Monitoring of Impacts of Gulpur Hydropower Project on Populations of Mahseer and Other Fish Species

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Hagler Bailly Pakistan

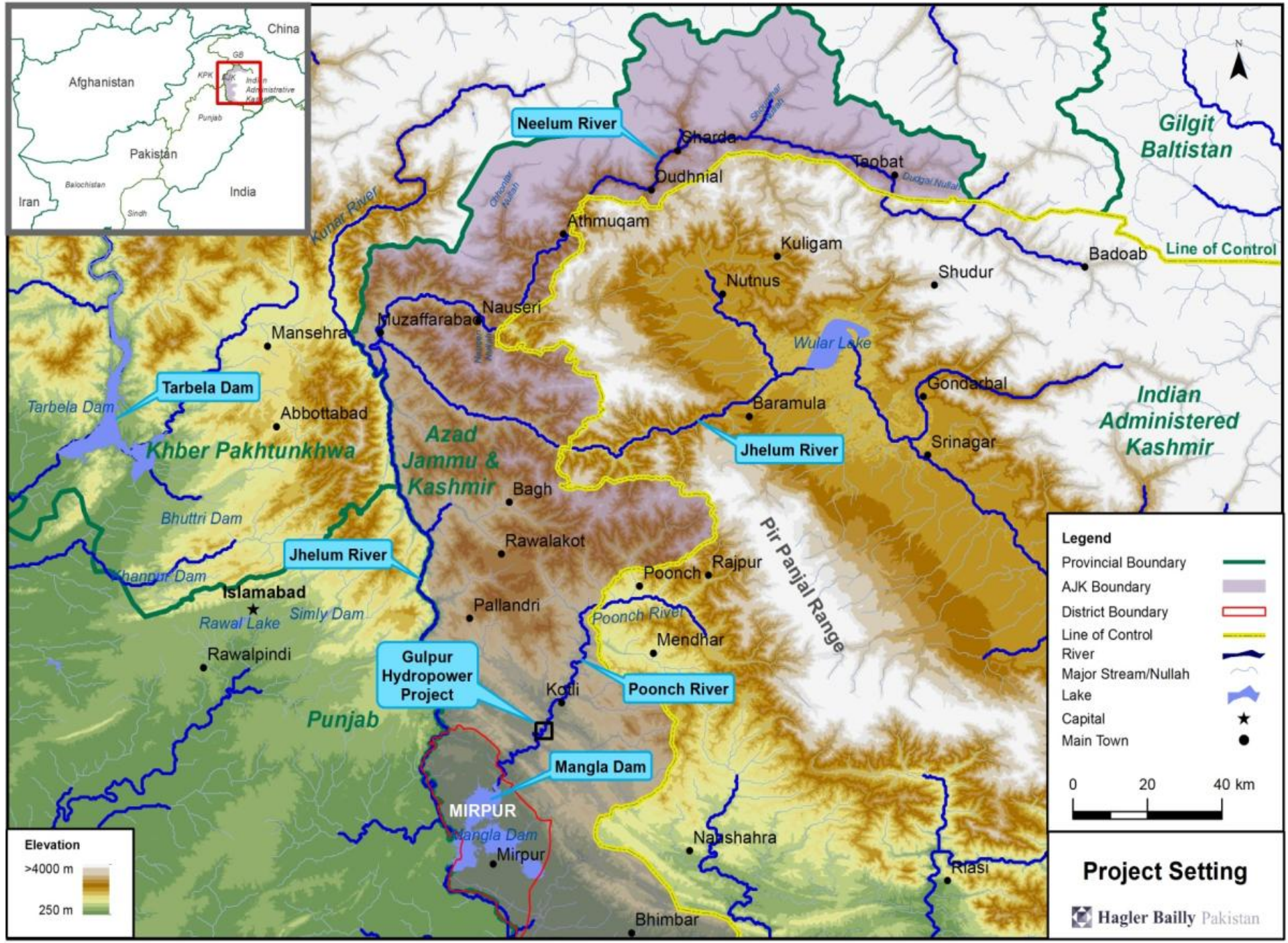
Introduction

- **100 MW Gulpur Hydropower Project is being constructed on the Poonch River in the Pakistan Administered Kashmir.**
- **It is expected to start its operation by mid 2019.**
- **Full length of Poonch River is 104 km.**
- **River and its associated tributaries were notified as a national park by the government in 2010.**
- **Poonch River provides a highly suitable habitat for the Golden Mahaseer "*Tor putitora*."**
- **In addition to Golden Mahaseer,**
  - At least 35 other species of fish in the river including the Critically Endangered *Glyptothorax kashmirensis*
  - 5 migratory
  - 2 restricted range species

Introduction

(Contd…)

