REPRODUCTIVE BEHAVIOR AND SPAWNING RESPONSE OF MAHSEER *Tor putitora* IN TROPICAL CLIMATE OF NEPAL

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Introduction

- Sahar *Tor putitora*, known as "Golden Mahseer" is most popular freshwater indigenous species of trans-Himalayan regions as sport fisheries
- Two species *Tor putitora* and *Tor tor* have been reported in Nepal
- Sahar comprises one of the main species of fisheries resources and sustaining livelihood of fisher.
- It is long range migratory fish, migrate upward to small rivers during rainy season for natural spawning.

- Despite their importance, their biological diversity is being threatened by various anthropogenic factors.
- At present attempts to culture and conserve *Tor spp* has been initiated in most of trans-Himalayan countries.
- Promotion of sahar, due to high value indigenous species, is essential for conservation in natural water bodies and exploration in aquaculture.
- Considerable development on techniques for *in-situ* as well as *ex-situ* conservation has been achieved in Nepal, which is a significant work among the trans-Himalayan region.
- Insufficient availability of fish seed is a major bottleneck for commercial production and conservation.

Sahar is one of the best candidate for :

Aquaculture

Sport fishing

Ranching to enhance livelihood of fishers

Why in Tropical Region

- Can tolerate wider range of temperature without any adverse effect.
- Tropical region is most potential for aquaculture and more than 85% of the product comes from this part and most of the Govt as well as Private hatcheries are in this region.
- Therefore, it is essential to develop reproduction technology for mass seed production and made available to fish grower as well as ranching in natural waters.

