Session D5: Using a Waterfall System as a Natural Laboratory to Inform the Design of Fish Passes in the Mekong

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Presenter Information
Eric Baran, Tuantong Jutagate, Tarek Ketelsen, Oudom Phonekhampheng, Phouvin Phousavanh, Samadee Saray, Peter Ward, and John Williams
USING A WATERFALL SYSTEM AS A NATURAL LABORATORY TO INFORM THE DESIGN OF FISH PASSES IN THE MEKONG

Eric Baran, Tuantong Jutagate, Tarek Ketelsen, Oudom Phonekhampheng, Phouvin Phousavanh Samadee Saray, Peter Ward, John Williams

Fish passage conference. Groningen, the Netherlands, June 2015
103 long-distance migratory species identified in the Mekong

At least 39% of the Mekong fish biomass is made of migratory fishes. This represents 800,000 tonnes of fish per year

= 20% of the US (marine + freshwater) fishery sector

Rapid dam development

14 dams in 2000,
47 nowadays
77 to 88 dams by 2030

Rapid loss of connectivity

23% of the Mekong watershed inaccessible to migratory fish in 2015, 88% blocked in 2030 if 88 dams are built
Efficient fish passes can be designed when the ecology, behavior and requirements of target species are well known.

Fish passes in the Mekong were designed based on the requirements of salmons or shads, and do not work for local species (e.g. Pak Mun Dam in Thailand).

There is a knowledge gap about the swimming capabilities and environmental requirements of local species.
THE STUDY

Using the Khone Falls system in Laos as a natural laboratory to study how Mekong fishes can pass obstacles

The study started in October 2014
Completion expected by June 2016
Testing phase completed
Fish migrations in Khone Falls

- **Water level in Pakse (m)**
  - JAN FEB MAR APR MAY JUN JUL AUG SEPOCT NOV DEC
  - 0 1 2 3 4 5 6 7 8 9 10

- **Fish species**
  - Large & medium-sized Cyprinids *esp. Probarbus, Hypsibarbus, Cosmocheilus*
  - Small Cyprinids *esp. Henichorhynchus*
  - Medium-sized Cyprinids *multiple species*
  - Large Cyprinids *esp. Cirrhinus*
  - Large Pangasiids
  - Small Pangasiids
  - Small & medium-sized Cyprinids
  - Other species

- **Migration**
  - Upstream
  - Downstream
  - Laterally

- **Fishing effort**
  - OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
Objective of the study

Match the migrations of 30 target fish species with passable and impassable current speeds and passable and impassable river bed conditions

Output

A matrix of 1000 to 1500 triplets

[Species x River hydraulics x River conditions]

to inform the design of fish passes in the Mekong
[Species x River hydraulics x River conditions]

Study relying on local ecological knowledge

Each month, structured interviews with fishermen, next to their gear, about the species they catch that month, their ecology and their behavior

Focus on 30 most abundant species among 52 long-distance migratory species passing through Khone Falls
<table>
<thead>
<tr>
<th>Lao name</th>
<th>Latin name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemicorhynchus lopesus</td>
<td>pa soi hang luang pa soi hua lem</td>
</tr>
<tr>
<td>Pangasius kremphi</td>
<td>Pa soi hang luang pa suay mak mai</td>
</tr>
<tr>
<td>Pangasius conchophilius</td>
<td>pa khe pa phoh</td>
</tr>
<tr>
<td>Paralaubuca typus</td>
<td>Pa tep</td>
</tr>
</tbody>
</table>

**KHONE FALLS FISH MIGRATIONS SURVEY FORM**

1. **FORM AND SITE IDENTIFICATION**
   1.1. **Surveyor name:**
   1.2. **Channel name:**
   1.3. **Location name or nearest island:**

2. **GEAR INFORMATION**
   2.1. **Owner name:**
   2.2. **Gear name:**
   2.3. **Gear for fish moving upstream or downstream?**
   2.4. **What are the months during which the gear is operational?**
   2.5. **Why did you set the gear in this place?**
   2.6. **Gear location:**
   2.7. **Location of gear relative to the channel:**

<table>
<thead>
<tr>
<th>Lao name</th>
<th>Latin name</th>
<th>Size (0-10 / 11-20 / 21-40 / 40-60 / &gt;60)</th>
<th>Adult</th>
<th>Juvenile</th>
<th>Breeder (eggs, sperm)?</th>
<th>Migrating Upstream or Downstream?</th>
<th>Migrations in Schools or Individually?</th>
<th>Need to rest in pools? (Y/N/?)</th>
<th>Preferred current speed? (Fast/Med/Slow/?)</th>
<th>Day or Night migration? (Y/N)</th>
<th>If yes, how high?</th>
<th>Time of catch (Morning/Day/Evening/Night/?)</th>
<th>Feeding or Breeding migration?</th>
<th>Surface or Bottom migration?</th>
<th>Preferred water depth?</th>
<th>Preferred channel width?</th>
<th>Comment</th>
</tr>
</thead>
</table>

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
Species x River hydraulics x River conditions

Focus on **water velocity**

Different tools for different flow conditions

Low-tech approach
Species x River hydraulics x River conditions

Focus on: height of the falls (head)
plunge pools
resting sites
New developments for a possible fish passage at Lower Sesan 2, a 45m high dam in Cambodia (concept based on Itaipu dam fish passage system)

More on dams and fish in the Mekong in the May issue of the National Geographic Magazine

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Thanks for your attention!
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