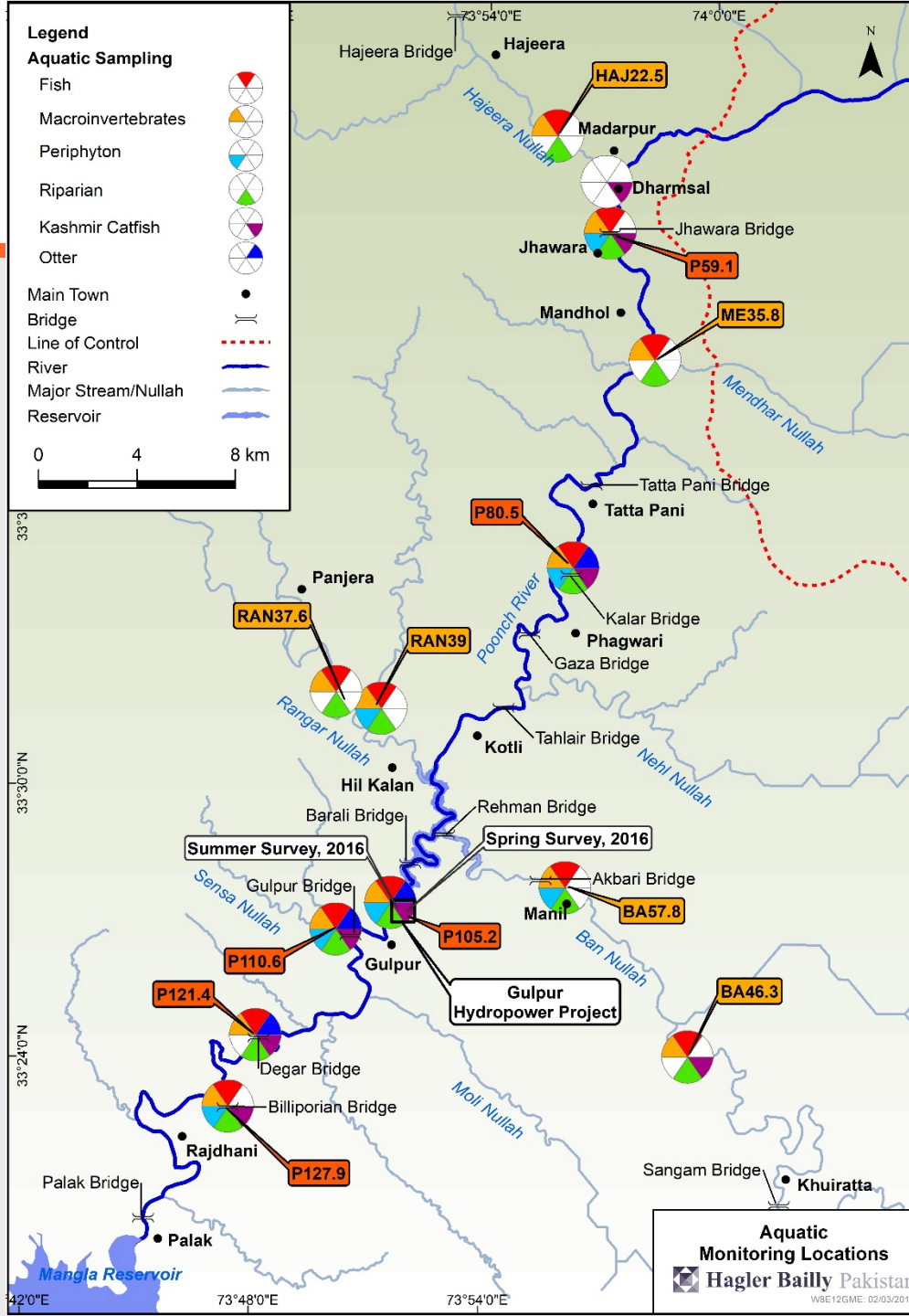
- **Condition for construction of project is only given to achieve Net Gain in biodiversity in consistent with the requirements of IFC Performance Standard 6 for projects falling Critical Habitat.**
- **A Biodiversity Action Plan inclusive of a Monitoring and Evaluation Plan was established to monitor:**
  - The impacts of the project on aquatic biodiversity.
  - The outcome of actions for in-situ protection of the fish to achieve the Net Gain in biodiversity.
- **Seasonal surveys following a defined protocol were initiated prior to:**
  - Construction of the project.
  - Construction of the coffer dam that has created a barrier to fish migration, and have continued since.


China
Afghanistan
Pakistan
India
Iran
Balochistan
Sindh
Punjab
GB
KPK
AJK
Indian Administrative Kashmir
Neelum River
Sharda
Dudhnial
Taobat
Athmuqam
Kuligam
Badoab
Line of Control
Shudur
Nutnus
Nauseri
Muzaffarabad
Mansehra
Kunar River
Gilgit Baltistan
Wular Lake
Gondarbal
Baramula
Srinagar
Indian Administered Kashmir
Tarbela Dam
Abbottabad
Khber Pakhtunkhwa
Azad Jammu & Kashmir
Jhelum River
Bagh
Bhuttri Dam
Rawalakot
Pir Panjal Range
Poonch
Rajpur
Khanpur Dam
Islamabad
Pallandri
Simly Dam
Rawal Lake
Poonch River
Mendhar
Rawalpindi
Gulpur Hydropower Project
Kotli
Punjab
Mangla Dam
MIRPUR
Mangla Dam
Mirpur
Nainshahra
Riasi
Bhimbar
N
Legend
Provincial Boundary
AJK Boundary
District Boundary
Line of Control
River
Major Stream/Nullah
Lake
Capital
Main Town
0
20
40 km
Elevation
>4000 m
250 m
Project Setting
Hagler Bailly Pakistan

Details of Surveys Completed

Sampling Year, Month	Sampling Season	Sampling Methods			
		Electrofishing	Gill Net	Cast Net	Fyke Net
October 2015	Fall 2015	✓	✓	✓	✓
December 2015	Winter 2015		✓		✓
May 2016	Spring 2016	✓		✓	✓
August 2016	Summer 2016	✓		✓	✓
January 2017	Winter 2016		✓		
May 2017	Spring 2017	✓		✓	
August 2017	Summer 2017	✓		✓	
January 2018	Winter 2017		✓		
May 2018	Spring 2018	✓		✓	
August 2018	Summer 2018	✓		✓	

