

ESTABLISHMENT OF RESCUE AND REHABILITATION CENTERS



FINAL REPORT

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[COMPONENT IV: BIODIVERSITY CONSERVATION AND GANGA REJUVENATION]



The background of the entire page is a blue-tinted photograph of several turtles in a body of water. One turtle is on the left, partially submerged, with its head and front legs visible. To its right, three more turtles are clustered together, also with their heads and front legs visible. The water is calm, and the overall scene is serene.

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Preface

The River Ganga traversing three distinct biogeographic zones, flows for approximately 2500 from its origin in Goumukh to Gangasagar, where it meets the Bay of Bengal. The river supports a rich biodiversity that is unique to each zone. The diverse life-forms that the river supports are however, struggling for their very existence due to the highly dense human population that is involved in unsustainable resource utilization. Pollution, poaching and climate change are additional threats that undermine the sustained survival of a range of vertebrate species. These factors are result in small, isolated and fragmented populations of conservation dependent species and necessitate interventions.

Achieving the conservation goals of multiple self-sustaining populations in suitable habitats within their natural range of occurrence is thus a challenging task. Improved enforcement efforts by line agencies result in confiscations of large number of multiple species confiscations of live animals, animal carcasses and body parts. Rescue and subsequent rehabilitation of live animals in natal/ suitable habitats addresses two key conservation concerns, namely judicious utilization of the confiscated animals and ensuring the presence of multiple self-sustaining populations of such species in suitable habitats within their natural range of occurrence. The current conservation paradigm of protected areas has limited application in addressing these concerns as much of the biodiversity of the river resides in areas outside the protected area network and the resource are utilized by multiple stakeholders.

A key concern at the outset was the limited capacities of line agencies in managing such rescue and rehabilitation efforts. Further a key stakeholder i.e. local communities inhabiting the riverfront and possessing traditional knowledge of the River and its inhabitants remain unaware of the quantum of the problem. These stakeholders with enhancement of capacities in skills required for effective rescue and rehabilitation of aquatic macro-fauna can play a critical role in conservation of the river and its biodiversity.

The activities under the project were focussed on addressing concerns regarding rescue and rehabilitation of aquatic macro-fauna of the River Ganga in natural habitats. Three facilities for rescue and rehabilitation of aquatic macro-fauna were upgraded/ established based on empirical knowledge and expert advice. Capacity enhancement programs for key stakeholders in the states of Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal, namely local communities inhabiting the riverfront, forest department officials and field veterinarians of animal husbandry departments were conducted to develop human resources that synergistically may contribute to the conservation of the river.

Authors

Executive Summary

One of the largest rivers of Asia, Ganga covers a distance of approximately 2500 km from its origin in Goumukh to Gangasagar, where it flows into the Bay of Bengal. The river supports a unique assemblage of biodiversity as it traverses three distinct biogeographic zones; the Himalayas, the Gangetic Plains and the Coastal Zone (Rodgers & Panwar, 1988). The river is accordingly divided into three stretches; the upper stretch from Goumukh to Haridwar, the middle stretch from Haridwar to Varanasi and the lower stretch from Varanasi to Gangasagar. Each of these stretches supports different assemblages of biota due to differences in climate and geomorphology.

The diversity of the higher vertebrate fauna in the river varies according to its biogeography and geomorphology with the upper stretch supporting the near threatened Eurasian otter (*Lutra lutra*) and the vulnerable smooth-coated otter (*Lutrogale perspicillata*) among mammals (Hussain, 2002; Nawab & Hussain, 2012). The representative higher vertebrate fauna of conservation significance in the middle stretch includes amongst mammals include the endangered Gangetic river dolphin (*Platanista gangetica*), smooth-coated otter. Amongst reptiles the critically endangered gharial (*Gavialis gangeticus*) the vulnerable marsh crocodile (*Crocodylus palustris*), the critically endangered Three-striped roofed turtle (*Batagur dhongoka*) and red-crowned roofed turtle (*Batagur kachuga*); the endangered Indian Narrow-headed Softshell Turtle (*Chitra indica*), Spotted Pond Turtle



(*Geoclemys hamiltonii*), the vulnerable Crowned River Turtle (*Hardella thurjii*), the vulnerable Indian Softshell Turtle (*Nilssonia gangetica*), the vulnerable Indian Peacock Softshell Turtle (*Nilssonia hurum*), the near threatened Brown Roofed Turtle (*Pangshura smithii*) near threatened Rock terrapin (*Melanochelys trijuga*).

Key bird species in the middle Ganga include the Vulnerable Sarus crane (*Grus antigone*) and the Vulnerable Indian skimmer (*Rynchops albicollis*) (Sundar et al., 2000; Sundar 2004; Sundar, 2011). The lower stretch in the coastal zone provides ideal habitat for critically endangered northern river terrapin (*Batagur baska*) and the vulnerable Indian Softshell Turtle (*Nilssonia gangetica*).

Anthropogenic influences

This rich biodiversity is; however, facing an existential crises owing to the high density (> 700 individuals/km²) of human population that is dependent upon the River for a variety of biotic and abiotic resources that the Ganga basin supports. Unsustainable resource extraction practices that include poaching, continue unabated and along with climate change phenomenon place the River and its biodiversity in jeopardy.



The resultant small, isolated and fragmented populations of conservation dependent species necessitate conservation interventions towards ensuring presence of multiple self-sustaining populations in suitable habitats within their natural range of occurrence. This; however, is a challenging task and a viable option that is being increasingly adopted is the translocation/ supplementation/ reintroduction of healthy animals from rescue and

rehabilitation facilities to natural habitats within the species range while attempting to mitigate factors that are causing population declines. Rescue and rehabilitation additionally contributes indirectly to conservation by increasing awareness through outreach programs and providing opportunities for understanding the biology and behaviour of the species. These programs can target the effect of illegal wildlife trade on public health, pet trade as a causal factor for population declines and the legal consequences of being caught with a conservation dependent animal.

Conventional conservation effort is focused on establishing a network of protected areas with a top down policy approach; however, conserving the biodiversity of River Ganga requires a different paradigm as the river system has limited protected area coverage and much of the biodiversity needing conservation effort lies outside this network. This would require involving multiple stakeholders that include officials of the forest department for providing the necessary legal framework for rescuing animals and their ultimate release, veterinary professionals of the state animal husbandry departments for providing the requisite veterinary health management required for restoring the sick and injured animals back to fitness to enable their ultimate release and last but not the least members of communities residing along the river's banks.

The local communities have a traditional dependence on the river's resources for their livelihoods, social needs and beliefs. Additionally, these communities have first-hand information of ongoing resource extraction and can serve as first responders by providing relevant information for enforcement and other government agencies engaged in conserving the river and its bio-diversity. Thus an integrated approach that actively involves local communities in rescue and rehabilitation of higher vertebrate fauna of River Ganga would also have a higher chance of success.



Objectives

Addressing of the above concerns for higher vertebrate fauna of River Ganga is critical for ensuring their conservation. It was accordingly proposed to establish rescue and rehabilitation centres for conservation dependent species that would serve as centres of excellence for dissemination of skills needed for addressing emergent situations. Accordingly, the Wildlife Institute of India under the aegis of National Mission Clean Ganga initiated a comprehensive project titled 'Biodiversity conservation and Ganga Rejuvenation' with the following objectives:

1. Establishment and upgradation of rescue and rehabilitation centres at Narora and Sarnath.
2. Capacity enhancement of local communities.
3. Capacity enhancement of personnel of the forest department and field veterinarians in managing emergent situations.

Activities initiated towards achieving project objectives

The activities undertaken by the project personnel engaged under the component towards achieving the above objectives are presented here.

Establishment and upgradation of rescue and rehabilitation centres at Narora, Sarnath and Bhagalpur

Three facilities were identified for the establishment of rescue and rehabilitation centres which include the head-starting centre for turtles established by Nuclear Power Corporation of India Limited at Narora and the Turtle Breeding Facility at Sarnath, Varanasi established and operated by the Uttar Pradesh Forest Department and Turtle rescue centre established at Bhagalpur by Bihar Forest Department. These facilities were brought under the aegis of project in 2016.

Detailed assessments of the Sarnath and Narora centers were carried out and based on these retrofitting/ refurbishment of the facilities was carried out keeping the requirements of the species to be housed while ensuring minimal expenditure. This entailed repair of the enclosures, installation of water-purification systems and creation of enriched environments that address species needs in captivity and minimize human imprinting. Additionally, efforts

of the project led the standardization of husbandry practices for freshwater turtles in rescue facilities. These include practices for nutrition, housing and environmental enrichment.

As a consequence of the efforts put in by the project team both the centres are fully functional and regularly receive rescued animals that are managed intensively to restore fitness. Once fit the animals are release back into nearby natural habitats or places from where they were rescued. Details of animals rescued, restored to fitness and successfully released are presented below:

Table 1: Status of turtles rescued and released

Species	No. Rescued		No. Released	
	Sarnath	Narora	Sarnath	Narora
Indian tent turtle (<i>Pangshura tentoria</i>)	1	7	16	7
Brown roofed turtle (<i>Pangshura smithii</i>)	0	11	0	11
Indian roofed turtle (<i>Pangshura tecta</i>)	0	77	0	77
Indian flapshell turtle (<i>Lissemys punctate</i>)	1772	8	1860	8
Indian peacock softshell turtle (<i>Nilssonia hurum</i>)	0	2	0	2
Indian/Ganges softshell turtle (<i>Nilssonia gangetica</i>)	6	10	4	10
Indian narrow-headed softshell turtle (<i>Chitra indica</i>)	0	1	0	1
Black pond turtle (<i>Geoclemys hamiltonii</i>)	0	19	14	19
Three-striped roofed turtle (<i>Batagur dhongoka</i>)	315	3	690	3
Red-crowned roofed turtle (<i>Batagur kachuga</i>)	0	0	89	0
Indian black turtle (<i>Melanocheilus trijuga</i>)	0	3	0	3
Brahminy river turtle (<i>Hardella thurjii</i>)	0	2	0	2
Mugger crocodile (<i>Crocodylus palustris</i>)	0	0	0	1
Total	4053*	143	4632**	144***

*4053 Including 1959 mixed spp. turtles confiscated by Uttar Pradesh Police in December 2016

**4632 including 1959 mixed spp. turtles confiscated and 579 mixed species of turtles present at Sarnath

***143 Including one Mugger

The salient points that emerged from the experience in managing the rescue and release operations were:

Effective health management

Animals entering rescue and rehabilitation facilities are often injured or sick or both and require intensive veterinary care. All new entrants are maintained in a quarantine facility for detailed investigation of health and fitness, prior to introduction to the existing populations of their conspecifics to ensure their health. It allows for a close observation of the animals and alleviation of stress that the animals have undergone. Other preventive health-care measures that are pertinent include restriction of visitor entry to prevent the spread of pathogens from the animals to humans and vice-versa and maintenance of water-quality to minimize incidence of disease as turtles are aquatic animals are maintained at much higher densities than they naturally exist at both the centres. Necessary veterinary interventions through triage are provided to individual animals from their entry to their exit for ensuring their wellbeing.

Importance of science based husbandry

Rescue and rehabilitation facilities due to limitations of space inadequately address critical needs of the species they hold. The husbandry protocols adopted were designed to adequately address these needs for providing appropriate nutrition that is accessible to all individuals and addressing species and age specific requirements. In herbivorous species the macrophytes provide and for carnivorous species provision of fish-fingerlings and crustaceans as feeding enrichments ensures retention of natural foraging patterns.

Since, all chelonians are cold blooded animals, provision of a mosaic of sun and shade areas enable effective thermoregulation are provided. This is achieved by appropriate enclosure enrichment and providing aquatic and terrestrial macrophytes that helps in creating thermal gradients in both the terrestrial and aquatic components of the enclosure and facilitate effective thermoregulation.

Planned release for scientific conservation

Efforts are made to ensure that animals on attaining fitness are repatriated to their natural habitats at the earliest. We evaluate the fitness of all the animals on the basis of health assessment and their ability to adapt to the habitats, they are to be released based on the evaluation and assessment of the release sites. For confiscated animals' information of their place of origin is often missing, in such situations animals are released in areas that form a part of the natural habitat of the species within its natural range of occurrence. Success of release is also dependent on the ambient weather conditions, avoidance of extreme weather conditions aids release success which are addressed.

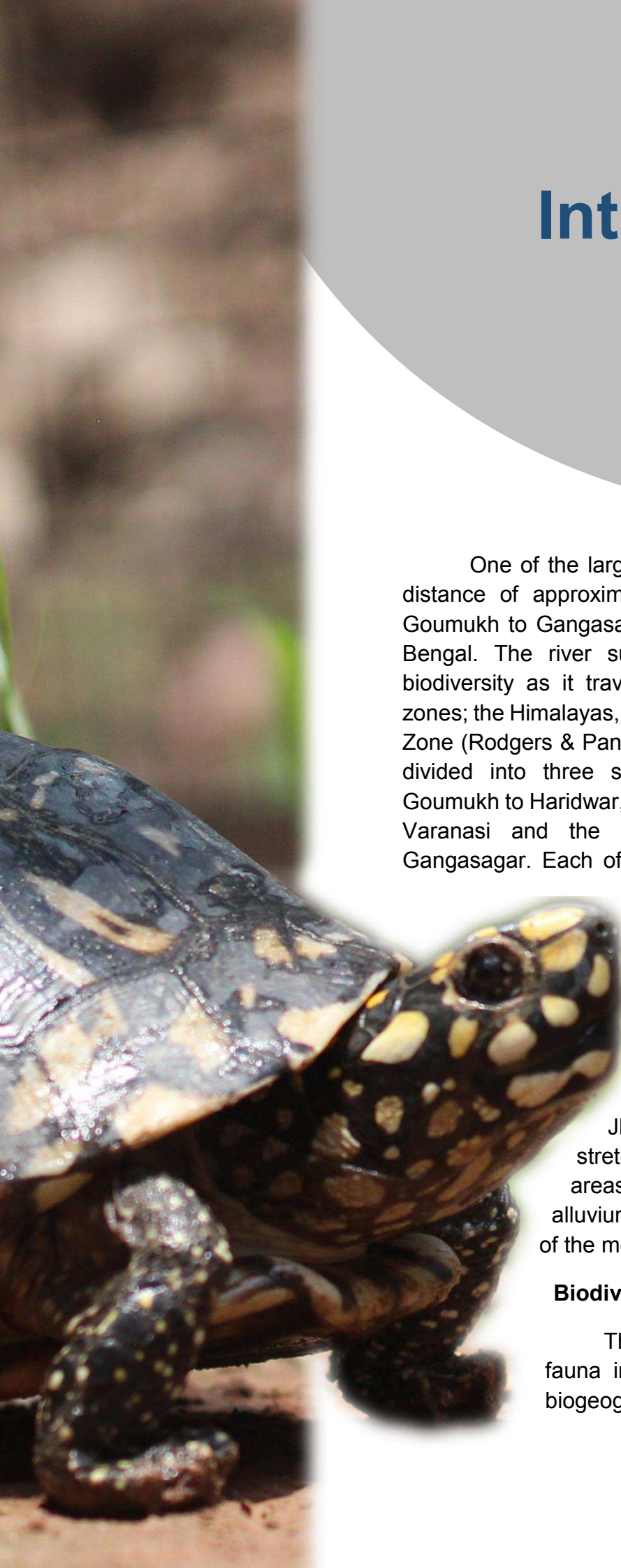
Capacity enhancement for conservation

Effective rescue and rehabilitation for achieving conservation goals is a participatory effort involving multiple stakeholders. Effective rescue and rehabilitation is however, a knowledge driven activity with various stakeholders having limited exposure to the skills required. Three stakeholder groups that hold the key to effective rescue and rehabilitation of aquatic macro-fauna were identified, these include local communities inhabiting the riverfront, state frontline forest officials and field veterinarians of animal husbandry departments. Various programs to enhance their capacities in skills needed for rescue and rehabilitation of aquatic macro-fauna were undertaken.

Local communities are the first responders to field rescues and crucial for protecting populations at release sites. The skills that can ensure their effective participation include field identification and scientific and humane handling of the rescued animals. Programs for capacity enhancement of local communities inhabiting riverfront were undertaken with a curriculum specially targeting their role in rescue and rehabilitation of aquatic macro-fauna. A total of 214 participants were trained from 5 Ganga River states *i.e.* Uttarakhand (15), Uttar Pradesh (95), Bihar (35), Jharkhand (33) and West Bengal (36).

The other stakeholders who play a major role in rescue and rehabilitation of aquatic macro-fauna are frontline officials of the state forest departments and field veterinarians of the state animals husbandry departments. Curriculum based on specific needs of the two different groups were developed and capacity enhancement programs were conducted for both forest officials and field veterinarians. A total of 232 forest officials from the states of Uttarakhand (27), Uttar Pradesh (127), Bihar (32), Jharkhand (31) and West Bengal (15) regarding field identification, handling and legalities. Veterinary professionals (69) were trained from the states of Uttarakhand (34) and Uttar Pradesh (30) regarding Identification and effective veterinary management of aquatic macro-fauna during rescue and rehabilitation. Another 5 veterinary professionals from Uttarakhand (2), Uttar Pradesh (1), Bihar (1) and West Bengal (1) were trained under international field course on “Intervention in Wild Animal Health, 2019” for effective management of aquatic macro-fauna during distress.





Introduction 1

One of the largest rivers of Asia, Ganga covers a distance of approximately 2500 km from its origin in Goumukh to Gangasagar, where it flows into the Bay of Bengal. The river supports a unique assemblage of biodiversity as it traverses three distinct biogeographic zones; the Himalayas, the Gangetic Plains and the Coastal Zone (Rodgers & Panwar, 1988). The river is accordingly divided into three stretches; the upper stretch from Goumukh to Haridwar, the middle stretch from Haridwar to Varanasi and the lower stretch from Varanasi to Gangasagar. Each of these stretches supports different

assemblages of biota due to differences in climate and geomorphology. The middle and lower stretches wind through the Gangetic plains extending from Yamuna river in the west to eastward through the states of Uttar Pradesh, Bihar, Jharkhand and West Bengal. This stretch is also one of the most fertile areas in the world owing to deposition of alluvium in the floodplains with the receding of the monsoons.

Biodiversity values

The diversity of the higher vertebrate fauna in the river varies according to its biogeography and geomorphology with the

upper stretch supporting the near threatened Eurasian otter (*Lutra lutra*) and the vulnerable smooth-coated otter (*Lutrogale perspicillata*) among mammals (Hussain, 2002; Nawab & Hussain, 2012). The representative higher vertebrate fauna of conservation significance in the middle stretch includes, amongst mammals: the endangered Gangetic river dolphin (*Platanista gangetica*), smooth-coated otter. Amongst reptiles the critically endangered gharial (*Gavialis gangeticus*) the vulnerable marsh crocodile (*Crocodylus palustris*), the critically endangered Three-striped roofed turtle (*Batagur dhongoka*) and red-crowned roofed turtle (*Batagur kachuga*); the endangered Indian Narrow-headed Softshell

Turtle (*Chitra indica*), Spotted Pond Turtle (*Geoclemys hamiltonii*), the vulnerable Crowned River Turtle (*Hardella thurjii*), the vulnerable Indian Softshell Turtle (*Nilssonia gangetica*), the vulnerable Indian Peacock Softshell Turtle (*Nilssonia hurum*), the near threatened Brown Roofed Turtle (*Pangshura smithii*) near threatened Rock terrapin (*Melanochelys trijuga*). Key bird species in the middle Ganga include the Vulnerable Sarus crane (*Grus antigone*) and the Vulnerable Indian skimmer (*Rynchops albicollis*) (Sundar et al., 2000; Sundar 2004; Sundar, 2011). The lower stretch in the coastal zone provides ideal habitat for critically endangered northern river terrapin (*Batagur baska*) and the vulnerable Indian Softshell Turtle (*Nilssonia gangetica*).

