

Cambodia • Lao PDR • Thailand • Viet Nam
For sustainable development



MRC Council Study: Status and Trends

Prepared by
BioRA Team

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Contents

- Purpose
- Process
- Areas
- Main impacts
- Preliminary results

Details in Technical Progress Report 2: DSS Setup

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Purpose of the Status and Trends assessment



- identify and document past and current pressures
- establish the historical context for the 2015 LMB aquatic ecosystems
- enhance understanding of how these have responded to past pressures
- used to inform description of baseline

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Process



- For each indicator:
 - define current ecological status
 - identify main impacts
 - estimate past changes. As a relative percentage of 2015 (100%) in:
 - 1900;
 - 1950;
 - 1970;
 - 2000.

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Status and trends areas



Status and trends areas		BioRA zones	
1	Mekong River in Laos PDR	1	Mekong River from the border with China to Pak Beng
2	Mekong River in Laos PDR/Thailand	2	Mekong River from downstream of the Nam Beng to upstream of Vientiane
		3	Mekong River from Vientiane to Nam Kam
3	Mekong River in Cambodia	4	Mekong River from Nam Kam to Stung Treng
		5	Mekong River from Stung Treng to Phnom Penh
4	Tonle Sap River and Cambodian Floodplains	6	Tonle Sap River from Phnom Penh to the Tonle Sap Great Lake
5	Tonle Sap Great Lake	7	Tonle Sap Great Lake
6	Mekong Delta in Vietnam	8	Mekong Delta from the Cambodian/Viet Nam border to the sea

- trends in development tend to be country-specific

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Main impacts identified



- habitat loss (rice and other production)
- harvesting pressure (fishing/hunting)
- changes in flow and sediment supply (dams, plus sand-mining, rubber plantations and deforestation)
- changes in connectivity (migration routes)
- Other impacts:
 - E.g., defoliation in American War
 - E.g., changes in utilisation pressures such as cancellation of fish lots in Cambodia)

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Chronology of main impacts



Date	Actions/developments	Consequences for LMR ecosystem
1800-	Expansion of rice and other production	Conversion of wetlands, and increasing control of flooding and salinity regimes
1800-	Sand mining	Changes to sediment budgets/habitats
1939-1979	Conflicts	Removal/poisoning/burning/killing of fauna and flora.
1950-	Expansion of rubber plantations and deforestation	Changes in sediment regimes
1966 -	Dams in tributaries	Changes in flow and sediment regimes.
1992 -	Lancang Cascade HPPs	Barrier effects.
-	Other policies	Pressure on resources

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2015 condition - summary



	Geomorphology	Vegetation	Macroinvertebrates	Fish	Herpetofauna	Birds	Mammals
Mekong River in Laos PDR	B/C	C	B/C	B/C	C	D	E
Mekong River in Laos PDR/Thailand	B/C	C/D	B/C	C	C	D	E
Mekong River in Cambodia	B/C	C	B/C	B/C	C/D	D	E
Tonle Sap River	B	D/E	C	B/C	C/D	D	E
Tonle Sap Great Lake	B	D/E	C	B	C/D	D	E
Mekong Delta	C	E	C/D	B/C	D	E	E

A	Unmodified, natural
B	Largely natural
C	Moderately modified
D	Largely modified
E	Completely modified

