Dec 12th, 11:00 AM - 12:40 PM

Wetland fish communities above stream regulators with and without fish passage in Lao PDR

Douangkham DK Singhanouvong
Living Aquatic Resource Research Center(LARReC)

Lee Baumgartner
Charles Sturt University

Wayne WR Robinson
Charles Sturt University

Garry GT Thorncraft
National University of Lao

Fish Passage 2018 Conference in Albury

10-14 December 2018

Wetland fish communities above stream regulators with and without fish passage in Lao PDR

Mr. Douangkham SINGHANOUVONG

Dr. Wayne Robinson

Mr. Garry Thorncraft

Mr. Thonglom Phommavong

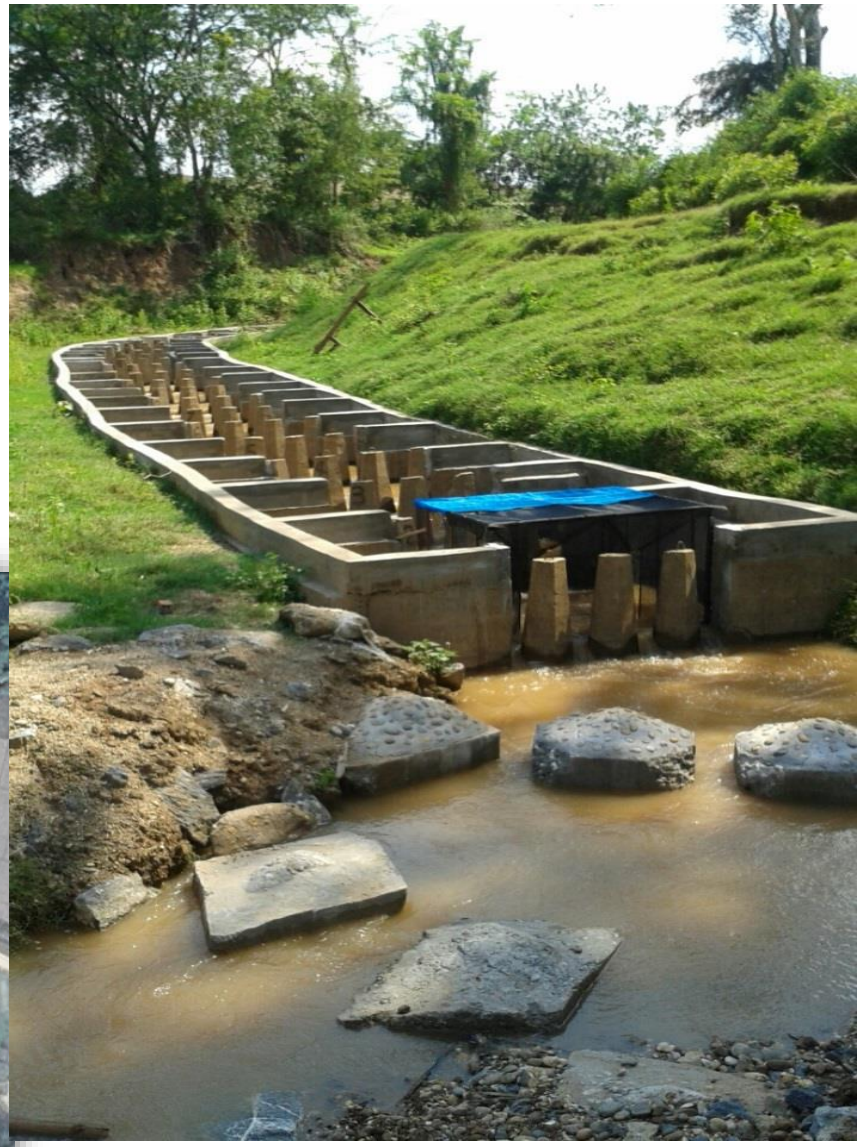
Mr. Khamla Phommachanh

Outline

1. Introduction
2. Location and Objective
3. Methodology
4. Preliminary results
5. Summary
6. Discussion and Conclusion

1. INTRODUCTION

- Cone fishway completed 2014



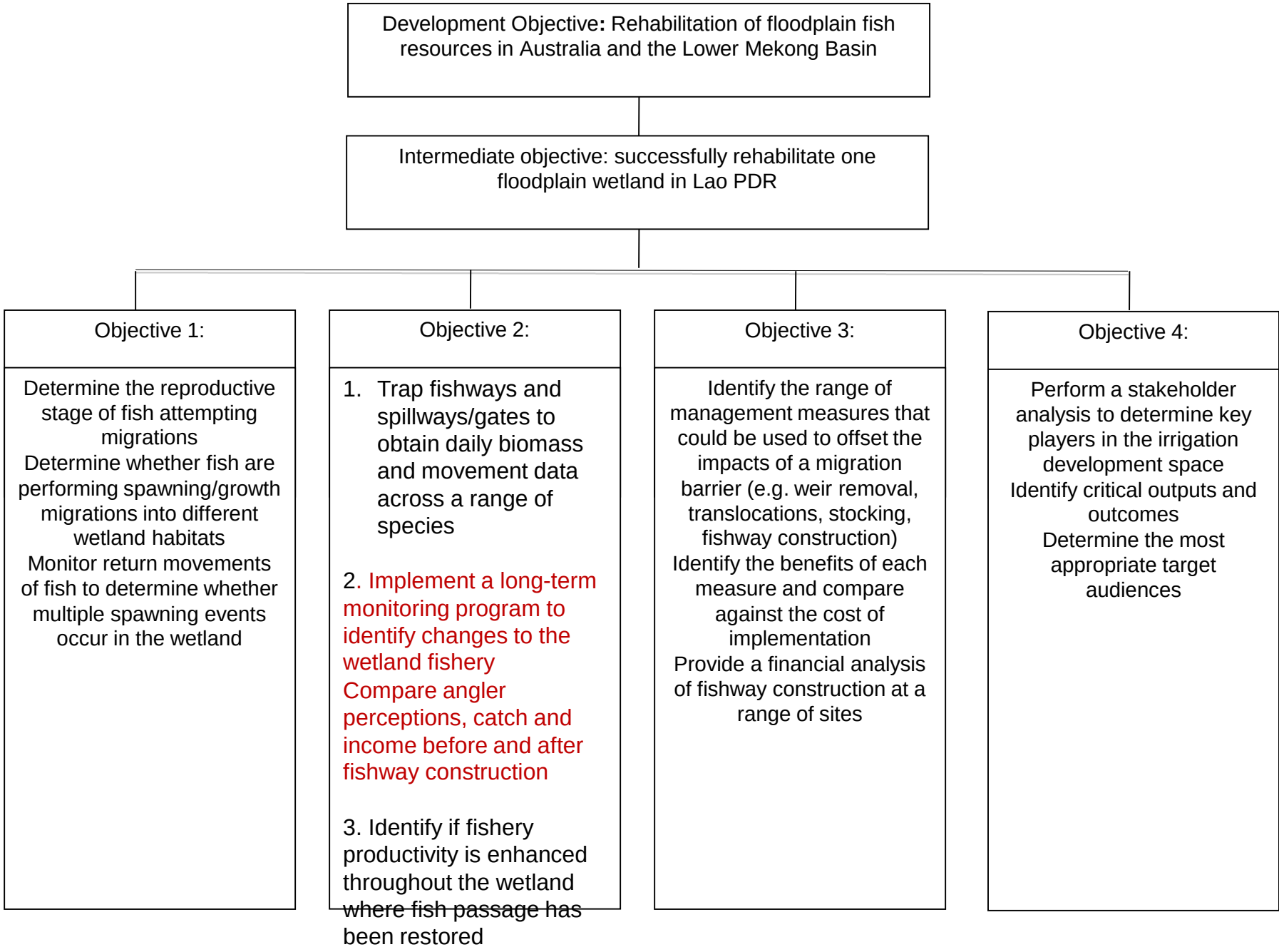
Quantifying biophysical and community impacts of improved fish passage in Lao PDR

FIS/2014/041

2016-2020

The Project of objectives

- **Objective 1**: To evaluate colonisation of riverine species in seasonal wetlands
- **Objective 2**: Quantify whether there is an annual increase in capture fishery production at sites where fishways have been constructed
- **Objective 3**: Quantify, in social and economic terms, the options for constructing fishways at riverine infrastructure
- **Objective 4**: To promote the uptake of project outputs


Development Objective: Rehabilitation of floodplain fish resources in Australia and the Lower Mekong Basin
Intermediate objective: successfully rehabilitate one floodplain wetland in Lao PDR
Objective 1:
Determine the reproductive stage of fish attempting migrations
Determine whether fish are performing spawning/growth migrations into different wetland habitats
Monitor return movements of fish to determine whether multiple spawning events occur in the wetland
Objective 2:
1. Trap fishways and spillways/gates to obtain daily biomass and movement data across a range of species
2. Implement a long-term monitoring program to identify changes to the wetland fishery
Compare angler perceptions, catch and income before and after fishway construction
3. Identify if fishery productivity is enhanced throughout the wetland where fish passage has been restored
Objective 3:
Identify the range of management measures that could be used to offset the impacts of a migration barrier (e.g. weir removal, translocations, stocking, fishway construction)
Identify the benefits of each measure and compare against the cost of implementation
Provide a financial analysis of fishway construction at a range of sites
Objective 4:
Perform a stakeholder analysis to determine key players in the irrigation development space
Identify critical outputs and outcomes
Determine the most appropriate target audiences

Are the fish communities above the fishways different than before the fishway was installed?

