From hilsa to catfish: Fish migration in Myanmar and the importance of free flowing rivers and fish passage

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Marine Science Association Myanmar
2nd Lower Mekong Fish Passage Conference 2025
Challenges Facing the Lower Mekong River Basin
5-7 Feb 2025

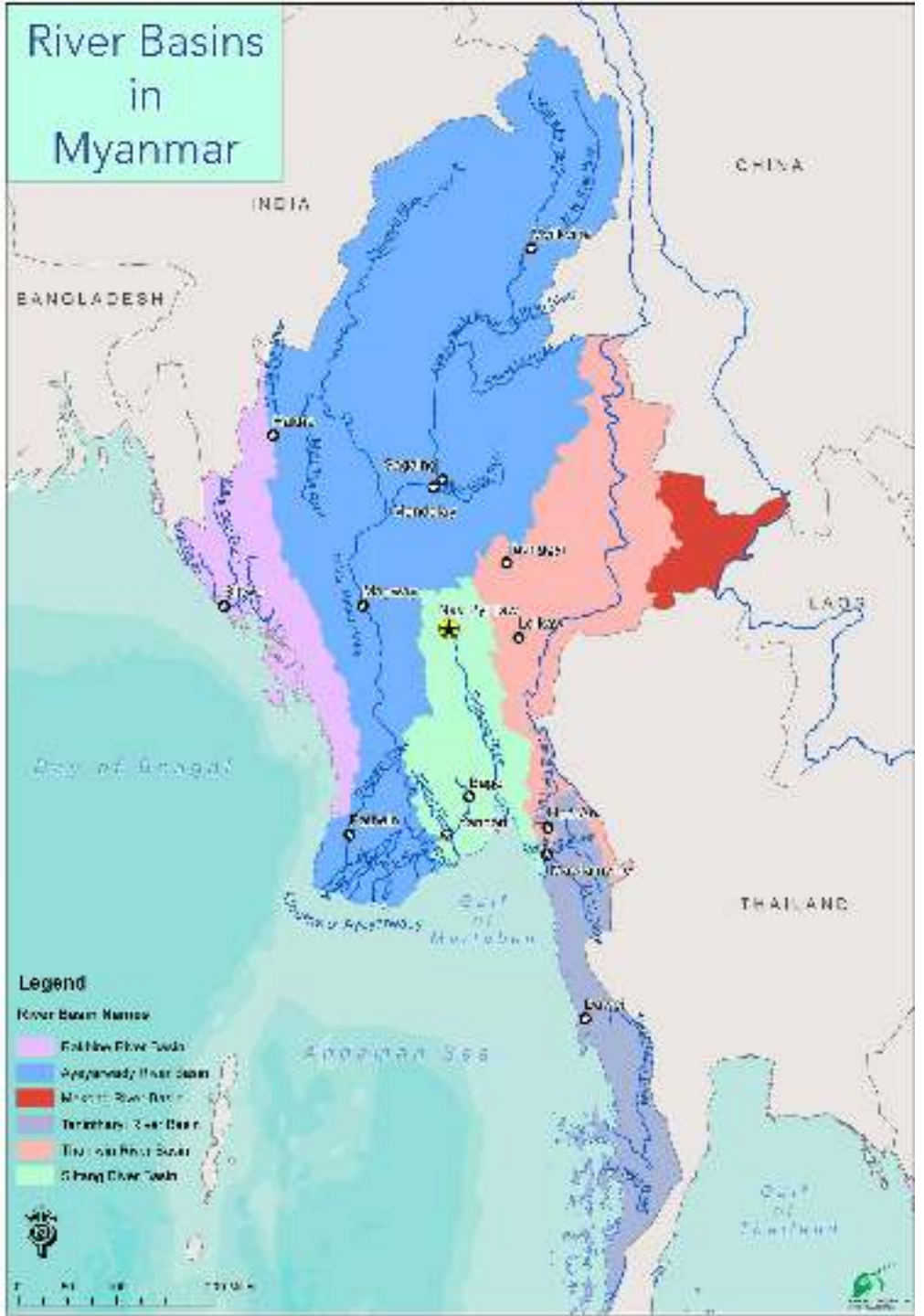
Myanmar Freshwater/wetlands and Marine

Freshwater river basins and wetlands

1. **Rakhine**
2. **Ayeyarwady (Indawgyi)**
3. **Sittaung (Moeyungyi)**
4. **Thanlwin (Inlay)**
5. **Mekong**
6. **Tanintharyi**

Marine

1. **Bay of Bengal**
2. **Andaman Sea**



Freshwater and wetlands are home for thousands of inland aquatic organisms

- Fish (about **564** species), Reptiles, Mammals and Birds
- Ayeyarwady River basin
  - **About 550 fish species**
  - **388** fish species, including China and India, were described
  - **311** in Myanmar: (55% of total freshwater species of Myanmar)
    - **193 species (50%)**: endemic species
    - **100 species (26%)**: known only from Myanmar
  - Many species remain unknown

