



Webinar on Thursday - November 19, 2020

Using Radio Telemetry to Develop a Conservation Strategy for the Golden Mahseer

Fisheries Conservation Foundation



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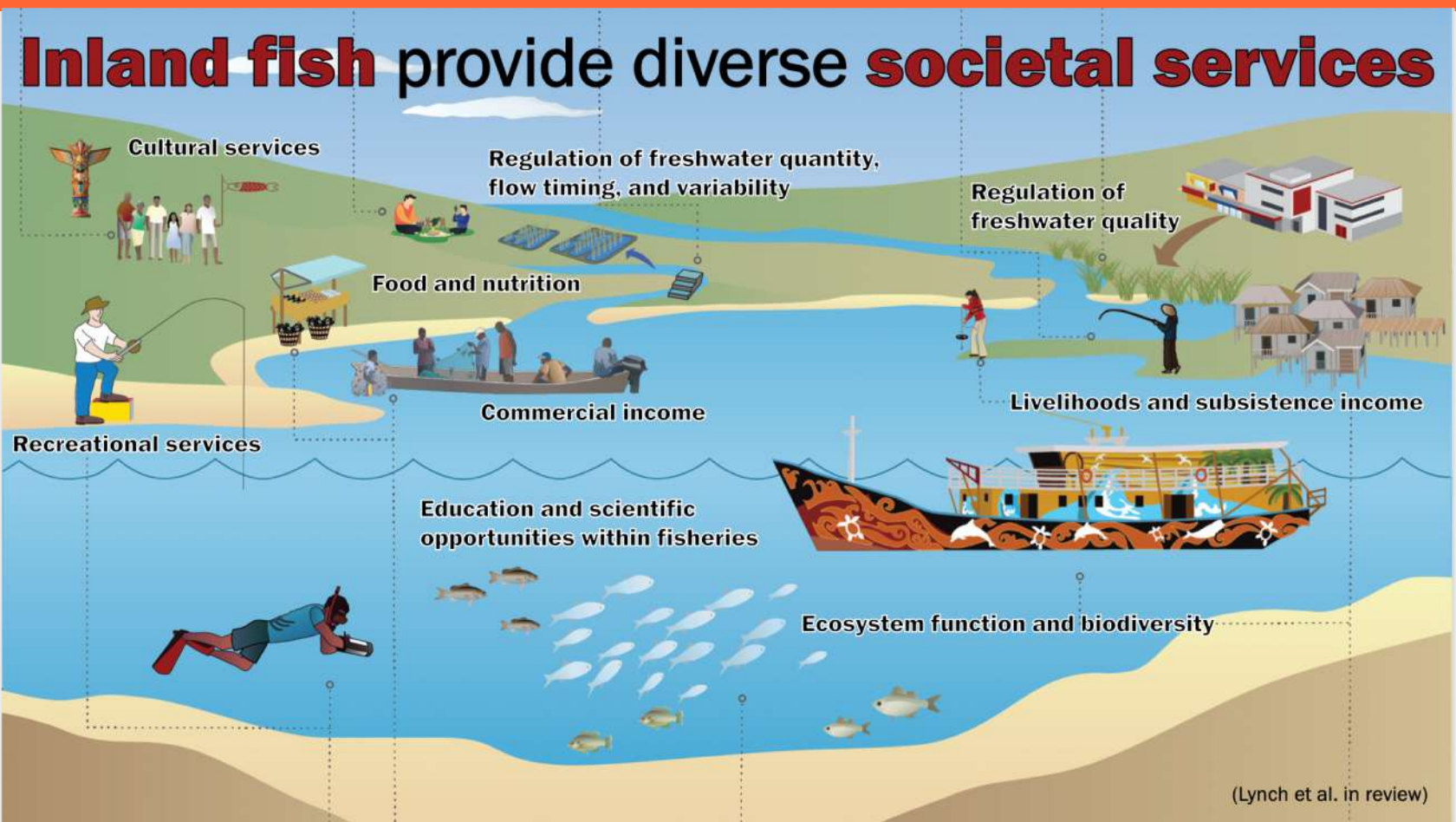
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FRESHWATER FISHERIES



STATUS OF GLOBAL FRESHWATER BIODIVERSITY

Biol. Rev. (2006), **81**, pp. 163–182. © 2005 Cambridge Philosophical Society
doi:10.1017/S1464793105006950 Printed in the United Kingdom

163

Freshwater biodiversity: importance, threats, status and conservation challenges

David Dudgeon^{1*}, Angela H. Arthington², Mark O. Gessner³, Zen-Ichiro Kawabata⁴, Duncan J. Knowler⁵, Christian Lévêque⁶, Robert J. Naiman⁷, Anne-Hélène Prieur-Richard⁸, Doris Soto⁹, Melanie L. J. Stiassny¹⁰ and Caroline A. Sullivan¹¹

BIOLOGICAL REVIEWS

Cambridge Philosophical Society

849

Biol. Rev. (2019), **94**, pp. 849–873.
doi: 10.1111/brv.12480

Emerging threats and persistent conservation challenges for freshwater biodiversity

Andrea J. Reid^{1*}, Andrew K. Carlson², Irena F. Creed³, Erika J. Eliason⁴, Peter A. Gell⁵, Pieter T. J. Johnson⁶, Karen A. Kidd⁷, Tyson J. MacCormack⁸, Julian D. Olden⁹, Steve J. Ormerod¹⁰, John P. Smol¹¹, William W. Taylor², Klement Tockner^{12,†}, Jesse C. Vermaire¹³, David Dudgeon¹⁴ and Steven J. Cooke^{1,13}

POLICY, PRACTICE AND STANDARDS |  Full Access

The Alliance for Freshwater Life: A global call to unite efforts for freshwater biodiversity science and conservation

William Darwall , Vanessa Bremerich, Aaike De Wever, Anthony I. Dell, Jörg Freyhof, Mark O. Gessner, Hans-Peter Grossart, Ian Harrison, Ken Irvine, Sonja C. Jähnig, Jonathan M. Jeschke, Jessica J. Lee, Cai Lu, Aleksandra M. Lewandowska, Michael T. Monaghan, Jens C. Nejtgaard, Harmony Patricio, Astrid Schmidt-Kloiber, Simon N. Stuart, Michele Thieme, Klement Tockner, Eren Turak, Olaf Weyl
... See fewer authors 