Objective

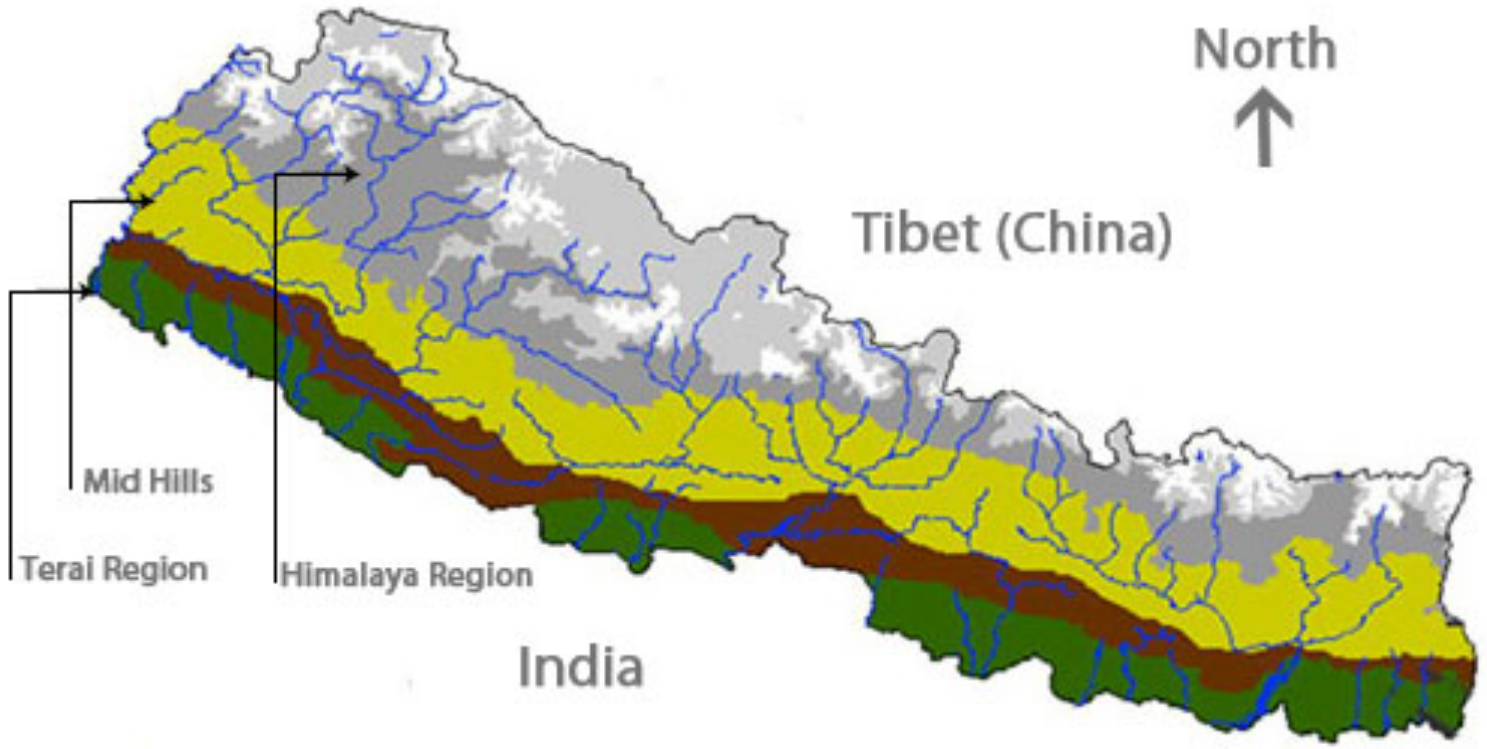
General objective

- To assess the breeding performance of Sahar *Tor putitora* in Terai region of Nepal

