MACRO-BENTHIC FAUNA OF RIVER GANGA

- AN ESSENTIAL ECOSYSTEM INDICATOR

CENTRAL INLAND FISHERIES RESEARCH INSTITUTE
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- AN ESSENTIAL ECOSYSTEM INDICATOR

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- AN ESSENTIAL ECOSYSTEM INDICATOR

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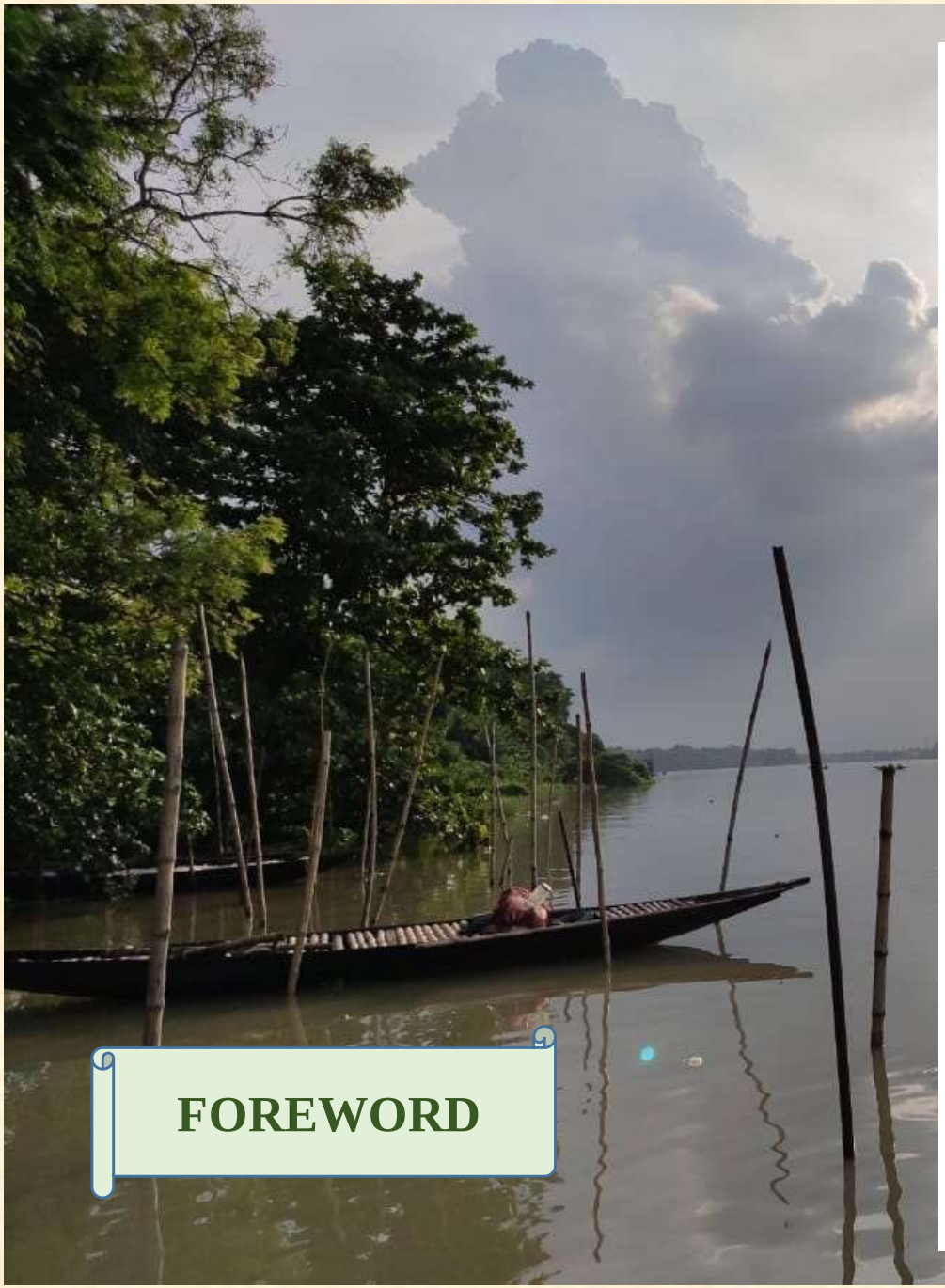

FOREWORD

राजीव रंजन मिश्रा, भा.प्र.से.
महानिदेशक
राष्ट्रीय स्वच्छ गंगा मिशन

Rajiv Ranjan Mishra, IAS
DIRECTOR GENERAL
NATIONAL MISSION FOR CLEAN GANGA

भारत सरकार
जल शक्ति मंत्रालय
जल संसाधन,
नदी विकास और गंगा संरक्षण विभाग
GOVERNMENT OF INDIA
MINISTRY OF JAL SHAKTI
DEPARTMENT OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION

FOREWORD

Benthic biodiversity reveals the ecological status of the river. Benthos is an important bottom-dwelling organism of any aquatic and land ecosystem. They play a principal role in maintaining the nutrient contents, recycling processes of the sediment and thereby increasing the primary productivity. Benthic organisms perform the churning of the sediment layer, ingestion, and decomposition of the decayed matter, thus enhancing the fertility of the soil. Ganga being one of the longest flowing rivers is home to several benthic faunal diversity, including macrobenthos like molluscs (gastropods, bivalves, and insects) and meiobenthic fauna like (chironomid larvae, oligochaetes, and polychaetes). Thus, one needs to create awareness of the consequences of the depletion of these organisms. ICAR- Central Inland Fisheries Research Institute in association with the National Mission for Clean Ganga (NMCG), under the *Namami Gange Programme*, conducted a indepth study along the Ganga stretch from Harshil to Fraserganj covering four states Uttrakhand, Uttar Pradesh, Bihar, and West Bengal. *"Assessment of fish and fisheries of the Ganga River system for developing suitable conservation and restoration plan"* is a stage where the researchers had portrayed the qualitative and quantitative aspects of the benthic biodiversity available at the preselected 20 sites along the river. Seasonal abundance and availability along the stretch is exhibited by mapping based monitoring. Knowledge about the organisms helps in the culture and conservation to escalate the quality of the pristine river as well as ecological and pollution benchmarking.

I appreciate the authors for their efforts to compile such information at one place where researchers, planners, policymakers would take forward this work, to ensure Nirmal Dhara in the River Ganga.

Rajiv Ranjan Mishra

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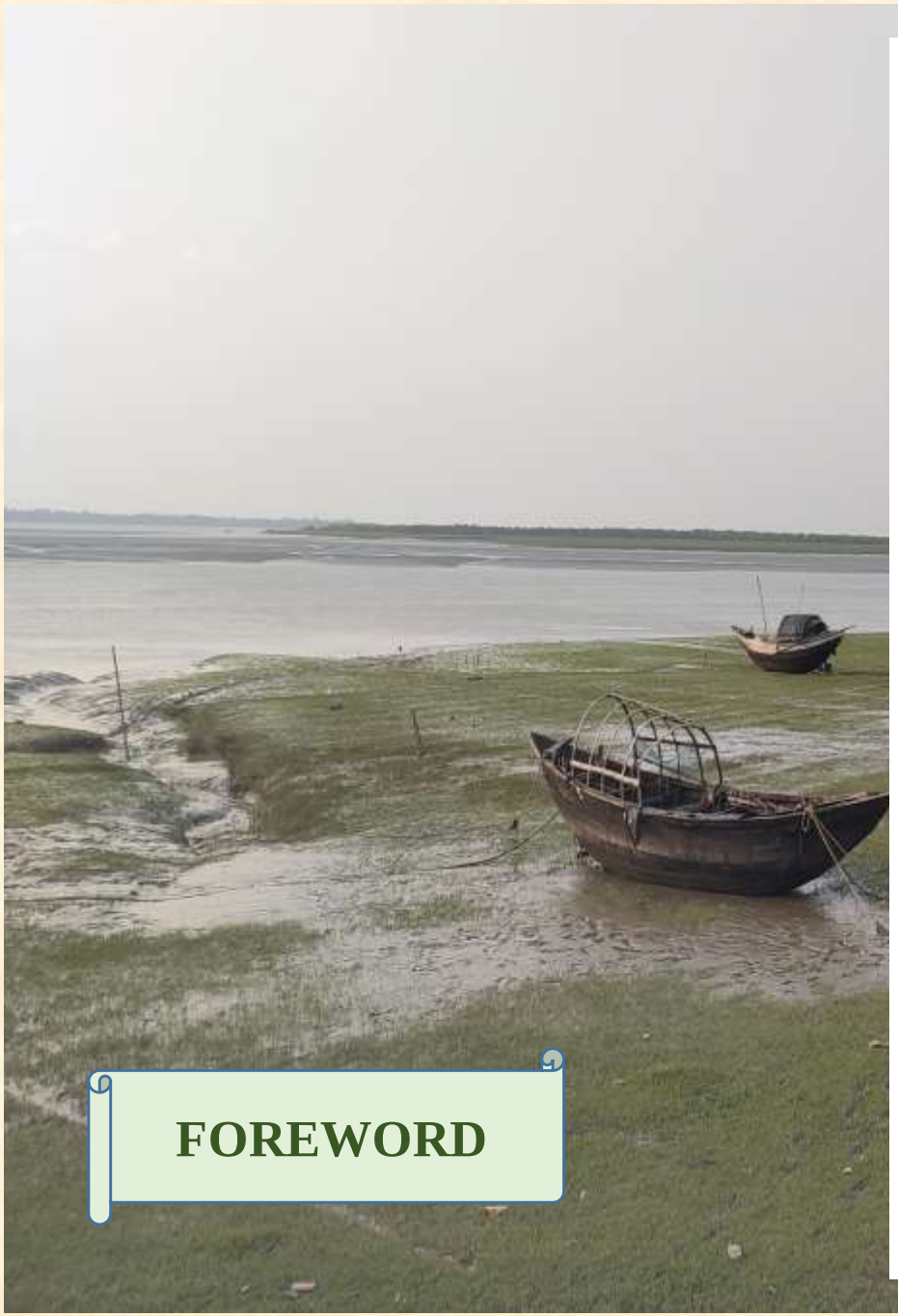

FOREWORD

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Deputy Director General (Fisheries Science)

FOREWORD

The River Ganga that originates from the Gangotri glacier in the high western Himalayas flows down the northern plains through five states before draining into the Bay of Bengal through Sunderbans delta, the largest mangrove system in the world. The Ganga River basin and its surrounding watershed spread across 11 states of India braces one of the most fertile and densely populated regions. The sprawling basin supports a wide variety of farming and fishing activities making it the lifeline for millions of people.

Despite its divine heritage, the Ganga is facing serious pollution pressures due to the discharge of sewage effluents, industrial effluents and other pollutants owing to rapid urbanization, industrialization and agricultural growth. As a result, the river water, as well as sediments, are sullied and the macro-benthos existing in bottom strata viz., crustaceans, insect larvae, molluscs, annelids, oligochaetes and gastropods are also affected. The macro-benthos form an important link in the aquatic food chain between abiotic and biotic components and are important pollution indicators and helps in biomonitoring of the ecosystem. Besides ecological importance, the macro-benthos are of economic importance too.

Macro-benthos are put to good use for their nutritional, medicinal and ornamentation values. To conserve this benthic biodiversity and create awareness ICAR-Central Inland Fisheries Research Institute (CIFRI) under the project 'Assessment of fish and fisheries of the Ganga River system for developing suitable conservation and restoration plan' of the revered 'Namami Gange Programme' studied the macro-benthic biodiversity over the entire stretches of river Ganga for the period from 2016 to 2019. The same has been brought out as a booklet entitled 'Macro Benthic Organisms of River Ganga-An Essential Ecosystem Indicator'. I am sure the information gathered on macro-benthic diversity during the five years study period will be of immense help to the students, fisheries professionals, planners and policymakers. My hearty congratulations to the authors and the project team for the compilation of this valuable document.

(J. K. Jena)

PREFACE

One of the oldest rivers flowing through the Himalayan terrain is the Ganga. The river starting from Gomukh in Uttrakhand flows sluggishly into the Bay of Bengal through Sundarban Biosphere Reserve. In its course, it takes in a maximum amount of sediments and provides habitat for a diverse group of benthic organisms along the river course. Macrobenthic faunal diversity of River Ganga is one of the potential groups of an organism, which helps in the study of water and soil characteristics. The bottom-dwelling organisms are the key indicator of ecological disturbance. Several studies had been conducted on the benthic biodiversity of river Ganga primarily on the heavy metal and toxicity analysis. The principal components for hazardous metallic toxicity are Copper(Cu), Cadmium(Cd), Zinc(Zn), Lead(Pb), Ferrus(Fe), and Nickel(Ni) which accumulate easily in the soft tissues of benthic organisms. A vast population of fisher community spends their livelihood on the banks of the river, living on these benthic organisms for a primary source of meat and other commercial activities. There can be a high risk of contamination and bioaccumulation in people due to regular consumption leading to severe health hazards. ICAR-Central Inland Fisheries Research Institute along with the Ministry of Jalsakti under five years project of National Mission for Clean Ganga entitled *"Assessment of fish and fisheries of the Ganga River system for developing suitable conservation and restoration plan"* took the initiative to study the abundance, distribution, and dominance pattern of different benthic associated phyla like Mollusca, Arthropoda, and Annelida. The study would provide a gateway for understanding the ecological whereabouts of all the biotic and abiotic correlations within the river.

The present booklet is a vivid description shown on GIS-Maps based on the availability of the species during different seasons from 2017-2019. The total abundance of the species is also portrayed on the mapping platform depicting the growth and dominance pattern of the different sedentary organisms under a particular ecological parameter during a different season. The study also establishes the assemblage of benthic organisms along the stretch and its availability at that particular sampling site. This would help the researchers for better planning in the ecological and addressing the pollution aspects and Ganga fishery rejuvenation in the coming years to make a successful Nirmal Dhara of the river.

Dated :
Barrackpore

(B. K. Das)
Director

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The authors are obliged to the Ministry of Jalsakti for providing a vast and enhancing platform for research and development along the River Ganga. National Mission for Clean Ganga (No: T-17/2014-15/526/NMCG-Fish and Fisheries Dated 13/07/2015) under *Namami Gange Programme* has supported by in association with ICAR-Central Inland Fisheries Research Institute, Barrackpore, West Bengal under the entitled project, "Assessment of fish and fisheries of the Ganga River system for developing suitable conservation and restoration plan". On-field research and technical support were received from various employees from the institute namely Shri Ashish Roy Chowdhury, Shri Subhendu Mandal, Shri Loknath Chakraborty, and Shri Kaushik Mandal from headquarter. The authors extend their gratitude to the Regional Center at Prayagraj, Uttar Pradesh for their constant reinforcement.

Authors

Summary

Ganga River comprises of an abundant faunal diversity in its ecosystem. The benthic community of the river plays an important role in the nutrient fixation of the soil. The team for National Mission For Clean Ganga at ICAR-Central Inland Fisheries Research Institute presents a holistic study of the benthic species observed at twenty different sampling sites along the river. The present study conveys the seasonal abundance and availability of fifty-three different benthic species belonging to three Phyla- Mollusca, Arthropoda, and Annelida. Phylum Mollusca comprises of two classes Gastropoda and Bivalvia or Pelecypoda, found in freshwater and brackishwater. The maximum available freshwater gastropods are *Filopaludina bengalensis*, *Melanoides tuberculata*, *Tarebia granifera*, *Tarebia lineate*, *Gabbia orcula*, *Brotia costula*, *Lymnaea acuminate*, *Racesina luteola*, *Gyraulus convexiusculus*, *Physella acuta* and *Assiminea francesiae*. The Common Banded Pond Snail is abundantly available from middle stretch to lower stretch copiously at Buxar, Patna, Bhagalpur, and Farakka with a maximum number of 4515 inds/m^2**.** *Melanoides tuberculata* is another abundantly found freshwater aquatic gastropod available at Farakka and Jangipur (22188 and 20339 inds/m^2). *Tarebia granifera* is available at Balagarh and Tribeni (1849 and 4902 inds/m^2) and *Brotia costula* is abundant at Jangipur (1935 inds/m^2). *Physella acuta* is a common benthic organism found in the upper stretch of River Ganga with a maximum number of 890 inds/m^2, this gastropod is an exotic species and prefers clear and fast-flowing water for their physiological development. *Assiminea francesiae* is abundantly found in the lower brackishwater region of the river i.e. mainly at Godakhali and Diamond Harbour with a maximum number of 8213 and 7921 inds/m^2. Amongst the commonly parasite-infested species *Lymnaea acuminate* and *Racesina luteola* are commonly available at Farakka and Patna (5719 and 1548 inds/m^2) respectively. *Gabbia orcula* is another benthic gastropod found abundantly at Farakka (47128 inds/m^2).

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Apart from the freshwater gastropods, brackishwater gastropods are also common at Diamond Harbour and Fraserganj. The commonly found species belonging to Neritidae family are *Vittina smithii*, *Neripteron violaceum*, *Nerita fulgurans*, *Nerita balteata*. Other organisms from different families like Potamidae, Melonginidae, Ancillaridae, and Nassariidae are also found along the river. Class Bivalvia comprise of three families: Pharidae, Unioinidae, and Cyrenoidae. *Novaculina gangetica* is a common species of a family – Pharidae with a maximum number collected from Kanpur (460 inds/m^2). Unioinidae family comprises of the genus Parreysia and Lamellidens which is abundantly found at Buxar (1419 inds/m^2) and Narora (270 inds/m^2) respectively. Phylum Arthropoda comprises of class Insecta which consists of six groups, Odonata, Hemiptera, Ephemeroptera, Coleoptera, Trichoptera, and Diptera within which twelve species like *Anax* sp**.,** *Leptophlebia* sp., *Heptagenia* sp., *Cinygma* sp., etc are identified. The maximum insect abundance is recorded at the upper stretch from Harshil to Varanasi. Dragonfly Nymph is a common insect belonging to Aeshnidae family with a maximum abundance of 170 inds/m^2 at Kanpur. *Leptophlebia* sp., *Heptagenia* sp., *Enallagma* sp. and *Baetis* sp. are commonly available at Harshil and Haridwar with a maximum abundance of 150 inds/m^2. Dipteran Chironomid larvae is one of the indicators of biological hazards which is maximumly available at Kanpur, Varanasi, and Patna (2770, 2245, and 2451 inds/m^2). Phylum Annelida is also one of the epifaunal sedentary organism which burrows through sediment layer, agitates the soil particles for better soil respiration. Class Clitellata comprise of the oligochates and polychaetes like *Tubifex tubifex*, *Hirudinaria* sp., *Lumbriculus variegates, and Lumbricus terrestri*. The maximum abundance is recorded to be Buxar, Bhagalpur, and Farakka while for *Tubifex tubifex* the abundance is recorded from Tehri to Varanasi with a maximum number 320 inds/m^2. This study primarily indicates the distribution pattern of the available benthic organisms along the river Ganga.

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INTRODUCTION

River Ganga rises from the melting of Gangotri glacier at Gomukh, flows through the Shivaliks and the Indo-Gangetic plain, reaching the Sundarban-Gangetic delta. The Ganga river basin covers an area of about 8,61,404 km^2 flowing from north to south into the Bay of Bengal. Considering it to be the 5^{th} largest river in the world, it is assumable to predict a diversified biota within the riverine ecosystem. The macro-benthic community shows a vast range of relationship with a long time assurance with the ecological parameters. These species contribute a major source of valued information for the study of the prey-predator relationship in the benthic substratum. The macro-benthic community within the freshwater ecosystem helps in deriving the organic nutrients from the dead and decayed organic matter, thus, enhancing the nutrient cycle and primary productivity helping the hierarchical stratum. Fifty-three species have been recorded from the current study belonging to four classes namely Gastropoda, Bivalvia or Pelecypods, Insecta and Clitellata, and seven clades comprising of freshwater and brackishwater species. The most dominant species are *Filopaludina bengalensis*, *Melanoides tuberculata*, *Tarebia granifera*, and *Brotia costula*, *Lamellidens corrianus*, and *Corbicula striatella* amongst freshwater gastropods and bivalves. Class Insecta comprised of six groups, Odonata, Hemiptera, Ephemeroptera, Coleoptera, Trichoptera, and Diptera within which twelve species like *Anax* sp**.,** *Leptophlebia* sp., *Heptagenia* sp., *Cinygma* sp., etc are identified. Ephemeropterons and Tricopterons are regarded as pollution sensitive bioindicators, thus, these species are commonly found in the upper stream of River Ganga. Odonata, Coleoptera, Dipteran, and Oligochaetes are more susceptible to pollution, thus, they are abundant in the upper stream than in the lower stream. Class Clitellata belonging to phylum Annelida comprise of all the Oligochaeta and Polychaeta. The maximum number of individuals observed during the study was at the middle and lower stretch at Patna, Farakka, Balagarh, and Godakhali while in the upper stretch assemblage of insects and annelids were observed. Pollution indicator species such as Tubifex worms and Chironomid larvae are also observed at Kanpur, Prayagraj, and Varanasi which helps to determine the rate of pollutions in the water system.

This study helps in the establishment of an on-field easy identification handbook denoting the IUCN status, habitat, relative abundance, seasonal distribution, and some facts about each species recorded during the study.

METHODS OF COLLECTION

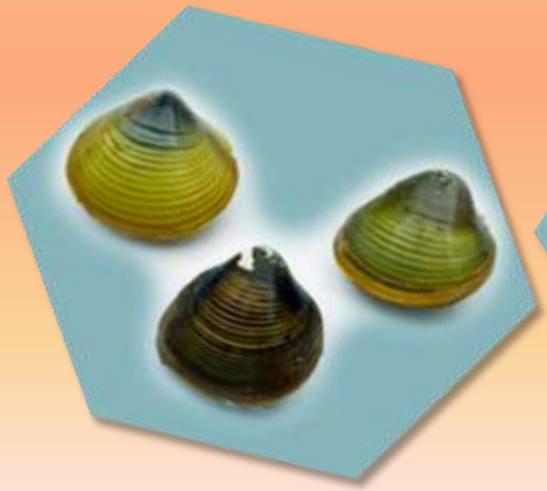
Collection of the sample was done by Peterson Grab (1m X 1m), scooping the sediment from the bottom substratum. A mesh size of 200 μm was used for the collection of gastropod and insect species, while the meiofaunal diversity was collected by a mesh size of 63 μm. The samples were preserved in 4% formalin and stored in Tarson sterile sample containers. Identification of the collected sample was done following the identification protocol from different literary books like Rao,1989; Needham,1957; Edmondson,1959 and Adoni,1985.

SAMPLING SITES

Sl No	Name	X (Long)	Y (Lat)
1	Harsil	78.7377	31.03831
2	Tehri	78.4782	30.3753
3	Haridwar	78.16516	29.93404
4	Bijnor	78.08725	29.35895
5	Narora	78.38138	28.19678
6	Farrukhabad	79.71246	27.46263
7	Kanpur	80.33187	26.44992
8	Prayagraj	81.84631	25.4358
9	Varanasi	82.97391	25.31765
10	Buxar	83.97775	25.56471
11	Patna	85.13756	25.59409
12	Bhagalpur	86.98243	25.3478
13	Farakka	87.90896	24.80067
14	Jangipur	88.10301	24.45265
15	Berhampore	88.26793	24.09883
16	Balagarh	88.46461	23.11886
17	Tribeni	88.4025	22.98671
18	Godakhali	88.14256	22.39321
19	Diamond Harbour	88.20229	22.19873
20	Fraserganj	88.25829	21.58249



IDENTIFYING FEATURES

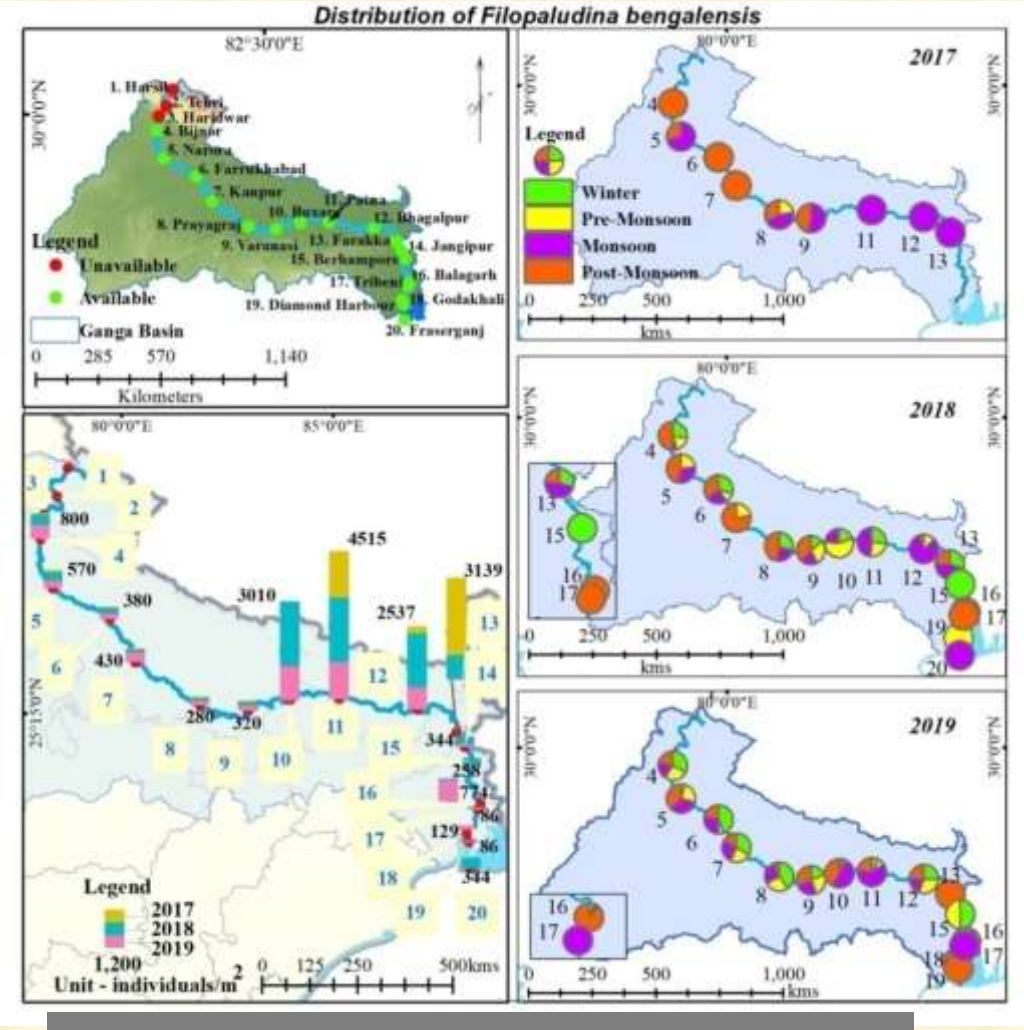


Phylum : Mollusca
Class : Gastropoda
Freshwater Species

Filopaludina bengalensis (Lamarck, 1822)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Architaenioglossa
- Viviperidae
- Bellamyinae
- ***Filopaludina***
- ***F. bengalensis***



Common Name : Common Banded Pond Snail

IDENTIFYING FEATURES :
The distinctive characteristics feature of this species is pointed apex and prominent whorls with spiral thick and thin lines along the whorls.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
The abundance of *F. bengalensis* is 9.59% and maximum is at Patna. The species are found during the monsoon season as it is the breeding season of the species.

KNOWLEDGE GAINING FACTS

Filopaludina bengalensis is an abundant species found in wetlands, ponds, and river streams. This is also found at different sewage outlets, indicating the species can tolerate and grow on it and not growing in heavy metals and other polluted waters (Gupta et al., 2015). It is also considered as one of the principal sources of meat across West Bengal and Jharkhand (Ramkrishna & Dey, 2007).

Idiopoma dissimilis (O. F. Müller, 1774)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Architaenioglossa
- Viviperidae
- Bellamyinae
- ***Idiopoma***
- ***I. dissimilis***

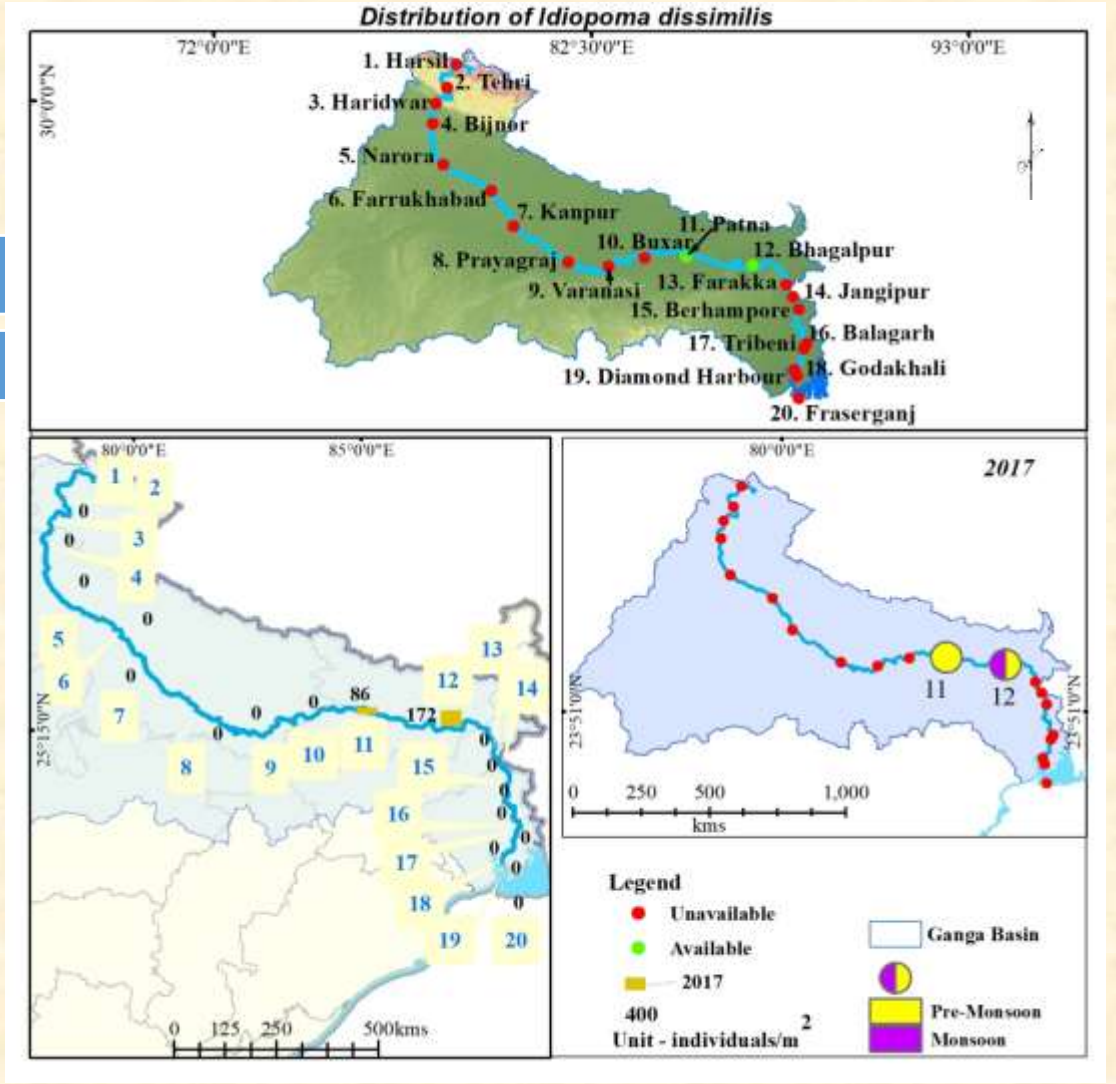
Common Name : Common Snail

IDENTIFYING FEATURES:
This is similar to *Filopaludina bengalensis* with a more oval shaped whorls. The apex is narrow and sharpened with a spiny operculum. The colour of the shell is dark olive-green with light bluish white inner colour.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
This species is mostly found in flowing inland aquatic systems and is recorded mostly at Patna and highest at Bhagalpur during pre-monsoon and monsoon. The total relative abundance percentage is 0.12 along the whole stretch while the maximum abundance (0.08%) is observed at Patna.



KNOWLEDGE GAINING FACTS

Idiopoma dissimilis is mostly found in Bihar, not yet dominant in West Bengal. This gastropod is used as a source of protein by the local people. The species is also used as bio-indicator species for toxicity analysis of water (Ramkrishna & Dey, 2007).