Anthropogenic influences

These species are however, facing an existential crises owing to the high density (> 700 individuals/km²) of human population that the Ganga basin supports that reaches its peak (1000 individuals/km²) in the lower stretch of the coastal zone. The river is flanked by 30 cities, 70 towns and thousands of villages on its banks. This highly dense human population along-with infrastructure development projects places the river under extreme threat.

The upper stretch of the Ganga faces dangers from climate change phenomenon resulting in the retreat of glaciers with associated reduction in water volume and from human induced structural changes that have been brought about to facilitate the construction of 16 hydroelectric projects in the Bhagirathi and Alaknanda basins. Hydro-electric projects under construction (14) and proposed (39) here place the river under further stress. These activities have resulted in a highly fragmented river with restriction of movement of several species limiting their reproduction, natural dispersal leading to isolated populations. These hydroelectric projects also impact the hydrology and ecology of the river basin. The middle Ganga stretch of the river with its fertile floodplains is extensively used for agriculture. Specific threats include extraction of water for diversion to four major irrigation canals that sustain this extensive agriculture reducing the water flow to a mere 10%. Coupled with this the unsustainable practice of bank alteration for agriculture, construction and sand mining and extensive sandbar cultivation places wildlife populations under stress. The discharge of treated/ untreated domestic and industrial effluents in the river renders

the aquatic habitat unsuitable for the array of species the stretch of the river supports. Further, a range of unsustainable biological resource extraction practices renders the populations of species dependent on the river prone to extinction.



In the lower Ganga stretch and the coastal zone, the construction of the Farakka Barrage has resulted in structural changes, this along-with modified flow regimes has resulted in increased sedimentation and eutrophic changes. These in association with unsustainable biological resource extraction and destructive fishing techniques places the wildlife populations in the stretch, under extreme stress.

Threats: Illicit wildlife trade

Biological resource extraction is widespread across the entire River Ganga, with the focus mainly on fishing. Other species such as turtles, dolphin, gharial, mugger and otters occasionally get trapped in the fishing nets. A more serious cause of concern however is the intentional extraction of these species for illegal trade in live animals and body parts that has severely undermined the population of these species and along-with habitat destruction poses the most potent threat.

Illicit trade in wildlife is a major issue of concern globally and contributes significantly to the global extinction crisis (Nijman 2010). The trade is fuelled by an exponential increase in demand both within India and globally for consumptive use as food, traditional medicine and as pets. The conservation crisis has attracted both global and local attention at the country level leading to improvements in enforcement with required legislative changes and international treaties and capacities of government agencies involved in curbing the illegal trade. It has led to an increase in confiscations of live animals and body parts. A majority of this effort is focussed on charismatic mega-fauna; however, a vast array of species that are traded both globally and locally, face much higher threats than these charismatic species.

A report by WWF India published in 1994 documents the illegal trade of chelonians in India. The report states that freshwater chelonians are group of animals that have been extensively exploited for various consumptive use throughout their range in India and all species occurring in the River Ganga are exploited as either food, or for medicinal purposes or as pets.



A recent report published in 2019 by TRAFFIC India indicates that tortoises and turtles formed a significant proportion of the animals confiscated in the country. A total of 1,11,312 individual animals were found in illegal wildlife trade in India between September 2009-September 2019. Of these 83,230 were seized alive and 855 were dead while the fate of the remaining animals remains unknown. The states of Uttar Pradesh and West Bengal accounted for more than 60% of these seizures. While for 51.5% of all seizures the species remained unidentified, 14 species of chelonians formed the remaining animals confiscated. These include seven species listed in Schedule I and II and three in Schedule IV of the Wildlife (Protection) Act, 1972. The report further indicates Indian Star Tortoise (*Geochelone elegans*), formed 49% of the identified seizures while Indian Softshell Turtle (*Nilssonina gangetica*) (Sch I (Part II) (26%), Indian Flapshell Turtle (*Lissemys punctata*) (Sch I (Part II) (15%) and Black spotted or Spotted Pond Turtle (*Geoclemys hamiltonii*) (Sch I (Part II), (9%) other species formed the remaining 1%.

Turtles are one of the most severely threatened faunal types inhabiting River Ganga. An added threat is the reduction in available habitats for egg-laying due to expansion of riparian agriculture. Further nesting areas are vulnerable to predation

from feral dogs and other anthropogenic stressors. Additionally, discharge of water for irrigation from barrages and dams follows agricultural requirements and is often in the lean season. This unseasonal discharge of water inundates eggs laid by turtles along the banks of river channels and necessitates their rescue

Rescue and rehabilitation as a conservation strategy

Threats described above increasingly amplify the number of species dependent on continued management for their sustained conservation/ survival. These result in small isolated fragmented populations necessitating conservation interventions. Achieving the conservation goals that include ensuring presence of multiple self-sustaining populations in suitable habitats within the natural range of occurrence for such species is a challenging task. A viable option that is being increasingly adopted is the translocation/ supplementation/ reintroduction of healthy animals from rescue and rehabilitation facilities to natural habitats within the species range while attempting to mitigate factors that are causing population declines.

Wild animals with injuries or illness, become orphaned or have been captured for illegal trade are incapable of living successfully in their natural habitats. Such animals are taken into captive facilities that provide intensive professional care with the objective of ultimately returning them to their natural habitats. While it is ethically essential to ensure that every animal casualty encountered has a chance to live and procreate in its natural habitat. Resource limitations necessitate prioritization of species/ individuals by identifying species they can help rehabilitate. Individuals of conservation dependent species therefore have a greater priority for inclusion in rescue and rehabilitation programs. In the Indian context the species included in Schedule I of the Wildlife (Protection) Act 1972 and those listed as prone to extinction in the IUCN Red list of threatened species assume a greater priority.

The trade in wildlife is largely driven by demand with rarer species that are more likely to be conservation dependent fetching higher prices. In such a scenario the rehabilitation of confiscated specimens in natural habitats can be used to supplement dwindling populations, establish new populations in suitable habitats that are a part of the distribution range of the species. Rescue facilities thus need to prioritize species that they need to rehabilitate with species under greater threat having a priority over commoner species. The IUCN also stresses on the 'need for a decision-making process for the management of live confiscated individual animals and plants that places the prevention of species extinctions and the maintenance of healthy wild populations and biodiversity above all other criteria; that includes assessing risks both to the confiscated species, and also to any species in the wild in a potential release site.'

A limited number of aquatic higher vertebrate animal casualties that occur in natural habitats find their way to rescue facilities and a majority of the animal rescue cases received by rescue centres are confiscated animals. Confiscations of live animals have increased in the recent past due to enhanced capacities of enforcement

authorities; however, as indicated by Badola *et al.* (2019) identification of species remains a challenge for them.



Rescue and rehabilitation is also effective in indirectly contributing to conservation by increasing awareness through outreach programs. These programs can target the effect of illegal wildlife trade on public health, pet trade as a causal factor for population declines and the legal consequences of being caught with a conservation dependent animal.

Managing rescue and rehabilitation

The animals in rescue facilities need to be maintained in a manner that ensures their retaining natural behavioural traits of predator avoidance, foraging, socialization, habitat selection and reproduction to ensure their survival on release in identified suitable habitats.

All these activities require adequate infrastructure in terms of housing facilities that address the requirements of the target species, availability of space in these facilities and committed financial support to manage the rescue and rehabilitation effort. Successful rescue and rehabilitation is a team effort requiring expertise in species identification, behavioural management in captivity, veterinary care nutrition and field biologists to identify suitable habitats for release and monitor animals post-release. The list below summarizes the diverse expertise needed for effective management of rescue and rehabilitation efforts of conservation dependent species.

- Taxonomic expertise to enable rapid and accurate identification to species/subspecies level.
- Medical and veterinary expertise on human and animal health, including quarantine facilities.
- Wildlife rescue, husbandry and behavioural expertise.

- Appropriate legal expertise.
- Logistical expertise to advise on holding and transport.

Limited expertise in these areas of knowledge exists within the country for most animals and in the case of aquatic higher vertebrates this knowledge is further limited to a handful of people. The magnitude of the rescue effort needed to effectively manage the large number of animals that are injured or confiscated requires the enhancement of capacities of the multiple stakeholders involved in rescue and rehabilitation efforts.



Animals received by way of rescue are often in large numbers and representatives of a few select species that are conservation dependent. These provide a much needed opportunity for research on various aspects of biology, pathogens and diseases and veterinary management of sick and injured animals of the species. Additionally, they also serve to standardize protocols for rescue and rehabilitation including soft/ hard release and post-release monitoring, besides helping in creating a database on the above aspects that on collation can aid in effective conservation of the species.

Freshwater chelonians shape the aquatic habitats they inhabit and healthy populations indicate the health of the habitat. They are however; a taxonomic group that is severely affected by the altered habitat conditions and unsustainable extraction. The Ganga River provides home to a large number of chelonian species; however, unsustainable practices have drastically impacted their habitats and populations. In

view of this the component IV, (Rescue and Rehabilitation) of the WII-NMCG project 'Biodiversity Conservation and Ganga Rejuvenation' has focused on the rescue and rehabilitation of freshwater chelonians of the Ganga River.

Community based conservation

Much of the conservation effort is focused on establishing a network of protected areas with a top down policy approach; however, conserving the biodiversity of River Ganga requires a different paradigm as the river system has limited protected area coverage and much of the biodiversity needing conservation effort lies outside this network. Additionally, communities residing along the banks have a traditional dependence on the river's resources for their livelihoods, social needs and beliefs.

Engineering based solutions attempted to address the problems plaguing the river under the Ganga Action Plan have met with limited success. It was therefore perceived that an integrated approach that addressed resource dependence of the communities while ensuring conservation of the river's biodiversity would have better success. The riverside communities with their generations of dependence on the river have developed a volume of traditional knowledge and had sustainable resource extraction practices and their participation in conservation efforts would have enhanced success.



Increasing demand for resources from the river has led to a growth in unsustainable practices being adopted by the riverside communities that had for generations coexisted with the river. This has also led to an erosion in the traditional knowledge base of these communities that ensured sustainable extraction.

An integrated approach that actively involves local communities in rescue and rehabilitation of higher vertebrate fauna of River Ganga would also have a higher chance of success. Additionally, these communities have first-hand information of ongoing resource extraction and can serve as first responders by providing relevant information for enforcement and other government agencies engaged in conserving the river and its bio-diversity. It was therefore decided to actively involve local community members in the efforts being made in this direction. Effective involvement of riverside communities may be ensured by reducing resource dependence through provision of alternate set of skills that enable socially acceptable livelihoods while meeting aspirations.

Role of Government agencies

While community based conservation may be able to achieve conservation objectives of the threatened river system and its biodiversity the various government agencies continue to play a pivotal role in addressing rescue and rehabilitation. The key agencies/ departments are the state forest departments and animal husbandry departments. The former provides the necessary legal cover, manpower and basic infrastructure while the latter after enhancement of capacities in veterinary health management of aquatic macro-fauna that can provide the necessary health care.



Objectives 2



Addressing of the above concerns for higher vertebrate fauna of River Ganga is critical for ensuring their conservation. It was accordingly proposed to establish rescue and rehabilitation centres for conservation dependent species that would serve as centres of excellence for dissemination of skills needed for addressing emergent situations. Accordingly, the Wildlife Institute of India proposed to the National Mission Clean Ganga a component under the project 'Biodiversity conservation and Ganga Rejuvenation' with the following objectives:

1. Establishment and upgradation of rescue and rehabilitation centres at Narora and Sarnath.
2. Capacity enhancement of local communities.
3. Capacity enhancement of personnel of the forest department and field veterinarians in managing emergent situations.

Expected outcomes

The expected outcomes of the proposed objectives were:

1. Development of infrastructure for effective rescue and rehabilitation of higher aquatic vertebrate fauna of Ganga River and centres for dissemination of skills needed for addressing emergent situations.
2. A network of representatives from riverside communities that is sensitive and motivated to report and assist in addressing emergent situations pertaining to higher aquatic vertebrate fauna of Ganga River.
3. Capacity development of forest department personnel and field veterinarians in skills needed for handling emergent situations pertaining to higher aquatic vertebrate fauna of Ganga River.



A large tortoise, likely a Galapagos tortoise, is shown in profile on a sandy beach. Its head is extended forward, and its mouth is slightly open. The background is a soft-focus view of the beach and the ocean.

Outcomes 3

3.1 Facility assessment and upgradation

3.2 Management of rescued animals

3.3. Capacity building of stakeholders

3.3.1 Local Communities with enhanced skills

3.3.2. Forest officials with enhanced skills

3.3.3 Veterinary professionals with enhanced skills

3.1 Facility assessment and upgradation of rescue rehabilitation centers

A major objective under the component was the development of infrastructure for effective rescue and rehabilitation of aquatic higher vertebrate fauna of Ganga River and developing centers for dissemination of skills needed for addressing such emergent situations to different stakeholder groups.

In this regard two facilities were identified, the first one was a head-starting centre for turtles established by Nuclear Power Corporation of India Limited at Narora under the Environment Stewardship Programme (ESP) in 2006. The second was a Turtle Breeding Facility at Sarnath, Varanasi established and operated by the Uttar Pradesh Forest Department. The facilities were renamed as Ganga Aqualife Rescue and Rehabilitation Centre at Narora and Kachua Punarvas Kendra at Sarnath, Varanasi respectively and brought under the aegis of the WII- NMCG Biodiversity Conservation and Ganga Rejuvenation project in 2017 to be a part of Component IV - Rescue and Rehabilitation.

3.1.1 Ganga Aqua-life Rescue and Rehabilitation Centre, Narora

Activities towards establishment of rescue and rehabilitation facility were initiated in July 2016, and a field visit by the project team to Narora, Dist. Bulandshar to explore the possibilities of establishing a rescue and rehabilitation facility for aquatic higher vertebrate fauna of Ganga River in its middle stretch. An existing turtle head-starting/ rearing facility was identified at the Narora Atomic Power Station (NAPS), a unit of the Nuclear Power Corporation of India Limited for the purpose. Discussions were initiated with Mr. Raja Mandal and Mr. P.D Mishra, members of the Environmental Stewardship Programme of NAPS in this regard. The discussions led to the Wildlife Institute of India and Nuclear Power Corporation of India Limited signing a Memorandum of Understanding to for the use of existing turtle head-starting/ rearing facility by the WII for operating a rescue facility.

Preliminary assessment of the existing facility at NAPS was carried out during the month of June 2017 and the facility and its vicinity were cleaned of vegetation undergrowth. The efforts were focused on operationalizing the centre, accordingly the two enclosures present were cleaned and the walls painted with whitewash. The state of the facility and enclosures at the time of takeover and the changes made are represented here pictorially. The facility was renamed as Ganga Aqualife Rescue and Rehabilitation Centre.

A detailed study of the facility was carried out after the cleaning operation from June to July 2017 for inventorying the existing stock of turtles and identifying and addressing shortcomings. The study formed the basis of further modifications to the enclosure environment through enrichment and changes in the husbandry practices

being followed. The salient findings of the study and the modifications undertaken are presented below.



Enclosures prior to preliminary upgradation

The centre comprises of two enclosures, referred to as enclosure1 and enclosure2. The study carried out included preparation of a layout plan of the two

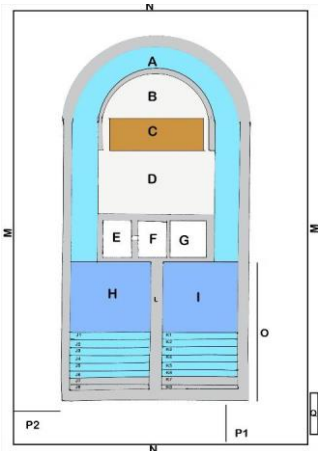
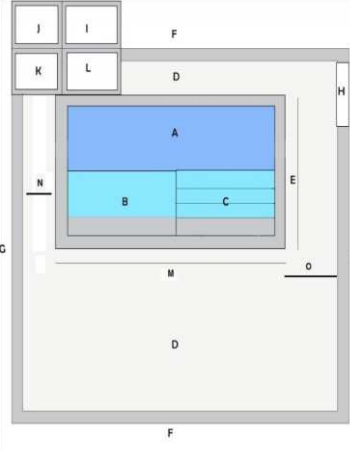
enclosures, assessment of existing husbandry practices including nutrition being provided, species-specific enrichment requirements and record keeping practices.

The species wise inventory of turtles housed at the time of carrying out the study were as described as **Table 3.1**

Table 3.1: Inventory at Narora Centre during June-July, 2017

Sr. No.	Species	Number of individuals
1	Indian Flapshell Turtle (<i>Lissemys punctata</i>)	2
2	Spotted Pond Turtle (<i>Geoclemys hamiltonii</i>)	7
3	Three Striped Roofed Turtle (<i>Batagur dhongoka</i>)	8
4	Indian Tent turtle (<i>Pangshura tecta</i>)	1
5	Brown Roofed Turtle (<i>Pangshura smithii</i>)	1
6	Crowned River Turtle (<i>Hardella thurjii</i>)	1
TOTAL		20

Table 3.2: Layout and status of the two enclosures

Enclosure 1		Enclosure 2	
 Layout plan of enclosure I		 Layout plan of enclosure II	
A: shallow water	Depth of water: 43.5 cm Width: 88 cm Length: 304.8cm	A: Deep water	Depth: 108.5 cm Length: 99.5 cm
B: Sand area for basking 1	Depth of sand: 32.5 cm Length: 162.4 cm From hide to post 1: 74 cm	B. Shallow water with inclined concrete	Width: 180.4 cm Water depth Width: 183.4 cm Length: 139 cm Depth: 91 cm
C: Hide for basking	Length: 150 cm Width: 278.4 cm	C. Shallow water with steps	Per step 36cm each and height 21 cm

Enclosure 1		Enclosure 2	
D: Sand area for basking 2	Length: 160.4 cm Width: 290 cm	D. Sand area for basking	Width: 318.4 cm
E: Aquatic vegetation chamber 1	Length: 105.5 cm Width: 76.5 cm	E. Width of the pool	238.5 cm
F: Aquatic vegetation chamber 2	Length: 105.5 cm Width: 76.5 cm	F1. Length of the facility F2: Length of the facility	587.2 cm 575.2 cm
G: Water reservoir and filtration Chamber	Width: 105.5 cm Length: 79.5 cm	G. width of the facility without gate	576.2 cm
H: Deep water 1	Depth of water: 107.5 cm Width: 208.4 cm Length: 144.2 cm	H. Gate	Width: 104 cm Height: 198.4 cm
I: Deep Water 2	Depth of water: 128 cm Width: 208.4 cm Length: 144.2cm	I,J,K,L. Filtration chamber (Not working)	
J 1-7, K 1-7: Steps with water	37 cm each		
J8, K8: Steps without water	17 cm each		
L: Area between two deep water chambers	Width: 24 cm Length: 165 cm		
M: Length of the facility	1371.6 cm	M: Length of the pool	363.8 cm
N: Breadth of the facility	804 cm	N: left area	52 cm
O: Deep water + steps	457 cm	O: Entry	104 cm
P1: Length of free area after shallow	38 cm	-	-



Enclosures after initial renovation

3.1.2 Recommendations

Based on the study carried out the following changes were recommended to be made at Ganga Aqualife Rescue and Rehabilitation Centre, Narora as described as Table 3.3.

