STRENGTHENING CAPACITIES OF STAKEHOLDERS IN RESCUE AND REHABILITATION OF AQUATIC MACRO-FAUNA OF GANGA BASIN:

TRAINING APPROACH AND CURRICULUM

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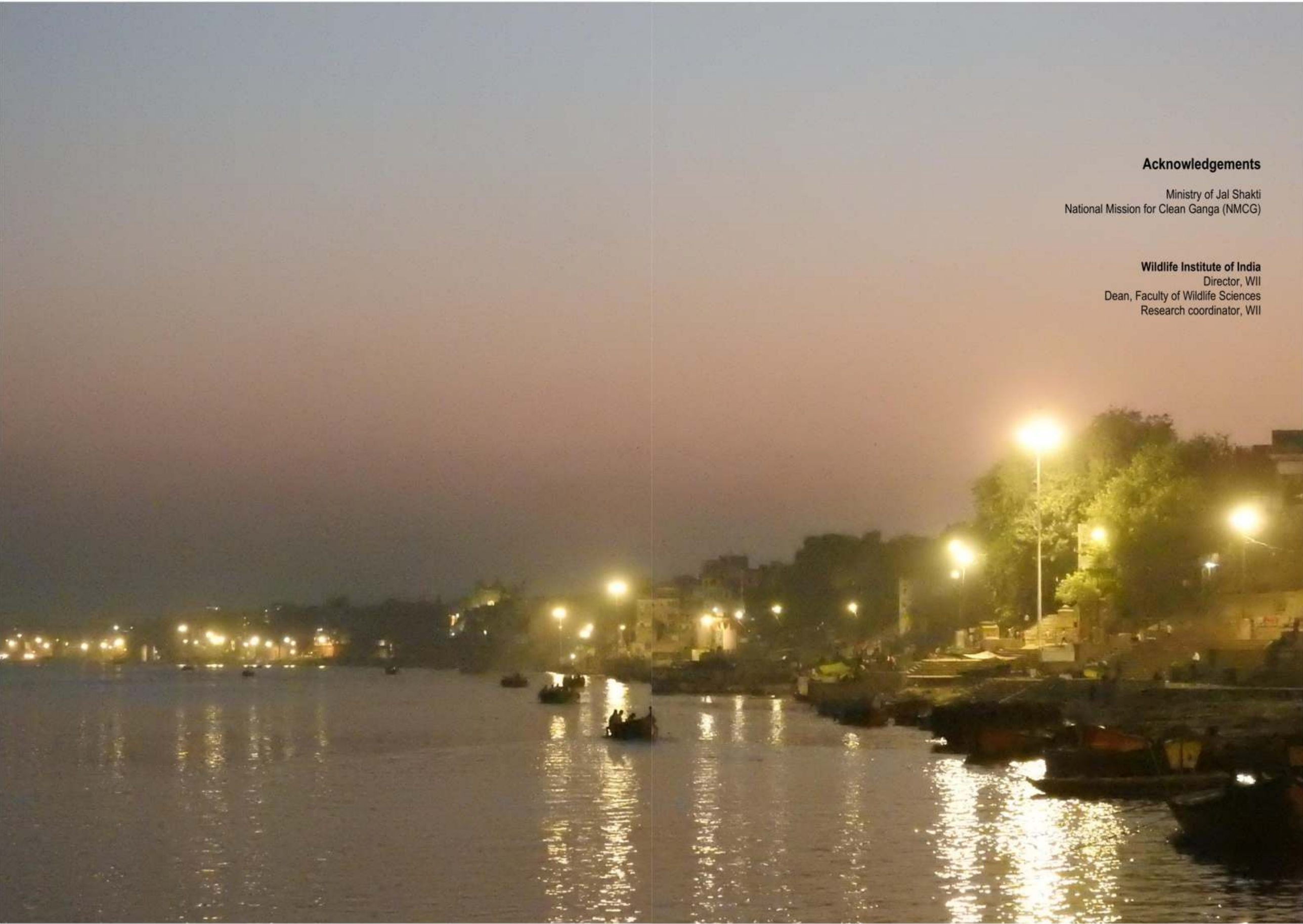

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FOREWORD

The Ganga Basin is a treasure trove of biodiversity. Recent times have; however, witnessed multiple threats to this biodiversity in the form of unsustainable resource extraction practices, development of linear infrastructure. These threats coupled with extensive illicit trade in aquatic animals and their derivatives for consumptive use and pet trade have rendered several species susceptible to extinction. Several species have become locally extinct in several parts of the river while severe declines in populations have been documented in large stretches of the rivers forming the Ganga Basin.

The Basin also provides an extensive array of ecosystem services to mankind. The sustained availability of these services is dependent on the complex biological processes that the rich biodiversity provides. Thus the conservation of the rich biodiversity of Ganga Basin is critical for the well-being of the human society dependent on its rich resources. The effective conservation of the rich biodiversity requires a strategic approach with planned interventions.

Extensive efforts are underway to conserve the rich biodiversity that include increased protection and enforcement, supplementation of depleting populations and reintroductions to establish new populations where local extinctions have occurred. Rescue and rehabilitation of animals encountered in distressed, displaced states and confiscated animals in illegal trade can form the founding populations for the population augmentation efforts besides creating an awareness about the plight of various species.

Significant headway has been made in standardizing procedures and developing capacities for a large number of terrestrial species; however, aquatic fauna remains a group of animals for which limited skills exist in the country. Rescue and rehabilitation of aquatic fauna involves multiple stakeholders as a large proportion of them inhabit areas outside the protected area network. It thus becomes essential to synergise these multiple stakeholders by developing their capacities according to their identified roles and responsibilities in rescue and rehabilitation and overall conservation of aquatic fauna.

This document titled “Strengthening Capacities of Stakeholders in Rescue and Rehabilitation of Aquatic Macro-Fauna of Ganga Basin: Training Approach and Curriculum” identifies specific roles and responsibilities of individual stakeholders and based on those roles and responsibilities provides a syllabus for addressing capacity building requirements. The document also takes into consideration the fact that development of individual capacities is not a onetime effort and requires continued progression of skills accordingly different levels of learning have been incorporated into the document.

I congratulate the team involved in this effort and hope that the document provides the basis for development of capacities in rescue and rehabilitation of aquatic macro-fauna.

(Dr. Dhananjai Mohan)
Director

PREFACE

The Ganga Basin comprises of the main stem Ganga River and several tributaries encompasses an area of 8,61,404 Sq. km. The basin extends across three biogeographic zones, the Himalayan zone where most of the north bank tributaries, Yamuna and the main stem river itself originate form glaciers. From the Himalayan zone the main stem river and these tributaries enter the Gangetic plain and finally enters the coastal zone where it splits into a number of distributaries in the Sunderban Delta.

Aquatic ecosystems are highly productive and rich in in biodiversity. Ganga Basin runs its course through the three biogeographic zones and similar to other aquatic systems is endowed with a rich biodiversity that is unique to each zone due to climatic adaptations. Additionally, a few species are seasonal migrants with movement regulated by the monsoon and water-flows.

The Gangetic plains and the coastal zone support a dense human habitation that relies extensively on the river basin for a variety of natural resources including water. Unsustainable resource extraction practices coupled with extensive development of linear infrastructure and discharge of domestic and industrial effluents places the river basin and its biodiversity under extreme stress. These along-with with the extensive illegal trade in aquatic animals' renders population susceptible to extinction and has led to localized extinction of several species while sharp declines in populations of several other species are observed.

A large number of animals get entangled in fishing nets, sustain injuries from boat hits, enter the extensive illicit trade in live animals and their carcasses and body-parts. Improved enforcement efforts and increased community awareness have led to the rescue of a large number of such distressed and displaced animals. This necessitates planned interventions both *in-situ* for animals that are fit, and can be released immediately after rescue and animals that require further interventions in captivity for return to fitness. While significant advances have been made in the rescue and rehabilitation of terrestrial fauna, limited knowledge and skills are available for managing emergent situations of aquatic wildlife.

As a part of the effort in the conservation of aquatic macro-fauna, component 1-C of the WII-NMCG Phase II project has developed the document titled "Strengthening Capacities of Stakeholders in Rescue and Rehabilitation of Aquatic Macro-Fauna of Ganga Basin: Training Approach and Curriculum" for supporting capacity building efforts of the various stakeholders involved in rescue and rehabilitation of aquatic macro-fauna.

Authors

STRENGTHENING CAPACITIES OF STAKEHOLDERS IN RESCUE AND REHABILITATION OF AQUATIC MACRO-FAUNA OF GANGA BASIN

"When we return wild animals to nature, we merely return them to what is already theirs. For man cannot give wild animals freedom, they can only take it away."

Jacques Costeau

1 INTRODUCTION

Rescue and rehabilitation is a knowledge driven process seeking to address welfare concerns of distressed or displaced animals. The process to be effective requires an in-depth understanding of the biology, ecology, behaviour, nutrition, disease and health-care of the species being rescued. The science of rescue and rehabilitation is relatively novel to our country and limited expertise in the domain exists. While significant gains have taken place in the rescue and rehabilitation of terrestrial macro-fauna, the realm of aquatic macro-fauna is largely untouched with various crucial facets of knowledge needed for effectiveness of efforts remaining unexplored for majority of species. An initiative to address these issues was undertaken under the NMCG supported project titled "Biodiversity Conservation and Ganga Rejuvenation (2016 – 2019)". The effort focussed on collating basic knowledge of the various conservation dependent species and standardizing techniques for the rescue and rehabilitation of distressed or displaced individuals. Efforts have also been initiated towards dissemination of the information generated for enhancement of capacities of various stakeholder groups.

These efforts were largely related to developing capacities based on best practices, experiences and learnings under the aforesaid project in the area of rescue and rehabilitation. The 'Planning and management for aquatic species conservation and maintenance of ecosystem services in the Ganga River Basin for a clean Ganga (WII - NMCG-Phase II)' project envisages a much larger area of operation and accordingly a much larger network of community representatives, frontline forest officials and field veterinarians. It is therefore imperative that a structured course design be prepared to enhance the skills of various stakeholders. Besides this, it is also of importance to identify mechanisms for imparting the information required to the diverse stakeholder groups with different learning abilities.

1.1 THE GANGA BASIN AND ITS BIODIVERSITY

The Ganga River is sacred and integral to the ethos of India. The main stem river and the points of confluence of its tributaries are important pilgrimage centres around which a range of religious and cultural practices of the human denizens of the Ganga Basin are centred. The Ganga Basin extends across three biogeographic zones; the Himalayas, the Gangetic Plains and the Coastal Zone with each of these stretches supporting different assemblages of biota due to differences in climate and geomorphology. The basin is thus home to a rich biodiversity that includes amongst mammals (Gangetic dolphin and otters), birds (waders and divers) and reptiles (crocodilians and freshwater chelonians).

Aquatic macro-fauna of Ganga basin

The Ganga basin supports a rich diversity of higher vertebrate fauna also termed as macro-fauna. The species assemblages in the main stem river as well as its various tributaries vary according to geomorphology, climatic pattern, and extent of anthropogenic influences. A review of available literature indicates that the basin supports five species of mammals belonging to two orders and three families. These include two dolphin species that are endangered and three species of otters with varying degrees of threat perception. The avian fauna is represented by 128 species of 27 families, of which 27 are conservation dependent. The basin is also home to a wide array of reptiles that includes amongst others three crocodilian species, a species of varanus and 15 chelonian species with varying threat perceptions. A list of the conservation dependent aquatic macro-fauna (higher vertebrates) of the Ganga basin is provided in table 1.