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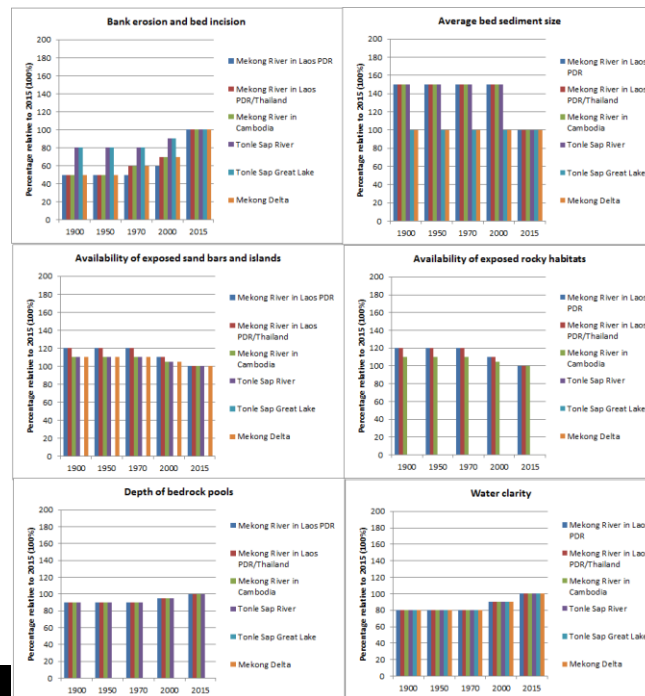
2015 condition - summary



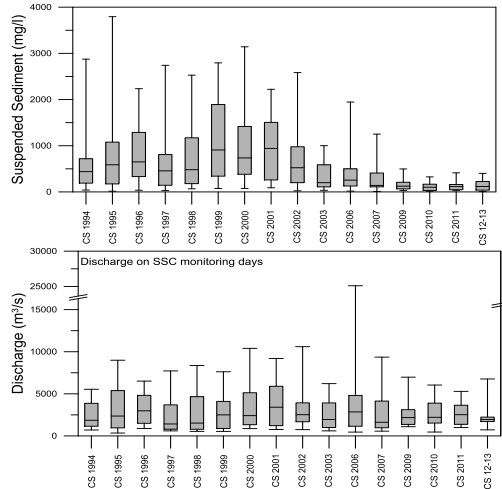
- Most change in Delta
- Least change in upper reaches of LMB
- Most change in riparian and floodplain vegetation, birds and mammals
- Least change in instream habitats

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Geomorphology



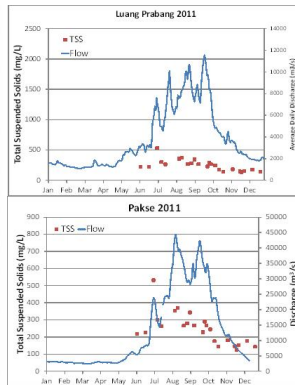
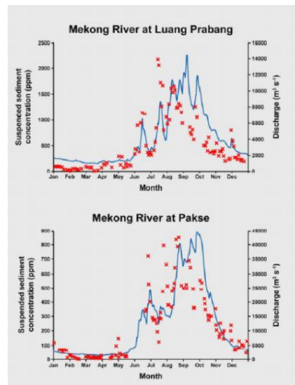
Bank erosion and bed incision



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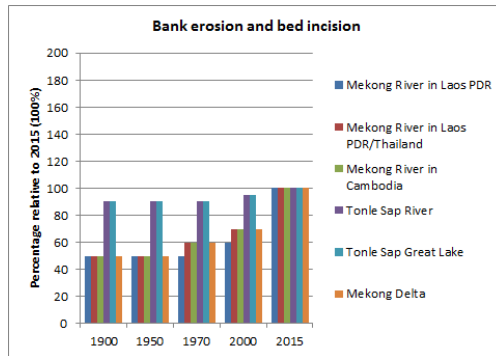
1961

2011



Flow and suspended sediment concentrations for Luang Prabang and Pakse show that large flows continue to occur within the river, but suspended sediment concentrations remain low throughout the year