Mekongia crassa (Benson, 1836)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Architaenioglossa
- Viviperidae
- Bellamyinae
- ***Mekongia***
- ***M. crassa***

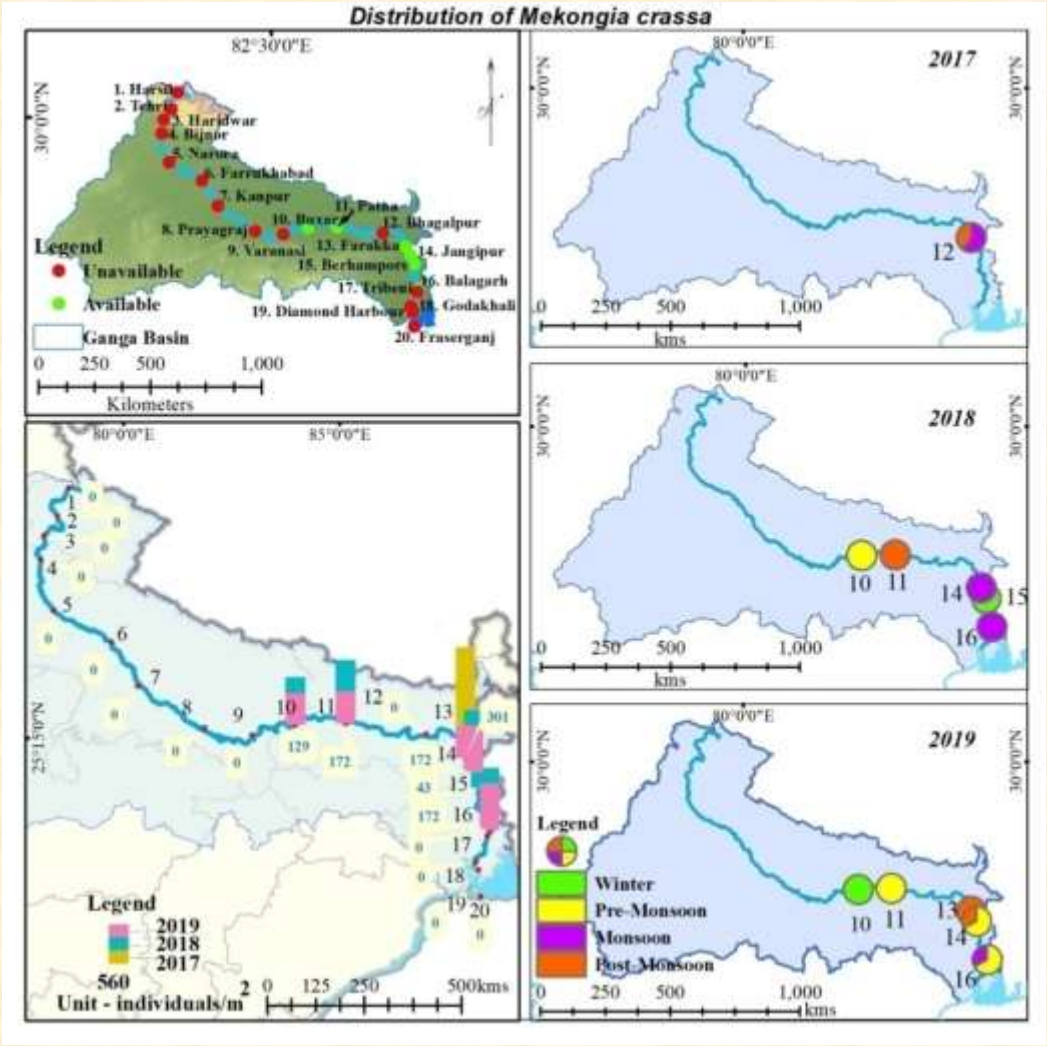
Common Name : Googli

IDENTIFYING FEATURES:
The blunt apical tip of the shell is one of the distinct characteristics of the *M. crassa*. The shell is stripeless olive green in colour which marks it different from the other molluscan species of Viviperidae family.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Mekongia crassa is found in all the inland aquatic systems. The highest abundance of this species at Patna and Balagarh is 0.08%. This is one of the sister species of *Filopaludina bengalensis*, thus found quite frequently.



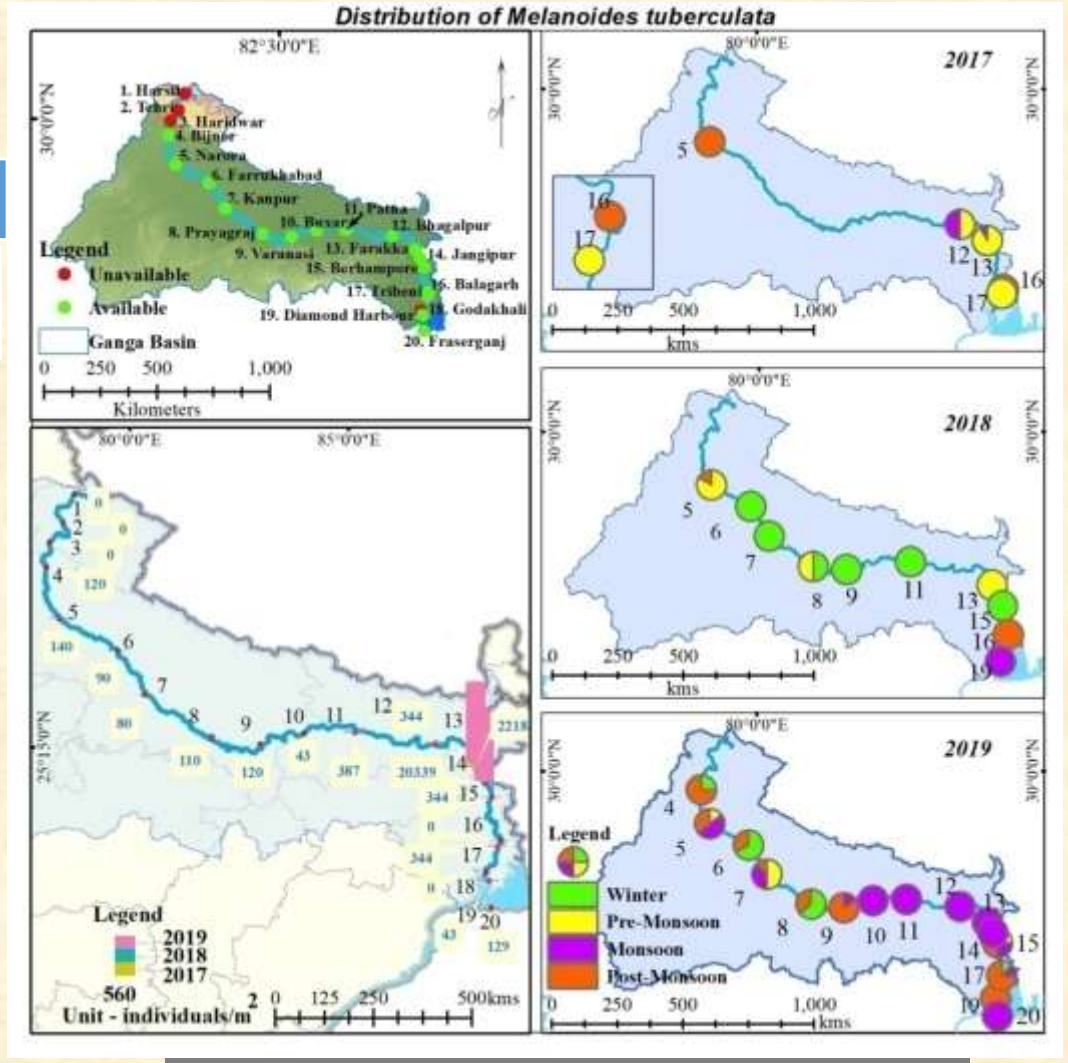
KNOWLEDGE GAINING FACTS

Mekongia crassa is an another gastropod found in the inland waters. They burrow deep into the ground and stay in groups during favorable conditions (Ramkrishna & Dey, 2007).

Melanoides tuberculata (O. F. Müller, 1774)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Caenogastropoda (Cerithioidae)
- Thiaridae
- Thiarinae
- ***Melanoides***
- ***M. tuberculata***



Common Name : Red – Rimmed Melania

IDENTIFYING FEATURES:
Long conical hard shelled freshwater mollusc. The shell has a pointed summit while the colour is dark brown with reddish patches of undulating flames throughout the whorls.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
This is one of the dominant species in the freshwater ecosystem. *M. tuberculata* is found maximum at Farraka (11.07%) followed by Jangipur (9.53%) during monsoon which is the breeding season of the species. The least availability is observed in the post-monsoon (43 inds/m^2) at Buxar. The species can also exist in the unfavorable marshy mangrove swamps.

KNOWLEDGE GAINING FACTS

Melanoides tuberculata is one of the dominant species found in the freshwater ecosystem(Guimarães et al., 2001) as well as Ganga river. It is found in a substratum, containing 5% detritus, 10% silt, 15% clay and 70% sand (CPCB report May 2017). It is reported that during harsh conditions, it can coexist with other gastropods or else they dominate and take over the habitat of other species (Pointier et al., 1993).

Tarebia granifera (Lamarck, 1816)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Cerithioidae
- Thiaridae
- Thiarinae
- ***Tarebia***
- ***T. granifera***

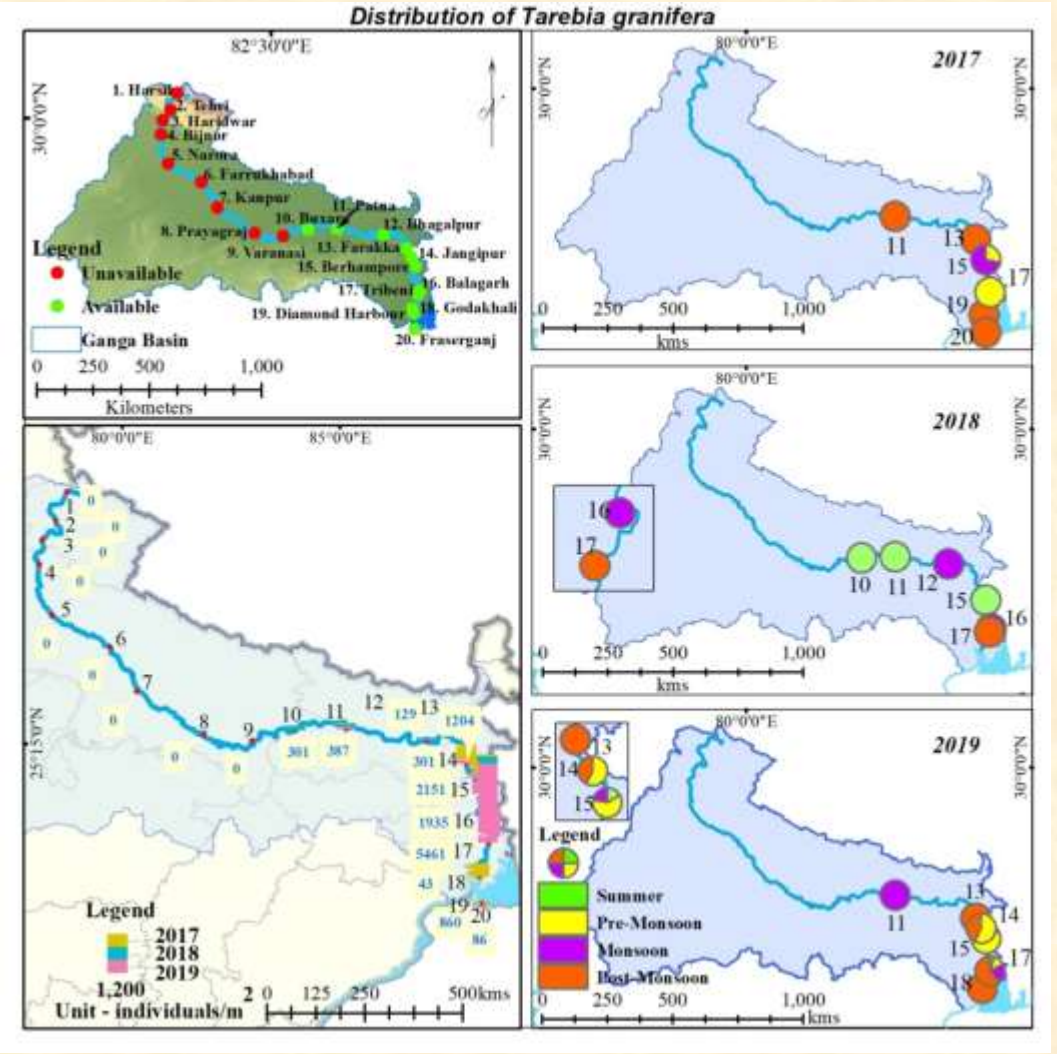
Common Name : Quilted Melania

IDENTIFYING FEATURES:
The shell is thick with a narrow aperture. The outer-lip is thick. The whorls are distinct with minute nodules arranged in a circular pattern. The colour of the shell is yellowish base with brown thick and thin stripes.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
The maximum abundance of Quilted Melania was recorded 6% in the entire stretch. The abundance was 2.54% at Tribeni, 0.48% at Berhampore and 4.83% at Farakka respectively during the post-monsoon while 0.58% at Balagarh during pre-monsoon.



KNOWLEDGE GAINING FACTS

Tarebia granifera typically found in warm temperate regions. This species is used to control the growth of native species which are carriers of parasitic trematodes. This gastropods can tolerate a high range of temperature, 0ºC - 47ºC and a saline concentration of 30psu. This organisms are capable of parthenogenetic reproduction which can be hindered due to high salinity (Miranda et al., 2010).

Tarebia lineata (Gray, 1828)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Cerithioidae
- Thiaridae
- Thiarinae
- ***Tarebia***
- ***T. lineata***

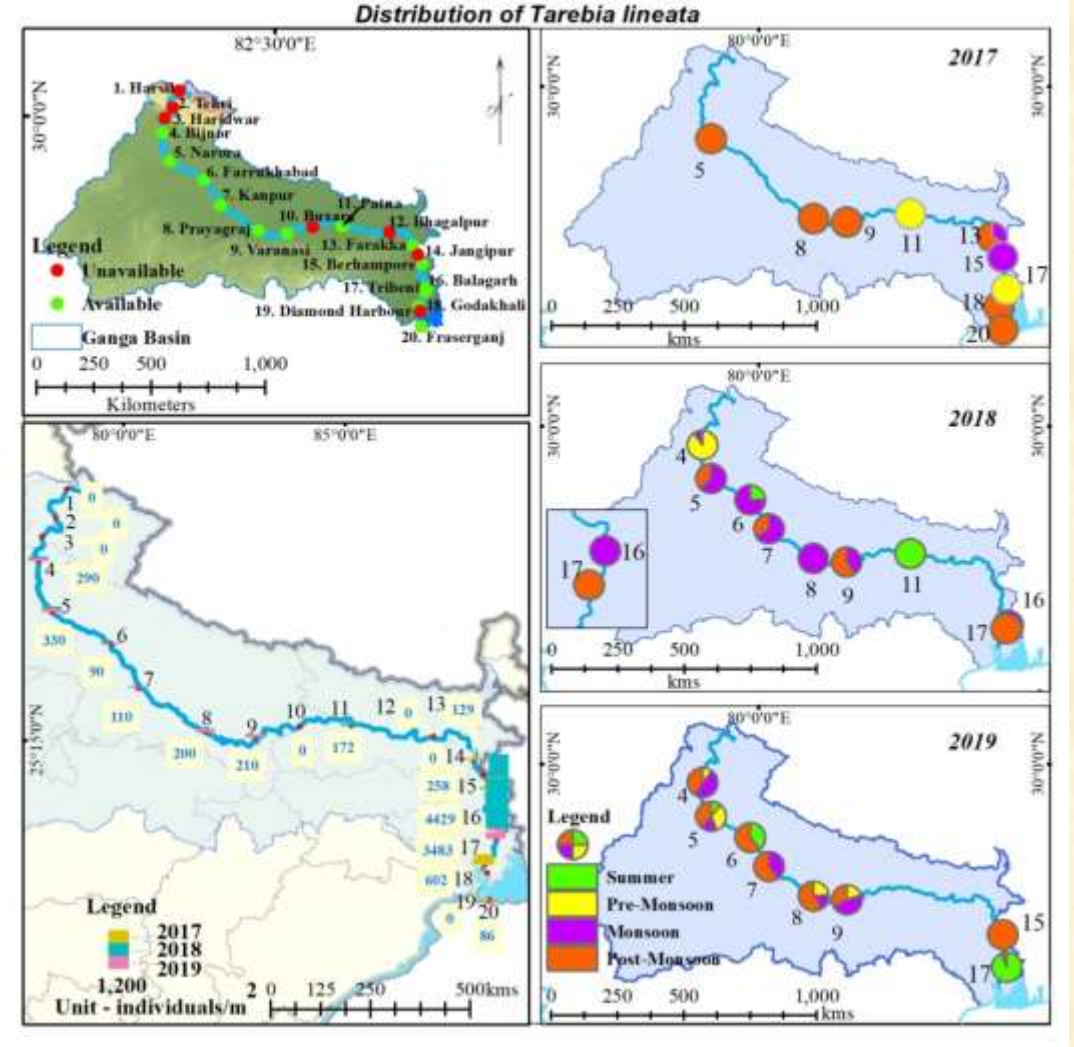
Common Name : Melania Snail

IDENTIFYING FEATURES:
The shell is thick and elongated with distinct whorls. The last whorl is large with prominent black lines. The colour is dark brown on the apex while light brown at the lower part.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Tarebia lineata is found maximum in the muddy substratum. The total abundance along the entire stretch is 4.84%. The maximum abundance of species found at Balagarh is 2.06% during pre-monsoon.



KNOWLEDGE GAINING FACTS

Tarebia lineata is similar to *T. granifera*, only difference with nodules along the shell. This species is considered as an invasive gastropod which has been accidentally introduced through aquarium trade probably from South East Asian countries like Hong Kong and Singapore, and can multiply at a rapid span of time. This explains the abundance of thiaridae species through the river bed (Appleton, 2003).

Mieniplotia scabra (O. F. Müller, 1774)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Cerithioidae
- Thiaridae
- Thiarinae
- ***Mieniplotia***
- ***M. scabra***

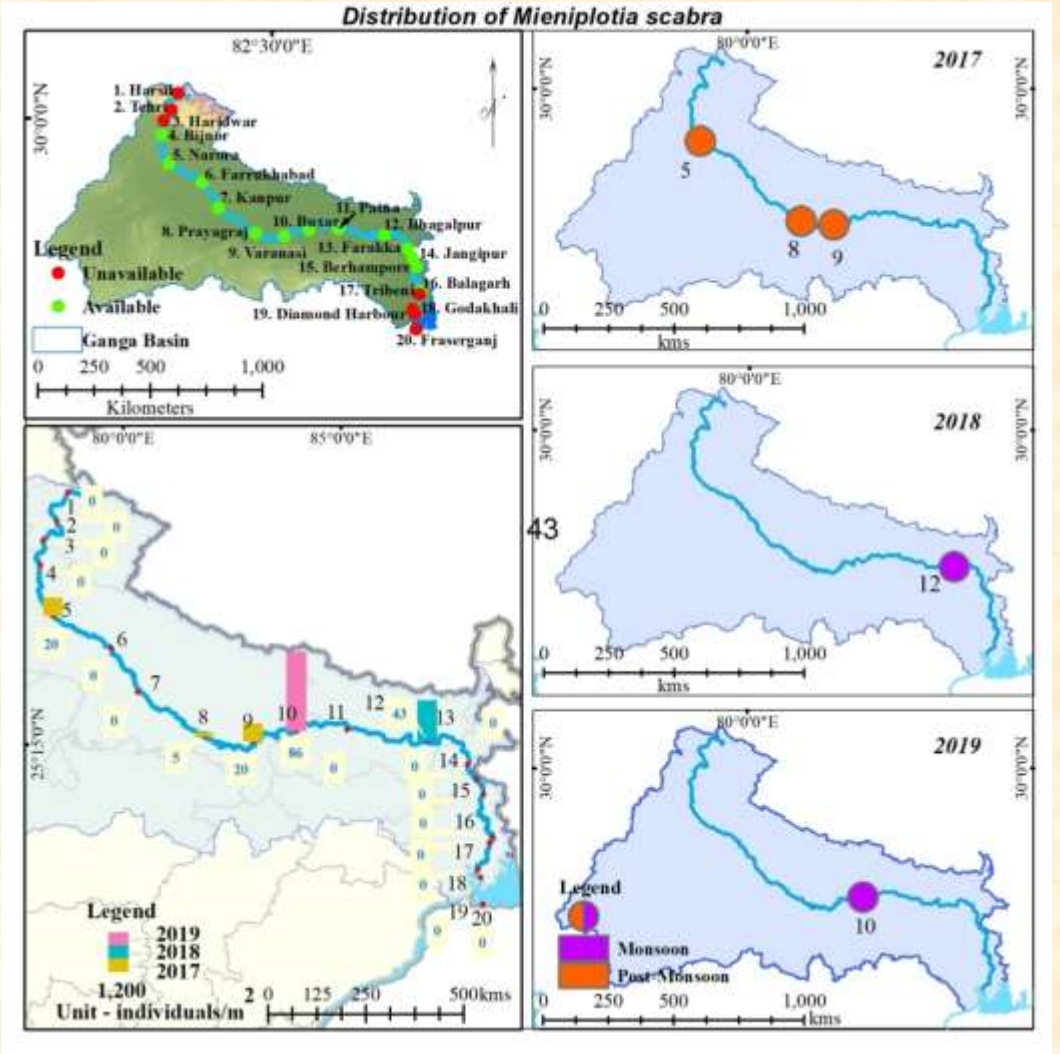
Common Name : Pagoda Tiara

IDENTIFYING FEATURES:
The dextral shell have whorls which is deeply inserted with projecting spines placed obliquely outward from each grove. The columella is oval in shape with thin outer-lip. The colour of the shell is rust brown with fire blaze blotches along the edge.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Belonging to the family Thiaridae, this species is also found along muddy bottoms. The maximum abundance is found in Buxar (0.04%) during the monsoon. In the upper stretch, the abundance is recorded to be 0.01% at Narora during post-monsoon.



KNOWLEDGE GAINING FACTS

Pagoda tiara is one of the invasive species, dominant over the major part of the world, including the Indo-Asiatic regions and even European region. It is also seen as a carrier of trematodes and parasitic organisms.

Gabbia orcula (Frauenfeld, 1862)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Littorinimorpha
- Truncatelloidea
- Bithyniidae
- ***Gabbia***
- ***G. orcula***

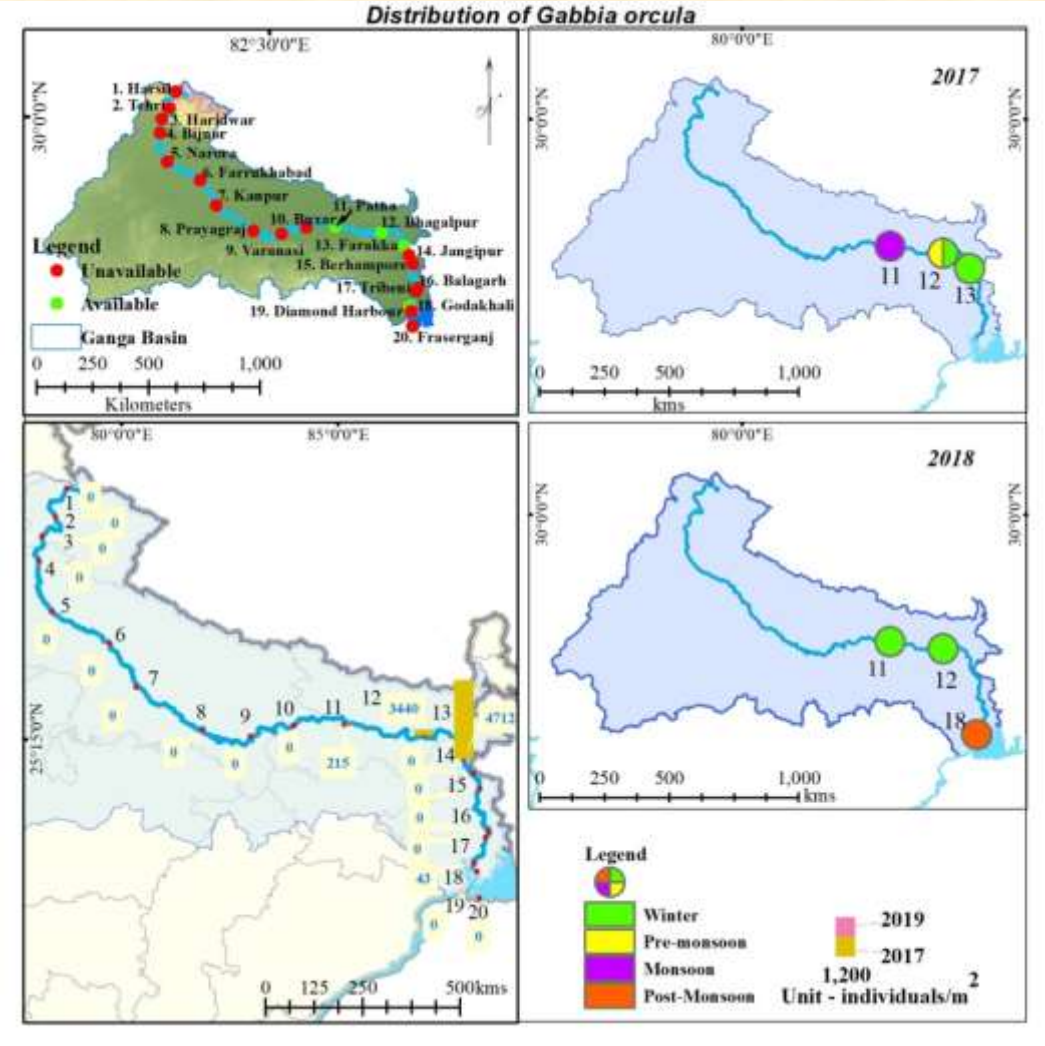
Common Name : Common Snail

IDENTIFYING FEATURES:
The shell is annular with 3 prominent whorls. The umbilicus is notched and aperture is enlarged. The apex is blunt. The colour of the shell is translucent and very fragile in texture.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
The relative abundance of *Gabbia orcula* is 23.71% during 2017-2019. The maximum abundance is found at Farakka (21.98%). Bhagalpur stretch also contributes an abundance of 1.56% during pre-monsoon and winter. Godakhali contributes the minimum abundance with a percentage of 0.02 during post-monsoon.



KNOWLEDGE GAINING FACTS

Gabbia orcula attains sexual maturity at the age of 52-58 days with a considerable amount of eggs, ranging from 50-100 eggs at a time. This gastropod reproduces during summer while lowest abundance was found during winter season.

Pila globosa (Swainson, 1822)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Architaenioglossa
- Ampullarioidae
- Ampullariidae
- Ampullariinae
- ***Pila***
- ***P. globosa***

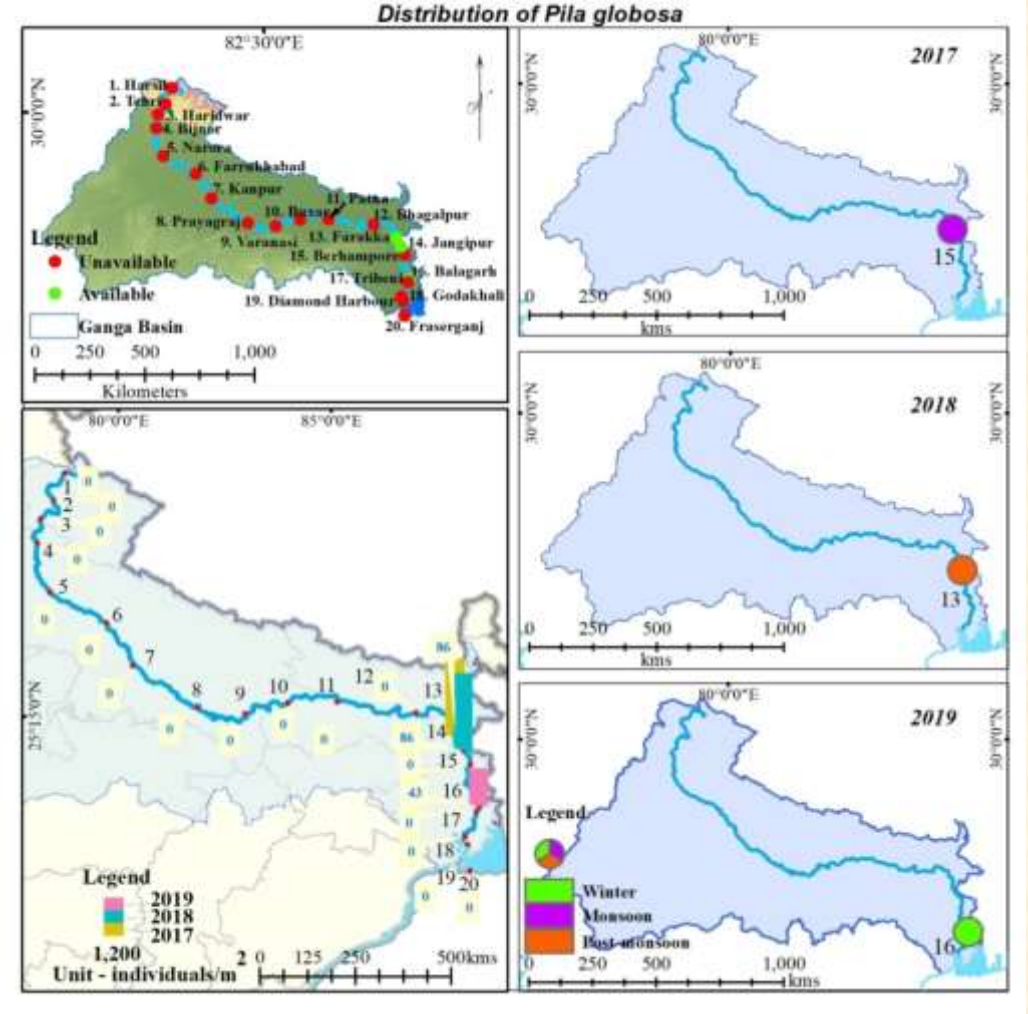
Common Name : Indian Apple Snail

IDENTIFYING FEATURES:
The shell is round with a very small suture. The apex is blunt and the whorls are closely associated. The operculum is large and oval in shape. The colour of the shell is olive green with light black strips.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
This is a commonly available gastropod in the inland water. A total of 215 individuals are recorded along the river during three years with a maximum abundance in Farakka and Jangipur 0.04% and 0.1% respectively during monsoon, post-monsoon and winter.



KNOWLEDGE GAINING FACTS

Pila globosa also known as Indian Apple Snail, reproduces sexually, laying 200-300 eggs in an excavated hole and protects it until the gelatinous eggs are covered with a calcarious outer covering (Ramkrishna & Dey, 2007). This snail is a voracious feeder of a weed called *Salvinia* sp. in Kerala and protecting the paddy field crops (Thomas, 1975).

Brotia costula (Rafinesque, 1833)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Caenogastropoda (Cerithioidae)
- Pachychilidae
- ***Brotia***
- ***B. costula***

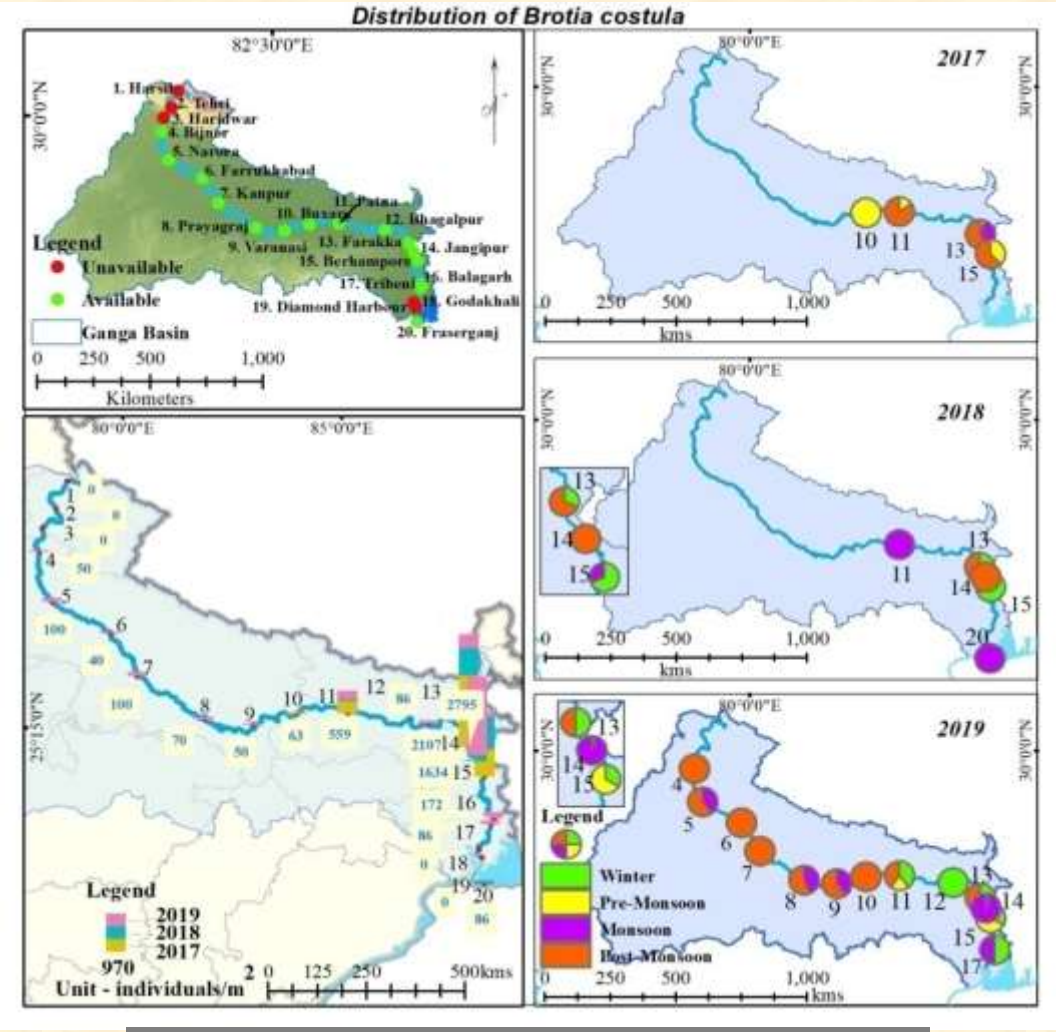
Common Name : Melania

IDENTIFYING FEATURES:
Columella aperture is rounded, with wavy structures running on each whorl. The shell consists of a dark brown colouration while the twisted columellar region consists of a lighter shade of brown.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
The abundance along river Ganga is found mostly in Farraka and Jangipur which comprise of 1.32% and 1.56% respectively. 2795 inds/m^2 is found in the monsoon season at Berhampur. This species is observed along the entire stretch of the Ganga at different seasons but mostly during monsoon and post-monsoon period. Many aquatic higher vertebrates consume this species.