Table 1: Conservation dependent aquatic macro-fauna of Ganga Basin

Species	WPA Status	IUCN Status	CITES Status
Mammals			
Gangetic river dolphin (*Platanista gangetica*)	Schedule I (Part I)	Endangered	Appendix I
Irrwaddy dolphin (*Orcaella brevirostris*)	Schedule I (Part I)	Critically Endangered	Appendix I
Smooth coated otter (*Lutrogale perspicillata*)	Schedule II (Part I)	Vulnerable	Appendix I
Eurasian otter (*Lutra lutra*)	Schedule I (Part I)	Vulnerable	Appendix I
Small-clawed otter (*Aonyx cinereus*)	Schedule II (Part I)	Near Threatened	Appendix I
Avifauna			
Black-bellied tern (*Sterna acuticauda*)	Not listed	Endangered	Not listed
Indian sarus crane (*Antigone antigone*)	Schedule IV	Vulnerable	Not listed
Indian skimmer (*Rynchops albicollis*)	Not listed	Vulnerable	Not listed
River tern (*Sterna aurantia*)	Not listed	Near Threatened	Not listed
Painted stork (*Mycteria leucocephala*)	Schedule IV	Near Threatened	Not listed
Great thick-knee (*Esacus recurvirostris*)	Schedule IV	Near Threatened	Not listed
Reptiles			
Crocodilians			
Gharial (*Gavialis gangeiticus*)	Schedule I (part II)	Critically endangered	Appendix I
Mugger (*Crocodylus palustris*)	Schedule I (part II)	Vulnerable	Appendix I
Salt-water crocodile (*Crocodylus porosus*)	Schedule I (part II)	Least concern	Appendix I
Turtles			
Red-crowned roofed turtle (*Batagur kachuga*)	Schedule I (part II)	Critically endangered	Appendix II
Northern river terrapin (*Batagur baska*)	Schedule I (part II)	Critically endangered	Appendix I
Three-striped roofed turtle (*Batagur dhongoka*)	Not listed	Endangered	Appendix II
Spotted pond turtle (*Geoclemys hamiltonii*)	Schedule I (part II)	Vulnerable	Appendix I
Indian tent turtle (*Pangshura tentoria*)	Not listed	Least concern	Appendix II
Brown roofed turtle (*Pangshura smithii*)	Not listed	Near threatened	Appendix II
Indian roofed turtle (*Pangshura tecta*)	Schedule I (part II)	Least Concern	Appendix I
Crowned river turtle (*Hardella thurjii*)	Not listed	Vulnerable	Appendix II
Indian black turtle (*Melanochelys trijuga*)	Not listed	Near Threatened	Appendix II
Eastern hill terrapin (*Melanochelys tricarinata*)	Schedule I (part II)	Vulnerable	Appendix I
Indian softshell turtle (*Nilssonia gangetica*)	Scheduled (part II)	Vulnerable	Appendix I
Indian peacock softshell turtle (*Nilssonia hurum*)	Scheduled I (part II)	Vulnerable	Appendix I
Indian narrow-headed softshell turtle (*Chitra indica*)	Not listed	Endangered	Appendix II
Indian flapshell turtle (*Lissemys punctata*)	Scheduled I (part II)	Least concern	Appendix II
Monitor lizard			
Water monitor lizard (*Varanus salvator*)	Scheduled I (part II)	Least concern	Appendix II

1.2 THREATS TO AQUATIC MACRO-FAUNA

The Ganga Basin holds a highly dense human aggregation (≥ 700 persons per km^2), with a high degree of dependence on the resources drawn from the river. The resource extraction had limited impact on the bio-diversity of the Basin till the human population was small. The incremental growth in human population with the attendant growth in resource extraction led to the adoption of unsustainable extraction practices leading to an increasingly disturbed and fragmented landscape and associated loss of suitable habitats for this rich biodiversity. This unique macro-faunal assemblage is; however, facing various threats of anthropogenic origin. The threats include unsustainable resource extraction (water extraction, poaching, sand mining, floodplain agriculture and fishing), pollution from sewage and industrial discharge, development of linear infrastructure (construction of dams, barrages, roads and highways along the banks, inland navigable waterways and redevelopment of the river-front in urban areas). Additionally, the effects of climate change phenomenon are also a potent threat. These threats, singly and in combination cause degradation and fragmentation of habitats by restricting water-flow, destroying nesting, basking and roosting areas of animals. Their effects are manifest in highly fragmented populations and localized extinction of species in several stretches that have been well documented.

1.3 RESCUE AND REHABILITATION AS A CONSERVATION STRATEGY

Wild animals are occasionally encountered in distressed (injured, sick and orphaned) or displaced (straying into human dominated habitats and confiscated animals captured for illegal trade) states. Such animals are often incapable of survival on their own and need to be rescued before they can be rehabilitated back into their natural habitats. The process of rescue removes them from the imminent danger they face while rehabilitation efforts provide opportunities for their release in natural habitats. The process of rescue and rehabilitation can thus form the basis for successful recolonization efforts. Such recolonization efforts require detailed planning and execution that is in tandem with amelioration of factors that localized population declines/ extinctions. These efforts if successful can lead to the achievement of the goal of establishing multiple self-sustaining populations that are key to species recoveries.

1.4 WII-NMCG PHASE II PROJECT

Freshwater aquatic macro-fauna shapes the aquatic habitat they inhabit with healthy populations indicating a stable habitat. They are a unique group that is severely affected by the altered habitat conditions and unsustainable resource extraction practices. The Ganga River Basin provides home to a large number species of aquatic macro-fauna; however, unsustainable practices have drastically impacted their habitats and populations.

The Government of India, through its flagship program Namami Ganga under the aegis of Ministry of Jal Shakti, Department of Water Resources, River Development and Ganga Rejuvenation aims to address the twin objectives of pollution abatement and biodiversity conservation. As a part of this initiative the NMCG in partnership with the Wildlife Institute of India has initiated a comprehensive program. The first phase of the project titled 'Biodiversity Conservation and Ganga Rejuvenation' has concluded and the second phase titled 'Planning and management for aquatic species conservation and maintenance of ecosystem services in the Ganga River Basin for a clean Ganga (WII - NMCG-Phase II)' has been initiated.

An important objective under the project is the development of infrastructure and capacities for the rescue and rehabilitation of conservation dependent species. In view of this, the component IC, (Rescue and Rehabilitation) of the Phase II Project focuses on the rescue and rehabilitation of freshwater aquatic macro-fauna of the Ganga River Basin and development of capacities for the same.

1.5 PRINCIPLES OF RESCUE AND REHABILITATION

Rescue and rehabilitation in wildlife management is a three step process involving the rescue of vertebrate animals that are injured, sick or in danger. Such rescued animals may be directly released in suitable natural habitats if apparently healthy and do not warrant further interventions. If an assessment indicates need for further interventions, the animal may be placed in captive care facilities where such interventions can be provided. The animals on return to a healthy state are released in their natural habitats.

Wildlife rescue and rehabilitation is thus a unique animal care practice, involving a blend of knowledge of multiple disciplines that include taxonomy (for accurate species identification), natural history, animal behaviour and ecology (for managing the housing and husbandry practices of species encountered in rescue), veterinary medicine and surgery (for healthcare of rescued individuals), environmental and animal ethics (ethical and humane management of rescued animals) along with a knowledge of outreach and extension activities for reaching out and seeking community support and ensuring success of release efforts.

Role of rescue and rehabilitation in conservation

Rescued wild animals provide a much needed opportunity to study various aspects of their biology, pathogens, diseases and veterinary management, besides providing an opportunity to standardize protocols for rescue and rehabilitation, soft versus hard release and post-release monitoring.

Information from all these activities if suitably collated can aid the creation of a database that can aid effective management of rescue and rehabilitation of species, besides providing insights into the overall conservation of the species. Rescue and rehabilitation of these lesser addressed species serves following purposes:

- **Aids in species conservation**
  Judicious selection of release sites and the number of animals being released in identified suitable habitats can aid conservation of species by supplementing depleting populations or establishing new ones in suitable habitats.

- **Provides a medium for creating a conservation ethos in the community.**
  Communities are often unaware of the wildlife that their surroundings support and the various threats that they face in these habitats. Use of rescued animals for highlighting the state of these animals through mass-media platforms and outreach activities can aid in the creation of a community that is sensitive to the conservation needs of various species in their surroundings and has empathy for the conservation of natural resources.
- **Addressing welfare concerns of wildlife communities.**
  Addressing welfare concerns of wildlife communities is a challenging task. A possible way out is ensuring that welfare concerns of rescued individuals are met on release through post-release monitoring. The welfare state of the released animals can be used as a surrogate for overall welfare assessment of the community.
- **Indicator of environmental health.**
  Regular monitoring of released individuals can be the basis for assessing the environmental health of habitats. Habitats in which the welfare status of released animals is optimum can be assumed to be in a good state while in those where the welfare status of the released animals is compromised are in a poor state.
- **Opportunities for development of knowledge base**
  Knowledge of a large number of species is still rudimentary for a large number of species. The process of rescue, rehabilitation and release can provide opportunities for creating a knowledge base in the areas of natural history of the species, its physiology, nutrition, techniques for capture and restraint, and most importantly in identifying and managing disease threats that individual animals face.

1.6 MANAGING RESCUE AND REHABILITATION

The animals in rescue facilities need to be maintained in a manner that ensures their retaining natural behavioral traits such as predator avoidance, foraging, socialization, habitat selection and reproduction. 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, behavioral 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.

1. Taxonomic expertise to enable rapid and accurate identification to species/subspecies level.
2. Medical and veterinary expertise on human and animal health, including quarantine facilities.
3. Wildlife rescue, husbandry and behavioral expertise.
4. Appropriate legal expertise.
5. Logistical expertise to advise on holding and transport.
6. Monitoring of animal populations to ensure that the animals have successfully adapted to the habitats in which they are released and are effectively contributing to the growth of the population in their new habitats.

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.



2 STAKEHOLDERS IN RESCUE AND REHABILITATION OF AQUATIC MACRO-FAUNA IN GANGA BASIN

The stakeholders critical to ensuring success of rescue and rehabilitation efforts include Local communities and voluntary organizations, personnel of state forest departments, enforcement agencies, various government line agencies and animal husbandry departments. The stakeholders for achieving the project objectives based on their affiliation have been categorized as under:

1. Local communities and voluntary organizations
2. Frontline forest officials including rescue teams and zoo personnel
3. Enforcement agencies (personnel of state and central police departments who work as confiscating agencies)
4. Government line agencies (personnel of civil administration, irrigation and public works departments)
5. Veterinary professionals (personnel of state animal husbandry departments and zoos)
6. Policy makers
7. Academicians, scientists and students
8. Media representatives

Under phase I of the WII-NMCG collaborative project capacity building programs in managing emergent situations of aquatic macro-fauna were carried out for representatives of riverside communities, officials of the state forest and animal husbandry departments. The focus has been on developing skills in field identification of species, scientific and humane handling procedures, basic principles of rescue and rehabilitation and for the field veterinarians an additional area has been veterinary management of select species.

