

BioRA Preparation Meeting PART I
Office of the Secretariat in Vientiane
04 – 10 July 2015

Fish and Fisheries

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www.mrcmekong.org

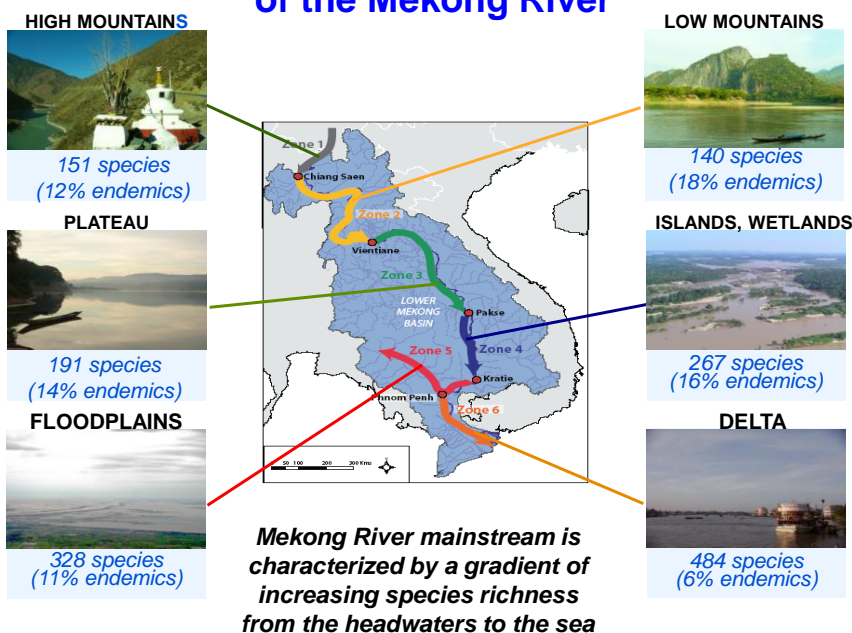


Fisheries of the lower Mekong Basin



- ⇒ Fish diversity: 800-1200 species
- ⇒ 200+ species; 30+ of high commercial importance
- ⇒ More than 50% of total fish catch in the lower Mekong basin (about 1.3 million tonnes worth US\$2.5 billion) dependent on migratory fish
- ⇒ Fish migrate all seasons of year
- ⇒ Total first-sale value is **US\$7.0 billion** per year
- ⇒ Per capita consumption average is about **46 kg/person/year**

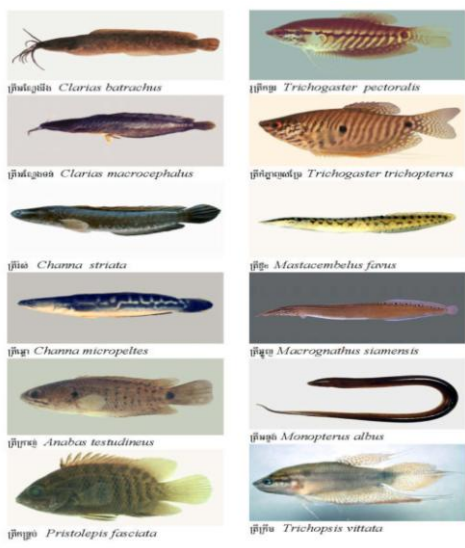
Fish species diversity in the 6 main zones of the Mekong River



Characteristics of the main fish groups

Black fish- Floodplain resident fish, with limited lateral migrations from the river onto floodplains and no longitudinal migrations upstream and downstream.

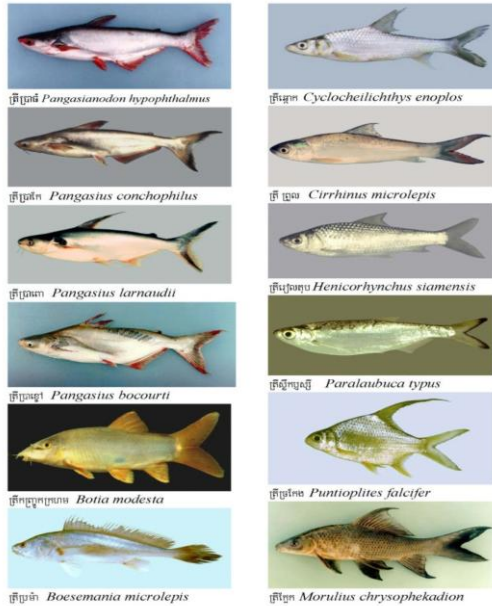
13% of species richness
50% of capture



Characteristics of the main fish groups

White fish, undertaking long distance migrations, in particularly between lower floodplains and the Mekong mainstream and its major tributaries.