Table 3.3: Recommendations for upgradation of Ganga Aqualife Rescue and Rehabilitation Centre, Narora

Sr.	Shortcomings identified	Actions to be initiated	Justification
1	Dysfunctional filtration unit in enclosure 2	Making the filtration unit functional at the earliest.	Maintenance of water-quality is essential for ensuring health and well-being of turtles.
2	Lack of quarantine space	Use of enclosure 2 as a quarantine space	To prevent infections from newly acquired animals from spreading into the resident population.
4	Lack of sun and shade areas in the enclosures	The roof in both enclosures needs to be covered with thatch/shade to create a mosaic of sun and shade areas	Mosaic of sun and shade areas in the enclosure is essential for thermoregulation
5	Lack of veterinary diagnostic facility	A minimal facility for basic investigations such as fecal and haematological examination	Essential for emergency management of rescued animals.
6	Lack of species specific nutrition for turtles	Diet charts that address species-specific, life-history stage and seasonal needs should be developed.	Essential for optimum growth of juveniles and health of all animals. To enable estimation of feed required and for budgetary considerations.

Based on the above observations the project team was able to carry out the following modifications:

1. Both enclosures were enriched by covering the top of the enclosure in patches to create a mosaic of sun and shade areas to enable effective thermoregulation by turtles.
2. The water-bodies were planted with *Hydrilla sp.* as feeding enrichment.
3. Species specific feeding charts were prepared based on their number and weight.
4. The same was explained to the facility staff along-with necessary instructions for maintaining records.

In view of the increasing work under the component and the need for additional professional expertise the services of a veterinary expert (Subject Matter Specialist-Veterinary Health and Management) with prior experience of working with aquatic macro-fauna were hired from February 2018. The expert carried out a further detailed assessment of the facility from 7th February 2018 to 10th February 2018 with the aim of evaluating the existing infrastructure and protocols and suggesting solutions for improvement/upgradation for catering to aquatic fauna in distress. The salient findings of the assessment are placed below:

Enclosure 1: The enclosure structure is metal mesh and was covered with 70% shade cloth from the outside. For winterizing, the entire enclosure was covered with plastic sheeting outside the shade cloth. A footbath was provided at the entrance. The enclosure has a single large “U” shaped pond with shallow water (less than 2 feet depth), without internal structural barriers and deep pools at either end. A floating log has been placed in one deep pool for basking for the turtles. A sand substratum is present in the shallow as well as deep pools (depth of sand not recorded). There is a central island with sand substratum and a metal structure used in summers as a shade for basking turtles. The shallow pools lead to the central island with a slope and sand is placed the top of this slope. The filtration unit is in the central island towards the deep pool. It circulates water from water from the whole pond and supplies it back to the pond. The enclosure then housed mixed species.

Enclosure 2: Enclosure 2 was a single pool with deep to shallow gradients. The deep end leads to land with a cemented haul-out ramp. The gradient in the pool is provided using concrete steps leading to the land. The land area has river sand substrate and a few lily shrubs. A metal shade is placed at one end. This enclosure has a wider land area as compared to Enclosure 1. This enclosure has a bio- filtration unit at one end.

3.1.3 Hatchling care facility

The facility has evolved since its inception and the current paradigm essentially requires a unit for the care of hatchlings. Hatchling care is critical for survivability and demands stringent temperature and water quality monitoring. A separate area for hatchlings allows for monitored feeding and necessary interventions. A closed section allowing for critical thermoregulatory behavior is essential.

3.1.4 Quarantine

Quarantine was not considered at the inception of the head-start facility, as it is not a critical essential. However, a Quarantine section is critical to any rescue and rehabilitation setup. General guidelines for setting up enclosures for this facility is to find the adult size of the turtle species and multiply the turtle's adult length by 5 for the length for one animal housing. Their adult length multiplied by 2.5 will be the water depth. This gives them plenty of room to move about freely and get some exercise,

as well as allow for a place as a basking area. For two turtles, adding about an extra 1/3 should be sufficient.

3.1.5 Filtration

Two filtration units are present, one in each enclosure, that use soil-gravel-pebbles and plants like water hyacinth for water filtration.

A detailed report of the above assessment was prepared as “Assessment of the Ganga Aqualife Rescue and Rehabilitation Centre, Narora, Uttar Pradesh, WII-NMCG Biodiversity Conservation and Ganga Rejuvenation Project” submitted to all concerned



Enclosure following upgradation

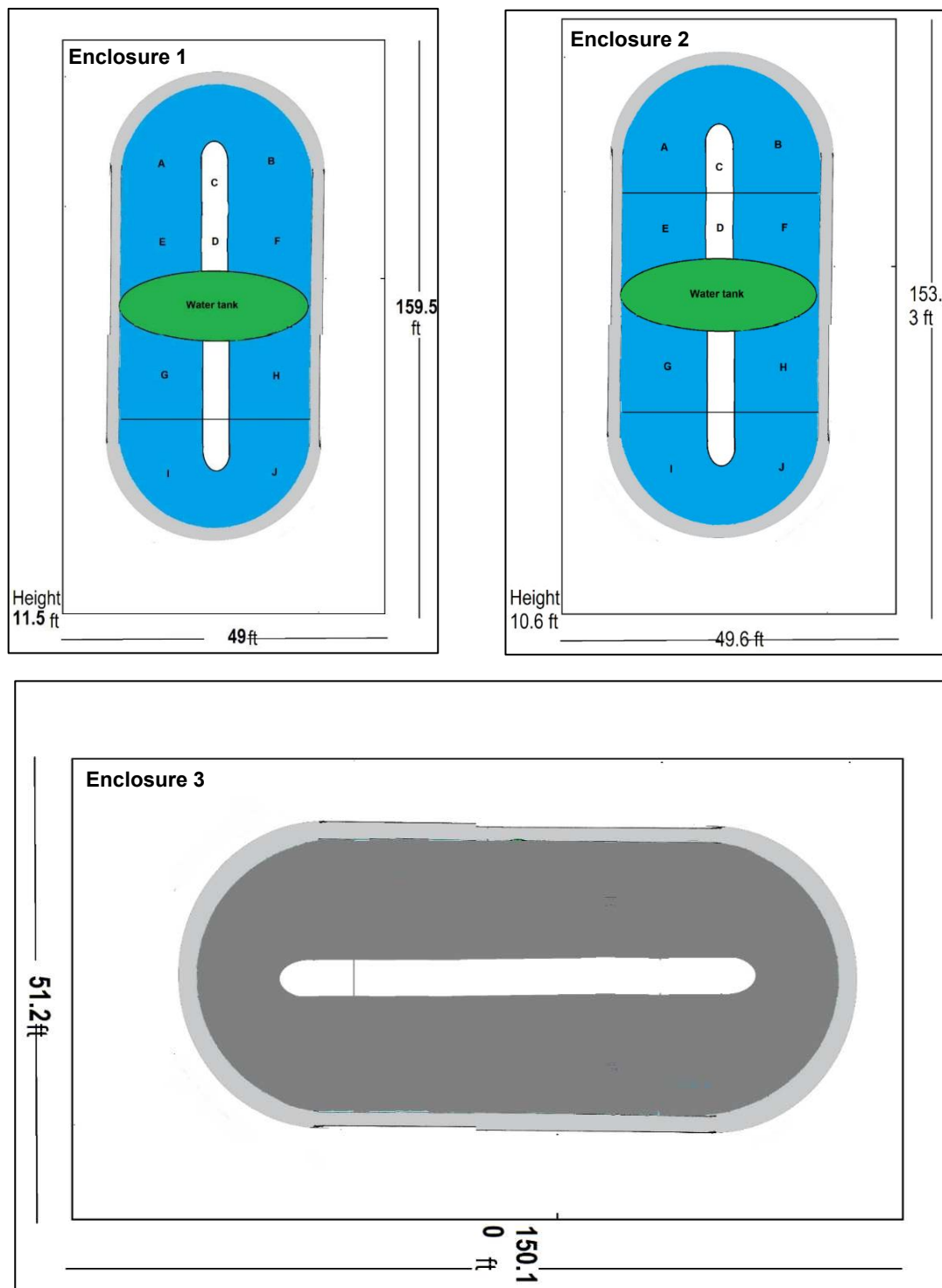
3.1.6 Upgradation of Infrastructure at Kachua Punarvas Kendra, Sarnath

The Kachua Punarvas Kendra, Sarnath was visited in August 2016 and a preliminary assessment of infrastructure was carried out. The facility had three enclosures, all three enclosures were overrun with vegetation undergrowth and the walls were covered with moss. As a preliminary measure the enclosures were cleared of undergrowth and pruning of trees was carried out.

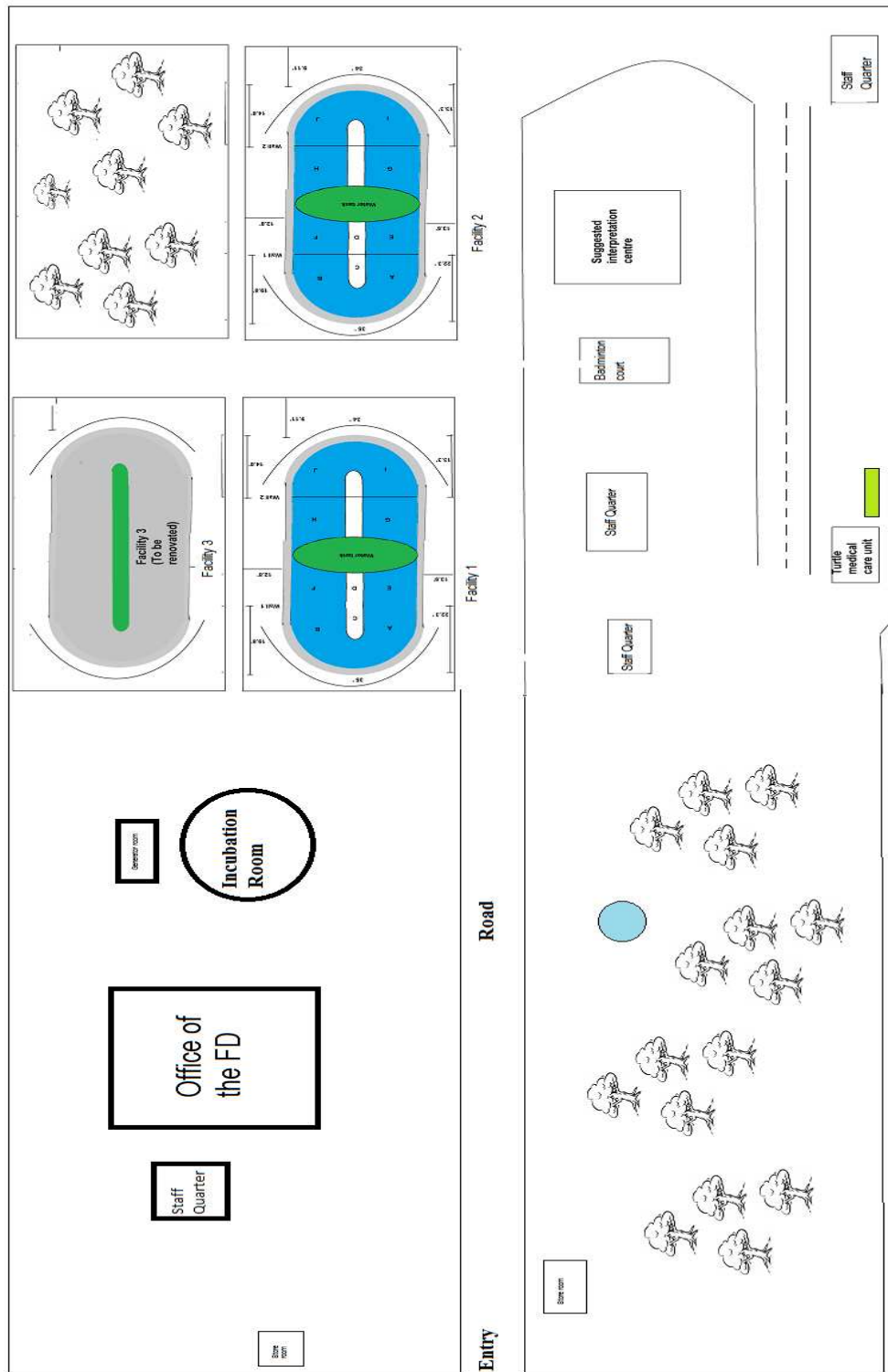


Enclosures at Sarnath prior to upgradation

A detailed assessment of the facility was carried out to gauge the suitability of the enclosures at Kachua Punarvas Kendra, Sarnath (KPK) for housing rescued freshwater chelonians during July 2017 and a detailed layout plan of the facility was prepared. The KPK consists of three enclosures, with enclosures I and II further described into four parts each placed below present structural features of each enclosure.



Layout of Enclosures



Schematic layout of Kachua Punarvas Kendra, Sarnath

Table 3.4: Turtles present at Kachua Punarwas Kendra, Sarnath (July 2017)

Sr. No.	Species	Nos.
1	Spotted Pond Turtle (<i>Geoclemys hamiltonii</i>)	14
2	Three Striped Roofed Turtle (<i>Batagur dhongoka</i>)	575
3	Indian Flapshell Turtle (<i>Lissemys punctata</i>)	492
4	Indian Roofed Turtle (<i>Pangshura tecta</i>)	17
6	Red Crowned Roof Turtle (<i>Batagur kachuga</i>)	74
7	Indian Softshell Turtle (<i>Nilssonia gangetica</i>)	1
	Total	1173

The assessment indicated that enclosures I and II could be made functional with minor modifications while enclosure III required major repair work. The salient features of the assessment are summarized in table 3.5 below:

Table 3.5: Salient findings of assessment:

Sr. No.	Shortcomings identified	Actions to be initiated	Justification
1	Water storage tanks in enclosure I and II were dysfunctional	Repair of water storage tanks and regulation of water flow into ponds.	Turtles are aquatic species and in a captive facility maintenance of water quality is necessary to minimize spread of infections.
2	Enclosure III was in a rundown state and presents a challenge for making it operational	Major repair works need to be carried out	Large number of turtles and their eggs are rescued each year. Additional enclosure space is needed to house the animals.
3	Absence of a quarantine area	A quarantine area that is separate and away from the existing enclosures needs to be developed.	Animals being rescued from different areas can bring different pathogens with them and can cause infection in the resident animals impairing their health. Health screening in a quarantine area prior to introduction to other resident conspecifics can minimize it.
4	Absence of adequate housing facility for larger turtles such as <i>Nilssonia gangetica</i>	Enclosure III has adequate depth (5') and can be developed to house these species with suitable portioning.	Larger turtles like <i>Nilssonia gangetica</i> are regularly received at KPK; however, there is no space for housing them.
5	No office space or treatment room is present at the centre	An unused staff quarter at the centre after repairs can be used as an office cum treatment room.	Rescued animals require round the clock monitoring and frequent veterinary interventions. An area away from the enclosures housing animals is required for this. Additionally space is required for maintaining a store for medicines, feed of turtles and relevant records of treatments and other interventions being made.

Sr. No.	Shortcomings identified	Actions to be initiated	Justification
6	Lack of veterinary diagnostic facility	A minimal facility for basic investigations such as fecal and haematological examination is required.	Essential for emergency management of rescued animals.
7	Lack of provision of standardized nutrition for the rescued animals	Standardization of nutrition provided to the animals housed needs to be done based on the species, life-history stage and season.	Adequate species specific nutrition is critical in ensuring optimum growth and well-being of captive animals.
8	The environment in enclosures I and II do not address critical habitat needs of turtles.	The enclosures need to be enriched to meet critical requirements of the animals housed such as thermoregulation and hauling out of the water-body onto the land needs to be provided.	Captive environments due to limitations of space cannot meet critical needs of animals housed in them. Enclosure enrichment aids addressing critical needs of the species housed.
9	Animals could not be individually identified.	Individual identification marks need to be placed on all animals received.	Individual identification is essential for identifying animals for veterinary interventions, to monitor growth and for post release monitoring.

Based on the above action was initiated for carrying renovation/ refurbishment of enclosures to meet critical needs of the species housed in the enclosures I and II with major changes carried out listed below:

1. The water storage tanks in enclosure I and II were repaired and a continuous supply of freshwater in the ponds housing turtles was initiated.
2. Required permissions and approvals were obtained and a basic animal treatment facility cum office was established at the centre.
3. Feeding charts were prepared for the turtles based on their number and weight. The same was explained to the staff at the centre and appropriate changes in the nutrition provided to turtles was made based on the species, life history stage and season.
4. Environmental enrichment in the form of logs for basking and hauling out, sun and shade areas for thermoregulation in the land area of the enclosures were provided.
5. Besides this to ensure proper functioning of the centre daily attendance register and work register were initiated and a health assessment of the staff engaged at the centre was carried out.
6. Animals present at the centre were individually marked with metal tags for soft-shelled turtles and scute notching for hard shelled turtles.
7. It was also decided to limit entry of people into the enclosures to minimize chances of spread of infections.

3.1.7 Renovation of existing building of forest department

Permission was granted for setting up a laboratory cum office room inside the campus of the centre from the Uttar Pradesh Forest Department, Kashi. It was cleaned and renovated for making it functional.



Building prior to renovation



**Renovated building with office space,
laboratory & Hospital**

3.1.7 Enrichment for turtles

The two enclosures for turtles, were covered with Bamboo platforms for providing different water temperature gradients in the same enclosure by creating a mosaic of sun light and shade areas as well as to provide hiding places for the turtles.



Provisioning of Basking area



Provisioning of shade

3.1.8 Barriers

Enclosures I and II were covered with Green net from all the sides of the enclosure to provide physical barrier for effective stress free environment. Entry to the enclosures was restricted to personnel of the centre only.



Physical barriers at enclosures

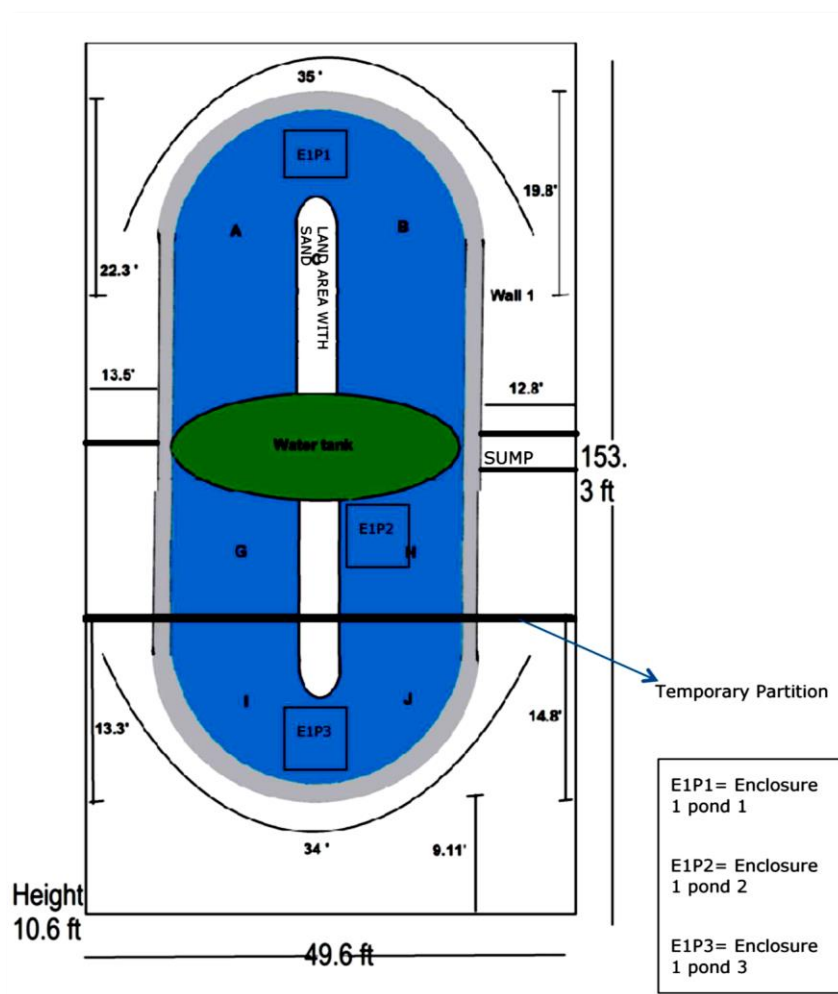
A further detailed assessment of the Kachua Punarvas Kendra (KPK), Sarnath was carried out by the Subject Matter Specialist. The salient findings of the assessment and the ameliorative actions initiated are presented below.