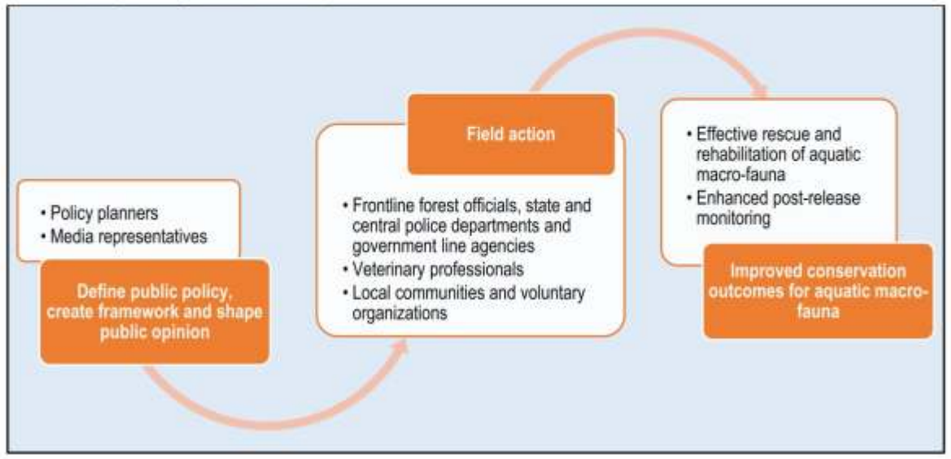

Fig. 1: Outline of roles and responsibilities of different stakeholders

2.1 LOCAL COMMUNITIES AND VOLUNTARY ORGANIZATIONS

The local communities have a traditional dependence on the river's resources for their livelihoods, social needs and beliefs. Voluntary organisations provide the advocacy support and link the communities and the government agencies for sustainable use of the resources of the Ganga River Basin. The people residing along riverfronts are the ones most effected by the changes in the river and are also the first to learn about incidents related to rescue, rehabilitation and release of aquatic macro-fauna.

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. They are most often the first respondents to emergent situations of aquatic macro-fauna and at the base of the information chain that can lead to effective rescue. Being present on site they can also perform an important role in monitoring animals released to natural habitats and can play a key role in protection if suitably motivated. Most members also possess limited knowledge and skills related to handling of aquatic macro-fauna.

Community based conservation

Much of the conventional conservation effort is focused on establishing a network of protected areas with a top down policy approach; however, conserving the biodiversity of Ganga Basin 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.

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.

Engineering based solutions that attempted to address the problems plaguing the river thus met with limited success. An integrated approach addressing resource dependence of the communities while ensuring conservation of the river's biodiversity would have a better chance of success.

The participation of these communities in the rejuvenation of rivers with a revival of traditional best practices for sustainable resource extraction would thus have a higher chance of success.

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. It was therefore decided to actively involve local community members in the efforts being made in this direction and develop their capacities in various facets of rescue, rehabilitation and release of aquatic macro-fauna.

2.2 FRONTLINE FOREST OFFICIALS

Frontline officials of the State Forest Departments are the interface between the public and the department they represent, as they are the ones interacting with the local communities for fulfilling their responsibilities. They can thus effectively liaison with the local communities and form networks for information gathering. They are also responsible for implementation of activities by the departments on the ground and are the ones that are a part of the rescue/ confiscation process. They are also the ones receiving the rescued/ confiscated animal(s) from the public/ enforcement agencies or performing similar activities as a part of their professional activities.

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 and animal husbandry departments. The former provides the necessary legal cover, manpower and essential infrastructure while the latter after enhancement of capacities in veterinary health management of aquatic macro-fauna can provide the necessary health care. Besides these the irrigation and public works departments under whose jurisdictions events requiring rescue and rehabilitation of aquatic macro-fauna can occur can also play an important role.

2.3 ENFORCEMENT AND GOVERNMENT LINE AGENCIES

Frontline officials of various agencies that include personnel of Railway Protection Force, Government Railway Police and state police departments are responsible for much of the enforcement activities carried out. They are representatives of their departments in the field and are the ones in direct contact with local communities, offenders and are the ones

entrusted with carrying out rescues and confiscations. They have regular interactions with local communities as a part of their daily work and thus can effectively liaison with them for information gathering and processing and conveying their findings through departmental hierarchies for further action.

A liaison with local communities' aids in creating a network for information gathering that helps them in initiating field level actions. Their rapport with local communities helps them in mobilizing community members in managing emergent situations. While most officials have knowledge that enables them to identify terrestrial mammalian species their lack of knowledge regarding aquatic macro-fauna and actions that need to be undertaken for managing the animals encountered in distressed or displaced conditions needs to be addressed.

Various government line agencies such as the civil administration, irrigation department and public works departments hold jurisdiction over areas where aquatic macro-fauna of conservation significance reside outside the protected area network and where displaced or distressed aquatic animals are often found. They also control infrastructure that in emergent situations can be used to support rescue efforts. Additionally, the civil administration is the controlling authority for most state government line agencies and is in a position to influence the representatives of local communities. The traditional roles of these agencies is to execute developmental activities of the state government.

The personnel of these agencies have limited exposure to issues related to conservation of biodiversity, much less aquatic macro-fauna. It is however, perceived that with appropriate exposure and capacity building the personnel of these agencies can help foster the necessary conservation ethos and aid the creation of a community sensitized to the needs of conservation of aquatic macro-fauna. Their services can also be used to develop an environment supportive of rescue and rehabilitation as part of the overall conservation strategy for aquatic macro-fauna.

2.4 VETERINARY PROFESSIONALS

Veterinary professionals working in the field under state animal husbandry departments and zoos, are the first line of action of the state machinery in addressing veterinary emergencies in their areas of posting. These professionals as a part of their education, across the country undergo a curriculum that trains them to perform various procedures related to health assessment and treatment of domesticated animals. This is further reinforced by continued practice and career development programs. The procedures of health assessment and treatment can vary significantly across wild animal species but the basic principles remain the same. Additionally, the state animal husbandry department has infrastructure available that can be used for managing veterinary emergencies of aquatic macro-fauna in distress.

Thus bridging the gap in knowledge through capacity building programs can ensure the creation of a cadre of professionals that can effectively address veterinary medical emergencies of aquatic macro-fauna in the Ganga Basin.

2.5 POLICY MAKERS

Policy makers from various government agencies through the policies framed by them influence the action of various departments in the field. It is thus essential to create an awareness about the ecosystems services that freshwater ecosystems provide with special emphasis on the Ganga Basin and the role of biodiversity in their regulation and sustained availability. A need for interdisciplinary action that is based on multiple government agencies acting in tandem for achieving the desired goals of biodiversity conservation and the role of rescue and rehabilitation in the overall conservation scenario needs to be effectively communicated to facilitate a supportive policy framework with associated financial commitment.

2.6 ACADEMICIANS, SCIENTISTS AND STUDENTS

Academicians, scientists and students are integral to shaping public opinion and carrying out research on basic and applied aspects of relevance for the conservation of aquatic macro-fauna. They can play a critical role in developing public opinion through their teaching and writing besides being the ones that are looked up to by the society for ushering in change. It thus becomes imperative to sensitize them about the position occupied by the Ganga Basin in the cultural ethos of the country and the wide range of ecosystem services that are availed by people residing in the Basin. Further capacity development in the field would motivate them to develop innovative technologies for addressing the challenges faced in conservation of the biodiversity of the Basin.

2.7 MEDIA REPRESENTATIVES

In today's information age the media plays an important role in influencing and shaping public opinion. Media personnel sensitized to the need for biodiversity conservation at large and that of Ganga Basin specifically, can play an important role in creating a sensitive community. They can play an important role in dissemination of information regarding the ecosystem services offered by the river basin and the role of biodiversity in supporting the sustained availability of these services. To achieve these objectives, it is necessary to first sensitize the media personnel to the role of freshwater ecosystems in human welfare and the functions of biodiversity in ensuring their sustained availability.

3 MULTI-TIERED APPROACH FOR CAPACITY DEVELOPMENT

The capacity development efforts aim at enhancing the skills of a diverse group of stakeholders with different learning abilities, varied roles and responsibilities and possessing varied skills. To effectively address the learning requirements of this diverse group of stakeholders the capacity development programs have to be based on the specific roles and responsibilities of each group. Additionally, the programs have to be in a stepwise manner with initial focus on developing primary skills and sensitizing the stakeholders about the biodiversity of Ganga Basin and its role in regulating ecosystem services. Development of further role-specific skills can be addressed in subsequent programs. A multi-tier approach is thus proposed for key stakeholder groups that include representatives of local communities and voluntary organizations, frontline forest officials and veterinary professionals.

A capacity development program for enhanced effectiveness needs to have a multi-tiered approach, with a defined structure to address the learning abilities of each stakeholder. The learning process needs to be structured in a manner that leads to development of desired learning outcomes in each learner as they progress through the learning continuum and are exposed to greater details of the process of rescue, rehabilitation and release of aquatic macro-fauna in its each step. The capacity development program in its initial stage would target at the sensitization of participants from the various stakeholder groups in the basic principles of rescue, rehabilitation and release with an increase in complexity of tasks that the learners are able to carry out as they progress in the learning continuum. Participants in the earlier stages with commitment and motivation to perform the tasks that they have been trained in and showing an interest in enhancing their skills further would be identified and their skills further enhanced. The process of transfer of skills will vary according to the identified roles and responsibilities depending on the existing knowledge levels of each stakeholder group and its learning needs.

3.1 **BEGINNER:** The first stage of the learning program needs to target the creation of a community that is sensitized to the use of rescue, rehabilitation and release as a conservation strategy and is able to effectively create an information chain that can lead to a successful rescue effort. The participants are also envisaged to have skills essential for species survival and post-release monitoring of individuals. Participants in these capacity building programs are anticipated to be proactive in their support for the rescue and rehabilitation process and be part of an active community that is able to rapidly relay information regarding incidents necessitating rescue and rehabilitation of aquatic macro-fauna.

This will be in the nature of a general orientation of the various stakeholders. The emphasis will be on sensitization towards roles and responsibilities that each group has in the overall rescue, rehabilitation and release process. Specific roles identified for each group will form the basis for creation of specific capacities of each stakeholder group.

Beginner	Beginners to be sensitized to rescue and rehabilitation needs of aquatic macro-fauna of Ganga Basin
• The participants in the capacity building programs will be exposed to the basics of wetland ecosystems with emphasis on Ganga basin, natural history and ecology of key aquatic macro-fauna species and basic principles of rescue and rehabilitation. • After undergoing the capacity building programs the participants are expected to be able to assist in rescue and rehabilitation of aquatic macro-fauna under guidance of experts.	
Advanced learners	Equipped with skills necessary for rescue and rehabilitation
• The participants will be given in-depth knowledge of the ecology and natural history of select species of aquatic macro-fauna that are frequently encountered in rescue situations. They will also be exposed to practices used in capture, restraint, crating and transportation of aquatic macro-fauna depending on their identified roles and responsibilities. • The participants are expected to carry-out routine rescue operations such as those involved in management of confiscated wildlife independently and effectively implement expert advice.	
Trainers	Possessing advanced skills in rescue and rehabilitation
• The participants will be given a hands experience of the practices being adopted for rescue and rehabilitation of aquatic macro-fauna depending on their identified roles and responsibilities. It is expected that the participants after capacity building will have relevant expertise in their identified roles and responsibilities. They are expected to independently handle rescue and rehabilitation efforts and provide necessary guidance to others in their area for carrying out similar efforts.	

Fig. 2: Levels of capacity development programs

3.2 **ADVANCED LEARNERS:** The second stage can lead to the creation of a community that is able to assist and begins to participate in a successful rescue and rehabilitation effort under the supervision of professionals engaged in similar work. The participants of this stage may be drawn from active participants from the sensitized community formed as an outcome of the beginner level learning programs. The skill development program will be structured in a manner to address specific learning needs of each stakeholder group. A mix of classroom sessions and hands on demonstrations aimed at developing the specific identified skills for each stakeholder group will be used to create the desired capacities.

3.3 **TRAINERS:** The third stage may lead to the creation of a community that is able to initiate and execute a successful rescue and rehabilitation effort. Participants of the second stage appreciative of the intricacies involved in rescue and rehabilitation efforts can be the participants in this stage. It is anticipated that adequate expertise is available in the field after completion of this stage and the course participants are able to create teams and manage rescue and release efforts independently.

The learners in this stage should be capable of initiating rescue and rehabilitation efforts, initially with handholding by experienced professionals in the field and eventually be able to lead such efforts. The learning methods in this phase would comprise of attachments with existing rescue and release teams for hands on experience, along-with classroom sessions aimed at developing expertise in the area.