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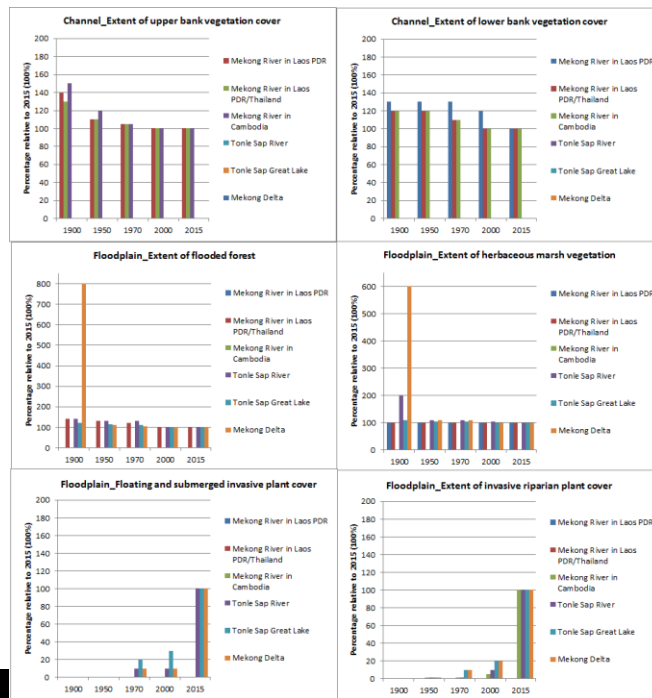


The 1900 rate is estimated to be about 50% of the present rate due to the following factors:

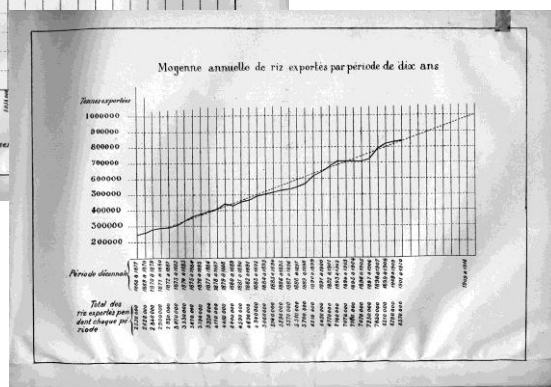
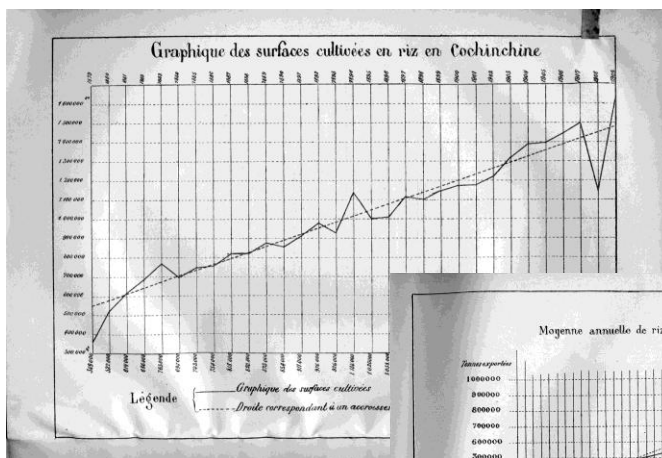
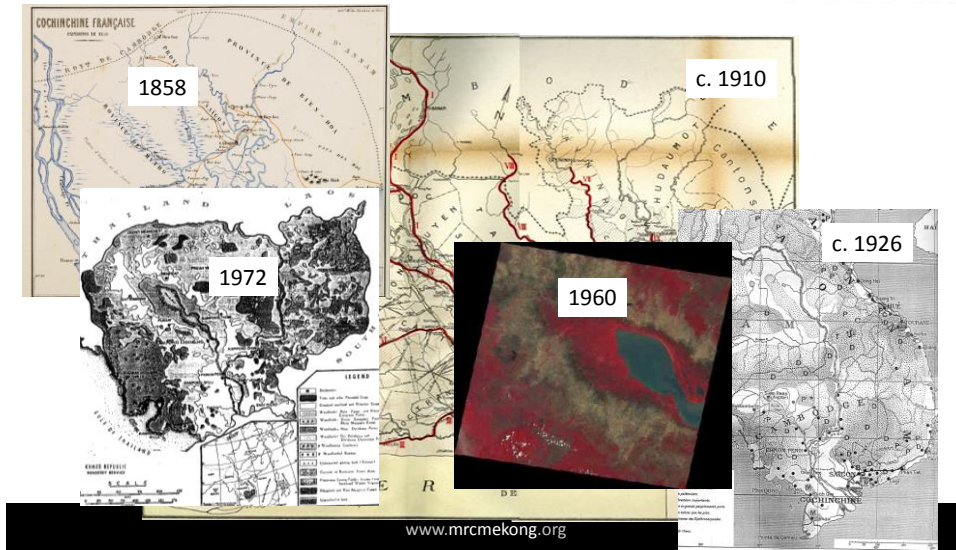
- there was likely to be more native vegetation on the river banks which would have increased bank stability;
- there were no impoundments on tributaries or mainstem;
- sediment extractions from the channel would have been minimal;
- the flow and sediment regime was much closer to natural than in 2015, so the river was likely in a dynamic-equilibrium with respect to bank erosion;
- there may have been additional sediment inputs due to land use changes which may have increased sedimentation relative to natural.

