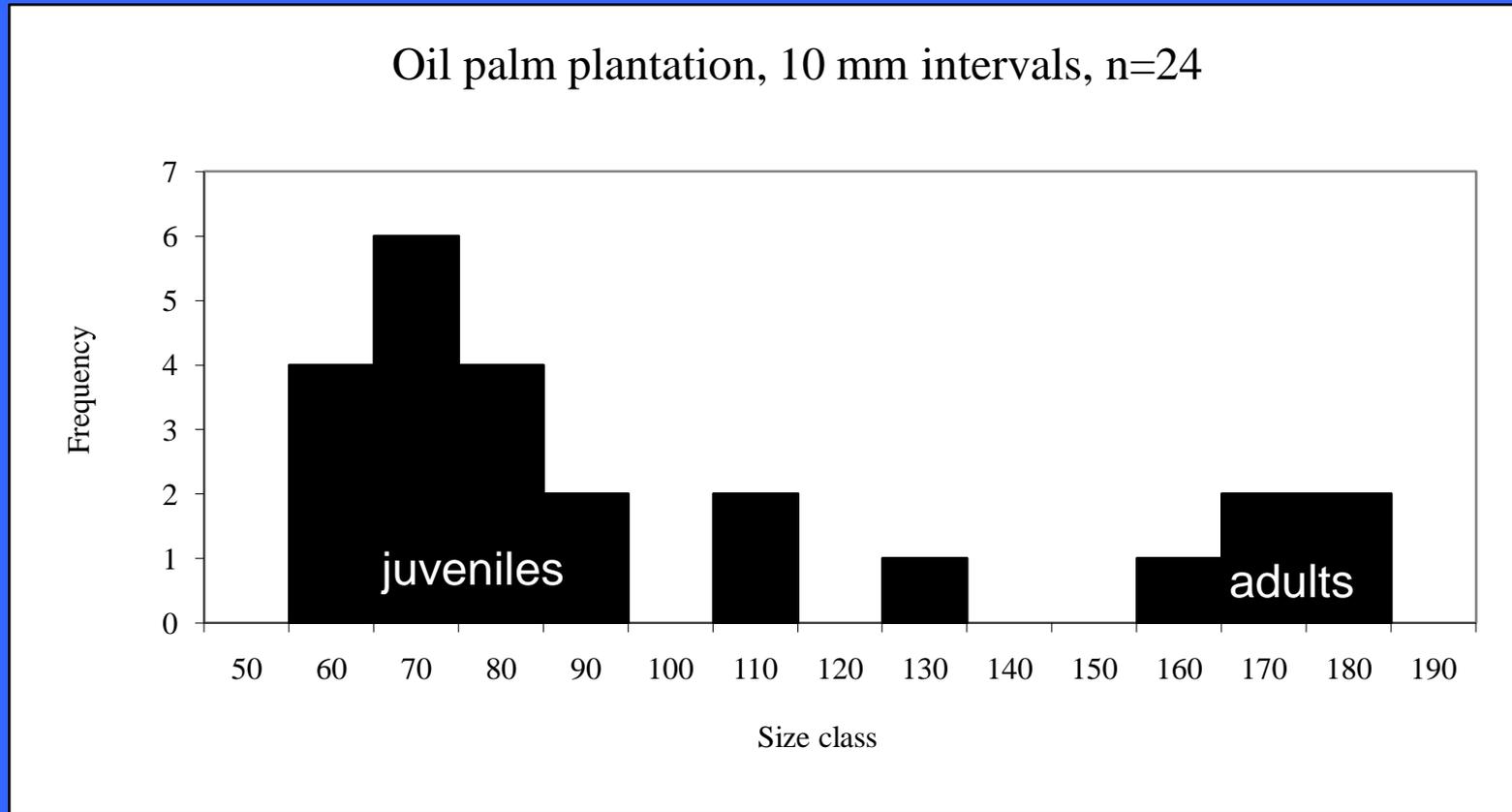
Size-frequency in Trade

18 traders in PM, 7 private individuals, shops and temples in Sarawak



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
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- 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!

