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Session D5: Efficiency of Fish Passages Facilities on Nam Kam River, Thailand

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Presenter Information

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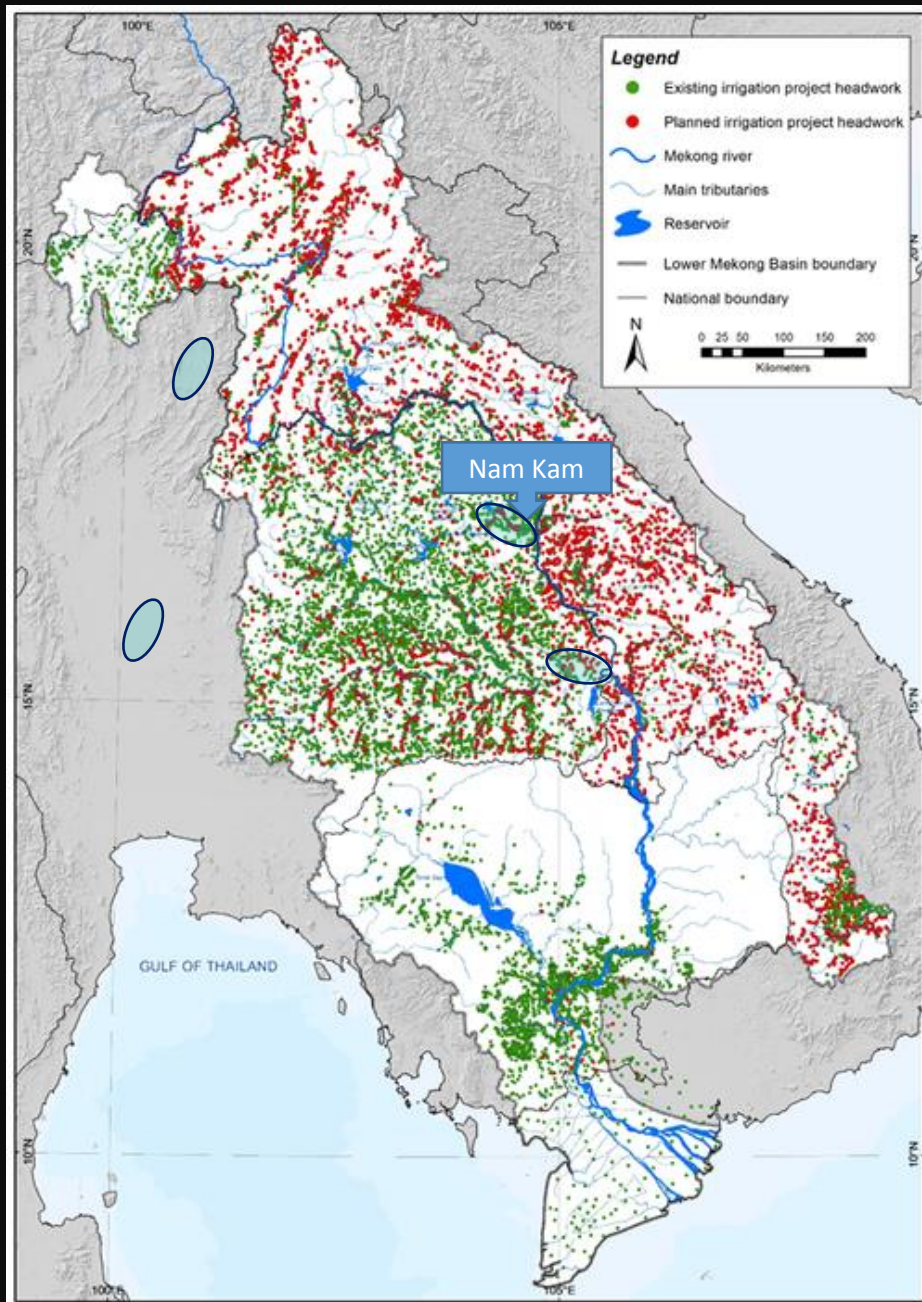
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Efficiency of fish passages facilities on Nam Kam River, Thailand.