Table 3.6: Findings of assessment carried out at KPK, Sarnath

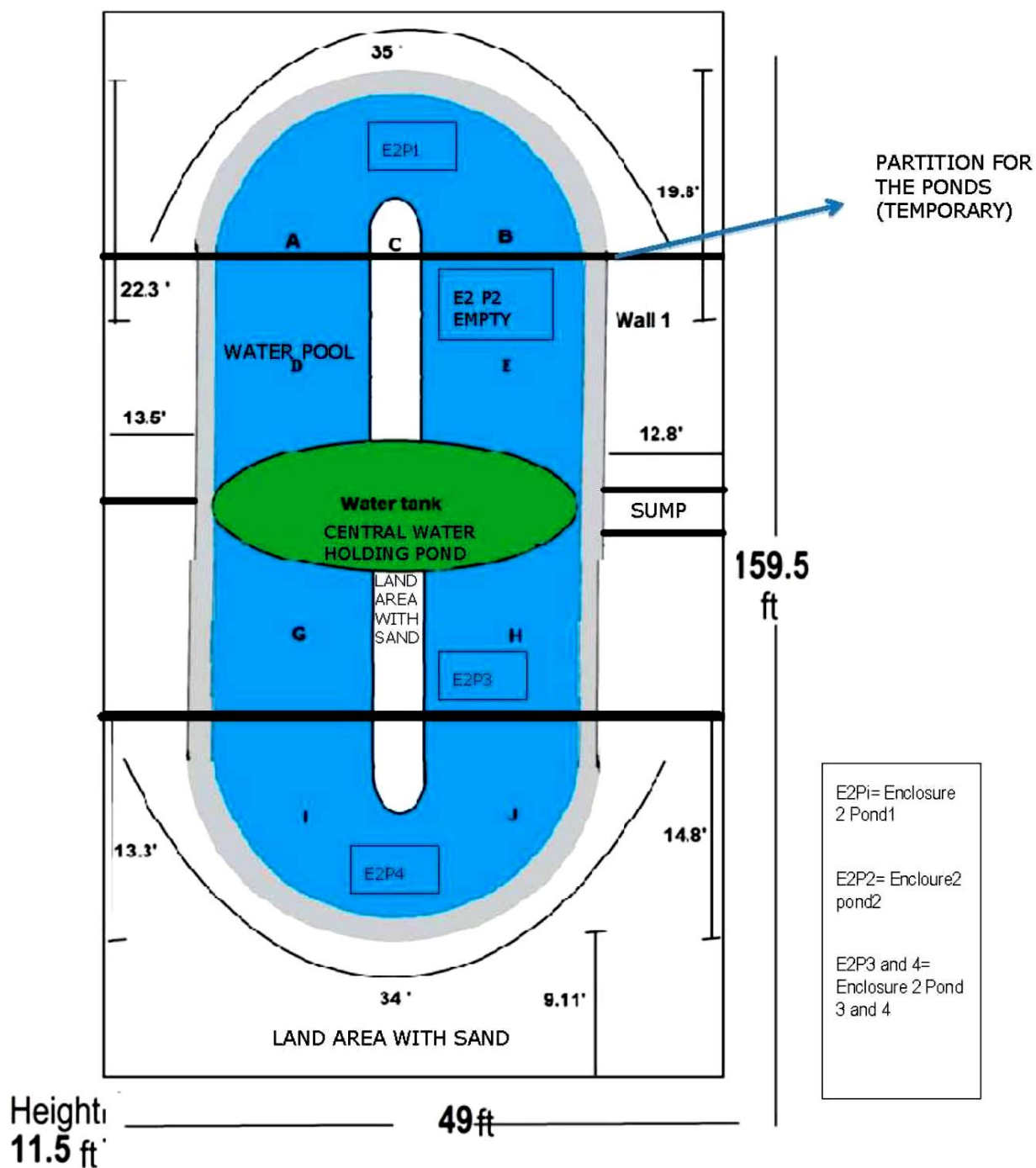
Sr. No.	Salient findings	Actions to be initiated	Justification
1	The enclosure barrier consists of a mild-steel angle frame covered with a chicken wire mesh. The frame and mesh are broken in places.	Need to replace broken supports and ensure complete coverage of the enclosure with chicken wire mesh.	While light-weight the barrier is effective for vermin proofing the enclosure.
2	The structure of the ponds is breached in several spaces with poor water retention and the partitions within enclosures are temporary in nature.	Appropriate measures for repair of ponds for optimum utilization of water are needed with permanent partitioning of the enclosures as detailed in figure: Proposed layout for species specific housing for enclosure I and II.	Turtles are aquatic animals and need continued access to water for survival. The partitioning of enclosures will enable providing species/ age specific housing.
3	At present the water in the ponds needs to be replaced to ensure maintenance of water quality.	The central water tank in both enclosures I and II needs to be repaired and connected to each of the smaller ponds created by partitioning, with water being recycled after filtration. This along with circulation of water was anticipated to maintain water quality.	Water in enclosures of captive animal gets fouled with fecal matter and left over food. The contaminated water can lead to infections in the animals.

Sr. No.	Salient findings	Actions to be initiated	Justification
4	Access to basking areas from water is through the cemented sides.	Rubber door mats need to be put along the slopes of the pond for easier access to basking areas.	The rough cemented sides can abrade the plastron of the turtles and cause injuries to smaller animals and soft-shelled specimens.
5	Enrichment in the form of basking logs and sun and shade areas is inadequate and needs to be reinforced.	Additional enrichment in the form of live fish fingerlings and aquatic macrophytes can be provided in the ponds. Enrichment plan for enclosures I and II are provided in figures titled proposed enrichment plan for enclosure I and II.	The live fish fingerlings can stimulate activity in carnivorous and help in retaining the hunting instinct. The aquatic macrophytes can act as feed for herbivorous species and create thermal gradients by create sun and shade areas in the shallow water-bodies.
6	The nutrition provided to the turtles is inadequate	Supplementation of the feed with protein and increasing the feeding frequency to daily feeding needs to be carried out. Carnivorous species require to be fed fish/shrimp @ 15% body weight. The project may provide the feed in view of the budgetary constraints of the forest department.	Protein is essential for ensuring growth of juveniles and sub-adults and also ensures health of the animals. The animals in captivity for achieving fitness at the earliest and to ensure optimum well-being need to be fed daily.
7	Health monitoring is inadequate and needs to be strengthened	Disease prevention procedures and veterinary pathological investigations (faecal analysis, blood profiles etc.) may be scheduled once a month. Sick animals so identified can be segregated and appropriate interventions provided. Post mortem examinations with necessary biological sampling for histopathology and disease investigation needs to be carried out.	The centre houses animals that are to be released in their natural habitats at the earliest possible. Regular health screening can help in ensuring that the animals return to an optimum state of fitness at the earliest and be ready for release. Post-mortem examinations provide an insight into the possible disease that may be present in the population.
8	Sanitation and hygiene at the centre need to be improved	Disinfectants like Virkon Aquatic (www.syndel.com/products/biosecurity-supplies-disinfectants/virkon-aquatic/virkon-aquatic-10-lb-tub-virkdlb0010.html) can be used to scrub the ponds. Virkon® Aquatic solutions are fast acting, colorless, fragrance free and non-irritating, which makes it the suitable for use in Aquatic applications.	Aquatic fauna are heavily dependent on water and good water quality is essential to the well-being of all aquatic species. In a captive set-up good hygiene is essential for maintaining animals' health.

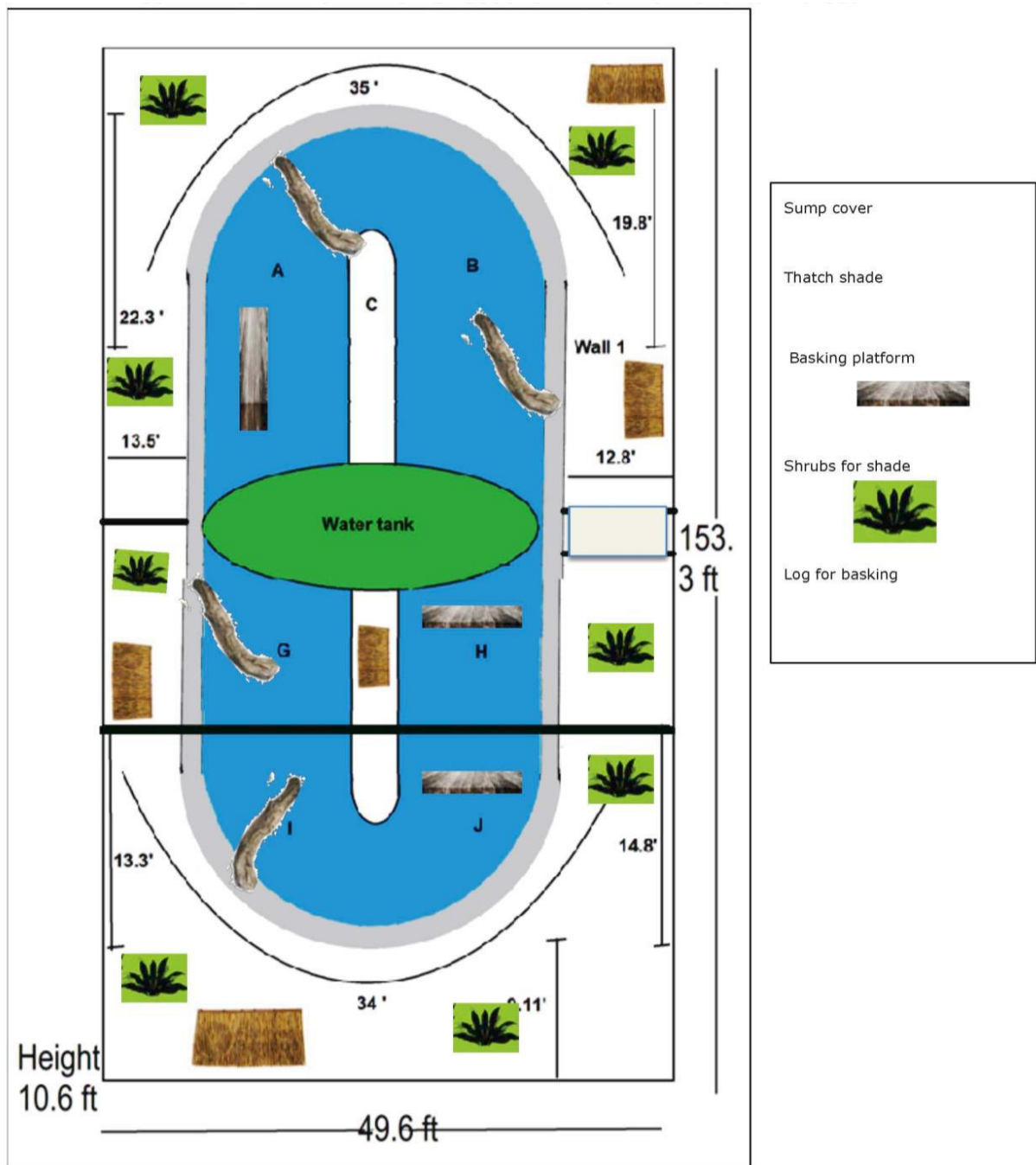
Sr. No.	Salient findings	Actions to be initiated	Justification
9	Quarantine facilities need to be strengthened	An area away from the rest of the enclosures must be provided for quarantine. The staff of the centre must be trained in following quarantine protocols.	All rescued animals coming into a rescue and rehabilitation facility need to go through isolation for required veterinary interventions before being placed into rehabilitation ponds to prevent spread of disease from the new entrants to the existing population.



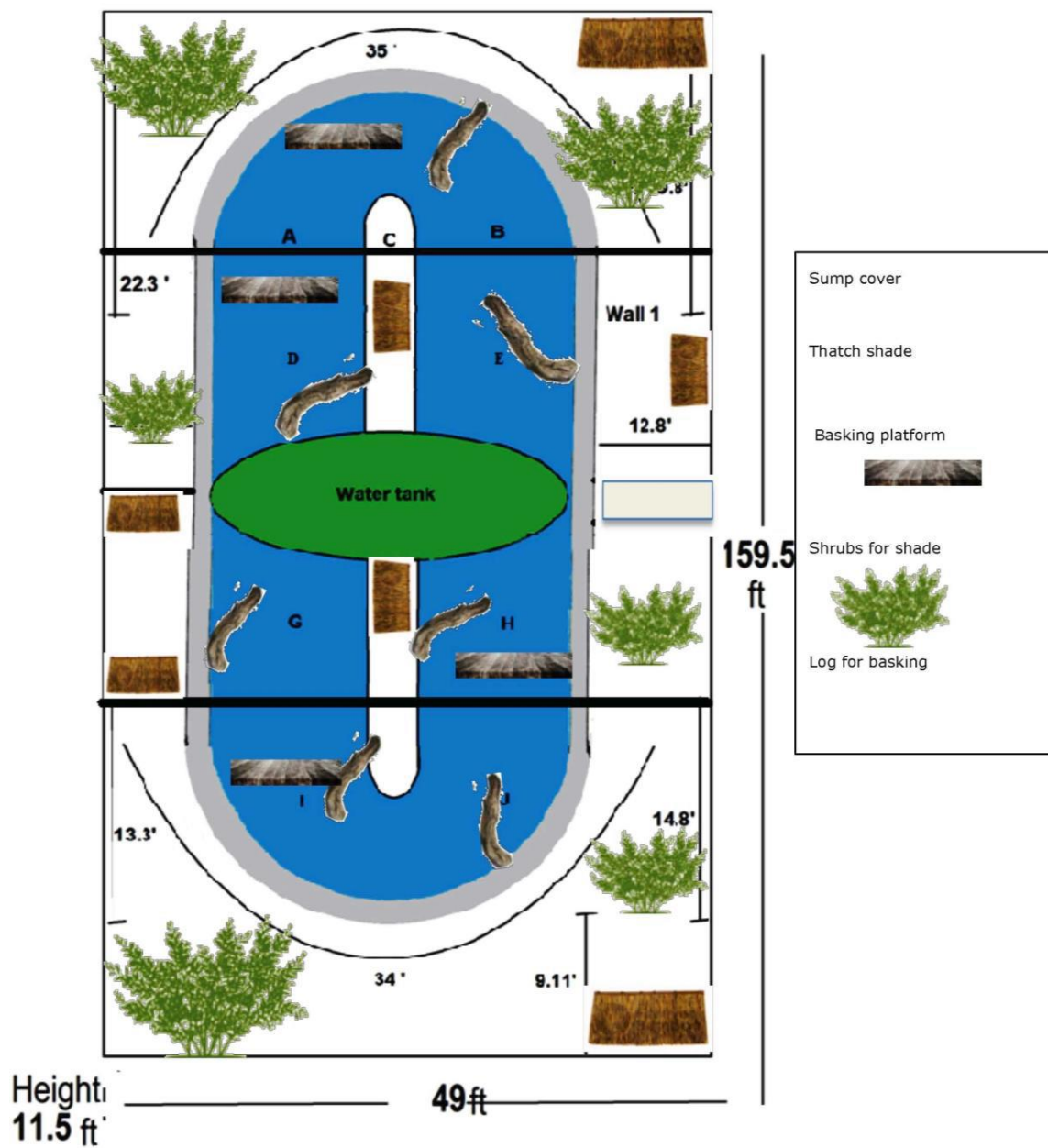
Proposed layout for species specific housing for enclosure I



Proposed layout for species specific housing for enclosure II



Proposed enrichment plan for enclosure I



Proposed enrichment plan for enclosure II

A detailed report regarding the assessment and subsequent necessary upgradation was provided as “WII-NMCG (2018). Technical Report: Assessment of the Ganga Aqualife Rescue and Rehabilitation Centre, Sarnath, WII-NMCG Biodiversity Conservation and Ganga Rejuvenation Project. Pp. 39”

As per assessment report submitted, minor modifications to Enclosure I of Kachua punarvaas Kendra from 7th April, 2018 to 25th April, 2018. a, Sarnath were undertaken for better management of the day to day activities at the centre. Improvements were made in the diet schedules and variety of food offered and enrichment of the enclosures. Stock registers for health examination and morphometry of the stock were created and being maintained at the centre.

Water quality is critical to housing turtles in captivity. Thus a simple filtration unit was installed for the pond 2 of Enclosure I. The filtration unit consists of 4 tubs perforated bottoms material that helps filter the water. The tubs are organized on a vertical bamboo lattice. The first/ top most tub was filled with small pebbles followed by next one containing large pebbles, the third one had sand and last one a mixture of coal and pebbles. All material was cleaned properly before use.

The water from the pond is pumped into the filtration unit. The water flows down by gravity through the holes in the tub, passing through the filtration material. This water is then supplied to the pond. The water is thus filtered and aerated.



3.1.9 Provisioning of live fish including turtle feed

Live fishes were incorporated into the diet of the all the carnivorous turtles and a small number of fishes were also released in the ponds for the juvenile of *Batagur kachuga* and *Batagur dhongoka*. Turtle food was added for the weaker individuals at 3 days' intervals.

3.1.10 Enclosure enrichment

Naturalistic enclosures providing habitat niches are important in any facility that houses wild animals, species typical. The various niches available to the animals reduce stress and encourage natural behavioral attributes. Keeping this in mind some environment enrichment, mainly using locally sourced materials was done.

- A) Logs have been strategically placed in water for enrichment: The logs are used for basking and also as visual barriers in the enclosures. These logs create small nooks where animals can hide and feel secure. Strategic placement allows for animals to hide under and use them for shade and also in an attempt to come out onto the land areas.



- B) Shades using bamboo platforms with hay cover have been created: - The shades were mainly placed in spots identified as spaces normally used by the animals. They were placed in a manner such that piling up is avoided. Bales of hay were additionally placed in some locations for turtles like Spotted Pond Turtles (*Geoclemys hamiltonii*) that often spend a significant amount of time outside the water. The shades placed in the water provide hides for the animals and keep water temperatures cooler.



- C) Enrichment Ponds: Two small ponds of 2'x4' and with 3' depth and with gentle slope were made in April 2018 near the existing pond in enclosure 1 pond 3 and Pond 4. These ponds provide opportunity for the smaller animals to have safe spaces. Hydrilla (*Hydrilla verticillata*) was introduced into these ponds for shade.



- D) Rubber mats have been placed at several points in all the ponds. They provide a strong grip for the animals to haul out of water and minimise abrasion from the coarse cement surface.



- E) Smaller niche areas for fossorial behaviour have been created to encourage natural burrowing behaviour in turtles like flapshells (*Lissemys punctata andersonii*). This allows for regular checks on the animals as they will hopefully remain in these areas and also for controlled use of the space.



- F) Landscaping- Grass has been planted along the edges of the enclosure to provide a more naturalistic space in the enclosure.



- G) Water hyacinth (*Eichhornia crassipes*) and Hydrilla (*Hydrilla verticillata*) have been added to the ponds to provide shade and hiding places in the ponds. The water hyacinth (*Eichhornia crassipes*) is also used as hides (noted even in wild circumstances- personal observation) by smaller animals. The younger animals are known to feed on aquatic vegetation and Hydrilla (*Hydrilla verticillata*) encourages this natural behaviour even in captivity.



3.1.11 Additional upgradation

The upgradation carried out to provide species specific enclosures to aid in the care of the animals at the centre and also for ease in specific acclimatization processes to prepare animals for eventual release in the wild. Ponds of enclosure 2 were mainly becoming un-usable as they were not able to hold water overnight due to excessive seepage through cracks.