Monitoring Locations



Field Activities

Electrofishing

Cast Netting

Gill Netting

Fyke Netting

Field Activities *(Contd…)*

Data Keeping

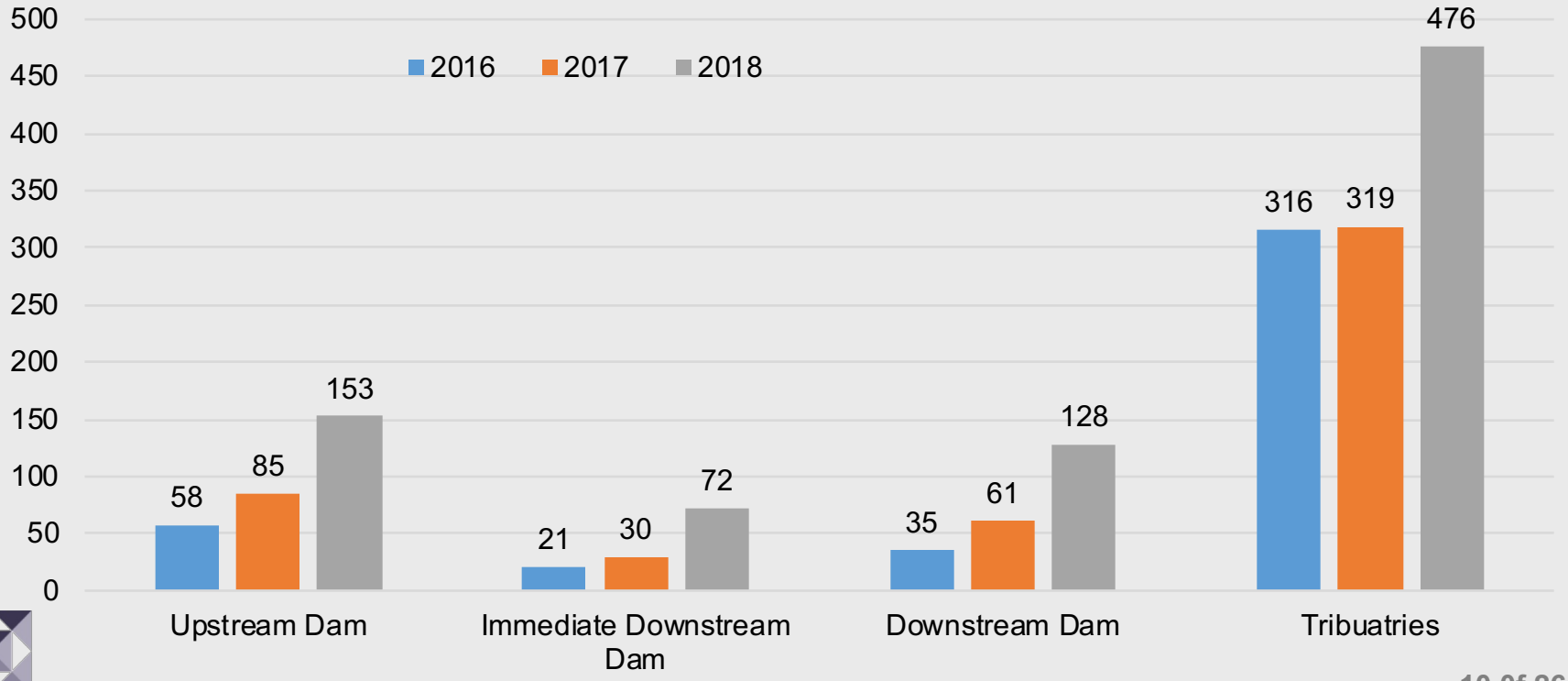
Macro-Invertebrates Sampling

Periphyton Sampling

Monitoring Results of Fish – Spring Surveys

Total fish specimens captured:

- **430 in 2016**
- **495 in 2017**
- **829 in 2018**

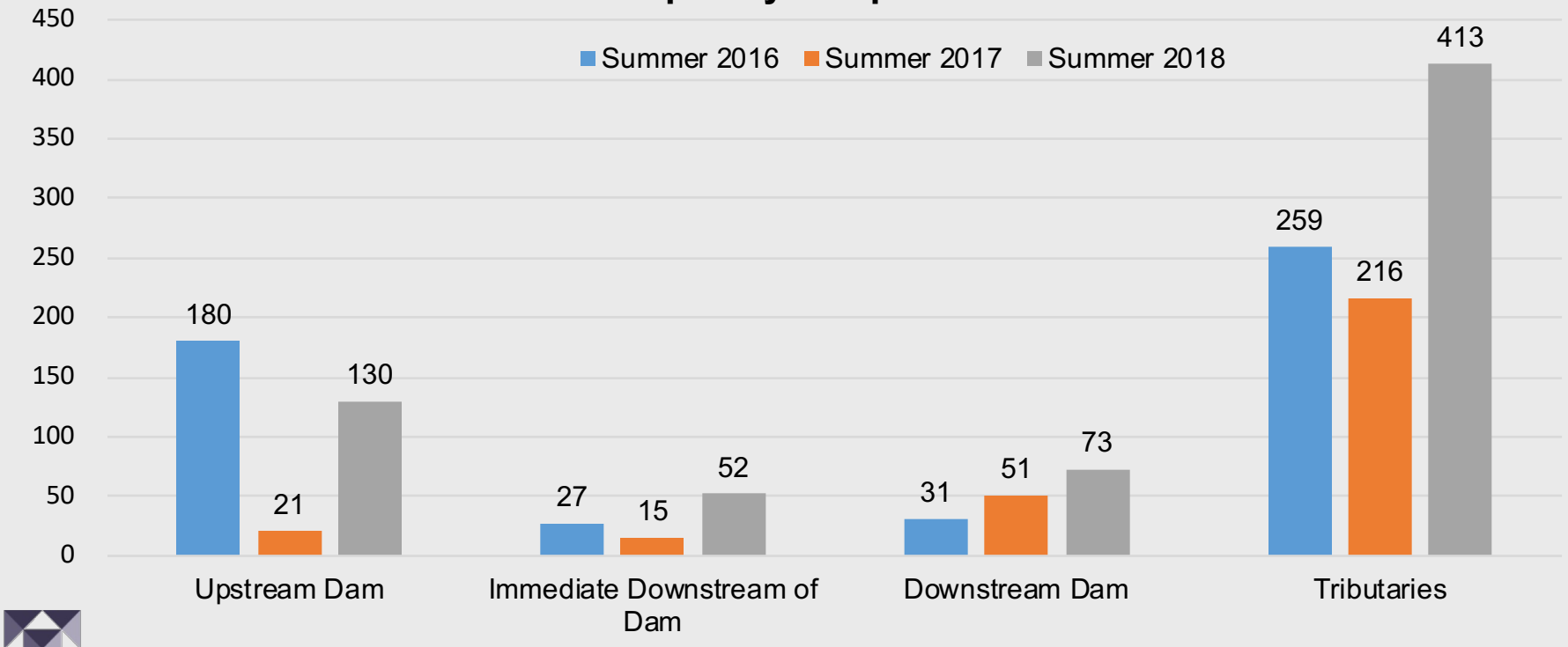


Monitoring Results of Fish – Summer Surveys

Total fish specimens captured:

- **497 in 2016**
- **303 in 2017**
- **668 in 2018**

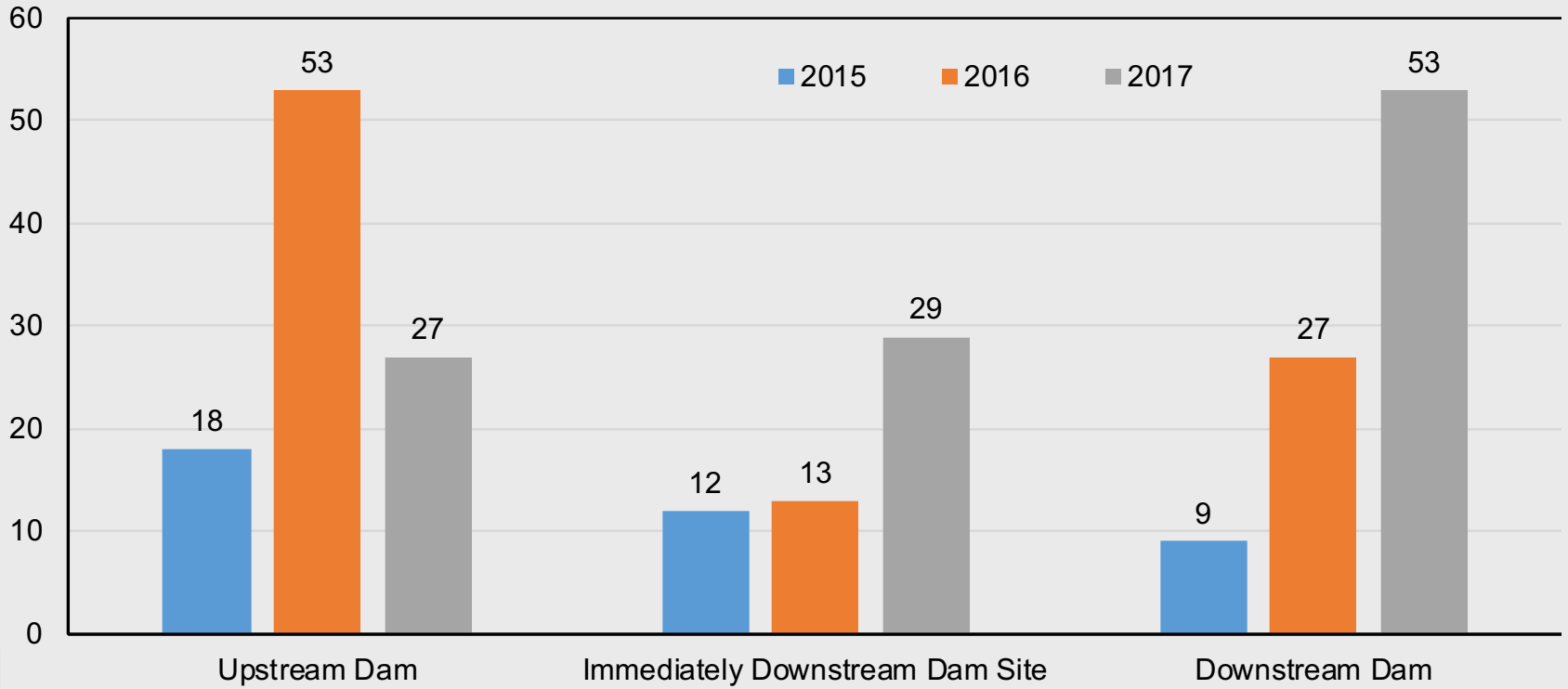
NOTE: three locations were not completely sampled in Summer 2017.



Monitoring Results of Fish – Winter Surveys

Total fish specimens captured:

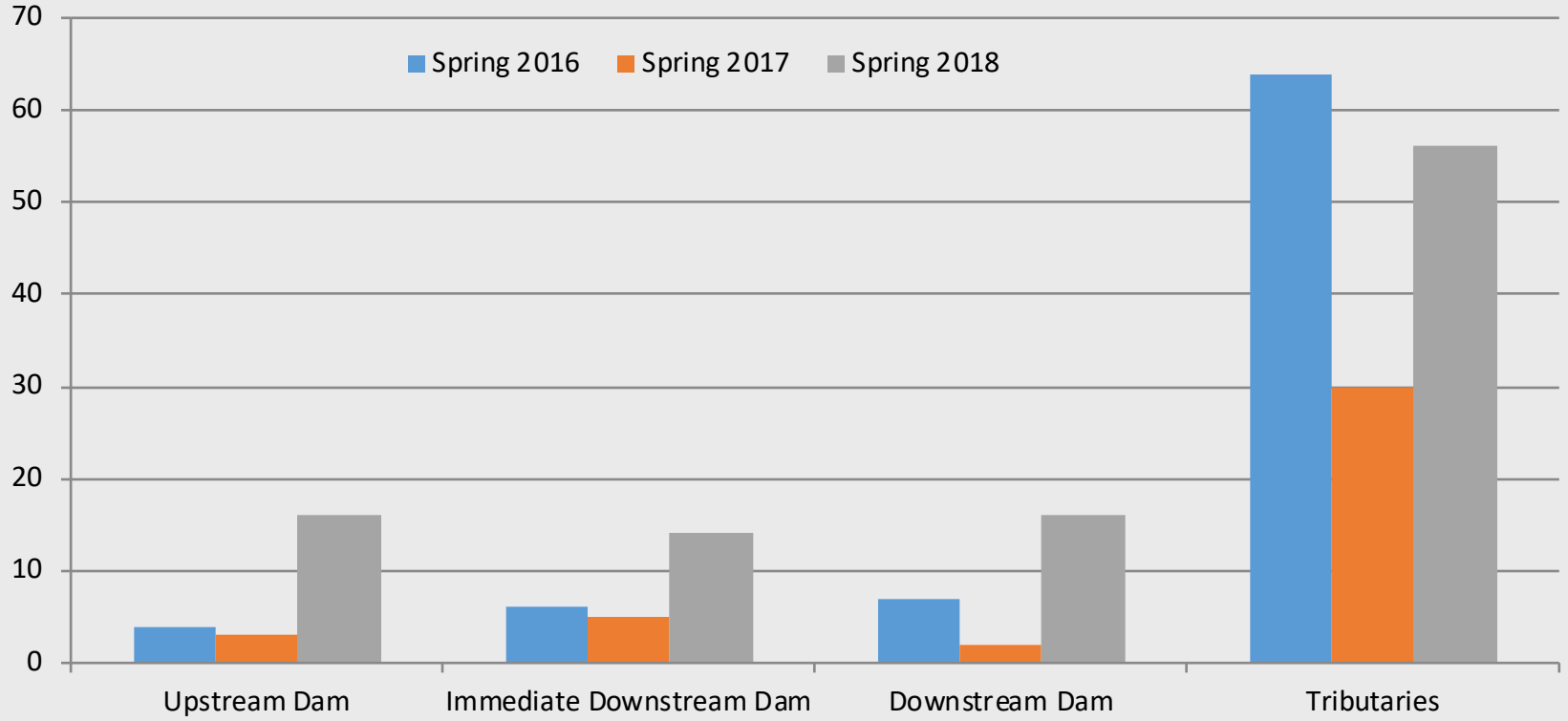
- **39 in 2015**
- **93 in 2016**
- **109 in 2017**