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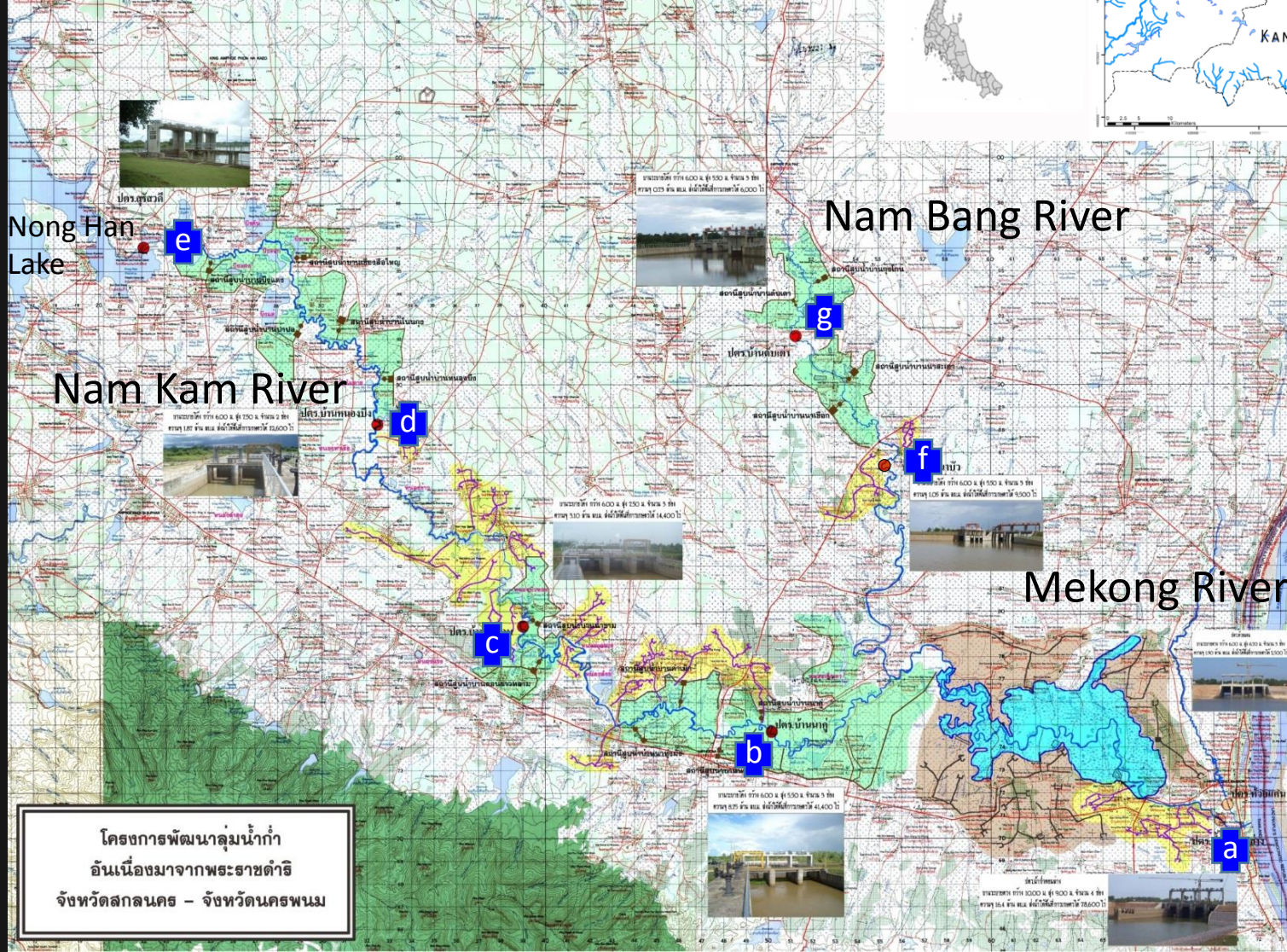
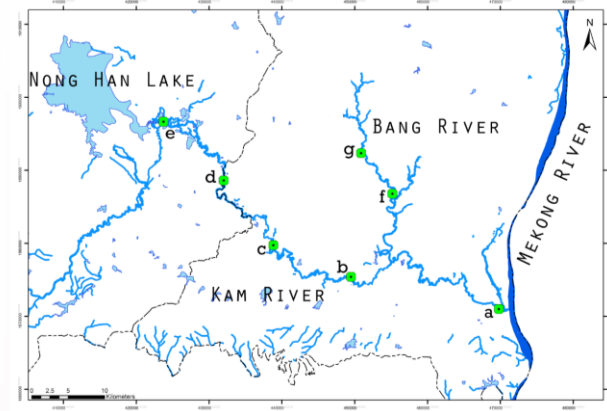
PROBLEM

Up to 14,900 existing and planned irrigation projects in the Lower Mekong Basin.

-Many still ignore migration of fish

- Only 4 fish passage facilities in Thailand
[>1000 projects]

Nam Kam



โครงการพัฒนาลุ่มน้ำก้ำอันเนื่องมาจากพระราชดำริ จังหวัดสกลนคร - จังหวัดนครพนม

- the pool and weir type fish pass
- slope of 1:5

- 3x3 m² pool area
- 108 m length



Aims

- Investigate the efficiency of fish passage facilities on the Nam Kam River for migration of fish.
- Determine migration patterns of economically important fish species after passing through fish passage facilities.



Fish sampling

- Seine net sampling at the last pool of fish pass (4 times a day) during migratory period at the most downstream fish pass.
- Data of fishes (species, number, length and weight) were record at each sampling.



Target species for migration pattern study

Hemibagrus nemurus

Max length : 65.0 cm SL



Osteochilus hasselti

Max length : 32.0 cm SL



Labeo chrysophekadion

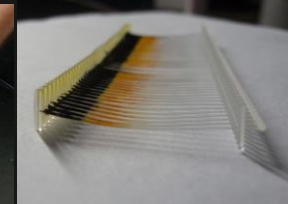
Max length : 90.0 cm SL



Tagging and recapture

Physical tags were modified from T-bar anchor tags

Colours on tag represent the code of tagging date



Release at the upstream area of fish pass



Migration pattern were describe by direction, distance, duration and ability to pass the weir.



Distribution and migration patterns was investigated through;

- Population structure
- Genetic differentiation of fish population in each area
- Number of migrant per generation (Nm)
- Genetic distance between subpopulation
- Number of recapture corrected.