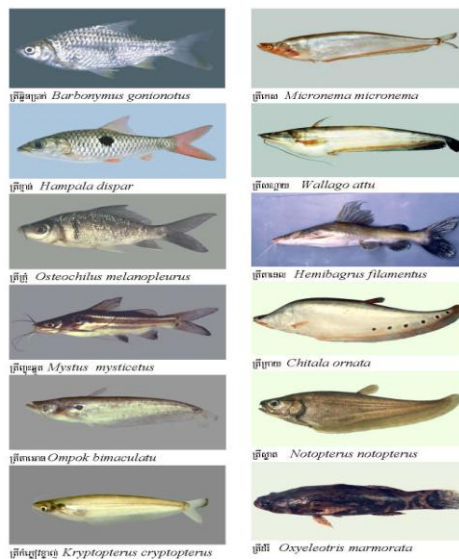
37% of species richness
36% of capture



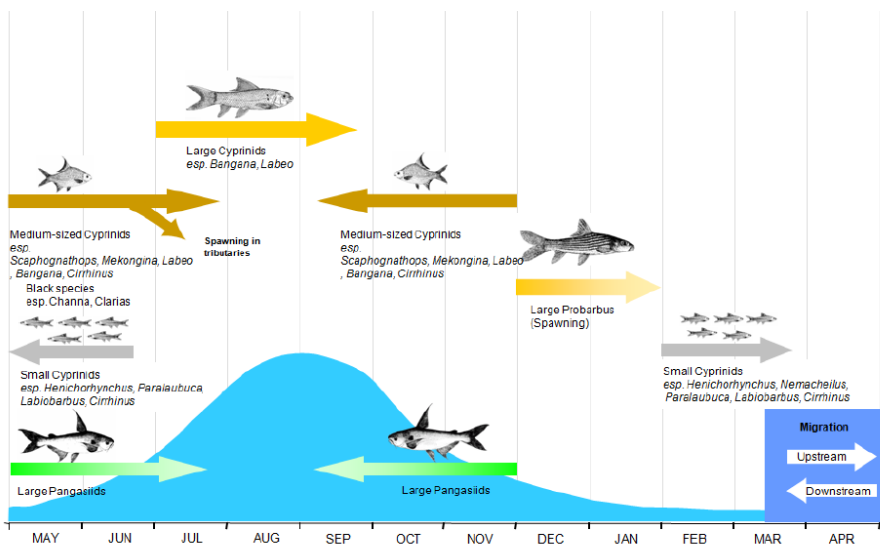
Characteristics of the main fish groups

Grey fish: ecologically intermediate between two previous groups, corresponds to fishes that do not spend the dry season in floodplain ponds, but do not undertake long distance migrations either.

50% of species richness
14% capture



Spawning migrations all year round



Baird and Shoemaker 2007

Pressures on Mekong fish and fisheries



Pressures on fisheries in LMB



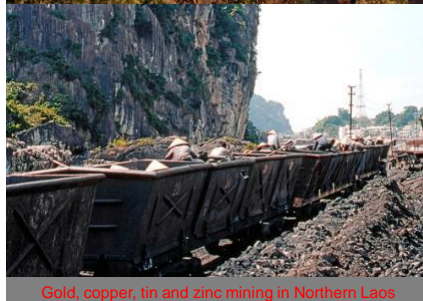
Ricefields replacing flooded forest near the Great Lake



The red-bellied pacu, *Piaractus brachipomus*, a member of the piranha family from South America

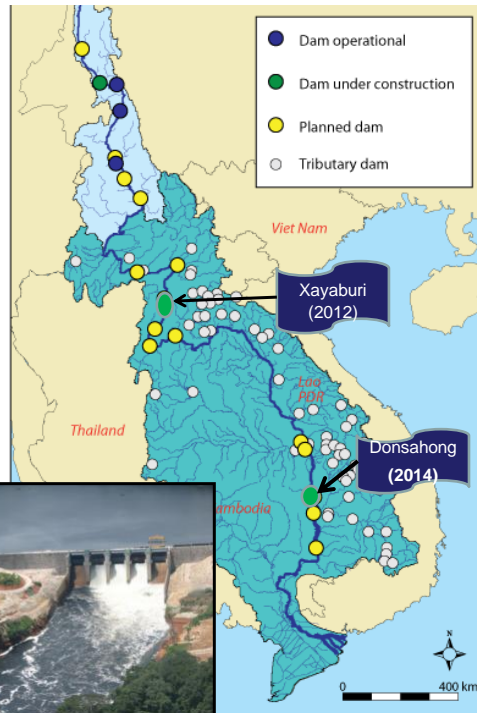


Pressures continue....



Biggest potential threat is considered hydropower dams

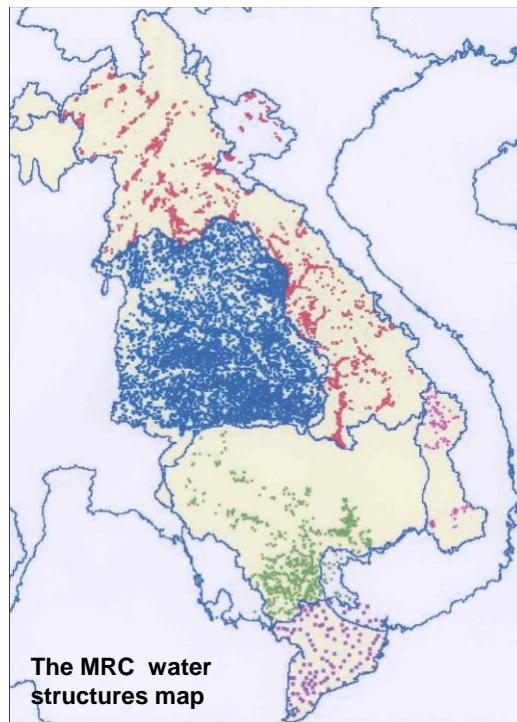
- ❖ 9 planned dams on LMB (mainstream) – two under construction.
- ❖ 23 existed dams (> 20 MW) on tributaries
- ❖ Many more tributary dams are projected or under construction



It isn't just about damming rivers.....!