(*Zockler & Kottelat, 2017*)

Summary of fish survey results (*Fauna & Flora projects*)

Sr.	River system	Total species	New species for science	Potential long migrant species
1	Malihka River (Ayeyarwady basin)	50	6	5
2	Ayeyarwady River (Ayeyarwady basin)	116	6	10
3	Sittaung River (Sittaung basin)	86	-	5
4	Thanlwin River (Thanlwin basin)	116	-	17
5	Tanintharyi River (Tanintharyi basin)	113	9	4
6	Lenyar River (Tanintharyi basin)	60	5	1
7	Indawgyi Basin (Ayeyarwady basin)	95	6	-

Crucial role of fisheries sector in Myanmar

- The fishery sector is considered as the most important one after the agriculture sector to fulfill the protein requirement of the people of Myanmar and to provide the food security as well as to get the opportunity for the employment to a large number of fishery communities and rural dwellers. Moreover, fish is second only to rice in the Myanmar diet (*DoF, 2018*).
- The abundant natural resources in freshwater and brackish-water fisheries contribute significantly to Myanmar's food security. Fishery products are a staple diet, a major source of animal protein, with a per capita consumption of 47.8 kg/year (2016) increased to 67 kg/year (2021) in Myanmar (*FAO, 2022*).
- Fishery export in 2020-2021 is 786.50 USD in Million (DoF, 2021). This amount is 5.17% of total export earning in 2020-2021 in Myanmar. {Total export earning in 2020-2021 is 15209.0 USD in Million (*Ministry of Planning and Finance, 2021*).}

Crucial role of fisheries sector in Myanmar

Food/Nutrition security

Subsistence livelihood/income

Gender

Some economically important migratory fish species (*DoF, 2021*)

Sr.	Family	Genus	Species	Remarks
1	Anguillidae	*Auguilla*	*bengalensis*	All river systems
2		*Auguilla*	*bicolor*	Ayeyarwady and Thanlwin
3	Clupeidae	*Tenualosa*	*ilisha*	All river systems
4		*Tenualosa*	*toli*	All river systems
5	Cyprinidae	*Neolisochelius*	*blythii*	Tanintharyi river system
6			*nigrovittatus*	Thanlwin river system
7			*stracheyi*	Thanlwin river system
8		*Tor*	*tambroides*	Thanlwin river system
9			*tor*	Ayeyarwady and Thanlwin
10			sp.	Ayeyarwady and Thanlwin
11	Sisoridae	*Bagarius*	*yarrelli*	Ayeyarwady, Sittaung, Thanlwin
12	Ailiidae	*Silonia*	*silondia*	Ayeyarwady and Thanlwin
13	Pangasiidae	*Pangasius*	*pangasius*	All river systems
14			*myanmar*	All river systems
15	Bagridae	*Hemibagrus*	*microphthalmus*	All river systems
16		*Rita*	*sacerdotum*	Ayeyarwady and Thanlwin
17	Latidae	*Lates*	*calcarifer*	All river systems

Long migrant economically important fish species for local communities in Myanmar (*Fauna & Flora and MSAM surveys*)

1. Hilsa shad *Tenualosa ilisha* (anadromous)
2. Pangas catfish *Pangasius* sp. (anadromous)
3. Salween rita *Rita sacerdotum* (anadromous)
4. Silond catfish *Silonia silondia* (anadromous)
5. Paradise threadfin *Polynemus paradiseus* (anadromous)
6. Indian mottled eel *Anguilla bengalensis* (catadromous)






- Hilsa shad and Myanmar

1) **1.6 million** artisanal fisher households (*Akester et al., 2023*)
2) **Top 6 export earning** from the fisheries sector in 2021 (10600.426 MT and 32.030 M USD) (*DoF, 2021*)
3) **4.017%** of total fisheries export earning in 2021

- **FREE FLOWING RIVERS ARE CRUCIAL FOR THE SUSTAINABLE PRODUCTION OF MIGRATORY FISH SPECIES IN MYANMAR.**
- **IF THERE IS ANY BARRIER ALONG THE RIVER SYSTEM, FISH FRIENDLY PASSAGE IS NEEDED FOR THE FISH TO PASS THE BARRIER TO REACH THE ESSENTIAL LOCATIONS FOR THEIR LIFE CYCLE COMPLETION.**

- Although, migratory fish species are economically important for Myanmar fisheries communities, Myanmar does not have specific fish passage policy.