- Methods Comparison between wetlands with and without fishways;
    - Household surveys of villager catch and location (back to 2009)
        - Monitors which fish are caught above and below fishways as well as assesses benefits to villagers
    - Sampling of fish within wetlands above regulators
    - Record of angler catch below regulators
- Collecting fish within fishways to asses which fish use them
- Also socio economic surveys BCA

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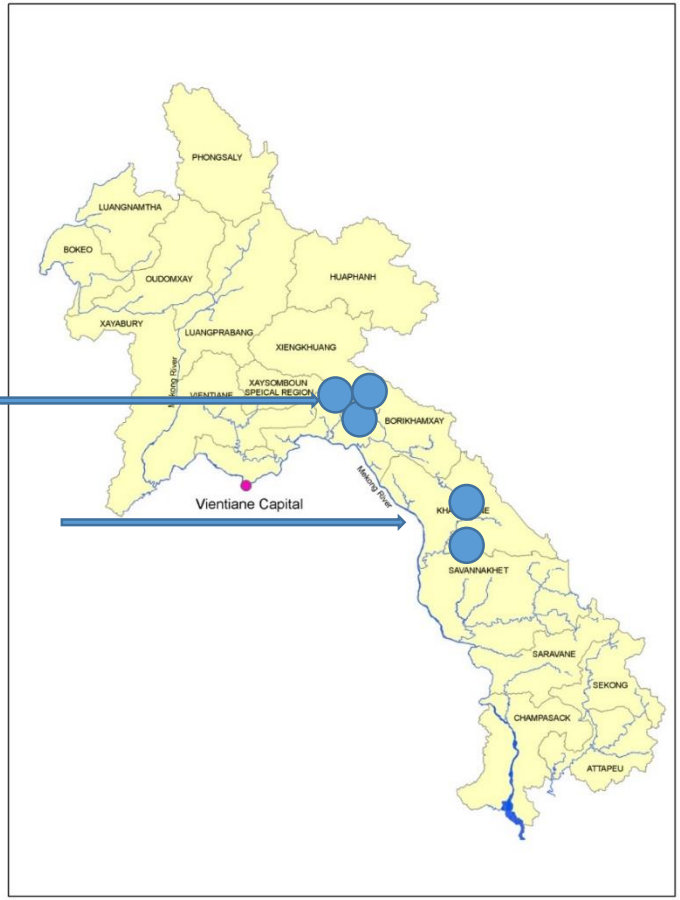
    - **Sampling of fish within wetlands above regulators (5 sites)**
    - Record of angler catch below regulators
- Fishways sampling to asses which fish use them (Pakpeung wetland)
- Also socio economic surveys for BCA

2. The location of fish sampling/monitoring (5 sites)

Paksan district

Xechamphone district

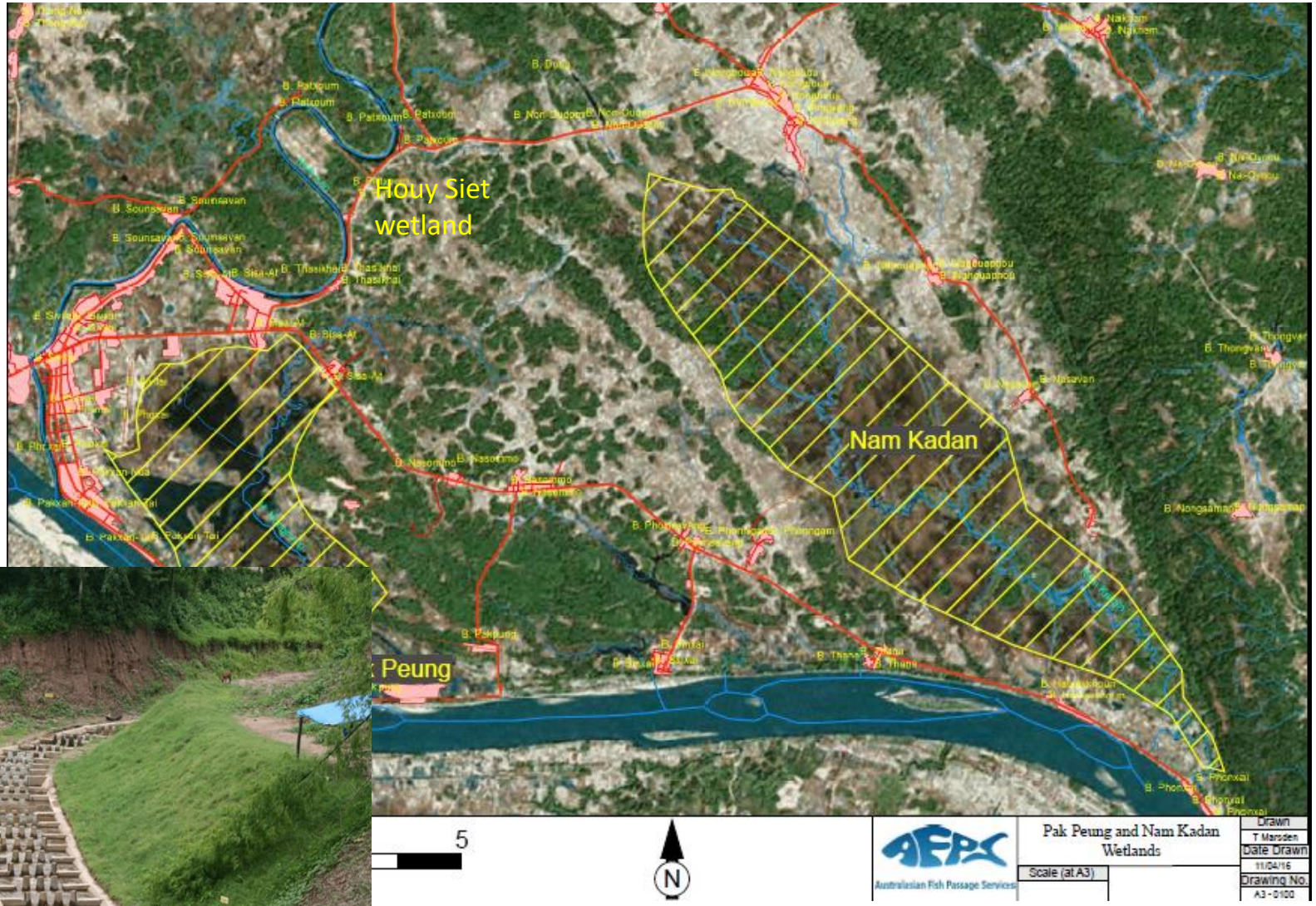


Paksan District

PAK PEUNG (fishway)

Houy Kadan (regulator no fishway)

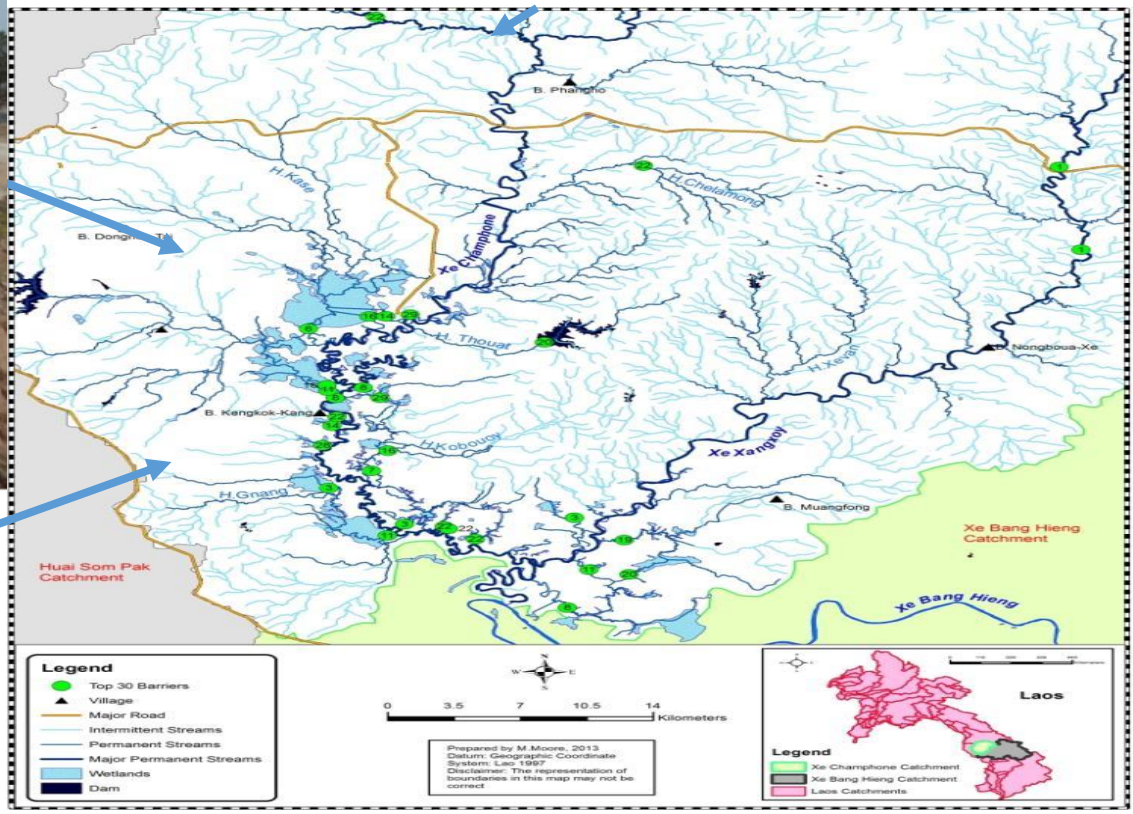
Houy Siet (no regulator)



Xechamphon district

Houy Souy Wetland
(Fish way)