To overcome this obstacle and to make the ponds available for use, plastic sheet was used to line the ponds where there were significant leakages. The plastic was anchored into the sand on the sides and sand as substrate was filled. The ponds were filled with water and tested overnight for water holding capacity. The animals were then introduced into the ponds the next day. A water change routine has been set in place to maintain water quality.



Temporary arrangement in enclosure II for retaining water

An assessment of enclosure III was carried out during visits to KPK, Sarnath during August to October 2019 and the enclosure III was observed to be in a poor state with the water body filled up with sand, water seeping through the various cracks and crevices in the structure caused by roots of vegetation and lack of maintenance and the enclosure was overgrown with weeds. It was also observed that the water body had a steep gradient for providing access to basking areas/ land.



State of enclosure III prior to initiation of refurbishment work

In view of the large numbers of turtles already presents at the centre and additional ones received each year through confiscation it was necessary to create additional housing space. After clearing the pond of sand and other debris a plastic sheet was spread across the bottom of the water-body and a three to four-inch-thick layer of concrete was evenly spread over it ensuring proper sealing of all cracks in the sides at the base. Water-proofing material was added to the concrete to ensure proper sealing of all cracks.



Minor civil work carried out at KPK, Sarnath

The concrete base was allowed to set overnight and subsequently cracks/damaged portions on the sides of the water body were filled with a mixture of cement-mortar and water-proofing mixture to ensure that it retains water.

As a further measure for ensuring that the seepage of water does not recur a double layer of water-proofing compound mixed with cement was overlaid over the entire cemented surface of the water body.



Water proofing of enclosure III

The water in captive facilities tends to get fouled with excreta of turtles, left-over food and debris; maintaining water-quality for aquatic animals is however, essential as captive housing facilities with poor water-quality lead to a build-up of pathogens and increase likelihood of animals falling prey to opportunistic infections. Accordingly, a small water filtration plant was set up in the enclosure.



Setting up of filtration unit

The wire-mesh protecting the enclosure from birds of prey had disintegrated with time and had to be replaced. As a cost effective measure a one-inch mesh size fishing net was spread over the top of the enclosure on the mild steel angle frame already present. The sides of the enclosure were covered with a green-mesh to act as visibility barrier and to provide shade in a part of the enclosure.



Turtles are ectothermic animals and use sun, shade and water to regulate their body temperature, they also feed on a variety of aquatic vegetation. The enclosure was appropriately planted with plants and grasses to provide a mosaic of sun and shade areas. While the water-body was filled with aquatic vegetation (duckweed: *Lemna sp.*) that occurs naturally in the area.

Rubber mats were placed to provide non-abrasive surface for the turtles to access the land areas of the enclosure. While a pipe with perforations was spread over the water-body to ensure aeration and maintenance of water-quality. Required electrical fittings for illumination of the enclosure, winter management and operating the water pump for the filtration unit were put in place.

Water supply was provided to the enclosure from the existing water-mains in enclosure I of the facility.



Enclosure III after upgradation

3.1.12 Setting up of field laboratory

In view of the large number of turtles being maintained at KPK, Sarnath, a field laboratory for basic pathological analysis was established to facilitate effective health assessment on arrival of turtles into the centre. Based on the laboratory investigation, necessary veterinary interventions are initiated. Health assessment is an important part of the pre-release activities as they supports release of fit individuals into natural habitats.



3.1.13 Animal care room

An animal care room has been set up to accommodate animals that need treatment and has in-house care facility.

3.1.14 Isolation set-up

Three pools were created next to the Laboratory to set up an isolation facility. The ponds have a depth of 3 feet with slopes leading onto land area. The boundary is covered by green-shade net and has pest proofing. Wooden logs have been added as enrichment devices and water hyacinth (*Eichhornia crassipes*) has been used for creating thermal gradients and providing cover for the animals. Shade areas have been developed using hay covered platforms. Solar powered pond fountains have been effectively used for providing aeration.

The ponds have been designed to house the hatchlings that are kept in these ponds for a period of one month. The ponds are temporarily used for housing recovering animals that require close monitoring.

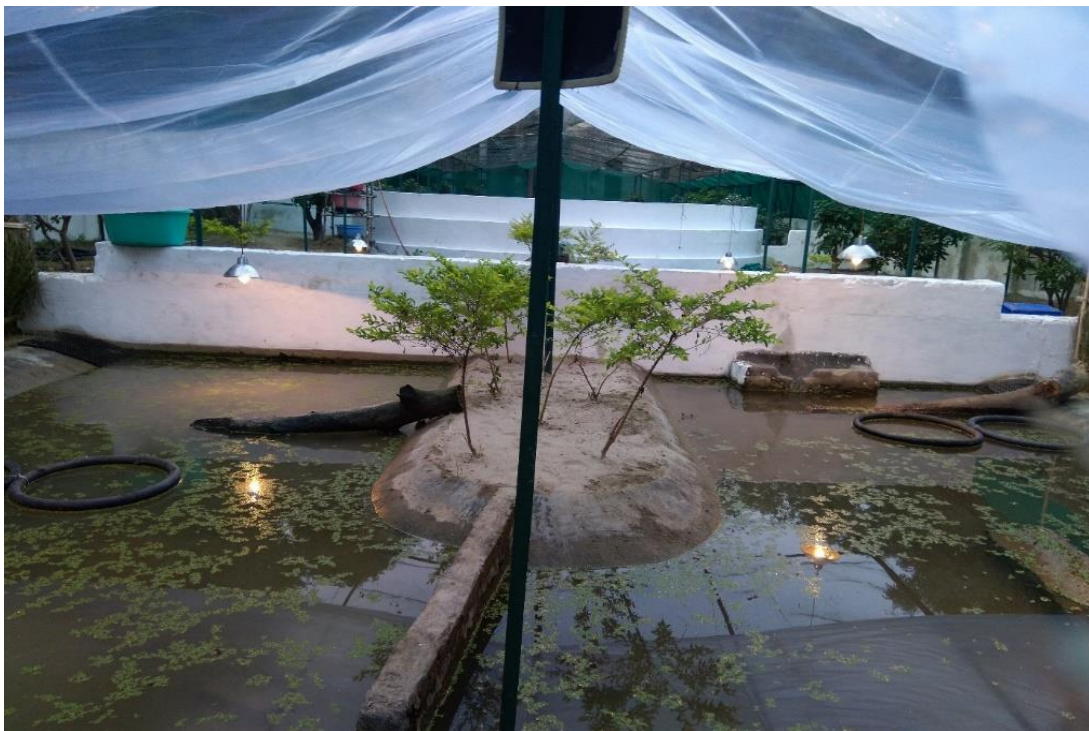


Isolation set-up

in pond or release in the wild. The ponds can also be used to keep infirm animals that need intensive care and confinement small spaces for recovery.

3.1.15 Maintenance of temperature

Maintaining optimal water temperatures in captivity is challenging as the temperatures drop to as low as 4–10 °C during winters and rise to as high as 40–48 °C during summers. During winters (November to mid-February), enclosures are insulated with thick plastic sheets and water is heated to maintain ambient temperatures around 29–30 °C for both the centres. During summers, thatched shades aquatic macrophytes and shrubs limit direct sunlight but still provide sufficient basking sites and roofs of enclosures are covered partially with thatch to prevent over-heating of water.



Temperature maintenance of enclosures

3.1.16 Establishment of a rescue and rehabilitation facility at Bhagalpur

A request was received from the Forest Department, Government of Bihar for facilitating the establishment of a rescue and rehabilitation facility for aquatic macro-fauna at Bhagalpur. Members of the project team visited Bhagalpur to initiate discussions with the forest officials and carry out a site assessment. The precincts of Sundervan (the forest office complex) at Bhagalpur were found to be suitable for establishing the facility.

The project team supported the Bihar Forest Department technically in the establishment of the centre. The activities carried out in this regard development of location specific layout plans for the facility and supervision of construction work to ensure that the designs are effectively executed. An enrichment plan for the facility was also developed and executed.



Enclosure at Bhagalpur

3.2 Management of rescued animal

Rescue operations are essentially a team effort and often involve several organizations and individuals. Those involved in rescue operations must be prepared at all times to manage emergencies and respond at the earliest on requiring any information regarding animals in distress. It is critical to always have all the equipment ready at hand with vehicle and driver on standby.

Table 3.2.1: Animals rescued and rehabilitated since 2016

Sr. No.	Species	No. Rescued		No. Released	
		Sarnath	Narora	Sarnath	Narora
1	Indian tent turtle (<i>Pangshura tentoria</i>)	1	7	16	7
2	Brown roofed turtle (<i>Pangshura smithii</i>)	0	11	0	11
3	Indian roofed turtle (<i>Pangshura tecta</i>)	0	77	0	77
4	Indian flapshell turtle (<i>Lissemys punctata</i>)	1772	8	1860	8
5	Indian peacock softshell turtle (<i>Nilssonina hurum</i>)	0	2	0	2
6	Indian/Ganges softshell turtle (<i>Nilssonina gangetica</i>)	6	10	4	10
7	Indian narrow-headed softshell turtle (<i>Chitra indica</i>)	0	1	0	1
8	Black pond turtle (<i>Geochelone hamiltonii</i>)	0	19	14	19
9	Three-striped roofed turtle (<i>Batagur dhongoka</i>)	315	3	690	3
10	Red-crowned roofed turtle (<i>Batagur kachuga</i>)	0	0	89	0
11	Indian black turtle (<i>Melanochelys trijuga</i>)	0	3	0	3
12	Brahminy river turtle (<i>Hardella thurjii</i>)	0	2	0	2
13	Mugger crocodile (<i>Crocodylus palustris</i>)	0	0	0	1
Total		4053*	143	4632**	144***

*4053 Including 1959 mixed spp. turtles confiscated by Uttar Pradesh Police in December 2016

**4632 including 1959 mixed spp. turtles confiscated and 579 mixed species of turtles present at Sarnath

***144 Including one Mugger crocodile

The project team after completion of mandatory legalities took the rescued animals to the nearest rescue facility for detailed assessments and subsequent management. The project veterinarian through triage (See section: practices and protocols) assessment determined the interventions required. Animals were removed from the distress situation (e.g., released from any ties or binds, removed from gunny sacs or bags etc.) and confined in a secure area. On assessing the animals and satisfying all administrative requisites, the animals if deemed fit can be crated for further transport to a suitable release site.



Animal confiscations

The transportation of freshwater turtles and tortoises was facilitated in crates. The crate types and crating methods were selected based on the species, number of animals, their size and the distance of travel. All crates used for transportation are well ventilated, secure and safe for the animals (without projections, bolts etc. that may injure the animals). Special precautions to avoid injuries during transit like padding were provided inside of the crates.



Transportation of animals to Centre

Triage, the process of determining the priority of patients' treatments based on the severity of their condition is used to prioritize and ration patient for treatment due to resource limitations. At triage animals were classified into categories based on the condition of the animals. Animals in triage categories 1 and 2, were released immediately while others that required first aid, treatment or veterinary support were handled accordingly. For critical injuries in animals, that compromised their fitness and limited chances of further survival were shifted to rescue centers for intensive care. Further to segregation of animals based on triage, the individuals requiring care were move to a quarantine area where detailed health assessment of each animal was carried out. The assessment formed the basis for its subsequent management of sick and injured animals were provided required veterinary interventions. Collection of biological i.e. blood and excreta samples for detailed pathological examinations were carried out.

Quarantine protocols were strictly adhered and used of personal protective equipment as required was ensured. During specified quarantine period, the animals were moved to enclosures for housing with their other conspecifics. Species specific husbandry protocols were adopted for maintaining the animals in the captive facility.

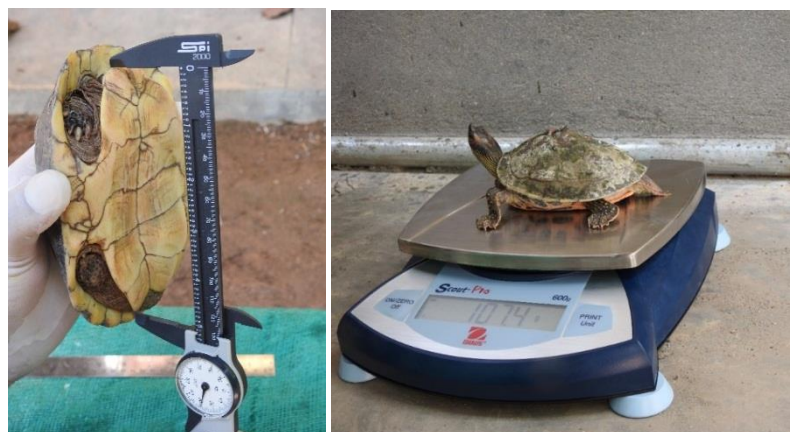


Quarantine facility at the Centre



Health assessment and veterinary interventions for animals under stress

Basic morphometric measurements of the turtles viz. Straight carapace length (SCL), Straight carapace width (SCW), Plastron length (PL) and Plastron width (PW) and body mass are indicators of growth and wellbeing. Records of the same were maintained to study growth patterns and the effect of interventions made on well-being of turtles. Periodic health assessments, growth rate, weight gained and behavioral patterns formed the basis for assessing return to fitness. Feeding is maintained as per species specific needs, life history stage and season. The feeding schedule was changed every month based on weight. All animals identified as fit were released into appropriate natural habitats after obtaining necessary permissions/ approvals. An additional consideration was prevailing weather conditions with harsh conditions being avoided during release operations.



Assessing individual animal growth

Management of hatchlings: On emergence, 474, 51 hatchlings and 230 hatchlings in 2017, 2018 and 2019 respectively the hatchlings were brought to the animal care room. They were cleaned of sand and kept in tubs with water for a minimum period of three days where the water was changed atleast once a day. The absorption of yolk monitored was on daily basis. On complete closing of the umbilicus the animals were released into the pond at the isolation set up for a month for close monitor and management. Feeding was started with turtle food. The diet for the animals was modified every month as per dietary needs, season and weight



Care of hatchling at the Centre



Isolation facility for hatchlings

At the end of the isolation period and sub-adult age for the animals hatched at the centre and after required permission/approvals for release, the animals are again assessed for fitness and fit individuals are released back to natural system. We have released 4775 turtles and 1 mugger after successful rehabilitation (Table 3.2.1).



Release of turtles in natural habitat



Community participation in turtle release programme

3.3 Capacity building of stakeholders

Ganga Basin is the largest river system of the Indian sub-continent that supports a rich aquatic bio-diversity. The second half of the twentieth century witnessed a variety of engineering interventions in the river system for the extraction of water for irrigation and generation of electricity that have altered the hydrology and geo-morphology of the river system, besides unsustainable biological resource extraction practices that include illegal trade in animals and their parts. These have undermined the rich bio-diversity of the river system resulting in ever increasing threats to the continued existence of this assemblage. Species that are dependent for their sustained survival on specific habitat attributes are more susceptible to declines than those that adaptable to the altered habitat conditions. The major conservation dependent species identified include, among mammals include the Gangetic Dolphin and three species of otters; among birds several species of waders and divers and among reptiles, turtles and gharial.

Few combined models to address the various threats exist posing a conservation conundrum for policy makers, managers and the conservation community. In such a scenario rescue and subsequent rehabilitation of higher vertebrate

fauna of the river in stretches that still provide the required habitat conditions for these conservation dependent species offers a viable alternative to ensure the long-term sustained survival of these species.

Effective rescue and rehabilitation for achieving conservation goals is a participatory effort involving multiple stakeholders. The major stakeholders identified include frontline forest officials for organizing the rescue effort and addressing legal aspects of confiscations and rescues, veterinary professionals to address the health-care needs of the rescued animals and local community members as first responders to field rescues and in protecting populations at release sites. The capacity of these stakeholders in addressing rescue and rehabilitation needs of higher vertebrate fauna of Ganga River is constrained by the lack of awareness on actions that need to be undertaken for effective rescue and rehabilitation.

The second major objective of the component IV of the project accordingly was the capacity enhancement of different stakeholder groups that have key roles to play in rescue and rehabilitation of aquatic higher vertebrate fauna of Ganga River. These include personnel of state forest departments, local community members, field veterinary professionals of the state animal husbandry departments. Each of these stakeholder groups has a key role to play in effective rescue and rehabilitation of aquatic higher vertebrate fauna. The personnel from the forest department ensure enforcement illegal provisions and act as confiscating agencies for the animals in illegal trade. The veterinary professionals provide the much-needed health-care expertise for diseased/traumatized aquatic higher vertebrate fauna while the boatmen

and fishermen communities possess traditional skills in capturing and handling the aquatic higher vertebrate fauna and often the first to learn and report the presence of distressed animals.

The identified objective for capacity enhancement was to develop ‘a network from representatives of riverside communities (from select Ganga states) that is sensitive and motivated to report and assist in addressing emergent situations pertaining to higher aquatic vertebrate fauna of River Ganga’

The deliverables to be achieved in this regard are placed below.

Year 1: Capacity development through trainings (2) of forest department personnel (25) and field veterinarians (25) in skills needed for handling emergent situations pertaining to higher aquatic vertebrate fauna of River Ganga.

Year 2: Capacity development through two training programmes of 25 forest department personnel and 25 field veterinarians in skills needed for handling emergent situations pertaining to higher aquatic vertebrate fauna of River Ganga.

Year 3: Capacity building of local communities Five for each Ganga state (25 nos).

The task of enhancing capacities of forest officials, field veterinarians and local communities was therefore initiated to provide desired skills in managing emergent situations with reference to aquatic higher vertebrate fauna of Ganga River. The number of stakeholders with enhanced capacities is summarized in table 3.3.1.

Table 3.3.1: Stakeholders with enhanced skills

	Veterinary Officers	Local Community members	Forest Officials
Number of stakeholders with enhanced capacities	69	214	232

3.3.1 Curriculum development

The varying roles and responsibilities of each group necessitated development of curriculum specific to that group. Specific curriculum was developed for each stakeholder group and details of the same are placed below.

3.3.2 Forest officials

The capacities of frontline officials of the forest departments of the five River Ganga states viz. Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal were identified for enhancement of their skills/ capacities in managing emergent situations with reference to higher aquatic fauna of River Ganga. The need for enhancing the capacities was perceived as the existing focus of wildlife wings of forest departments

is primarily on conservation/ management of terrestrial systems though several wetland areas have been prioritized for conservation in each of these states.

The curriculum accordingly addressed lacunae in the knowledge base (species identification, fauna handling techniques, first aid for injured fauna, captive husbandry and legal aspects of rescue and rehabilitation) for enhancement of capacities of frontline forest officials. The curriculum was based on strengthening capacities on the following aspects:

- Aquatic ecosystems and biodiversity conservation issues along Ganga Basin.
- The objectives of rescue and rehabilitation of higher vertebrate fauna of River Ganga.
- Identification of species likely to be rescued.
- Ecology, animal behavior (e.g. habitat selection, foraging strategies, reproduction, competition, and predator-prey interactions) and basic biology (anatomical and physiological peculiarities) of identified species (Reptiles: turtles and crocodiles; Aves: waders and divers; mammals: Otters and Gangetic River Dolphin).
- Nest Rescue, Captive management essentials, neonatal care and release.
- Humane and safe handling and capture of identified species.
- Welfare of herpeto-fauna in captivity.
- Trade in aquatic fauna.
- Legal aspects of wild animal confiscations.

3.3.3 Field veterinarians

The capacities of field veterinary officers of the state animal husbandry departments of the five River Ganga states viz. Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal were identified for enhancement of their skills/ capacities in managing emergent situations with reference to higher aquatic fauna of River Ganga. The need for enhancing the capacities was perceived as the existing curriculum of the Bachelor of Veterinary Science and Animal Husbandry (essential qualification for entry into the animal husbandry department) deals primarily with domesticated animals with a limited exposure to wild animals and minimal exposure to aquatic wildlife.