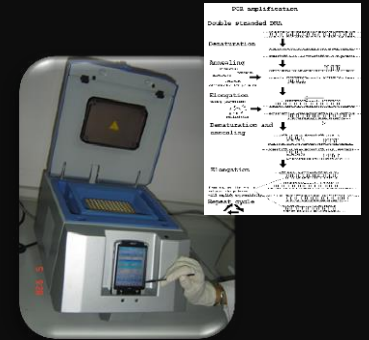
Locus	Repeat motif	Primer sequence (5'-3')	Annealing temperature (°C)	Allele sizes (bp)
Bgon 75	(AC) ₁₀	F: CTGGTAAAGACTTCAGATGC R: GCATGCAAAATGAGAAAGGCT	49	84-108
Ns 16	(TG) ₁₈	F: CGCGGGAATTCGATTACAGGTGC R: GCGCATTCTGTTCTCACCGCAAGGA	52	162-250
Hmo 34	(GT) ₁₉	F: GTTCCCTGAGGCTTTACAA R: GGGTCATTATCCTCTCACTTT	59	92-132
Hw 8	(CA) ₉	F: GAGGGAAGTTAGCCCCAAAT R: TCATTCTCCGGCTGTTCTT	52	180-210
Hw 26	(TG) ₁₆	F: CCATGGTTCGCCAAACCTG R: TAGCGTGTCCAATCACCTGC	52	140-178
Hw 32	(CA) ₁₁	F: CCACATTGAGTTCTCCAGCATGA R: CTTAACACGCTCCACACGGA	52	186-224



DNA extraction from preserved samples



Determination of DNA by Spectrophotometer and then dilute

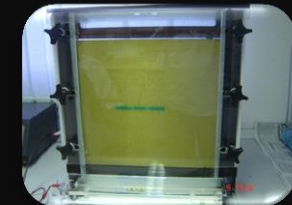


Generate more copies of the DNA piece by PCR reaction

Microsatellite DNA Analysis



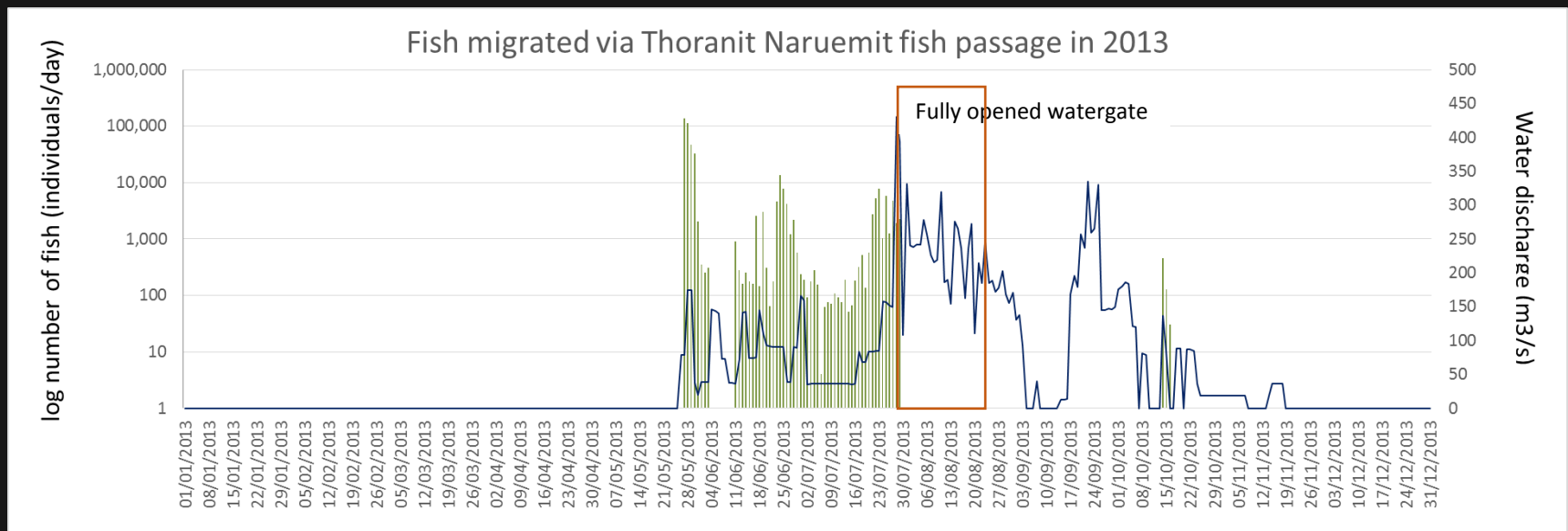
Photographed and sized using Universal software