4. ROLES, RESPONSIBILITIES, KNOWLEDGE REQUIREMENTS AND SYLLABUS FOR CAPACITY BUILDING OF STAKEHOLDERS

4.1 ROLES, RESPONSIBILITIES AND KNOWLEDGE REQUIREMENTS OF LOCAL COMMUNITIES AND VOLUNTARY ORGANIZATION REPRESENTATIVES

Representatives of local communities and voluntary organizations are often the first to learn about the presence of distressed/ displaced animals in their areas. The eventual success of rescue efforts is largely guided by their initial actions. The local communities have considerable traditional knowledge about the fauna of the river basin; however, lack of knowledge of scientific and humane capture techniques, appropriate infrastructure and legal provisions in the rescue and subsequent management of species protected under the various schedules of the Wildlife (protection) Act 1972 limits their effective participation in rescue efforts. Enhancement of their capacities in their identified roles in being an integral part of the information flow process and in protecting distressed/ displaced aquatic macro-fauna and members of their community is thus critical to their effective contribution in rescue efforts.

Eligibility: Participants in the capacity building effort should at least have passed Senior secondary examination (12th) preferably with biology as a subject.

Overall roles and responsibilities

The key roles that representatives of local communities and voluntary organizations can play in the rescue and rehabilitation process is to collect, process and transmit relevant information to forest officials and rescue teams about distressed/ displaced animals. They can also play an important role in ensuring that animals do not suffer further harm and the public remains safe. Being onsite they can also play a crucial role in facilitating transport of the rescued animal(s) and in protection and monitoring of animals' post-release. Their key roles and responsibilities are summarized in fig. 3.

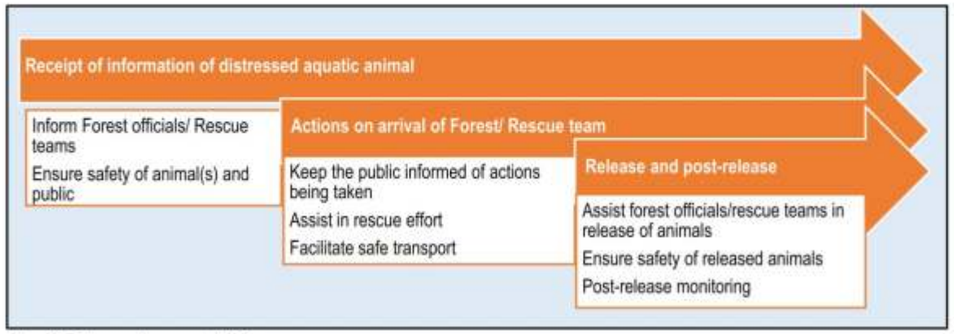

Fig. 3: Roles and responsibilities

4.1.1 ROLES AND RESPONSIBILITIES AND SYLLABUS AT BEGNINER LEVEL

In the initial part (level: beginner) it is anticipated that they are able to effectively identify different conservation dependent macro-fauna species in the field, distinguish between distressed and healthy animal(s), displaced and those performing natural movement patterns, able to assess rescue situations and effectively communicate the same to designated forest officials'/ rescue teams. It is also envisioned that they are able to keep both the community members and the animal safe till the arrival of the rescue teams.

Skills/ knowledge requirements at beginner level

The skills and knowledge required by representatives of local communities and voluntary organizations as beginners in fulfilling their responsibilities in rescue and rehabilitation of aquatic macro-fauna are presented as table 2.

Table 2: Skills and knowledge requirements as beginners

	Roles and responsibilities		
	Carry out an assessment of the rescue situation	**Communicate assessment to Forest Department/ Rescue Team**	**Ensuring safety of the animal and the public**
Skills/ knowledge requirements	1. Knowledge of Biodiversity of Ganga Basin 2. Ability to identify different species in field 3. Ability to differentiate between normal dispersal movements and displaced animals and are able to recognize injured animals	1. Ability to identify different species commonly received in rescue 2. Able to identify threats to aquatic macro-fauna 3. Able to carry out a preliminary assessment of status of animals 4. Knowledge of topography and local conditions at rescue site 5. Able to effectively communicate the information available to Forest officials	1. Basic knowledge of the ecology, natural history and biological characteristics 2. Threats faced by aquatic macro-fauna 3. Ability to communicate with onlookers and other community members for protecting the animal(s) and the public 4. Able to assist rescue teams in capture, restraint, and transport of rescued animals 5. Able to facilitate transportation of rescued animals

The syllabus for development of capacities at beginner level of representatives of local communities and voluntary organizations is placed in the following section. As a part of the learning process it is planned to provide an overview of the Ganga Basin, the ecosystem services it offers and the role of biodiversity in ensuring sustained availability of these services to sensitize them to the need for conserving the biodiversity of the River Basin.

Syllabus

Module I: Overview of Ganga Basin and its biodiversity

1. The mythological and cultural significance of River Ganga
2. Introduction to freshwater aquatic ecosystems and services provided
3. Introduction to ecology and geomorphology of Ganga Basin
4. Introduction to macro-faunal biodiversity of Ganga Basin and its conservation needs
   a. Amphibians of Ganga basin
   b. Reptiles of Ganga basin (Chelonians, Varanids and Crocodilians)
   c. Birds of Ganga basin (Waders and Divers)
   d. Mammals of Ganga basin (Otters and Dolphins)
5. Threats to biodiversity of Ganga basin
   a. Poaching and illegal trade
   b. Effect of development of linear infrastructure
   c. Effect of sand mining and riparian agriculture
   d. Effect of pollution and climate change

Module II: Field identification, ecology and natural history of aquatic macro-fauna inhabiting Ganga Basin

1. Reptiles of Ganga basin (Chelonians, Varanids and Crocodilians)
2. Birds of Ganga basin (Waders and Divers)
3. Mammals of Ganga basin (Otters and Dolphins)

Module III: Rescue and rehabilitation as a conservation strategy

1. Principles of rescue and rehabilitation of aquatic macro-fauna
2. Role of reintroduction and supplementation in conservation with special reference to aquatic macro-fauna of Ganga basin
3. Role of nest protection and egg rescue in conservation of reptiles.

Module IV: Legal aspects of rescue and rehabilitation

1. The application of the Wildlife (protection) Act 1972 to rescue and rehabilitation
2. Permissions required for rescue and rehabilitation of aquatic macro-fauna
3. Essential records to be maintained during rescue and rehabilitation of aquatic macro-fauna

Module V: Assessment and communication of rescue situations

1. Identifying distressed, displaced and sick aquatic macro-fauna
2. Topography, accessibility and local issues at rescue site
3. Liaison with forest officials'/ rescue teams
4. Collating information and communicating assessment to forest officials'/ rescue teams

Module VI: Ensuring Safety of animal(s) and local people during capture and transport

1. Basic communication skills for sharing information with community members
2. Scientific and humane crating considerations for rescued aquatic animals
3. Transport considerations of rescued aquatic animals

4.1.2 ROLES AND RESPONSIBILITIES AND SYLLABUS AT ADVANCED LEARNER LEVEL

The representatives of local communities and voluntary organizations at the advanced learner level of capacity development are anticipated to have undergone the capacity development program at the beginner level and would possess the desired skills of that level. It is also anticipated that they would be fulfilling the roles identified for them in assisting in emergent situations of aquatic macro-fauna. After participating in the capacity building program as advanced learners their anticipated role would be in creating awareness about the zoonotic potential of aquatic macro-fauna, mobilize public support and create awareness about rescue and rehabilitation. Besides this it is expected that with the skills developed they would be able to assist in identification of potential release sites and carry out post release monitoring under the guidance of experts.

Skills/ knowledge requirements at advanced learner level

The skills and knowledge required by representatives of local communities and voluntary organizations at advanced learner stage in rescue and rehabilitation of aquatic macro-fauna are presented as table3.

Table 3: Skills and knowledge requirements in fulfilling identified roles and responsibilities as advanced learners

	Roles and responsibilities		
	Create an awareness on the zoonotic potential of aquatic macro-fauna	**Create awareness in support of rescue and rehabilitation**	**Assist in release site identification and post-release monitoring**
Skills/ knowledge requirements	1. Knowledge of disease agents of aquatic macro-fauna that have the potential to cause disease in human beings 2. Knowledge of preventive measures for prevention of zoonotic disease transmission	1. Knowledge of threats to biodiversity of Ganga basin 2. Knowledge of impact of illegal trade on biodiversity of Ganga Basin 3. Knowledge of role of rescue and rehabilitation in conservation of aquatic macro-fauna 4. Skilled in dissemination of above information	1. Knowledge of ecological requirements of conservation dependent species of Ganga Basin 2. Knowledge of best practices used for rapid assessment of aquatic ecosystems 3. Knowledge of marking of animals for individual identification 4. Knowledge of best practices used in post-release monitoring of rescued animals

The syllabus for development of capacities at advanced learner level of representatives of local communities and voluntary organizations is placed in the following section. As a part of the learning process it is planned to enhance their skills in providing assistance in rescue and rehabilitation and assist in nest protection and rescue of aquatic reptiles and birds.

Syllabus

Module I: Create an awareness on the zoonotic potential of aquatic macro-fauna

1. Zoonotic diseases of aquatic macro-fauna
2. Personal protection and safety during rescue and rehabilitation

Module II: Create awareness in support of rescue and rehabilitation

1. Ways of communicating with local communities on issues related to rescue and rehabilitation

Module III: Release site identification

1. Ecology, animal behaviour (e.g. habitat selection, foraging strategies, reproduction, competition, and predator-prey interactions) and basic biology (anatomical and physiological peculiarities) of identified species
   a. Reptiles of Ganga basin (Chelonians, Varanids and Crocodilians)
   b. Birds of Ganga basin (Waders and Divers)
   c. Mammals of Ganga basin (Otters and Gangetic Dolphin)
2. Ecological and anthropogenic attributes of release sites for the above groups of animals
3. Criteria for identification of potential release sites

Module IV: Post-release monitoring

1. Marking methods for different classes of animals of Ganga basin
    a. Reptiles (Chelonians, Varanids and Crocodilians)
    b. Birds (Waders and divers)
    c. Mammals (Otters and Gangetic Dolphin)
2. Basic principles of post-release monitoring

4.1.3 ROLES AND RESPONSIBILITIES AND SYLLABUS AT TRAINER LEVEL

With the skills, knowledge and expertise developed at the beginner and advanced learner level it is anticipated that the representatives of local communities and voluntary organizations are able to assist in monitoring the biodiversity of Ganga Basin and act as sentinels for warning about emergent situations besides actively providing assistance to forest departments and rescue teams in the rescue and rehabilitation of aquatic macro-fauna and in protection and rescue of nests as conditions necessitate.

Skills/ knowledge requirements at trainer level

The skills and knowledge required by representatives of local communities and voluntary organizations at trainer level in rescue and rehabilitation of aquatic macro-fauna are presented as table 4.

Table 4: Skills and knowledge requirements in fulfilling identified roles and responsibilities as trainers

Skills/ knowledge requirements	Roles and responsibilities		
	Assist in monitoring biodiversity of Ganga Basin	**Assist in rescue and rehabilitation of aquatic macro-fauna**	**Assist in nest protection, relocation and egg rescue**
	1. Techniques for biodiversity assessment of different macro-faunal types of Ganga basin 2. Techniques for assessment of threats to biodiversity of Ganga Basin	1. Aware of legal provisions required for initiating rescue action 2. Physical capture and restraint techniques for aquatic macro-fauna a. Reptiles b. Aves c. Mammals	1. Be able to assess threats to nests of aquatic reptiles and birds 2. Be aware of best practices for in-situ nest protection/ relocation 3. Protocols for rescue and transportation of eggs 4. Liaison with forest department officials and rescue agencies for subsequent hatchery management of rescued eggs

The syllabus for development of capacities at trainer level for representatives of local communities and voluntary organizations is placed in the following section. As a part of the learning process it is planned to enhance their skills in biodiversity monitoring, provide assistance in rescue and rehabilitation and assist in nest protection and rescue of aquatic reptiles and birds.