Floodplain & basin connectivity

- Every dot is a registered water control structure
- Loss of connectivity = loss of productivity in floodplain/riverine fisheries



River-floodplain habitats - many dams already built in LMB
Rivers fragmented and cut off from floodplains



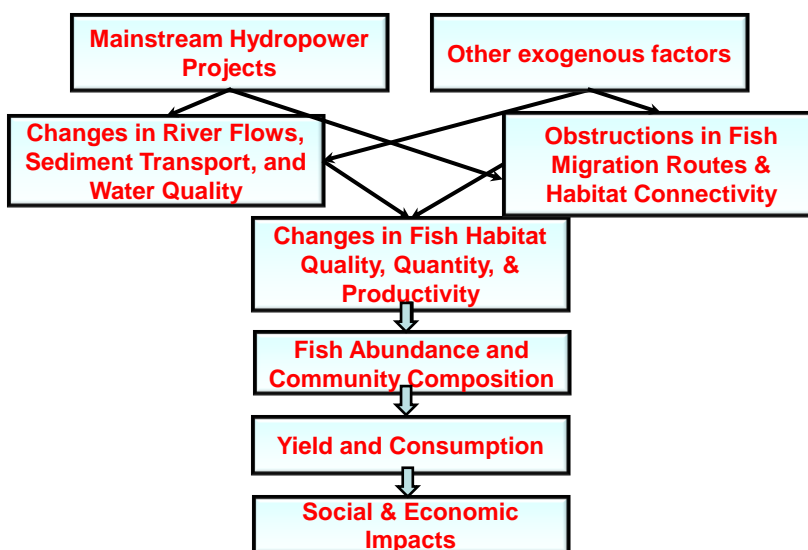
Pesticides ...Fertilizers



Pressures on fisheries

- Fisheries harvesting pressure
- Aquaculture linked to invasive species
- Land use changes
- In-channel barriers
- Impoundments
- Run-of-river abstractions
- Irrigation
- Urbanisation
- Industrial and urban pollution
- Agricultural pollution
- Mining pollution
- Sediment mining
- Climate change

Overview – cause effect of pressures on fisheries





Indicators

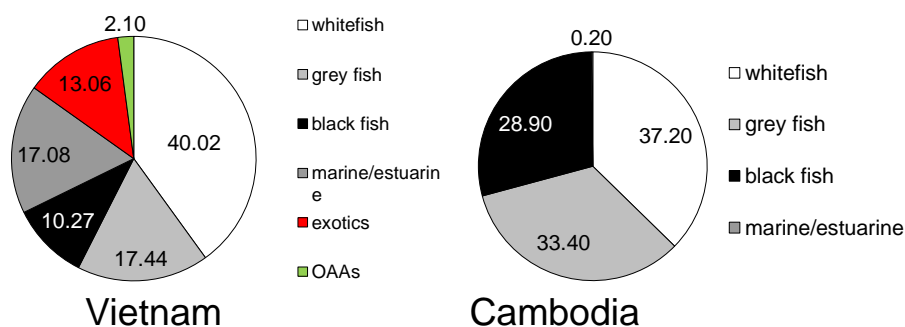
- Need to account for diversity of species – 800+ species
- Need to account for spatial and temporal distribution
- Need groupings that are responsive to pressures
- Adopted fisheries guild structure commonly used in in this type of analysis

Indicators

#	Indicator	Code
1	Rithron resident species	Rithron
2	Main channel resident (long distant white) species	CRes
3	Main channel spawner (short distance white) species	CSpawn
4	Floodplain spawner (grey) species	FSpawn
5	Eurytopic (generalist) species	Gen
6	Floodplain resident (black fish)	FRes
7	Estuarine resident species	ERes
8	Anadromous species	Anad
9	Catadromous species	Catad
10	Marine visitor species	Marine
11	Non-native species	NonN

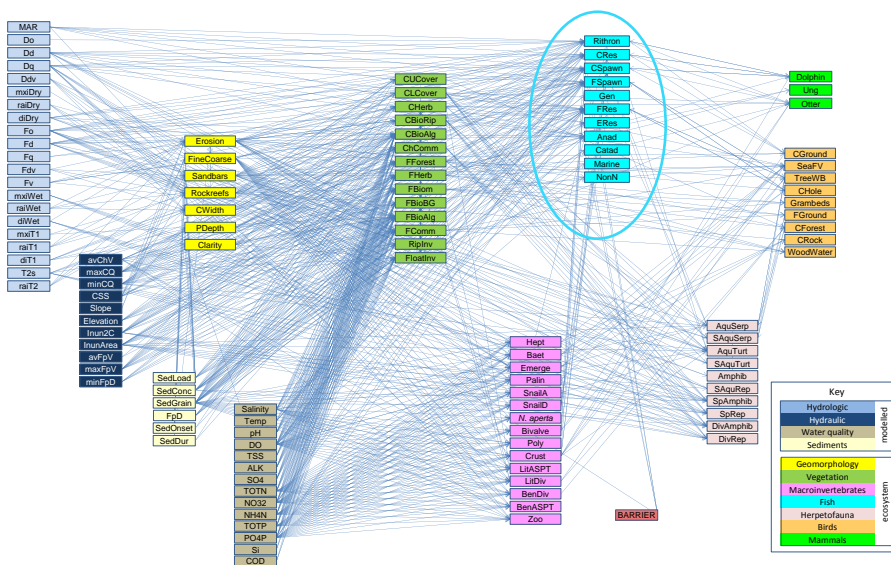
Impact of disruption to longitudinal connectivity

Contribution of fish species guilds to catches



40 % whitefish [33 species] in Vietnam and
37% [37 species] highly vulnerable/at risk

Indicator linkages



Status and trends

Status and trends - fisheries data sources

- 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 .