- ***Need for policy and legislation*** within Myanmar to support fish migration.
- ***Need to be cross-sectoral strategies and policies*** developed that recognize and address the needs of ***both irrigation and fisheries where there is crucial species***, without prioritizing one over the other.
- ***Fisheries issues should be considered in the design and implementation phase*** of water control infrastructure with ***mixed-use irrigation systems***, providing an opportunity ***to promote win-win solutions***.
- The fisheries and irrigation sectors ***need to be supported and encouraged to collaborate***, including on research projects to build knowledge around migratory fisheries and the trade-offs linked with ***irrigation infrastructure***.

Fish passage project (*DoF, 2021*)

With the objective of the replenishment of the inland capture fisheries, FFI is implementing a fish passage project in collaboration with the Charles Sturt University along the Bago-Sittaung watershed in the Bago Region starting from 2018. The project is being implemented together with the Department of Fisheries and the Irrigation and Water Utilization Management Department. **The project result will inform to develop how to mitigate the impact on the inland capture fisheries resources in the irrigation barrier construction policy.**

Fish migration research (*DoF, 2021*)

FFI is implementing research on the economically important migratory fish species, such as *Pangasius* sp., *Anguilla* sp., Hilsa shad and Toli shad along the river systems in Myanmar by means of otolith chemistry methodology started from 2017 to understand the migration pattern to inform the development of management plan in the fisheries sector. (Charles Sturt University)

Threats and challenges

1. Dams (hydro power/agriculture)
2. Saltwater intrusion barriers/ sluice gates
3. Seawater flood barriers (dikes)
4. Pollution (discharges from factories and settlements)
5. Rice/agriculture priority policy in Myanmar Sustainable Development Plan
6. Weak understanding about the migration among the relevant stakeholders
7. Weak collaboration among the relevant stakeholders
8. Technology weakness
9. Funding constraint