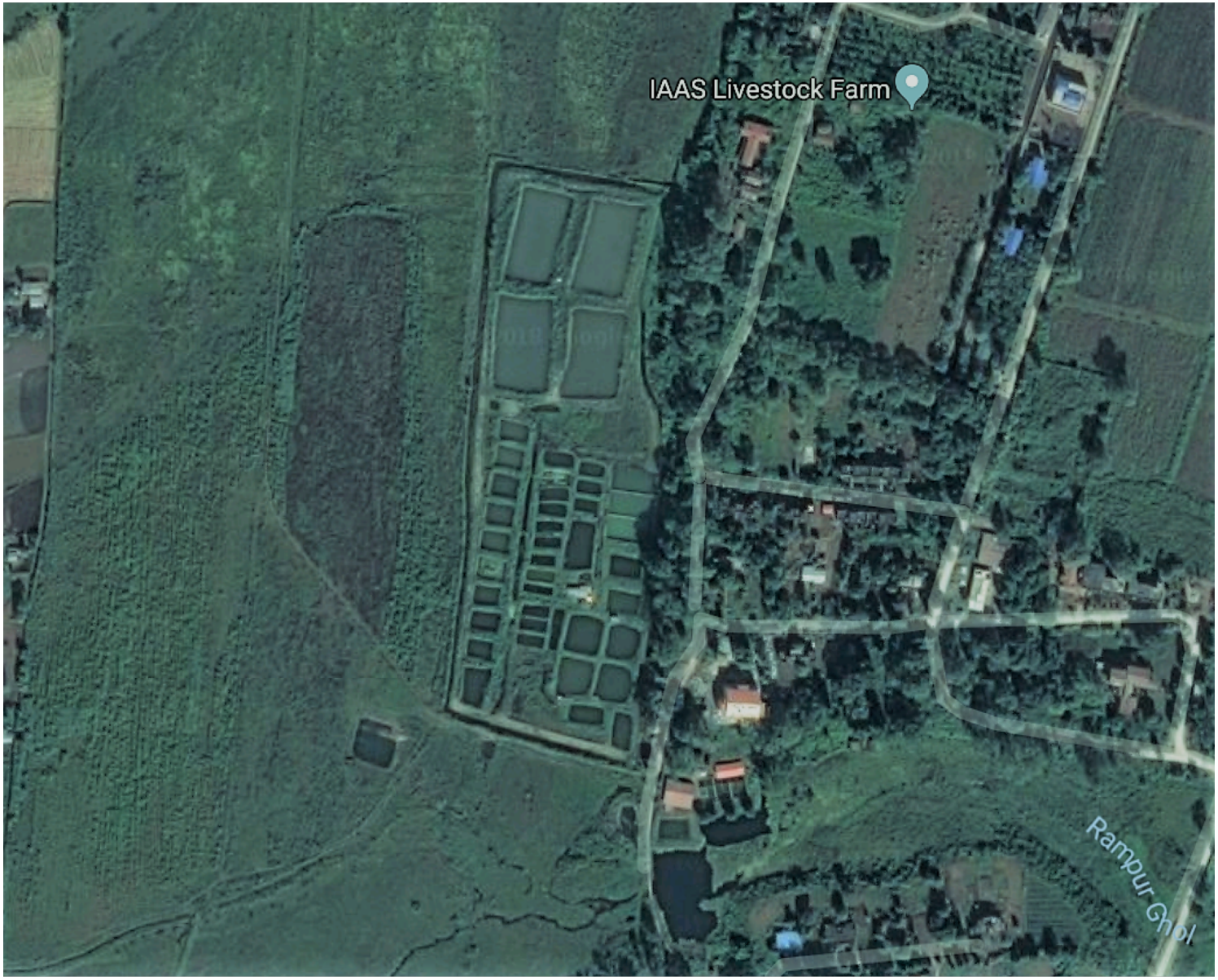
Specific objectives

- To assess the breeding season of sahar in Terai region
- To evaluate the reproductive behavior and spawning performance with inducement of hormone

Topographic Map of Nepal



Aquaculture Ponds (AFU)



Methodology

- **Experimental setup**
  - at aquaculture farm (AFU) from
    August 2014 to April 2015 1st phase
    August 2016 to April 2018 2nd phase
- **Brood fish selection**
  - 165 broods (65 female and 100 male)
  - Rearing in one earthen pond (400 m^2) and 35 female broods were shifted one month before spawning season
  - Two cemented pond (25 m^2)

- **Feeding and water management**
  - Fed with 35 % CP containing feed @ 3-4% of total biomass
  - Continuous replacement of water was maintained in cemented pond
  - No fertilizer was applied
- **Maturity observation**
  - Brood fish (only female) were checked for maturity in

    Biweekly (Aug- Sept)

    Weekly (Oct-November) and
  - Alternate day (Feb-Mar)
- **Spawning method**
  - Induced spawning method was applied by using Ovaprim hormone
  - Naturally matured females were striped directly