The curriculum accordingly addressed lacunae in the knowledge base (species identification, fauna handling techniques, first aid for injured fauna, recognizing the signs and management of disease and captive husbandry) for enhancement of capacities of field veterinarians. The curriculum was based on strengthening capacities on the following aspects:

- Aquatic ecosystems and biodiversity conservation issues along Ganga Basin.
- The objectives of rescue and rehabilitation of higher vertebrate fauna of River Ganga.
- Identification of species likely to be rescued.

- Ecology, animal behavior (e.g. habitat selection, foraging strategies, reproduction, competition, and predator-prey interactions) and basic biology (anatomical and physiological peculiarities) of identified species (Reptiles: turtles and crocodiles; Aves: waders and divers; mammals: Otters and Gangetic River Dolphin).
- Humane and safe handling and capture of identified species.
- Diseases of Aquatic Macro Fauna and their Management.
- Management of veterinary medical emergencies (drowning, stranding, strayed, injured and traumatized animal).
- Health and safety issues associated with fauna rehabilitation (e.g. disease transmission, managing hazardous chemicals and operating in dangerous locations and times).
- General field procedures including necropsies, biological sampling and documentation.
- Record-keeping.
- Trade in aquatic fauna.
- Legal aspects of wild animal confiscations.

3.3.4 Local communities

The capacities of members of local communities of the five River Ganga states viz. Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal were identified for enhancement of their skills/ capacities in managing emergent situations with reference to higher aquatic fauna of River Ganga. The need for enhancement of capacities was perceived as local communities that inhabit areas along the Ganga River have traditional knowledge that is based on personal experiences; however, certain gaps/ shortcomings that exist in it need to be addressed. The curriculum addressed these gaps in knowledge and aimed at providing empirical information.

- Need for biodiversity conservation along Ganga River.
- The objectives and necessity of rescue and rehabilitation of higher vertebrate fauna of River Ganga.
- Identification of species likely to be rescued.
- Ecology, animal behavior (e.g. habitat selection, foraging strategies, reproduction, competition, and predator-prey interactions) and basic biology (anatomical and physiological peculiarities) of identified species (Reptiles: turtles and crocodiles; Aves: waders and divers; mammals: Otters and Gangetic River Dolphin).
- Human health and safety issues associated with fauna rehabilitation.
- Basics of rescue and rehabilitation of aquatic macro-fauna including the rescue of crocodilian and chelonian nests\ eggs.
- Techniques for humane and safe handling and restraint of turtles and crocodilians

3.3.5 Capacity enhancement programs for forest officials

A series of four workshops were conducted exclusively for forest officials of the states of Uttar Pradesh and Bihar with a participation of 139 forest officials of different ranks (Divisional Forest Officer to daily wage worker under forest department), while three integrated workshops with participation of forest officials and local community members were organized in the states of Uttarakhand, Jharkhand and West Bengal with the participation of 73 forest officials.

The desirable deliverables under the project objectives have been effectively achieved with capacities in the skills necessary for rescue and rehabilitation of higher vertebrate aquatic fauna of River Ganga being developed in 232 forest officials of five states.

The details of the sensitization programs organized in this regard are summarized in table 3.3.5 (a) and 3.3.5 (b) while details of participants of the sensitization programs are presented in *Annexure I*.

Table 3.3.5 (a): Capacity enhancement programs for forest officials

Sr. No.	Date	Workshop/Training	No. of Participants
1.	7 th to 8 th December, 2018	Two one day workshops on managing aquatic macro-fauna along Ganga River for Forest Officials of Kashi division, Uttar Pradesh Forest Department	64 Forest Officials
2.	18 th February, 2019	Sensitization Workshop on “Managing Aquatic Macro Fauna Along Ganga River” for Frontline Forest Department Officers of Bulandshahr Division, Uttar Pradesh Forest Department	39 Forest Officials
3.	18 th to 19 th June, 2019	State Level Training Workshop for Forest Officials On “Rescue and Rehabilitation Techniques” At Bhagalpur, Bihar	32 Forest Officials
4.	27 th and 28 th June, 2019	Workshop on “Approaches for Rescue and Rehabilitation of Aquatic Macro-fauna” for field forest officers of Kashi Wildlife Division, Uttar Pradesh forest Department.	24 Forest Officials

Table 3.3.5 (b) Joint workshop of forest officials and local communities

Sr. No.	Date	Workshop/Training	No. of Participants
1.	29 th August, 2019.	Sensitization Workshop on “Managing Aquatic Macro Fauna Along Ganga River” for community members and forest officials Laksar Forest Division, Uttarakhand	27 forest officials and 15 Community Members
2.	14 th September, 2019	Sensitization Workshop on “Managing Aquatic Macro Fauna Along Ganga River” for community members and forest officials Sahibganj Forest Division, Jharkhand	31 forest officials and 33 community members
3.	18 th September, 2019	Sensitization Workshop on “Managing Aquatic Macro Fauna Along Ganga River” for community members and forest officials Barrackpore Forest Division, West-Bengal	15 forest officials and 36 community members



Releasing Field guide “Turtles and Tortoise along Ganga basin” for field identification.



Class room teaching for the trainees



Demonstration of handling techniques for turtles and tortoises



Demonstration of marking techniques for crocodilians



Demonstration of capturing and handling of crocodilians during class room session



Demonstration of egg rescue essentials and handling of eggs



Field demonstration of handling of turtles and tortoises.

3.3.6 Capacity Enhancement of Field Veterinarians

Based on the curriculum developed two, three-day sensitization workshops on “Managing Aquatic Macro-fauna along Ganga River” for field veterinary officers of Uttarakhand and Uttar Pradesh were organized. Besides this five field veterinarians of the states of Uttarakhand, Bihar, West Bengal and Uttar Pradesh were provided an intensive exposure on various aspects of wildlife health management in the International Field Course titled “Intervention in Wild Animal Health, 2019” jointly conducted by the Wildlife Institute of India, Zoological Society of London and Royal Dick Veterinary College of the University of Edinburgh. The participation of veterinary professionals in these capacity building efforts are summarized in table 3.3.6.1 below while details of participants of the sensitization programs are presented in Annexure II.

The project envisaged the development of capacities of 50 field veterinarians in addressing emergent situations of higher aquatic vertebrate fauna of River Ganga. The stated deliverables in this regard have been achieved with the capacities of a total of 69 veterinarians being enhanced in programs conducted under or financially supported by the project.

Table 3.3.6.1: Field Veterinary with enhanced capacities

Sr. No.	Date	Workshop/Training	No. of Participants
Stakeholder group: Veterinary professionals			
1.	26 th to 28 th April, 2018	3-day Sensitization workshop on managing aquatic macro-fauna along Ganga River for Veterinary Officers of Uttarakhand.	34 Veterinary Officers
2.	27 th to 28 th June, 2018	3-day Sensitization workshop on managing aquatic macro-fauna along Ganga River for Veterinary Officers of Uttar Pradesh.	30 Veterinary Officers
3.	27 th Jan to 15 th Feb, 2019	Intervention in Wild animal Health International Field course for 5 veterinary officers from Ganga States of Uttarakhand, Bihar, West Bengal and Uttar Pradesh	5 Veterinary Officers



Field inputs at Dehradun Zoo for Veterinary Officers



Demonstration of animal weighing



Hands on practice for handling crocodilian species by participants

3.3.7. Sensitization workshops for local communities

Various workshops were conducted exclusively for local communities of the states of Uttar Pradesh, Uttarakhand, Jharkhand, West Bengal and Bihar with a participation of 214 community members from different community starting from Ganga Praharies, general local people, members of local NGOs, boatman, fisherman, etc.

The details of the sensitization programs organized in this regard are summarized in table 3.3.7.1 while details of participants of the sensitization programs are presented in Annexure III.

Table 3.3.7.1: Capacity enhancement programs for community members

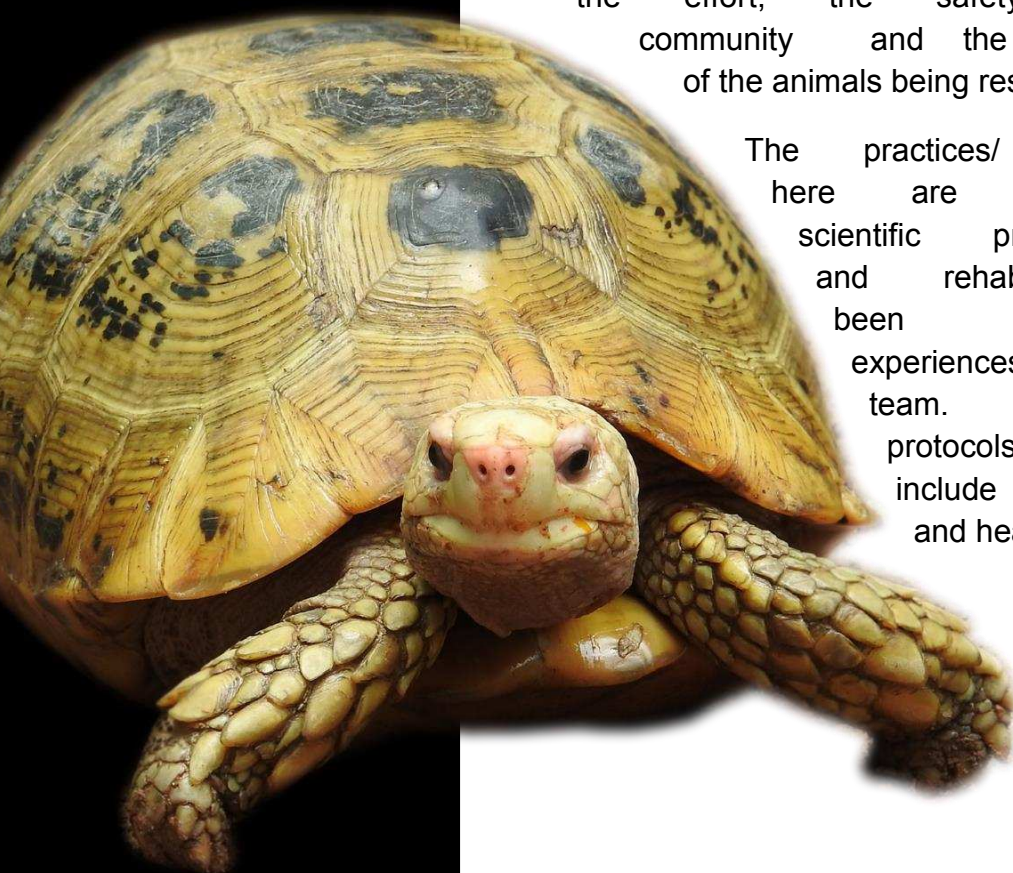
Sr. No	Date	Workshop/Training	No. of Participants
Stakeholder Group: Local Communities			
5.	15 th to 17 th May, 2018	3-day Sensitization workshop on managing aquatic macro-fauna along Ganga River for Ganga Praharis of Varanasi, Uttar Pradesh	33 Local community members
6.	23 rd July, 12 th August, 2018	Trained Ganga Praharies in roles of first- responders in Rescue and rehabilitation of aquatic macro fauna along Ganga River for the workshop titled "Certificate course on Ganga Prahari Livelihood enhancement under Green Skill Development programme"	20 Local community members
7.	18-22 August, 2018	Inputs in awareness workshop organised at Varanasi by Component VI (Nature interpretation) for Boatman and Fisherman regarding role of first responder in rescue and rehabilitation of aquatic macro-fauna along Ganga River.	42 Local community members
8.	22 th – 23 th June 2019	Workshop on communities and their role in rescue rehabilitation of select aquatic fauna along Ganga Basin for Ganga Praharis/ community/ first responder organized at Bhagalpur	35 Local community members
Stakeholder Group: Joint workshop of Forest Officials and Local Communities			
4.	29 th August, 2019.	Sensitization Workshop on "Managing Aquatic Macro Fauna Along Ganga River" for community members and forest officials Laksar Forest Division, Uttarakhand	15 Community Members
5.	14 th September, 2019	Sensitization Workshop on "Managing Aquatic Macro Fauna Along Ganga River" for community members and forest officials Sahibganj Forest Division, Jharkhand	31 forest officials and 33 community members
6.	18 th September, 2019	Sensitization Workshop on "Managing Aquatic Macro Fauna Along Ganga River" for community members and forest officials Barrackpore Forest Division, West-Bengal	15 forest officials and 36 community members

Standardization of Protocols

4

Standardized empirical knowledge driven practices/ protocols that guide rescue of aquatic macro-fauna can enable the various agencies to work in partnership characterized by defined roles and responsibilities that facilitate cooperation and understanding to ensure safety and wellbeing of both the personnel and animals involved. The defined practices/ protocols must address three critical issues; namely the safety of personnel involved in the effort, the safety of the affected community and the safety and wellbeing of the animals being rescued.

The practices/ protocols described here are based on tested scientific principles of rescue and rehabilitation that have been tested through experiences of the project team. The practices/ protocols described here include those for rescue and health assessment.



4.1 Rescue protocols

Animals are occasionally encountered in a compromised state where they may be orphaned, injured, or displaced. The last category also includes live animals in legal confiscations of animals in illegal trade. The objective of rescue and rehabilitation of aquatic macro-fauna is to relieve the suffering of animals in a compromised state, assess their health status and if necessary provide required interventions to restore fitness to enable them to be rehabilitated back in natural habitats to be contributing members of their species populations.

Rescue efforts have several stakeholders that need to be involved in a combined effort with each having a defined role based on specific skills along with specified tasks. The roles and responsibilities of different stakeholders are as follows.

1. First responders: They are first on site and assist with a quick response that usually involves combating stress followed by separation of the animals according to their species and condition, and holding them in the best possible way until further process can be initiated.
2. Enforcement agencies: These are enforcement agencies like the forest department, railway authorities, airport customs officials, officials of the Wildlife Crime Control Bureau who encounter situations warranting rescue (confiscations, human wildlife conflict mitigations, etc.)
3. Veterinary Health Professionals: Veterinarians trained to deal with emergencies in aquatic macro-fauna.
4. Non- Governmental Organizations: Organizations that work with the intention of bridging the gaps between the bureaucracy and on ground implementing agencies. Volunteers from NGOs are often the backbone of successful rescue and rehabilitation operations.

4.1.1 Preparedness and action items

Rescue operations are essentially a team effort and often involve a complex web of events that run their course as the exercise is executed. Organizations or individuals involved in rescue operations must be prepared at all times to manage emergencies and respond at the earliest to any information involving managing animals in distress. It is considered part of protocol to always have all the equipment ready at hand and a vehicle with the driver on standby. The sequence of events further to receiving information of a distress situation is summarized below;

4.1.2 Initiating rescue

1. First responders'/ community members will promptly pass message on to the relevant forest department officials or identified rescue teams.
2. Confiscating agencies including Forest Department Personnel will ensure appropriate authorities are informed and contact veterinary wildlife health professionals and identified and trained rescue teams. Approach civil authorities like police departments for support.

3. Trained veterinary health professionals will ensure after due paperwork and necessary legal formalities by the officials of the forest department and confiscating agencies, is received and proceed promptly to site of rescue. Permits should be in place for handling the animals, processing (treating) the confiscated animals and also to move them away from the site of the confiscation to an appropriate location.
4. Non-Governmental Organizations will enlist needs and put together a team for assisting in various areas of the operations.

4.1.3 Roles and responsibilities at the rescue site

1. First responders/ community citizens will ensure:
 - a. Crowd control to ensure safety of the animals and people in the area.
 - b. Engage the public and use this as an opportunity to spread awareness.
 - c. Communicate with teams from forest department, implementing agencies, veterinarians and trained rescue teams.
2. Confiscating agencies Including Forest Department Personnel will
 - a. Assess the situation and communicate with the veterinary professionals.
 - b. Assign roles for crowd control to the first responders and NGO volunteers.
 - c. Prepare site for triage (If essential in rescue operation).
 - d. Organize for transport vehicle.
 - e. Communicate regarding destination of animals and course of action to be initiated via correct channels.
3. Trained veterinary health professionals will
 - a) Assess the situation and intervene based on triage.
 - b) Animals should be removed from the distress situation (e.g., released from any ties or binds, removed from gunny sacs or bags etc.) and confined in a secure area.
 - c) On assessing the animals and satisfying all administrative requisites, the animals can be crated for further transport to a rehabilitation center or release site as deemed fit.
4. Non-Governmental Organizations will
 - a) Support in crowd control.
 - b) Support in animal care if deemed necessary by veterinary health professionals.
 - c) Support in crating and transport as instructed by veterinary professionals.

‘Triage’ is the process of determining the priority of patients’ treatments based on the severity of the animals’ condition, that rations patient treatment efficiently when resources are insufficient for all to be treated immediately. It becomes most important to efficiently segregate the animals as per the demand on time of the personnel, available resources on site, the species in question and the seriousness of the patient at hand.

Individual animal identification (species, sex and age class) is initially recorded followed by assessment of body parameters including weight and morphometry. At triage, each animal is handled by one person, who becomes responsible for the animal and for maintaining proper records until completion of all procedure. A priority classification of 1 to 5 (1=healthy, 5=dead) can be assigned to each animal.

4.1.4 The classification of categories are as follows

Category I: Healthy, no ocular, nasal discharge, nil to slight dehydration, no external or debilitation injuries

Category II: Mild dehydration, fish hook injuries, mild respiratory distress, external parasites.

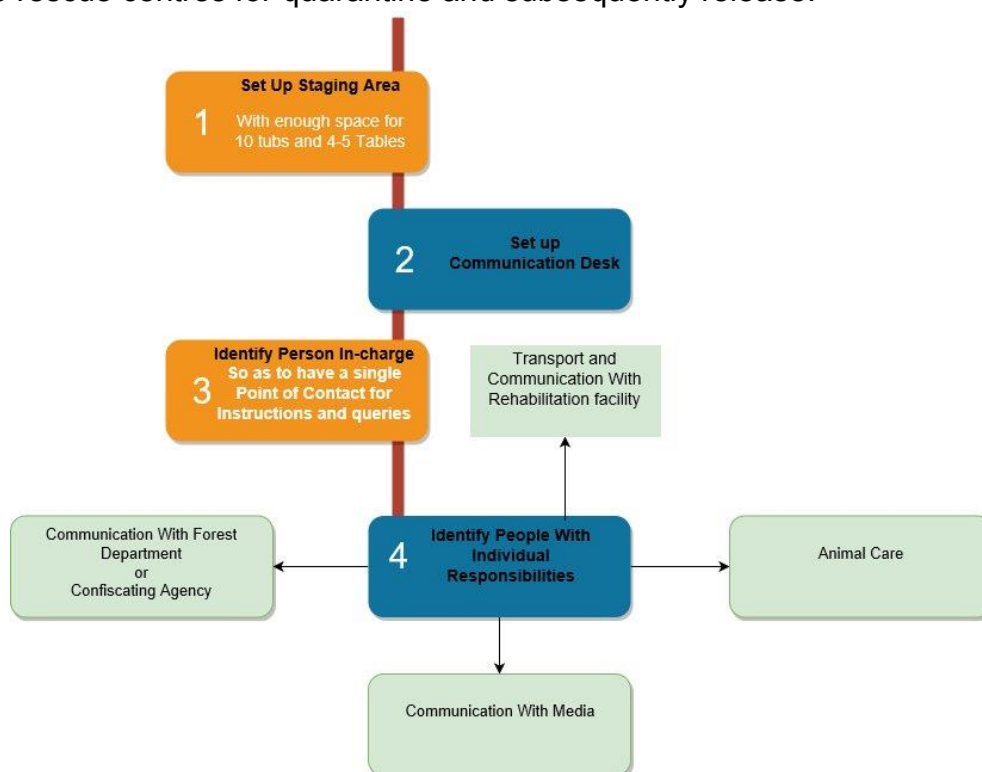
Category III: Sunken eyes, ocular and/or nasal discharge, blood from nostrils/mouth/vent, injuries.