Problem for the fish species to complete life cycle successfully

Barriers along the fish migration routes

Problem for the fish species to complete life cycle successfully

Barriers along the fish migration routes

Problem for the fish species to complete life cycle successfully

Problem for the fish species to complete life cycle successfully

Ayeyarwady River development

All dams

Hydropower: planed

Hilsa shad

Catfish

Sea

Sea

Sea

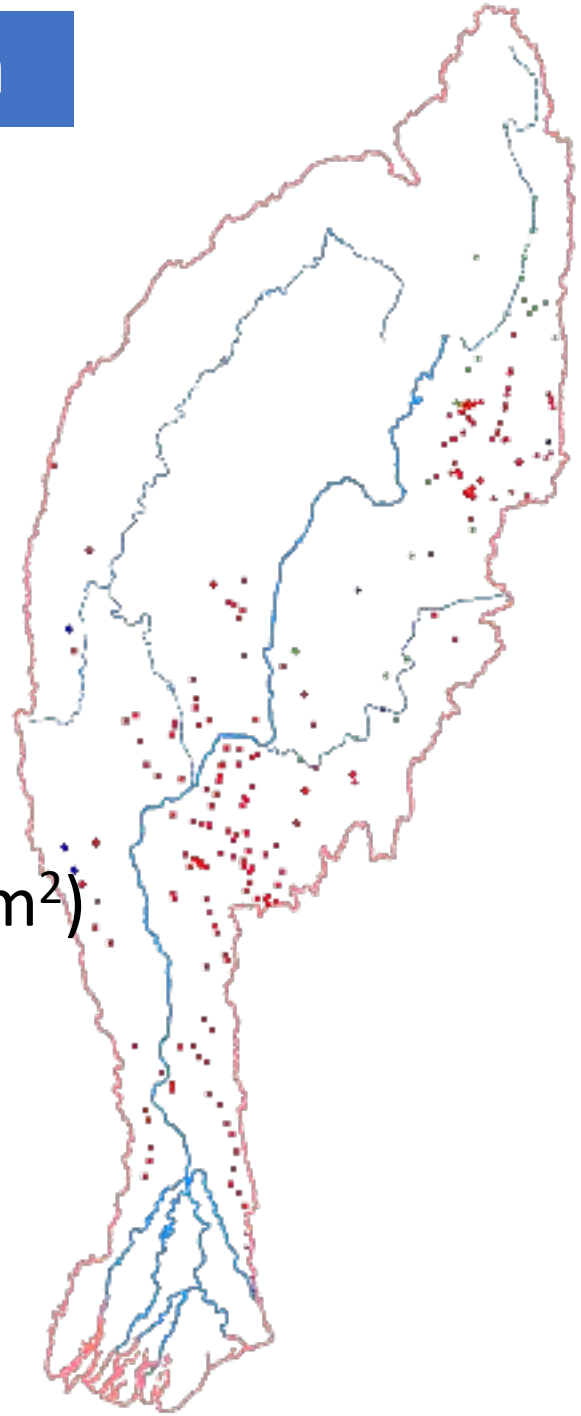
Sea

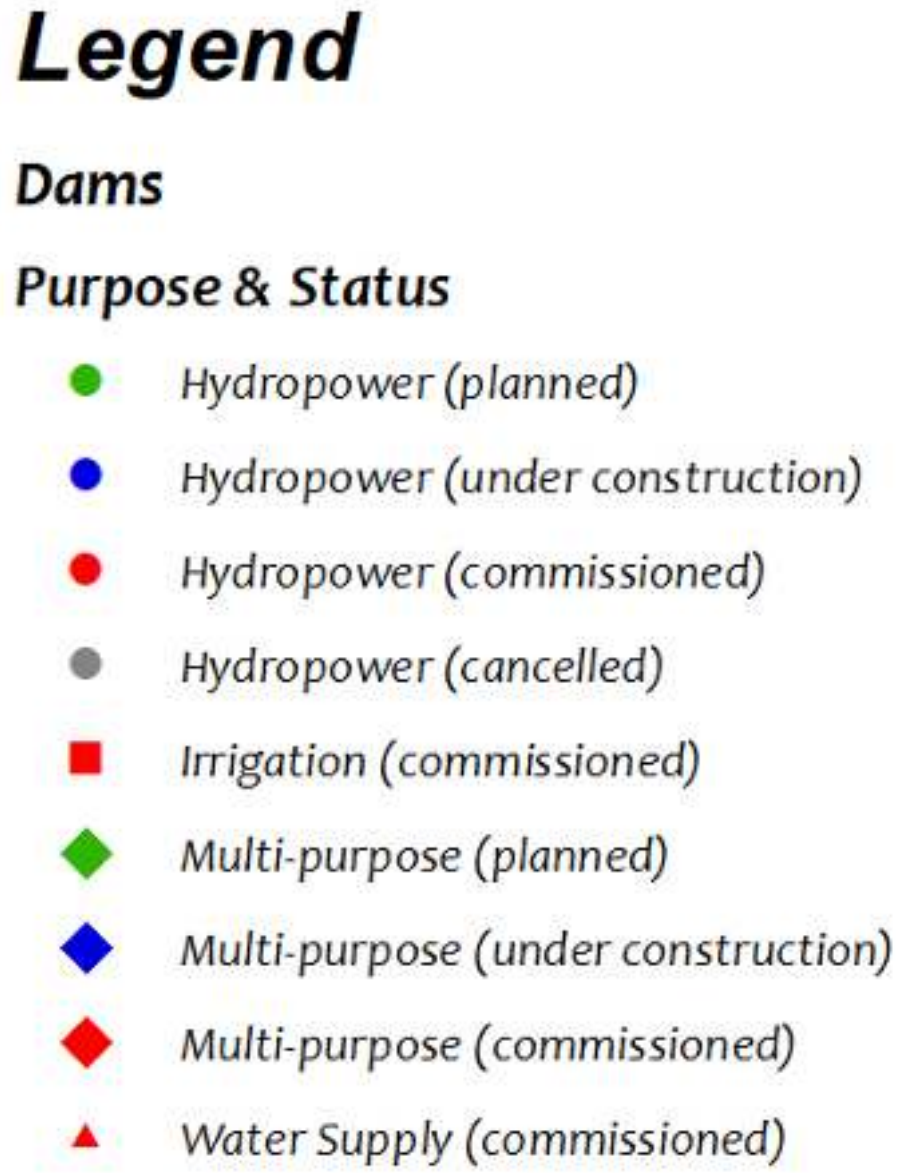
Conallin et al., 2022:
(Fish passage, 13-16
June 2022)

Ayeyarwady River basin

River development:

- Dams: 104
  - Planned: 24
    - Mainstream: 6
    - Tributary: 18
- Irrigation structures:
  - 118 reservoirs (≥0.5km^2)
- Dikes: 1,300 km





WLE (2022); ICEM (2020)

Threats/challenges and impacts/consequences

Threats and challenges	Impacts/consequences
Dams (hydro power/agriculture)	Change environmental and seasonal flow patterns, block connectivity between freshwater and marine, and fish migration
Saltwater intrusion barriers/ sluice gates	
Seawater flood barriers (dikes)	
Pollution (factories/settlements)	Water quality
Rice/agriculture priority policy in Myanmar Sustainable Development Plan	Plan and construct more irrigation barriers
Weak understanding & collaboration among the relevant stakeholders	Dam/barrier constructions with limited consultations with relevant stakeholders
Technology weakness	Constraint to start the fish passage project
Funding constraint	

Fish catch trend

- Fish catch is declining considerably in these decades.
- According to the KAB surveys, the common problems informed by the communities is expansion of agricultural lands, using environmental unfriendly chemicals in the agriculture, electric fishing, pollution, etc.
- Very few respondents informed/recognized the impact of barriers, i.e. sluice gates/irrigation barriers/dikes along the rivers to the fish catch.
- We need awareness regarding fish migration and fish passage.