Syllabus

Module I: Monitoring biodiversity and threats in Ganga Basin

1. Field monitoring techniques for assessment of macro-faunal biodiversity of Ganga basin
    a. Reptiles (Chelonians, Varanids and Crocodilians)
    b. Birds (Waders and Divers)
    c. Mammals (Otters and Gangetic dolphin)
2. Best practices for assessment of anthropogenic threats

Module II: Rescue of aquatic macro-fauna

1. Permissions required for rescue and rehabilitation of aquatic macro-fauna
2. Physical capture, restraint and transport protocols for aquatic macro-fauna
    a. Reptiles (Chelonians, Varanids and Crocodilians)
    b. Birds (Divers and Waders)
    c. Mammals (Otters and Gangetic dolphin)

Module III: Nest protection, relocation and egg rescue

1. Assessment of threats to nests of chelonians, varanids and crocodilians
2. Best practices for *in-situ* nest protection/ relocation
3. Protocols for rescue and transportation of eggs

4.2 STAKEHOLDER GROUP: FOREST AND ZOO OFFICIALS AND RESCUE TEAMS

Forest departments of state governments are tasked with the management and protection of the rich biodiversity that our country harbours under the various provisions of the Wildlife (protection) Act 1972. As a consequence, forest and zoo officials that constitute rescue teams are one of the most important stakeholders in rescue and rehabilitation of distressed/ displaced aquatic macro-fauna being tasked with rescue and rehabilitation of all wild animals. Frontline officials of the forest department and zoos are responsible for a large part of the activities related to rescue and rehabilitation of aquatic macro-fauna. Additionally, it is anticipated that they would provide the necessary leadership in carrying out rescue operations on-site by establishing a liaison with local communities, government line agencies and veterinary professionals for successful rescue and rehabilitation efforts. Key roles and responsibilities that they are tasked to carry-out are summarized in fig. 4.

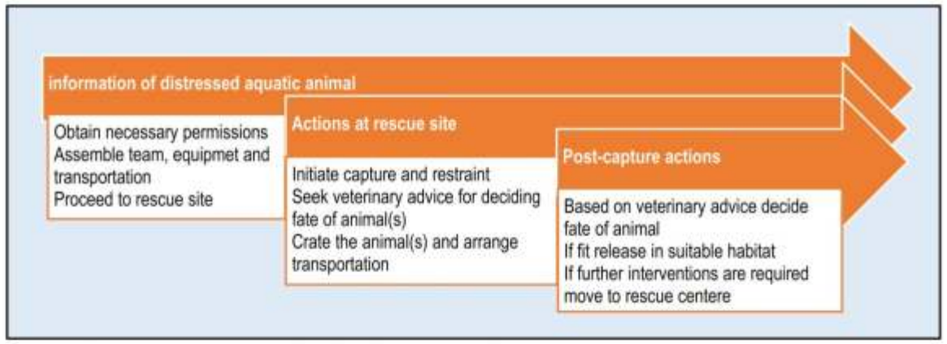

Fig. 4: Roles and responsibilities of forest officials and rescue teams

Eligibility: Participants in the capacity building effort should at least have passed Senior secondary examination (12th) preferably with biology as an elective

4.2.1 ROLES AND RESPONSIBILITIES AND SYLLABUS AT BEGINNER LEVEL

In the initial part (level: beginner) it is anticipated that they are able to effectively identify different conservation dependent macro-fauna species in the field, distinguish between distressed and healthy animal(s), displaced and those performing natural movement patterns, able to assess rescue situations and effectively mobilize designated forest officials'/ rescue teams. It is also envisioned that they are able to liaison with concerned line agencies and representatives of local communities and voluntary organizations for carrying out rescue operations.

Skills/ knowledge requirements at beginner level

The skills and knowledge required by frontline forest officials as beginners in rescue and rehabilitation of aquatic macro-fauna are presented as table 5.

Table 5: Skills and knowledge requirements in fulfilling identified roles and responsibilities as beginners

Skills/ knowledge requirements	Roles and responsibilities		
	Mobilize rescue teams	**Assessment of rescue situations and conduct of rescue operations**	**Liaison with other agencies and stakeholders**
	1. Knowledge of equipment and infrastructure required for initiating a rescue effort according to the species 2. Knowledge of legal procedures to be adopted in field rescues and confiscations 3. Knowledge of topography and local conditions at rescue site	1. Ability to identify different species commonly received in rescue 2. Able to carry out a preliminary assessment of status of animals 3. Able to effectively communicate the information available to Forest officials for permissions 4. Basic knowledge of capture, restraint and handling protocols for different aquatic species	1. Role and responsibilities of different stakeholders in rescue and rehabilitation of aquatic animals a. Local communities and Voluntary Organizations b. Enforcement agencies (State and Central Police departments) c. Animal Husbandry Departments of the state governments and veterinary institutions d. Media persons e. Irrigation and revenue departments of the state governments 2. Communicating and seeking help from different stakeholders

The syllabus for development of capacities at beginner level of frontline forest officials is placed in the following section. As a part of the learning process it is planned to provide an overview of the Ganga Basin, the ecosystem services it offers and the role of biodiversity in ensuring sustained availability of these services to sensitize them to the need for conserving the biodiversity of the River Basin, besides knowledge and skill development on key aspects of rescue and rehabilitation of aquatic macro-fauna.

Syllabus

Module I: Overview of Ganga Basin and its biodiversity

1. The mythological and cultural significance of River Ganga
2. Introduction to freshwater aquatic ecosystems and services provided
3. Introduction to ecology and geomorphology of Ganga of Ganga Basin
4. Introduction to macro-faunal biodiversity of Ganga Basin and its conservation needs
    a. Amphibians of Ganga basin
    b. Reptiles of Ganga basin (Chelonians, Varanids and Crocodilians)
    c. Birds of Ganga basin (Waders and Divers)
    d. Mammals of Ganga basin (Otters and Dolphins)
5. Threats to biodiversity of Ganga basin
    a. Poaching and illegal trade
    b. Effect of development of linear infrastructure
    c. Effect of sand mining and riparian agriculture
    d. Effect of pollution and climate change

Module II: Field identification, ecology and natural history of aquatic macro-fauna inhabiting Ganga Basin

1. Reptiles of Ganga basin (Chelonians, Varanids and Crocodilians)
2. Birds of Ganga basin (Waders and Divers)
3. Mammals of Ganga basin (Otters and Dolphins)

Module III: Rescue and rehabilitation as a conservation strategy

1. Principles of rescue and rehabilitation of aquatic macro-fauna
2. Role of reintroduction and supplementation in conservation with special reference to aquatic macro-fauna of Ganga basin
3. Role of nest protection and egg rescue in conservation of reptiles

Module IV: Mobilize rescue teams

1. Assembling a rescue team
2. Preparedness for rescue (infrastructure including transport vehicles, capture equipment and transport containers)
3. Permissions required for rescue and rehabilitation
4. Standardized record-keeping practices in rescue and rehabilitation of aquatic macro-fauna

Module V: Assessment of rescue situations and conduct of rescue operations

1. Assessment of rescue situations
    a. Identifying distressed, displaced and sick aquatic macro-fauna
    b. Topography, accessibility and local issues at rescue site
2. Documenting and communicating situation assessments
3. Physical capture and restraint techniques for aquatic macro-fauna

Module VI: Liaison with other agencies and stakeholders

1. Roles and responsibilities of different stakeholders
    a. Local communities and Voluntary Organizations
    b. Enforcement agencies (State and Central Police departments)
    c. Animal Husbandry Departments of the state governments and veterinary institutions
    d. Media persons
    e. Irrigation and revenue departments of the state governments
2. Networking and liaison with other stakeholders

4.2.2 ROLES AND RESPONSIBILITIES AND SYLLABUS AT ADVANCED LEARNER LEVEL

It is anticipated that the personnel after having their skills enhanced at the beginner level and having practiced them at the field level are ready for assuming further responsibilities with requisite enhancement of capacities. After participating in the capacity/ skill development program at the advanced learner level they should be able to effectively monitor and report threats to aquatic biodiversity in their areas of operation. They are also expected to be able to plan and implement effective rescue operations and rehabilitate rescued animals back to safe natural habitats after ensuring the suitability of animals for release. It is also expected that the personnel are able to carry-out post-release monitoring for protection of released animals and ensure success of release efforts.

Skills/ knowledge requirements at advanced learner level

The skills and knowledge required by them as advanced learners in rescue and rehabilitation of aquatic macro-fauna are presented as table 6.

Table 6: Skills and knowledge requirements of frontline forest and zoo officials in fulfilling identified roles and responsibilities as advanced learners

	Roles and responsibilities		
	Monitoring and reporting threats to bio-diversity	**Planning and implementing effective rescue and rehabilitation**	**Release site identification and post-release monitoring**
Skills/ knowledge requirements	1. Knowledge of best practices used for rapid assessment of aquatic ecosystems 2. Monitoring techniques of biodiversity of Ganga Basin and standardized recording of data	1. Preparedness and planning for effective rescue and rehabilitation 2. Capture, restraint and transportation of select aquatic macro-fauna 3. Captive management of select aquatic species requiring critical care 4. Liaison with wildlife health professionals for expert advice	1. Knowledge of ecological requirements of conservation dependent species of Ganga Basin a. Reptiles b. Aves c. Mammals 2. Knowledge of marking of animals for individual identification 3. Knowledge of best practices used in post-release monitoring of rescued animals

Syllabus

Module I: Monitoring and reporting threats to bio-diversity

1. Ecosystem services of Ganga basin
2. Role of freshwater aquatic macro-fauna in maintaining ecological integrity of freshwater ecosystems
3. Monitoring techniques for anthropogenic threats to biodiversity of Ganga Basin
4. Best practices for assessment of factors threatening biodiversity.
5. Standard formats for recording and reporting

Module II: Planning and implementing effective rescue and rehabilitation

1. Preparedness and planning for effective rescue and rehabilitation
2. Best practices for the capture, restraint and transportation of select aquatic macro-fauna
3. Liaison with government line agencies
4. Legal aspects of confiscation and the rescue of wild animals included under various schedules of the Wildlife (protection) Act 1972
5. Participatory approach: mobilizing community support for rescue and rehabilitation

Module III: Release site identification and post-release monitoring

1. Fundamentals of population ecology for aquatic macro-fauna
2. Marking and tagging of animals for individual identification
3. Crating and transportation of animals for release
4. Identification of release sites based on habitat requirements of conservation dependent aquatic macro-fauna.
    a. Reptiles
    b. Aves
    c. Mammals
5. Best practices in monitoring released aquatic macro-fauna

4.2.3 ROLES AND RESPONSIBILITIES AT TRAINER LEVEL

After having undergone capacity development at the beginner and advanced learner levels it is anticipated that the forest officials' and rescue team members would possess the skills desired for those levels and be able to fulfil their identified roles and responsibilities. As a further step in development of their capacities their skills would be further enhanced to enable them to assess threats to neonates of mammals and nests and eggs of reptiles and birds, develop and implement mitigation measures *in-situ*. It is also anticipated that if required they would be able to rescue neonates and eggs. They would be able to rear the neonates and manage hatchlings successfully for subsequent release in suitable habitats. They are also expected to be able to manage the well-being of rescued animals in captivity based on established best practices for subsequent release.

Skills/ knowledge requirements at trainer level

The skills and knowledge required by frontline forest officials as trainers in rescue and rehabilitation of aquatic macro-fauna are presented as table 7.