Monitoring Results of Fish – Spring Surveys
Mahseer Abundance

Total fish specimens captured:

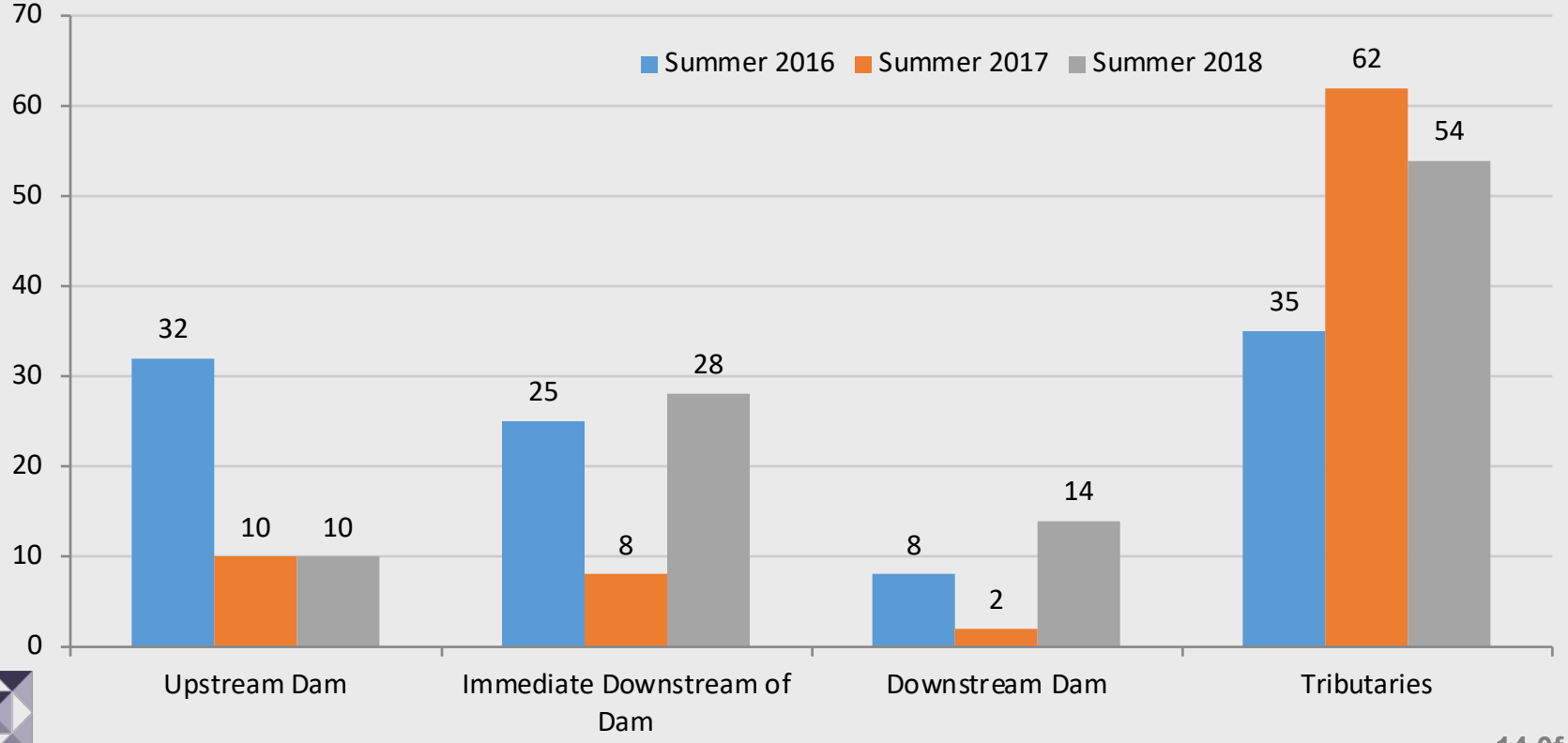
- **81 in 2016**
- **40 in 2017**
- **102 in 2018**



Monitoring Results of Fish – Summer Surveys
Mahseer Abundance

Total fish specimens captured:

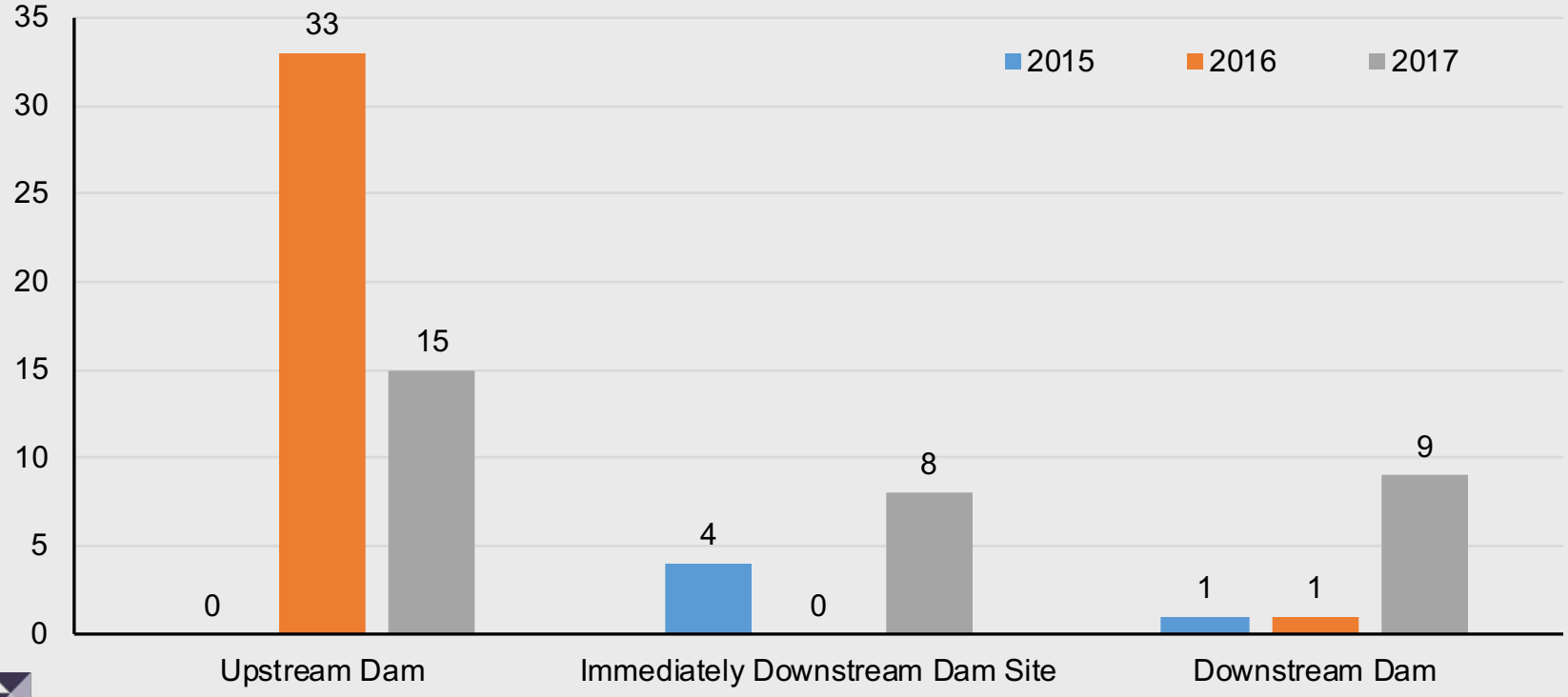
- **100 in 2016**
- **82 in 2017**
- **106 in 2018**