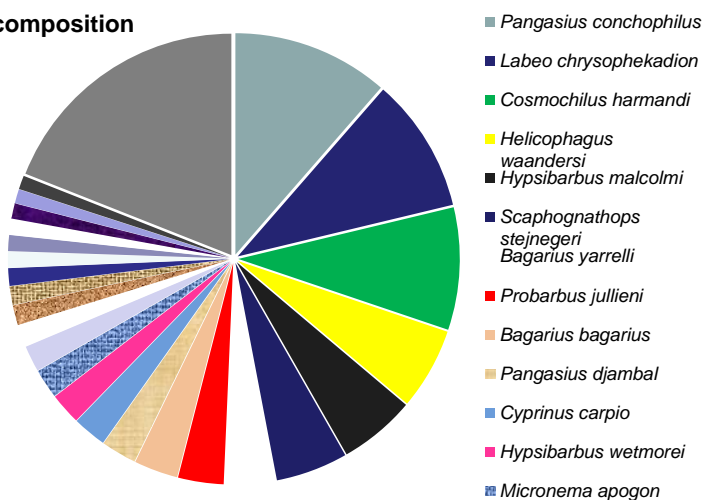
Lao PDR: Status and Trends

- Lee trap monitoring 1997-2012 Champasack province (Wet season June-September)
- Fish abundance and diversity monitoring (Gill net monitoring) 2008-2012 (Jan-Dec)



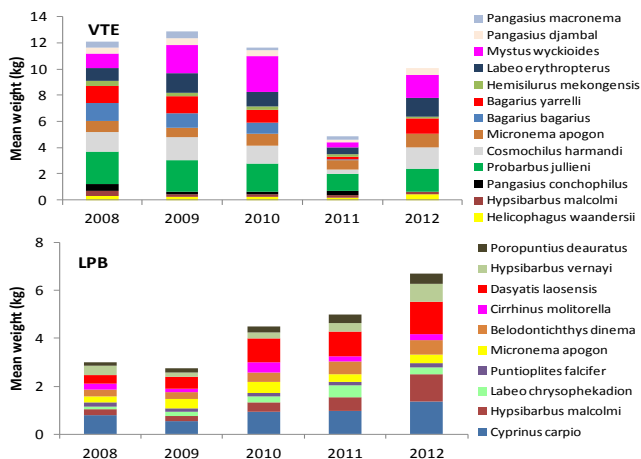
Gill net monitoring

Catch composition



In total 157 fish species were recorded between 2008 and 2012

Inter annual variation of mean CPUE of common species



Pressures on fisheries in Laos

	1900 (115)	1950 (65)	1970 (45)	2000 (15)	2015 (0)
1. Intense fishing pressure					
2. Agriculture development ???					
3. Flood mitigation					
4. Deforestation					
5. Rubber plantation					
5. Mining					
6. Hydro power					
7. Alien species					

- Little development during 1900-1950.

- First tributary dam Nam Ngum 1 constructed in 1968 and commissioned 1971

- Theun-Hiboun dam commissioned 1998

- More dam built during 2000-2012 (Nam Ngum 2, Xeset 2, Nam Lik 2, Nam Theun 2)

Laos PDR Zone 1

Pressure	Status	Abundance estimates as % relative to 2015			
	2015	1900 (115)	1950 (65)	1970 (45)	2000 (15)

Laos PDR Zone 1

Fish Group	Status	Abundance estimates as % relative to 2015			
	2015	1900 (115)	1950 (65)	1970 (45)	2000 (15)
1. Rithron resident species	B	150	150	130	120
2. Long distant white	C	200	200	170	140
Long distance migrants, associated in mainstream. Fishing pressure and tributary dams.					
3. Short distance white	C	220	220	200	150
4. Grey	-	-	-	-	-
5. Generalist	B	150	150	130	120

Fishing pressure + Land-use change + tributary dams

Laos PDR Zone 1

Fish Group	Status	Abundance estimates as % relative to 2015			
	2015	1900 (115)	1950 (65)	1970 (45)	2000 (15)
6. Black fish	N/A	-	-	-	-
7. Estuarine species	N/A	-	-	-	-

Few black fish as little off channel isolated flooding area

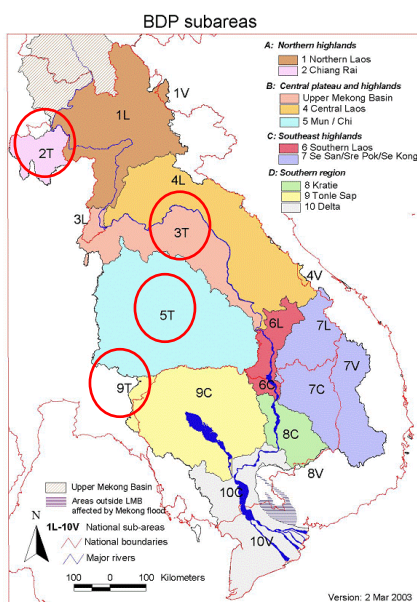
Isolated from estuary

Laos PDR Zone 1

Fish Group	Status	Abundance estimates as % relative to 2015			
		2015	1900 (115)	1950 (65)	1970 (45)
8. Anadromous species	C	200	200	180	120
9. Catadromous species	C	200	200	180	120
10. Marine visitor species	N/A	-	-	-	-

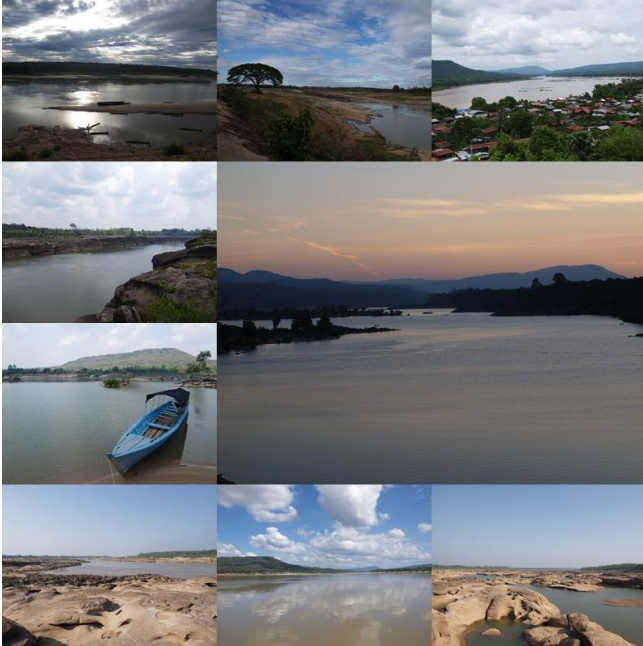
Fishing pressure + Land-use change + tributary dams
Isolated from marine