Table 7: Skills and knowledge requirements in fulfilling identified roles and responsibilities as trainers

	Roles and responsibilities		
	Assessment of threats to neonates and nests and mitigation *in-situ*	***Ex-situ* management of rescued neonates and eggs**	***Ex-situ* management of rescued aquatic macro-fauna**
Skills/ knowledge requirements	1. Knowledge of different stressors to neonates and eggs in natural habitats 2. *In-situ* measures for mitigation of stressors (Nest relocation and protection)	1. Collection and transportation of rescued eggs and neonates 2. Incubation, hatchery management and rearing of neonates a. Reptiles b. Aves c. Mammals 3. Nutrition and monitoring growth of neonates	1. Infrastructural requirements for quarantine, housing, health monitoring and nutrition of select species. 2. Maintaining water quality and thermal gradients in enclosures 3. Providing species typical enriched environments 4. Monitoring recovery and assessing fitness for release using behavioral and biological indices

Syllabus

Module I: Assessment of threats to neonates and nests and mitigation *in-situ*

1. Reproductive biology and ecology of conservation dependent aquatic macro-fauna.
   a. Reptiles
   b. Aves
   c. Mammals
2. Factors influencing successful reproductive outcomes in conservation dependent aquatic macro-fauna
3. Best practices for assessment of threats to neonates and eggs of conservation dependent aquatic macro-fauna

Module II: *Ex-situ* management of rescued neonates and eggs

1. Assessment of rescue needs of eggs/ nests and neonates
   a. Reptiles
   b. Aves
   c. Mammals
2. Nest site and neonate protection, relocation
3. Neonate and egg rescue
4. Hatchery and neonate management in rescue centres

Module III: *Ex-situ* management of rescued aquatic macro-fauna

1. Quarantine principles in rescue and rehabilitation
2. Husbandry of rescued animals in captivity
3. Creating enriched environments: using cues from nature
4. Nutritional management of rescued animals
   a. Reptiles
   b. Aves
   c. Mammals
5. Liaison with veterinary professionals from the Animal Husbandry Department for health assessment and management,

4.3 STAKEHOLDER GROUP: VETERINARY PROFESSIONALS OF THE STATE ANIMAL HUSBANDRY DEPARTMENT AND ZOOS

Animals received in rescue are often in a poor state of health as a result of injuries suffered due to poor handling, crating besides being stressed and dehydrated. Veterinary services are thus imperative to assess the health status of the animals and initiate interventions for returning the animals to a healthy state. The services of veterinarians are also called upon to assess the health status of animals prior to release.

The skills of veterinary professionals in managing emergent situations of aquatic macro-fauna is limited as the existing curriculum of the Bachelor of Veterinary Science and Animal Husbandry deals primarily with health aspects of domesticated animals with limited exposure on issues related to wild animal health and minimal information on aquatic animals. This limited exposure to health issues of aquatic wildlife undermines their capacities to address their healthcare and necessitates strengthening their skills. The major roles and responsibilities of veterinary professionals in rescue and rehabilitation of aquatic wildlife is represented in fig. 5.

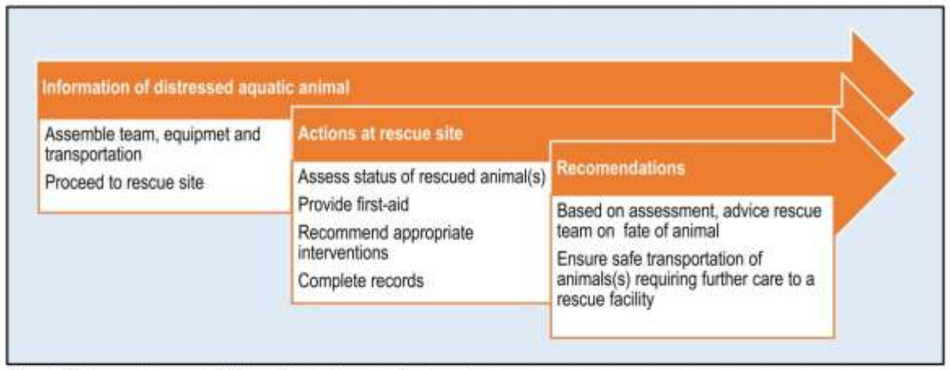

Fig. 5: Roles and responsibilities of veterinary professionals

Eligibility: Participants in the capacity building effort should at least have passed Bachelor of veterinary science and animal husbandry degree

4.3.1 ROLES AND RESPONSIBILITIES AND SYLLABUS AT BEGINNER LEVEL

In the initial phase of the skill development process of veterinary professionals it is anticipated that they are able to assess the needs of the rescued animal, ensure its welfare and help the rescue team in deciding the fate of the animal based on the preliminary health assessment. It is also expected that they are able to seek expert help from their peers and provide the desired assistance besides assessing the welfare state of the animal and guide the rescue team in addressing welfare concerns.

Skill and knowledge requirements at beginner level

The skills and knowledge enhancement of veterinary professionals after participating in the capacity building program for beginners are summarized in table 8.

Table 8: Skills/ knowledge requirements of veterinary professionals in fulfilling roles and responsibilities as beginners

	Roles and responsibilities		
	Assess the needs of the rescued animal	**Ensuring welfare of the rescued animal**	**Deciding the fate of the animal**
Skills/ knowledge requirements	1. Ability to identify different species in field 2. Ability to carry out a preliminary health assessment of rescued animals 3. Ability to seek professional advice from established experts	1. Ability to assess the welfare state of the rescued animals using gross examination and physiological indices 2. Ability to guide the rescue team in addressing welfare concerns of the rescued animal 3. Able to provide first-aid to the rescued animal 4. Knowledge of appropriate crating and transport protocols	1. Knowledge of the basic principles of rescue and rehabilitation of aquatic macro-fauna 2. Knowledge of principles of triage of rescued aquatic macro-fauna 3. Skills in deciding the fate of the rescued animal (whether the animal is fit for release, needs to be maintained in a rescue facility for ensuring recovery or the animal is beyond recovery) based on triage and expert advice

The syllabus for development of capacities at beginner level of veterinary professionals is placed in the following section. The first module aims at providing an overview of the Ganga Basin, the ecosystem services it offers and the role of biodiversity in ensuring sustained availability of these services to sensitize the veterinary professionals about the need for conserving the biodiversity of the River Basin. The other modules aim at enhancing knowledge and skills on key aspects of rescue and rehabilitation of aquatic macro-fauna. It is also proposed to provide information on subject experts and knowledge resources that the veterinary professionals can reach out to for seeking advice or additional knowledge.

Syllabus

Module I: Overview of Ganga Basin and its biodiversity

1. The mythological and cultural significance of River Ganga
2. Introduction to freshwater aquatic ecosystems and services provided
3. Introduction to ecology and geomorphology of Ganga of Ganga Basin
4. Introduction to macro-faunal biodiversity of Ganga Basin and its conservation needs
   a. Amphibians of Ganga basin
   b. Reptiles of Ganga basin (Chelonians, Varanids and Crocodilians)
   c. Birds of Ganga basin (Waders and Divers)
   d. Mammals of Ganga basin (Otters and Dolphins)
5. Threats to biodiversity of Ganga basin
   a. Poaching and illegal trade
   b. Effect of development of linear infrastructure
   c. Effect of sand mining and riparian agriculture
   d. Effect of pollution and climate change

Module II: Field identification, ecology and natural history of aquatic macro-fauna inhabiting Ganga Basin

1. Reptiles of Ganga basin (Chelonians, Varanids and Crocodilians)
2. Birds of Ganga basin (Waders and Divers)
3. Mammals of Ganga basin (Otters and Dolphins)

Module III: Assessment of the needs of the rescued animal(s)

1. Identifying distressed, displaced and sick aquatic macro-fauna
2. Basic principles of health assessment of rescued aquatic animals
   a. Reptiles of Ganga basin (Chelonians, Varanids and Crocodilians)
   b. Birds of Ganga basin (Waders and Divers)
   c. Mammals of Ganga basin (Otters and Gangetic Dolphin)

Module IV: Ensuring welfare of the rescued animal(s)

1. Scientific and humane capture and restraint of freshwater aquatic reptiles (crocodiles and turtles)
2. Principles of first-aid rescue and rehabilitation of select aquatic macro-fauna.
3. Rescued aquatic macro-fauna in conservation oriented reintroductions and population supplementations
4. Welfare considerations in rescue and rehabilitation of aquatic macro-fauna
5. Legal aspects of wildlife rescue and rehabilitation
   a. Wildlife (protection) act 1972
   b. Vetero-legal issues in rescue and rehabilitation of aquatic macro-fauna

MODULE V: Deciding the fate of the animal(s)

1. Principles of rescue and rehabilitation of aquatic macro-fauna.
2. Principles of gross examination and physiological indices for assessing the health status of animals.
   a. Reptiles
   b. Birds
   c. Mammals
3. Principles of triage as applicable to rescue and rehabilitation of aquatic macro-Fauna

4.3.2 SKILLS/ KNOWLEDGE REQUIREMENTS AT ADVANCED LEARNER LEVEL

The roles and responsibilities, skills and knowledge requirements of veterinary professionals after enhancement of their capacities at the advanced learner level are summarized in table 9. The syllabus for development of the desired skills is presented in the following section.

Table 9: Skills/ knowledge requirements of veterinary professionals in fulfilling roles and responsibilities as advanced learners

Skills/ knowledge requirements	Roles and responsibilities		
	Assessing the status of the rescued animal(s)	**Managing health-hazards from select rescued aquatic animals**	**Managing health-care of rescued animals in captivity**
	1. Knowledge of the anatomy and physiology of select aquatic animals in rescue 2. Knowledge of behavioural and physiological indicators of well-being of rescued aquatic animals	1. Diseases of aquatic animals and their modes of transmission 2. The zoonotic potential of aquatic animals 3. Use of personal protection equipment for safe capture and handling of aquatic animals 4. Use of safe handling practices for minimizing injury to handlers	1. Knowledge of disease and toxicological agents and their effects on aquatic macro-fauna and principles of management 2. Knowledge of prophylactic measures for prevention of disease transmission including quarantine, sanitation and hygiene and use of disinfecting agents 3. Drugs of choice, their modes of action, doses and dosages for identified groups of aquatic animals

Syllabus

Module I: Health assessment of rescued animal(s)

1. Anatomy and physiology of conservation dependent aquatic macro-fauna
   a. Reptiles (Chelonians, Varanids and Crocodilians)
   b. Aves (Divers and Waders)
   c. Mammals (Gangetic dolphin and Otters)
2. Natural behaviour patterns and indicators of well-being of select aquatic macro-fauna
3. Using physiological indices to assess the well-being of select aquatic macro-fauna

Module II: Hazards and their management in rescue and rehabilitation

1. Zoonotic disease threats from aquatic animals
2. Use of personal protection equipment in rescue of aquatic macro-fauna
3. Potential hazards of injury from animals and use of hazardous chemicals
4. Scientific and humane capture and handling protocols for aquatic macro-fauna

Module III: Health-management in captivity

1. Infectious diseases of aquatic reptiles, birds and mammals and their management
2. Non-infectious diseases of aquatic reptiles, birds and mammals and their management
3. Prophylactic measures for prevention of disease transmission including quarantine, sanitation and hygiene and use of disinfecting agents
4. Role of water-quality in maintaining sanitation and hygiene for aquatic macro-fauna in rescue centres
5. Toxicological agents and their effects on select aquatic macro-fauna
6. Drugs of choice, their modes of action, doses and dosages for identified groups of aquatic animals

4.3.3 SKILLS/ KNOWLEDGE REQUIREMENTS AT TRAINER LEVEL

Veterinary professionals after having their capacities and skills developed at the beginner and advanced learners stage are anticipated to fulfil their roles and responsibilities at these levels. After undergoing the capacity development program at the trainer level it is expected that they should be able to address issues related to captive management of rescued animals, neonates and eggs in a manner that would lead to their successful return to natural habitats after recovery and reaching the life history stage where they can be expected to survive on their own and contribute to the conservation goals of the species. The identified roles and responsibilities and the knowledge and skills required for achieving them are summarized in table 10, while a detailed syllabus for the same is presented in the following section.