Category IV: Severe and debilitating injuries, laceration, fractures, frank blood from orifices, severe dehydration,

Category V: Dead on Arrival

4.2 Triage process and protocols

Subsequent to this, if the animals are in triage categories 1 and 2, they can be released immediately while others requiring first aid, treatment or veterinary support may be handled accordingly. For critical injuries in animals, that compromises their fitness or wellbeing and limits chances of further survival, it is important to either shift them to rescue centres for quarantine and subsequently release.



Triage protocol

4.3 Quarantine protocol

It is mandated that quarantine be followed for animals once they come into captivity from an outside location, pre-release, or even for captive wild animals being returned to the wild. The quarantine process is mandated for at least 30 days prior to release and in most cases is to be supervised by a veterinary health professional.

4.3.1 Quarantine measures to be followed at a facility

- 1) Quarantine premises must be species appropriate keeping in mind epidemiological factors.
- 2) The premises must allow adequate visual access and permit clinical examination, sampling and when necessary, restraint and isolation from all possible sources of infection.
- 3) Equipment used for feeding, cleaning the enclosure and for enrichment must be handled by a single care-taker and must be regularly disinfected with an appropriate disinfectant, approved by the attending veterinary professional.
- 4) If an animal or group undergoing quarantine with others of the same species contracts an infectious disease or tests positive for an infectious disease while in quarantine, they must be detached from the group and placed in further isolation for 30 days or more. This is dependent upon the disease incubation period with appropriate testing.
- 5) Precautions must be taken to minimize the risk of exposure of the quarantine facility staff to zoonotic diseases that may be present in the newly acquired animals. These precautions include the use of disinfectant foot baths, wearing appropriate protective clothing, masks and gloves and minimizing physical exposure.
- 6) When it is decided to release the animals into the wild, it is predominantly important to screen them cautiously, to minimize the risk of introducing an infection into the wild population.

4.3.2 Quarantine protocols on receiving animals at a facility

On receiving confiscated or rescued animals a health assessment must be carried out as follows:

Stage 1:

Examinations	Techniques	Findings	Interventions
Physical examination	Visual	Injuries, ecto-parasites and dehydration.	Physical restraint, sedation, medical intervention, surgical interventions removal of external parasites, fluid therapy.

Hematology and serum biochemistry	Blood smear and serum biochemistry analysis at a laboratory.	Infections, anaemia, gout, imbalance in minerals, metabolic bone disease and hypoproteinemia.	Antibiotics and supportive medication.
Blood examination for microbiology and virology	PCR and blood cultures.	Salmonellosis, herpes virus, cryptosporidiosis, mycobacteria, mycoplasma.	Antiviral drugs, antimicrobial drugs following a culture sensitivity test.
Faecal examination	Direct, sedimentation and flotation method and under microscope.	Endo-parasites like coccidiosis, ascariasis, etc.	Anthelmintics and supportive medication.

Stage 2

The animals are to be maintained in isolation in species specific and size specific holding ponds which allows for observation of normal/abnormal behavior like thermoregulation, swimming, diving etc. During this stage, intervention (medical or supportive) is performed only when essential. Regular assessment of morphometry, diet and health is carried out. The enclosures are provided with filtration and aeration systems and basic furniture, to allow for thermoregulation and for the animals within to have access to temperature gradients and niches.

Stage 3

Pre-release health assessment to be done to ensure optimal health. Animals designated fit for release can be returned to wilderness habitats.

4.4 First-aid protocol

At the entry animals must be stabilized with rehydrating fluids. A basic dose of a broad-spectrum antibiotic is suggested for infections. Depending on specific cases, antifungal agents, nutrient supplementation, critical care formulae and medications are suggested. The animal must be examined for external parasites subsequently treated using ectoparasiticides. The animals are screened for common bacterial and viral diseases, invasive foreign body like fish hook and endoparasitism. Anesthesia and surgical removal of the any foreign body is suggested. The rehabilitation process can be intensive or just maintenance for basic observation with minimum intervention prior to release back to the natural habitat. The process is essential to ensure fitness and to afford them the best chance at survivability in their natural habitat.

If animals are presented as Dead On Arrival (DOA), a subset of the animals should be necropsied by veterinary health professionals with relevant biological sampling for ascertaining the cause of death. All information should be carefully recorded to enable future use.

As per the guidelines of the re-introduction specialist group of the IUCN, at the time of release of animals one must take into account disease risk: as no translocated organisms can be entirely free of infection with micro-organisms or parasites. This may give rise to a consequent risk of their spread and disease risk assessment should start at the planning stage. A pre-release health assessment should be followed one month prior to planned release, animals should be quarantined and undergo pre-release examination and testing consisting of physical exam, complete blood counts, serum biochemistries and blood smears for haemoprotezoa and fecal examination for endoparasites.

4.5 Marking and post release monitoring

Monitoring of aquatic species can be done using externally attached tags, natural marking, colour marking and scute clipping, etc visible to the naked eye. This allows for identification of the animals and monitoring their post release dispersal from the location of release. The externally attached tags are susceptible to loss, this aspect should be kept in mind when designing the study for monitoring species and data recording. It is considered valuable in all cases of external tag attachment to have an alternative marking in place for identification.

4.5.1 Selection of release sites

The release sites have to be assessed and identified based on attributes and ecological needs that supports species survival with special emphasis on existing pressures and potential challenges. The criteria for selection of release sites should check for the following-

- 1) Presence or absence of geomorphological attributes like sand banks, appropriate substrate.
- 2) Flow and dynamism of the river and width of the channel including seasonal variations.
- 3) Type of aquatic and riparian vegetation.
- 4) Anthropogenic pressures (presence or absence) and their seasonality like fishing, large netting operations.
- 5) Presence of predators.
- 6) Possibility of infighting.

4.5.2 Release

Once the animals are assessed and confirmed for fit and legal permissions from concern authority (i.e. Forest Department) the animals are released back to the natural system.

Publications

Technical Reports:

1. WII-NMCG (2018). Technical Report: Assessment of the Ganga Aqualife Rescue and Rehabilitation Centre, Narora, Uttar Pradesh, WII-NMCG Biodiversity Conservation and Ganga Rejuvenation Project. Pp.25
2. WII-NMCG (2018). Technical Report: Assessment of the Ganga Aqualife Rescue and Rehabilitation Centre, Sarnath, WII-NMCG Biodiversity Conservation and Ganga Rejuvenation Project. Pp. 39.
3. WII-NMCG (2018). Assessment and Activity Report Assessment and Activity Report; Ganga Aqualife Rescue and Rehabilitation Centre, Narora, Uttar Pradesh, WII-NMCG Biodiversity Conservation and Ganga Rejuvenation Project. Pp 10

Note: The first technical assessment was made during February 2018 and action items were highlighted for up-gradation in the infrastructure and husbandry protocols at the facility. The enclosures had minimal enrichment and civil faults. A generalistic overhaul was essential keeping in mind the capacity of the facility and the future work plans. The July 2018 assessment visit was made to revisit the issues flagged in February 2018 and put in place some modifications in the enclosures and animal care regimen.

4. WII-NMCG (2018). Activity Report. Kachua Punarvas Kendra, Sarnath, WII-NMCG Biodiversity Conservation and Ganga Rejuvenation Project. Pp.31

Note: This report includes activities carried out for upgradation of centre, Species specific enrichment, veterinary intervention and capacity enhancement workshop for local communities as well as rescue and release during April-May, 2018.

5. WII-NMCG (2018). Health Assessment of Turtles of Ganga Aqualife Rescue & Rehabilitation Centre, Narora, WII-NMCG Biodiversity Conservation and Ganga Rejuvenation Project. Pp.8

Note: This report includes activities carried for documentation related to modifications put in place for species wise separation, enrichment and sanitation hygiene protocols/ Additionally as a part of the plan for the visit a health assessment of the animals at the facility.

6. WII-NMCG (2019). Technical Report Assessment of the Gharial Centre, Deori, Morena, Madhya Pradesh WII-NMCG Biodiversity Conservation and Ganga Rejuvenation Project. Pp. 15

Note: The assessment report includes evaluation of the existing infrastructure and protocols at Gharial Rearing Centre, Deori, Morena and suggesting potential long-term upgrades for a facility that could cater to scientific, ethical and humane management of animals and capacity building for professionals.

7. WII – NMCG (2019). Refurbishment of enclosure III at Kachua Punarvaas Kendra, Sarnath. WII-NMCG (Component IV) Biodiversity Conservation and Ganga Rejuvenation Project. Technical Report Pages 14.

Note: The report describes work regarding refurbishment of enclosures carried out for a part of enclosure III for making it as a functional.

Field manuals:

1. Talukdar, A., Mallapur, S. Sengupta, D., Bajaj, A., Hussain, S. A., Malik, P.K., and Nigam, P. (2019). Turtles and tortoises along Ganga Basin. WII, Dehradun, Uttarakhand, India. WII-NMCG. Pp 18

Note: Considering the overall lacunae in information about the species along the Ganga River basin as well as in India there is an immediate need to create awareness among the populace at large regarding conservation and protection of freshwater turtles and tortoises. The aim of the document is to showcase the freshwater turtle and tortoise diversity along the Ganga basin and share science based information with various stakeholders.

2. Mallapur, S., Talukdar, A., Hussain, S. A., Malik, P.K., and Nigam, P. (2019). Conservation reference guide: Rescue and Rehabilitation of Freshwater Turtles and Crocodilians. Wildlife Institute of India, Dehradun, India. WII-NMCG. Pp 100

Note: The process of rescue and subsequent rehabilitation has to be an organized effort of professionals done with informed interventions and through need-based assessments of the available natural habitats. Monitoring of the released animals to ensure their survival and recruitment into populations is critical. Further, these processes must become integral parts of inclusive conservation management plans drawn up for freshwater ecosystems. This kind of “conservation” initiative is a novel step in the ongoing efforts to protect and manage aquatic fauna. It can be described as the way forward to create an inclusive network of conservation practitioners and organizations working together to take responsibility for developing, supporting, and implementing the necessary solutions for aquatic biodiversity conservation. Without such concerted, inclusive conservation strategies, the pressures on the aquatic system and its species may lead to an irreparable loss of this unique and bio-diverse ecosystem resource. The document is an attempt to provide insights into the multifaceted science of rescue and rehabilitation of turtles and crocodilians.

Peer reviewed journals:

1. Talukdar, A., Sengupta, D., Mallapur, S., Hussain, S. A., Malik, P.K., and Nigam, P. (2019). Amelioration of the Freshwater Turtle Breeding and Rehabilitation Station in Varanasi, India, *IRCF Journal*. pp. 170–173. www.ircf.org/journal/volume-26-2-2019.

Note: Upgradation of centres and activities carried out starting from rescue, rehabilitation, enrichment and release other than daily activities performed for chelonian conservation at KPK, Sarnath.

2. Talukdar, A., Mallapur, G., Hussain, S.A., and Nigam, P. (2019). Management of Penile Prolapse in Indian Tent Turtle (*Pangshura tentoria circumdata*, Gray, 1834). *The Indian veterinary journal*. 96. 65-66.

Note: A free ranging male Indian Tent Turtle (*Pangshura tentoria circumdata*) at Kachua Punarwas Kendra, Sarnath with a history of red swollen mass protruding and bleeding below the tail that was presented. This was diagnosed as penile prolapse. The organ was cleaned with dilute Savlon followed by cold fomentation to decrease the inflammation. Attempts to gently push the organ back were not successful. The prolapsed mass was again pushed and tied using purse-string sutures with absorbable suture material under local anesthesia. Topical antiseptic and analgesics were administered postoperatively. The turtle

showed uneventful recovery in 10 days and was kept under observation for 20 days before being rehabilitated back in natural habitat.

Popular articles:

1. Talukdar, A., & Sengupta, D., Mallapur, G., Bajaj, A., Hussain, S.A. and Nigam, P. (2019). Twist in turtle tale. Down to earth. <https://www.downtoearth.org.in/blog/wildlife-biodiversity/twist-in-turtle-tale-64153>

Note: Popular article regarding upgradation of Kachua Punarvas Kendra, Sarnath after being taken up by WII-NMCG project and work and activities carried out therein for a successful rehabilitation centre.



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Adam Britton, www.crocodilian.com © 1995-2012

Annexure I

Participants in Capacity Building Programs

Forest Officials

Venue: Kachua Punarvas Kendra, Sarnath, Varanasi. Date:7 th December 2018		Venue: Kachua Punarvas Kendra, Sarnath, Varanasi. Date:8 th December 2018	
Sr. No.	Name	Sr. No.	Name
1.	Shri. K. M Verma	1.	Shri. Janaki Saran Singh
2.	Shri. Ram Gati Rai	2.	Shri. Rajendra Prasad
3.	Shri. Yogesh Kumar Singh	3.	Shri. Hari Shankar Mishra
4.	Shri. Khaleeqe Ahmad	4.	Shri. Afzul Rahman
5.	Shri. Ram Charitra Singh	5.	Shri. Dharmendar Kumar
6.	Shri. Satya Prakash Singh	6.	Shri. Eshwar Singh
7.	Shri. Akhilesh Kumar	7.	Shri. Jai Prakash Yadav
8.	Shri. Rana Pratap Singh	8.	Shri. Ram Charan Singh
9.	Shri. Raj Kumar	9.	Shri. Dharmdwaja Singh
10.	Shri. Aditya Kumar	10.	Shri. Shiv Narayan Lal
11.	Shri. Nirmip Singh	11.	Shri. Rajendra Kumar Sonkar
12.	Shri. Omkar Nath Shukla	12.	Shri. Vijay
13.	Shri. Manish Gupta	13.	Shri. Babulal
14.	Shri. Sanjay Kumar	14.	Shri. Virendra Pandey
15.	Shri. Mhd. Mustaq	15.	Shri. Sadanand Yadav
16.	Shri. Bechu Ram	16.	Shri. Ramprakash Yadav
17.	Shri. Gurudev Singh	17.	Shri. Prasiddh Prasad
18.	Shri. Ramashankar Yadav	18.	Shri. Mukhtar Ahmad
19.	Shri. Yogendra Prasad	19.	Shri. Kripa Shankar
20.	Shri. Sunil Vikram	20.	Shri. Shailesh Kr. Varma
21.	Shri. S.N. Prajapati	21.	Shri. Shivpal Chauhan
22.	Shri. Ambika Prasad	22.	Shri. Ravishankar Sharma
23.	Shri. Ravindra Kumar	23.	Shri. Anand Dubey
24.	Shri. Mandeep Kumar	24.	Shri. Brijesh Pandey
25.	Shri. Nagendra Singh	25.	Shri. Ram Singh Yadav
26.	Shri. Bechu Prasad	26.	Shri. K Bashir
27.	Shri. Pradeep Kumar Mishra	27.	Shri. Abhishek Yadav
28.	Shri. Pradeep Kumar	28.	Shri. P. Raviprasad Dubey
29.	Shri. Umesh Singh	29.	Shri. Shailendra K Varma
30.	Shri. Pappu Sonkar	30.	Shri. M N Yadav
31.	Shri. Seema Chandan	31.	Shri. Ram Murat Yadav
32.	Shri. Nishikant Sonkar		

Bulandshahar Forest Division, 18 th February 2019		Bhagalpur forest division 18 th – 19 th June 2019	
Sr. No.	Name	Sr. No.	Name
1.	Shri. Satendra Kumar	1.	Shri. S Sudhakar Rao, IFS
2.	Shri. Kamal Kumar	2.	Shri. Rajeev Mishra, IFS
3.	Shri. Hitesh Kumar	3.	Shri. Sanjeev Ranjan
4.	Shri. Gautam Singh	4.	Shri. Sunil Kumar Sharan
5.	Shri. Umesh Chandra Pathak	5.	Shri. Amit Kumar
6.	Shri. Subhash Babu	6.	Shri. Shatrunjay Kumar
7.	Shri. Pushpendra Kr Sharma	7.	Shri. B. K. Singh

Bulandshahar Forest Division, 18 th February 2019		Bhagalpur forest division 18 th – 19 th June 2019	
Sr. No.	Name	Sr. No.	Name
8.	Shri. Ashok Kumar	8.	Shri. Vishwabandhu
9.	Shri. Kuber Dutt Sharma	9.	Shri. Anjani Choudhary
10.	Shri. Vinod Kumar Sharma	10.	Shri. Sudhir Kumar Verma
11.	Shri. Sundar Pal Singh	11.	Shri. Kapilesh Pradhanpal
12.	Shri. Dev Dutt Singh	12.	Shri. Satyendra Kumar
13.	Shri. Hamid Ali	13.	Shri. Kaushal Kumar Jha
14.	Shri. Bheeshm Singh	14.	Shri. Shankar Mishra
15.	Shri. Sukhvir Singh	15.	Shri. Naresh Prasad
16.	Shri. Onkar Singh	16.	Shri. Prabhat Chandra Mishra
17.	Shri. Mukesh Kumar Sirohi	17.	Shri. Dilip Kumar Singh
18.	Shri. Premchand	18.	Shri. Madan Goyal
19.	Shri. Giri Prasad Singh	19.	Shri. Binay Kumar Singh
20.	Shri. Virbahadur Singh	20.	Shri. Ravi Kumar
21.	Shri. Ram Pal Singh	21.	Shri. R. Kumar Singh
22.	Shri. Chandrabbeer Singh	22.	Shri. Arvind Kumar
23.	Shri. Yogdutt Sharma	23.	Shri. Mohammed Shamsher
24.	Shri. Veerendra Kumar	24.	Shri. Kanhaiya Nandan
25.	Shri. Vachan Singh	25.	Shri. Subhash Chandra Yadav
26.	Shri. Deshpal Singh	26.	Shri. Ram Bilas Mandal
27.	Shri. Dheeraj Kumar	27.	Shri. Bhola Yadav
28.	Shri. Bhim Sen	28.	Shri. Vipin Kumar
29.	Shri. Shiv Kumar Singh	29.	Shri. Baidnath K
30.	Shri. Rohtash Singh	30.	Shri. Mohammad A Rahman
31.	Shri. Vinod Kumar	31.	Shri. Vivek Kumar
32.	Shri. Fateh Singh	32.	Shri. Vikram Yadav
33.	Shri. Subhash Chandra		
34.	Shri. Abhisekh Rastogi		
35.	Shri. Vinod Kumar		
36.	Shri. Deepak Kumar Singh		
37.	Shri. Bhimrao		
38.	Shri. Shanti Gautam		
39.	Shri. Hari Angira		

Kashi Wildlife division, Varanasi 27 th and 28 th June, 2019		Laksar Forest Division, Uttarakhand 29 th August, 2019	
Sr. No.	Name	Sr. No.	Name
1.	Shri. Brijesh Pandey,	1.	Shri. Ramnath
2.	Shri. Akabal Bahadur Singh	2.	Shri. Parabesh Kumar
3.	Shri. Tara Sankar Yadav	3.	Shri. Baripash Singh
4.	Shri. Khaleeqe Ahmad	4.	Shri. Gautam Kumar
5.	Shri. Shyam Narayan Upadhyay	5.	Shri. Manoj Bhatt
6.	Shri. Raj Kumar Verma	6.	Shri. Deepak Kumar
7.	Shri. Hari Shankar Mishra	7.	Shri. Bholeram
8.	Shri. Ravi Kumar Singh	8.	Shri. Dharmendra Singh
9.	Shri. Chandrabhan Singh	9.	Shri. Arun Nath
10.	Shri. Pradeep Kumar	10.	Shri. Pawan Kumar
11.	Shri. Surendra Kumar Rao	11.	Shri. Sushil
12.	Shri. Sunil Vikram Singh	12.	Shri. Panni
13.	Shri. Bechu Ram	13.	Shri. Sushil Kumar