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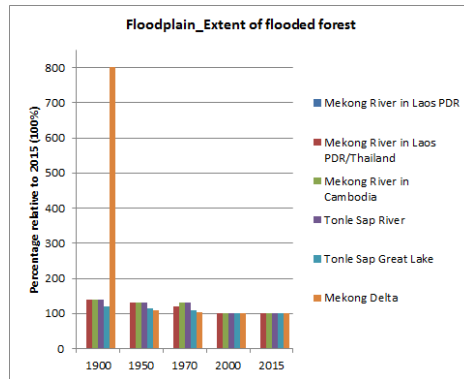
Vegetation



Floodplain_Extent of flooded forest



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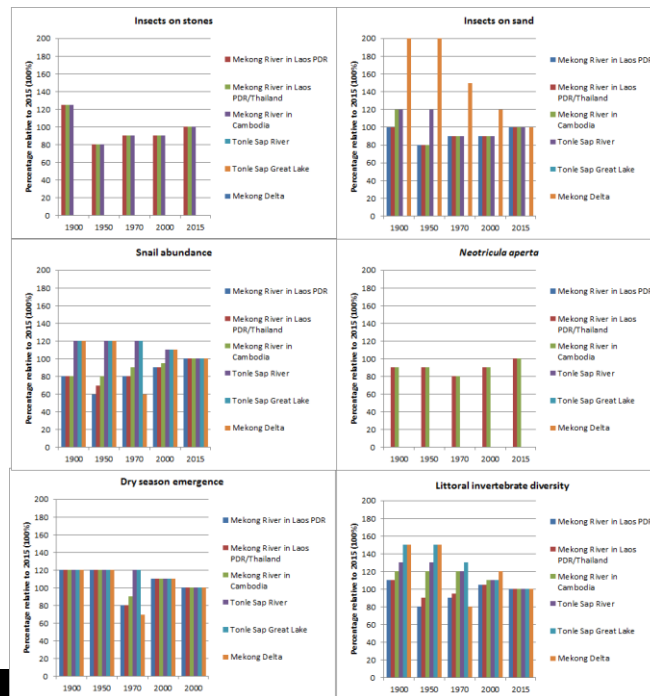


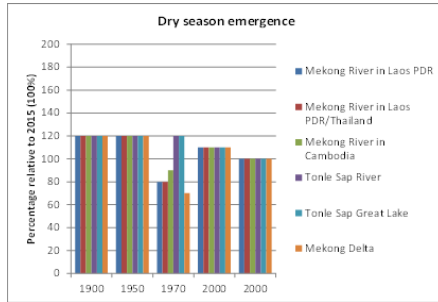
Massive changes in the delta at the turn of the last century (c. 1900):