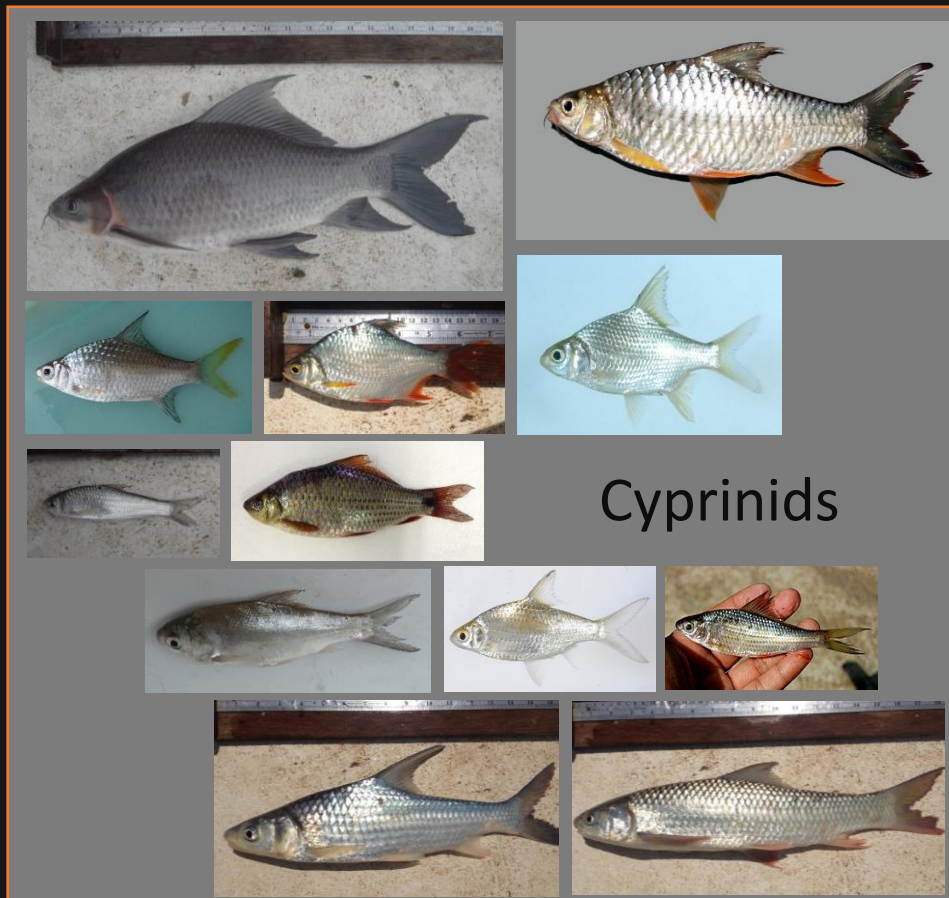
Size fractionated by electrophoresis in polyacrylamide gel