Thai - Mekong

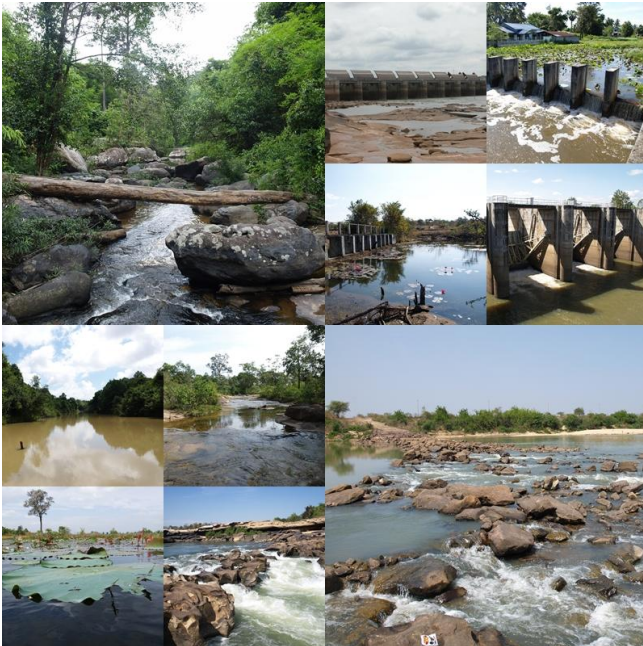


The Lower Mekong Basin (LMB) is divided into 10 sub-areas (SA) based on the hydrological conditions and country boundary. The Mekong Basin's part in Thailand included:

1. The Northern highlands SA-2T (covering Kok and Mekong river basins in the North)
2. The Central plateau and highlands include SA-3T (Mekong River Basin in the Northeast) and SA-5T (Chi and Mun river basins)
3. The Southern region SA-9T (Tonle Sap sub-basin) that adjacent with Cardamom mountain range in Thailand



Mekong river



Mun river and
Its branches

Type of Habitat



shallow swamp



large swamp

Type of Habitat



small reservoir



large reservoir

Type of Habitat



large stream

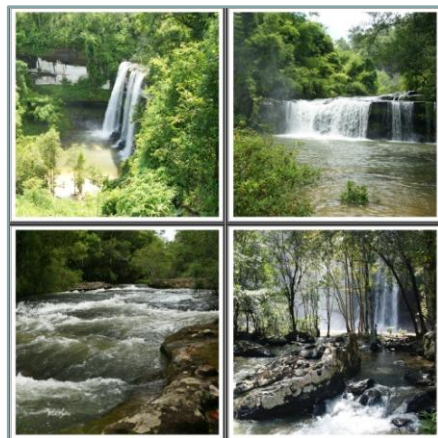


small stream

Type of Habitat



sand bar



water Fall

Type of Habitat



large river

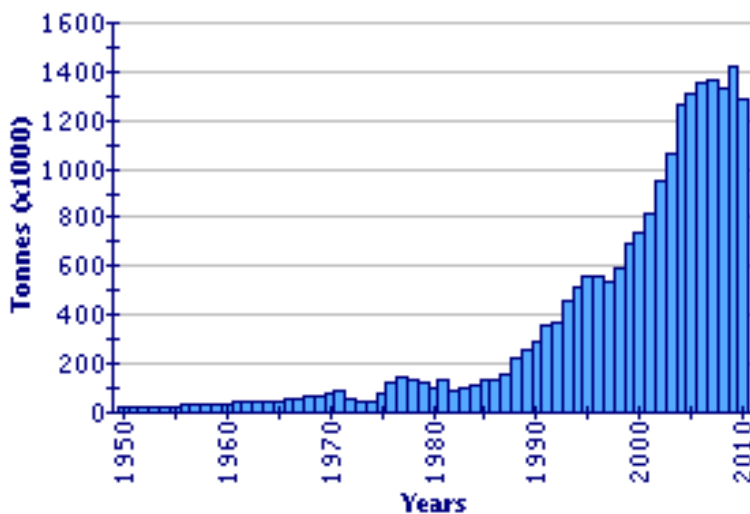
rocky rapid

Type of Habitat



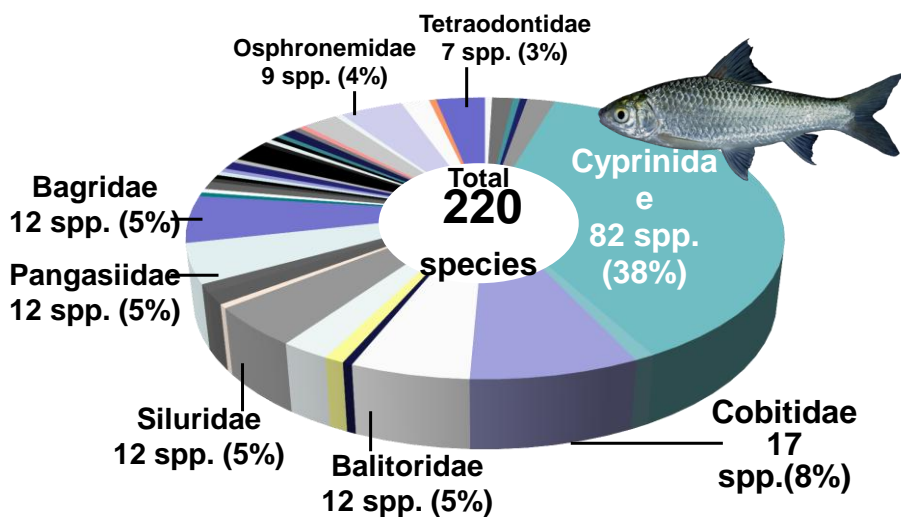
deep pool

Reported aquaculture production in Thailand (from 1950)
(FAO Fishery Statistic)