Monitoring Results of Fish – Winter Surveys
Mahseer Abundance

Total fish specimens captured:

- **5 in 2015**
- **34 in 2016**
- **32 in 2017**



Conclusion of Fish Monitoring Results

- **Relative increase in fish populations of most of the species upstream of the dam including the Mahaseer, while downstream the population of Mahaseer has remained stable.**
- **Consistent results with the predictions of impacts made using the DRIFT DSS as a part of the project ESIA, and shows that the impact of the barrier created by the cofferdam has been offset by the conservation program put in place.**

Special aspect studied: impact of temporary diversion tunnels on fish populations that allow fish to move downstream only

- **Trend in the populations of migratory fish:**
  - species that prefer warmer water have accumulated downstream of the dam
  - species that prefer cooler water have survived largely upstream of the dam.

Entrapment of Fish

- Observed in the summer sampling that migratory species e.g. Pakistani Labeo, Mahaseer and Snow Trout were trapped below the diversion tunnels.
- A drop of about one meter at the outlet of the diversion tunnel provided a barrier to fish migrating upstream.
- Water velocities were also high and appeared to be 4-5 m/s or more.

Fish Entrapped at the Mouth of Tunnel

Capture and Transportation of Fish

Gill Netting for the Collection of Fish

Collection of Fish

Transportation of Fish

Releasing Fish

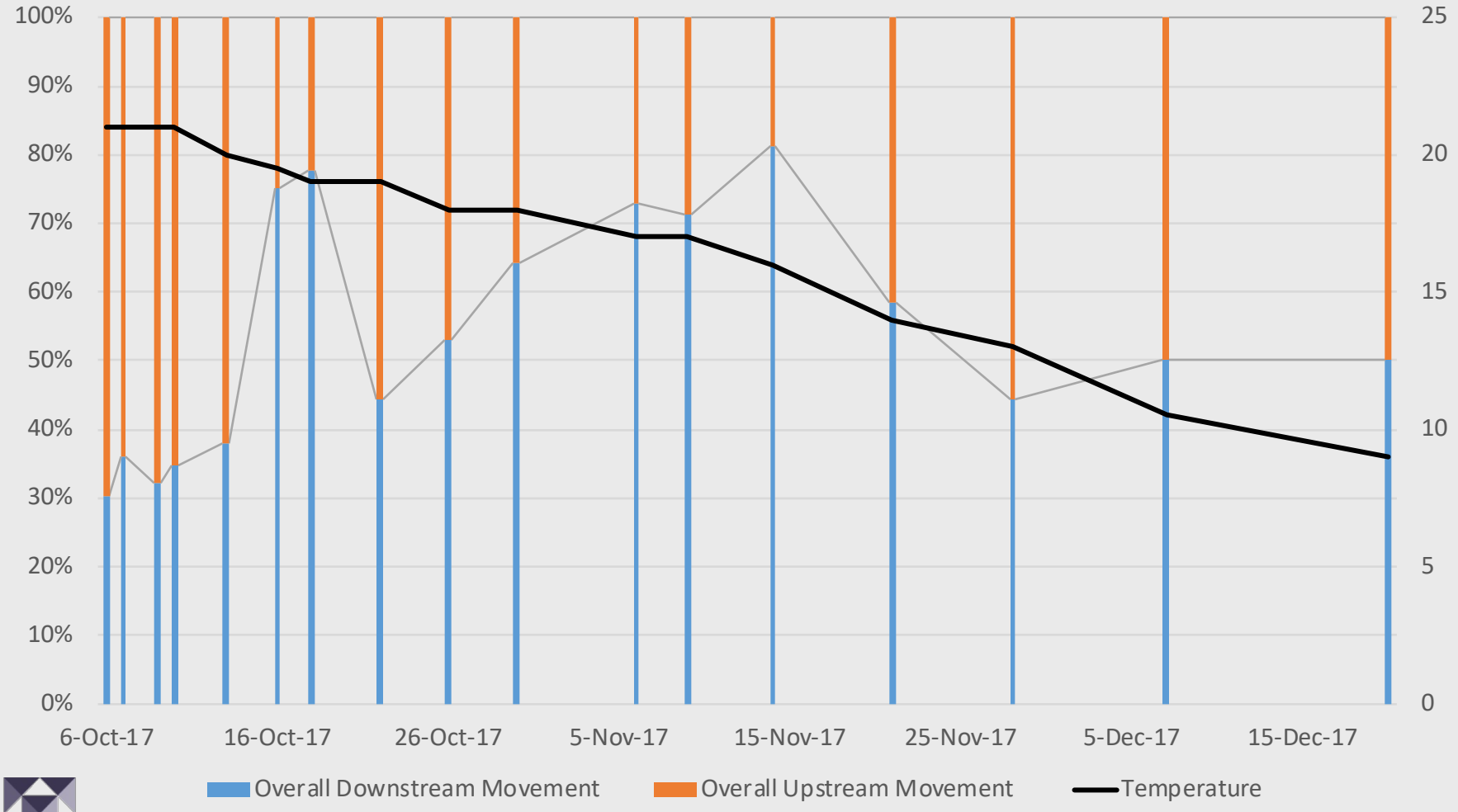
Fish Capture and Transportation

- Fish capture and transportation was conducted between October 06 – December 20, 2017
- Gill nets were used for fish capture.
- The captured specimens were transported and released at three points.
  - Main River near the confluence of Bann Nullah
  - Main River near the confluence of Rangar Nullah
  - Main River near the confluence of Nehl Nullah