Table 10: Skills/ knowledge requirements of veterinary professionals in fulfilling roles and responsibilities as trainers

Skills/ knowledge requirements	Roles and responsibilities		
	Nutrition of rescued animals in captivity	**Assessing fitness and welfare of animals**	**Management of rescued neonates and eggs**
	1. Knowledge of nutritional ecology and behaviour of rescued aquatic animals 2. Food preferences of select aquatic animal species 3. Nutritional surrogates in captivity 4. Dietary supplements for animals	1. Symptoms and signs of disease in identified groups of aquatic animals 2. Behavioural indicators of fitness 3. Physiological indices of health in identified groups of aquatic animals 4. Pathological examination of biological samples for disease identification in identified groups of aquatic animals	1. Environmental management of rescued eggs (humidity and temperature control) for incubation 2. Care of neonates and hatchlings in captivity (housing and thermal requirements) 3. Nutritional management of neonates and hatchlings in captivity 4. Nutritional supplementation for neonates and hatchlings in captivity

Syllabus

Module I: Nutrition of rescued animals in captivity

1. Nutritional ecology and foraging behaviour of select species of aquatic macro-fauna of conservation significance
   a. Reptiles (Chelonians, Varanids and Crocodilians)
   b. Birds (Waders and Divers)
   c. Mammals (Gangetic Dolphin and Otters)
2. Nutritional requirements at different life history stages and their surrogates in captivity
3. Role of dietary supplements in health management of aquatic macro-fauna in captivity

Module II: Assessing fitness and welfare of animal(s)

1. Symptoms and signs of disease in select species of aquatic macro-fauna
2. Behavioural indicators of well-being in aquatic animals (normal and abnormal behavioural patterns)
3. Physiological indices as indicators of health in select aquatic macro-fauna
4. Techniques for collection of biological samples
5. Pathological techniques for examination of biological samples including blood, serum, tissue, urine and faeces
6. Protocols for the post-mortem examination of identified species of aquatic animals

Module III: Management of rescued neonates and eggs

1. Best practices for collection of eggs of aquatic reptiles and birds
2. Best practices for crating and transportation of eggs
3. Hatchery management including environmental conditions for incubation of eggs
4. Managing hatchlings: best practices for housing and husbandry
5. Rescue and care of neonates

4.4 STAKEHOLDER GROUP: ENFORCEMENT AGENCIES (STATE AND CENTRAL POLICE DEPARTMENTS), LINE AGENCIES (STATE IRRIGATION, PUBLIC WORKS AND REVENUE DEPARTMENTS)

The various enforcement agencies as a part of their routine and special operations often encounter aquatic wild animals that are a part of the large illegal trade in such articles for consumption and pet trade. The animals found are in various states of compromised welfare that range from extreme stress due to improper restraint, and crating to dead animals. The existing capacity development programs of these agencies are primarily directed towards routine policing and detection and investigation of crime with limited focus on wild animals. Similarly, other government line agencies are also critical to the well-being of aquatic animals in their natural habitats as well as those that may be distressed or displaced as a large part of the natural habitat of aquatic animals falls within the administrative control of these departments specially irrigation department. It is thus essential that personnel of these departments be sensitized to the necessity of conservation of aquatic macro-fauna and their capacities enhanced in acting as first responders to emergent situations of aquatic macro-fauna in areas under their jurisdiction. The major roles and responsibilities of personnel of enforcement agencies and government line agencies are summarised in fig. 6.

Eligibility: Participants in the capacity building effort should at least have passed Senior secondary examination (12th).

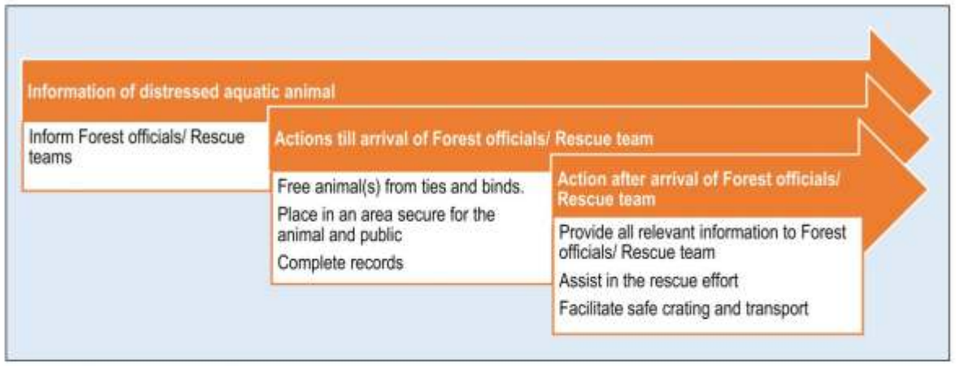

Fig. 6: Roles and responsibilities of personnel from enforcement and government line agencies

4.4.1 SKILLS/ KNOWLEDGE REQUIREMENTS AND SYLLABUS

The knowledge required by personnel of enforcement and government line agencies are summarised in table 11 and a detailed syllabus for the development of their capacities is placed in the following section.

Table 11: Skills and knowledge requirements in supporting rescue and rehabilitation

Skills/ knowledge requirements	Roles and responsibilities		
	Address legal issues in rescues/ confiscations and maintain records	**Identify species being rescued/ confiscated and address immediate needs**	**Assess and communicate rescue/ confiscation situations to Forest officials and Rescue team**
	1. Awareness of legal issues including different schedules of the Wildlife (protection) Act 1972 and its application in rescue/ confiscations 2. Essential records to be maintained for initiating appropriate legal process	1. Morphology and unique characteristics of aquatic macro-fauna of Ganga Basin a. Reptiles b. Aves c. Mammals 2. Preliminary assessment of rescued/ confiscated animals 3. Basic handling and care of rescued/ confiscated animals	1. Assessing rescue/ confiscation situations for ensuring appropriate logistic preparation by forest department officials/ rescue teams 2. Communicating information of confiscations and animals needing rescue to forest department personnel or designated rescue teams 3. Knowledge of scientific practices in crating and transportation of rescued animals

The capacity development program for enforcement and line agencies would be in the form of a sensitization program for creating an awareness of the ecosystem services that the Ganga Basin in particular and freshwater habitats provide in general and the role of biodiversity in maintaining their sustained availability. It would also provide information on the actions to initiate before rescue teams arrive and concerned stakeholders (forest officials and rescue teams) to contact

for a suitable placement of the confiscated animals besides providing an insight into the legal framework within which rescue and rehabilitation works.

Syllabus

Module I: Overview of ecosystem services provided by Ganga Basin and the role of biodiversity for promoting its conservation

1. The mythological and cultural significance of River Ganga
2. An overview of freshwater aquatic ecosystems and services provided
3. The role of biodiversity in sustainable management of ecosystem services
4. An overview of conservation dependent aquatic macro-fauna of Ganga Basin and threats
5. Rescue and rehabilitation as a conservation adjunct

Module II: Legal issues in confiscations and essential records to be maintained

1. The application of the Wildlife (protection) Act 1972 in confiscation of illegally traded wild animals
2. Essential records to be maintained and their formats for prosecution of offences under the Wildlife (protection) Act 1972

Module III: Identification of species being rescued/ confiscated and address immediate needs

1. Species in trade
2. Morphology and unique characteristics of aquatic macro-fauna of Ganga Basin
   a. Reptiles (Chelonians, Varanids and Crocodilians)
   b. Aves (Waders and Divers)
   c. Mammals (Otters and Gangetic Dolphin)
3. Identifying features of species, body parts and their derivatives in trade

Module IV: Assessment of rescue situations and communication of information

1. Preliminary assessment of confiscated animals
2. Liaison with forest officials'/ rescue teams
3. Collating information and communicating assessment to forest officials'/ rescue teams

4.5 STAKEHOLDER GROUP: POLICY MAKERS

Rescue and rehabilitation of aquatic wildlife finds limited representation in the overall conservation policy framework. This has resulted in minimal allocation of resources be it in terms of manpower or infrastructure. Mainstreaming rescue and rehabilitation of aquatic macro-fauna as a conservation adjunct is imperative to ensure the availability of adequate infrastructure and budgetary support. It thus becomes imperative to sensitise policy makers at both the state and central government levels for ensuring the availability of desired support.

Policy makers can define the role of different agencies, guide the actions of organizations and personnel working under them, facilitate availability of budgetary support and ensure availability of appropriate infrastructure based on an assessment of requirements. Besides this the policy makers can facilitate inter-departmental cooperation between different line agencies that are stakeholders in management of inland water resources for a quick response to emergent conditions of aquatic macro-fauna.

Eligibility: Participants in the capacity building effort should at least have a graduation degree

4.5.1 SKILLS/ KNOWLEDGE REQUIREMENTS AND SYLLABUS

The roles and responsibilities of policy makers and the knowledge required by them in fulfilling them are summarized in table 12. A detailed syllabus for enhancing their skills is placed in the following section

Table 12: Skills and knowledge requirements

Skills/ knowledge requirements	Roles and responsibilities		
	Guiding action of field personnel	**Facilitate development of appropriate infrastructure and skills**	**Promote conservation of aquatic biodiversity**
	1. Legal considerations including permissions required for rescue and rehabilitation of aquatic animals 2. Facilitate inter-departmental liaison for safe and humane rescue and rehabilitation of aquatic animals 3. Knowledge of roles and responsibilities of key stakeholders in rescue and rehabilitation	1. Knowledge of infrastructural requirements in rescue and rehabilitation of aquatic wildlife 2. Knowledge of available expertise for building key skills in rescue and rehabilitation 3. Knowledge of funding sources for skill and infrastructure development	1. Are aware of key components of biodiversity of Ganga Basin 2. Are aware of the ecosystem services of the Ganga Basin and their role in human well-being 3. Aware of various threats to biodiversity and options for mitigation 4. Aware of roles of different stakeholder groups in conservation of the biodiversity of Ganga Basin and ensuring sustained availability of ecosystem services

The capacity development program for policy makers would be in the form of a sensitization program for creating an awareness of the ecosystem services that the Ganga Basin in particular and freshwater habitats provide in general and the role of biodiversity in maintaining their sustained availability. It would also provide information on the infrastructural and manpower requirements for operating successful rescue rehabilitation programs besides providing information on key stakeholders and their roles and responsibilities. It would also provide them with an insight into the legal framework within which rescue and rehabilitation works.

Syllabus

Module I: Overview of the Ganga Basin

1. The mythological and cultural significance of River Ganga
2. Introduction to freshwater aquatic ecosystems and services provided
3. Introduction to ecology and geomorphology of Ganga of Ganga Basin
4. Introduction to macro-faunal biodiversity of Ganga Basin and its conservation needs

Module II: Overview of ecosystem services provided by Ganga Basin and the role of biodiversity

1. An overview of freshwater aquatic ecosystems and services provided
2. The role of biodiversity in sustainable management of ecosystem services
3. An overview of conservation dependent aquatic macro-faunal biodiversity of Ganga Basin and threats
4. Rescue and rehabilitation as a conservation adjunct

Module III: Facilitate development of appropriate infrastructure and skills

1. Principles of rescue and rehabilitation as applicable to aquatic macro-fauna of Ganga Basin
2. Infrastructure and personnel required for effective rescue and rehabilitation
3. Skills and knowledge required by different stakeholders in fulfilling their identified roles.