Published: 29 September 2010

Global threats to human water security and river biodiversity

C. J. Vörösmarty , P. B. McIntyre, M. O. Gessner, D. Dudgeon, A. Prusevich, P. Green, S. Glidden, S. E. Bunn, C. A. Sullivan, C. Reidy Liermann & P. M. Davies

Nature **467**, 555–561(2010) | Cite this article

21k Accesses | 3093 Citations | 162 Altmetric | Metrics

nature sustainability

PERSPECTIVE

<https://doi.org/10.1038/s41893-020-0517-6>

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Inland fish and fisheries integral to achieving the Sustainable Development Goals

Abigail J. Lynch ^{1,2}, Vittoria Elliott², Sui C. Phang^{3,9}, Julie E. Claussen⁴, Ian Harrison ⁵, Karen J. Murchie⁶, E. Ashley Steel⁷ and Gretchen L. Stokes ⁸



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STATUS OF GLOBAL RIVERS

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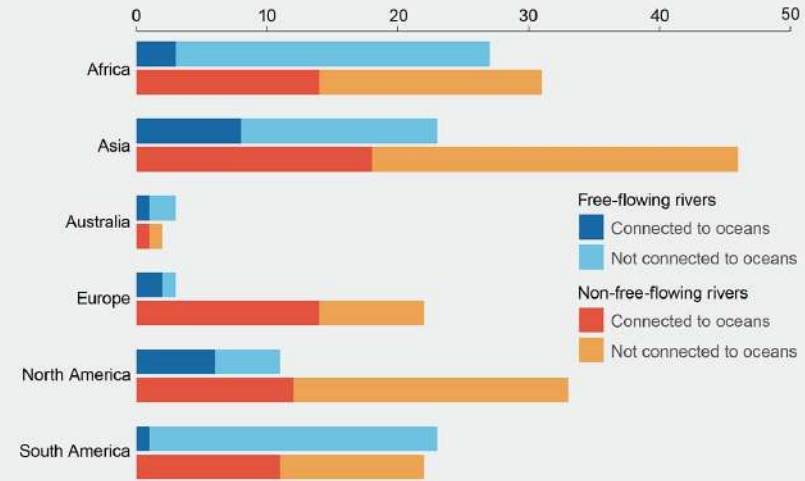
Article | Published: 08 May 2019

Mapping the world's free-flowing rivers

G. Grill , B. Lehner , M. Thieme, B. Geenen, D. Tickner, F. Antonelli, S. Babu, P. Borrelli, L. Cheng, H. Crochetiere, H. Ehalt Macedo, R. Filgueiras, M. Goichot, J. Higgins, Z. Hogan, B. Lip, M. E. McClain, J. Meng, M. Mulligan, C. Nilsson, J. D. Olden, J. J. Opperman, P. Petry, C. Reidy Liermann, L. Sáenz, S. Salinas-Rodríguez, P. Schelle, R. J. P. Schmitt, J. Snider, F. Tan, K. Tockner, P. H. Valdujo, A. van Soesbergen & C. Zarfl  -Show fewer authors

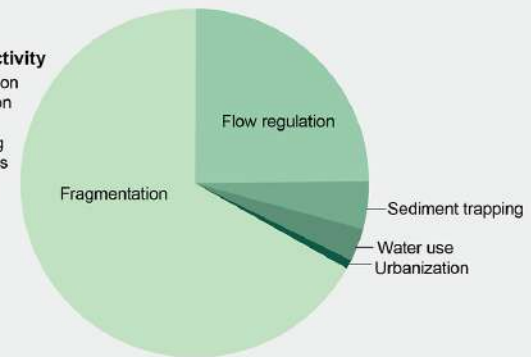
Nature 569, 215–221(2019) | Cite this article

Number of the World's Free-Flowing Rivers and Non-Free-Flowing Rivers (greater than 1,000 kilometers long)



Causes of Lost River Connectivity

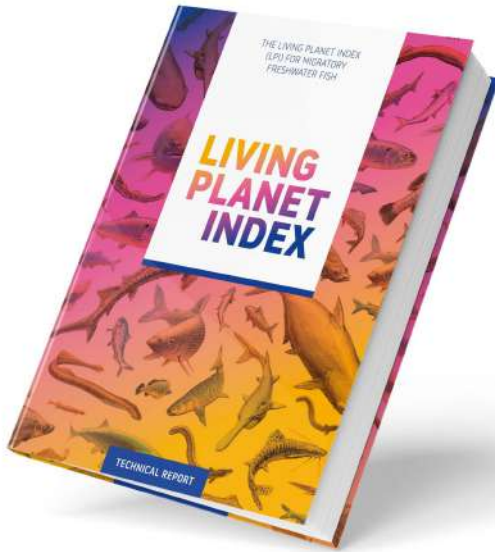
The main causes of river interruption (lost connectivity) are fragmentation by impediments such as dams; changes to the strength and timing of water flow by, for example, dams or levees; and sediment trapping behind structures such as dams.



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STATUS OF MIGRATORY FISH



The **Living Planet Index for Migratory Freshwater Fish** is the first comprehensive global report on the status of migratory fish.

In less than 50 years, we have seen an overall average decline of 76% in monitored migratory freshwater fish populations.



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CONSERVATION STRATEGIES



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BARRIERS TO CONSERVATION OF RIVERS



- Lack of social and political will
- Lack of funding
- Lack of good conservation strategies



BARRIERS TO CONSERVATION OF RIVERS



- Lack of social and political will
- Lack of funding
- Lack of good conservation strategies
- **Lack biological knowledge**



CONSERVATION STRATEGIES



Too often, mitigation actions are proposed as an easy fix.