Maturity observation

Brood fish hauling

Maturity observation

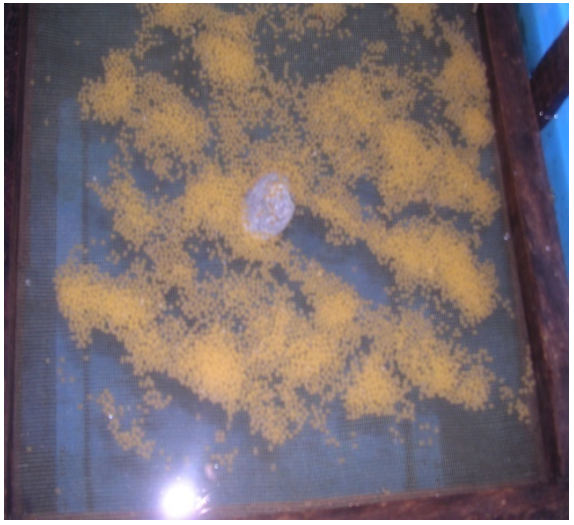
Use of hormone

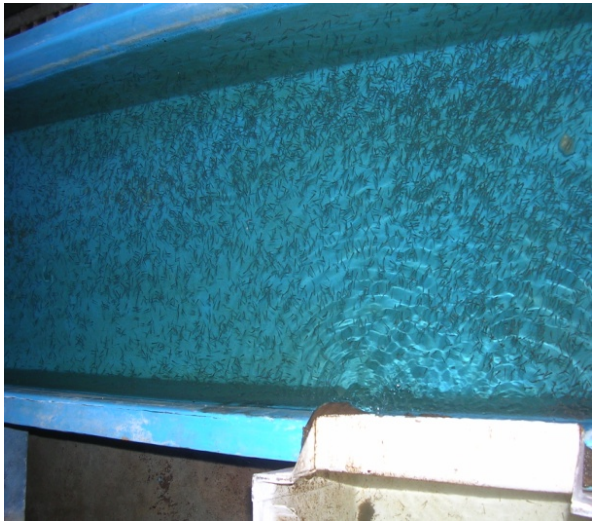
Ovaprim (Gonadotropine Releasing Hormone) was applied to female as practiced in carps hatcheries in Nepal.