Analysis of Thai-Mekong Fishes

Composition of Fishes by Family



Pressure on Fisheries Mekong-Thailand

	1900 (115)	1950 (65)	1970 (45)	2000 (15)	2015 (0)
1. Agriculture - monoculture					
2. Aquaculture					
3. Fisheries exploitation					
4. Deforestation					
5. Irrigation network					

Remarks:

1. Northeastern part of Thailand is the major area of the Mekong-Thailand, growth rate population fast since 1970 resulting in development.
2. High rate of deforestation starting around 1950
3. Monocrop plantation (rice, sugar crane, cassava, fruit and rubber tree)

Status and trends-Fish : Ecological status ratings (historic abundance estimates as % relative to 2015 (100%))

Mekong River from Laos/Thailand	Status	Abundance estimates as % relative to 2015			
	2015	1900	1950	1970	2000
Rithron resident species	C	200	200	150	120
Main channel resident (long distant white) species	C	200	200	150	100
Main channel spawner (short distance white) species	C	200	200	150	100
Floodplain spawner (grey) species	D	200	150	130	100
Eurytopic (generalist) species	C	200	200	200	130
Floodplain resident (black fish)	C	200	150	150	120
Estuarine resident species	n/a	n/a	n/a	n/a	n/a
Anadromous species	n/a	n/a	n/a	n/a	n/a
Catadromous species	c	200	200	200	150
Marine visitor species	n/a	n/a	n/a	n/a	n/a
Non-native species	c	0	10	20	70

Remarks: Ecological status rating A=Excellent, B=Good, C=Satisfactory, D=Room for improvement and E=Improvement necessary

Thank You For Your Attention



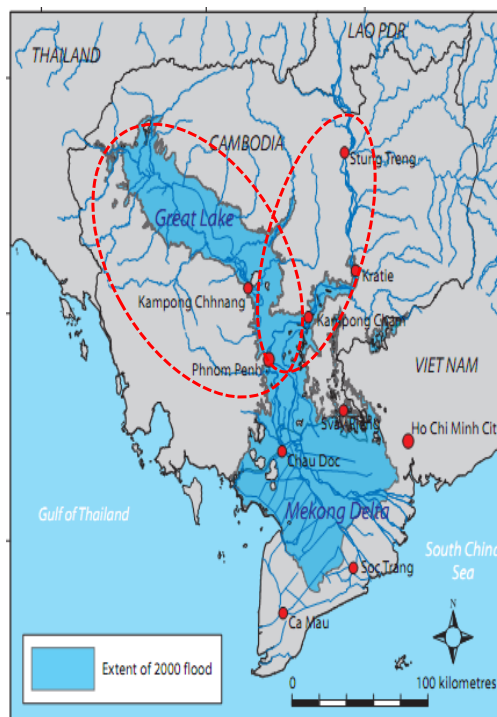
Cambodia Floodplain and Tonle Sap

FAO statistical data

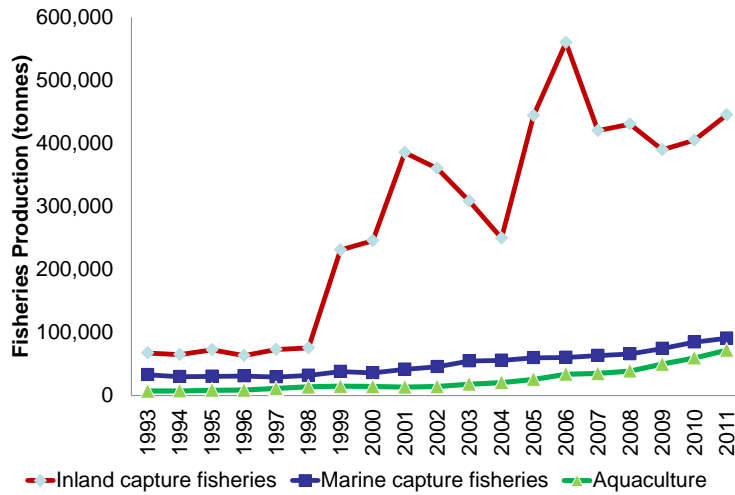
Fishers Catch Monitoring in the
Cambodian floodplain and Tonle
Sap under support of FP/MRCS:
2003 to 2013.

Larval Fish Monitoring in the
Cambodian floodplain and Tonle
Sap under support of FP/MRCS:
1999 to 2013.

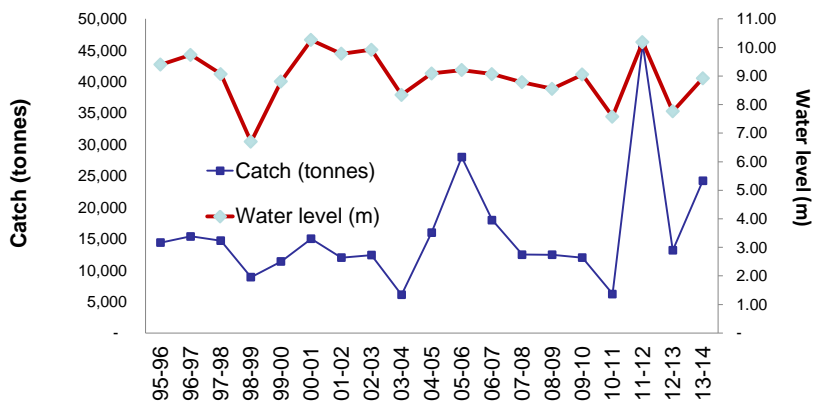
Technical Reports...