KNOWLEDGE GAINING FACTS

The *Brotia* species consists of elongated tentacles and short legs which are sleek in nature. The snout on the other hand is widened and protractible. *Brotia costula* is regarded as one of the edible species amongst freshwater benthic organisms, but accumulation of heavy metals has been recorded, showing a higher concentration of arsenic, exceeding beyond the permissible limit for human consumption (Lau et al., 1998).

Lymnaea acuminata (Brongniart, 1810 †)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Heterobranchia
- Hygrophilla
- Lymnaeoidae
- Lymnaeidae
- ***Lymnaea***
- ***L. acuminata***

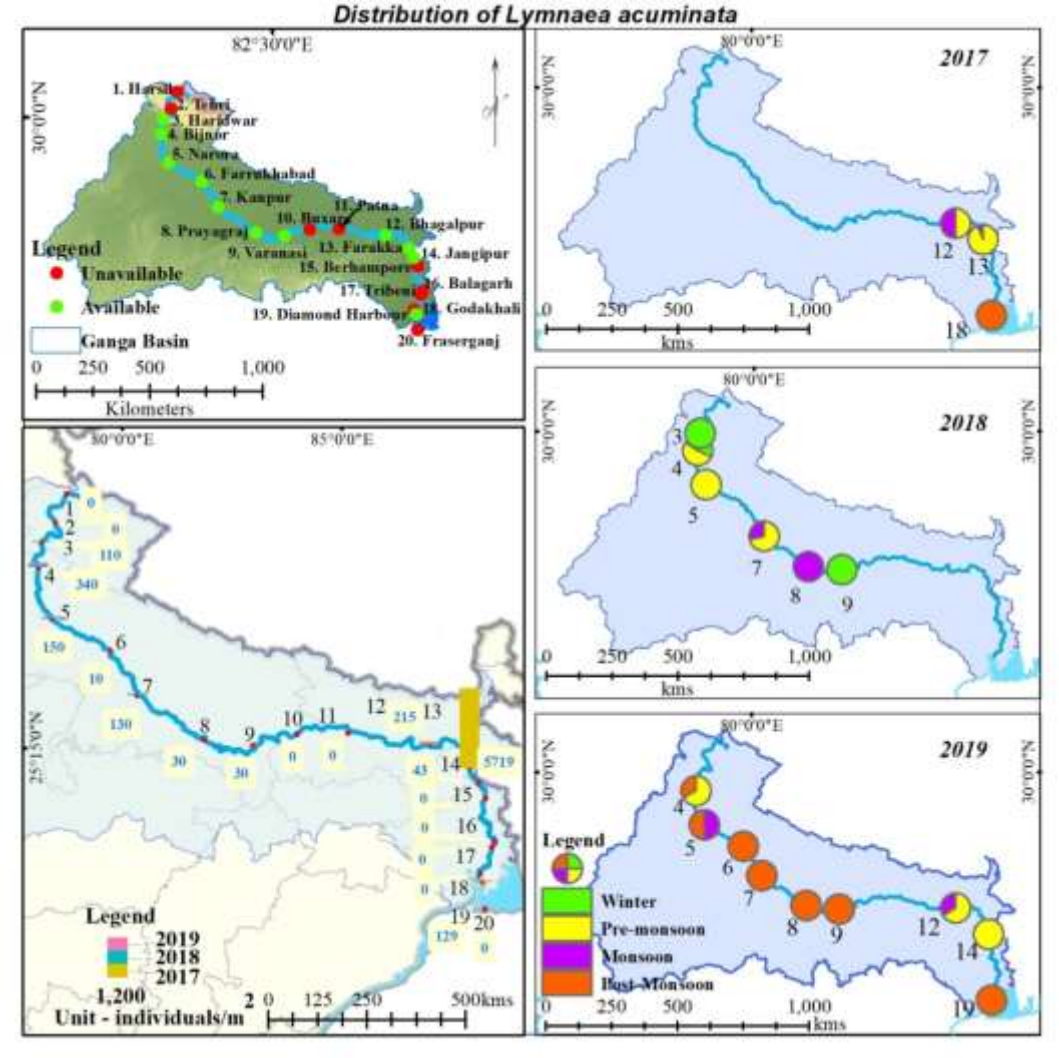
Common Name : Melantho Snail

IDENTIFYING FEATURES:
Shell is opaque and oblong in shape. The shell is elevated in the middle having a large operculum. The base is constricted with transpiral striations from top to the bottom of the shell. The colour of the shell is light brown with white coloured columellar region.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Lymnaea acuminata is one of the species which is found abundantly in Farraka (2.66%) with the maximum abundance in the pre-monsoon period.



KNOWLEDGE GAINING FACTS

Evidences from Lymnaeidae family shows that *Lymnaea acuminata* is one of the important bio-indicators. *L. acuminata* are found in the lentic water and the species is infected by parasites (Choubisa et al.,2013).

Racesina luteola (Lamarck, 1822)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Heterobranchia
- Hygrophilla
- Lymnaeoidae
- Lymnaeidae
- Amphipepleinae
- ***Racesina***
- ***R. luteola***

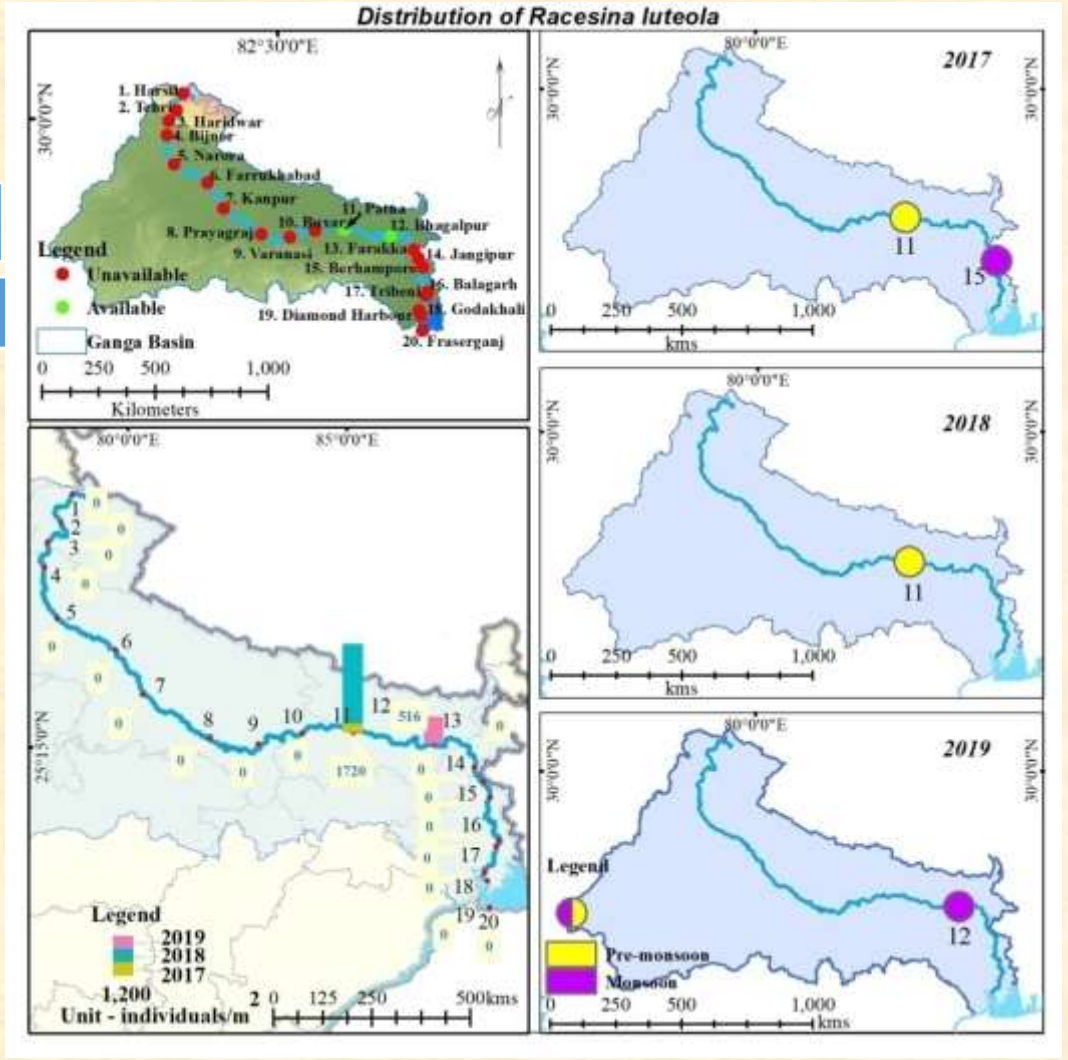
Common Name : Radicine Snails

IDENTIFYING FEATURES:
Shell is ovoid in shape and brittle in texture. The spire is tiny and tapered at the apex. The aperture is broad with transpiral serrations along the body. The shell is transparent with a golden yellow colouration.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
This gastropod is dominant during pre-monsoon at Patna and Bhagalpur with a percentage of 0.802 and 0.24 respectively. The lowest abundance is observed in Berhampur/Reginagar (0.02%). The observations showed that *Recesina luteola* is distributed to few places of the river.



KNOWLEDGE GAINING FACTS

Like *Lymnaea acuminata*, *Racesina luteola* is also bio-accumulate heavy metals. Studies have shown that the pulmonate snails like *R. luteola* have their hatching delayed due to the toxic bioaccumulation of copper in their body (Khangarot & Das, 2010).

Gyraulus convexiusculus (Hutton, 1849)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Hygrophilla
- Lymnaeoidae
- Planorbidae
- ***Gyraulus***
- ***G. convexiusculus***

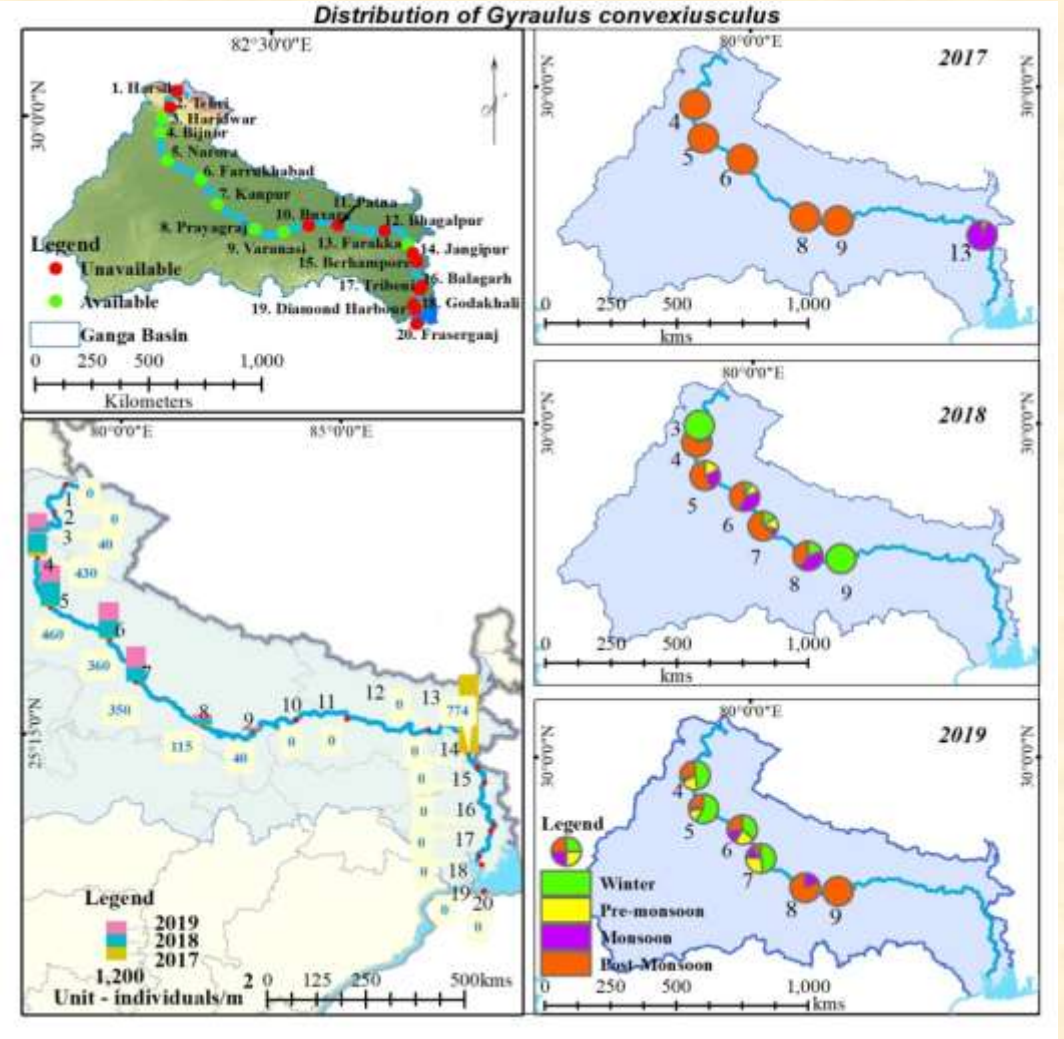
Common Name : Ram's Horn Snail

IDENTIFYING FEATURES:
The gastropod is flat discoidal in shape. 4-5 whorls are coiled to the center, 5 mm in diameter. The umbilicus is broad while the aperture is widened. The colour of the shell is transparent but gets whitish after calcification of the shell.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Gyraulus convexiusculus is found 1.19% each at Haridwar and Farakka in the Gangetic river bed. The maximum abundance is found at Farakka with a percentage of 0.34 during monsoon while the minimum abundance is observed at Prayagraj with a percentage of 0.01 during post-monsoon.



KNOWLEDGE GAINING FACTS

Gyralus convexiculus is one of the gastropod species which acts as a host for different trematodes in wild. Planorbidae organisms acts as the host for many parasitic organisms like *Fasciola elongatus*, *Gastrothylase crumenijer* and etc.. *Cercaria* sp species are also found in the shells of this species in inland waters of Malabar (Sanil et al., 2018).

Gyraulus parvus (Say, 1817)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Hygrophilla
- Lymnaeoidae
- Planorbidae
- ***Gyraulus***
- ***G. parvus***

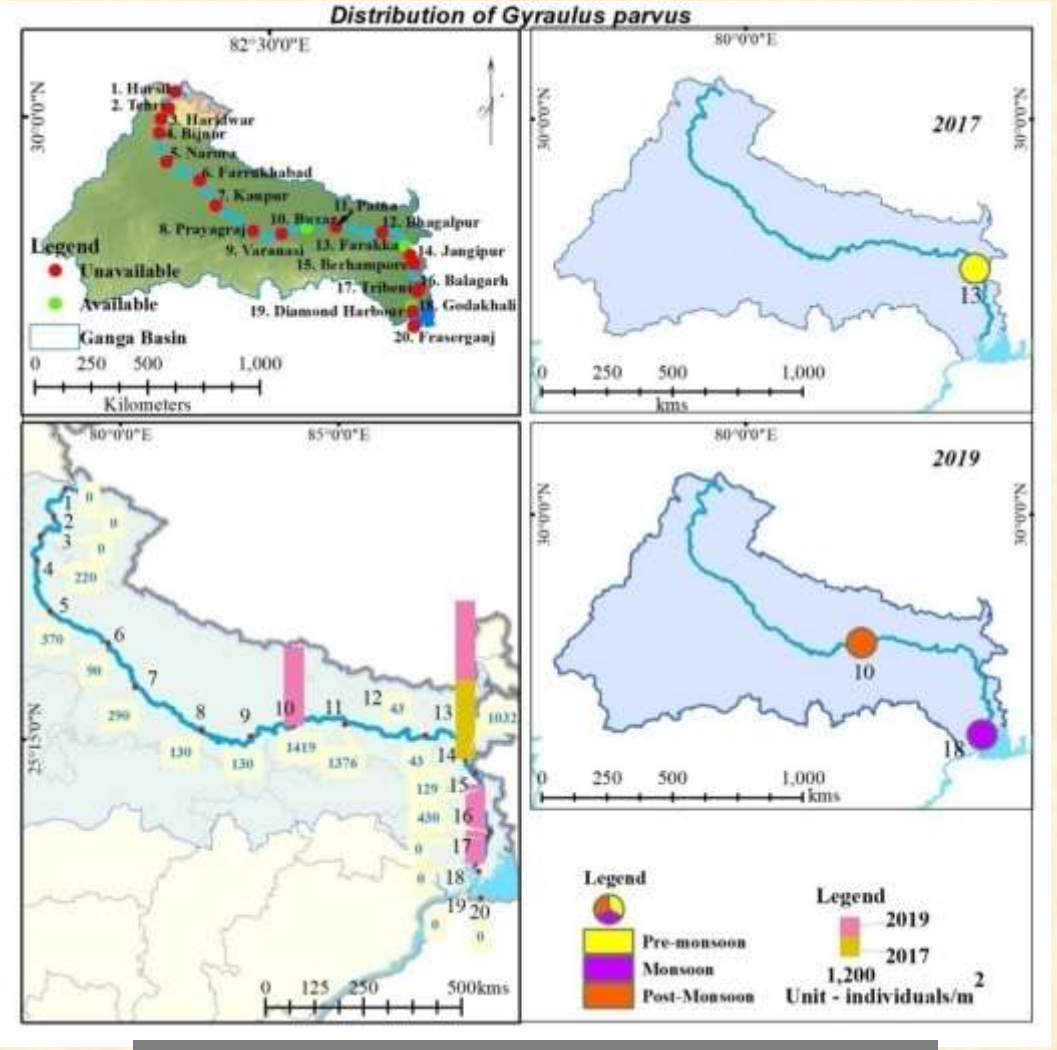
Common Name : Ram's Horn Snail

IDENTIFYING FEATURES:
Shell is small, rounded and fragile in nature. There are 4-5 whorls with a distinct umbilicus. The ventral part is depressive and dorsal part is flattened. The colour of the shell is shiny golden with a transparent outer covering.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Total abundance of this species is 0.06% along the river. Not many species are found along the stretch. 0.02% has been observed at Buxar, Farakka and Godakhali during pre-monsoon, monsoon and post-monsoon respectively.



KNOWLEDGE GAINING FACTS

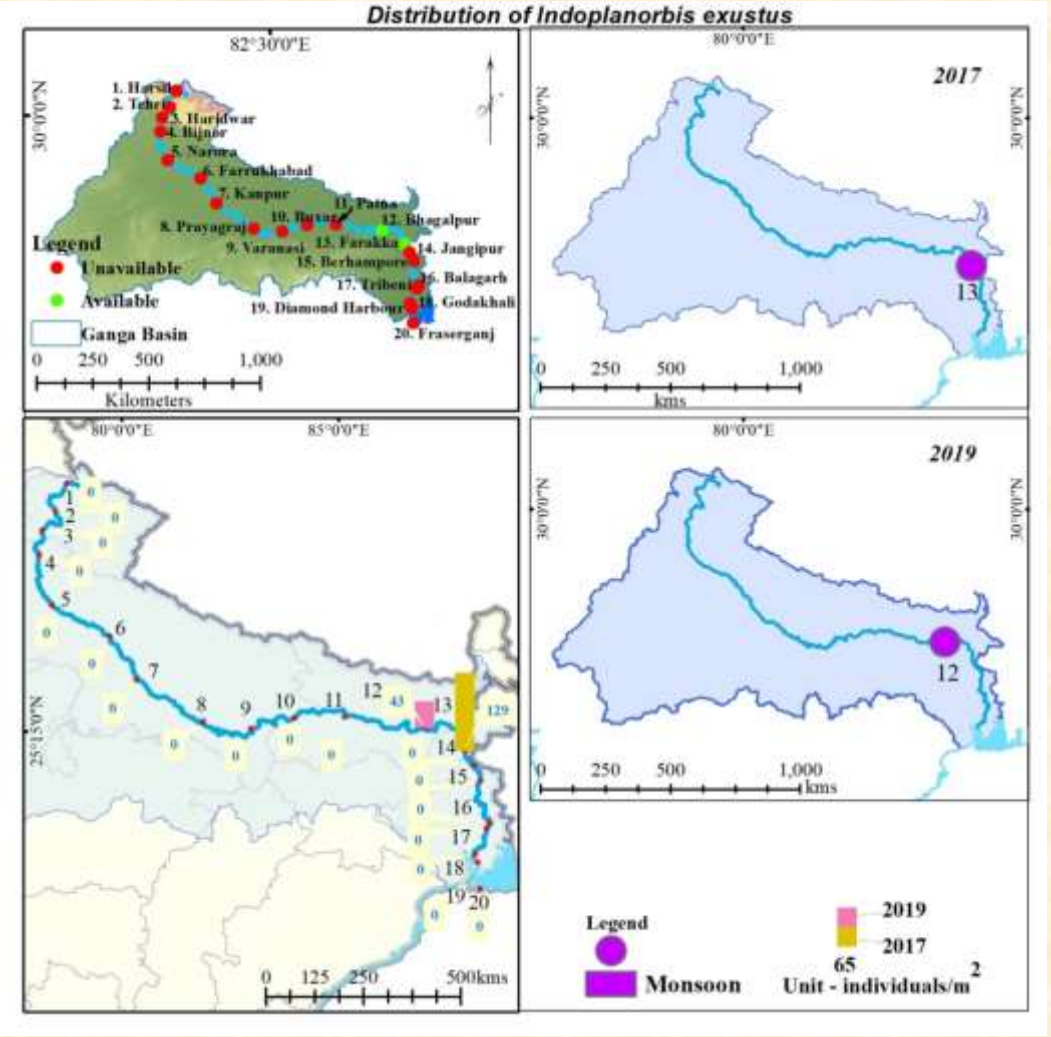
Belonging to the Planorbidae family, *Gyraulus* species are commonly available along the river. Muddy substratum is one of the ideal condition for their abundance. Macrophyte vegetations and detritus are one of the growing platform for this gastropod, with slight polluted water. This gastropod is a carrier of parasitic organisms which reside in buffalo, cow, sheep, goat etc. (CPCB Report, May 2017).

Indoplanorbis exustus (Deshayes, 1833)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Heterobranchia
- Hygrophilla
- Lymnaeoidea
- Bulinidae
- ***Indoplanorbis***
- ***I. exustus***

Common Name : Ram's Horn Snail



IDENTIFYING FEATURES:
Small shell and discoidal in shape with 4-5 whorls concentric in the middle. The colour of the shell is light yellow and transparent.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
The maximum abundance recorded is 0.06% in Farakka during monsoon. The number of individuals found during the survey are dominant only during monsoon season, both at Bhagalpur and Farakka (43 and 129 nos./m^2).

KNOWLEDGE GAINING FACTS

Indoplanorbis exustus is a fragile gastropod in freshwater ecosystems, exhibits the survival growth rate at different temperatures which are directly proportional to each other. The maximum number of eggs are produced with temperature range of 18 - 35ºC which prevails in the plain geographical lands of West Bengal. These tiny gastropods are also recorded as the host for many parasitic species like *Fasciola* sp.

Physella acuta (Draparnaud, 1805)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Heterobranchia
- Hygrophilla
- Lymnaeoidae
- Physidae
- Physinae
- ***Physella***
- ***P. acuta***

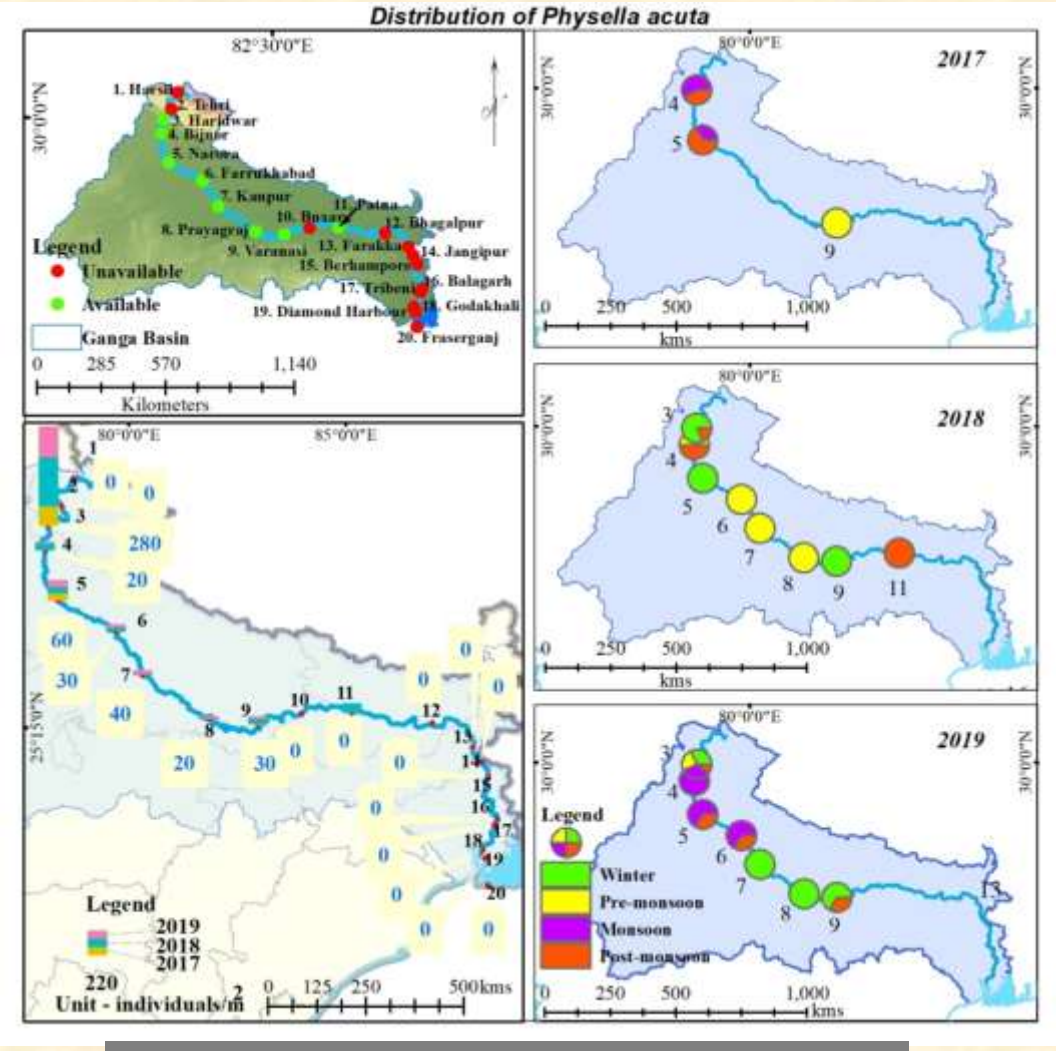
Common Name : Bladder Snail

IDENTIFYING FEATURES:
Sinistral shape of the shell with an ovoid structure. The apical part is sharpened with prominent sutures. The aperture broad and ovoid. The colour of the shell is translucent (light fawn) with patches on the shell.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Abundance of *Physella acuta* recorded is 0.683% along the stretch. The maximum availability was observed at Haridwar during the winter with a percentage of 0.415 and the minimum is 0.0139 at Prayagraj.



KNOWLEDGE GAINING FACTS

Physella acuta feeds on algal and detritus biofilm on the benthic substratum and also accidentally feeds on micro-plastics of size 10µm to 90µm (Scherer et al., 2017).This organism is regarded as one of the invasive amongst all the freshwater gastropods, surviving in any kind of habitat. *P. acuta* is more threatening species for the paddy cultivation (Banha et al., 2014).

Assiminea francesiae (Wood, 1828)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Littorinimorpha
- Rissooidae
- Assimineidae
- ***Assiminea***
- ***A. francesiae***

Common Name : Dun Sentinel

IDENTIFYING FEATURES:

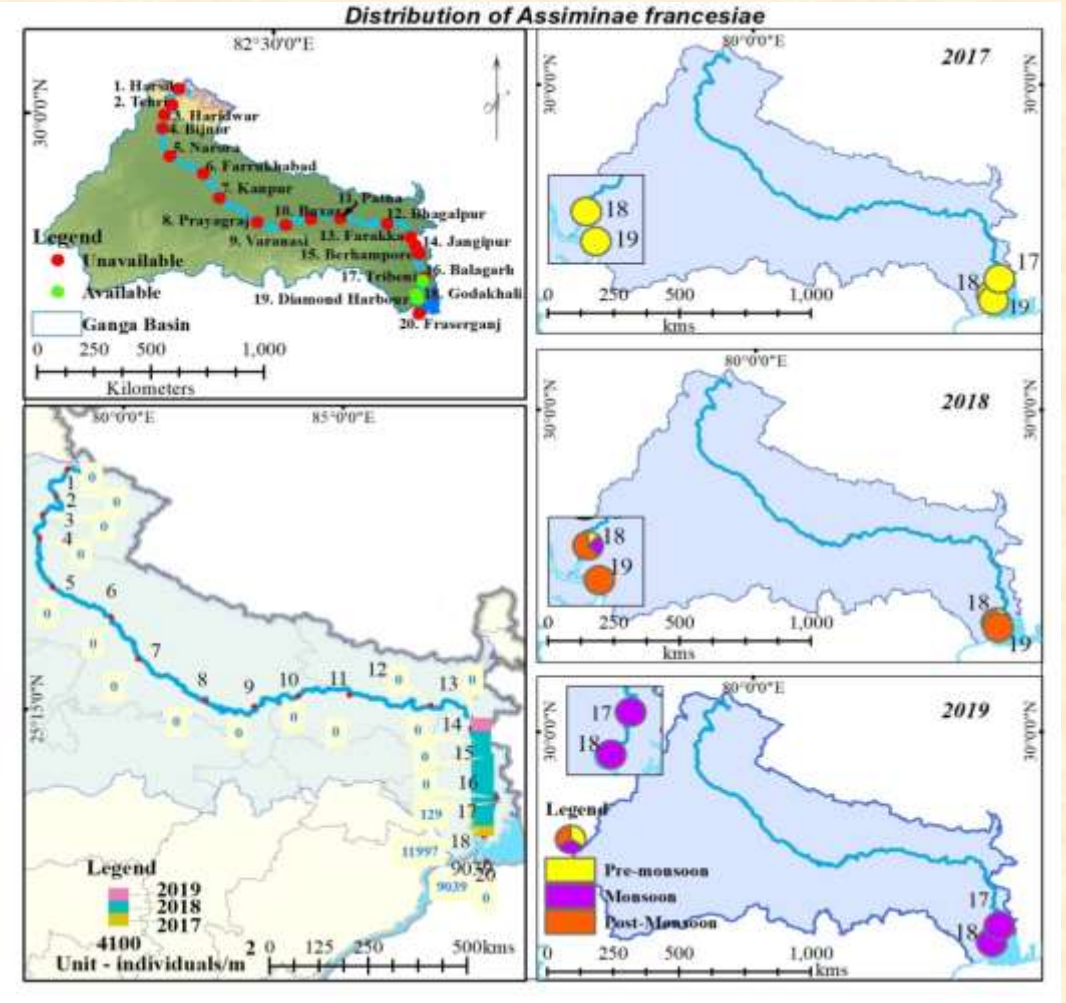
Shell is elongated and conical with a sharp pointed apex. There are 6-7 body whorls which keeps on increasing in width. Aperture of the shell is obliquely situated. The shell is yellow coloured with distinct red bands spirally coiled along the whorls.

HABITAT : Freshwater/ Brackishwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :

A relative abundance of 9.42% was observed at Godakhali during pre-monsoon, monsoon and post-monsoon. This species is mostly dominant at Tribeni, Godakhali and Diamond Harbour. It was observed 0.66% during monsoon 2019 and 1.103% during pre-monsoon, 2017 at Godakhali. Apart from that, Tribeni and Diamond Harbour were also recorded the species distribution with an abundance of 0.061% and 7.9% respectively.



KNOWLEDGE GAINING FACTS

It has been seen that *Assiminea francesiae* is common in the brackishwater regions of Ganga river like, Tribeni, Godhakhali and Diamond Harbour, indicating that it can survive in brackishwater area with 0.5 psu salinity. There are reports that *A. francesiae* is considered as one of the important mangrove species residing in Sundarban. This organism is one of the primary intermediate host for parasitic organisms like *Fasciola* sp.