Hatchery operation



Egg incubation





Nursing of hatchlings

- Nursing and fry rearing was done as practiced in carp species

  -Pond drying

  -Liming

  -Manuring

  -Water management and

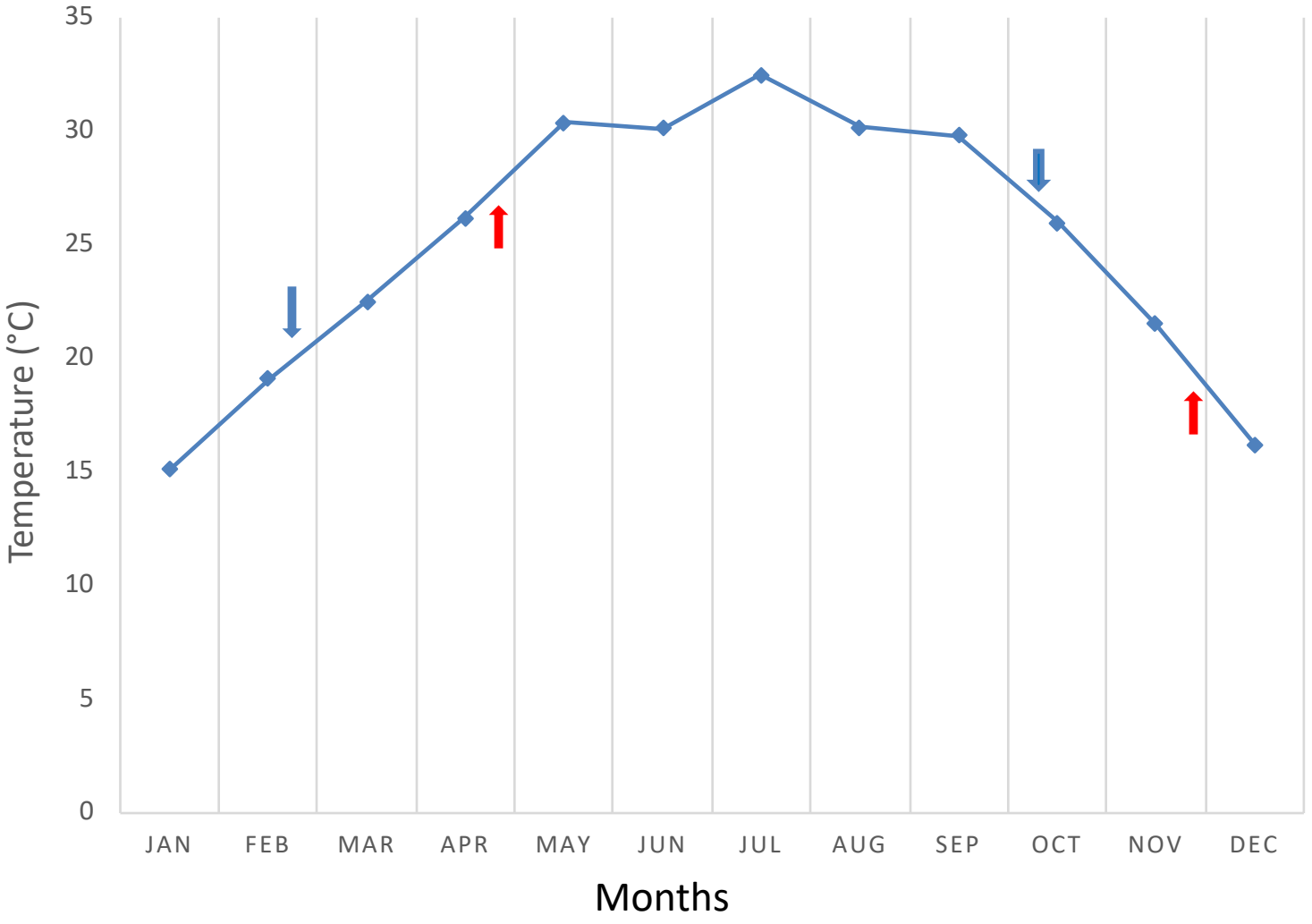
  -Stocking of hatchling

Proximate composition of Floating feed

S.N	Description	%
1	Crude Protein	35
2	Crude Fat	9
3	Ash	8
4	Fiber	8
5	NFEE*	32
6	Moisture	10

* Nitrogen free ether extract

Result and Discussion



Spawning Response

Description	Natural	Induced
Total no of spawners	6	16
Over matured brood	5	0
Not responded	0	5
Total egg spawned (gr)	256.0	635.5

Performance of induced spawning

Parameter	**Range/Mean**
Breeding duration	2017-2-26 to 2017-4-9
Water temperature (°C)	21.4-28.5
Total female spawners	16
Mean weight of females (kg)	1.47±0.09
Mean weight of males (kg)	0.76±0.05
Mean egg number per kg body weight	3531±184
Mean egg number per gr egg weight	104±2
Mean fertilization rate (%)	96.8±1.5
Incubation period (hour)	79-90
Mean hatching rate (%)	78.4±1.9
Yolk sac absorption period (days)	4-6

Mean and Range of Egg diameter, length and weight of larvae

Parameters	Natural	Induced
Mean diameter of egg (mm)	2.9±0.2	3.1±0.3
	(2.8-3.5)	(2.8-3.3)
Mean weight of egg (mg)	12.37±0.80	12.69±0.78
	(11.57-13.17)	(11.97-13.47)
Mean length of larvae (mm)	9.4±1.2	8.9±0.7
	(8.2-10.6)	(8.2-9.6)
Mean weight of larvae (mg)	13.01±0.53	13.19±0.49
	(12.48-13.54)	(12.70-13.68)

Results at reference site in mid hill Pokhara

Fecundity:
4000-8000 eggs/kg
90-105 eggs/g

Fertility: 90-95 %

Hatchability: 75-95%.

Water quality parameter during experiment

Stage	Temperature (°C)	DO (mg/L)	pH
Brood rearing ponds	15.1-32.8	5.5-7.2	7.3
Spawning period(tank)	21.3 -28.7	6.5-7.0	7.2
Egg incubation tanks	21.0-25.8	6.6-7.0	7.4
Fry Rearing Hapa	31.5-33.7	5.8- 6.0	7.6

Reproductive behavior of Sahar

- Male get maturity within one year, though the size of fish even smaller (50-100 gm.)
- Female are only mature at the age of 3^{+} years (> 700 g).
- The mature broods get over maturity within very short time
- Sahar is well responded to induced spawning as practiced in other carps in Nepal.
- Fecundity is lower then other carps but Can breed twice in a year under culture system which is mostly not in carps.
- Survival of hatchling to fry is higher (75-90 %) compare to other carps.

Conclusion and Recommendation

- Pond reared Sahar breed twice in a year in two distinct season, Spring (February-April) and Autumn (September -November).
- In natural waters it spawn during monsoon (May to August) when river and rivulets are fool of flood.
- Higher spawning rate can be achieved by determining the optimum stripping time by frequent checking of female fish or inducing hormone to avoid over maturity by synchronizing the spawning time.
- Insufficient availability of fish seed is a major bottleneck for commercial production and conservation.
- This has provided the opportunity to develop sahar seed for commercial cultivation, as well as rehabilitation in natural waters.

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