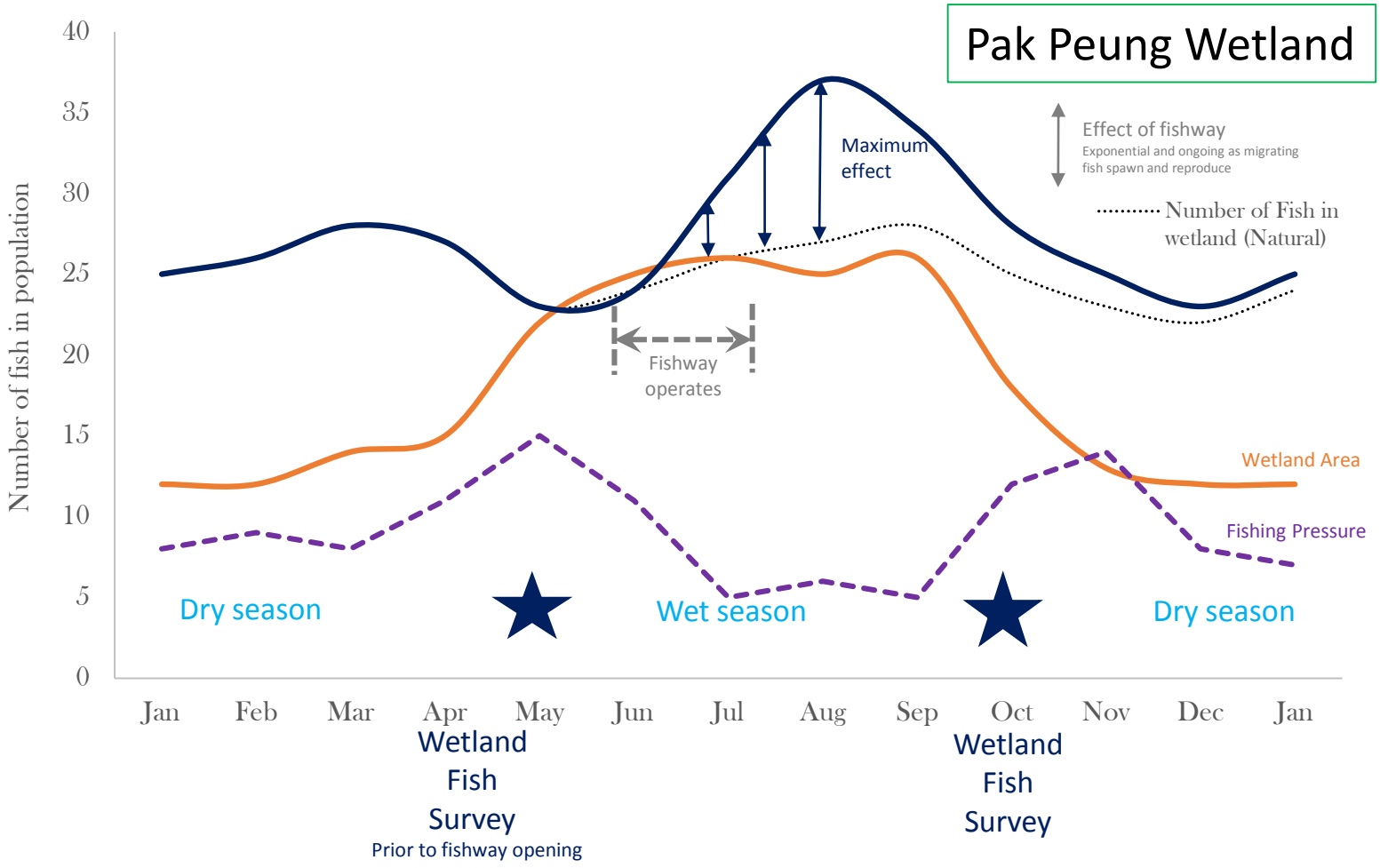
Houy Bak wetland
(no fish way)

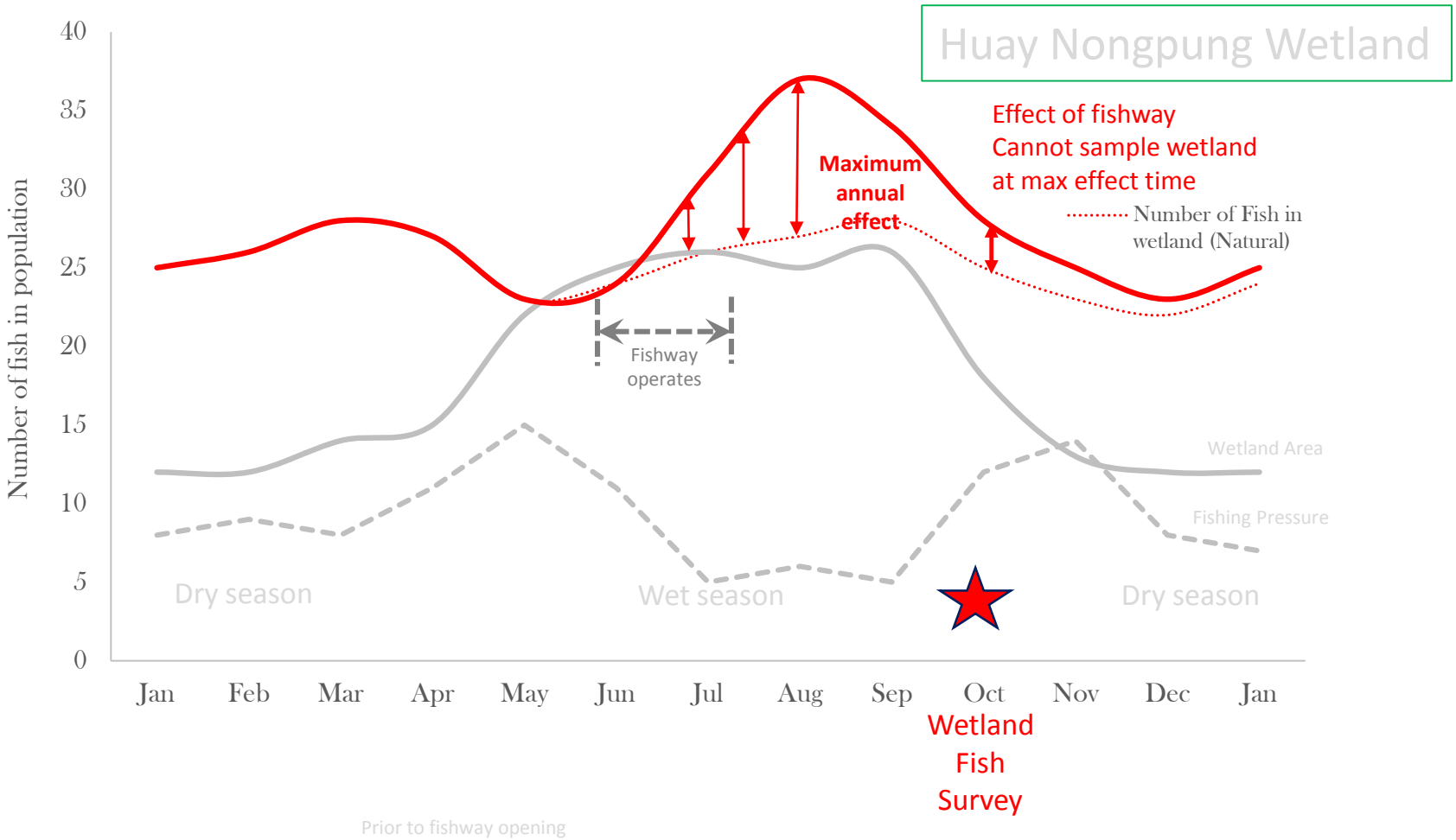


3. Methodology

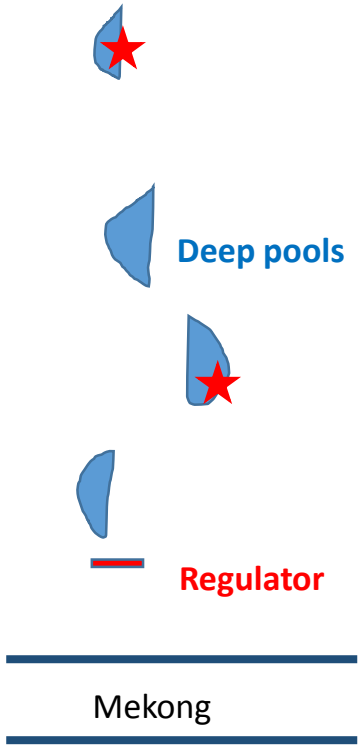
Conceptual model for each wetland

Fish sampling was conducted in Wet and Dry Season



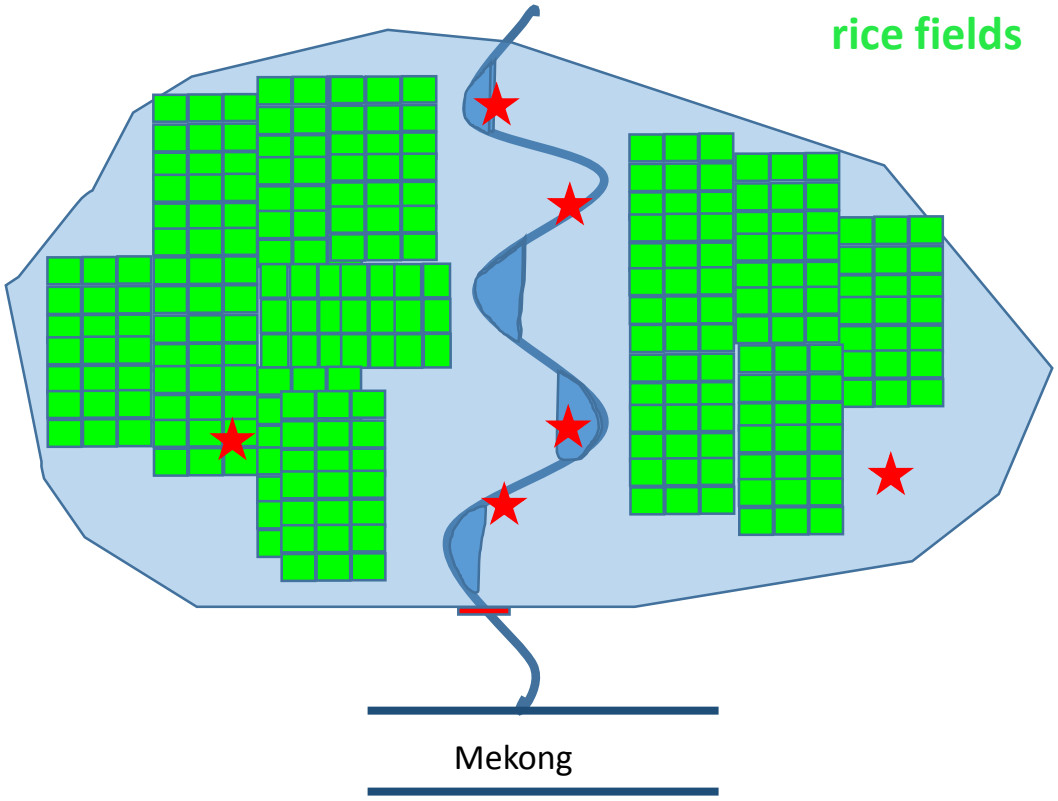

Huay Nongpung Wetland
Effect of fishway
Cannot sample wetland
at max effect time
Maximum
annual
effect
Number of Fish in
wetland (Natural)
Fishway
operates
Wetland Area
Fishing Pressure
Dry season
Wet season
Dry season
Number of fish in population
40
35
30
25
20
15
10
5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Wetland
Fish
Survey
Prior to fishway opening