BUT, assuming that a mitigation strategy will work without verification can have long-term negative impacts

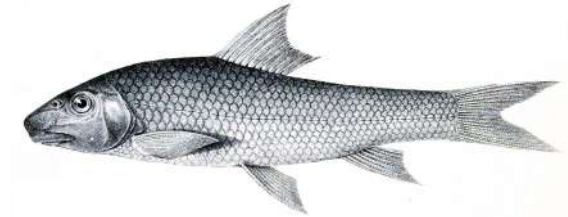


Assumptions for Common Mitigation Strategies

- Hatcheries/stocking
- Fish Ladders



DEVELOPING CONSERVATION STRATEGIES



STEP 1: DEFINE THE CONSERVATION GOAL

STEP 2: IDENTIFY EXISTING THREATS TO SPECIES AND THE ECOSYSTEM AS A WHOLE

STEP 3: IDENTIFY WHAT BIOLOGICAL INFORMATION IS NEEDED

How do we get that information?

- a) Sometimes through assimilating existing information
- b) Other times by generating new data



DEVELOPING CONSERVATION STRATEGIES

Fish populations in the Poonch River around Gulpur Dam

What is the conservation goal?

What information is needed to develop the strategy?

How do we get that information?



RESEARCH METHODS TO ASSESS FISH MOVEMENT



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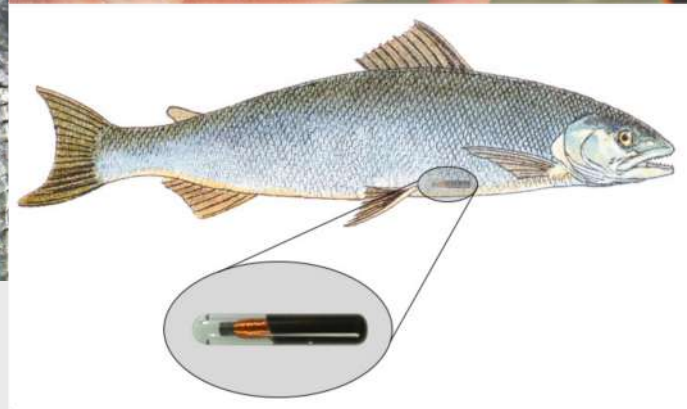
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METHODS TO ASSESS MOVEMENT – Physical Tags



SPAGHETTI TAG



PIT TAGS



CODED WIRE TAGS

METHODS TO ASSESS MOVEMENT – Remote Telemetry



SATELLITE TAGS



METHODS TO ASSESS MOVEMENT – Remote Telemetry



ACOUSTIC TAGS



METHODS TO ASSESS MOVEMENT – Remote Telemetry



RADIO TAGS



RESEARCH QUESTIONS - Bhutan



1. When and where do Mahseer go to spawn?
2. Where do Mahseer live during the rest of the year?
3. How do Mahseer navigate high water during monsoon season?
4. What are the critical habitats for each of the Mahseer's life history stages?



RESEARCH QUESTIONS – Poonch River



1. When and where do Mahseer go to spawn?
2. Where do Mahseer live during the rest of the year?
3. How do Mahseer navigate high water during monsoon season?
4. What are the critical habitats for each of the Mahseer's life history stages?
5. How do Mahseer in the lower river use the Mangla Reservoir?
6. Does the Gulpur Dam block lower river Mahseer migration upriver for spawning?
7. Does the Gulpur Dam block upper river Mahseer migration downstream for overwintering?
8. How do Mahseer in the upper river use the Gulpur Reservoir?