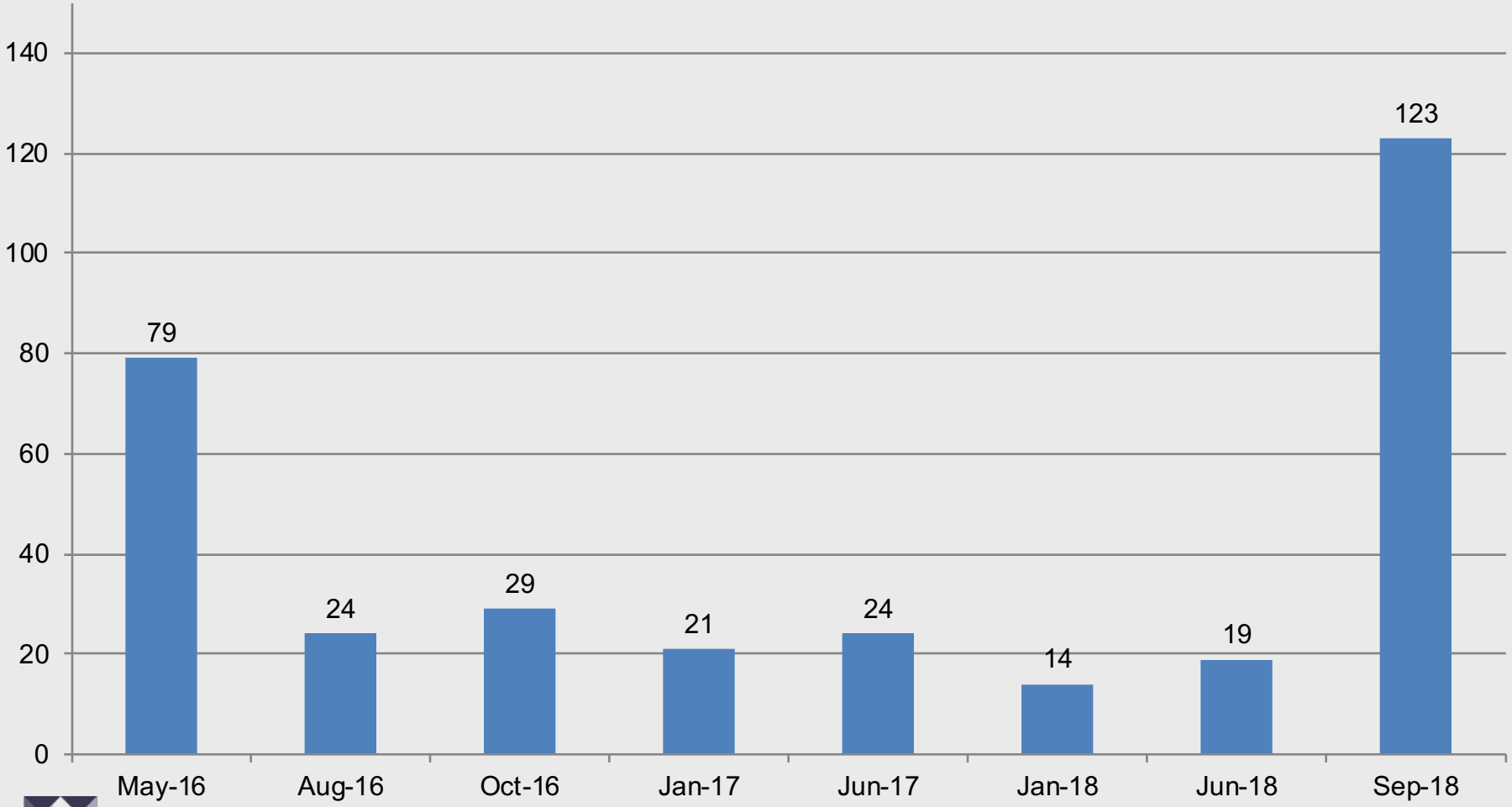
Total Fish Transported from Downstream to Upstream of the Dam

- **Total specimens of fish transported: 3,276**
- **Total Number of Labeo: 2,003**
- **Total Number of Snow trout: 951**
- **Total Number of Mahseer: 322**
- **Mortality rate 2-3%**