Dry Season
sampled only in deep pools



Wet Season

Sampled in :
Channel
Flooded vegetation &
rice fields

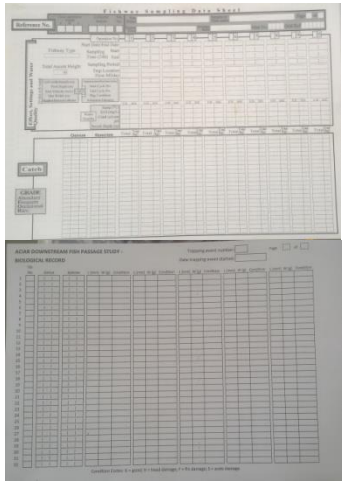


We sample two sites per habitat per wetland per season
use cast nets, push nets and gill nets with a standard effort and area in each site

Collaborative team

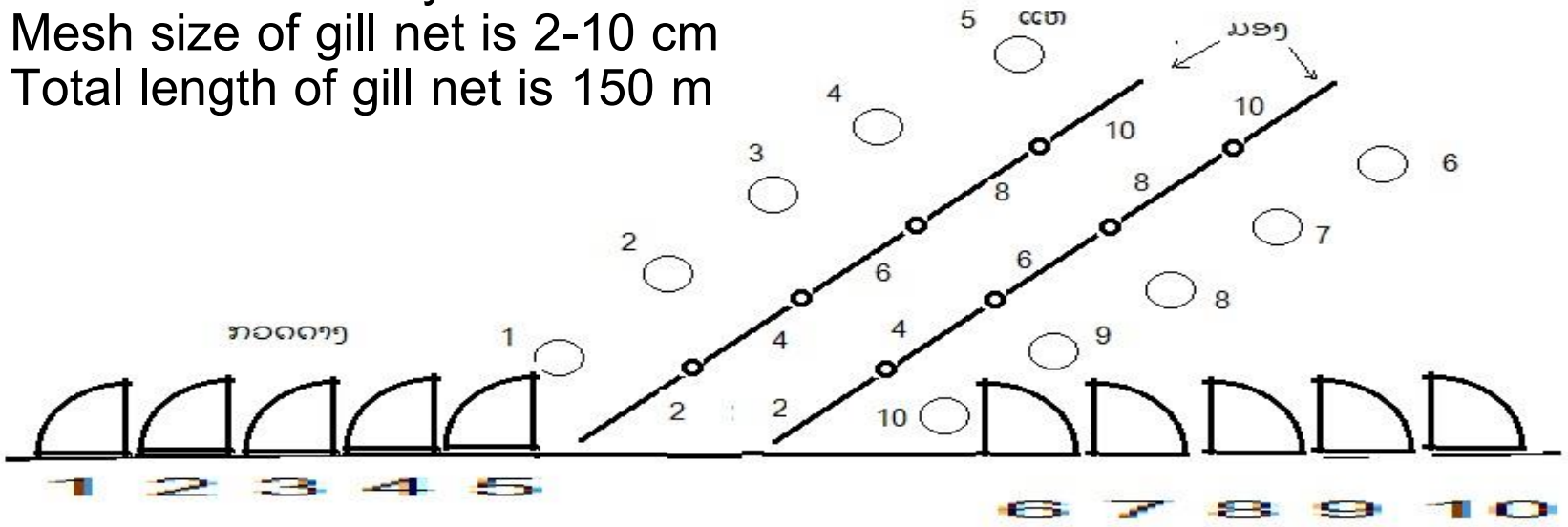

CSU

Sampling equipment



Fish sampling/surveys method

- Fishing time: 4 hour/day;
  collected fish every 2 hour
  Mesh size of gill net is 2-10 cm
  Total length of gill net is 150 m



Fishway sampling 2018

- Given the large effect sizes required and moderate sampling budget, in 2018 we used our (small!) budget to sampling in the fishway to allow modelling of the amount of fish entering each year

- Sampled fish entering the Peung wetland via the fishway over a 3 week period in July (n = 18 days and nights)

- We also sampled above and below the road culvert at Pak Peung to see if it was passing fish (See Nathan Ning presentation to follow)

- Also sampled fish exiting via the fishway and via the regulator
  - (not presented here)

Fish trap at the below culvert/fish entering the Peung wetland

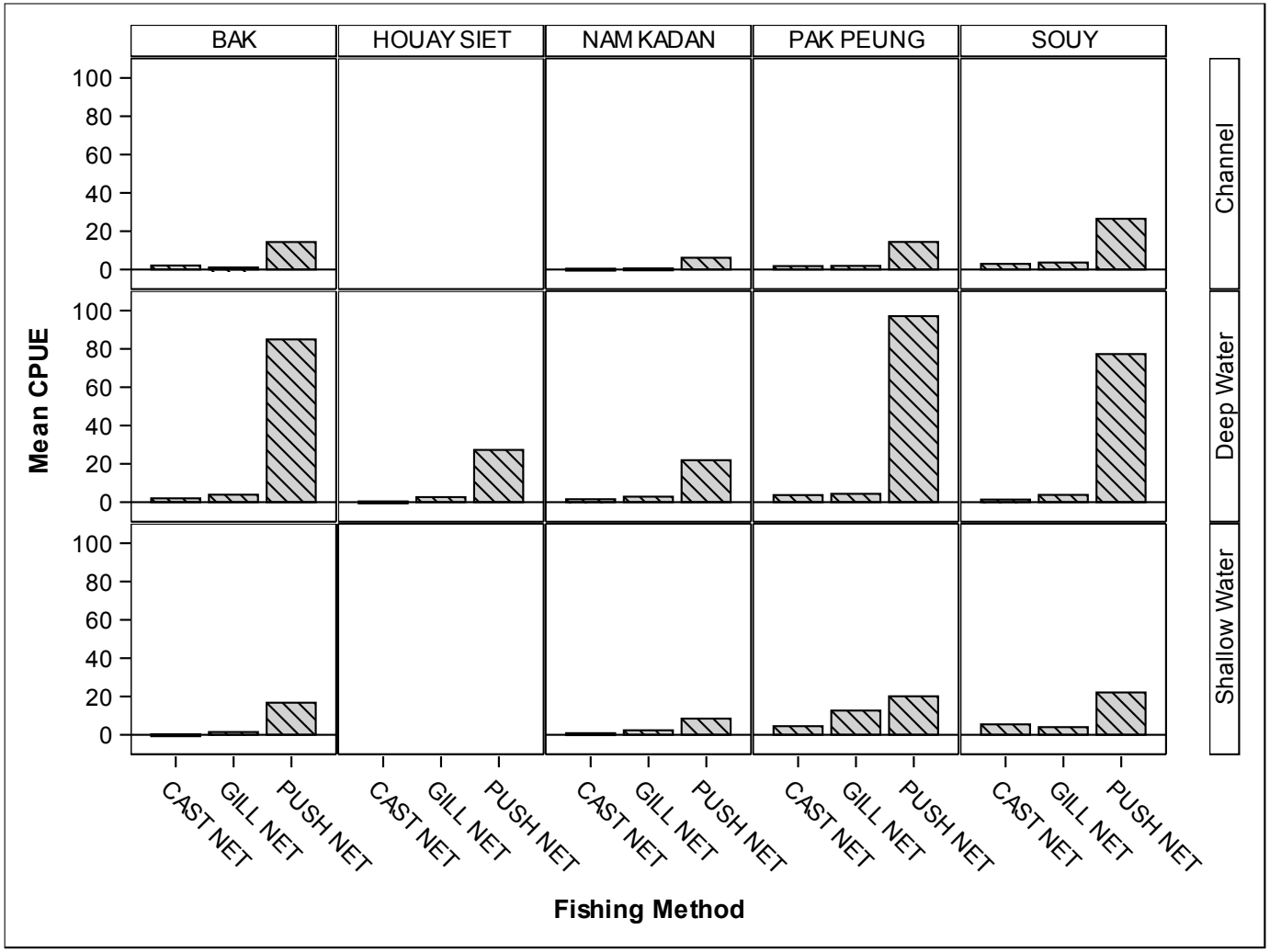
4. Preliminary results

- After two years of sampling we did a power analyses
  - Determine the effect size that we needed

- Considered a snapshot of natural variations in:
  - Starting fish populations between the 5 wetlands
  - Annual/seasonal fish populations within each wetland
  - Types of fish in different habitats within each wetland