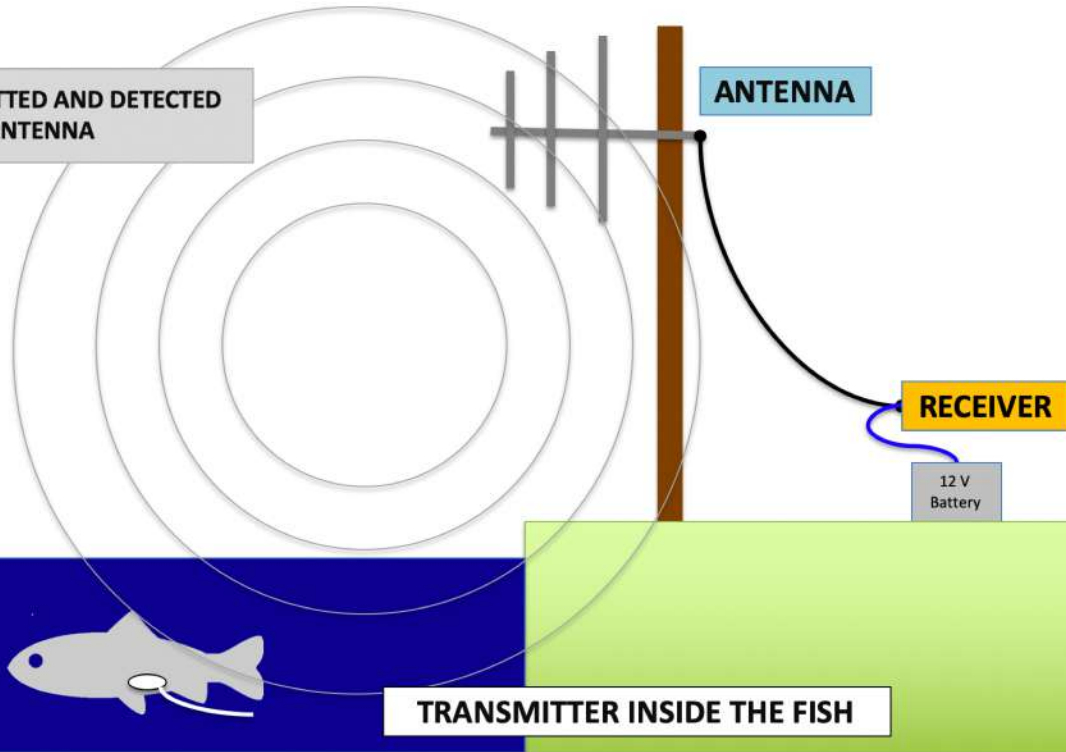
IMPORTANT TO CHOOSE THE BEST METHOD FOR THE RESEARCH QUESTION



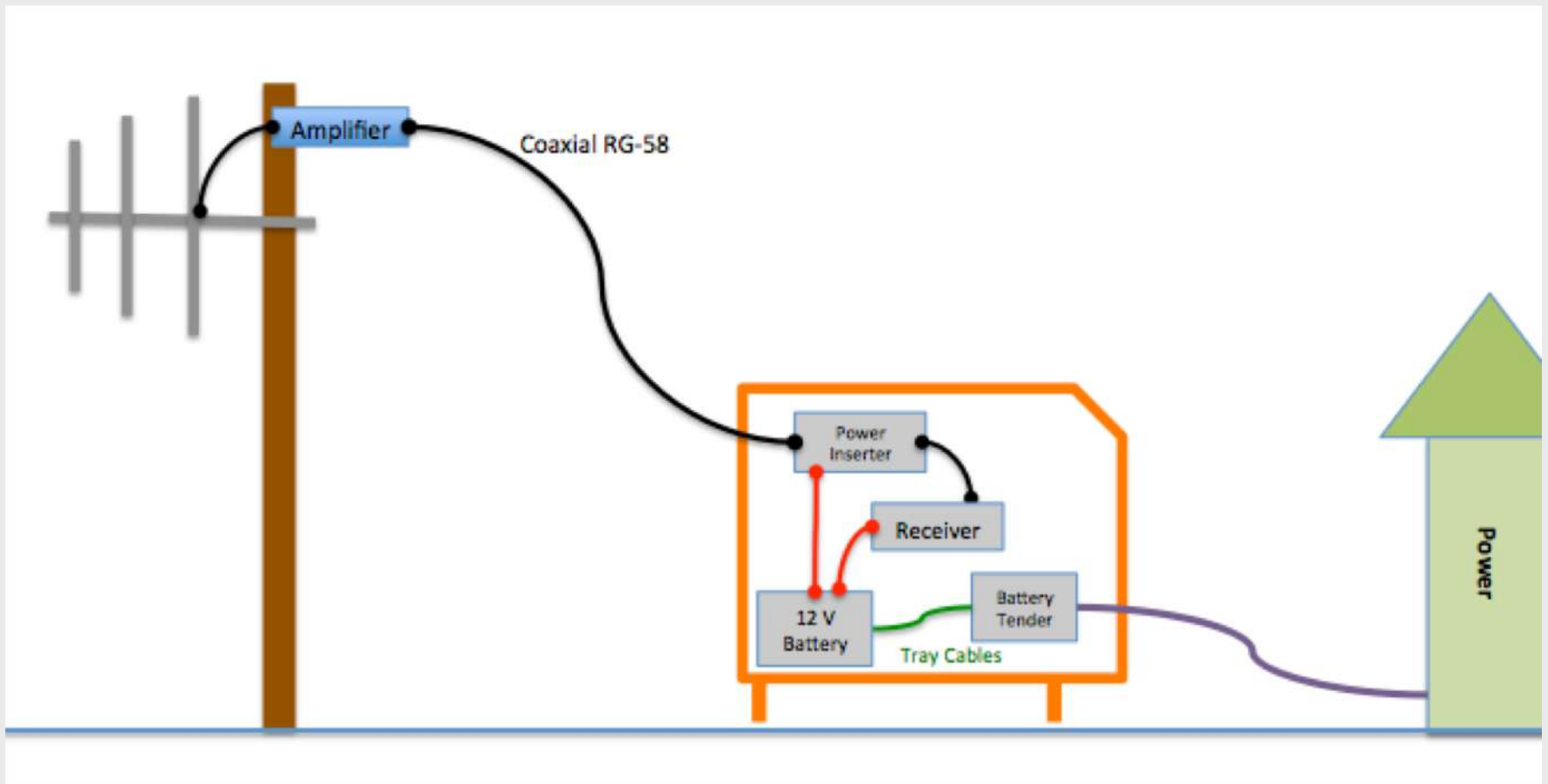
METHODS TO ASSESS MOVEMENT – Remote Telemetry

RADIO – TELEMETRY

SIGNAL IS TRANSMITTED AND DETECTED BY THE ANTENNA



RECEIVERS



International Finance Corporation
WORLD BANK GROUP
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RECEIVERS