14.	Shri. Devendra Kumar	14.	Shri. Chatarpal Singh
15.	Shri. Jayprakash Yadav	15.	Shri. Sanjay Pant
16.	Shri. Nishikant Sonkar	16.	Shri. Soni Devi
17.	Shri. Sunil Kumar Srivastav	17.	Shri. Vipin Chandra
18.	Shri. Rammurat Nishad	18.	Shri. Mumtiaz Ali
19.	Shri. Rajiv Singh	19.	Shri. Harsh Chandra Juyal
20.	Shri. Shubham Kumar Pandey	20.	Shri. Dheera Singh
21.	Shri. Rahul Kumar	21.	Shri. Rakesh Kumar Saini
22.	Shri. Ashutosh Singh	22.	Shri. Mayank Garg
23.	Shri. Shankar Lal	23.	Shri. Sarvendra Kumar
24.	Shri. Shamim Khan	24.	Shri. Pankaj
25.	Shri. Brijesh Kumar Maurya	25.	Shri. Javed
26.	Shri. Ishu Verma	26.	Shri. Ranveer Singh
27.	Shri. Pintu Yadav	27.	Shri. Shiv Kumar
28.	Shri. Pyare Lal		
29.	Shri. Rahul Yadav		
30.	Shri. Ajay Maurya		

Sahibganj Forest Division, Jharkhand, 14 th September, 2019		18 th September, 2019 Barrackpore Forest Division, West-Bengal	
Sr. No.	Name	Sr. No.	Name
1	Shri. Vikash Paliwal, IFS	1	Shri. Rabindra Nath Saha, IFS
2	Shri. Jitendra Dubey	2	Shri. Angshuman Mukhopadhyay WBFS
3	Shri. Sunil Kumar	3	Shri. Subhasish Halder
4	Shri. Amit Kumar	4	Shri. Bisu Das
5	Shri. Prem Kumar Sah	5	Shri. Madhab Biswas
6	Shri. Vijay KumarSingh	6	Shri. Samiran Mukharjee
7	Shri. Pawan Kumar Yadav	7	Shri. Kunal Kumar Singh
8	Shri. Yashobardhan Pandey	8	Shri. Biswa Nath Sengupto
9	Shri. Baby Fatima	9	Shri. Rajendra Singh
10	Shri. Maanvi Nitya	10	Shri. Sardar Ram B.S.
11	Shri. Astha Mishra	11	Shri. Anup Ghosh
12	Shri. Pappu Kumar Yadav	12	Shri. Badal Maily
13	Shri. Madan Mohan Mishra	13	Shri. Kaushik Das
14	Shri. Akhilesh Kr. Marandi	14	Shri. Debasish Kar
15	Shri. Benjamin Tundu	15	Shri. Amiyangshu Sarkar
16	Shri. Timotty Kundu		
17	Shri. Rajesh Marto		
18	Shri. Brij Kishor Verma		
19	Shri. Rajesh Udis		
20	Shri. Duryodhan Mandal		
21	Shri. Bihari Mandal		
22	Shri. Ramesh Chandra Yadav		
23	Shri. Sunny Kumar Pathak		
24	Shri. Rajib Ray		
25	Shri. Prince Kumar Gope		
26	Shri. Rabindra Tiwari		
27	Shri. Munji Ali		
28	Shri. Dablu Yadav		
29	Shri. Debabrata Sarkar		
30	Shri. Binay Kumar		
31	Shri. Pappu Kumar Thakur		

Annexure II

Participants in Capacity Building Programs

Field Veterinary Professionals

1. Uttarakhand

Sr. No	Name	Designation	Place of posting
1.	Dr. Ravinder Singh	Veterinary Officer Grade 2	Joshimath, Dist. Chamoli
2.	Dr. Geetanjali	Veterinary Officer Grade 2	Nandprayag, Dist. Chamoli
3.	Dr. Lakshita Azad	Veterinary Officer Grade 2	Karnprayag, Dist. Chamoli
4.	Dr. Rajeev Singh	Veterinary Officer Grade 1	Sadar, Rudraprayag
5.	Dr. Rajnish Pande	Veterinary Officer Grade 2	Srinagar, Garhwal
6.	Dr. Archana Saraf	Veterinary Officer Grade 2	Kandakhal, Pauri Garhwal
7.	Dr. Amandeep Arora	Veterinary Officer Grade 2	Nyuli, Tehri Garhwal
8.	Dr. Sadhana Bisht	Veterinary Officer Grade 2	Munikeereti, Tehri Garhwal
9.	Dr. Naveen Pandey	Veterinary Officer Grade 2	Bachhelikhal, Tehri Garhwal
10.	Dr. Siddhartha S Srivastava	Veterinary Officer Grade 1	New Tehri
11.	Dr. Sarveshwar Uniyal	Veterinary Officer Grade 2	Dhanaulti, Tehri Garhwal
12.	Dr. Shivanand Pathak	Veterinary Officer Grade 1	Bhatwadi, Uttarkashi
13.	Dr. Himanshu Pandey	Dy. Chief Veterinary Officer	Uttarkashi
14.	Dr. Rajababu Gupta	Veterinary Officer Grade 1	Chinyalisaur, Uttarkashi
15.	Dr. Monika Goyal	Veterinary Officer Grade 2	Naugaon, Uttarkashi
16.	Dr. Meenakshi Dobhal	Veterinary Officer Grade 2	Uttarkashi
17.	Dr. Sunita Bhatt	Govt. Veterinary Hospital	Sachal , Uttarkashi
18.	Dr. Umesh Chandra Bhatt	Veterinary Officer Grade 1	Roorkee, Haridwar
19.	Dr. V.P.S. Jadon	Veterinary Officer Grade 1	Sadar, Haridwar
20.	Dr. Amit Pal Panwar	Veterinary Officer Grade 1	Manglaur, Haridwar
21.	Dr. Amit Kumar	Veterinary Officer Grade 1	Raisi, Haridwar
22.	Dr Parul Singh	Veterinary Officer	Kamand
23.	Dr. Alok Khanduri	Veterinary Officer Grade 2	Circle Lab, Pauri Garhwal
24.	Dr. Pradeep Mishra	Veterinary Officer Grade 2	Nopur, Dehradun
25.	Dr. Raj Kumari	Veterinary Officer Grade 2	Naya Gaon Pelio, Dehradun
26.	Dr. Rajesh Raturi	Veterinary Officer Grade 2	Rishikesh
27.	Dr. Aastha Chandra	Veterinary Officer Grade 2	Saankar, Almora
28.	Dr. Swati Bhoj	Veterinary Officer Grade 2	Bhimtal, Distt. Nainital
29.	Dr. Laxmi Upadhyay	Veterinary Officer Grade 2	--
30.	Dr. Rajeev Kumar	Veterinary Officer Grade 2	Sukar, Kashipur, U. S. Nagar
31.	Dr. P.G. Vimalraj	Veterinary Officer	Western Circle, Haldwani
32.	Dr. Ayush Uniyal	Veterinary Officer	Western Circle, Haldwani
33.	Dr. Dushyant Sharma	Senior Veterinary Officer	Corbet Tiger Reserve
34.	Dr. Aditi Sharma	Veterinary Officer	Rajaji Tiger Reserve

2. Uttar Pradesh

Sr No	Name	Designation	Place of posting
1.	Dr. Dharmendra Kumar	Veterinary Officer	Sultangarh
2.	Dr. Vinay Kumar Sharma	Veterinary Officer	Doodabagh, Sambhal
3.	Dr. Vikas Kumar	Veterinary Officer	Singhpurrani
4.	Dr. Satish Chandra Tiwari	Veterinary Officer	Ramnagar, Varanasi
5.	Dr. Zamaluddin	Veterinary Officer	Jakhni, Varanasi
6.	Dr. Vinod Kumar Singh	Veterinary Officer	Rajatalab, Varanasi
7.	Dr. Awadh Narayan Kushwaha	Veterinary Officer	Zero Road, Allahabad
8.	Dr. Purnendu P Singh	Veterinary Officer	Sindhora, Varanasi
9.	Dr. Ajit Singh	Veterinary Officer	Chilla, Allahabad
10.	Dr. Ashok Kumar Singh	Veterinary Officer	Saidabad, Allahabad
11.	Dr. Harikant Patel	Veterinary Officer	Mallawa, Hardoi
12.	Dr. Sunil Kumar	Veterinary Officer	Kursath, Hardoi
13.	Dr. Sanjay Singh Yadav	Veterinary Officer	Mohammadpur, Hardoi
14.	Dr. Kaushlendra	Veterinary Officer	Rancho, Hardoi
15.	Dr. Jitendra Singh	Deputy Chief Veterinary Officer	Aonla, Bareilly
16.	Dr. Yogesh Kumar	Veterinary Officer	Bareilly
17.	Dr. Sardool Singh	Veterinary Officer	Sherghar, Dist Bareilly
18.	Dr. Gaurav Mohan	Veterinary Officer	Bhamora, Barielly
19.	Dr. Kaushlendra Pratap Singh	Veterinary Medical Officer	Deoranian, Bareilly
20.	Dr. Anil Kumar Singh	Veterinary Officer	Sarkara, Bijnor
21.	Dr. Vinaya K Dwivedi	Veterinary Officer	Allahabad
22.	Dr. Neeraj Kumar	Veterinary Officer	Kakawan, Kanpur Nagar
23.	Dr. Ravishankar Gautam	Veterinary Officer	Lal Bunglow, Kanpur Nagar
24.	Dr. Vivek Singh	Veterinary Officer	Sarsolu Kanpur Nagar
25.	Dr. Sushil Kumar	Veterinary Officer	Uttaripura, Kanpur Nagar
26.	Dr. Anand Kumar Gill	Veterinary Officer	Bahadurgarh Distt. Hapur
27.	Dr. Madanpal	Veterinary Officer	Bhaina, Hapur
28.	Dr. Hardeo Singh	Jt. Director/ Registrar	Badhshah Bagh, Lucknow
29.	Dr. Veer Singh	Deputy Chief Veterinary Officer	Gadhmutkeshwar, Hapur
30.	Dr. Aditya Kumar	Veterinary Officer	Bidhnu, Kanpur Nagar

3. Trained under IWAH, 2019 course (ZSL & WII)

Sr No	Name	Designation	Place of Posting
1	Dr. Parul Singh	Veterinary Officer	Kamand, Tehri Garhwal Uttarakhand- -249161
2	Dr. Anchal Power	Veterinary Officer	Bagwan, Tehri Garhwal, Uttarakhand- - 249126
3	Dr. Samrendra Bahadur Singh	Senior Veterinary Officer	S.G. Biological Park Patna, Bihar-800001
4	Dr. Rakesh K.Singh	Veterinary Officer	Kanpur Zoological Garden Azad Nagar, Kanpur-208002, Uttar Pradesh.
5	Dr. Sankar S Biswas	Veterinary Officer	Sundarban Tiger Reserve, Canning Town, Canning, South 24 Parganas-743329, West Bengal.

Annexure III

Participants in Capacity Building Programs

Local Communities

1. 15th to 17th May, 2018, 3-day Sensitization workshop on managing aquatic macro-fauna along Ganga River for Ganga Praharis of Varanasi, Uttar Pradesh

Sr No	Name	Address
1	Sunil Kumar Sahani	Sarai, Dumri
2	Sitaram Sahani	Tarapur, KV
3	Vinod Kumar	Tarapur , KV
4	Kishanlal Sahani	Tarapur, KV
5	Ankit Sahani	Chandouli
6	Pogesh Kumar	Chandpur, Chiraigaon
7	Ragesh Kumar Nishad	Domri
8	Shyam Bihari Sahani	Saraymohana
9	Rambaba Sahani	Saraymohana
10	Shivchandran Sahani	Sujabaad
11	Suryababi Rajbhar	Betawar, KV
12	Rajkumar Sahani	Betawar, KV
13	Manoj Kumar	Gobarahan, Chiraigaon
14	Sonoo Sahani	Mokalapur, Chiraigaon
15	Pramod Kumar Nishad	Baluaghat
16	Anil Kumar	Siristhi, Varanasi
17	Baba Sahani	Assi Ghat
18	Pradeep Sahani	Bhardani, Varanasi
19	Mansha Sahani	Sujabaad
20	Soni Kumari	Domri
21	Purnima Nishad	Sujabaad
22	Darshan Kumar Nishad	Sujabaad
23	Jitendar Kumar	Amba
24	Harish Singh	Domri
25	Laxman Sahani	Mandarwa
26	Arvind Kumar Bhaskar	Dhaka
27	Nagendra K. Nishad	Dhaka
28	Ajay Kumar	Tarapur
29	Shiv Kumar	Ramchandipur
30	Pavan Kumar	Siristhi
31	Avinash	Bakshpura
32	Prem Prakash	Kuraw Parmapur
33	Pramod Kumar	Mushidpur

2. 23rd July, 12th August, 2018, Trained Ganga Praharies in roles of first-responders in Rescue and rehabilitation of aquatic macro fauna along Ganga River for the workshop titled “Certificate course on Ganga Prahari Livelihood enhancement under Green Skill Development programme”

Sr No	Name	Address
1	Anita	Saray Mohana
2	Pooja Patel	Domari
3	Rajesh Kumar Nishad	Domari
4	Neetu Kumari	Domari
5	Balendra Kumar	Amba
6	Abhishekh Keshari	Sujabad
7	Pramod Kumar Nishad	Sarsaul
8	Shyam Bihari Sahani	Saray Mohana
9	Vishal Kumar	Sujabad
10	Darshan Kumar Nishad	Sujabad
11	Deepak Jaiswal	Domari
12	Vivek Kumar Nishad	Sujabad
13	Arvind Kumar Bhaskar	Barthara Kalan
14	Vikram Ram	Barthara Kalan
15	Sanjay Kumar	Chandrawati
16	Santosh Kumar	Narayanpur
17	Payal Sharma	Sujabad
18	Vikash Sahani	Sujabad
19	Pawan Kumar	Domari
20	Akash Singh	Domari

3. 22th – 23th June 2019, Workshop on communities and their role in rescue rehabilitation of select aquatic fauna along Ganga Basin for Ganga Praharis/ community/ first responder organized at Bhagalpur

Sr No	Name	Sr No	Name
1.	Mr. Binod Kumar Mandal	23	Mr. Rahul Kumar
2.	Mr. Nishant Kumar	24	Mr. Jai Nanda Mandal
3.	Mr. Ajay Yadav	25	Mr. Ravindra Kumar
4.	Mr. Mahindra Maladar	26	Mr. Praful Kumar Nandan
5.	Mr. Joginder Mahalda	27	Mr. Divyanshu
6.	Mr. Abhijeet	28	Ms. Diksha Kr. Bajaj
7.	Mr. Gynaranjan Kumar	29	Mr. Rakshit Mishra
8.	Mr. Dilip Kumar	30	Mr. Md. Adnan Najam Khan
9.	Mr. Anuj Kumar Das	31	Mr. Md. Abdulla
10.	Mr. Ravindra Kumar Raman	32	Mr. Bipin Thakur
11.	Mr. Sunil Das	33	Mr. Jayanand Kumar
12.	Mr. Om Prakash Das	34	Mr. Vatsa Nishant Krishnan
13.	Mr. Rajendra Rajak	35	Mr. Ashish Kumar
14.	Ms. Gudiya Kumari		
15.	Mr. Vikas Kumar		

16.	Ms. Bharti Kumari		
17.	Ms. Chandani Kumari		
18.	Mr. Rupesh Kumar		
19.	Mr. Mukesh Kumar		
20.	Mr. Jayant Kumar Sharma		
21.	Mr. Ranjan Kumar		
22.	Mr. Sonu Kumar		

4. 29th August, 2019, Sensitization Workshop on “Managing Aquatic Macro Fauna Along Ganga River” for community members and forest officials Laksar Forest Division, Uttarakhand

Sr No	Name	Address
1.	Mr. Samash Singh	Laksar
2.	Mr. Rohtash	Laksar
3.	Mr. Jitendra K Saini	Laksar
4.	Mr. Adesh Kumar	Laksar
5.	Mr. Babu Ram Saini	Laksar
6.	Mr. Sompal Saini	Laksar
7.	Mr. Dharamveer	Laksar
8.	Mr. Vikram	Laksar
9.	Mr. Sher Singh	Laksar
10.	Mr. Shamshad	Laksar
11.	Mr. Quamruddin	Laksar
12.	Mr. Tahir Hasan	Laksar
13.	Mr. Talib	Laksar
14.	Mr. Manoj Nishad	Laksar
15.	Mr. Govind Tomar	Laksar

5. 14th September, 2019, Sensitization Workshop on “Managing Aquatic Macro Fauna Along Ganga River” for community members and forest officials Sahibganj Forest Division, Jharkhand

Sr No	Name	Sr No	Name
1	Mr. Pappu Sharma	18	Mr. Ramniranjan Mandal
2	Ms. Lakshmi Kumari	19	Mr. Diwakar Mondal
3	Mr. Bijay Kumar Mondal	20	Mr. Masud Alam
4	Mr. Avinash Kumar Sah	21	Mr. Azad Ali
5	Mr. Kamdev Kumar Mondal	22	Mr. Atul Promanik
6	Ms. Kavita Kumari	23	Mr. Ajjur Rahman
7	Mr. Nagendra Kumar Choudhary	24	Mr. Ashok Kumar Mandal
8	Mr. Badal Kumar	25	Mr. Digambar Karmakar
9	Mr. Manikant Rajak	26	Mr. Rabindra Nath Mondal
10	Mr. Amar Kumar	27	Mr. Shivjee Mandal
11	Mr. Vijay Kumar Rabidas	28	Mr. Nilambar Prasad Malakar
12	Kajal Kumari	29	Mr. Sadanand Mandal

13	Mr. Rajesh Kumar	30	Mr. Jasim Saikh
14	Mr. Prince Kumar Modi	31	Mr. Bobby Kumar
15	Mr. Jogendra Mallah Choudhary	32	Mr. Ashish Kumar
16	Mr. Beichen Sah	33	Mr. Ashok Kumar Yadav
17	Mr. Mukesh Kumar Sah		

6. 18th September, 2019, Sensitization Workshop on “Managing Aquatic Macro Fauna Along Ganga River” for community members and forest officials
Barrackpore Forest Division, West-Bengal

Sr No	Name	Sr No	Name
1	Ms. Samhati Bhukta	19	Mr. Debraj Halder
2	Ms. Urbee Banerjee	20	Mr. Gaurab Banerjee
3	Ms. Deblina Nath	21	Mr. Niladri Mondal
4	Ms. Sreemoyee Ghosh	22	Mr. Kaushik Banerjee
5	Mr. Pradipta Kumar Ghosh	23	Mr. Amit Biswas
6	Mr. Prattay Das	24	Mr. Deep Roy
7	Mr. Darshan Halder	25	Mr. Saurav Malik
8	Mr. Sayed Ahmed Laskar	26	Mr. Papai Dey
9	Mr. Sekhar Saha	27	Mr. Debabrata Biswash
10	Mr. Parha Shah	28	Mr. Sapon Rajbongshi
11	Mr. Debasish Sahu	29	Mr. Saruk Ansari
12	Mr. Nabajyoti Biswas	30	Mr. Abhijit Mondal
13	Mr. Sailen Biswas	31	Mr. Manik Das
14	Mr. Anik Kar	32	Mr. Surajit Jha
15	Mr. Sekh Badshah	33	Mr. Tanmoy Dhara
16	Mr. Anish Bala	34	Mr. Sumit Das
17	Mr. Animesh Sarkar	35	Mr. Rajib Das
18	Mr. Tonmoy Biswas	36	Mr. Jyoti Prasad Bharadwaj



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