4.1. WETLAND SAMPLING

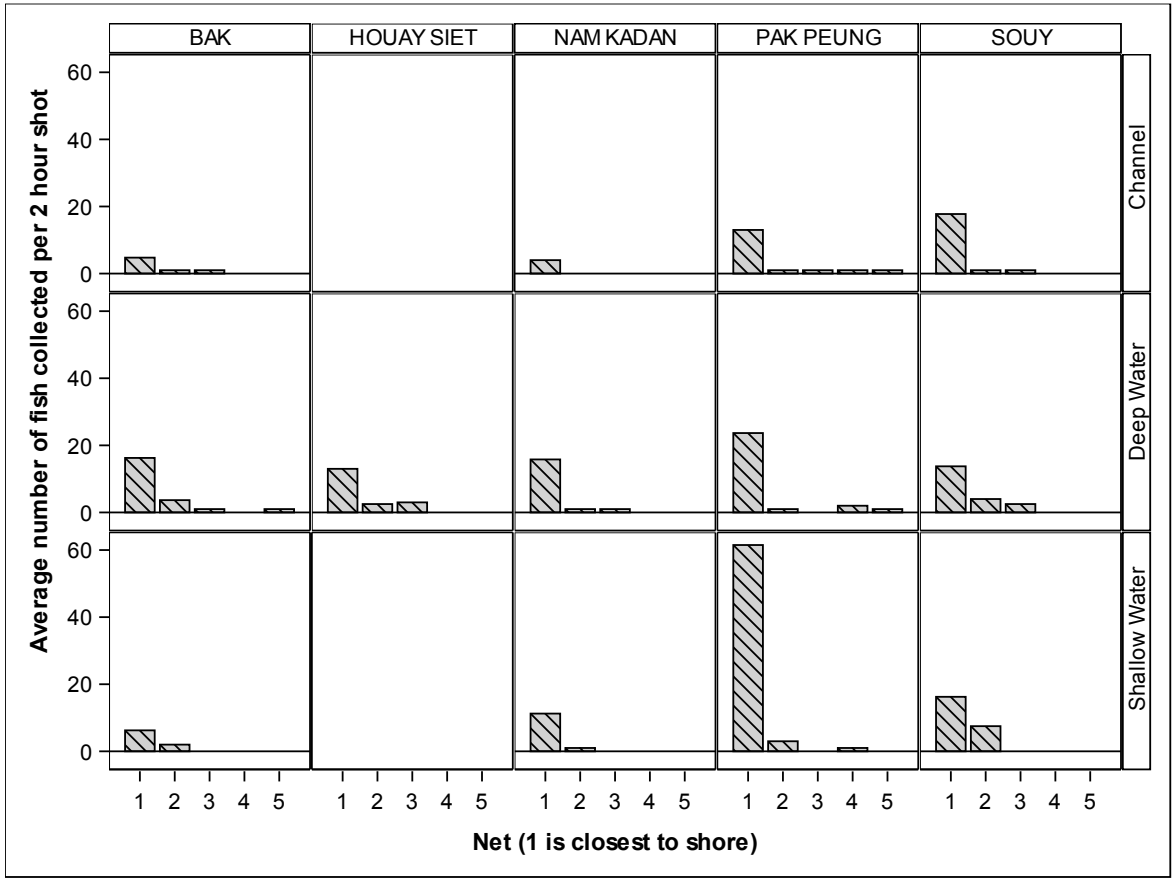
Fish Catch by gears types



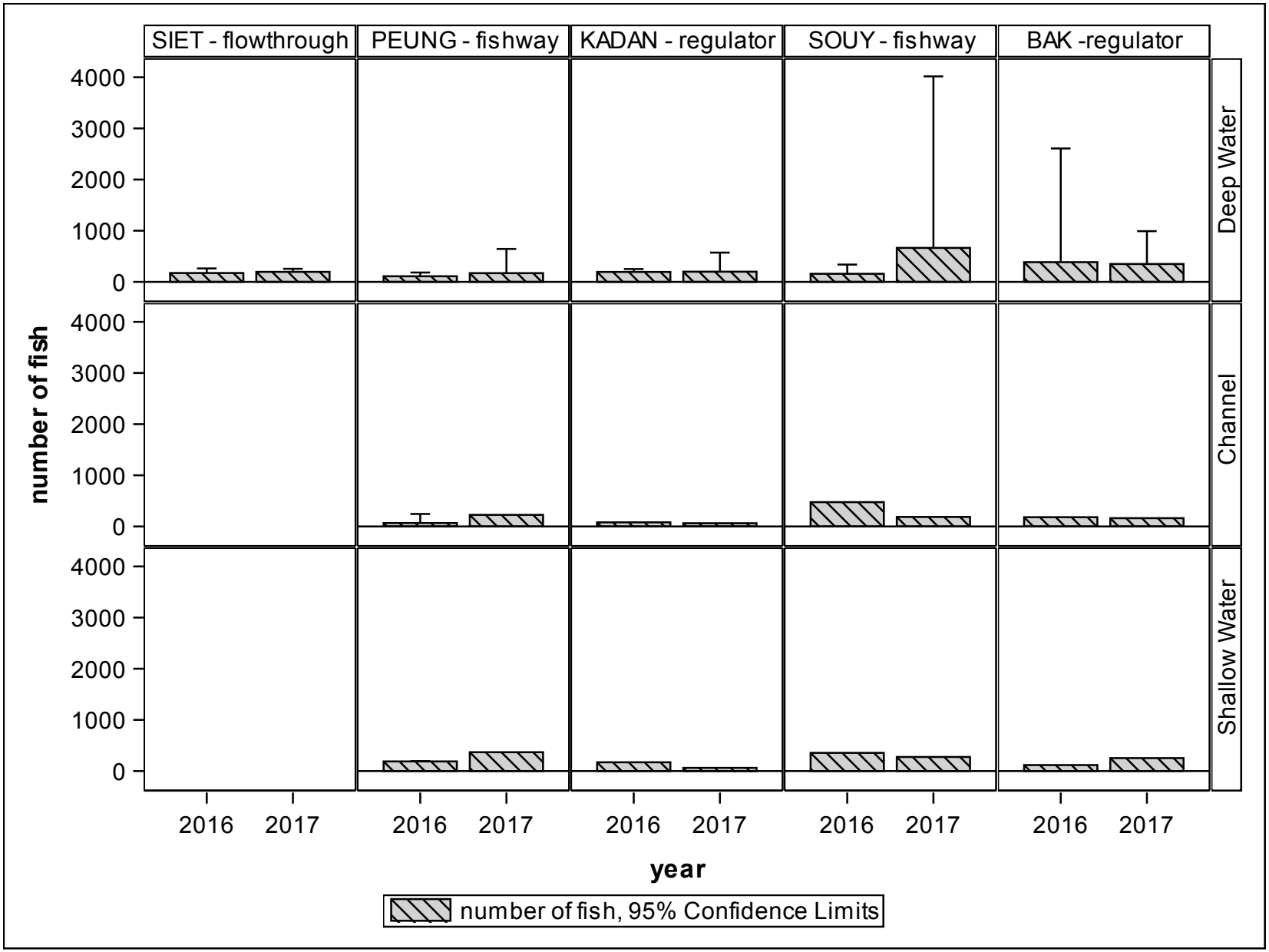
This one shows that the push nets catch the most fish

Fish Catch by gears types

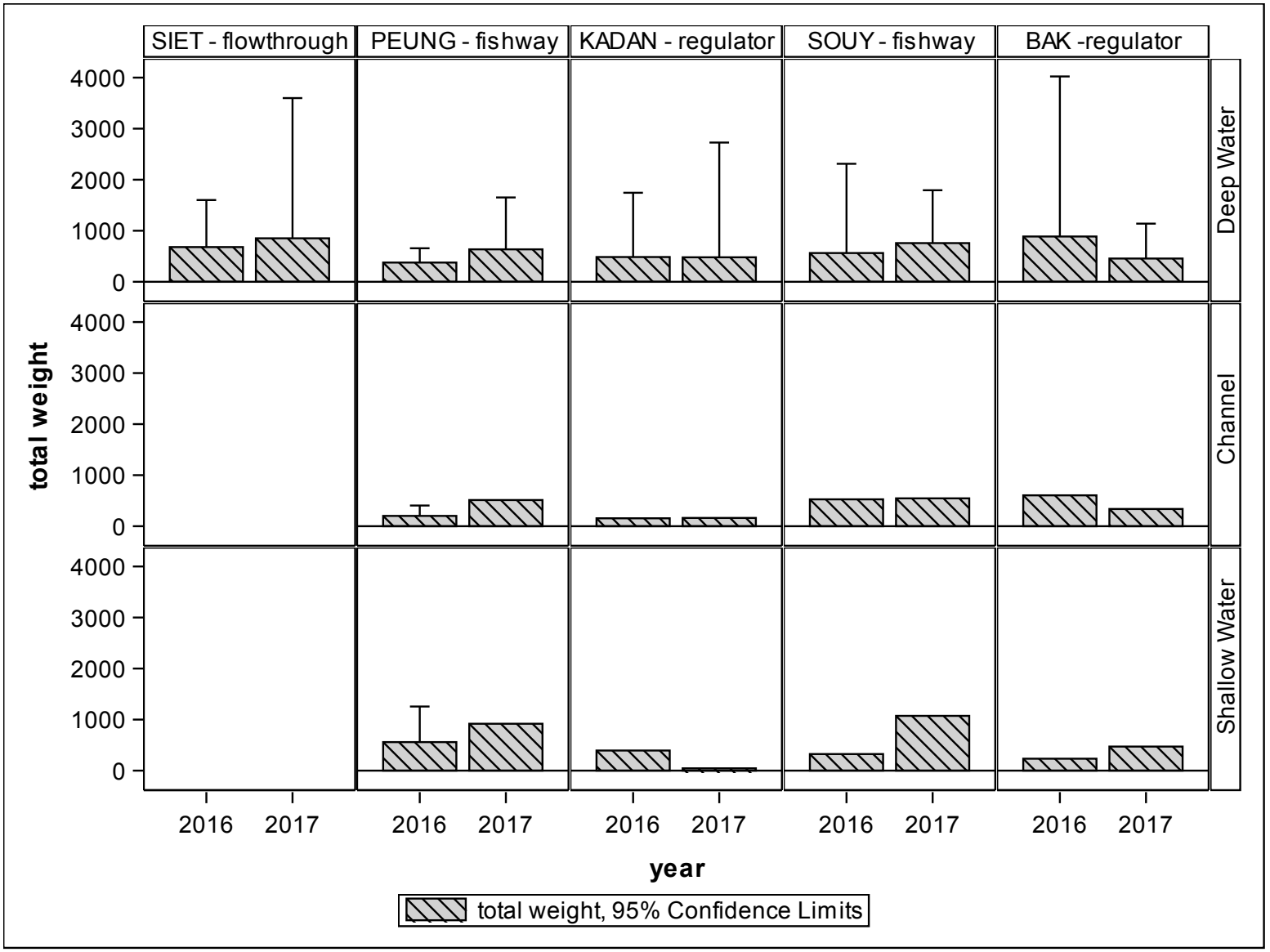
- Catch in the 100m gill net
- This graph shows how moist fish are collected in the net closest to the shore.