RECEIVER STATION



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RECEIVER STATIONS



RECEIVER STATIONS



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YAGI ANTENNA



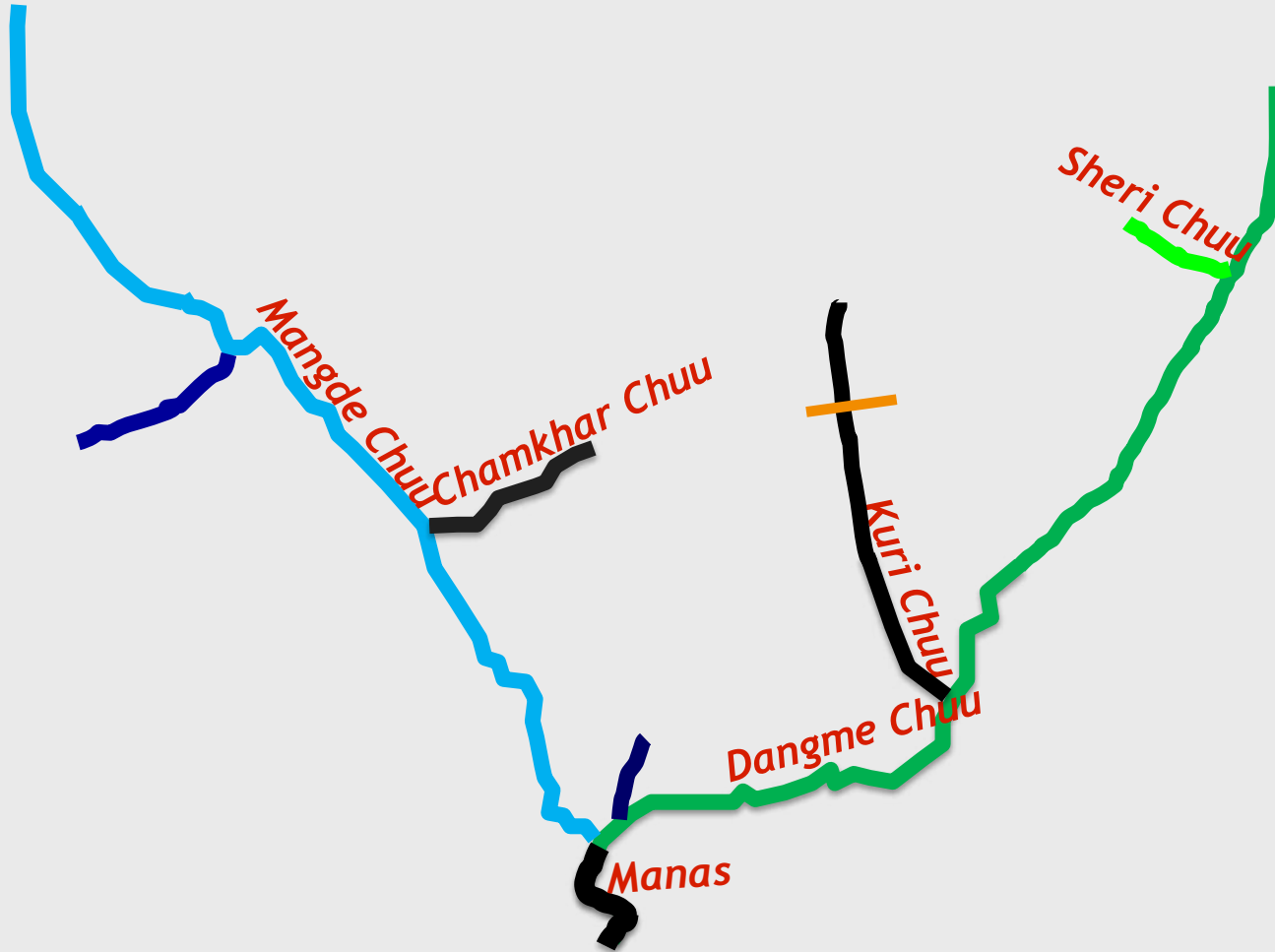
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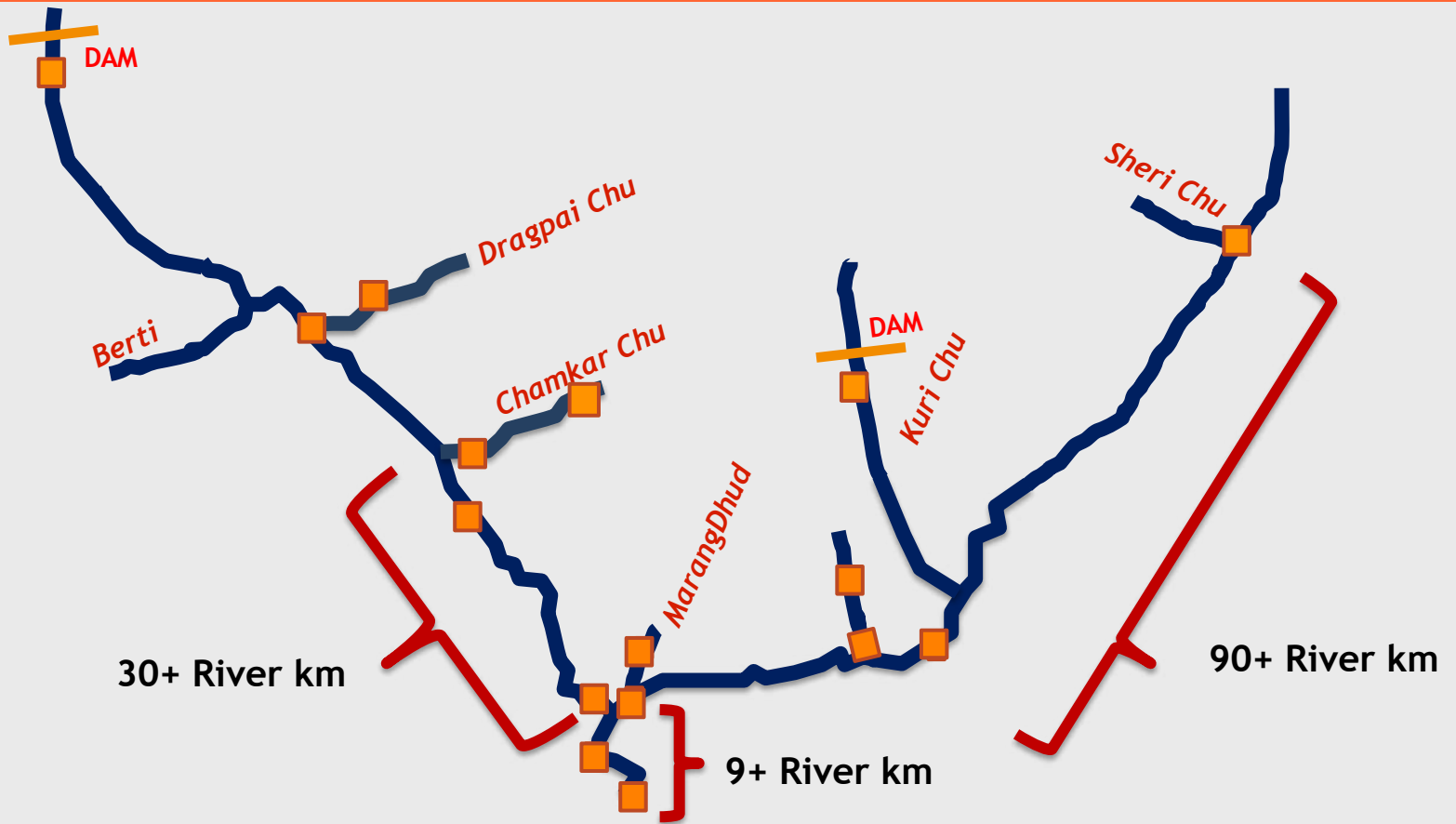
ANTENNA