Phylum : Mollusca
Class : Gastropoda
Brackishwater Species

Cerithidea obtusa (Lamarck, 1822)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Caenogastropoda
- Cerithioidae
- Potamididae
- ***Cerithidea***
- ***C. obtusa***

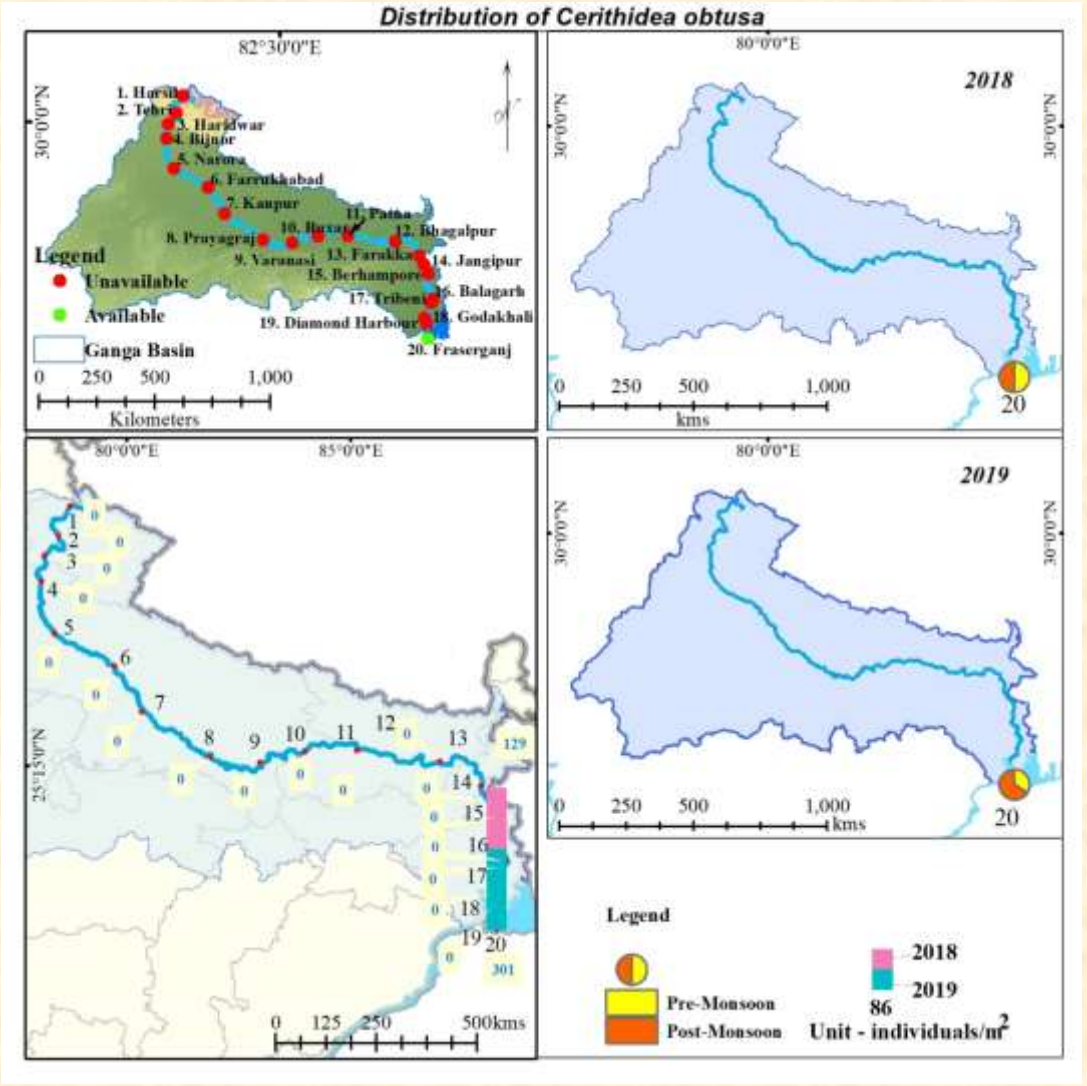
Common Name : Mud Creeper

IDENTIFYING FEATURES:
The shell is thick with prominent whorls. There are circular striations on each whorl. The thick outer lip is protruding outwardly. The operculum is broad and expanded with flaring red inner surface. The top of the shell is blunt with dull coloration on the outer surface .

HABITAT : Brackishwater / Marine

IUCN : Not Evaluated

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
It is commonly found in Fraserganj. The maximum abundance is 0.140% for 2018-2019. The species is wildly available during pre-monsoon and post-monsoon period with an abundance of 0.04%.



KNOWLEDGE GAINING FACTS

Bioaccumulation of heavy metals has been seen in the soft tissues of the *Cerithidea obtusa*, particularly in the foot, digestive tract and operculum. The meat is red coloured and is quite nutritious. These shells are consumed by humans by chopping off the tip and taking out the meat.

Pirenella cingulata (Gmelin, 1791)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Caenogastropoda
- Cerithioidae
- Potamididae
- ***Pirenella***
- ***P. cingulata***

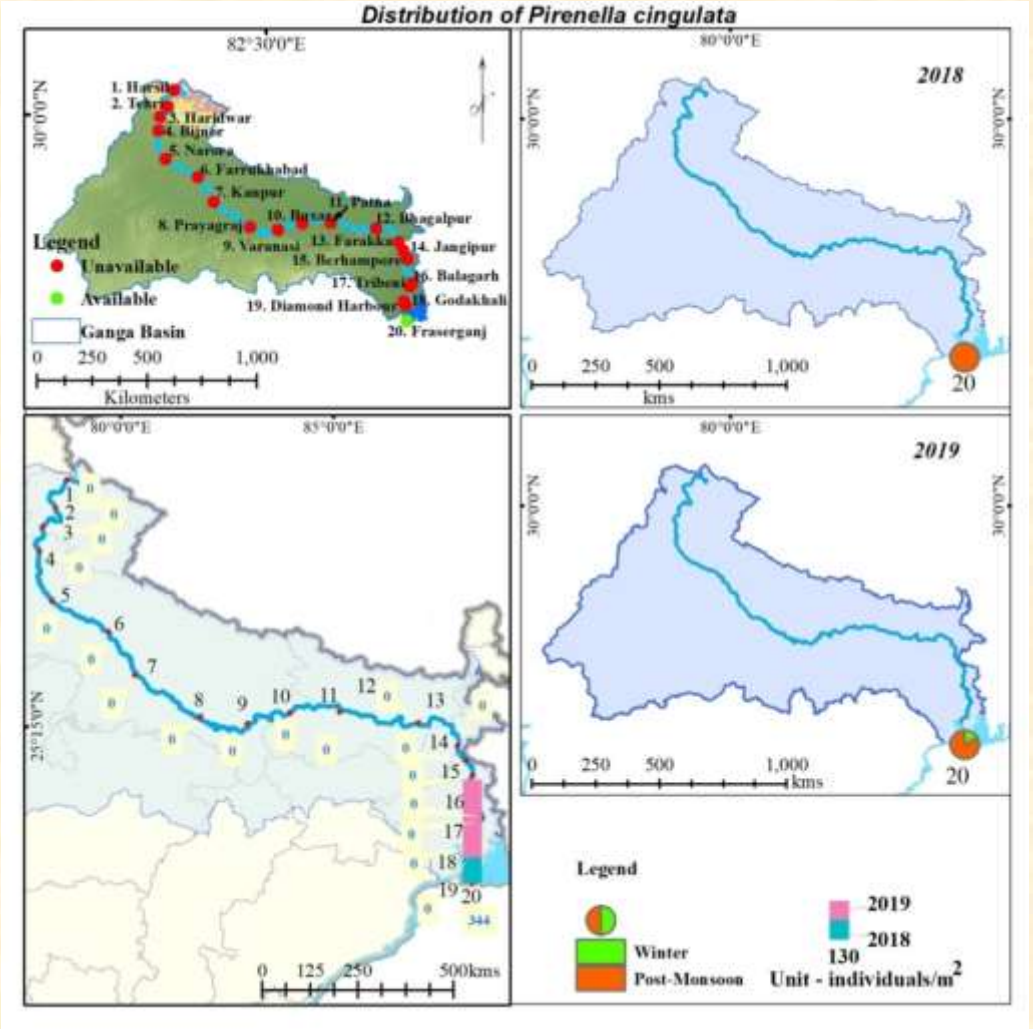
Common Name : Girdled Hornsnail

IDENTIFYING FEATURES:
This organism belonging Potamidae is a small and granulated mollusc. The shell is thick and operculum is flowery. The colour of the shell is black with distinct spire of nodules on the shell.

HABITAT : Brackishwater / Marine

IUCN : Not Evaluated

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
This is a common marine species along the southern coast of river Ganga recording an abundance of 0.98% during post-monsoon period. The abundance for each year. is 0.16%.



KNOWLEDGE GAINING FACTS

Pirenella cingulata is a feeder of micro algae and bacteria. Mostly found in the muddy soft bottom of silt and clay associated with mangrove fauna. This gastropod have a greater affinity towards higher salinity and have a significant positive influence with temperature and dissolved oxygen for their survival (Solanki, 2017).

Telescopium telescopium (Linnaeus, 1758)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Caenogastropoda
- Cerithioidae
- Potamididae
- ***Telescopium***
- ***T. telescopium***

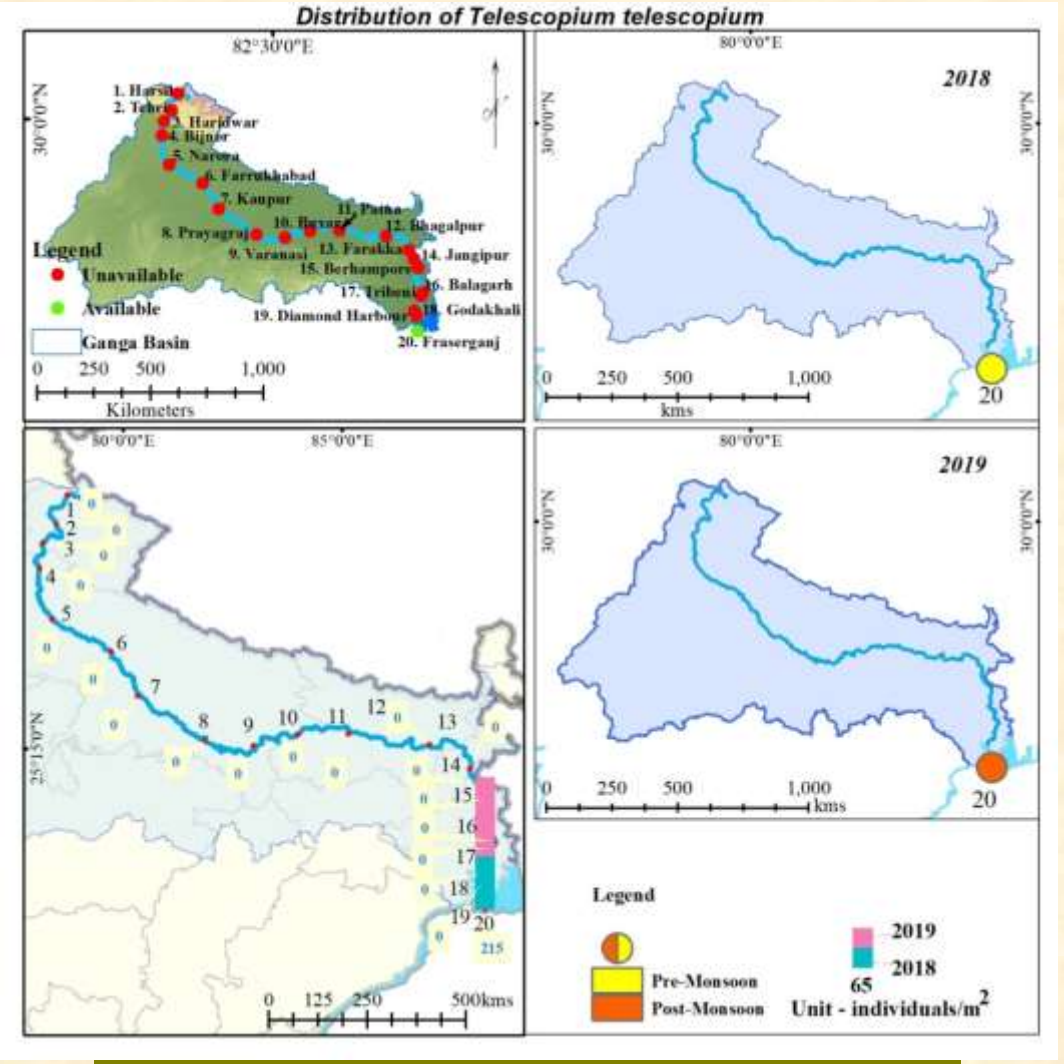
Common Name : Telescope Shells

IDENTIFYING FEATURES:
The shell is broad and large in shape, like cork screw shape which gently glides down in the shape of a cone. There are spirally coiled ridges along the whole body of the outer shell. Uniform dark brown to light brown colouration.

HABITAT : Brackishwater / Marine

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Telescopium telescopium represents a total abundance of 0.1%. The species is found throughout the year in muddy soils of the marshy places. It is mostly found in the both in pre-monsoon and post-monsoon. Euryhaline species found in the creeks and crevices of estuarine zone.



KNOWLEDGE GAINING FACTS

Telescopium telescopium also known as Horn Shells or Telescope Shells. This shell remains buried in the muddy substratum and regulates its day-to-day feeding operations even during high tide (Budiman,1988). During unfavorable conditions, the species aggregate together (Haque et al., 2015). This species is often used as dietary food for many coastal villagers as a source of nutrition.

Vittina smithii (W. Wood, 1828)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Neritimorpha
- Cycloneritida
- Neritoidae
- Neritidae
- Neritinae
- ***Vittina***
- ***V. smithii***

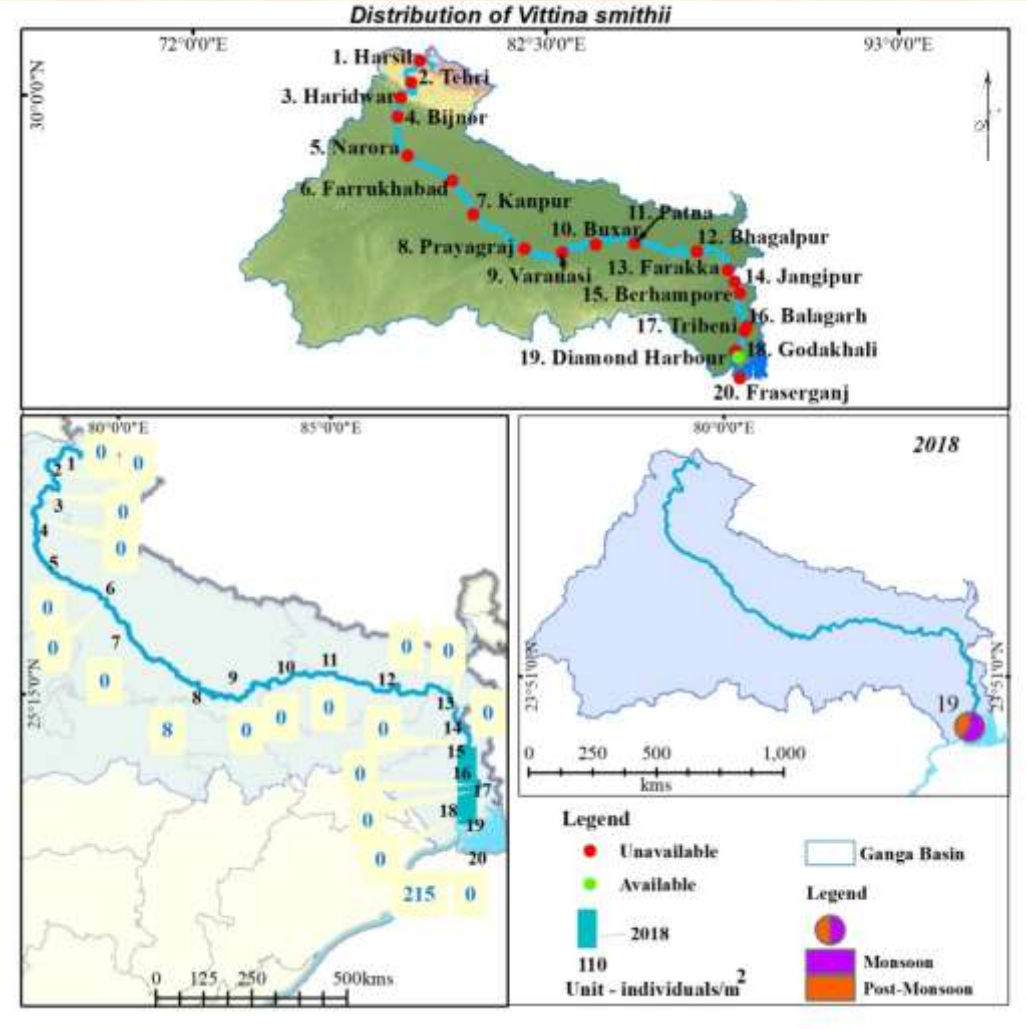
Common Name : Neritina Snail

IDENTIFYING FEATURES:
Shell is tough and coiled with an unsharpened peak. There are 5 whorls which are progressively increasing from coiled structure till the last whorl being the largest. Collumellar region have 13-15 serrations like teeth. Black colouration, with patches of light yellowish patches on the surface.

HABITAT : Brackishwater / Marine

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
The gastropod is found in brackishwater zone. The relative abundance of the species is 0.1% at Diamond Harbour, mostly during monsoon and post-monsoon.



KNOWLEDGE GAINING FACTS

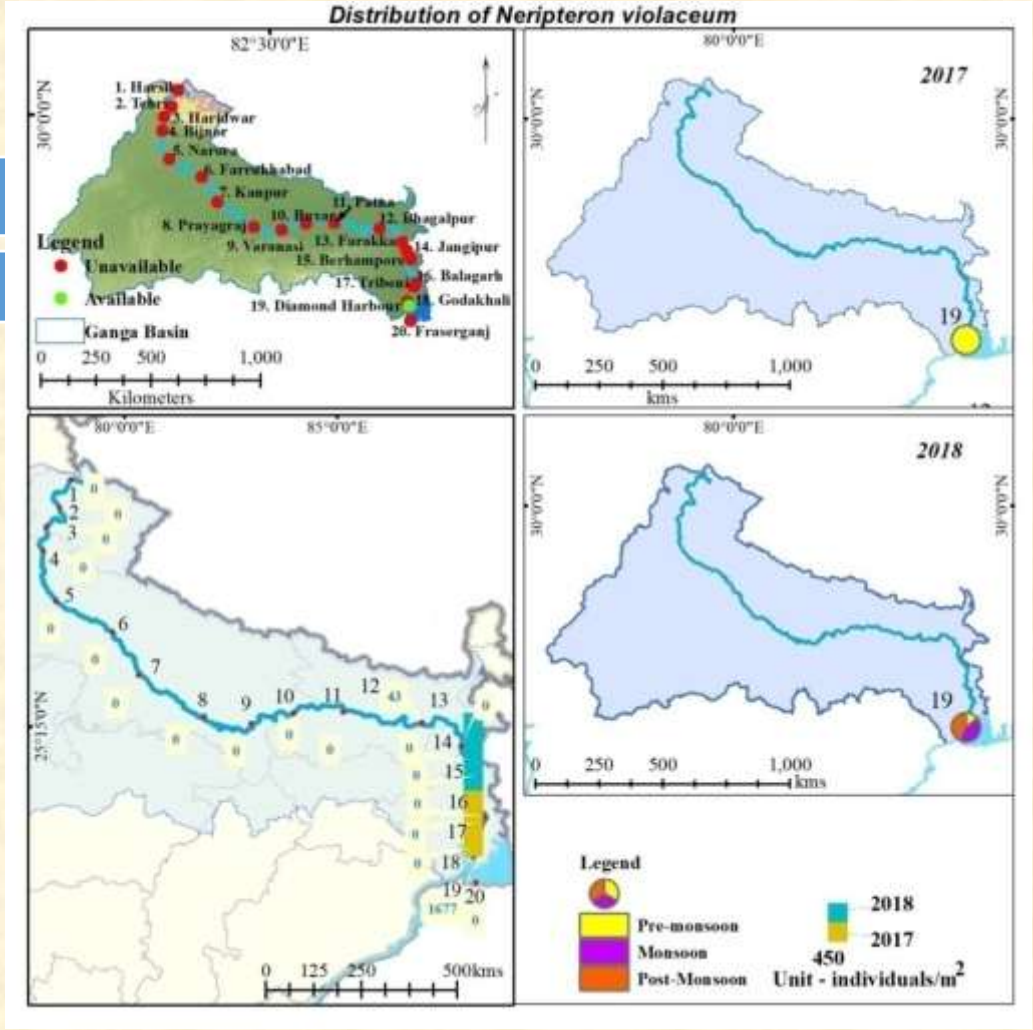
Neritina Snail is confined to the estuarine region of West Bengal, whereas now it is seen that their population extended towards Odisha coast in Paradeep mangroves and sea grass bed (Yadav et al., 2019; Mahapatro et al., 2015).

Neripteron violaceum (Gmelin, 1791)

Common Name : Neritina Snail

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Neritimorpha
- Cycloneritida
- Neritoidae
- Neritidae
- Neritinae
- ***Neripteron***
- ***N. violaceum***



IDENTIFYING FEATURES:

The shell is like a cusp shaped with a broad aperture. Peristracum is yellowish brown in colour. Presence of two whorls while the apical top is twisted inward with a slight protrusion. Colour of the shell is dark brown with horizontal black dotted striations on the last whorl.

HABITAT : Brackishwater / Marine

IUCN : Not Evaluated

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :

This organism belongs to Neritidae family, collected from Diamond Harbour**.** The total abundance along the stretch is 0.78% while maximum abundance recorded at Diamond Harbour (0.36%) during pre-monsoon 2018.

KNOWLEDGE GAINING FACTS

Neripteron violaceum is a unique gastropod existing in the brackishwater which acts as a biomonitoring agent. Estuarine acidic waters dissolves the calcareous shell and exposes the soft tissues resulting in the depletion of the species.

Nerita fulgurans (Gmelin, 1791)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Neritimorpha
- Cycloneritida
- Neritoidae
- Neritidae
- Neritinae
- ***Nerita***
- ***N. fulgurans***

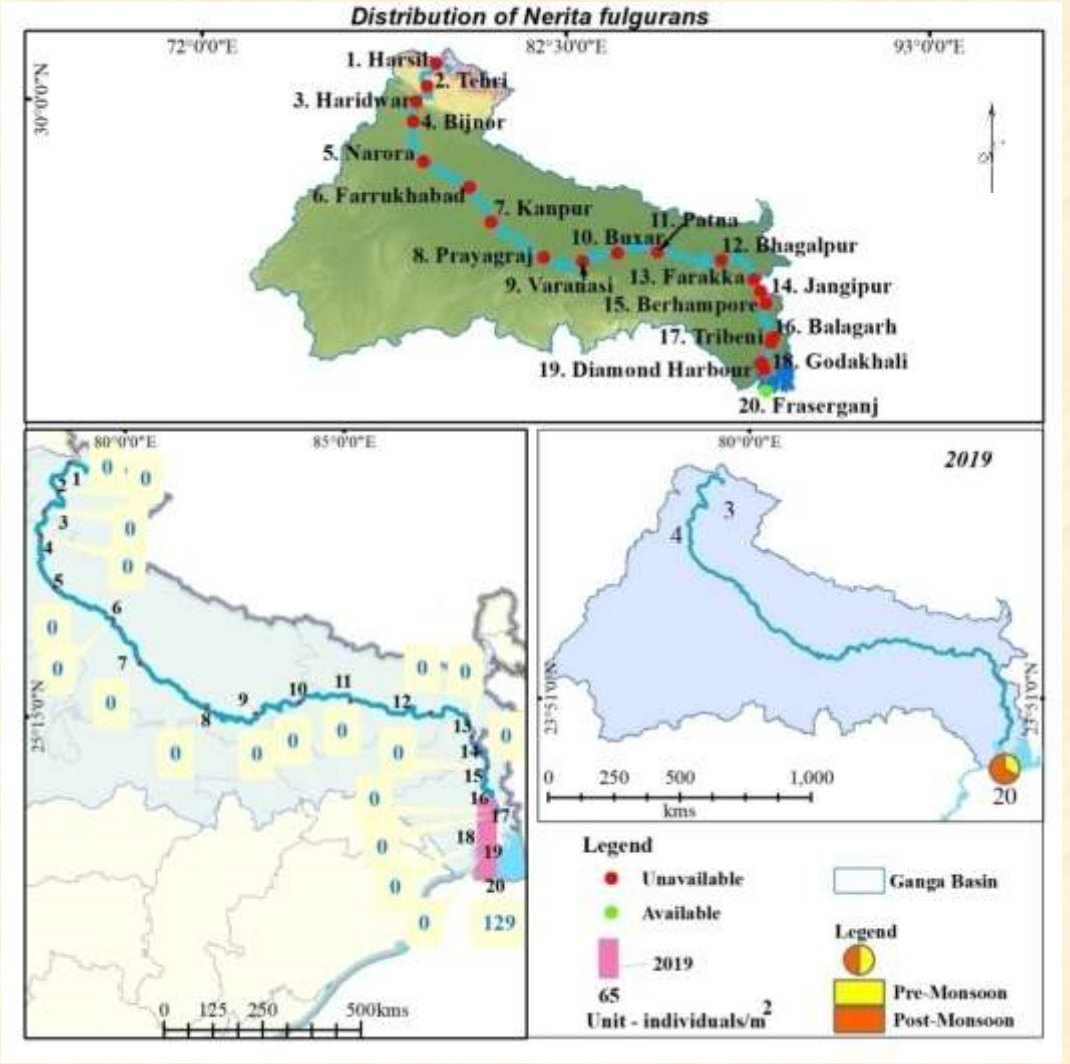
Common Name : Lightning Nerite

IDENTIFYING FEATURES:
The size of the shell is ¾ to 1 inch. The edge of the shell is rough and uneven. The shell is concentric at the centre. The collumelar region is white with yellowish tinge. The shell is brown with thick striations of white and black lightening marks on the dorsal side of the shell.

HABITAT : Brackishwater / Marine

IUCN : Not Evaluated

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
An abundance of 0.06% is found in the estuarine waters of Fraserganj during pre-monsoon and post-monsoon. High salinity is one of the influencing factor for the availability of this species along the southern coastal region of Ganga.



KNOWLEDGE GAINING FACTS

Nerita fulgurans is a commonly available species in the lower supra-tidal regions till upper sub-tidal regions. The orientation of Lightning Nerite shows visual response in its dwelling habitat range while it showed predator avoidance behavior by visual and chemical response.

Nerita balteata (Reeve, 1855)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Neritimorpha
- Cycloneritida
- Neritoidae
- Neritidae
- Neritinae
- ***Nerita***
- ***N. balteata***

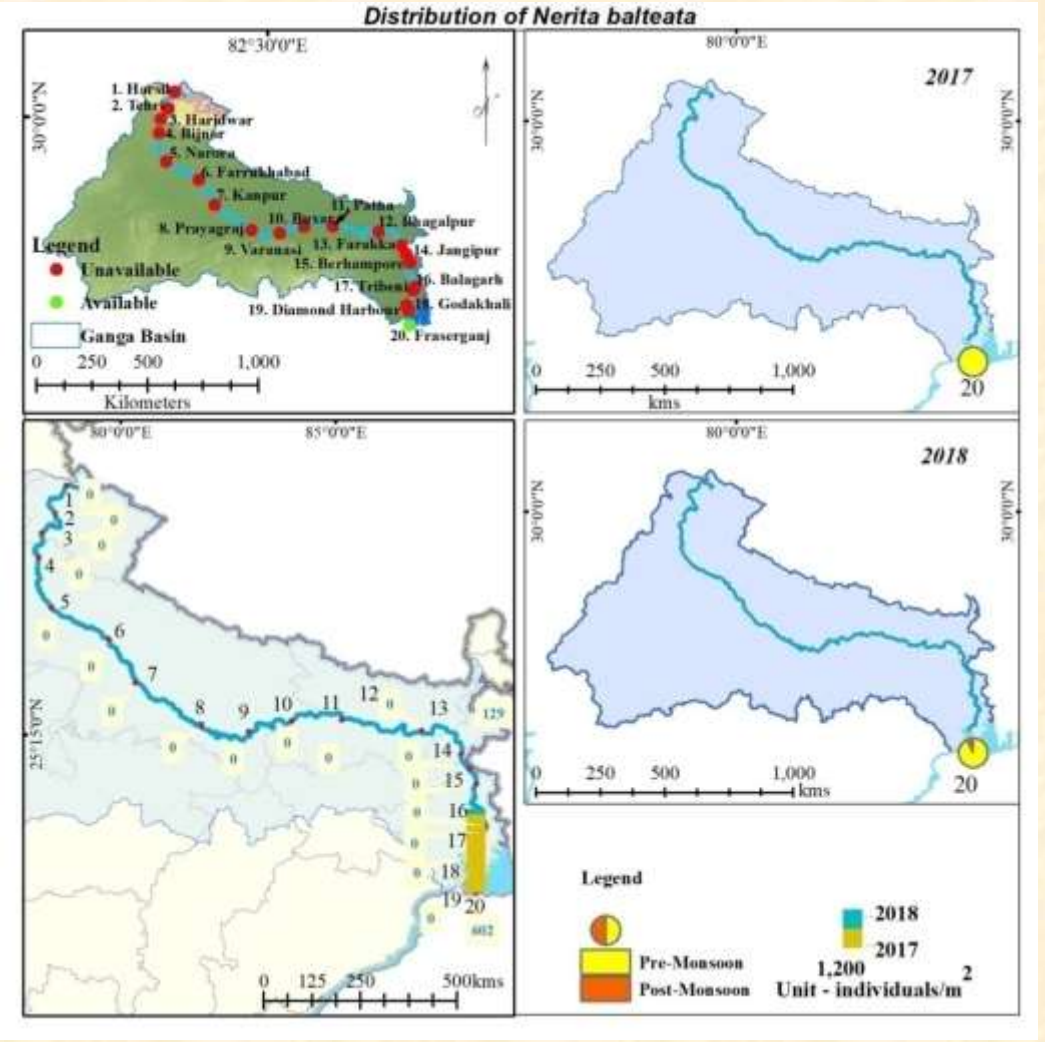
Common Name : Sea Snail

IDENTIFYING FEATURES:
The shell is medium in size with radial strips running from top to the end of the outer lip of columellar region. Fully grown specimens have prominent spiral threads with finer structures. Parital wall is yellowish on the outer side and white on the inner columelar side. The colour may vary from jet black to grey.

HABITAT : Brackishwater / Marine

IUCN : Not Evaluated

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
A total abundance of 0.28% is recorded amongst the total population. This organism is also found in the less salinity zone. The species is most dominant at Fraserganj (0.26%), during pre-monsoon.



KNOWLEDGE GAINING FACTS

Nerita balteata is one of the important species which resides in the saline waters of the mangrove ecosystem. This is a bioindicator species showing accumulations of heavy metals like cadmium, lead and nickel in the shell while zinc, copper and iron accumulation in the soft tissues.

Volegalea cochlidium (Linnaeus, 1758)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Neogastropoda
- Buccinoidae
- Melonginidae
- ***Volegalea***
- ***V. cochlidium***

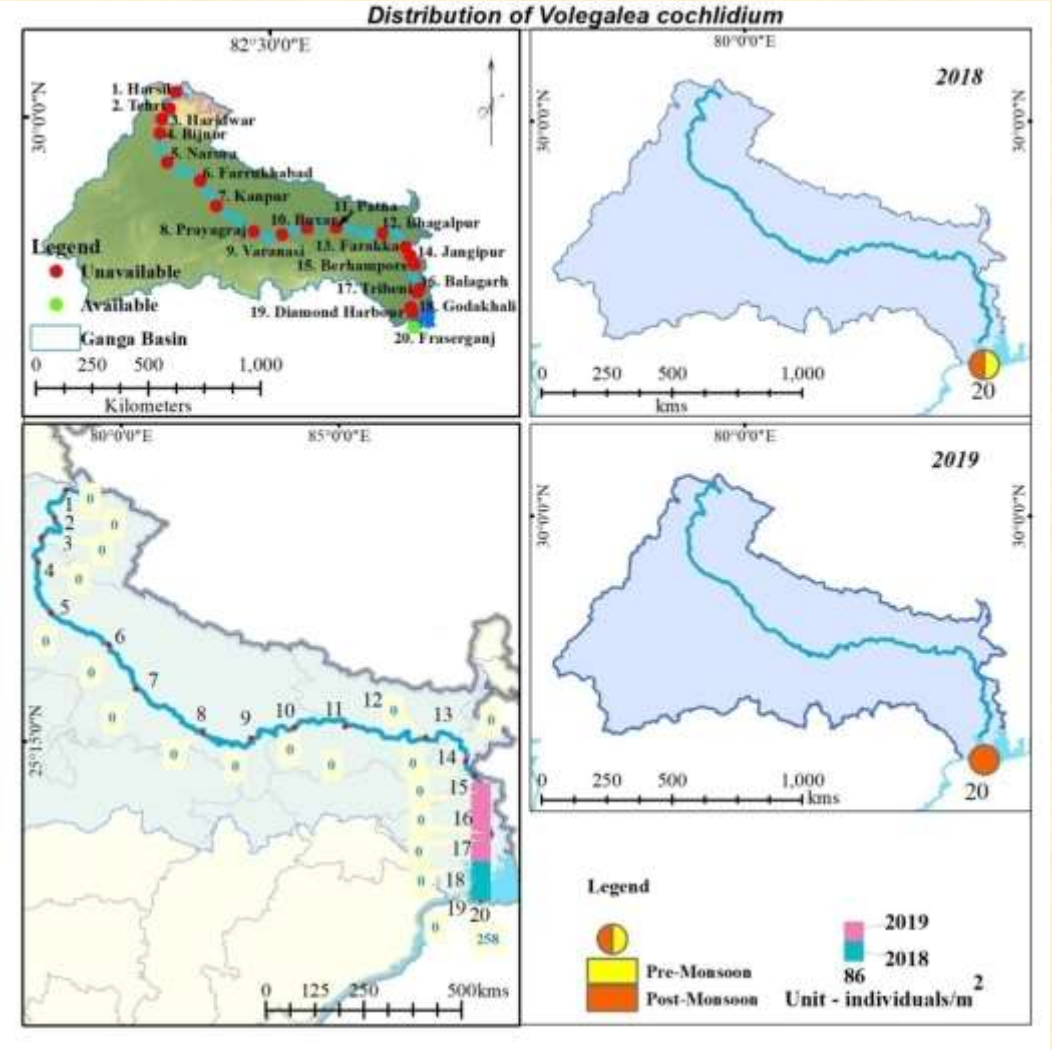
Common Name : Spiral Melongina

IDENTIFYING FEATURES:
Shell is broad and elongated, with distinct curve on the shoulder depicting a particular characteristics of Melonginidae family. The body is fusiform with wide columella. The edge of the sutures is protruding. The colour of the shell is white and calcified with patches of brownish flame like display.