Result

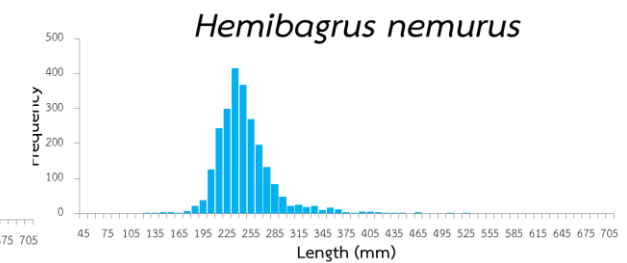
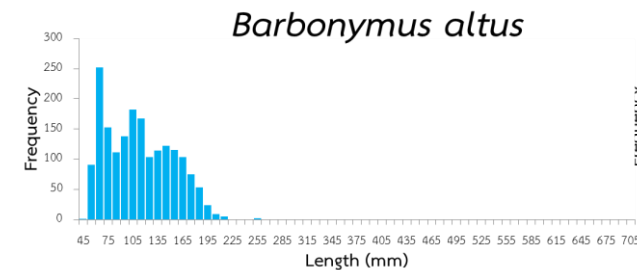
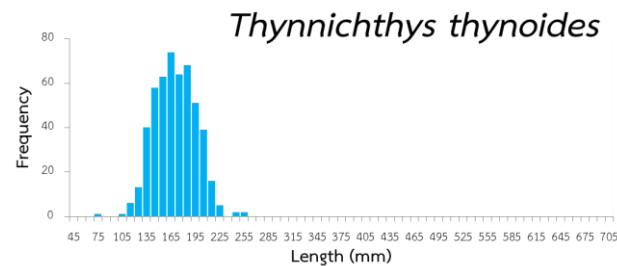
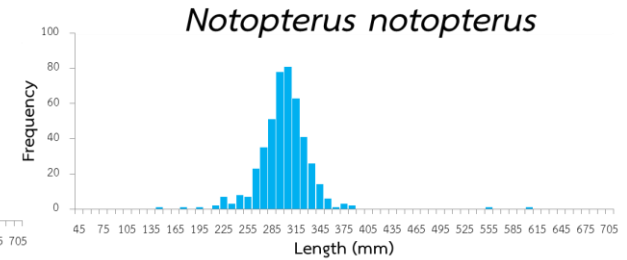
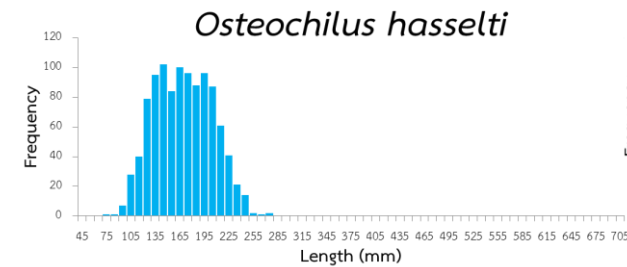
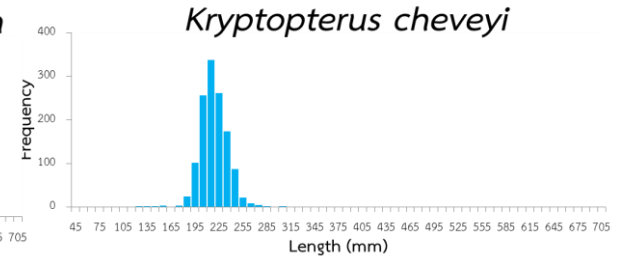
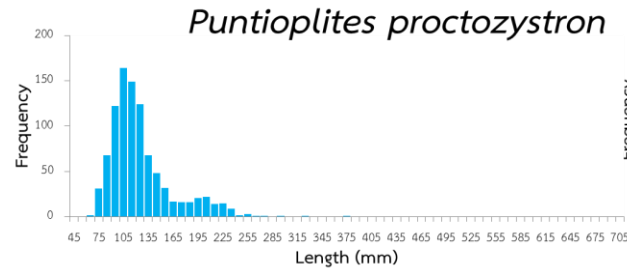
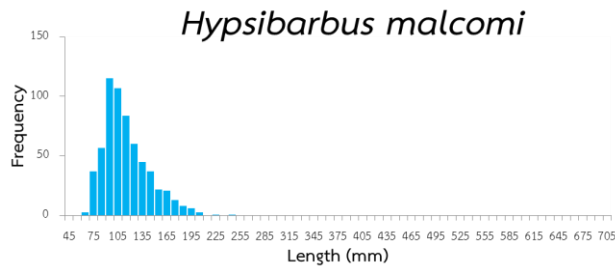
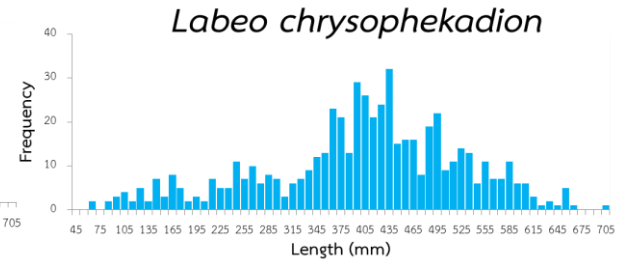
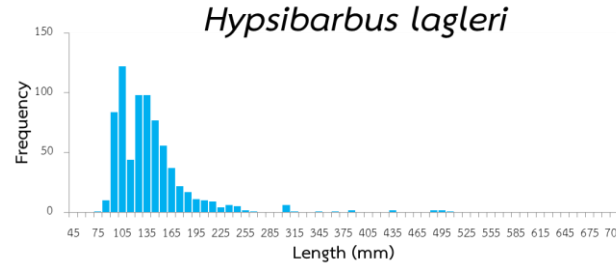
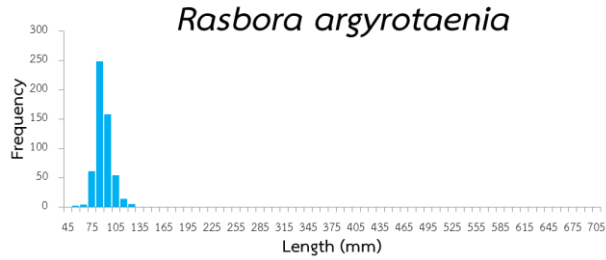
- Migration from Mekong into Nam Kam river system starts at onset of rainy season (end of May to early October).
- 83 species of fish (>440,000 individuals or ≈ 11 tons) observed at most downstream fish pass.
- Majority of fish observed in early rainy season [averaging $\approx 47,000$ individuals per day or ≈ 607 kg per day].



- Fish migrate more during the day ($\approx 95\%$) than night ($\approx 5\%$) in terms of abundance while number of species was not significantly different (70 and 68 species).
- Cyprinids dominant group migrating during day but Bagrids and Silurids mostly migrated at night.



Fish pass can support all sizes of fish [ranging between 45-700 mm]



Majority of fish species were mature and ready to spawn >> indicates reproductive migration.