Fisheries Production By Sub-Sector



Fisheries Production - Dai fishery



Pressures on fisheries in Cambodia

	1900 (115)	1950 (65)	1970 (45)	2000 (15)	2015 (0)
1. Intense fishing pressure					
2. Agriculture development					
3. Deforestation					
4. Hydropower					
5. Mining					
Climate change					
Exotic species					

Main channel resident (long distant white) species

Area	Status	Abundance estimates as % relative to 2015			
		2015	1900	1950	1970
Mekong River in Cambodia	B	200%	180%	160%	150%
Tonle Sap River	B	220%	200%	180%	150%
Tonle Sap Great Lake... Fish Catalogues Chea Tharith.pdf	B	200%	180%	160%	140%

Main channel spawner (short distance white) species:

Area	Status	Abundance estimates as % relative to 2015			
	2015	1900	1950	1970	2000
Mekong River in Cambodia	C	250%	200%	180%	150%
Tonle Sap River	B	250%	220%	200%	180%
Tonle Sap Great Lake	C	200%	180%	160%	150%

Floodplain spawner (grey) species

Area	Status	Abundance estimates as % relative to 2015			
	2015	1900	1950	1970	2000
Mekong River in Cambodia	B	230%	200%	180%	150%
Tonle Sap River	B	220%	200%	180%	150%
Tonle Sap Great Lake	C	230%	220%	200%	150%

Eurytopic (generalist) species

Area	Status	Abundance estimates as % relative to 2015			
		2015	1900	1950	1970
Mekong River in Cambodia	B	220%	200%	180%	150%
Tonle Sap River	B	250%	220%	200%	150%
Tonle Sap Great Lake	C	250%	200%	180%	150%

Floodplain resident (black fish

Area	Status	Abundance estimates as % relative to 2015			
		2015	1900	1950	1970
Mekong River in Cambodia	B	220%	200%	180%	130%
Tonle Sap River	B	220%	200%	160%	150%
Tonle Sap Great Lake	B	250%	220%	200%	180%

Estuarine resident species

Area	Status	Abundance estimates as % relative to 2015			
	2015	1900	1950	1970	2000
Mekong River in Cambodia	B	200%	180%	150%	120%
Tonle Sap River	B	250%-	200%-	180%-	150%-
Tonle Sap Great Lake	B	250%-	220%-	180%-	150%-

Minor contribution to catches

Anadromous species:

Area	Status	Abundance estimates as % relative to 2015			
	2015	1900	1950	1970	2000
Mekong River in Cambodia	B	200%	180%	150%	120%
Tonle Sap River	B	250%	200%	180%	150%
Tonle Sap Great Lake	B	250%	220%	180%	150%

Catadromous species

Area	Status	Abundance estimates as % relative to 2015			
	2015	1900	1950	1970	2000
Mekong River in Cambodia	C	170%	150%	140%	130%
Tonle Sap River	C	200%	180%	150%	140%
Tonle Sap Great Lake	B	180%	150%	130%	110%

Marine visitor species

Area	Status	Abundance estimates as % relative to 2015			
	2015	1900	1950	1970	2000
Mekong River in Cambodia	B	190%-	180%-	150%-	130%-
Tonle Sap River	B	190%-	180%-	150%-	130%-
Tonle Sap Great Lake	N/A	-	-	-	-

Minor contribution to catches

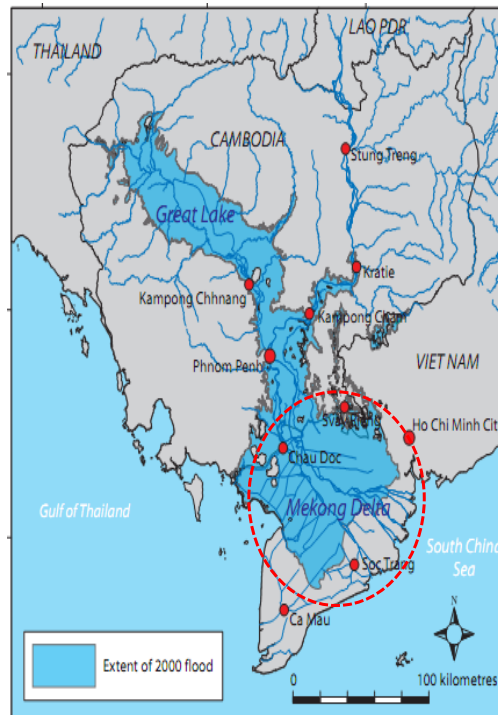
Mekong Delta

GSO (General Statistics Office):
1995 to present: Annual data of
capture fisheries, aquaculture,
annual crops (rice) + Perennial
crop (fruits), forestry...

Fishers Catch Monitoring in the
Mekong Delta under support of
FP/MRCS: 2003 to 2013.

Larval Fish Monitoring in the
Mekong Delta under support of
FP/MRCS: 1999 to 2013.

Technical Reports...



Mekong Delta

Main Driving Factors	1900 (115)	1950 (65)	1970 (45)	2000 (15)	2015
Fishing pressure + illegal gears					
Agricultural development					
Aquaculture development					
Deforestation					
Urbanization + pollution					
Climate change					
Exotic species					

Mekong Delta

Pressure	Status	Abundance estimates as % relative to 2015			
	2015	1900 (115)	1950 (65)	1970 (45)	2000 (15)