(*Fauna & Flora-Myanmar and MSAM projects*)

Impacts

- Fish diversity
- Livelihood opportunity of fisher communities
- Income opportunities of fisher families

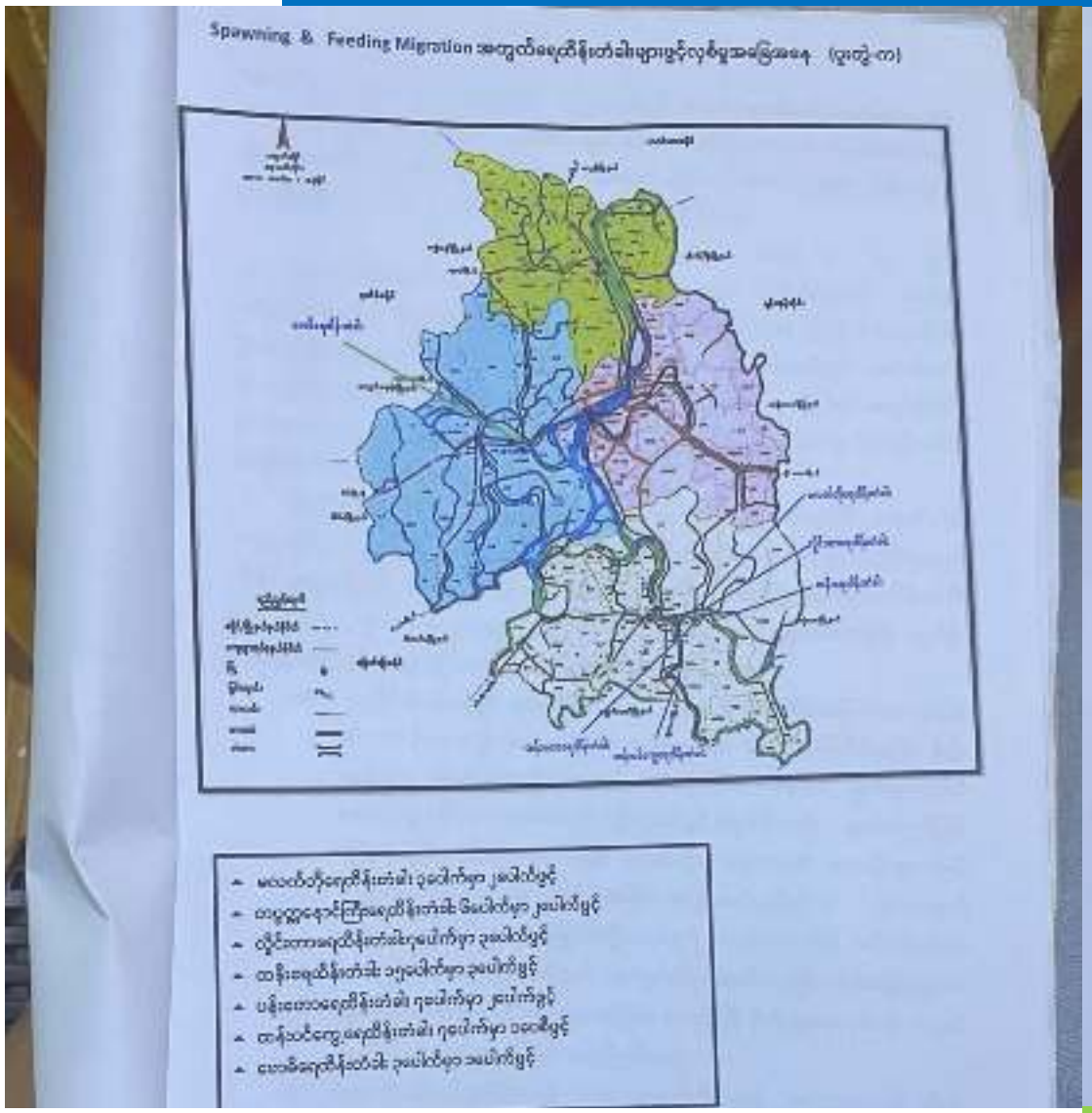
WE NEED

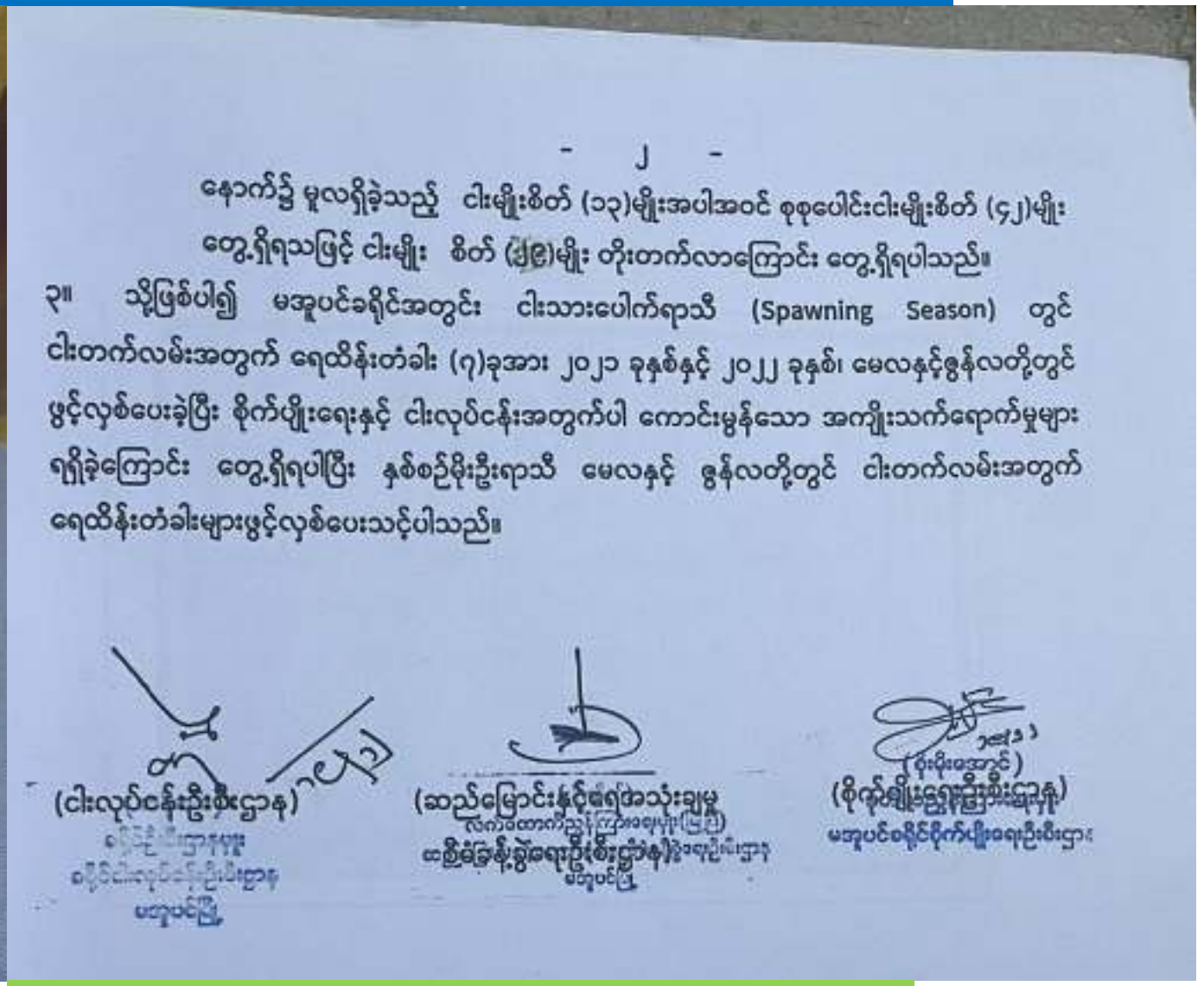
FISH FRIENDLY PASSAGE

Fish passage initiatives

Fish passage master class (2019)

Success story of fish passage master class





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နောက်၌ မူလရှိခဲ့သည့် ငါးမျိုးစိတ် (၁၃)မျိုးအပါအဝင် စုစုပေါင်းငါးမျိုးစိတ် (၄၂)မျိုး တွေ့ရှိရသဖြင့် ငါးမျိုး စိတ် (၂၉)မျိုး တိုးတက်လာကြောင်း တွေ့ရှိရပါသည်။

၃။ သို့ဖြစ်ပါ၍ မအူပင်ခရိုင်အတွင်း ငါးသားပေါက်ရာသီ (Spawning Season) တွင် ငါးတက်လမ်းအတွက် ရေထိန်းတံခါး (၇)ခုအား ၂၀၂၁ ခုနှစ်နှင့် ၂၀၂၂ ခုနှစ်၊ မေလနှင့်ဇွန်လတို့တွင် ဖွင့်လှစ်ပေးခဲ့ပြီး စိုက်ပျိုးရေးနှင့် ငါးလုပ်ငန်းအတွက်ပါ ကောင်းမွန်သော အကျိုးသက်ရောက်မှုများ ရရှိခဲ့ကြောင်း တွေ့ရှိရပါပြီး နှစ်စဉ်မိုးဦးရာသီ မေလနှင့် ဇွန်လတို့တွင် ငါးတက်လမ်းအတွက် ရေထိန်းတံခါးများဖွင့်လှစ်ပေးသင့်ပါသည်။