Fish Catch by years

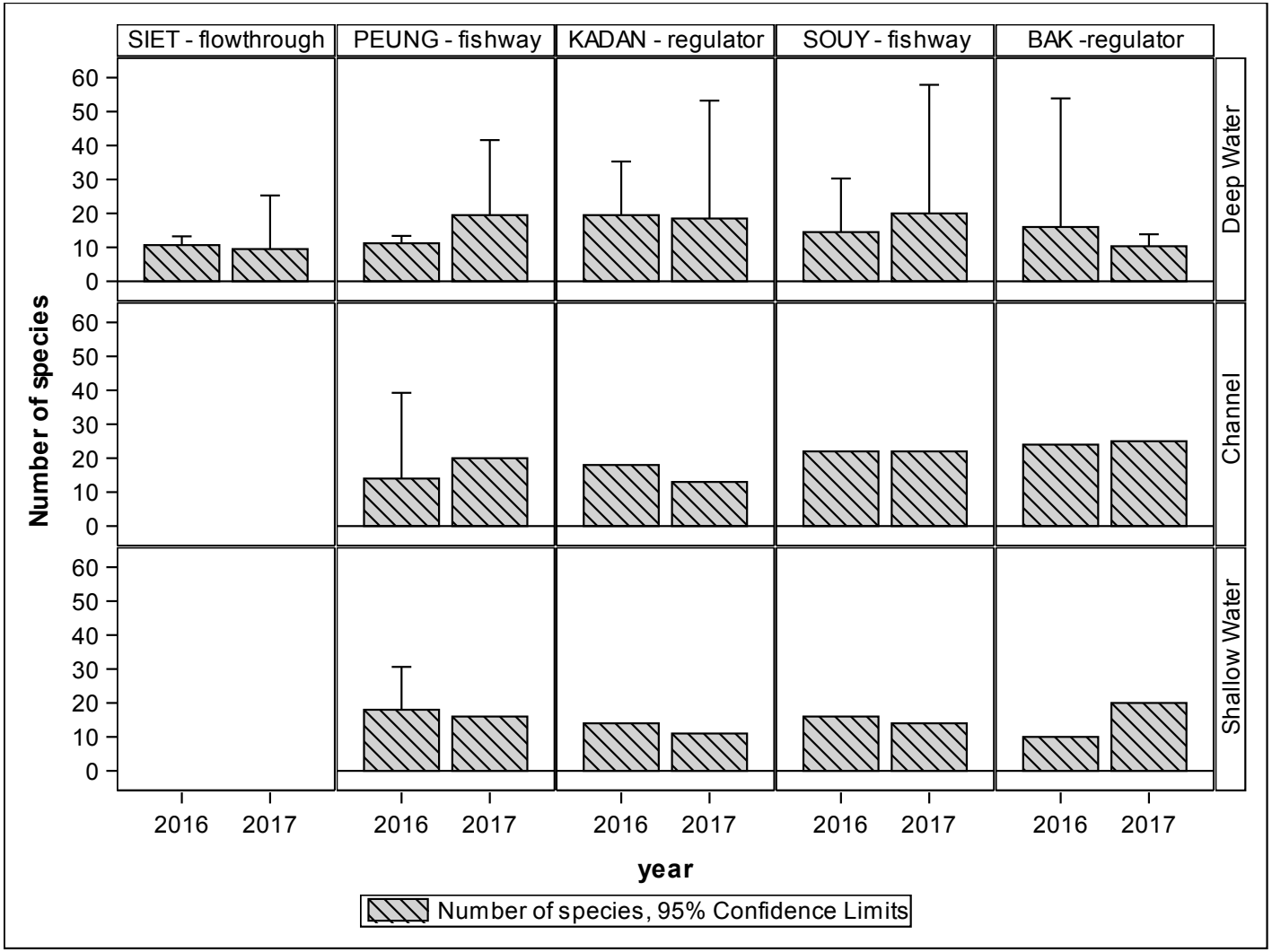


Fish Catch by years Fish Weight



Fish Catch by year

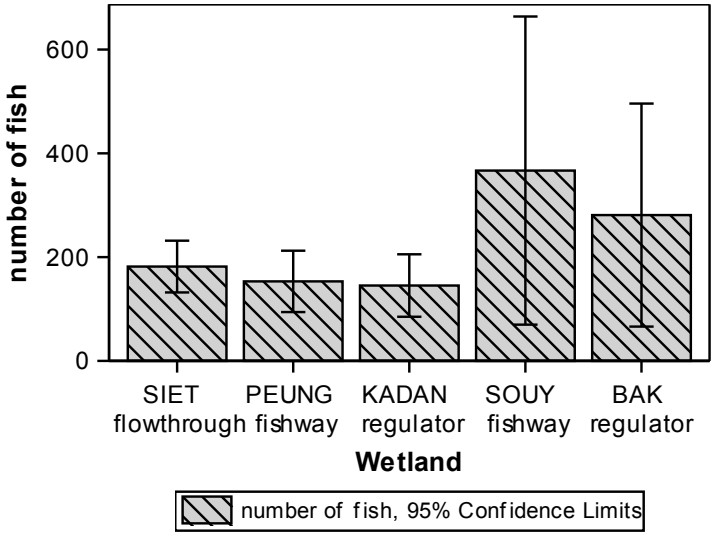
Number of species



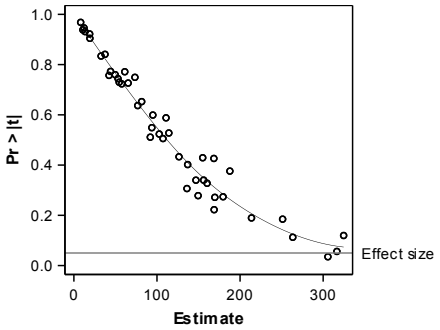
- Highly variable catch
- Low sample size
- High effect sizes

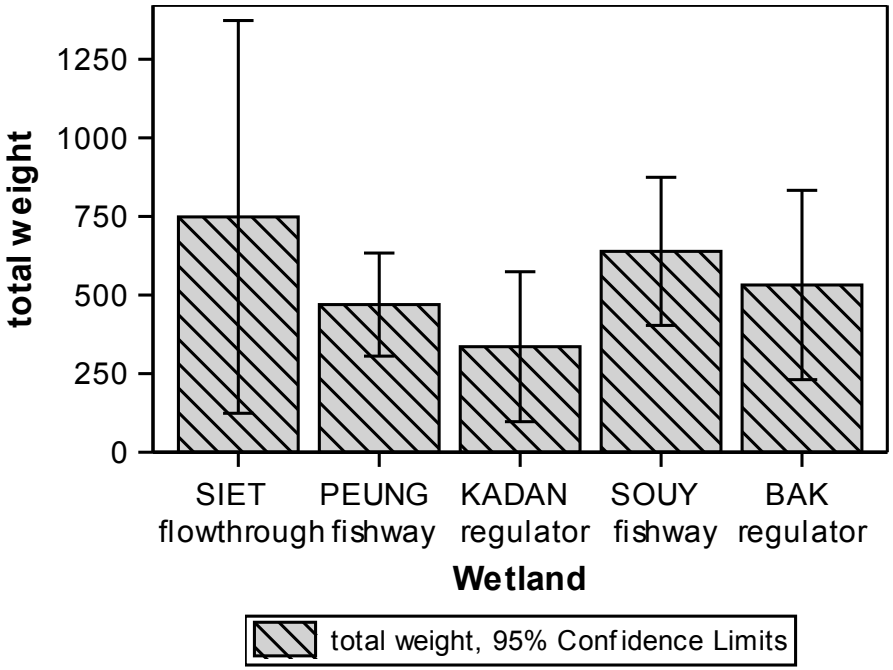
- Would require very large changes to fish catch to declare fishway working

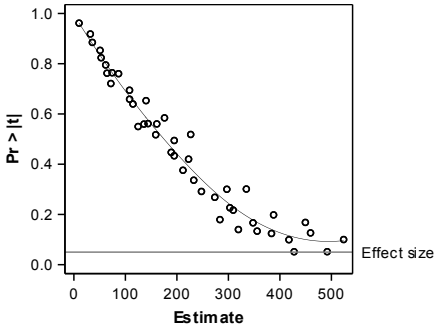
Marginal means



Effect sizes





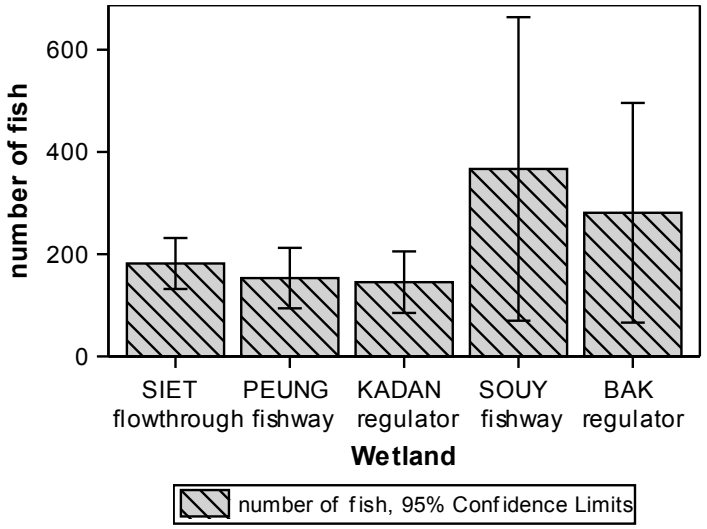


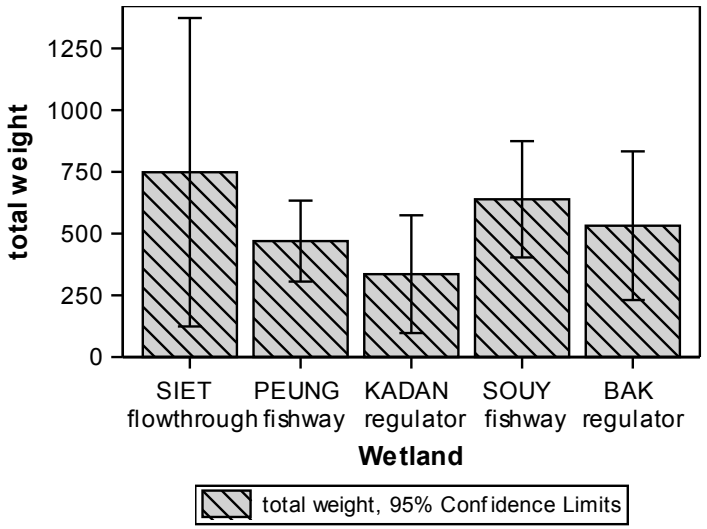
- Highly variable catch
- Low sample size
- High effect sizes