HABITAT : Brackishwater / Marine

IUCN : Not Evaluated

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
This organism found in brackishwater at Fraserganj with an abundance of 1.20% during pre-monsoon and post-monsoon.



KNOWLEDGE GAINING FACTS

It is observed from fossils of Miocene epoch in Indonasian / Malaysian subcontinent and have the assemblage of Melonginidae family and subsequently known as *Volegalea cochlidium* (Landau, 2013). This estuarine gastropod is often used for ayurvedic healing, in which the operculum is burnt and mixed with mustard oil for retention of pus in the ear.

Ancilla ampla (Gmelin, 1791)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Neogastropoda
- Olivoidae
- Ancillariidae
- ***Ancilla***
- ***A. ampla***

Common Name : Lantern Snail

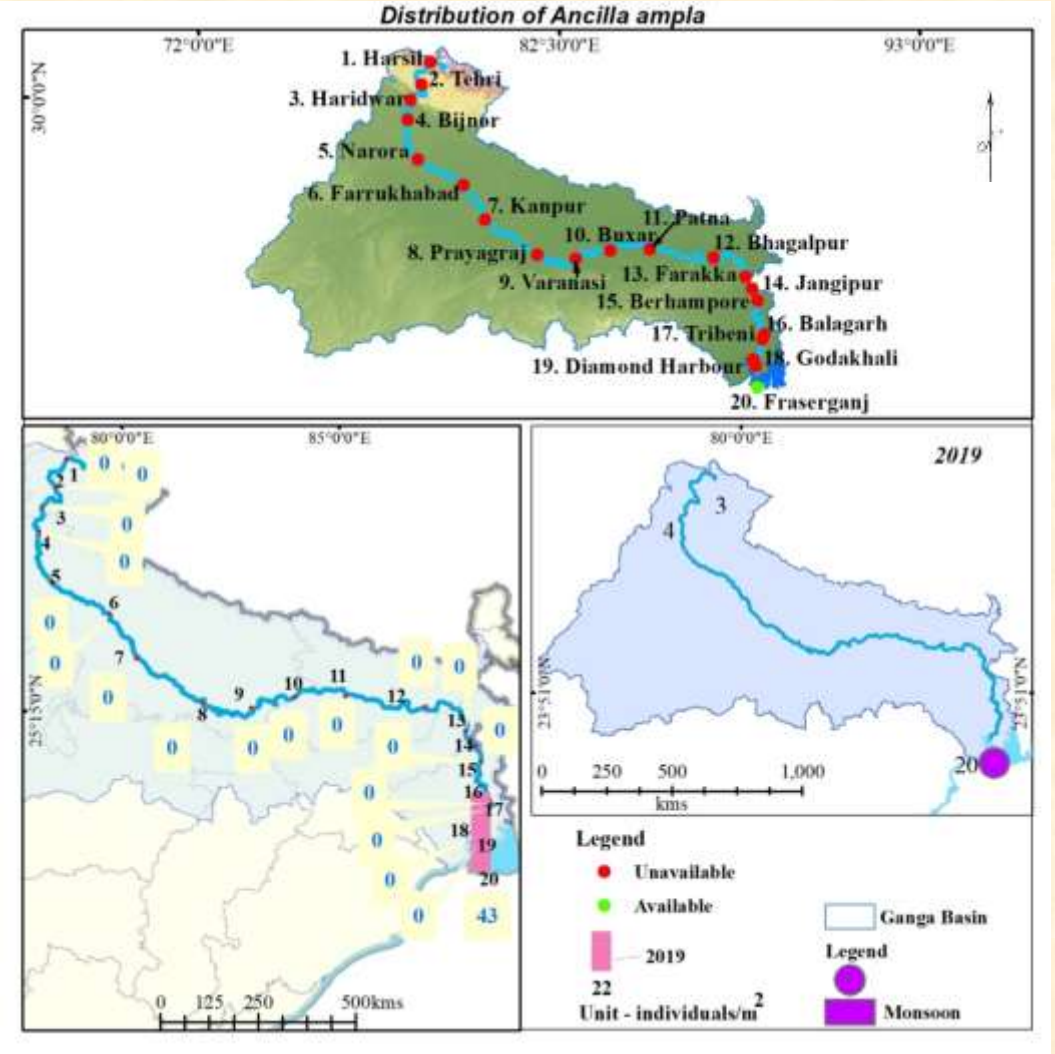
IDENTIFYING FEATURES:
This gastropod is elongated with a wide aperture. The apex is pointed and round. The whorls are not prominent. The bottom structure of the shell is V-shaped. The shell colour is white with striations on the edge of the columellar region.

HABITAT : Brackishwater / Marine

IUCN : Not Evaluated

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :

Ancilla ampla is one of the marine species recorded at the mouth of river Ganga. Not much abundance is observed apart from availability at Fraserganj (0.02%) during the monsoon season.



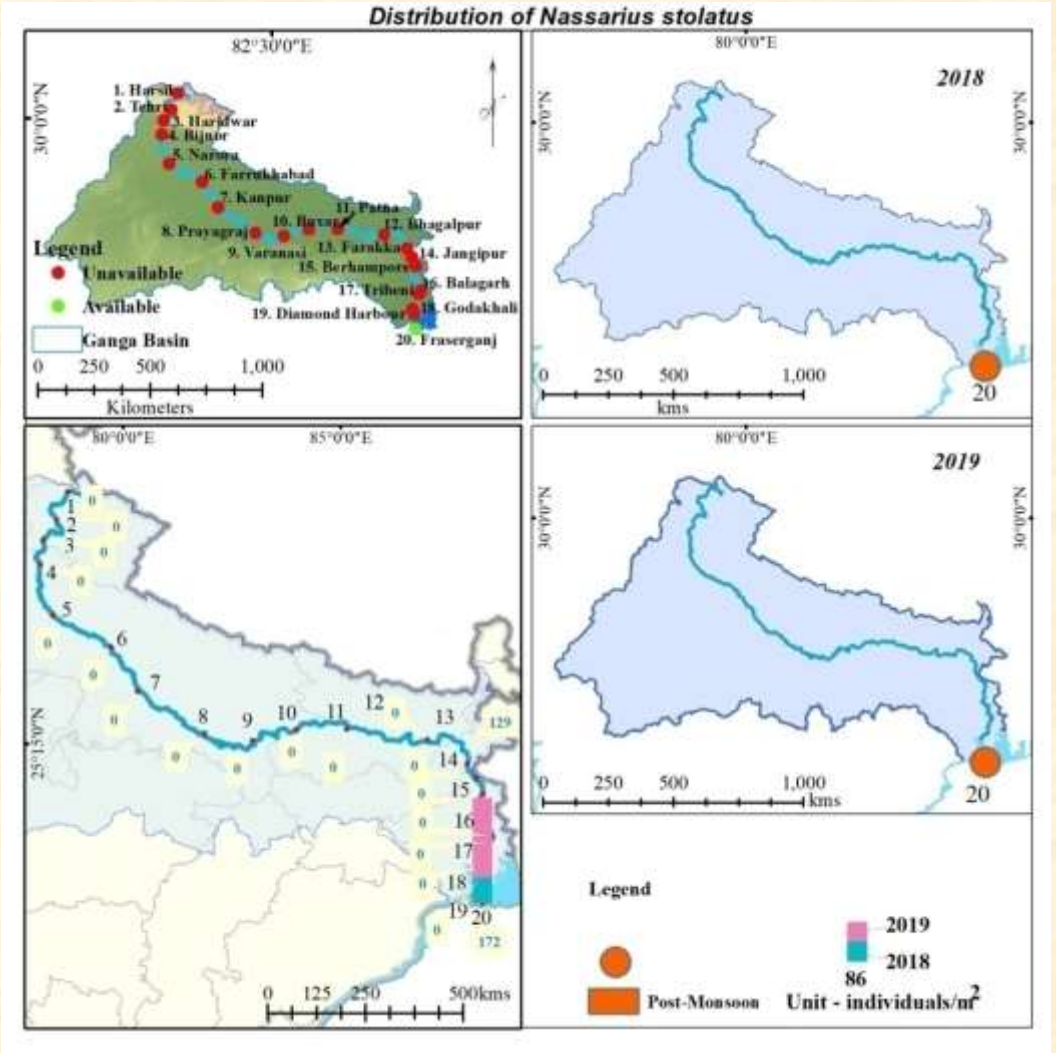
KNOWLEDGE GAINING FACTS

Ancilla ampla is a commonly available species in the southern part of Ganges river typically in the estuarine part. This species is commonly used for the preparation of ornaments and necklaces.

Nassarius stolatus (Gmelin, 1791)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Neogastropoda
- Buccinoidae
- Nassariidae
- ***Nassarius***
- ***N. stolatus***



Common Name : Nassa Mud Snail

IDENTIFYING FEATURES:
The summit of the shell is oval and pointed. The spire forms 6-7 smooth convex whorls. The colour of the shell is violaceous white. Dark red bordered suture and broad bands of dark brown running spirally along the shell.

HABITAT : Brackishwater / Marine

IUCN : Not Evaluated

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
A total abundance of 0.08% is recorded from 2018-2019. Both the year showed dominance of this species during post-monsoon with an abundance of 0.06% and 0.04%.

KNOWLEDGE GAINING FACTS

Nassarius stolatus is one of the commonly available marine shells also known as Dog Whelks. It is used as potential heavy metal bioindicator for ferrous, lead, manganese, nickel and cadmium.

Nassarius foveolatus (Dunker, 1847)

TAXONOMIC CLASSIFICATION

- Mollusca
- Gastropoda
- Caenogastropoda
- Neogastropoda
- Buccinoidae
- Nassariidae
- ***Nassarius***
- ***N. foveolatus***

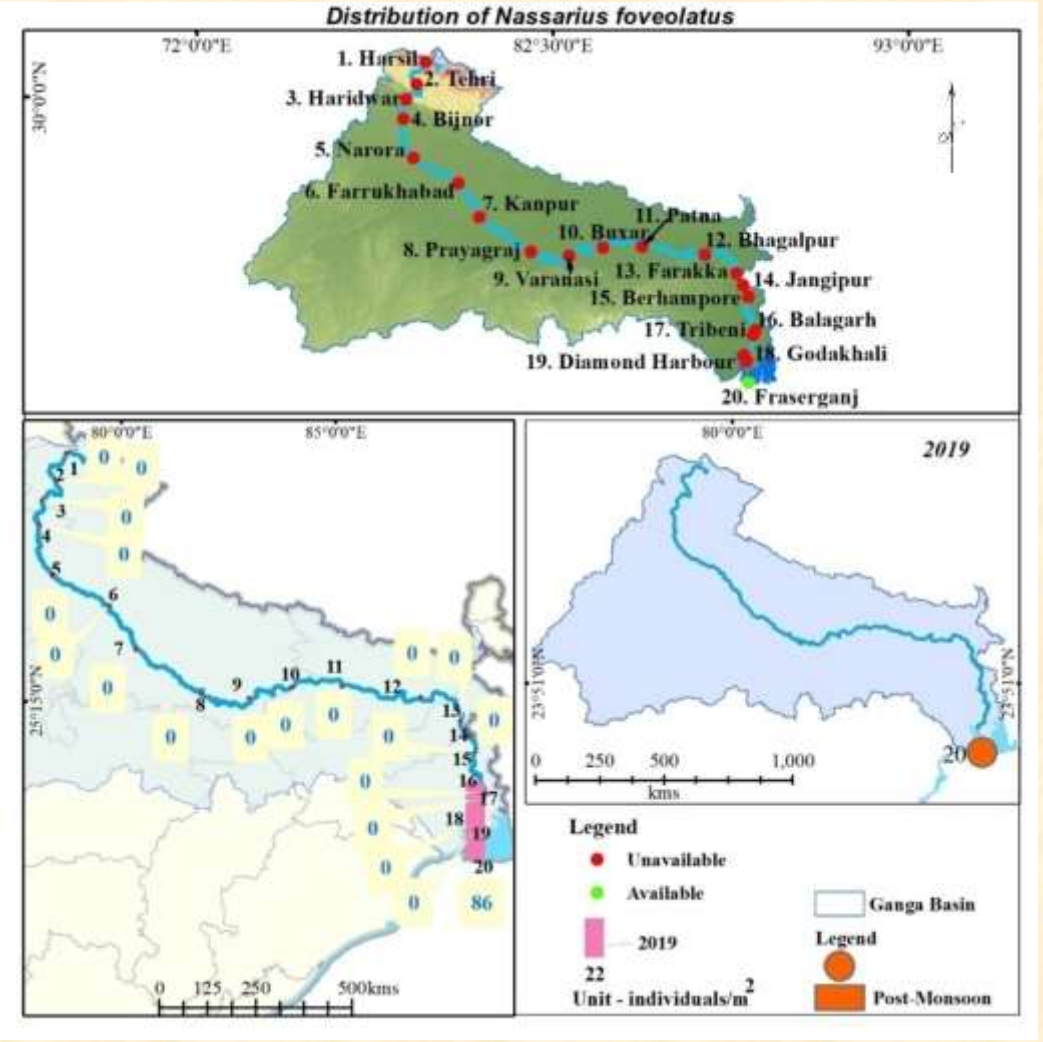
Common Name : Nassa Mud Snail

IDENTIFYING FEATURES:
The shell has a pointed apical ridge, with 6-7 whorls. The shell is thick and hard with teethed outer lips. There are fine lines running from top to bottom of each whorl. The colour is slightly yellowish with dark brown and black patches.

HABITAT : Brackishwater / Marine

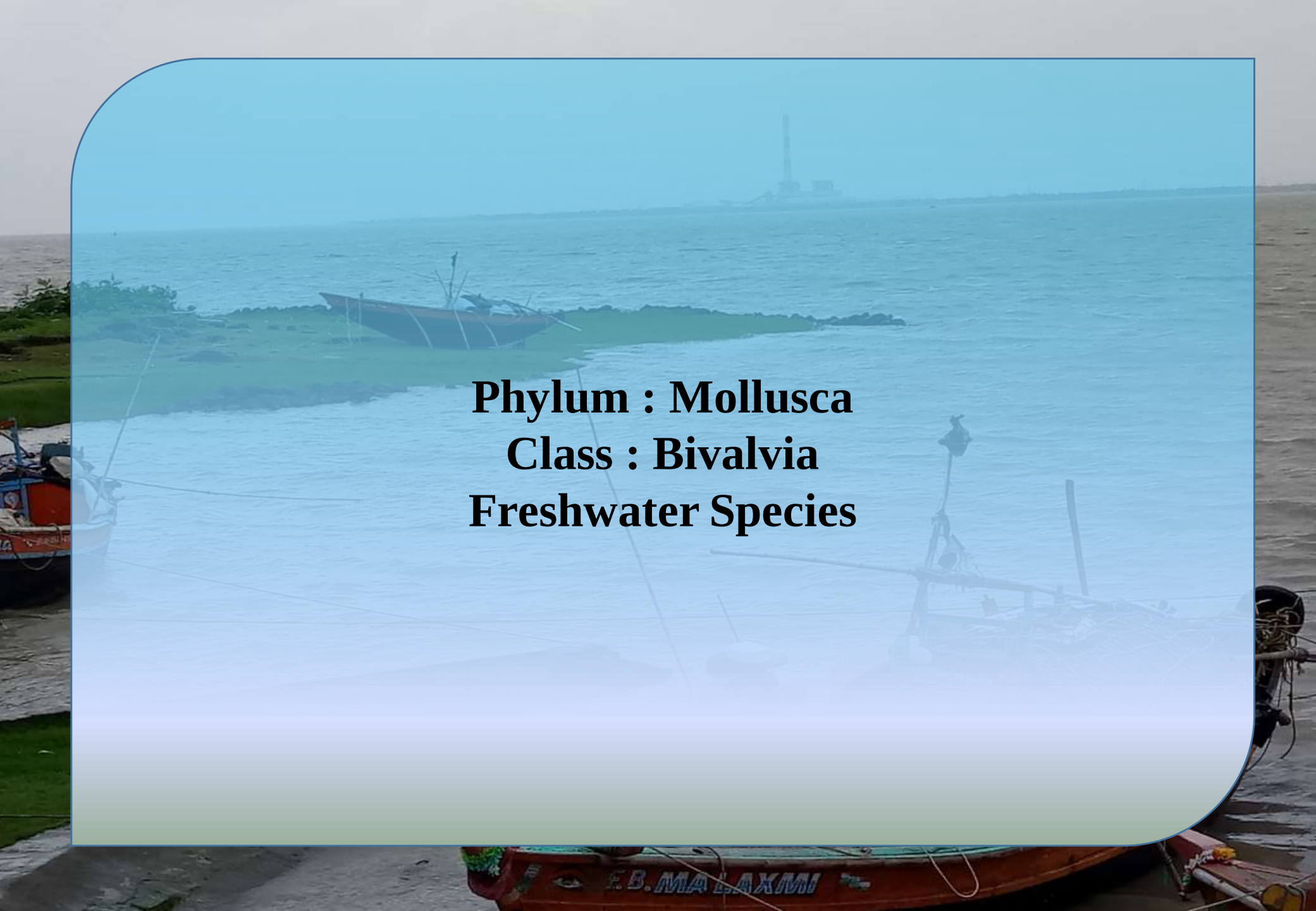
IUCN : Not Evaluated

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Nassarius foveolatus is one of the commonly available species in the estuarine zone. The species has been recorded from Fraserganj with a relative abundance of 0.05% during post-monsoon.



KNOWLEDGE GAINING FACTS

Nassarius foveolatus is one of the species of Nassariidae family which is predominantly native to the Central and Eastern part of Indian Ocean, and also extends upto East China Sea. Experimental studies have shown that *Nassarius foveolatus* and *Nassarius vibex* share the same kind of niche in the native habitat.



Phylum : Mollusca
Class : Bivalvia
Freshwater Species

Novaculina gangetica (Benson, 1830)

TAXONOMIC CLASSIFICATION

- Mollusca
- Bivalvia
- Caenogastropoda
- Adapedonta
- Solenoidae
- Pharidae
- ***Novaculina***
- ***N. gangetica***

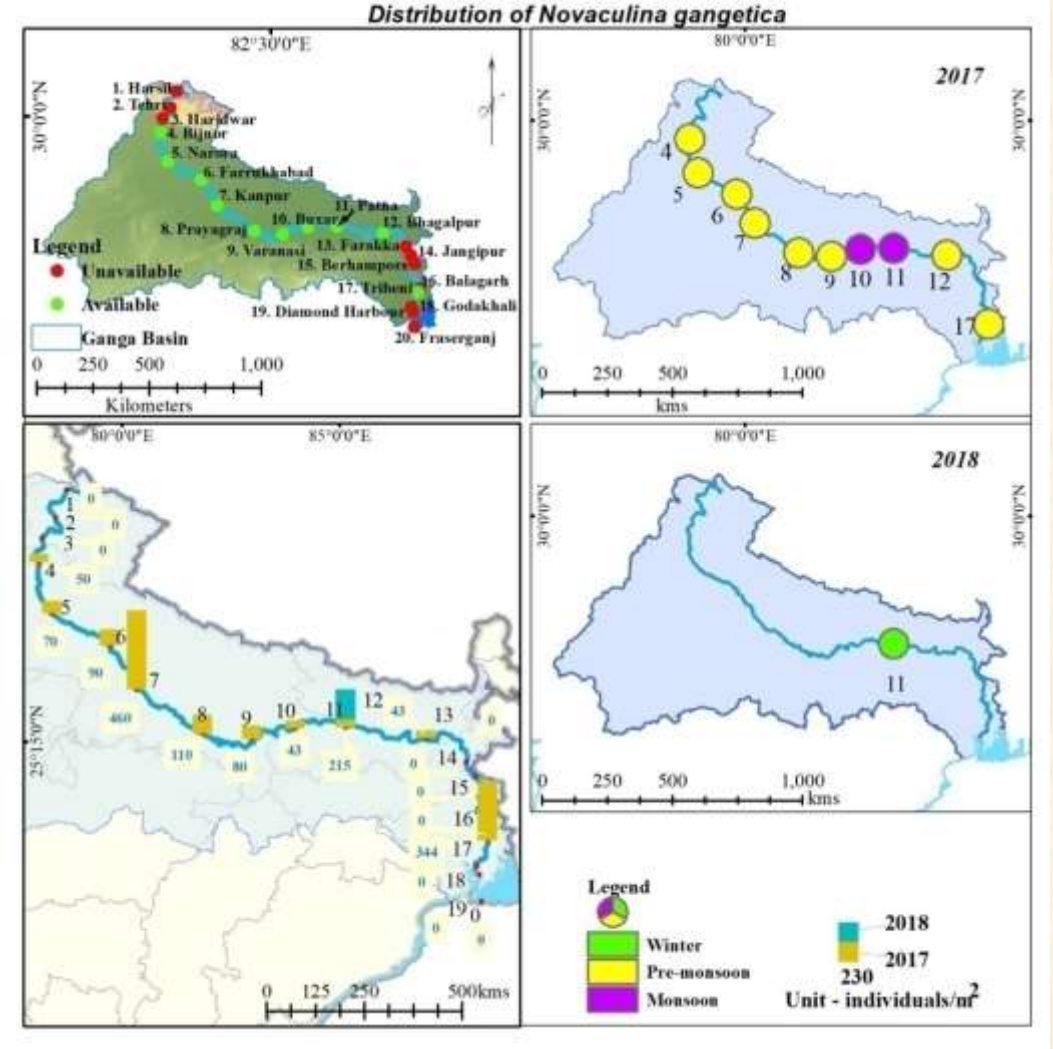
Common Name : Razor Clam

IDENTIFYING FEATURES:
The shell is elongated and dorsoventrally flattened. Discoidal foot which helps locomotion. Shell is thin or moderately thick. The hinge is not situated at the centre. The colour of the shell is yellowish brown.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
A total abundance of 0.70% is the available along the river Ganga. The maximum number is available at Kanpur (0.214%) during pre-monsoon. This bivalve is common along the upper stretch from Bijnor to Varanasi, whereas lower stretch records is maximum abundance at Tribeni (0.16%) during pre-monsoon.



KNOWLEDGE GAINING FACTS

Novaculina gangetica is one of sister species *N. siamensis* belonging to Pharidae family. The report of this species in two basins (Ganga and Mekong) is the impact of allopatric speciation. Pharidae is marine dominated family, but yet it have records of freshwater species like *N. gangetica*, *N. siamensis* and *N. chinensis*.

Parreysia favidens (Benson, 1862)

TAXONOMIC CLASSIFICATION

- Mollusca
- Bivalvia
- Heteroconchia
- Unionida
- Unionidae
- Parreysiinae
- ***Parreysia***
- ***P. favidens***

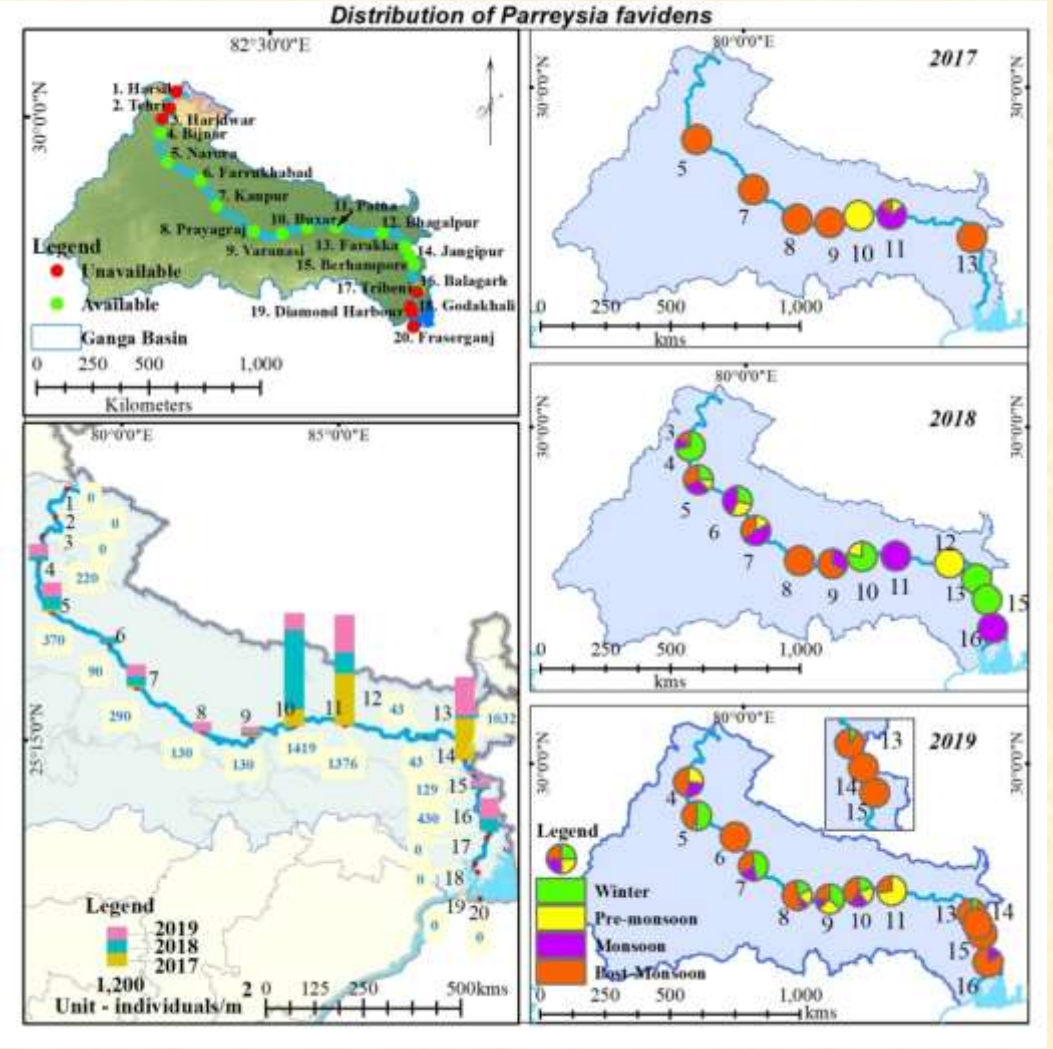
Common Name : Freshwater Mussel

IDENTIFYING FEATURES:
The shell is elongated and dorsoventrally flattened. The cardinal teeth is broad. Umbo is strong and extended outward. The colour of the shell is greenish yellow.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
The total abundance of 2.66% is estimated from the stretch. The maximum abundance is found at Kanpur (0.34%) during winter in 2018. The minimum abundance is observed at Bhagalpur and Jangipur 0.04% and 0.06% during pre-monsoon and post-monsoon respectively .



KNOWLEDGE GAINING FACTS

The bivalves have immense medicinal values important for humans. The hunting of molluscan species leads to the traditional delicacies made by the local people (Chakraborty et al., 2012).

Parreysia corrugata (O. F. Müller, 1774)

TAXONOMIC CLASSIFICATION

- Mollusca
- Bivalvia
- Heteroconchia
- Unionida
- Unionidae
- Parreysiinae
- ***Parreysia***
- ***P. corrugata***

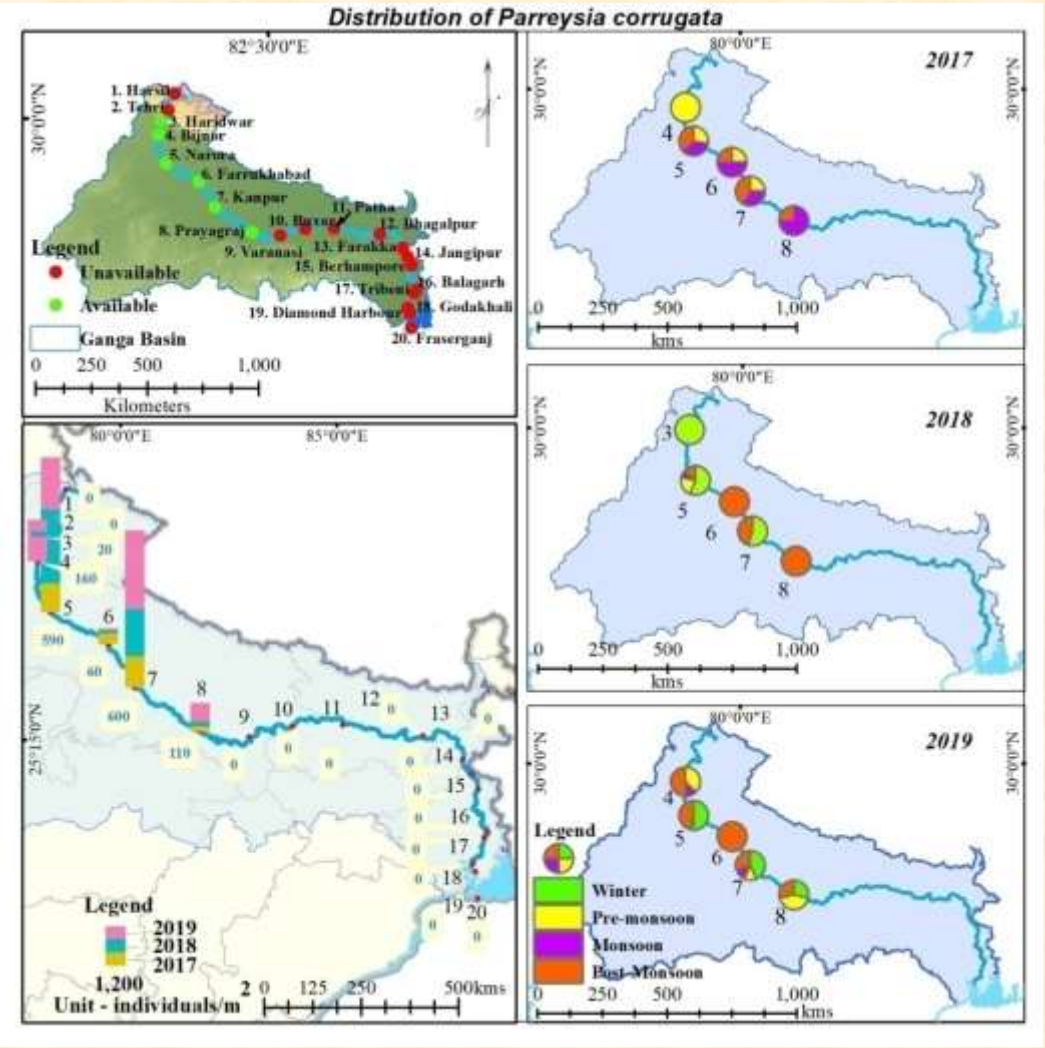
Common Name : Freshwater Mussel

IDENTIFYING FEATURES:
Shell is thick and elliptical structure. The umbo is distinct with zig-zag gradual striations ascending from umbo to bottom. The anterior portion is rounded while the posterior is pointed. The shell is brownish green in colour.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
It is commonly available species in upper stretches of Ganga with 0.72% of faunal abundance. The maximum abundance is found at Kanpur and Narora with a percentage of 0.27 and 0.28 respectively. The minimum abundance is found at Haridwar (0.01%) during winter.



KNOWLEDGE GAINING FACTS

Freshwater Mussel are regarded as one of the indicator species in aquatic ecosystem. *Parreysia corrugata* is known for accumulation of bacterial infestation especially fecal coliform which can be used for microbial indicator studies. This bivalve is also used as medicinal aid for controlling blood pressure.

Parreysia occata (Lea 1860)

Common Name : Freshwater Mussel

TAXONOMIC CLASSIFICATION

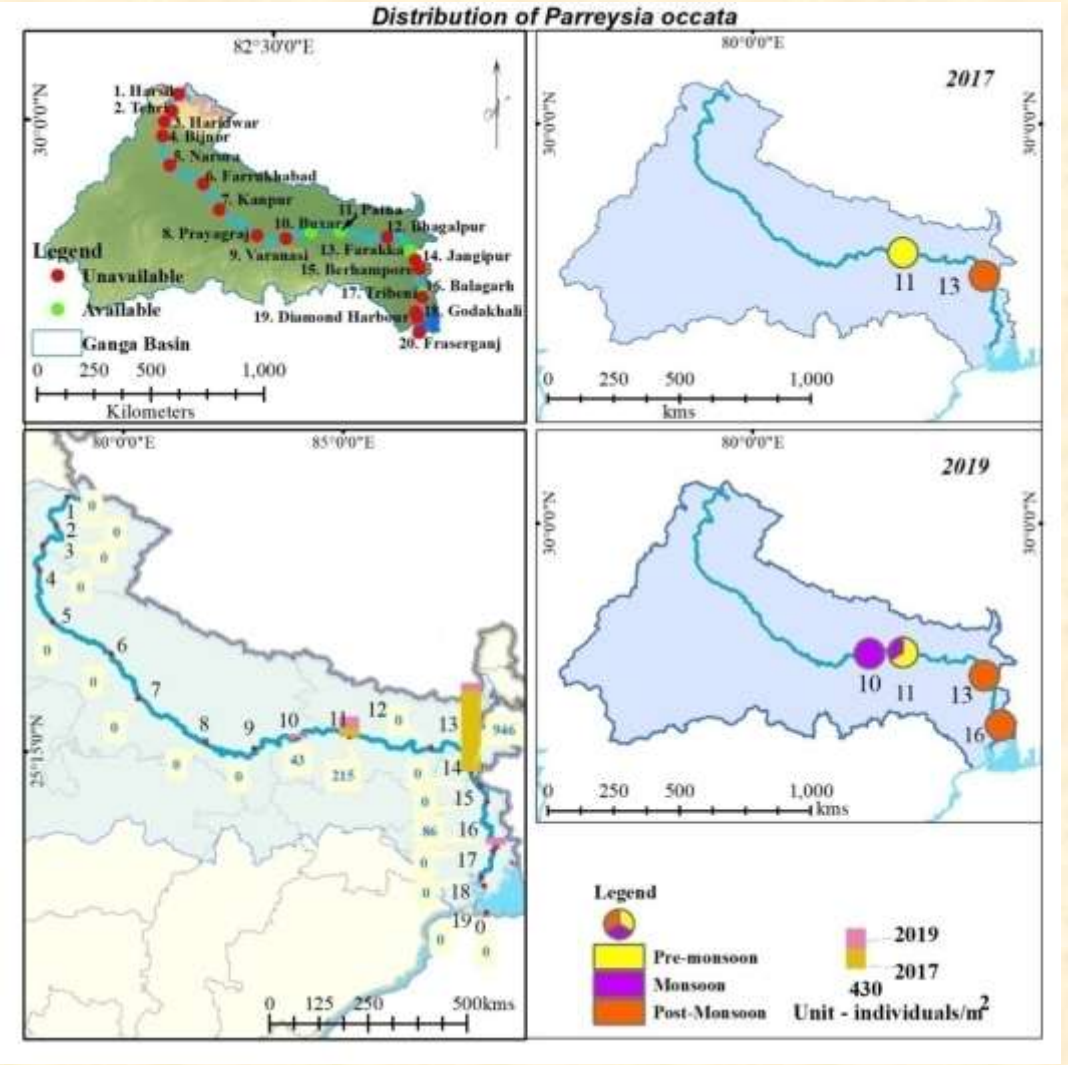
- Mollusca
- Bivalvia
- Heteroconchia
- Unionida
- Unionidae
- Parreysiinae
- ***Parreysia***
- ***P. occata***

IDENTIFYING FEATURES:
Rhomboidal in shape with tapered end at both the edges. Prominent lines running from left to right horizontally. Presence of granulated ridges along the extreme end. The shell is greenish brown in colour.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
The total abundance is 0.60% prevailing during pre-monsoon, monsoon and post-monsoon. The maximum abundance was recorded at Farakka (0.4%) during post-monsoon while the minimum is recorded at Buxar (0.02%) during monsoon.