- 800% probably conservative;
- large increase in rice production;
- between the late 1800s and c. 1930, 2 Million ha of mangroves in the western portion of the Delta (Mien Tay) were reduced to 0.33 ha (Brocheux 1995);
- extensive mangrove swamps still existed in 1950s south of Ho Chi Min City and on the whole of the southern tip of Viet Nam;
- large changes in upper parts of LMB – but flooded forest much more limited there

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Macroinvertebrates

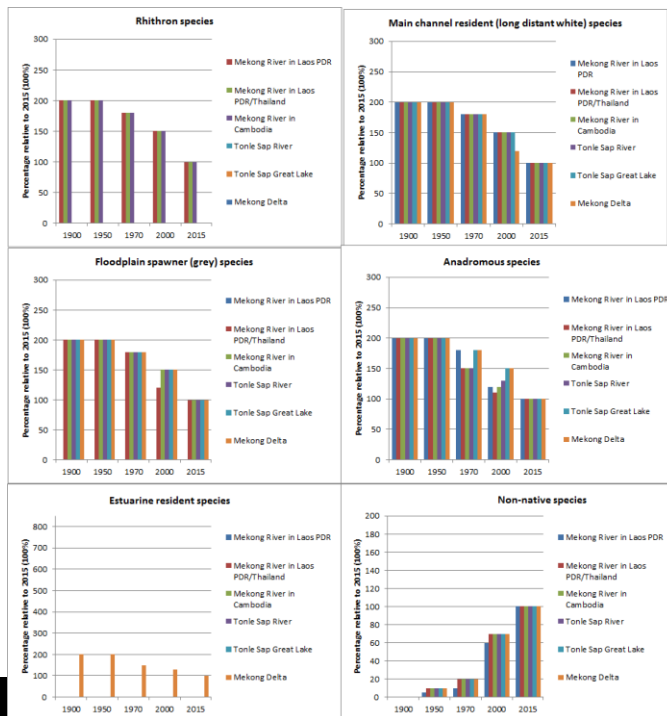




- applies for many of the aquatic insects, particularly Ephemeroptera and Trichoptera
- occurs everywhere, but is of particular significance in the mainstream in Lao PDR and Cambodia;
- higher sediment load in the 1950s probably reduced emergence in these reaches around the time of the Korean War (rubber plantations)
- increased dry season flows have reduced emergence somewhat in the past few years, especially in the upper reaches (MRC monitoring)

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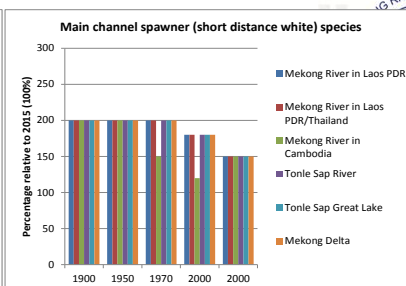
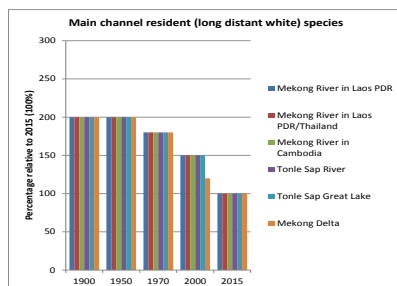
Fish