TELEMETRY ARRAY



TELEMETRY ARRAY



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TRANSMITTER TAGS



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CATCHING FISH



CATCHING FISH



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SURGERY



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ANESTHESIA



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SURGERY



SURGERY



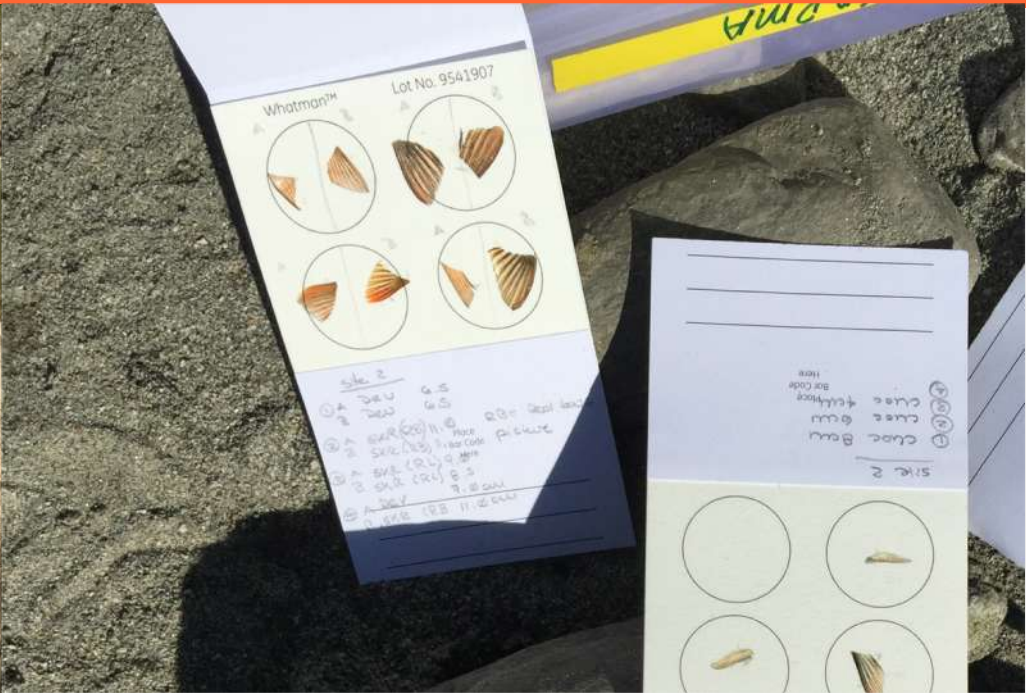
SURGERY



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TISSUE SAMPLES



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RECOVERY



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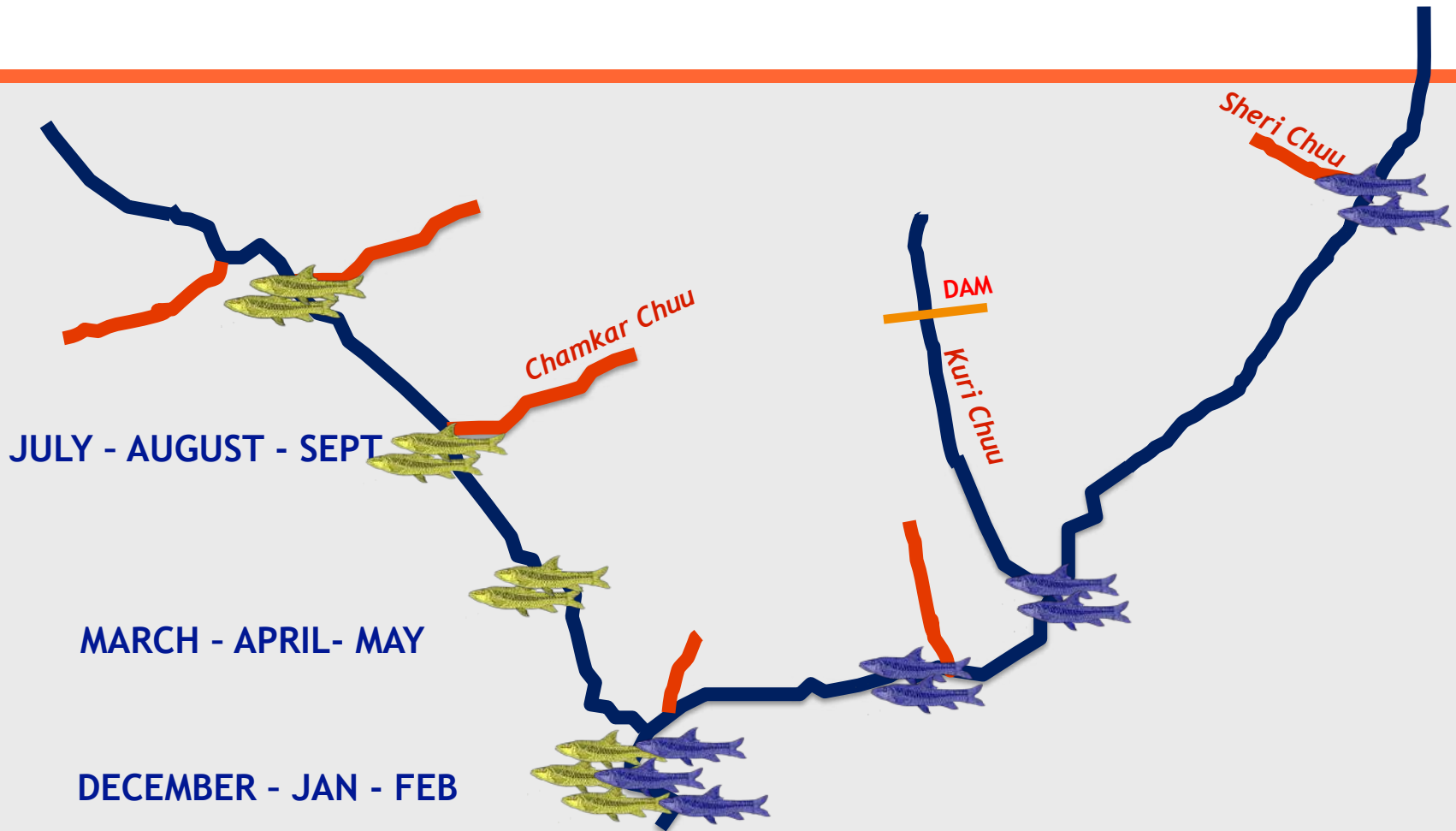
DOWNLOADING DATA