KNOWLEDGE GAINING FACTS

Parreysia occata is available mostly during summer and monsoon in the inland freshwater ecosystems. This bivalve is often used for medicinal purpose, principle dietary item and also for ornamentation.

Parreysia shurtleffiana (Lea 1856)

TAXONOMIC CLASSIFICATION

- Mollusca
- Bivalvia
- Heteroconchia
- Unionida
- Unionidae
- Parreysiinae
- ***Parreysia***
- ***P. shurtleffiana***

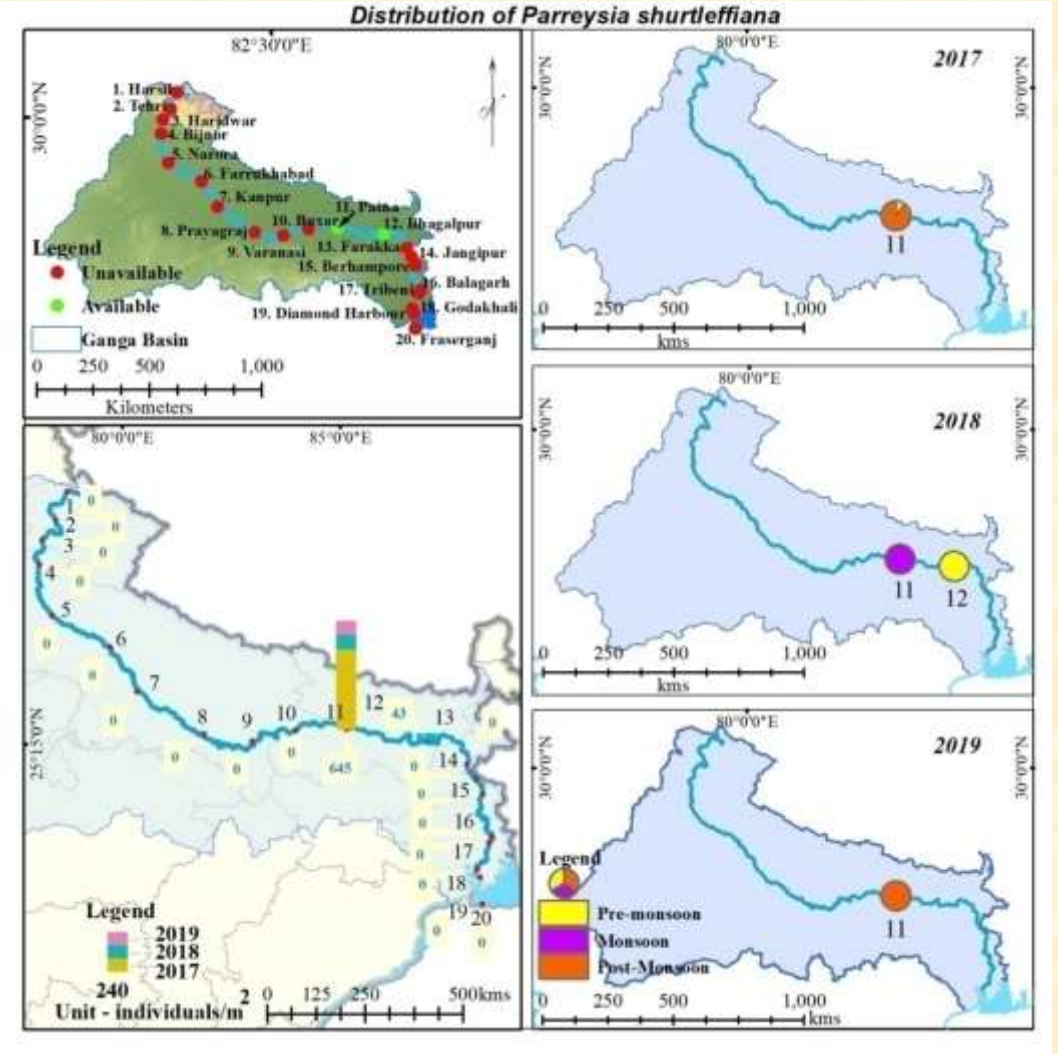
Common Name : Freshwater Mussel

IDENTIFYING FEATURES:
Shell is thick and ovoid in shape. Anteriorly tapped and the posterior is orbital. Umbo is neither flattened nor pointed. The colour of the shell is dark brown.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
A total abundance of 0.31% is found along Patna and Bhagalpur during pre-monsoon, monsoon and post-monsoon. The maximum abundance is recorded along Patna during post-monsoon with an abundance of 0.21%.



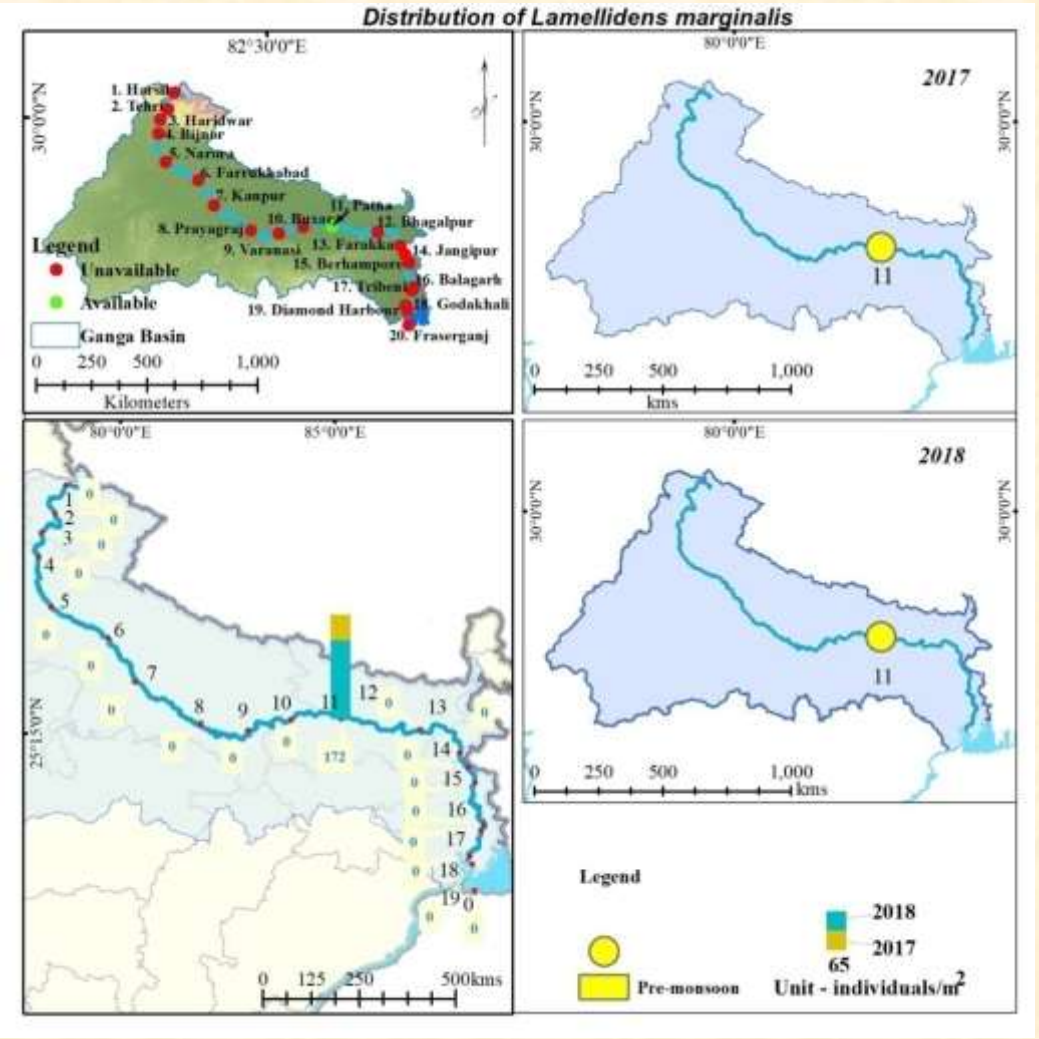
KNOWLEDGE GAINING FACTS

Parreysia shurtleffiana is one of common species in the Gangetic plain. The organisms are embedded in silt and mud covered soil texture (Nesemann et al., 2005)

Lamellidens marginalis (Lamarck, 1819)

TAXONOMIC CLASSIFICATION

- Mollusca
- Bivalvia
- Heteroconchia
- Unionida
- Parreysiinae
- Lamellidentini
- ***Lamellidens***
- ***L. marginalis***



Common Name : Freshwater Pearl Mussel

IDENTIFYING FEATURES:
The shell is oval in shape with distinct 'Y' between the two valves. The umbo is not significant. Colour of the shell is dark brown. The internal face of the shell is iridescent and pearly white.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
The maximum abundance is 0.08% found along the river. The specimens was found during pre-monsoon only at Patna.

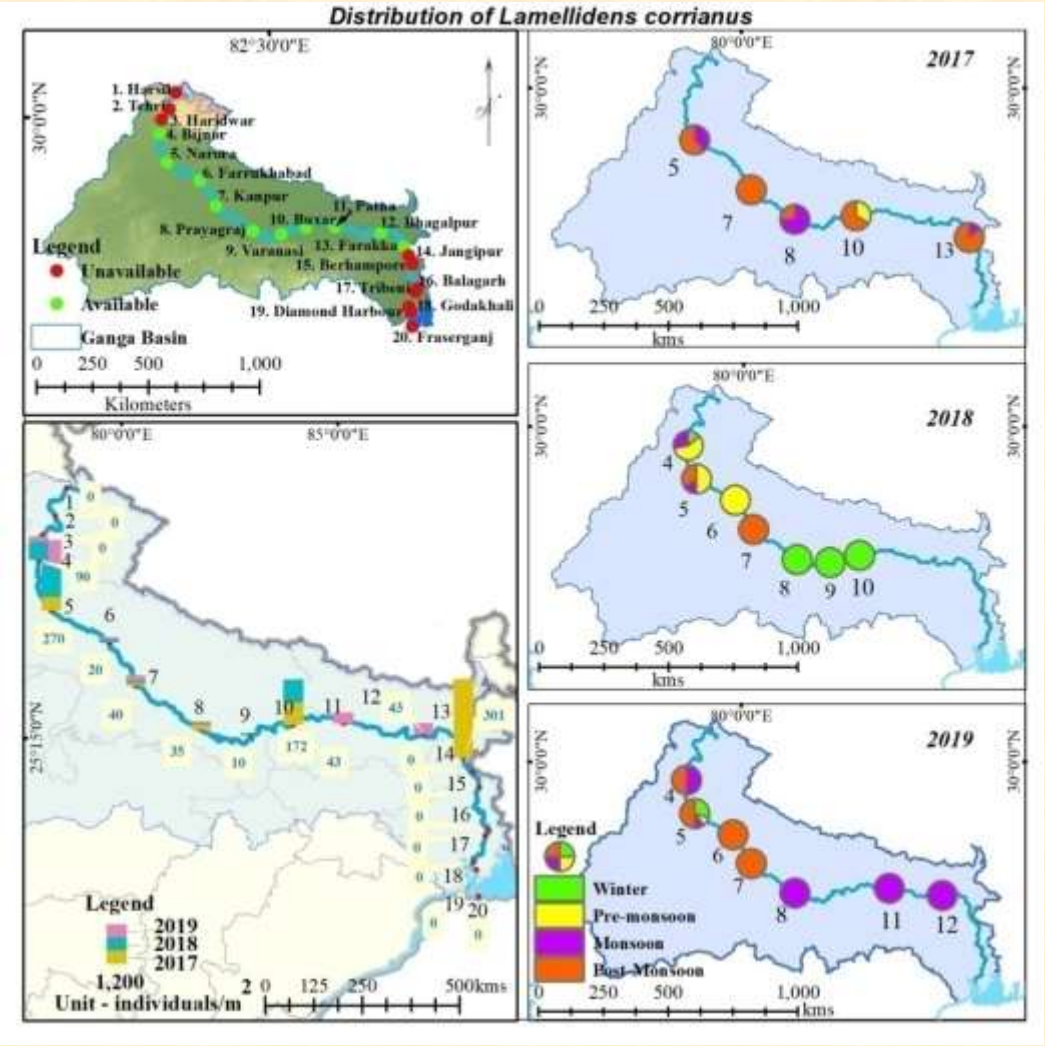
KNOWLEDGE GAINING FACTS

Presence of Glycogen, pyruvate and lactate in exposed tissues of the mussel. Studies have showed that there has been reduction in oxygen intake when intoxicated with copper sulphate solution (Satyaparameshwar et al., 2006).

Lamellidens corrianus (I. Lea, 1834)

TAXONOMIC CLASSIFICATION

- Mollusca
- Bivalvia
- Heteroconchia
- Unionida
- Parreysiinae
- Lamellidentini
- ***Lamellidens***
- ***L. corrianus***



Common Name : Freshwater Pearl Mussel

IDENTIFYING FEATURES:
Oval structured valves. The umbo is indistinct with small sharp hinge teeth. The inside of the shell is bright and shiny with distinct occipital groves.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
It is a commonly available species along the river from Bijnor to Farakka, with a relative abundance of 0.49%. The maximum abundance recorded from Farakka (0.12%) during post-monsoon. Prayagraj recorded the minimum abundance of 0.002% during pre-monsoon and post-monsoon.

KNOWLEDGE GAINING FACTS

Lamellidens corrianus is one of the nutrient rich food source for local people. It is seen that the mussel contains a high calorific value with proper protein and carbohydrate diet. Freshwater mussels show positive correlation with dissolved oxygen and pH whereas it shows negative correlation with conductivity, nitrate, turbidity and total dissolved solids (Dey et al., 2016)

Corbicula striatella (Deshayes, 1855)

TAXONOMIC CLASSIFICATION

- Mollusca
- Bivalvia
- Heteroconchia
- Venerida
- Cyrenoidae
- Cyrenidae
- ***Corbicula***
- ***C. striatella***

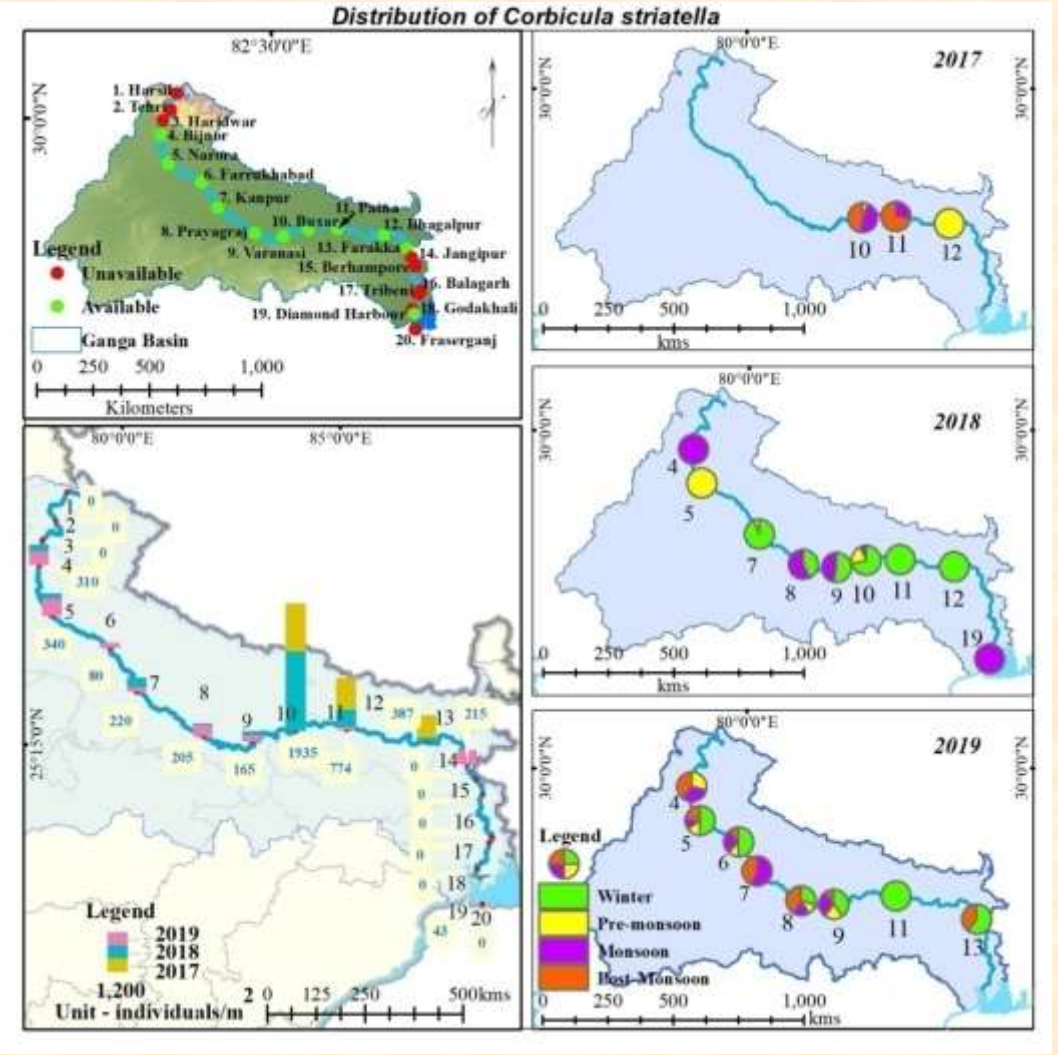
Common Name : Basket Clam

IDENTIFYING FEATURES:
Thick calcified valves with triangular oval shape. The umbo is prominent and elevated while the dorsal margin is arched. Presence of horizontal striations on shell. The colour of the shell is bright yellowish green with bluish coloured umbo.

HABITAT : Freshwater

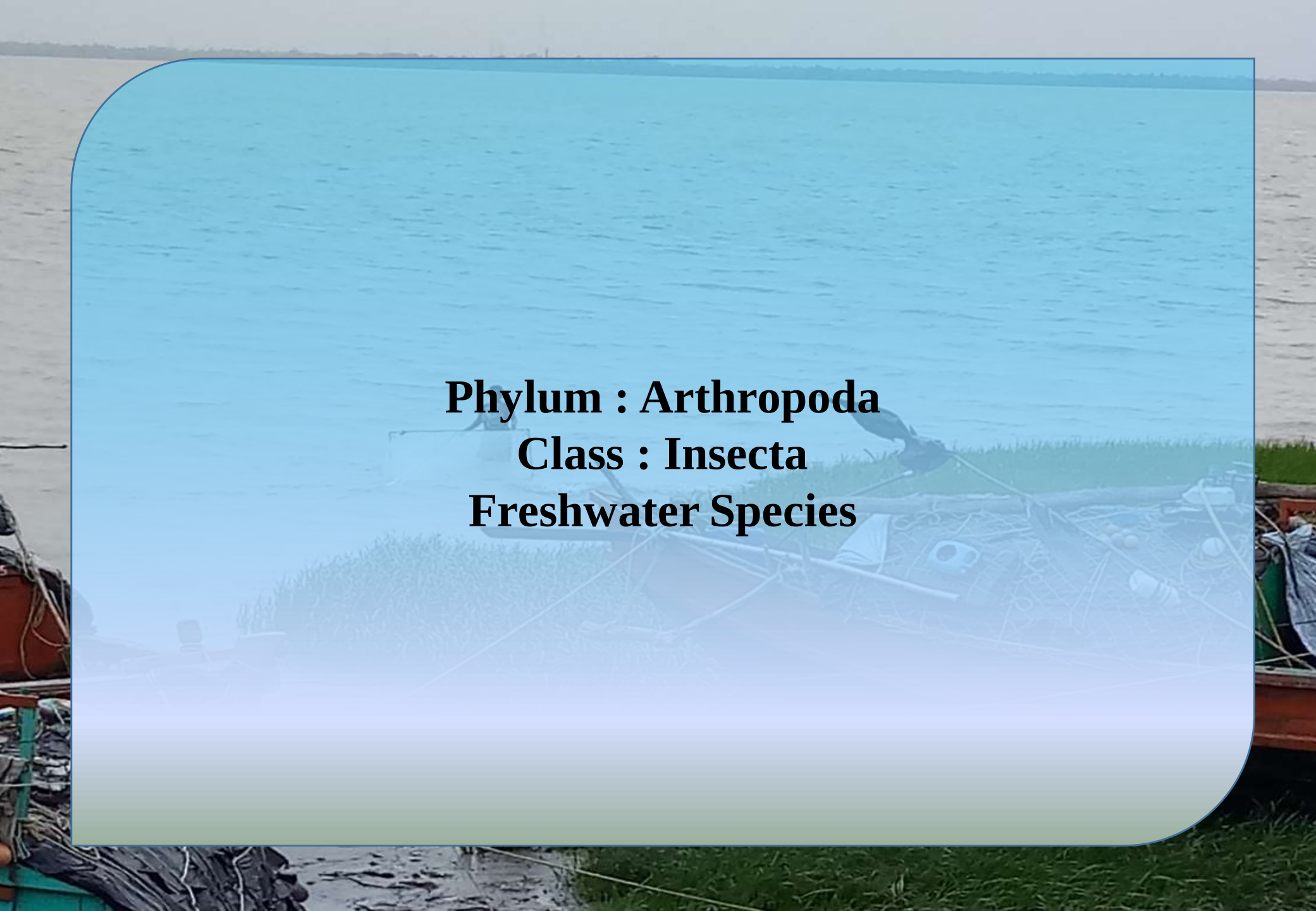
IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Total abundance of 2.16% is recorded from Bijnor to Farakka. The highest abundance is recorded from Buxar (0.90%) during winter. Patna recorded second highest abundance (0.36%) during monsoon and post-monsoon. The least abundance is recorded at Farukhabad (0.04%) during pre-monsoon and post-monsoon. Due to reduced salinity, 43 inds/m^2 are recorded at Diamond Harbour during monsoon in 2018.



KNOWLEDGE GAINING FACTS

Corbicula striatella is available all throughout the year in the inland freshwater ecosystems. Biomagnification of copper, lead and zinc concentrations were seen to be the highest amongst any other bivalves, for which it is regarded as a sentinel species for biomonitoring of ecosystem.



Phylum : Arthropoda
Class : Insecta
Freshwater Species

Anax sp. (Leach, 1815)

TAXONOMIC CLASSIFICATION

- Arthropoda
- Insecta
- Odonata
- Anisoptera
- Aeshnidae
- ***Anax* sp.**

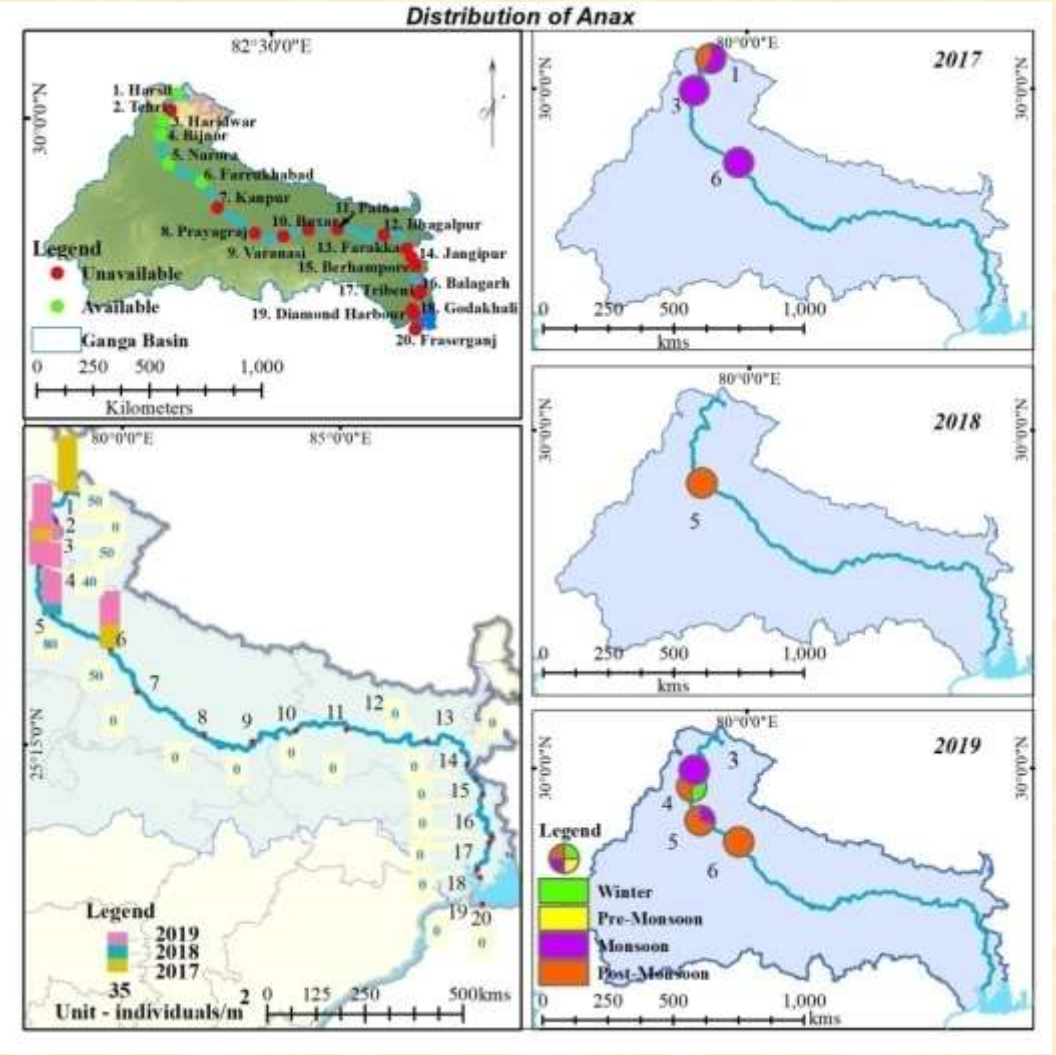
Common Name : Dragonfly

IDENTIFYING FEATURES:
Five anal appendages consisting of a pair of dorsolateral cerci, an epiproct (above the anus), and a pair of paraproct (one at each side and extending below the anus). The anal appendages are usually shorter than the combined lengths of the last three abdominal segments. 7-9 lateral spines on abdominal segments.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Total abundance of 0.125% is available from upper stretch, Harshil to Farrukhabad. 100 inds/m^2 were collected from Bijnor and Farrukhabad during post-monsoon, apart from monsoon.



KNOWLEDGE GAINING FACTS

Dragonflies can swim in water by propulsion though the abdomen on the water which helps them to move forward. *Anax* sp. is one of most voracious predator for fish spawn and fry. It can feed on 15 – 20 mm sized pike fish fry specially in open water systems (Louarn, 1997).

Aeshna cyanea (Müller, 1764)

TAXONOMIC CLASSIFICATION

- Arthropoda
- Insecta
- Odonata
- Anisoptera
- Aeshnidae
- ***Aeshna***
- ***A. cyanea***

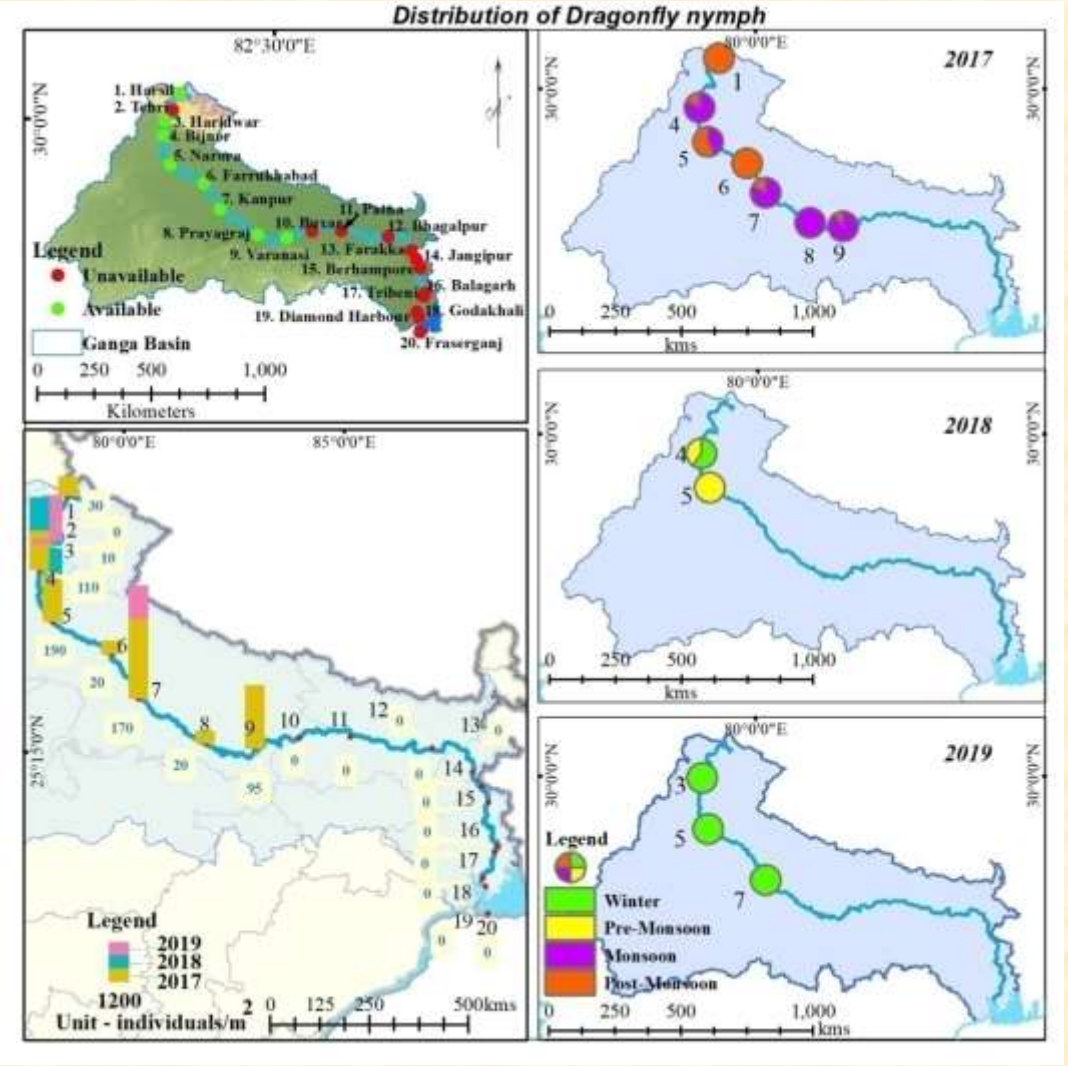
Common Name : Dragonfly Nymph

IDENTIFYING FEATURES:
Usually drab, chunky or elongated aquatic insect with six appendages. Each leg having two claws. Eyes are larger. Abdomen often oval or rounded segmented, often with five wedge-shaped or pointed structures at the hind end. Scoop like lower jaw, covering most of the lower portion of the head. External feathery gills are absent.

HABITAT : Freshwater.

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Starting from Haridwar to Varanasi a total abundance 0.30% was recorded. The maximum percentage of 0.08 was observed at Narora followed by 0.07 at Kanpur and 0.05 at Bijnor and the minimum abundance was at Haridwar (0.01%).



KNOWLEDGE GAINING FACTS

Dragonfly nymph are fast swimmers and swims on the surface of the water by jet spraying. The elongated cylindrical body contracts during speeding in which the muscles and body fluid squeezes and helps them to move forward. The gills are protected with rectal chamber which during breathing pumps out water through anus and propels rapidly forward towards the prey.