Fisheries information



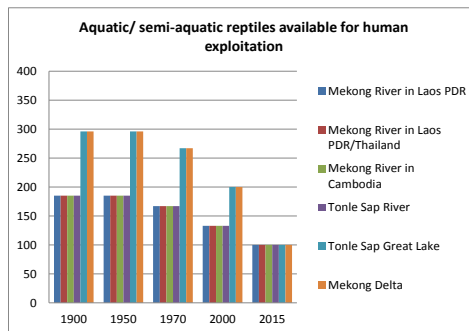
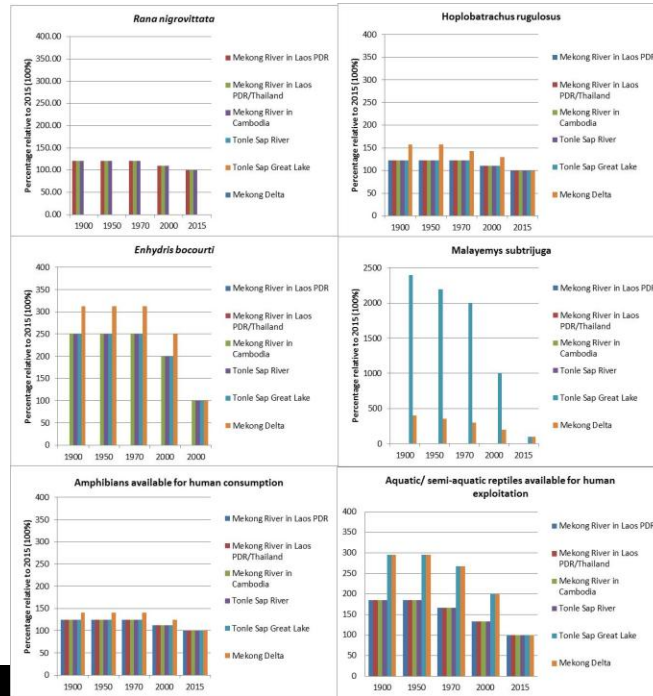
- Literature review and historical documentation
- FAO Capture fisheries data
- National fish and aquaculture production data
- **Dai Fishery Monitoring Programme (DFMP)**, Tonle Sap, Cambodia (1994–2014);
- **MRC lee trap and gillnet Monitoring Programme** Lao PDR (1994-2014) – **outside impact assessment area**
- **Vietnam fisher catch database-2005- 2013** – **good spatial and temporal coverage of catch composition and CPUE**
- **Fish Abundance and Diversity Monitoring Programme (FADMP)** at up to 40 sites across the LMB (2003–2013) - **provides spatial and temporal catch composition and CPUE per habitat and gear**
- **Fish Larvae Density Monitoring Programme (FLDMP)**, Cambodia and Viet Nam (1999–2013) **provides temporal fluctuations in catch composition and CPUE**



37% of species richness
36% of capture

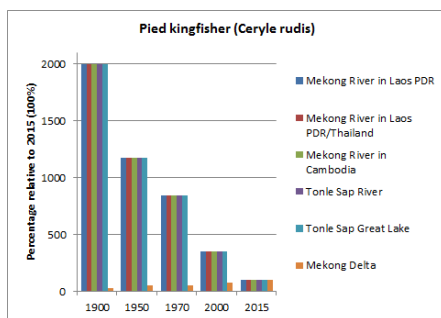
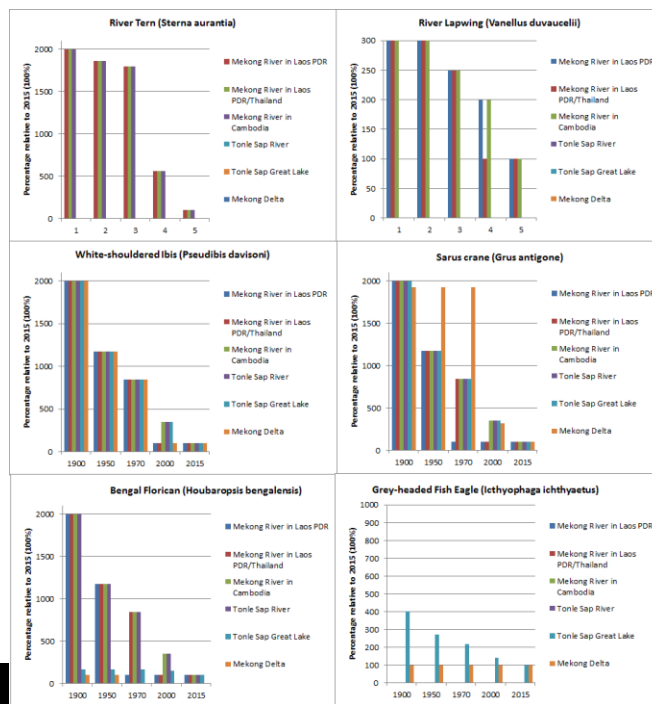
- longitudinal migrants within the main river channel, or up and down tributaries;
- require relatively high dissolved oxygen levels, and as such they are sensitive to reductions in water quality;
- one breeding season per year - closely linked to peak flows and rely on increased flow as cues for migration and maturation;
- have disappeared from dammed tributaries;
- fishing pressure.