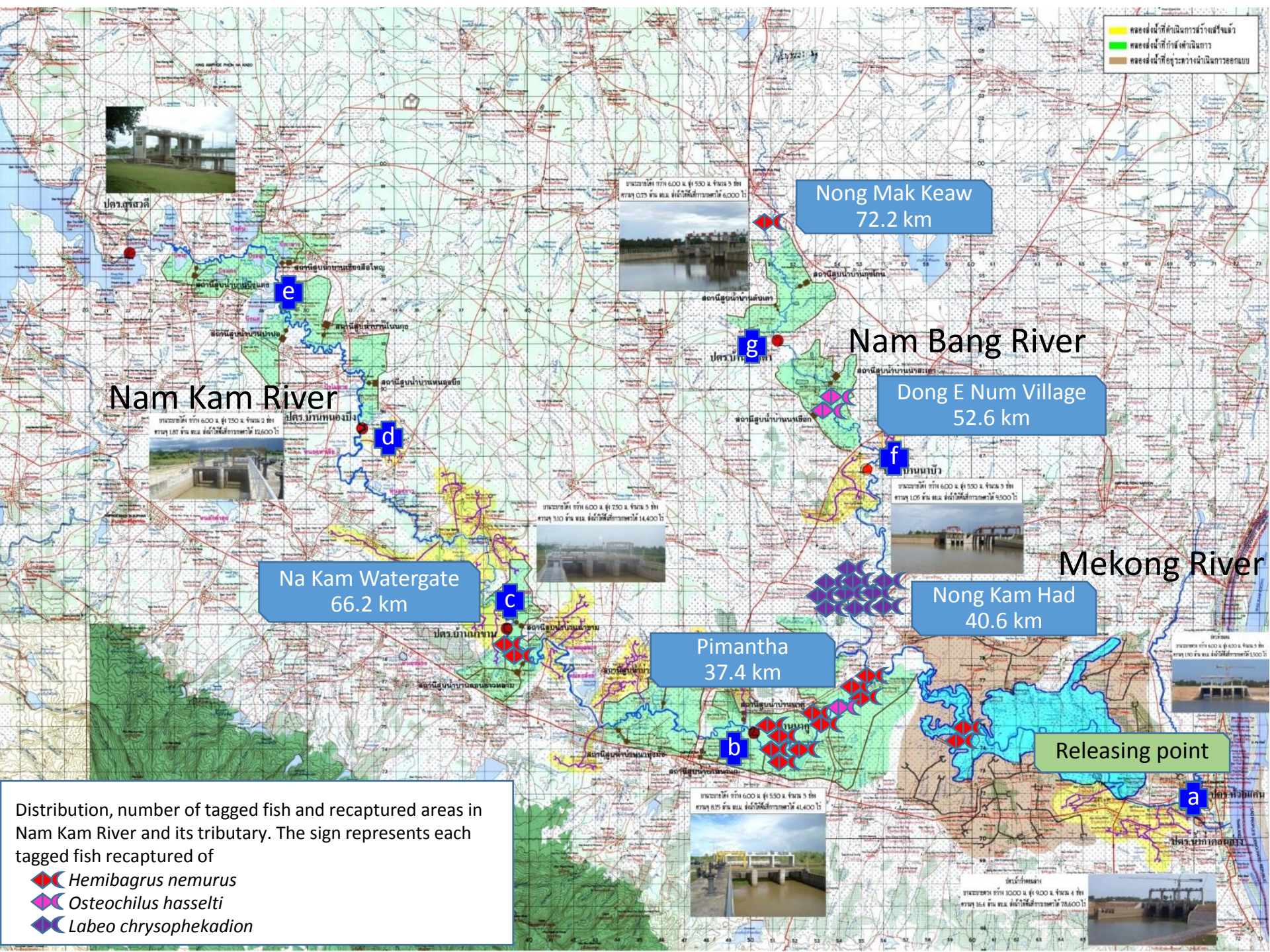


Mark and recapture



	<i>Hemibagrus nemurus</i>	<i>Osteochilus hasselti</i>	<i>Labeo chrysophekadion</i>
No. of migratory fish from Mekong river through Thoranit Naruemit fish pass	2,429 individuals	1,040 individuals	566 individuals
% from all migratory fish	8.6%	3.8%	2.0%
No. of tagged fish	1,552 individuals	515 individuals	343 individuals
% tagged fish	63.9% (1,552 /2,429)	49.5% (515/1,040)	60.6% (343/566)
No. of recaptured fish	15 samples	3 samples	10 samples
Recovery rate	0.96% (15/1,552)	0.58% (3/515)	2.91% (10/343)

ตลอดแม่น้ำที่ดำเนินการสำรวจแล้ว
 ตลอดแม่น้ำที่กำลังดำเนินการ
 ตลอดแม่น้ำที่ดูระหว่างดำเนินการออกแบบ