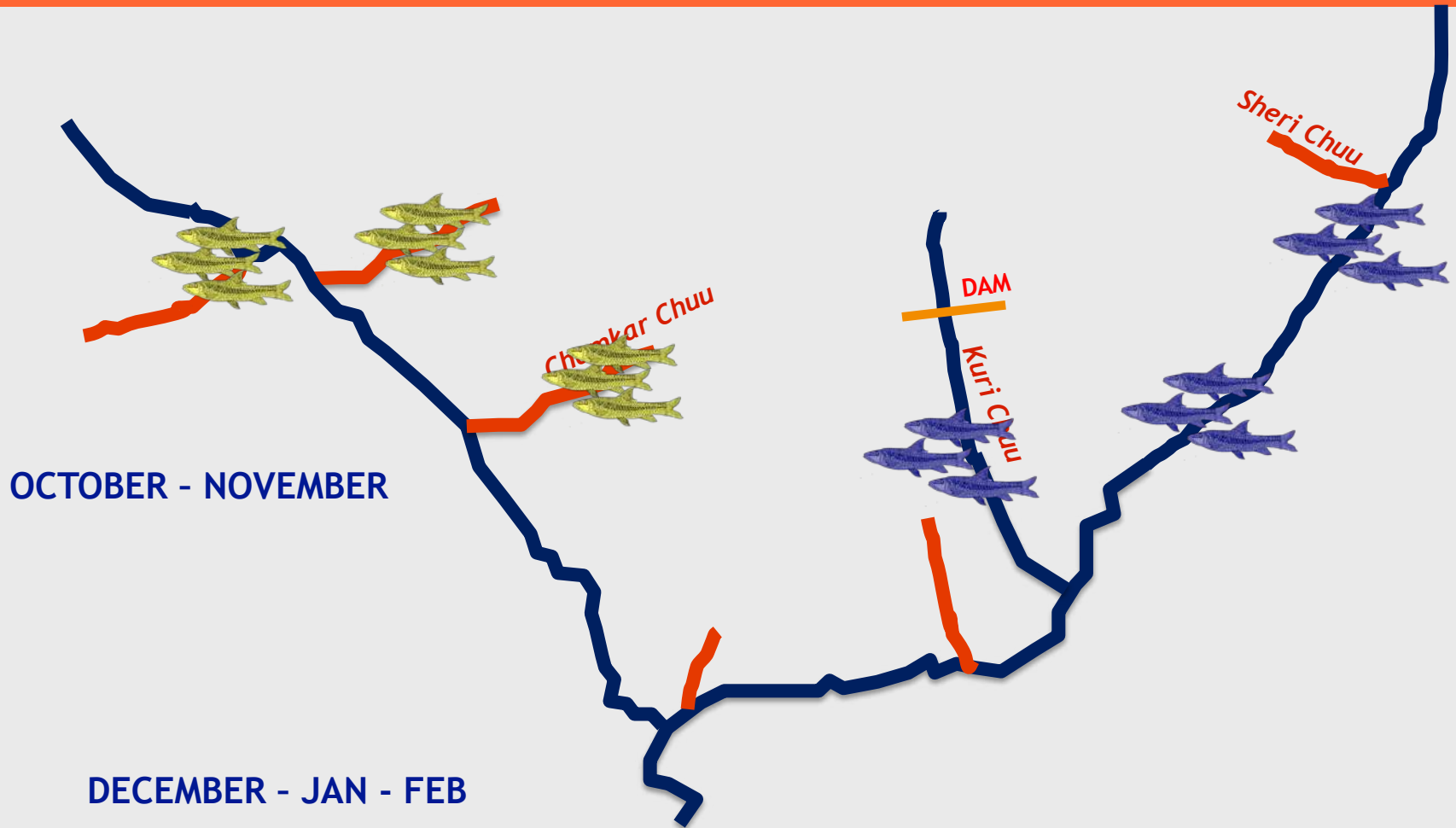
DATA ANALYSIS



MAHSEER MIGRATIONS



MAHSEER MIGRATIONS



SPAWNING



SPAWNING

SEE SAME PATTERN
OF INDIVIDUALS
RETURNING
BACK TO SAME
TRIBUTARY
EVERY YEAR



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SUMMARY OF FINDINGS



- **Need to protect over-wintering areas where there are high concentrations of fish**
- **The tributaries + mouths are key habitats**
- **Migration corridor**



SUMMARY OF FINDINGS



- There is a high probability for local adaptation to individual rivers
- Genetic evidence suggests that Mahseer return to natal rivers to spawn
- Adult Mahseer move upstream for spawning before water levels rise in summer
- They do not return downstream until after the monsoonal rains