Herpetofauna



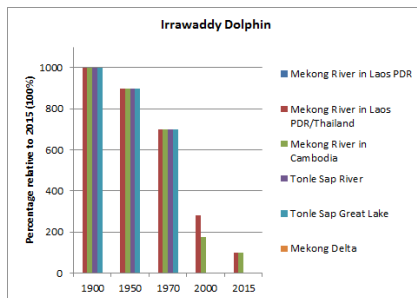
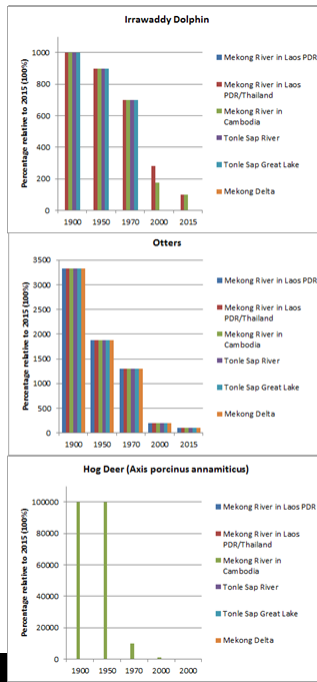
- in Cambodia, 1999/2000: > 8 500 water snakes were harvested and sold per day in Tonle Sap Lake area primarily for crocodile and human food (Stuart et al. 2000);
- in Lao PDR, local residents reported that turtles, monitor lizards and large snakes much more difficult to find in late 1990s than they had been in the early 1990s (Stuart et al. 2000);
- in Viet Nam, c. 1900 individuals of 21 species were found in reptile trade shops (Stuart 2004);
- since 2000, severe decline in the availability reported by local people (Brooks 2007).

Birds



- bank / hole-nesting species
- described as 'common' along the Mekong, Tonle Sap and Bassac rivers in Cambodia prior to 1970 (Thomas and Poole 2003);
- is considered to have undergone the steepest historical decline of any bird in Laos PDR (Duckworth 2002), and as such is considered to be present at population levels of less than 5% of its 1900 populations (Will Duckworth pers. comm.);
- in Delta – increased numbers because of habitat in canal walls.

Mammals



- c. 1900: “a few thousand” in the river between Khone Falls and the delta” Gruvel (1925) and Krempf (1924; 1925; cited in Lloze 1973)
- evidence of direct persecution of the species for oil extraction in Tonle Sap Great Lake in the mid-1970s (Perrin et al. 1996), with the Khmer Rouge using the oil from dolphins in lamps, and motorbike and boat engines, and also ate dolphin meat;
- 1994: the population of the entire river was estimated 200 individuals (Baird et al. 1994).
- 2005: c. 125 (95% CI = 114-152) (Beasley et al. 2007)
- 2014: 78 and 91 individuals (WWF)

Main messages ...



- Indicators in riparian and seasonal wetlands
 - Large, historical changes
 - Land-use (cultivation, logging, etc.)
 - Overharvesting
- Indicators in-channel
 - Less marked, more recent changes
 - Flow and sediment
 - Herbicides and pesticides
 - Overharvesting

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The RTWG is specifically requested to:



- Take note on the progress of the work on status and trends
- Provide feedback and guidance on the results as detailed in the Progress Report

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Thank you



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