Nam Kam River

Nong Mak Keaw
72.2 km

Nam Bang River

Dong E Num Village
52.6 km

Mekong River

Nong Kam Had
40.6 km

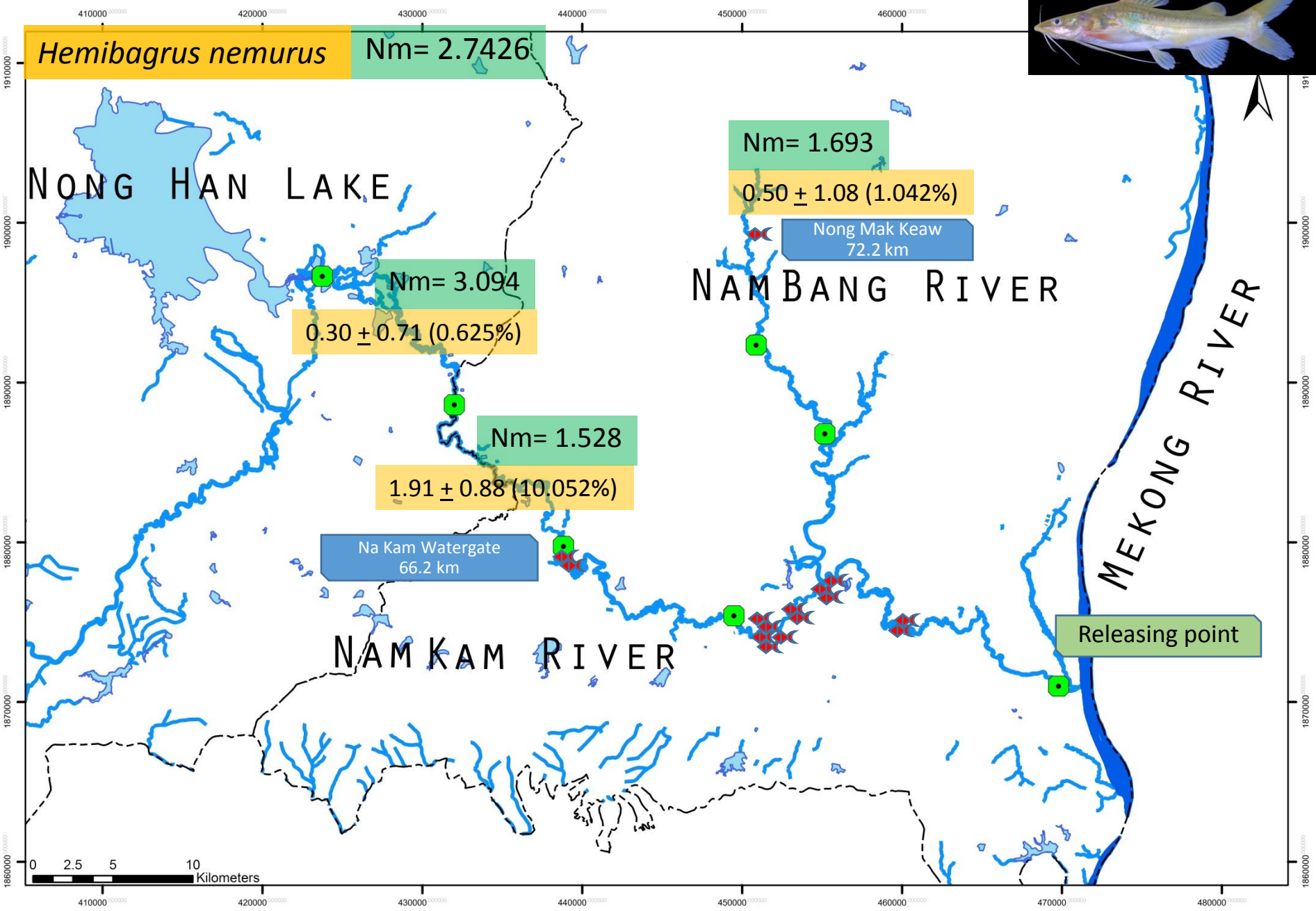
Pimantha
37.4 km

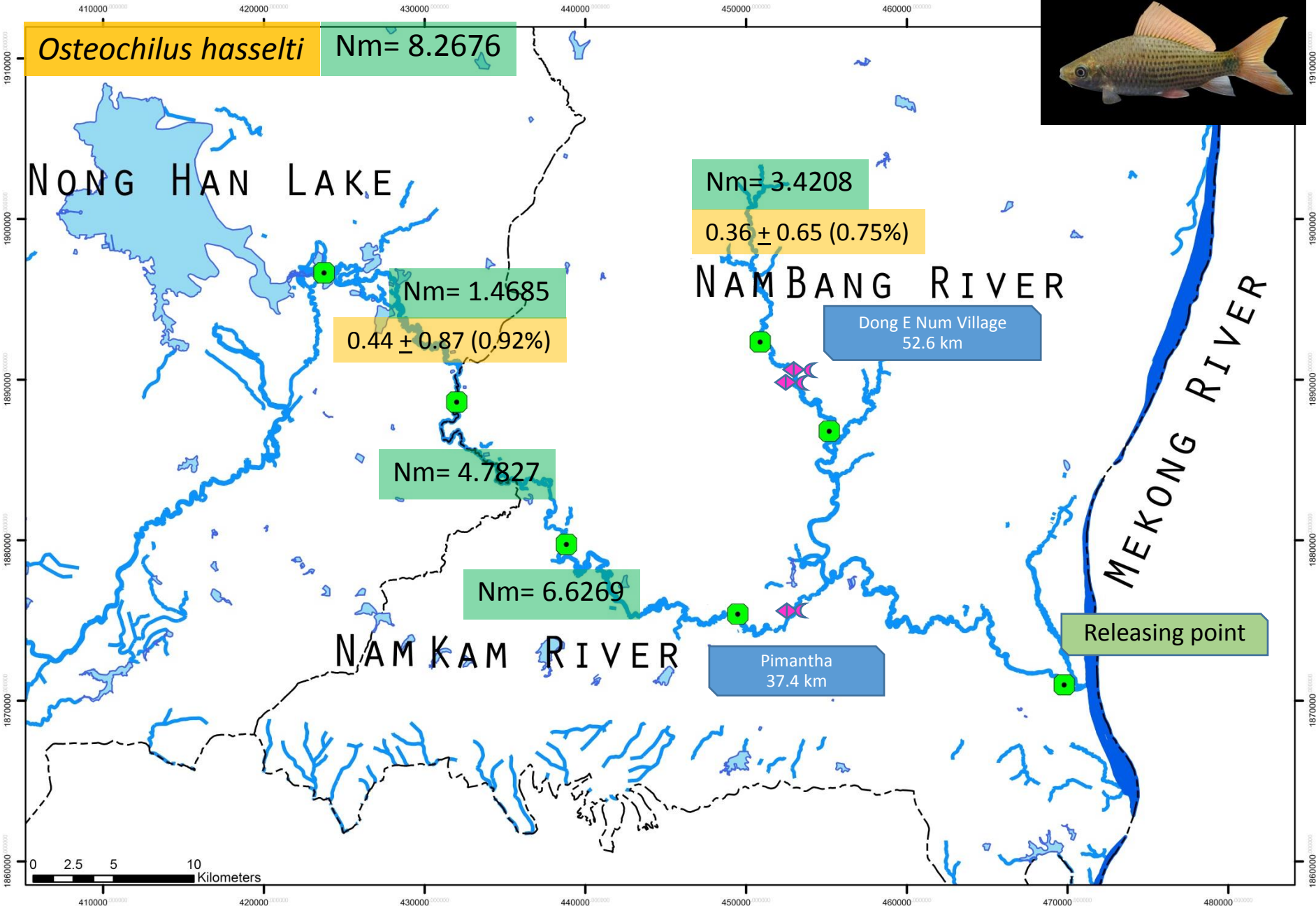
Na Kam Watergate
66.2 km

Releasing point

Distribution, number of tagged fish and recaptured areas in Nam Kam River and its tributary. The sign represents each tagged fish recaptured of

- ◀▶ *Hemibagrus nemurus*
- ◀▶ *Osteochilus hasselti*
- ◀▶ *Labeo chrysophekadion*



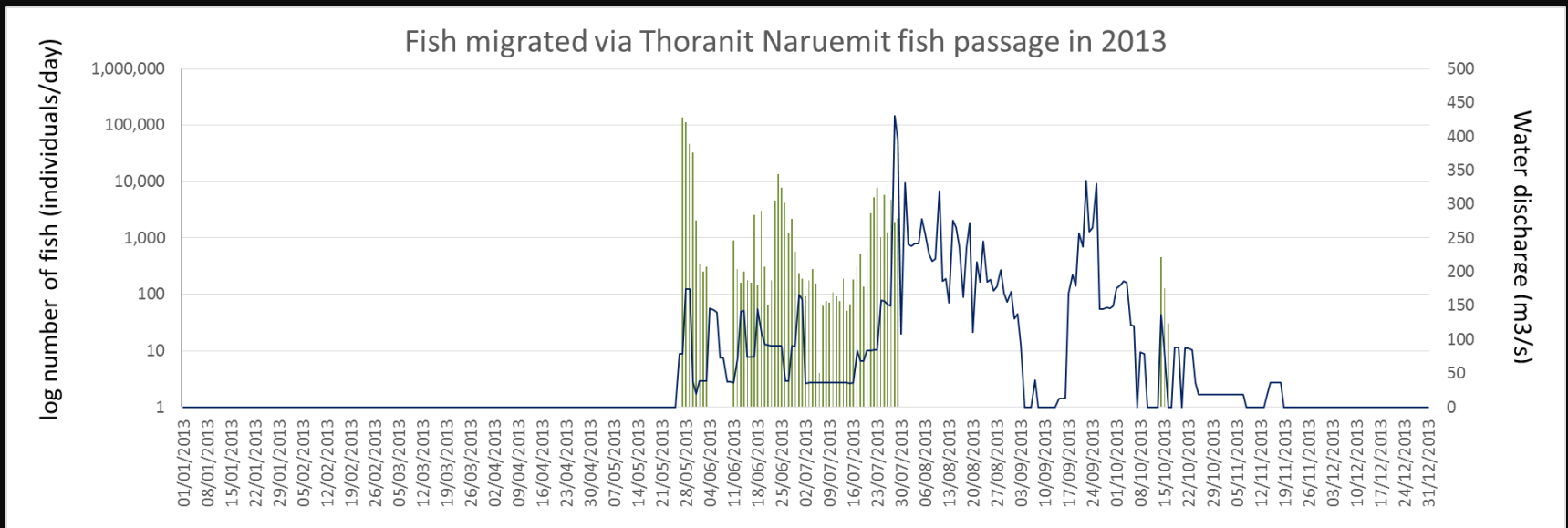


Discussion

- 104 species of fishes found along the river: 95 species observed in fish passes.
- Large number of fish observed migrating through the fish passes suggests the facilities are effective and maintain diversity of fish in Nam Kam River.

Name of fish passes (year)	No. of migration period (days)	No. of fish that migrated through fish passes (fish)	No. of species that migrated through fish passes (species)
Suraswadi 2012	22	234,540	43
Nong Bueng 2012	2	1,048	11
Na Kham 2012	4	4,772	16
Na Koo 2012	2	932	8
Thoranit Naruemit 2012	31	347,375	82
Suraswadi 2013	40	413,471	50
Thoranit Naruemit 2013	60	440,015	83

- However, cumulative effect of a series of watergates might, to some extent, obstruct the migration of fishes in Nam Kam River – noted number of tags recovered from two techniques and migration rate were very low.
- Managing operation of watergates and fish passes around migration and spawning seasons of most migratory species could increase the rate of fish migration in the river.



Acknowledgements

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