- Would require very large changes to fish catch to declare fishway working

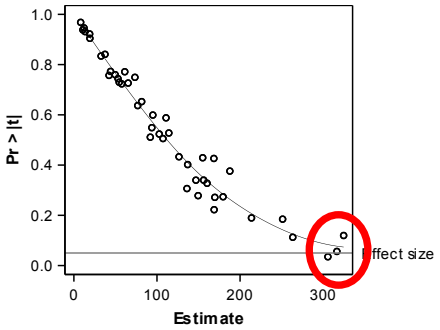
- Or a lot more sampling ($$$)

Marginal means

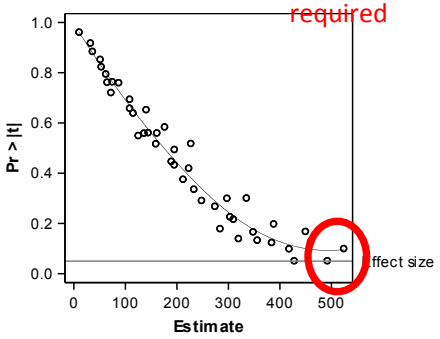




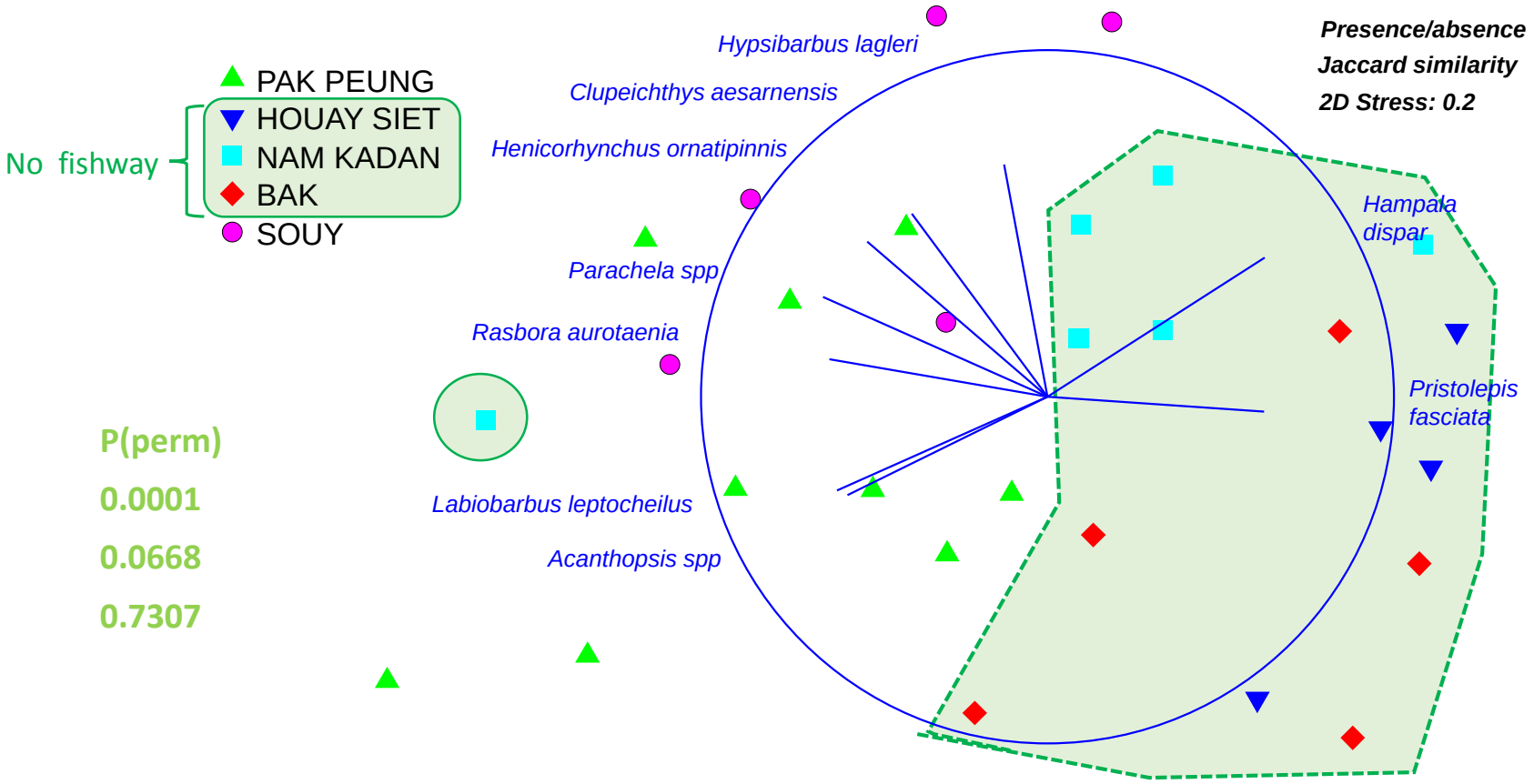
Effect sizes



60 to 100% change in catch or biomass required



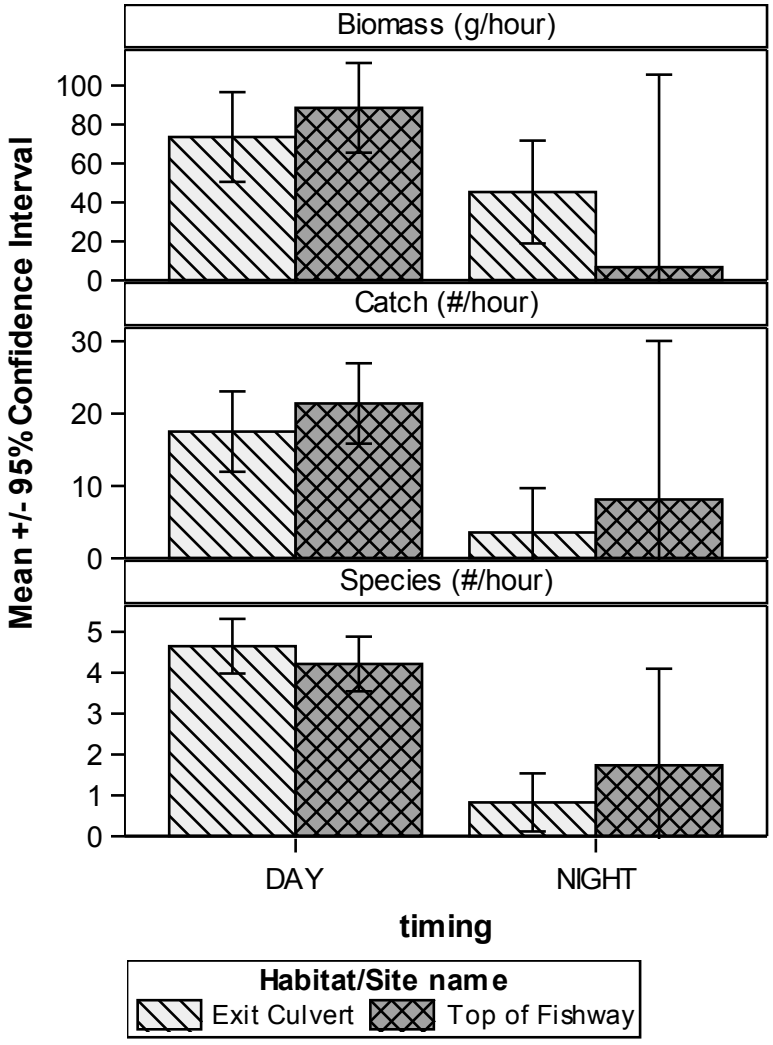
Wetland species assemblages



Source	P(perm)
Wetlands	0.0001
Habitat	0.0668
wetXHab	0.7307

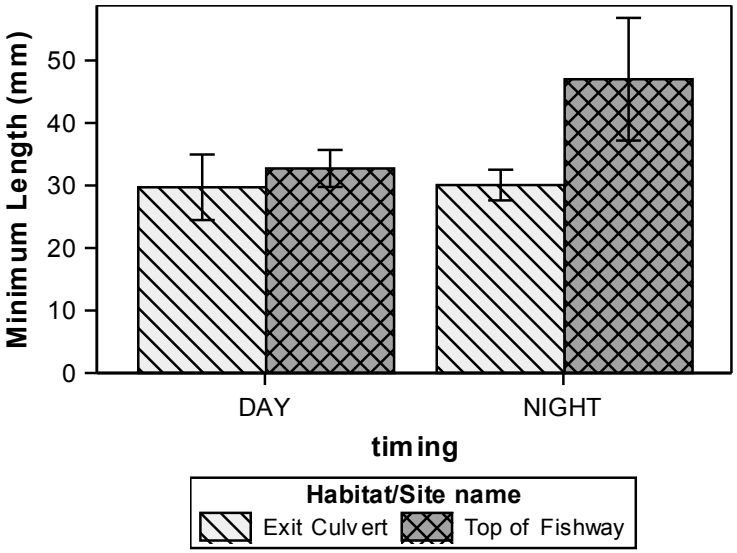
4.2. Fishway sampling

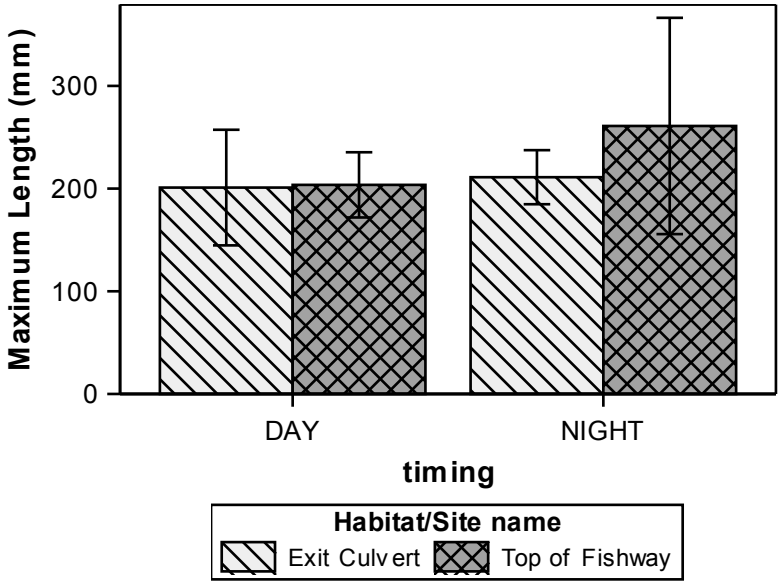
- **Fish species: 72 species collected**
  - 68 exiting the culvert
  - 43 in the fishway (below culvert)
    - 56 below regulator (angler catch)
- However, few fish in general, only 15 to 20 individuals per hour
- Less than 100 g/ hour on average

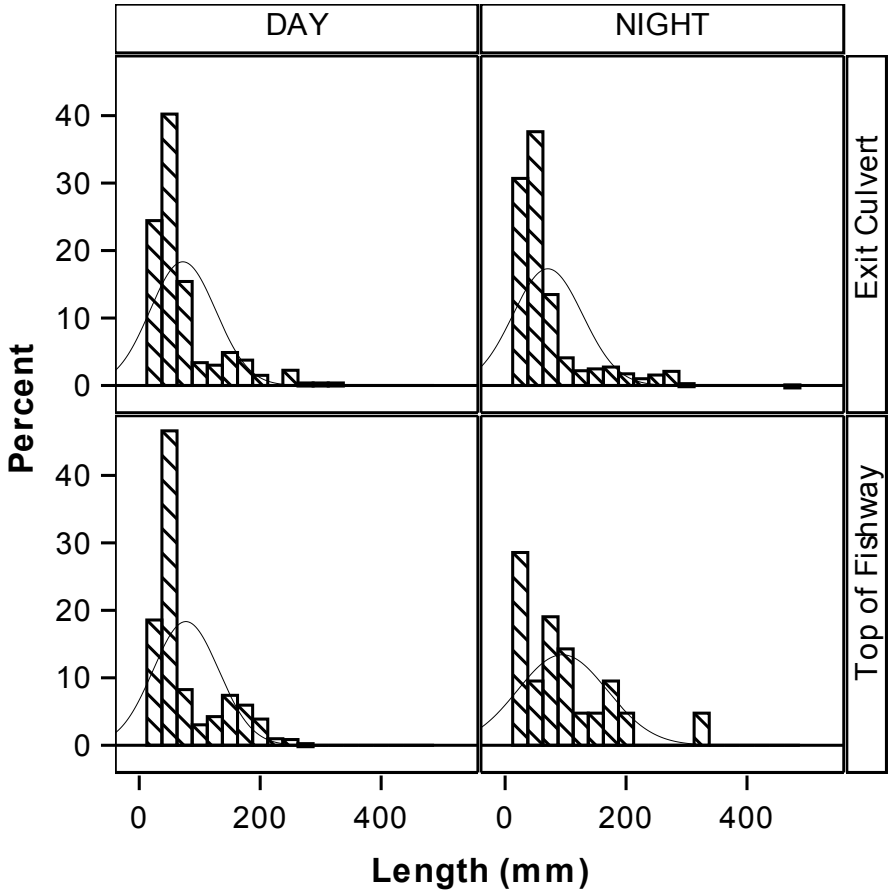


- **Fish Length:**

Fish exiting culvert and entering wetland were from 20 mm up to 483 mm

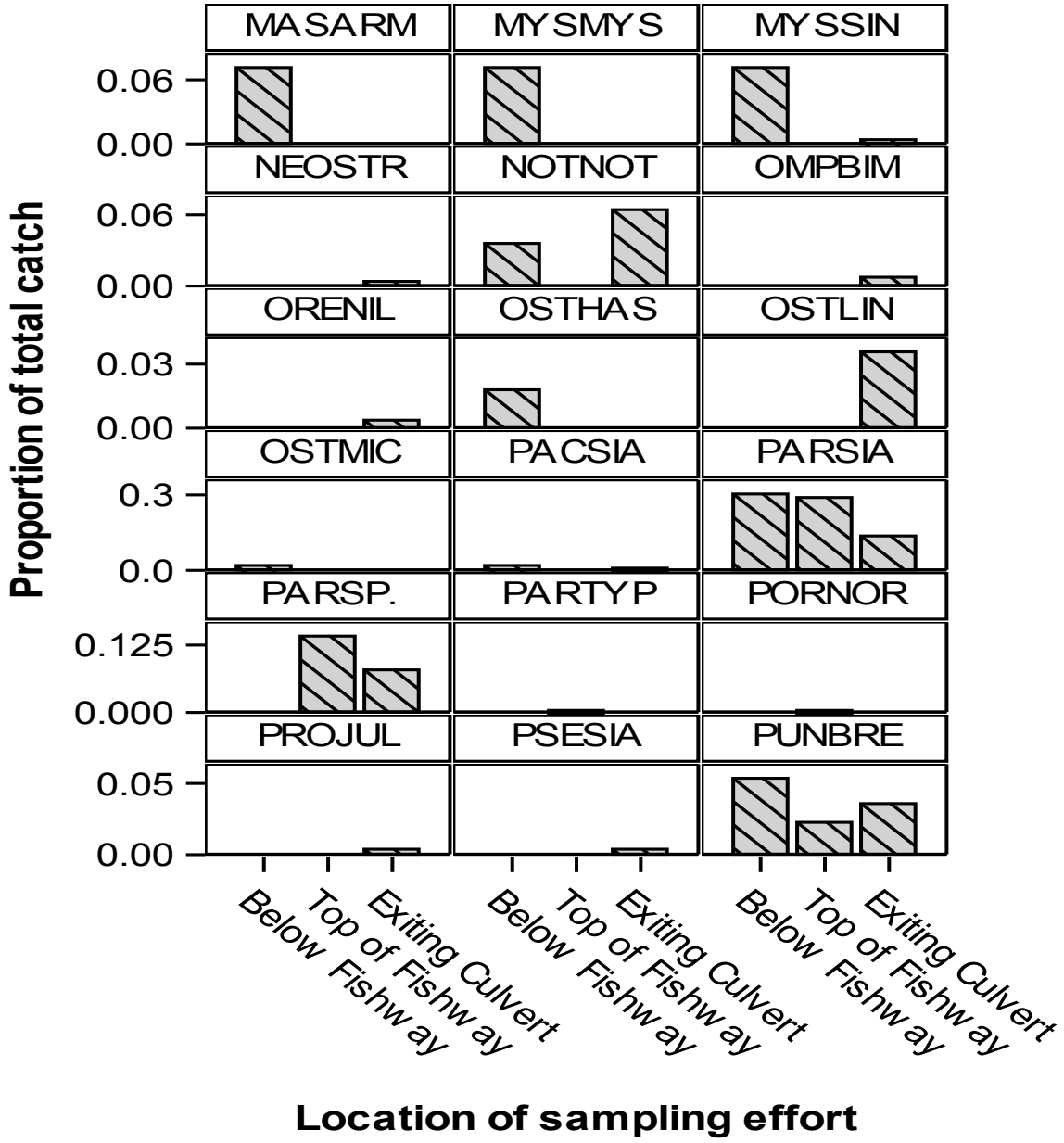






Comparison with Angler catch below Fishway

- When anglers fished on same days as trapping
- Caveat – methodology mismatch
- Nevertheless, some species appear better suited than others for fishway operations at time of sampling



The main species caught in Pakpeung fish way






















5. Summary of monitoring

- We are using a before/after comparison wetland approach with a limited sampling budget
  - The effect size required is large so we require either
    - a long-term monitoring program ($$$$)
    - more intensive sampling ($$$$)
    - or a very big impact from the fishway

- Alternatively, we switched to a modelling approach to predict wetland changes after surveying fish using the fishway