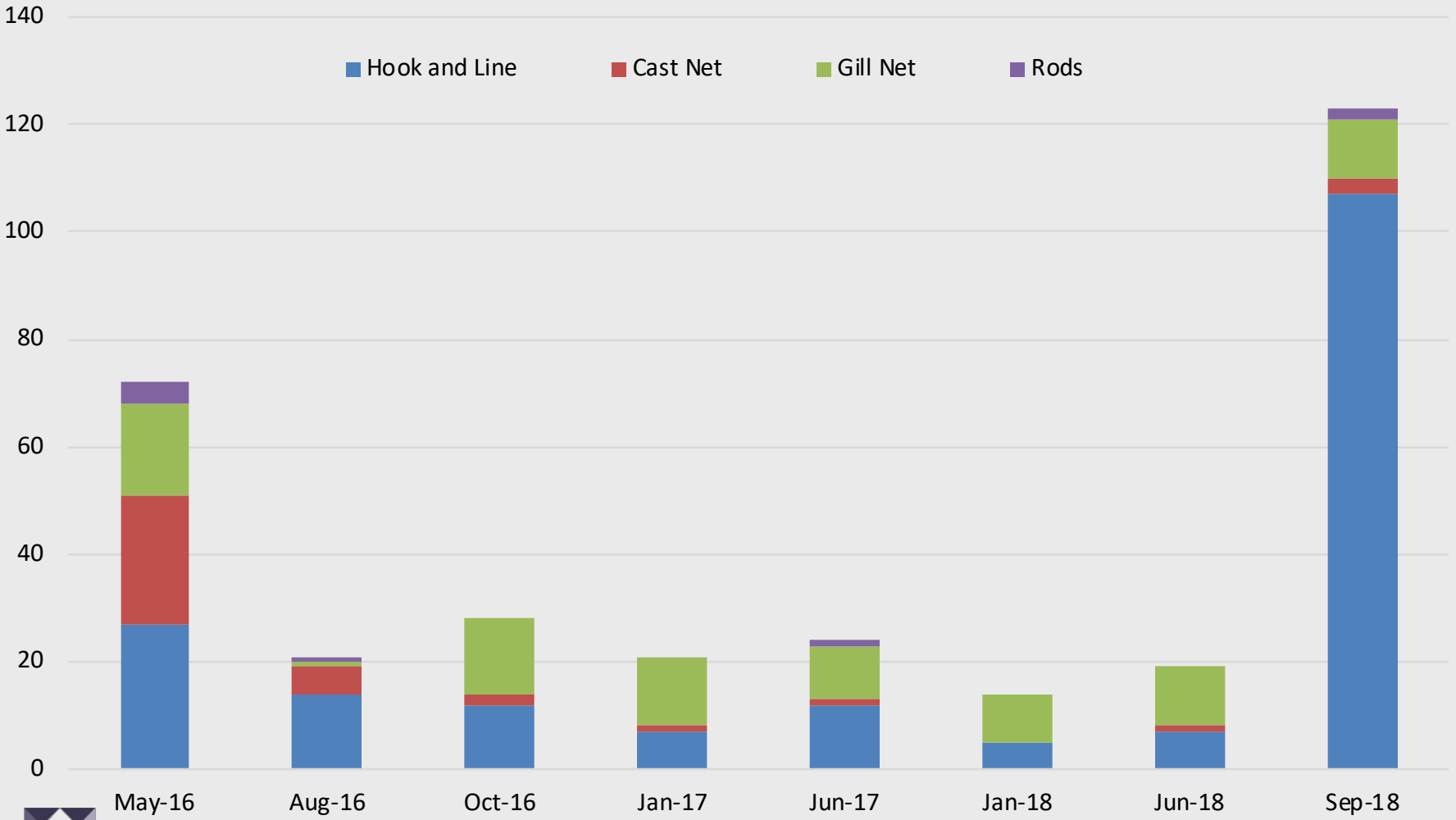
Fish Migration Pattern



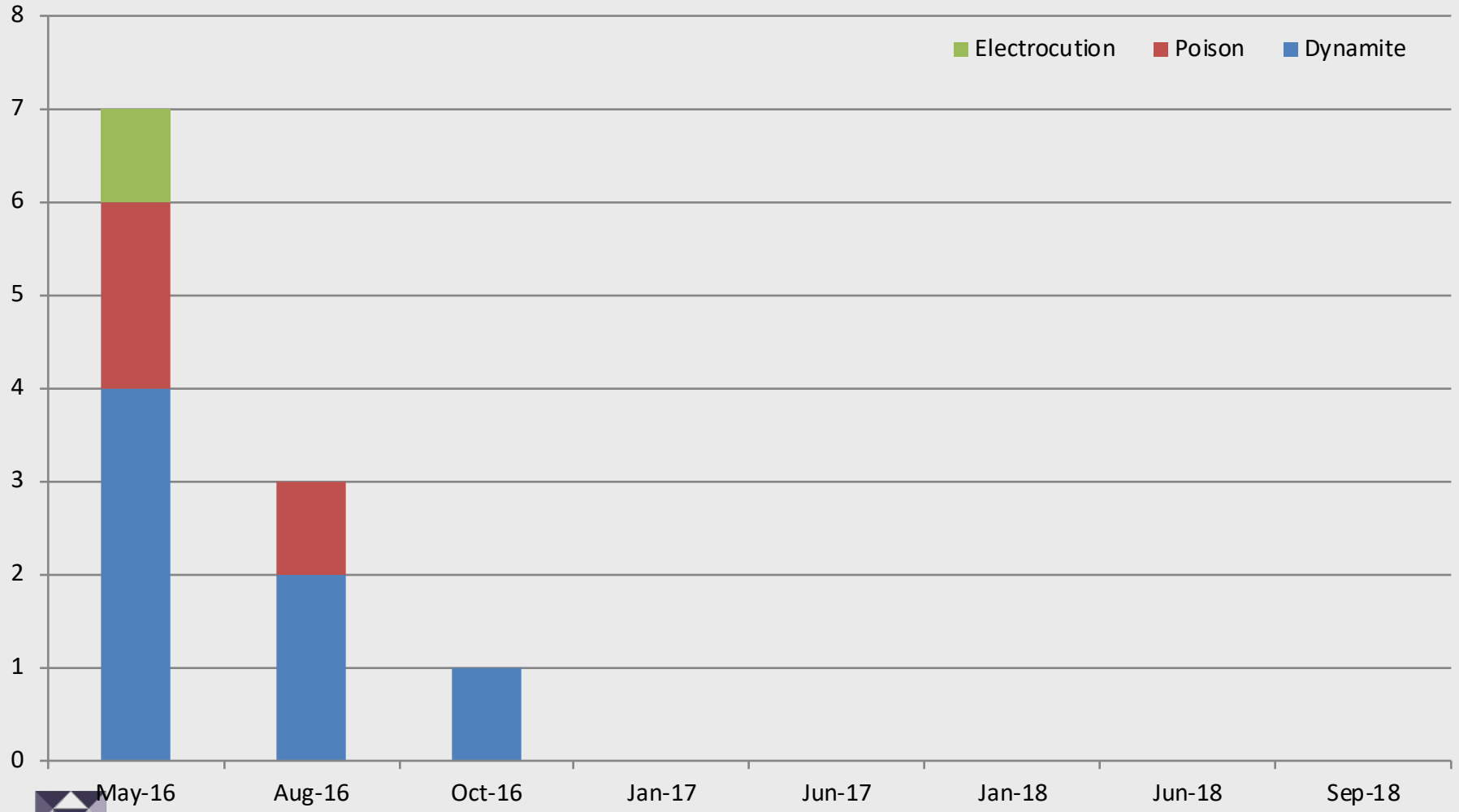
Inspection for Fishing Pressures – Incidents of Fishing Observed



Inspection for Fishing Pressures – Level of Fishing by Selective Fishing Methods



Inspection for Fishing Pressures – Level of Fishing by Non-Selective Fishing Methods




Thank You.