Enallagma sp. (Charpentier, 1840)

TAXONOMIC CLASSIFICATION

- Arthropoda
- Insecta
- Odonata
- Coenagrionidae
- ***Enallagma* sp.**

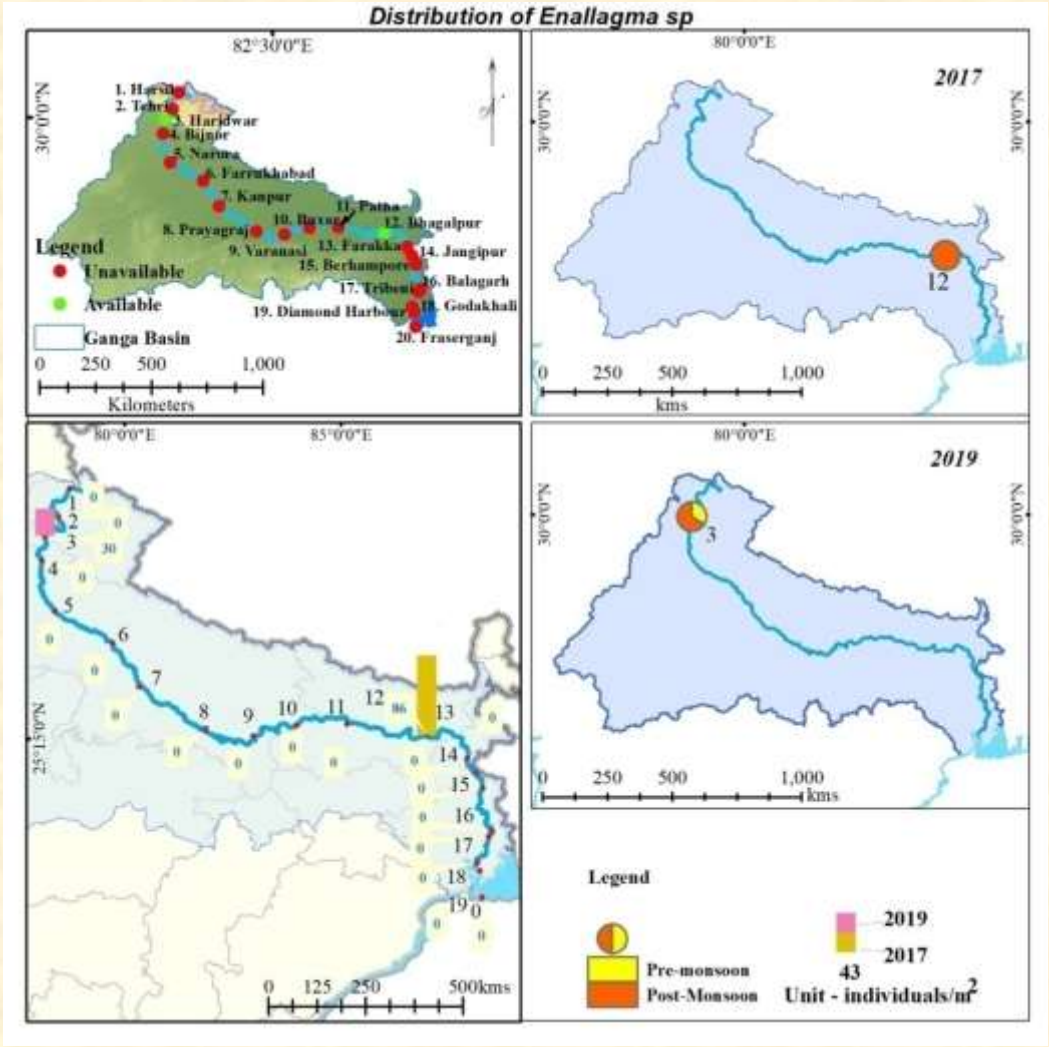
Common Name : Bluet

IDENTIFYING FEATURES:
Slender body shape with head wider than thorax and abdomen. Three long feather-like gills at posterior end. Mask-like labium below chewing mouthparts is present in nymph. Segmented legs present, each with two claws. Pair of lobes at distal end of labral mask each with 6 setae.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
The total available abundance along the stretch is 0.05%. The maximum abundance is recorded at Bhagalpur (0.004%) during post monsoon. Species available from pre-monsoon and post-monsoon at Haridwar is 10 and 20 inds/m^2 respectively during 2019.



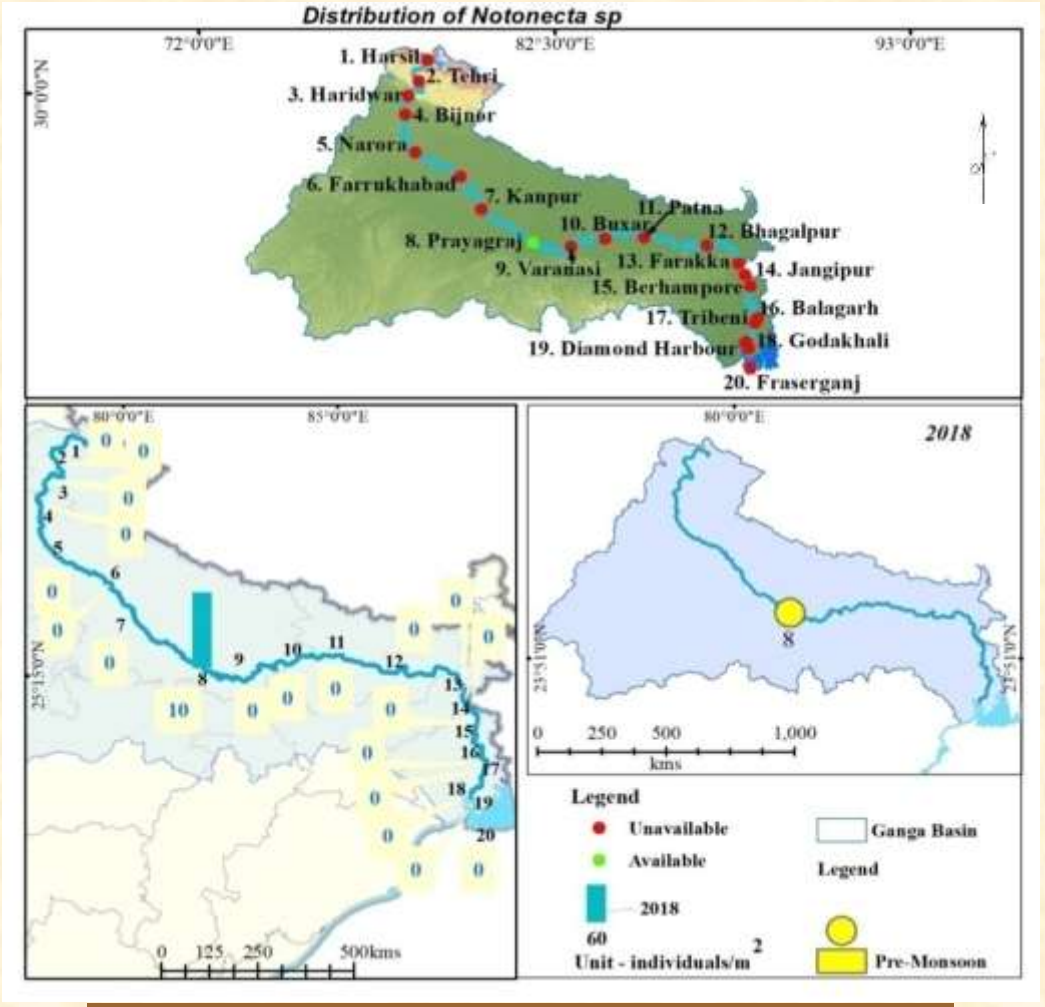
KNOWLEDGE GAINING FACTS

Enallagma sp. has been seen in acidic as well as eutrophic water bodies. They have been considered as one of the sensitive insects in an aquatic system. They are important within the trophic levels as they are an intermediate predator. They consume smaller larvae and prey on fish larvae.

Notonecta sp. (Linnaeus, 1758)

TAXONOMIC CLASSIFICATION

- Arthropoda
- Insecta
- Hemiptera
- Notonectidae
- ***Notonecta* sp.**



Common Name : Common Backswimmers

IDENTIFYING FEATURES:
Body shape is elongated with wings which may or may not be present in adults. Mandibles are needle like pointed in nymph and adult. From dorsal view, antennae are hidden and short. Hind legs are fringed with curing hairs.

HABITAT : Freshwater

IUCN : Not Evaluated

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
It is a common water insect found inhabiting in unclean waters of Prayagraj. The total abundance is 0.004% recorded during pre-monsoon. Insects breed well during the pre-monsoon period.

KNOWLEDGE GAINING FACTS

Notonecta consists of hair like setae which help them to maintain their lifestyle in the aquatic environment. They swim upside down from the surface of the water. They consume direct air rather breathing dissolved oxygen from water. The setae helps to trap the air and help the insect to intake atmospheric oxygen. A unique fact about Notonecta is that the air film is visible as a silvery layer on the body (Kuru et al., 2011) .

Caenis sp. (Stephens, 1835)

TAXONOMIC CLASSIFICATION

- Arthropoda
- Insecta
- Ephemeroptera
- Caenidae
- ***Caenis* sp**

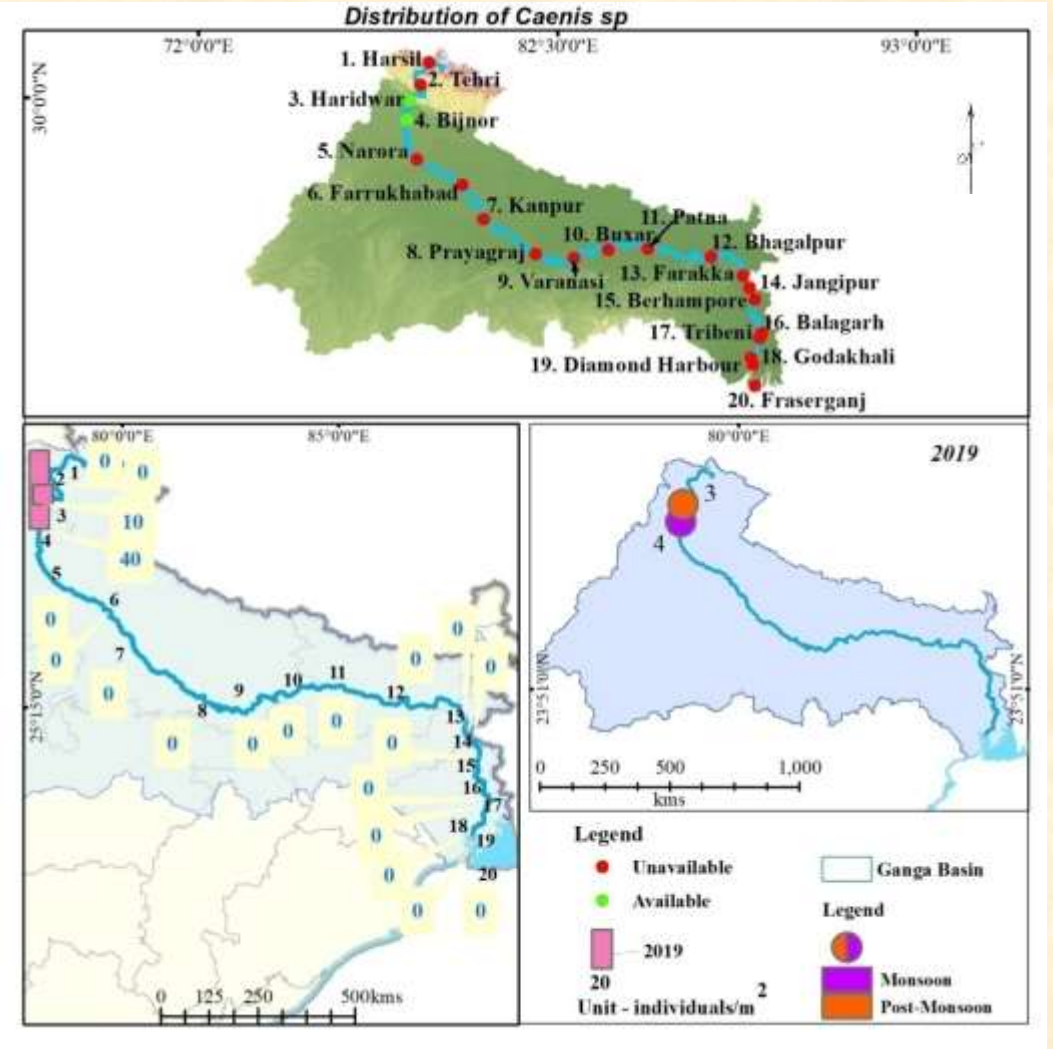
Common Name : Mayfly

IDENTIFYING FEATURES:
Mouth is well developed for mastication. Gill are present on the side and top of the abdomen. The segmented appendages are attached with tarsal claw. The gills are present in the abdominal segment of the body**.**

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
A total abundance of 0.04% was recoded along the river bed. Species is recorded in Haridwar and Bijnor with a maximum abundance of 0.02%. Monsoon is the ideal season for their abundance.



KNOWLEDGE GAINING FACTS

Caenis sp. reveals a great deal of ideas about the benthic community of the lacustrine ecosystem as well as riverine ecosystem. These insects also exhibit parthenogenetic behavior as their one of reproductive technique.

Leptophlebia sp. (Banks 1900)

TAXONOMIC CLASSIFICATION

- Arthropoda
- Insecta
- Ephemeroptera
- Leptophlebiidae
- ***Leptophlebia* sp.**

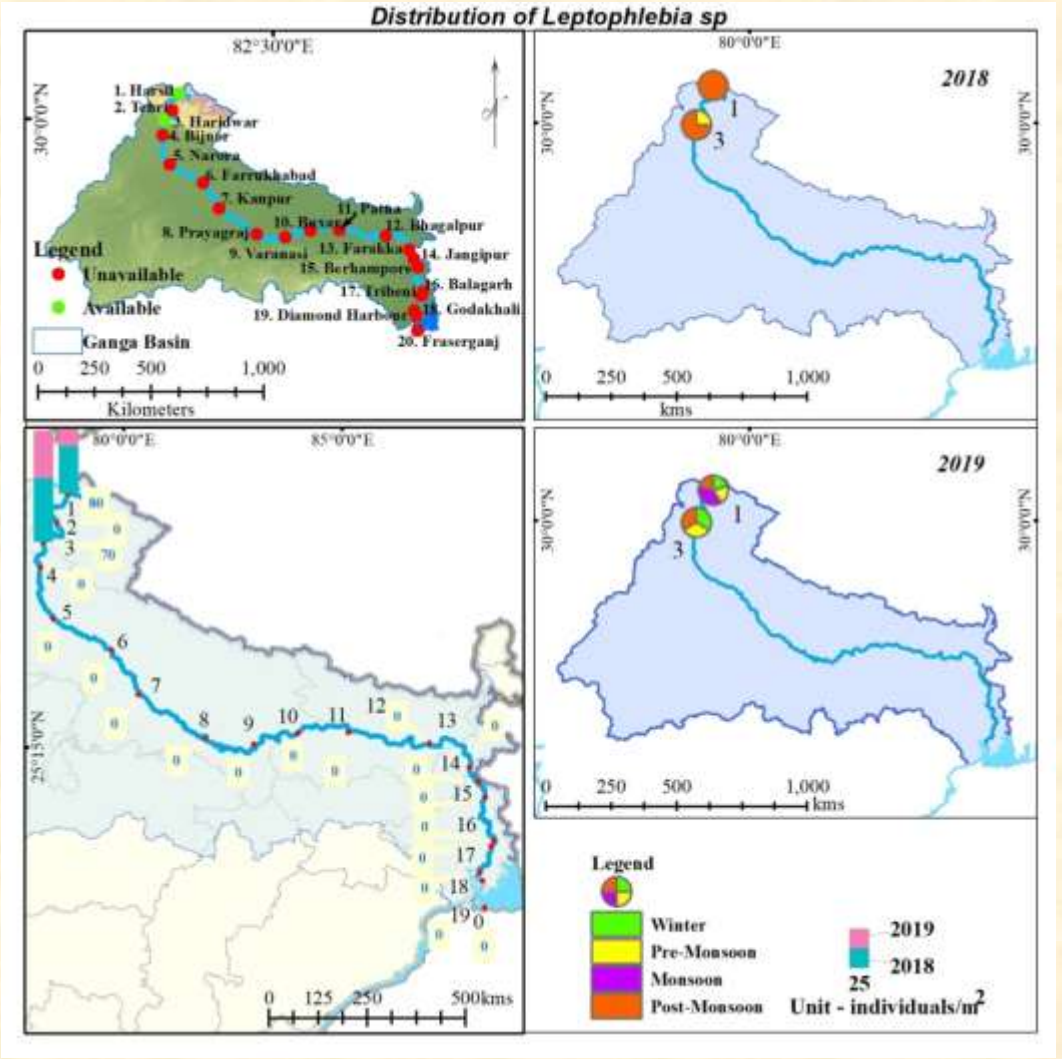
Common Name : Prong-gilled Mayfly

IDENTIFYING FEATURES:
Mouth is well developed for mastication. Gills are present on the side and top of the abdominal segment The segmented appendages are attached with a tarsal claw.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Harshil and Haridwar are infested with Mayfly with low abundance of 0.06%. It is recorded that in 2019, the species is available throughout the year. In 2018, 0.032% abundance was observed during pre-monsoon and post-monsoon.



KNOWLEDGE GAINING FACTS

Leptophlebia sp. acts as an alternate host for the parasitic nematode *Cystidicoloides tenuissima* which infects fish in their alimentary canal. The Mayfly nymph feeds on the eggs of nematode, which thereby consumed by fish and gets infected.

Heptagenia sp. (Walsh, 1863)

TAXONOMIC CLASSIFICATION

- Arthropoda
- Insecta
- Ephemeroptera
- Heptageniidae
- ***Heptagenia* sp.**

Common Name : Flatheaded Mayflies

IDENTIFYING FEATURES:

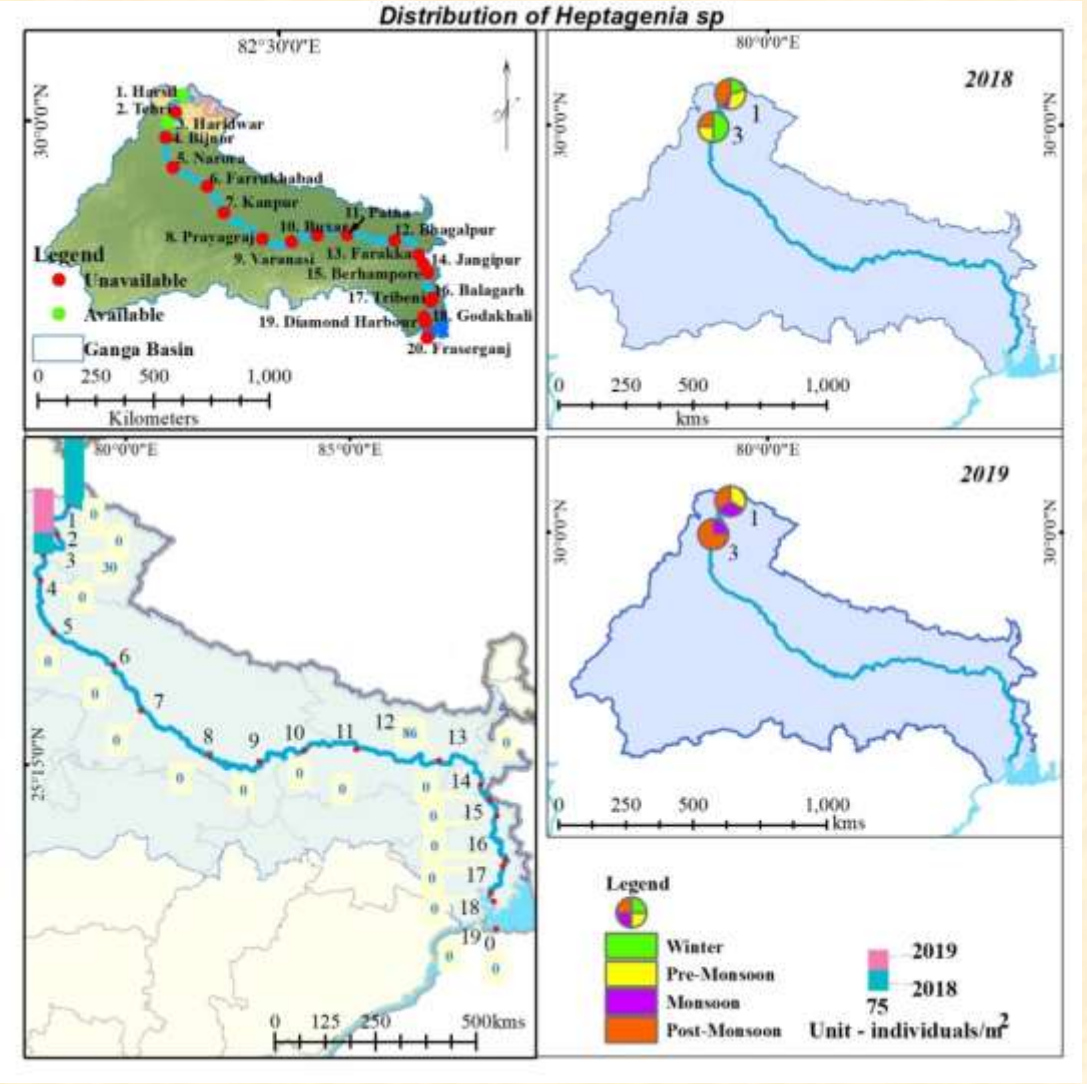
Body is markedly compressed with thorax, wide head, and femora. Eyes are dorsal, plate-like gills, each usually with tuft while the Pronotum is behind head. Femoral dark spot is absent. From dorsal side mandibles are not noticeable. Claws are much tinier than tarsi. Abdominal gills on 2–7th segment are of variable shaped depending on genus and species.

HABITAT : Freshwater (Nymph sticks on the stone surface).

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :

Total abundance of 0.15% is recorded from Harhsil and Haridwar. The species abundance at Harshil is recorded maximum during all the four season (0.09%) while in Haridwar lowest abundance recorded is 0.05% during pre-monsoon and post-monsoon.



KNOWLEDGE GAINING FACTS

The nymph of *Heptagenia* sp. is a stone clinger mostly common on rivers. These flattened stone-clinger nymphs have alternating light-and-dark strapped tails which helps to separate this species from other organisms.

Cinygma sp. (McDunnough, 1934)

TAXONOMIC CLASSIFICATION

- Arthropoda
- Insecta
- Ephemeroptera
- Heptageniidae
- ***Cinygma* sp.**

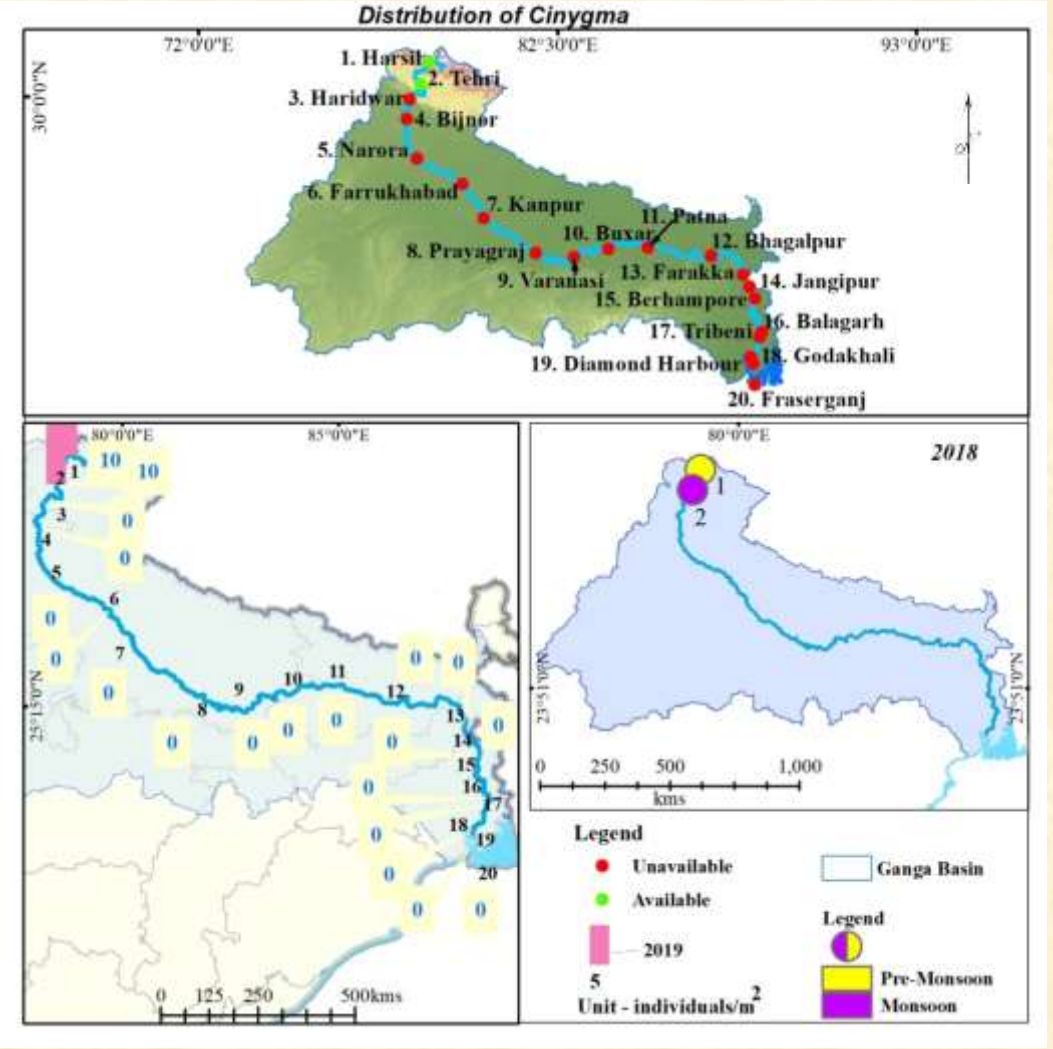
Common Name : Mayflies

IDENTIFYING FEATURES:
The body is flattened. The mandibles have tusk like projection. Adult having tracheal gills on the abdomen, unpaired tarsal claws and an enlarged mesothorax. The metathoracic wing pad is seen only by lifting the mesothoracic wing. Tracheal gills occur on abdominal segments 1 to 7 or reduced or absent. There are always two or three tails arising from the tenth abdominal segment. First pair of gill lamellae is smaller than the second pair which has smaller fibrilliform.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Harshil and Tehri recorded the maximum abundance of 0.01%. The species are dominant during pre-monsoon and monsoon at Harshil and Tehri respectively.



KNOWLEDGE GAINING FACTS

Cinygma sp. can breath both dissolved oxygen and atmospheric oxygen in order to survive in a aquatic habitat. There are presence of organophosphate insecticides particularly Chloropyrifos, since they have a wide exposure of epithelial surface to take in atmospheric oxygen as well as perform osmoregulatory activities in water.

Beatis sp. (Leach, 1815)

TAXONOMIC CLASSIFICATION

- Arthropoda
- Insecta
- Ephemeroptera
- Baetidae
- ***Beatis* sp.**

Common Name : Minnow Mayflies

IDENTIFYING FEATURES:

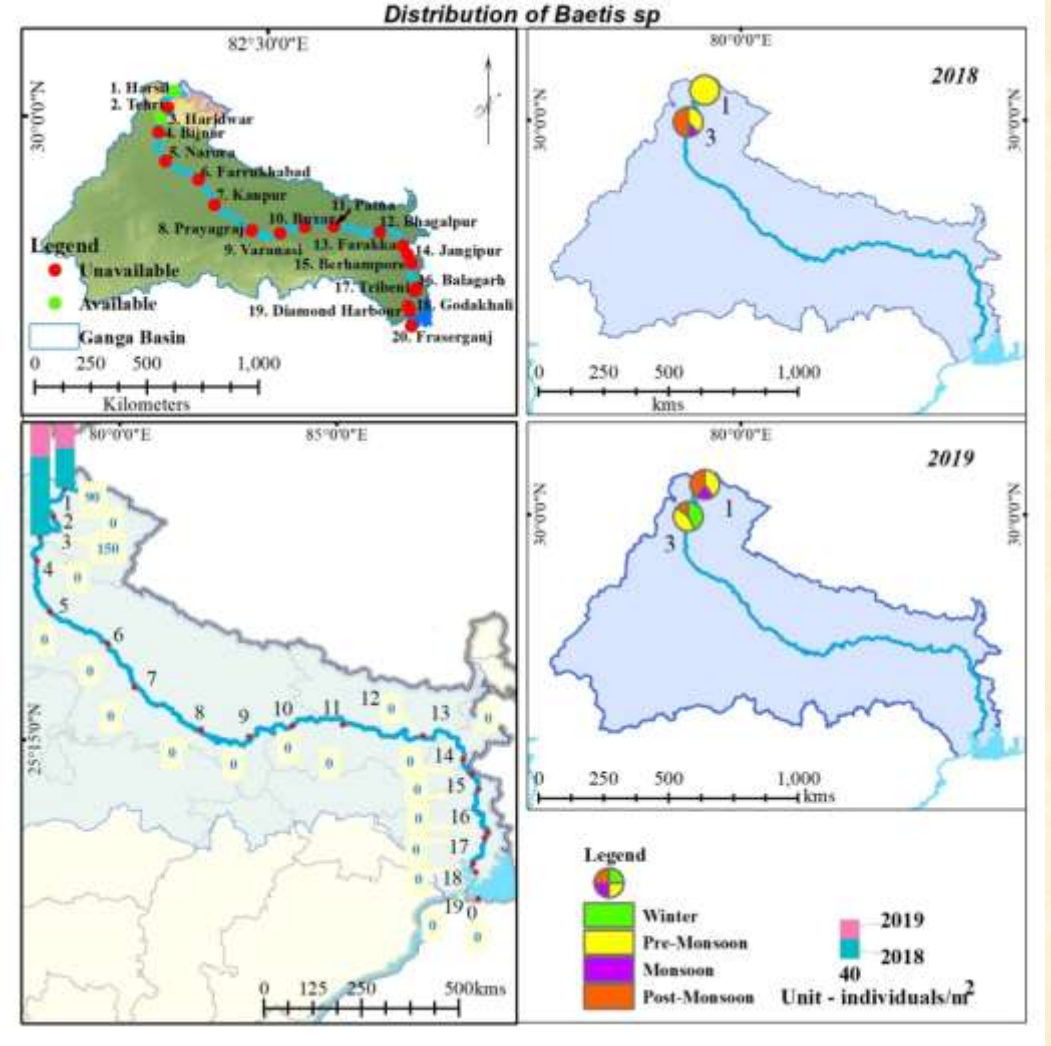
Gills exists on sides and tops of abdomen which are oval shaped. Gill lamellae are single, double or triple folded; rarely with fringe on internal margins, never with pointed ends or terminal filaments. Each leg is having one tarsal claw. Tails are generally 3 in number (occasionally 2). Labrum is usually with median antennae and notch is usually elongated.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :

Baetis sp. is one of the dominant species at Harshil and Haridwar with a total abundance of 0.11%. Pre-monsoon, monsoon and post-monsoon abundance is recorded during 2018 at Haridwar (0.14%). Lowest abundance of 0.06% is recorded at Haridwar during winter.



KNOWLEDGE GAINING FACTS

Beatis sp. are active swimmers and live in running water, but maximum population observed in slow flowing stream. They have a habit of purposefully drifting short distances with the current to find a new home; sunrise and sunset is the main time for this activity.

Psephenus sp. (Haldeman, 1853)

TAXONOMIC CLASSIFICATION

- Arthropoda
- Insecta
- Coleoptera
- Psephenidae
- ***Psephenus* sp.**

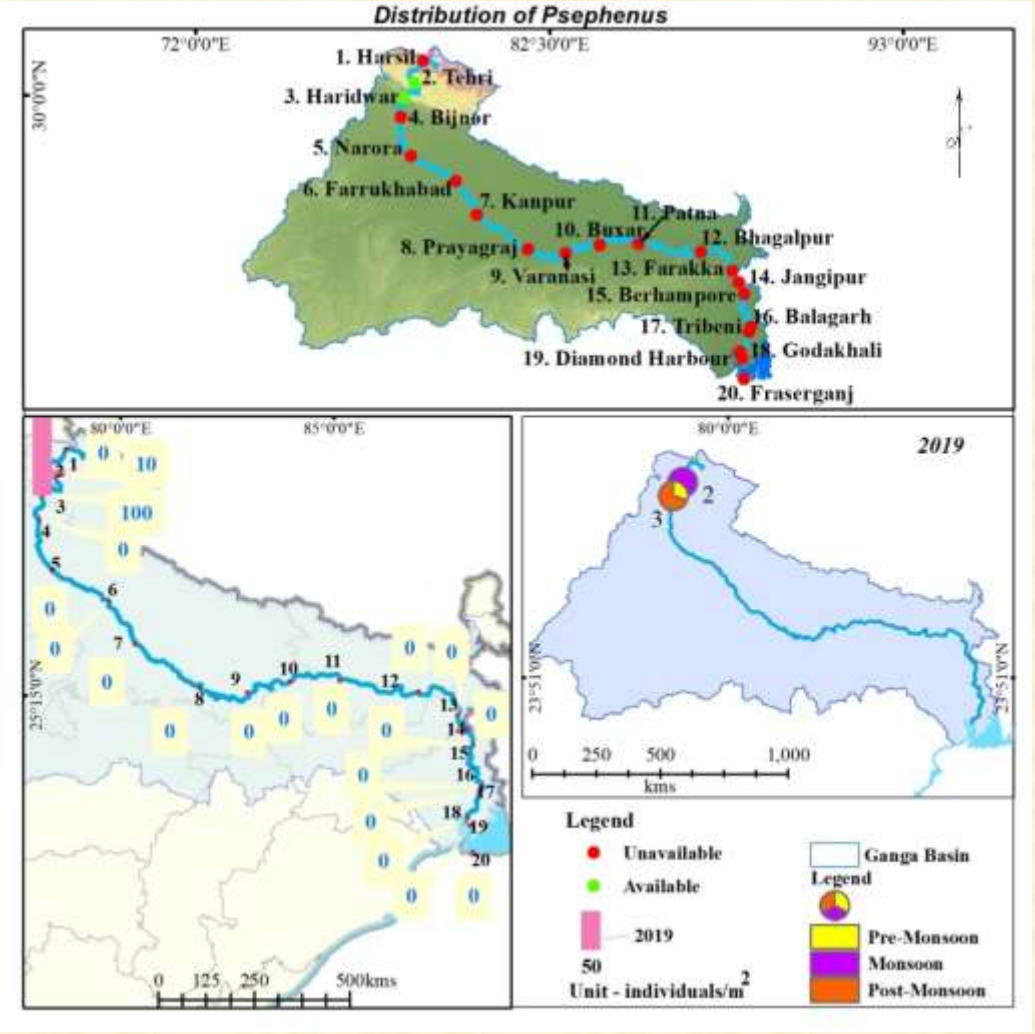
Common Name : Water Penny Beetles

IDENTIFYING FEATURES:
Body dorsoventrally compressed with nine abdominal segment and thoracic tergite extended laterally. Head have 2 to 3 short segmented antenna. Each thoracic leg comprise of 4 or 5 segments with 1 or 2 claws with single tarsal claw, used for walking.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Found in Tehri and Haridwar with a relative abundance of 0.051%. The maximum abundance observed in post-monsoon at Haridwar (0.032%) while minimum is found at Tehri (0.004%) during monsoon.