- All data are valuable as they complement the other monitoring
  e.g. household surveys

6. Discussion and Conclusion

- The fishway clearly **can** pass a lot of different species and sizes of fish
  - Don’t forget to see the talk by Nathan Ning in 20 minutes

- Next phase project (after this one is completed) will be to work with local operators and optimise the fishway operations
  - Will be complex because of seasonal variability

- We are working in a highly variable system, with large variability in;
  - Annual conditions, resulting in variability in
  - Fishway operations, resulting in variability in
  - Potential fish passage benefits
- Overall benefits of the program are major– not just fish passage
  - Local awareness,
  - Capacity building,
  - Advancing knowledge

Capacity building (Learning by doing) at Pakpeung fish way

Project team worked with local authorities in Savanakhet and Khammoun Province

- **Fish way is not just to allow the fish to move up and down stream in order to complete their life circle only, BUT its also can be supported of increasing fish biodiversity and fish production in water bodies/wetland, more importantly its eventually support food security for rural peoples.**

- ***MORE FISHWAYS , MORE FISH, MORE INCOME, BETTER LIFE AND POVERTY REDUCTION***

Acknowledgements

- I would like to thanks to ACIAR for supporting Lao PDR (LARReC and NUOL) carried out this research.

- I also would like to thanks to the Department of Lao Irrigation (World Bank) for supporting me to attend this conference

- Finally, I would like to thanks to conference committee for accepting me to attend this conference.

Thank you very much for your attention