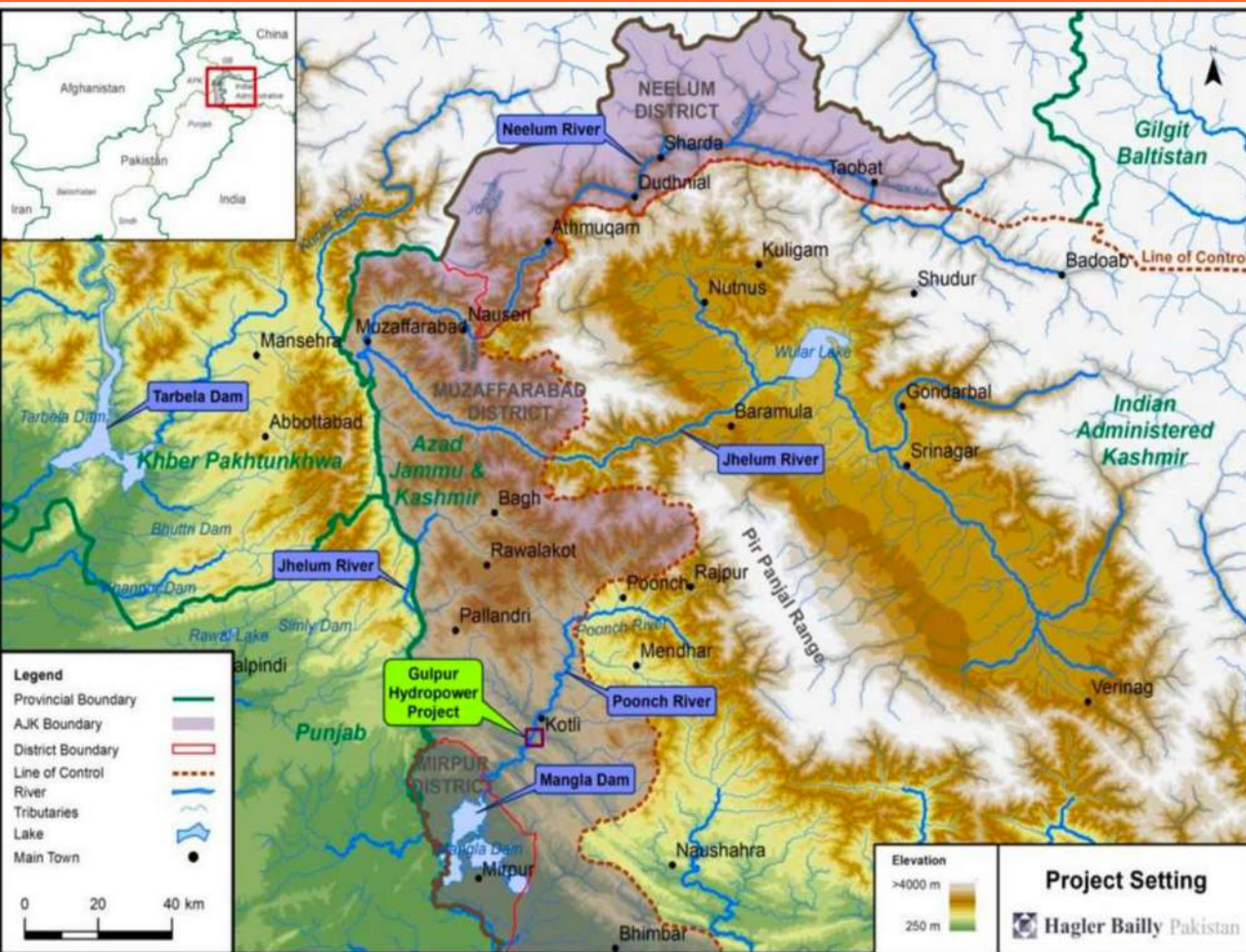
SUMMARY OF FINDINGS



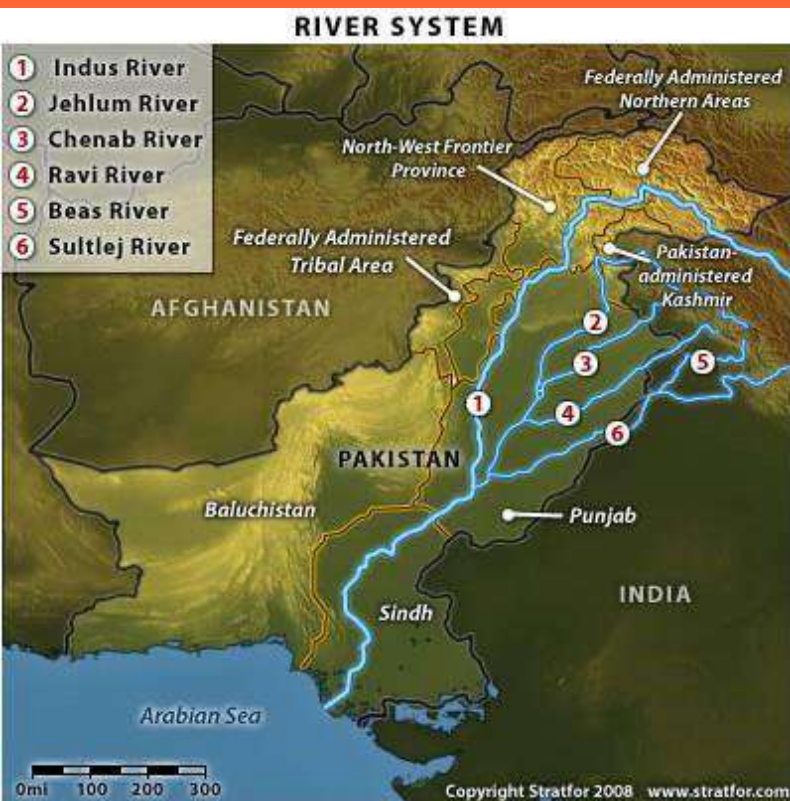
- Mahseer move upstream for spawning before water levels rise in summer.
- They do not return downstream until after the monsoonal rains.
- Reduction of river flows during low water periods will impact migration.



DEVELOPING CONSERVATION STRATEGIES



POONCH RIVER TELEMETRY STUDY



Poonch River

Research Questions

1. When and where do Mahseer go to spawn?
2. Where do Mahseer live during the rest of the year?
3. How do Mahseer navigate high water during monsoon season?
4. What are the critical habitats for each of the Mahseer's life history stages?
5. How do Mahseer in the lower river use the Mangla Reservoir?
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POONCH RIVER TELEMETRY STUDY



■ Poonch River

- Constructing the Array



POONCH RIVER TELEMETRY STUDY



■ Poonch River

■ Capturing and Tagging the Fish

- Golden Mahseer
- Snow Trout
- Labeo
- Carp



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POONCH RIVER TELEMETRY STUDY



■ Poonch River

■ Potential Results / Implications

1. When and where do Mahseer go to spawn?
2. Where do Mahseer live during the rest of the year?
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4. What are the critical habitats for each of the Mahseer's life history stages?
5. How do Mahseer in the lower river use the Mangla Reservoir?
6. Does the Gulpur Dam block lower river Mahseer migration upriver, thereby preventing spawning?
7. Does the Gulpur Dam block upper river Mahseer migration downstream for overwintering?
8. How do Mahseer in the upper river use the Gulpur Reservoir?



DEVELOPING CONSERVATION STRATEGIES FOR THE POONCH RIVER MAHSEER NATIONAL PARK

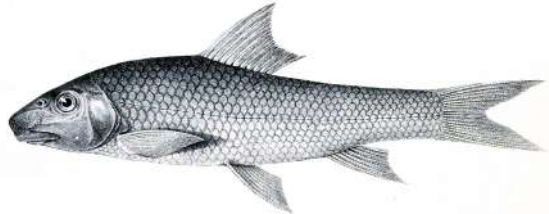


A Telemetry Study Will Help:

- Define Critical Habitats
- Identify Harmful Areas
- Establish Recreational Fishing and Ecotourism
- Identify Protected Areas / Closed Seasons
- Plan Single Species vs Ecosystem Based Management
-
- Community-Based Conservation
- Educational Programs



QUESTIONS



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