(ငါးလုပ်ငန်းဦးစီးဌာန)

(ဆည်မြောင်းနှင့်ရေအသုံးချမှု

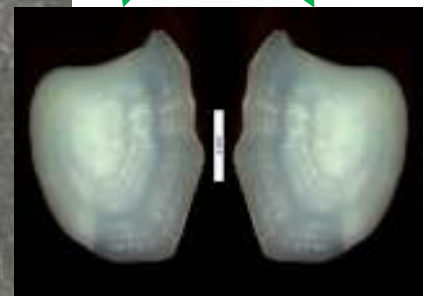
(စိုက်ပျိုးရေးဦးစီးဌာန)

Open May and June in 2021 & 2022

- Before sluice gate open: 13 species
- After sluice gate open: 42 species

Fish passage initiatives

1. Water chemistry sampling (2019-20)
2. Otolith collection (2020-21)



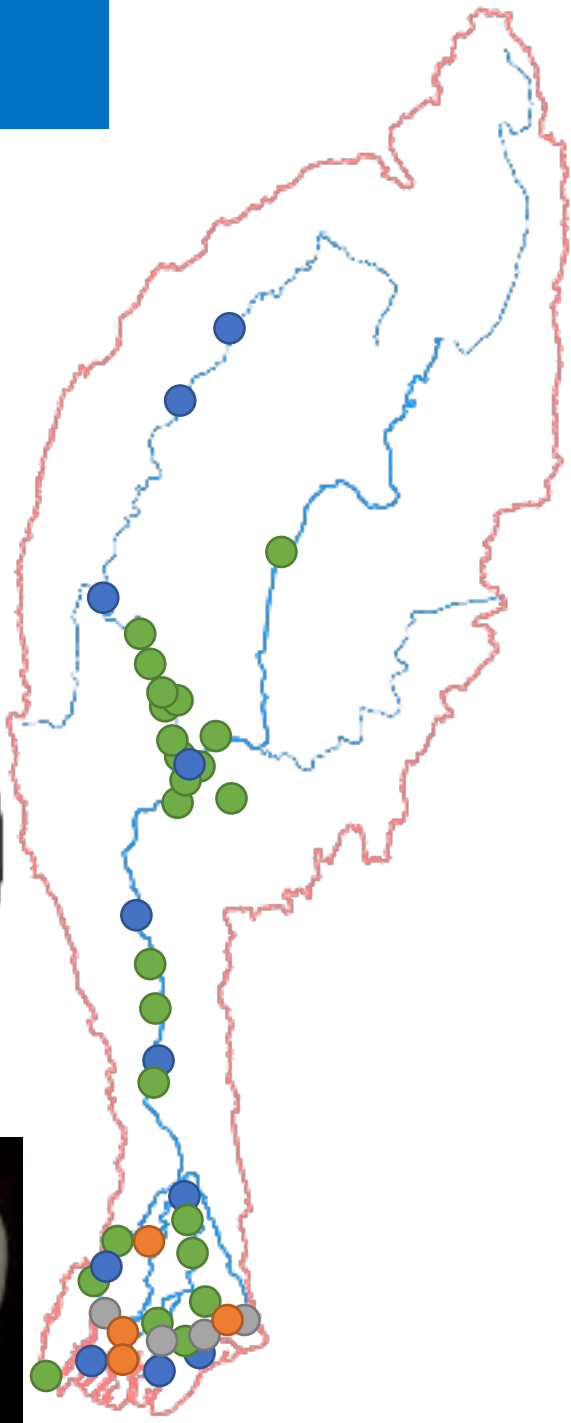


Figure 3. The Shan Gaing Sluice located on the Abyar tributary, a tributary of the Sittaung River which discharges into the Gulf of Mottama.