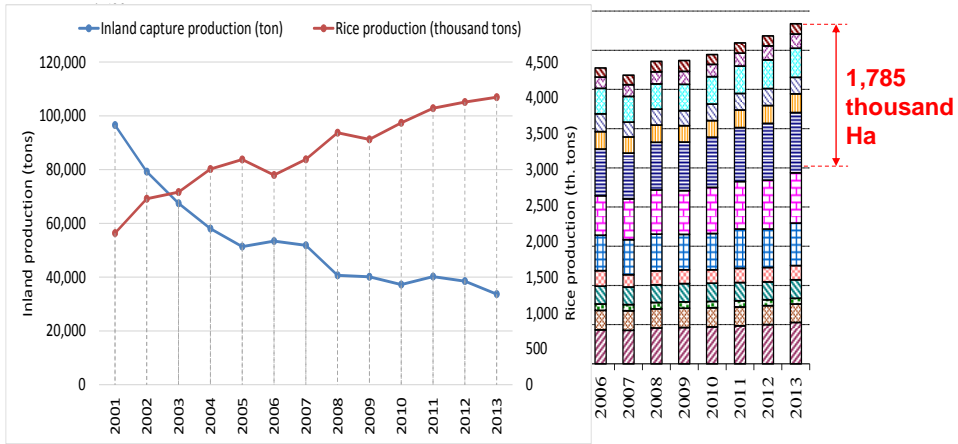
Mekong Delta

Fish Group	Status	Abundance estimates as % relative to 2015			
	2015	1900 (115)	1950 (65)	1970 (45)	2000 (15)
1. Rithron resident species	-	-	-	-	-
2. Long distant white	C	300%	250%	200%	130%
Long distance migrants, associated in mainstream. Fishing pressure (Mekong Delta + upstream) .					
3. Short distance white	C	250%	220%	180%	120%
4. Grey	C	250%	220%	200%	120%
5. Generalist	C	250%	220%	200%	130%

Fishing pressure + Land-use change + food demand

Mekong Delta

Rice farming areas (more crops): --> habitat degradation



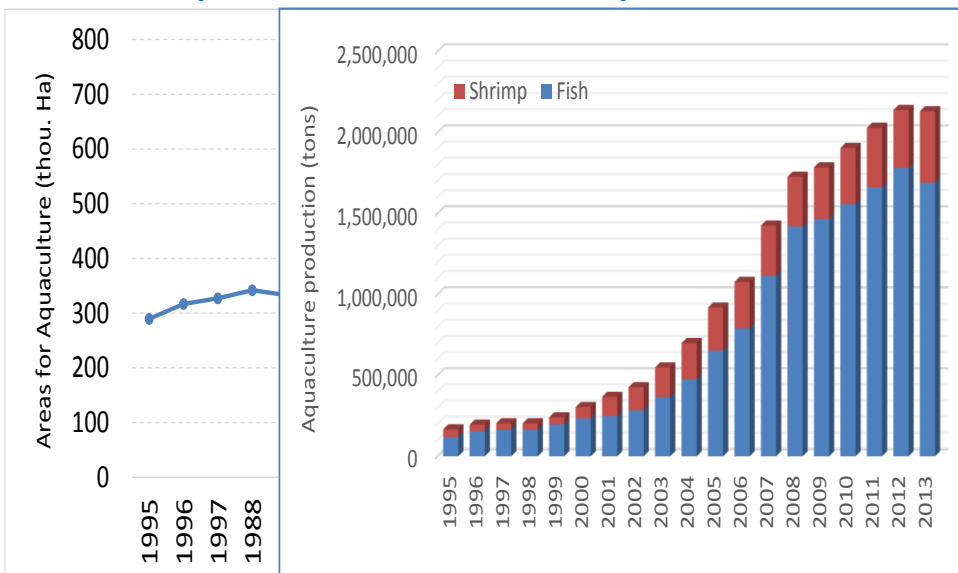
	2015	1900	1950	1970	2000
6. Black fish	B	230%	220%	200%	110%

Fishing pressure + Land-use change

Mekong Delta

Areas for Aquaculture:

Aquaculture Production



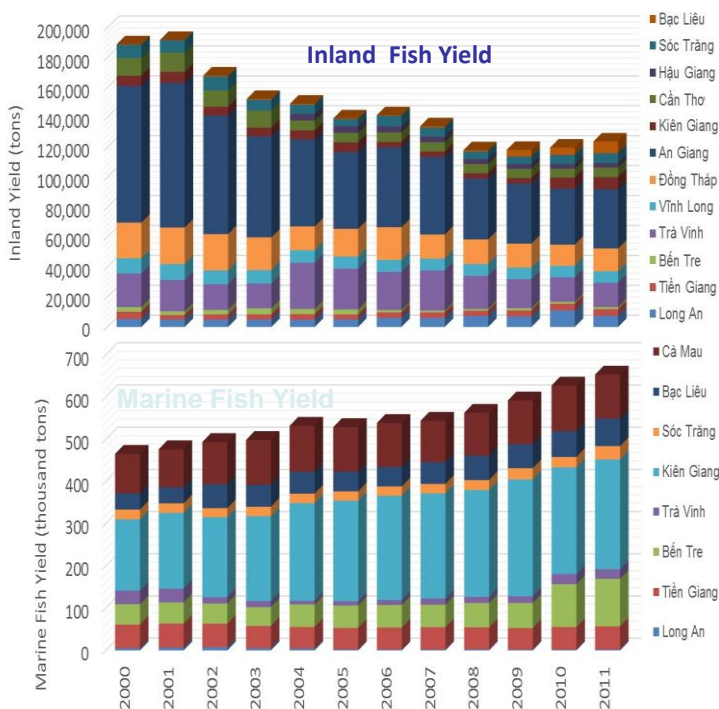
Mekong Delta

Fish Group	Status	Abundance estimates as % relative to 2015			
		2015	1900 (115)	1950 (65)	1970 (45)
7. Estuarine species	C	210%	180%	150%	110%

Fishing pressure + mangrove forest clearance for shrimp farming

8. Anadromous species	B	170%	160%	150%	120%
9. Catadromous species	B	150%	140%	130%	110%
10. Marine visitor species	B	150%	150%	130%	110%

Mekong Delta



Accumulative forest clearance