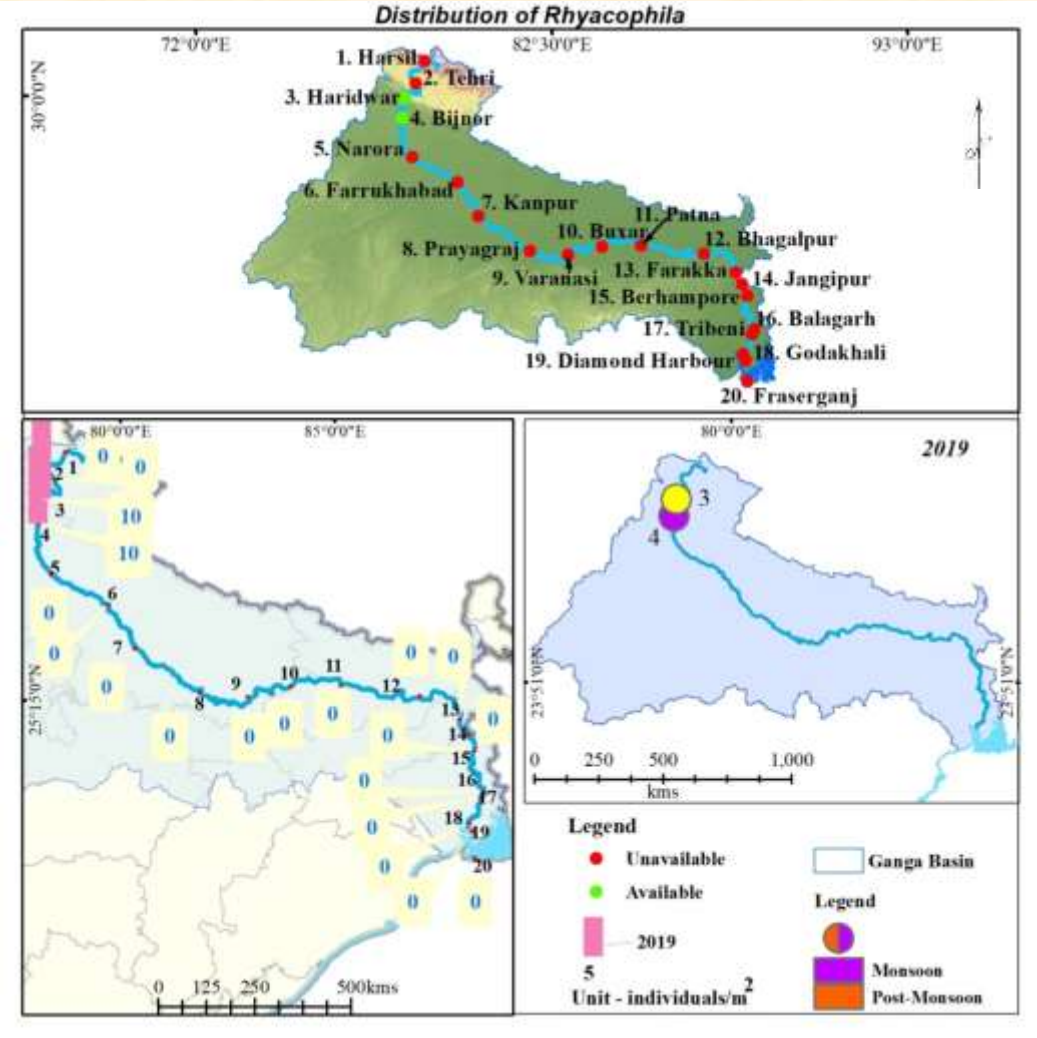
KNOWLEDGE GAINING FACTS

The highly flattened larvae of *Psephenus* sp. are able to withstand the force of flowing water in streams through numerous body mechanisms. An interpretation of the flattened body-shape is an adaptation to fast currents which prevent the larvae from being removed from substrate like undersides of stones, by any predator.

Rhyacophila sp. (Pictet, 1834)

TAXONOMIC CLASSIFICATION

- Arthropoda
- Insecta
- Tricoptera
- Rhycophilidae
- ***Rhycophila* sp**



Common Name : Caddis Fly

IDENTIFYING FEATURES:
Compound eyes are absent but eye spots are present. In anterior corners pronotum without lobes. Antennae are usually small and inconspicuous. Thorax is three pairs of segmented legs. Pair of free anal prologs each with single hook is located on last abdominal segment. Dorsal accessory hook is absent on anal claw; though, occasionally with a secondary lateral claw and sometimes with ventral teeth.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Haridwar and Bijnor have a relative abundance of the 0.135% during pre-monsoon and monsoon.

KNOWLEDGE GAINING FACTS

Rhyacophila sp. is regarded as one of the largest caddisfly genera in the world. There are about 100 species recorded from this genera. *Rhyacophila* sp. is regarded as one of the most predacious insect which inhabit in the cold swift flowing water.

Chironomus Larvae (Meigen, 1803)

TAXONOMIC CLASSIFICATION

- Arthropoda
- Insecta
- Diptera
- Chironomidae
- **Chironomus Larvae**

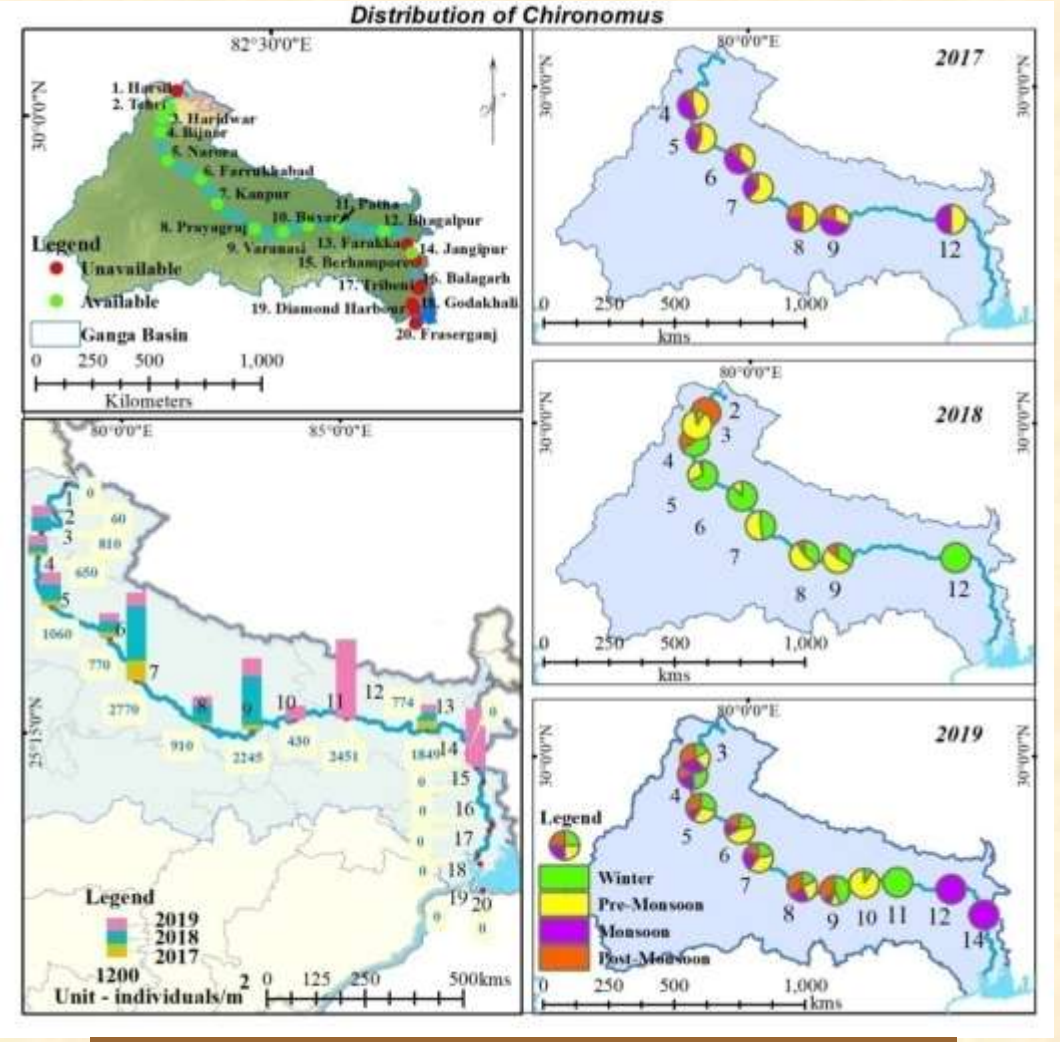
Common Name : Blood Worm

IDENTIFYING FEATURES:
Body is elongate, flattened and cylindrical. The larvae consists of scaleless, wingless and segmented body parts. The abdominal segment does not consists of radial hooks, instead have paired pseudopodia for locomotion. The mouth lies at the anterior part of the head capsule.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Larvae are found along the stretch from Tehri to Jangipur. The total abundance recorded is 6.89%. Highest abundance found at Patna (1.14%) during winter. The lowest is recorded at Tehri (60 inds/m^2) during post-monsoon.



KNOWLEDGE GAINING FACTS

Chironomid larvae are profusely available in the freshwater ecosystem, and thus can survive in a wide area of vegetation. Different chironomid larvae feeds on different organic matters, like some employs filter feeding mechanism through a sieve made by salivary secretion at the anterior part of the mouth while others feed on organic matter from the soil by ingesting the mud to extract the nutrition.

Phylum : Annelida
Class : Clitellata
Freshwater Species

Hirudinaria sp. (Whitman, 1886)

TAXONOMIC CLASSIFICATION

- Annelida
- Clitellata
- Arhynchobdellida
- Hirudiniformis
- Hirudinidae
- ***Hirudinaria* sp.**

Common Name : Common Leeches

IDENTIFYING FEATURES:

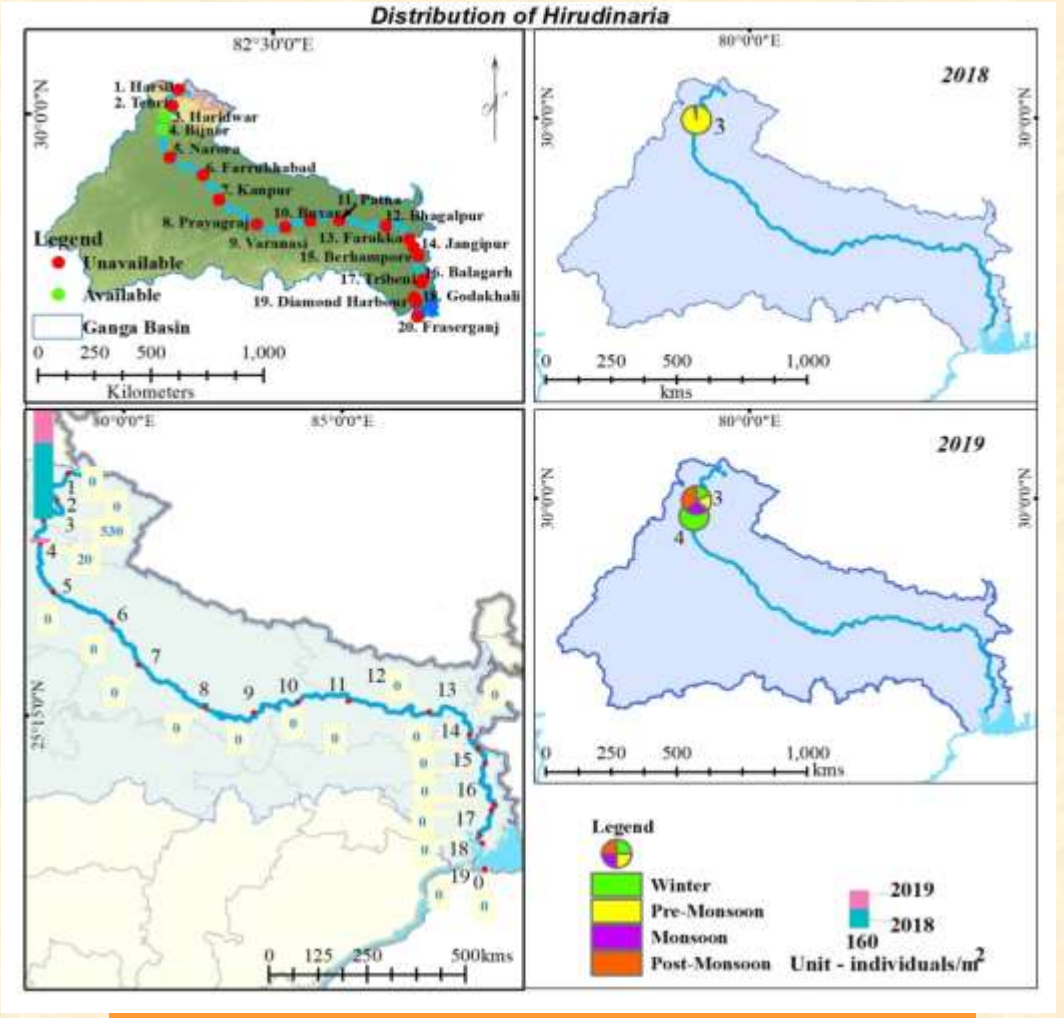
Body is soft, elongated, bilaterally symmetrical and segmented. The body is dorso-ventrally flattened but in a state of contraction, the body becomes more or less cylindrical. The colour of the body is olive-green with a black line in the middle.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :

A total abundance of 3.72% is recorded along the river bed primarily from Haridwar and Bijnor. The maximum abundance recorded during pre-monsoon is 2.02%, at Haridwar in 2018.



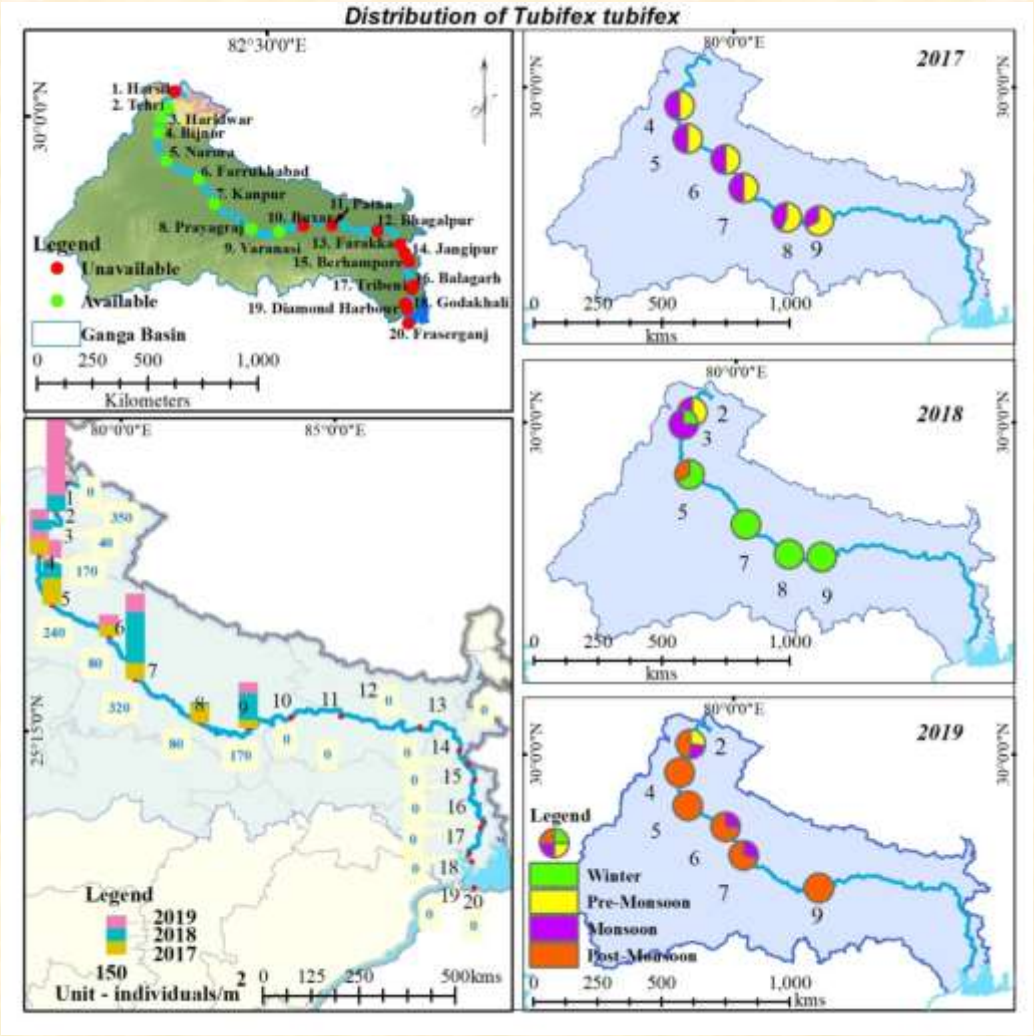
KNOWLEDGE GAINING FACTS

Hirudinaria sp. commonly known as medicinal leeches. They secrete saliva containing about 60 different proteins. Several of these secreted proteins serve as anticoagulants (such as hirudin), platelet aggregation inhibitors (most notably apyrase, collagenase, and calin), vasodilators, and proteinase inhibitors. The saliva contains an anesthetic secretion which makes the bite painless (Mohammad et al., 2013).

Tubifex tubifex (Müller, 1774)

TAXONOMIC CLASSIFICATION

- Annelida
- Clitellata
- Oligochaeta
- Haplotaxida
- Naididae
- ***Tubifex***
- ***T . tubifex***



Common Name : Sludge Worm

IDENTIFYING FEATURES:

Long slender body with red colour segmentation. The body is lined with bifurcated hairline setae. Male and female is differentiated with the presence of testes in male in the Xth segment and male pore in the XIth segment. The female XIth segment consists of the ovaries.

HABITAT : Freshwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :

Commonly available species in inland aquatic system. Total abundance of 0.67% is recorded along the stretch. The maximum abundance is found at Tehri (0.16%) during post-monsoon. At Kanpur, the highest abundance recorded during winter is 0.008% in 2018. The abundance reduced in Haridwar (0.001%) during winter.

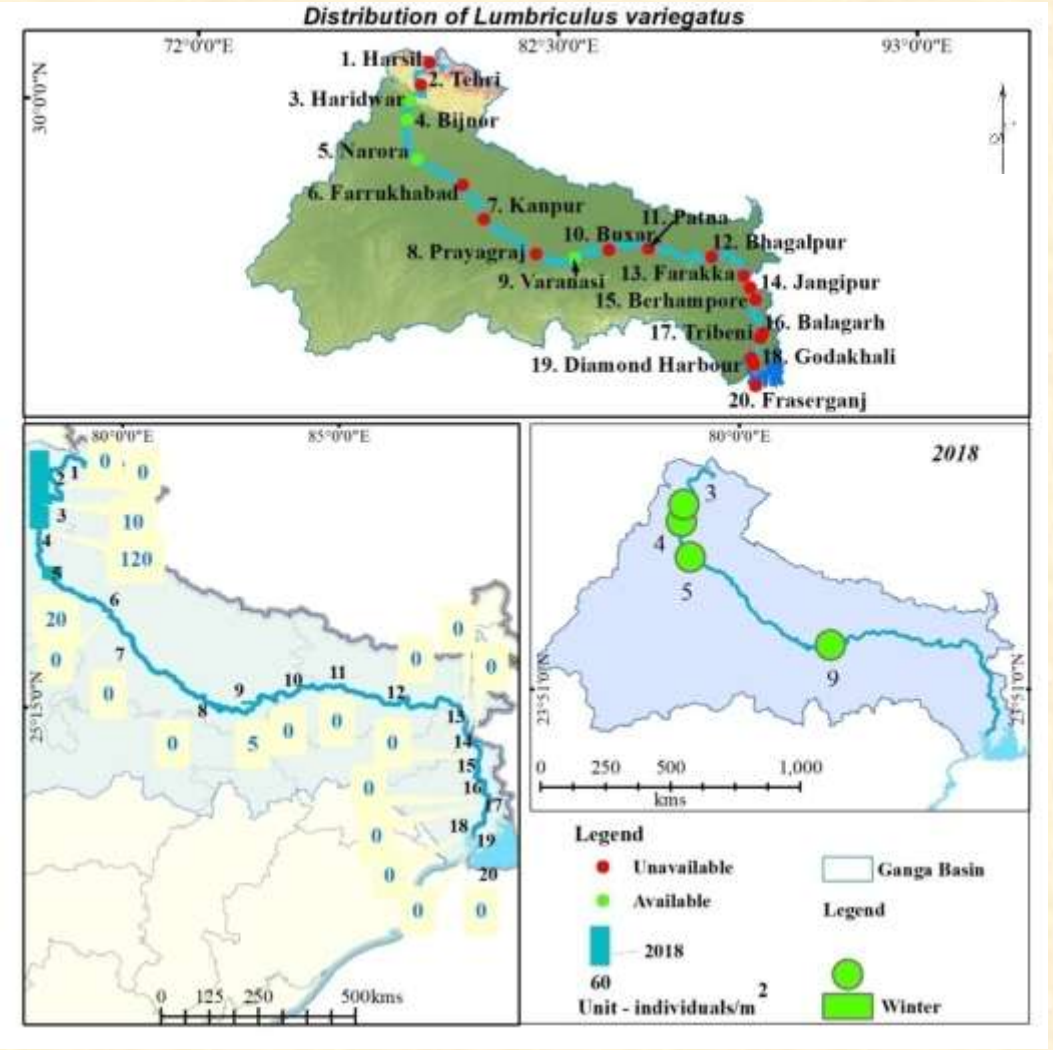
KNOWLEDGE GAINING FACTS

Tubifex tubifex can sustain in freshwater as well as in the oligohaline habitats and also coexist in the rain pools of arid habitats. The metal cations acts as bioaccumulation in the tissue cells of the organism. Cadmium and lead showed lethal evidence of high dosage exposure to the soft tissues of the organism.

Lumbriculus variegatus (Müller, 1774)

TAXONOMIC CLASSIFICATION

- Annelida
- Clitellata
- Oligochaeta
- Lumbriculida
- Lumbriculidae
- ***Lumbriculus***
- ***L. variegatus***



Common Name : California Blackworms

IDENTIFYING FEATURES:
Body is streamlined with numerous setae along the body for locomotion. The tail is tapered and head is broadened. The body contains 150-250 segments.

HABITAT : Lives on the muddy substratum of the marshy

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
Total abundance of 0.07% is available along the stretch. The maximum abundance is found at Bijnor (0.05%) during winter while minimum abundance is observed at Varanasi (0.002%) during winter.

KNOWLEDGE GAINING FACTS

Lumbriculus variegatus is a species of worms, inhabiting mostly in freshwater ponds, rivers and lakes. This oligochaete has 150-250 segments in the body which can regenerate to form another part. It has quick reflexes, and uses both photo-receptors to detect shadows and movement, and to escape prior threats.

Lumbricus terrestris (Linnaeus, 1758)

TAXONOMIC CLASSIFICATION

- Annelida
- Clitellata
- Oligochaeta
- Crassaclitellata
- Lumbricidae
- ***Lumbricus***
- ***L. terrestris***

Common Name : Common Earthworm

IDENTIFYING FEATURES:

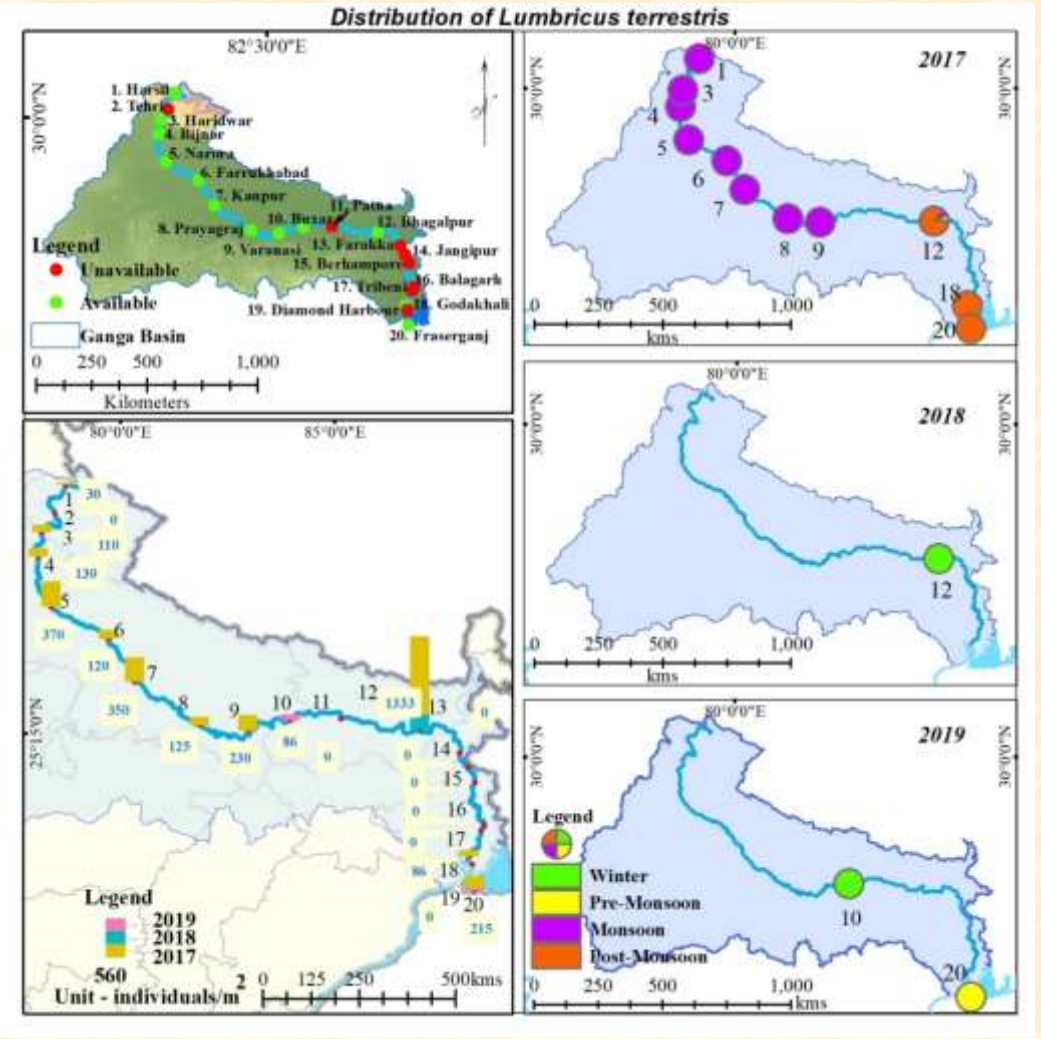
Body is elongated and segmented, measures upto 25-10 cm in length. Presence of primitive brain, a tuft of ganglion in the head region. Anterior part is dark coloured while the lower abdominal part is light coloured. Smooth flattened skin with a constant secretion of mucus and presence of tiny brush like setae which help them to anchor to substratum.

HABITAT : Freshwater / Brackishwater

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :

Harshil and Bhagalpur recorded 1.34% total abundance during monsoon. A percentage of 0.72 is recorded during monsoon at Prayagraj, while less abundance is recorded during winter (0.08%) at Bhagalpur.



KNOWLEDGE GAINING FACTS

Lumbricus terrestris is a relatively large anecic earthworm and it is a keystone detritovore that consumes leaf litter on the soil floor, thereby altering nutrient cycling and nutrient availability. It also affects seedling establishment and plant communities through its ingesting the seeds.

Polychaeta (Grube, 1850)

Common Name : Polychaete Worm

TAXONOMIC CLASSIFICATION

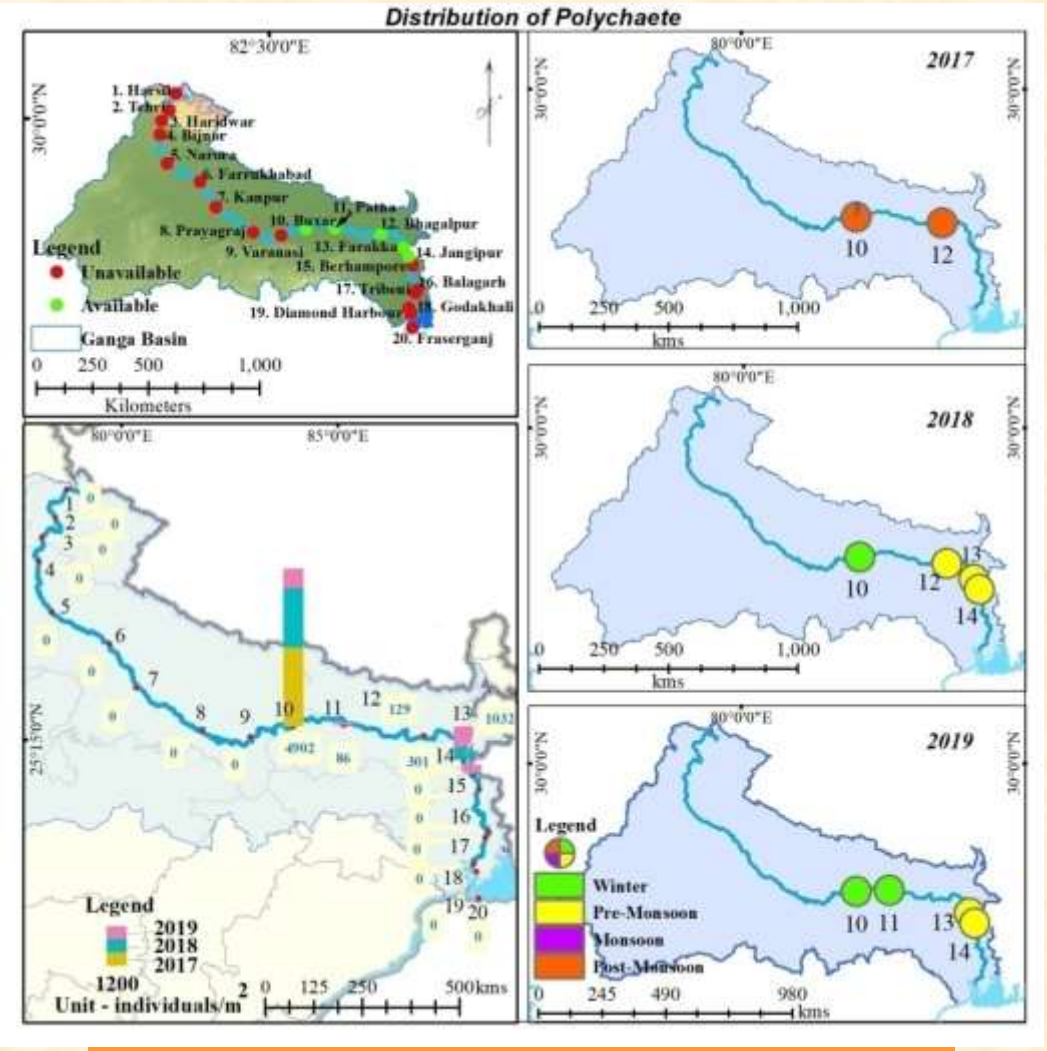
- Annelida
- Clitellata
- **Polychaeta**

IDENTIFYING FEATURES:
Long cylindrical segmented body with paddle-shaped vascularized parapodia used for locomotion purpose. The prostomium is well developed and consists of 4 pairs of eyes. Gills are absent instead breath through the thin body surface for surviving underground. Some of the polychaetes are having radiant colouration.

HABITAT : Sediments of the river and bottom dwelling

IUCN : Least Concern

RELATIVE ABUNDANCE AND SEASONAL DISTRIBUTION :
A total abundance of 3% is observed along the river. The maximum abundance recorded at Buxar is 1.08% during post-monsoon while the minimum is observed during winter at Patna (0.004%).



KNOWLEDGE GAINING FACTS

Polychaetes play essential ecological role, serving as predators on small invertebrates, as well as food for fish and large invertebrates. Polychaetes usually have a well-developed head, often complete with well-developed eyes, antennae, and sensory palps. They lack any permanent sexual organs ((Hickman and Roberts, 1994).

Sampling Activities





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