Conallin et al., 2020

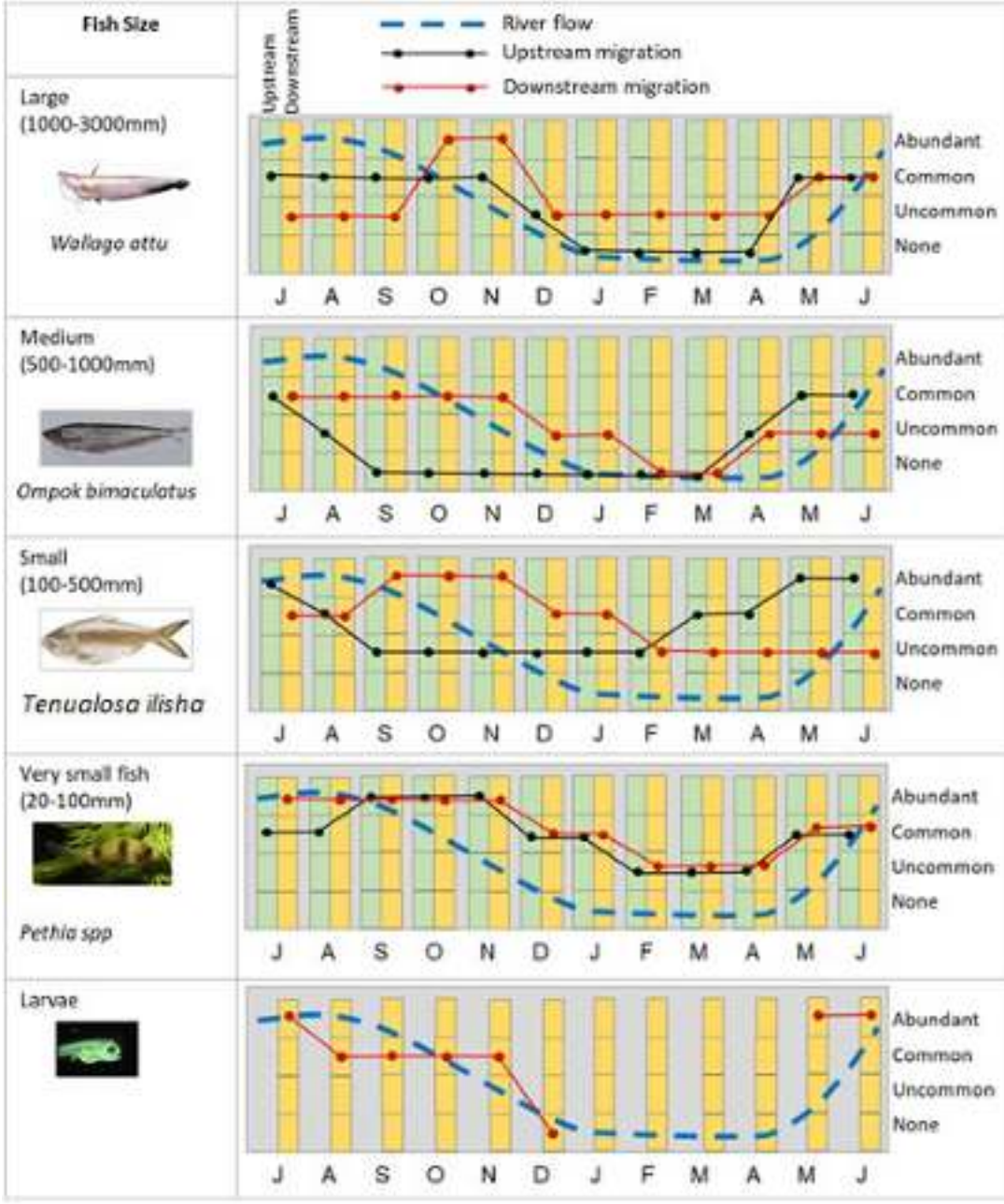


Figure 1. Example of a simple conceptual model for a fish passage project showing migration, fish size, abundance, season and flow.

Figure 10. Predicted zones of fish attraction at **high flows** with uniform flow through all sluice gates.

Conallin et al., 2020

Conallin et al., 2020

Potential layout of a vertical-slot fishway aligned with

Figure 20. Potential layout of a vertical-slot fishway that av

Figure 21. Potential layout of a vertical-slot fishway as a straight channel for construction simplicity.

Fish passage research and awareness (2022)

SWOT analysis

Strengths

- Long migrant fish species
- Department of Fisheries (DoF) and Irrigation and Water Utilization Management Department (IWUMD) has international trained staff (CSU)

Weaknesses

- Weak in technology
- Funding constraint
- Weak in understanding on the fish passage impact among the stakeholders/communities

Opportunities

- DoF and IWUMD has initiated fish passage project
- DoF plan to collaborate international organizations for fisheries development
- DoF is willing to implement the fish passage project
- IWUMD is willing to support the fish passage project

Threats

- Plan to construct new dam projects (hydropower to fulfill the electricity requirement for country development/irrigation to improve agricultural yield to fulfill food security)
- Current political turmoil
- Sanction

WE NEED
CLOSE COLLABORATION WITH REGIONAL PARTNERS FOR FISH FRIENDLY PASSAGE CONSTRUCTION.

- TO SAVE RIVERINE/WETLAND BIODIVERSITY
- TO FULFILL FOOD/NUTRITION SECURITY OF THE PEOPLE.

Fish Passage

- Though barriers may block our path,

  A fishway shows the way at last.

- With its help, we glide with ease,

  Upstream, downstream, as we please.

- We journey freely, unrestrained,

  Our destinations joyfully gained.

- We (the fish) aspire to a golden stage—

  This is the essence of a fish passage.

Translated by Zau Lunn

MSAM

Charles Sturt University
Gulbali Institute
Agriculture Water Environment

We need collaboration.

Thank you