Module IV: Guiding action of field personnel

1. Legal considerations in rescue and rehabilitation of aquatic macro-fauna
2. Roles and responsibilities of different stakeholders (government agencies) in rescue and rehabilitation of aquatic macro-fauna

4.6 STAKEHOLDER GROUP: ACADEMICIANS, SCIENTISTS AND STUDENTS

Rescue and rehabilitation of aquatic macro-fauna is a knowledge driven activity requiring expertise in diverse fields that include ecology, natural history, behaviour, nutrition and health care of the various species. Aquatic macro-fauna; however, remains one of the poorly studied groups of animals with limited information on most aspects of their biology, ecology and health care. Sensitizing academicians, scientists and students to the conservation concerns and gaps in knowledge of these species can be a driving force in motivating them to undertake studies to bridge the critical gaps in knowledge. The filling of the gaps is crucial for effective conservation of these species and can aid their effective rescue and rehabilitation. They can also play an important role in monitoring and documenting biodiversity in their areas besides playing a crucial role in shaping public opinion and create an environment that is supportive of the conservation of aquatic biodiversity of Ganga Basin for sustained availability of ecosystem services.

Eligibility: Academicians and scientists should be a part of the strength the regular cadre of organizations and universities while the students should preferably be of the post-graduate level or above.

4.6.1 SKILLS/ KNOWLEDGE REQUIREMENTS AND SYLLABUS

The roles and responsibilities of policy makers and the knowledge required by them in fulfilling them are summarized in table 13. A detailed syllabus for enhancing their skills is placed in the following section.

Table 13: Skills and knowledge requirements

	Roles and responsibilities		
	Identifying and bridging gaps in knowledge for the conservation of aquatic macro-fauna and management of rescue and rehabilitation	**Monitoring of aquatic ecosystems and their biodiversity**	**Shaping public opinion for supporting conservation goals and rescue and rehabilitation of aquatic wildlife**
Skills/ knowledge requirements	1. Knowledge of the biodiversity of Ganga Basin 2. Knowledge of threats faced by conservation dependent species of Ganga basin 3. Knowledge of actions for sustainable conservation of aquatic macro-fauna of Ganga Basin	1. Knowledge of the abiotic and biotic components of aquatic ecosystems 2. Knowledge of relationships between the abiotic and biotic components 3. Knowledge of flagship and umbrella species that can be used as biological indicators of ecosystem health	1. Knowledge of actions for effective rescue and rehabilitation of aquatic macro-fauna of Ganga Basin 2. Knowledge of roles and responsibilities of different stakeholders in rescue and rehabilitation of aquatic macro-fauna 3. Skills in communication for conservation education

The capacity development program for academicians, scientists and students would be in the form of a sensitization program for creating an awareness of the ecosystem services that the Ganga Basin in particular and freshwater habitats provide in general and the role of biodiversity in maintaining their sustained availability. It would also focus on enabling them to understand the various facets of ecology, natural history, behaviour, nutrition and health care of these poorly studied species.

Syllabus

Module I: Overview of Ganga Basin and its biodiversity

1. The mythological and cultural significance of River Ganga
2. Freshwater aquatic ecosystems and services provided
3. Ecology and geomorphology of Ganga Basin
4. Introduction to macro-faunal biodiversity of Ganga Basin and its conservation needs
   a. Amphibians of Ganga basin
   b. Reptiles of Ganga basin (Chelonians, Varanids and Crocodilians)
   c. Birds of Ganga basin (Waders and Divers)
   d. Mammals of Ganga basin (Otters and Dolphins)
5. Threats to biodiversity of Ganga basin
   a. Poaching and illegal trade
   b. Effect of development of linear infrastructure
   c. Effect of sand mining and riparian agriculture
   d. Effect of pollution and climate change

Module II: Field identification, ecology and natural history of aquatic macro-fauna inhabiting Ganga Basin

1. Reptiles of Ganga basin (Chelonians, Varanids and Crocodilians)
2. Birds of Ganga basin (Waders and Divers)
3. Mammals of Ganga basin (Otters and Dolphins)

Module III: Conservation assessments and actions for conservation

1. Conservation assessment of aquatic macro-fauna of Ganga Basin
   a. Assessment of species based on Wildlife (protection) Act 1972
   b. The use of IUCN Red-listing process for assessing conservation status
2. The use of flagship and umbrella species for assessment and planning of conservation
3. Use of biological indicators for conservation assessment
4. The protected area framework for conservation of species
5. Conservation of species outside the protected area network through community participation

Module IV: Ecology and geomorphology of Ganga Basin

1. Geomorphology water regime of the Ganga basin
2. Biogeography of Ganga basin
3. Trophic structure and nutrient cycling in Ganga basin
4. The role of biodiversity in maintaining trophic structure and nutrient cycling
5. Critical water-flows and effects on biodiversity
6. Anthropogenic modifiers and their effects on biodiversity
   a. Water-extraction
   b. Riparian area agriculture
   c. Resource extraction (biotic and abiotic)
   d. Pollutants and their toxicological effects

Module V: Rescue and rehabilitation of aquatic macro-fauna

1. Rescue and rehabilitation of aquatic wildlife as a conservation strategy
2. Knowledge requirements for effective rescue and rehabilitation
3. Actions for effective rescue and rehabilitation
   a. Capture and restraint
   b. Crating and transportation
   c. *Ex-situ* management
   d. Role of veterinary interventions
   e. Release and post-release monitoring of rescued aquatic animals
   f. Welfare of rescued animals

Module VI: Conservation education

1. Participatory approach in biodiversity conservation
2. Roles and responsibilities of stakeholders in rescue and rehabilitation
3. Communication strategies for mobilizing community support for conservation

4.7 STAKEHOLDER GROUP: MEDIA PERSONS

The society today lives in an information age where events in any part of the globe are rapidly disseminated to a global audience. Media persons often sensationalize and misrepresent facts, especially on news related to wild animals. This sensationalism is counterproductive and fosters misconceptions and myths about wild animals in their audience. An urgent need exists towards sensitizing media persons about the ecosystems services that freshwater habitats provide to the human population and the role of biodiversity in sustainable maintenance of these services. They also need to be sensitized about reporting factually on various events and actions by the various government agencies related to wild animals particularly their rescue and rehabilitation. Appropriate sensitization may lead to their active support in conservation initiatives that could be magnified several times over through their receptive audience. The roles and responsibilities of media persons and the skills and knowledge required by them in fulfilling these roles are summarized in table 14 while the following section details the syllabus to be adopted for their capacity enhancement.

	Roles and responsibilities		
Skills/ knowledge requirements	**Create an empathy in the public for rescue and rehabilitation**	**Factual reporting of rescue/ confiscations**	**Creating an environment supportive of aquatic biodiversity conservation**
	1. Awareness of the role of aquatic ecosystems in human welfare and threats to aquatic biodiversity 2. Awareness of the role of rescue and rehabilitation in conservation of aquatic biodiversity	1. Knowledge of scientific best practices in rescue and rehabilitation of aquatic animals 2. Awareness of legal issues including different schedules of the Wildlife (protection) Act and its application in rescue/ confiscations	1. Knowledge of the policy framework for conservation of aquatic biodiversity 2. Role of habitats outside the protected area network in conservation of aquatic biodiversity 3. Awareness of the influence of media in framing public opinion and in policy making 4. Networking with stakeholders for influencing policy making

Table 14: Skills/ knowledge requirements of media persons in supporting rescue and rehabilitation

Eligibility: Participants in the capacity building effort should be accredited by the relevant professional body and be involved in covering wildlife issues

Syllabus

The capacity development program for media persons would be in the nature of a sensitization program aimed at making them aware of the various threats to biodiversity and the proactive role they can play in its conservation.

Module I: Overview of ecosystem services provided by Ganga Basin and the role of biodiversity

1. The mythological and cultural significance of River Ganga
2. An overview of freshwater aquatic ecosystems and services provided
3. The role of biodiversity in sustainable management of ecosystem services
4. An overview of conservation dependent aquatic macro-faunal biodiversity of Ganga Basin
5. Threats to aquatic macro-fauna
   a. Poaching and illegal trade
   b. Effect of development of linear infrastructure
   c. Effect of sand mining and riparian agriculture
   d. Effect of pollution and climate change

Module II: Best practices in rescue and rehabilitation of aquatic macro-fauna

1. Rescue and rehabilitation as a conservation adjunct
2. Overview of rescue and rehabilitation of aquatic macro-fauna
3. Legal aspects of rescue and rehabilitation of aquatic macro-fauna
4. Stakeholders in rescue and rehabilitation of aquatic macro-fauna

Module III: Creating an environment supportive of aquatic biodiversity conservation

1. The policy framework and its implementation for rescue and rehabilitation of aquatic macro-fauna
2. Role of line agencies in conservation of aquatic macro-fauna outside the protected area network
3. Role of media in shaping public opinion and influencing policy

5. DELIVERY METHODS FOR CAPACITY BUILDING

"Learning is more than the acquisition of the ability to think; it is the acquisition of many specialized abilities for thinking about a variety of things."

Lev Vygotsky

Efforts directed in capacity building of the multiple stakeholders need to be aligned to integrate their learning outcomes for a synergistic collaboration to achieve effective rescue and rehabilitation. Developing a structured instructional design approach that meets these goals in an immersive learning environment that is often open-ended, and promotes exploratory and experiential learning is a challenging task. It would involve guiding, directing and showing the right path to the stakeholders in their pursuit of knowledge and in working in a synergistic manner for the rescue and rehabilitation of aquatic macro-fauna. The instructional process that is proposed to be adopted for developing the capacities of the multiple stakeholders across the three learning stages is represented in fig. 7. The first three components *viz.* roles and responsibilities of stakeholders, learning goals and instruction methods have been formalized based on experiences acquired as part of the capacity building efforts undertaken under WII-NMCG Phase I Project. The development of teaching aids and knowledge products that address specific stakeholder groups at different learning stages, evaluation of instruction methods and knowledge acquired is an ongoing process that is used to enhance the learning experience of the different stakeholders.

Fig. 7: Development of the instructional process

Instructional methods

It is proposed to use both synchronous and asynchronous methods in the capacity enhancement process for different stakeholders. The synchronous methods would target knowledge development in critical basic principles of rescue and rehabilitation across different stakeholder groups using classroom teaching wherever possible and online mode (webinars) in situations where logistic reasons limit conduct of such programs. The skills in specialised roles and responsibilities (such as captive husbandry and healthcare) can be carried out in asynchronous mode using online hosting of knowledge products or delivery of printed documents that can be used by the learners for enhancing their capacities. These capacity development efforts can be reinforced by attachment of stakeholders for specific periods of time at identified rescue and rehabilitation facilities. These would primarily target frontline officials from forest

departments, zoos and animal husbandry departments to develop their skills for taking over day-to-day activities of the rescue and rehabilitation facilities developed under the project. Synchronous teaching methods would include lectures, demonstrations, group discussions and case studies, whereas asynchronous methods would include independent study and project-work.

Instructional methods

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The instructional methods suggested to be used for delivery of inputs and the duration of each module for different stakeholders at each level is presented as Annexure I.

6. ASSESSMENT OF LEARNING OUTCOMES

The assessment of learning outcomes of the knowledge provided to the learners is integral to any capacity building effort as it provides an insight into the proficiency acquired by the learners in desired skills and behaviours and the efficiency of the capacity building program in delivering the desired learning outcomes. The assessment of the learning outcomes is of all the greater relevance in this capacity building program as the goal here is to develop a networked cadre of community representatives, forest officials and field veterinarians in delivering services that enable the effective rescue, rehabilitation and release of aquatic macro-fauna of Ganga Basin. The assessment methods suggested at the end of each learning stage are:

At Beginner level: The suggested assessment methodology includes the use of multiple choice questions to gain an insight into the retention of the theoretical inputs received by the participants. Inputs on the bio-diversity of the Ganga Basin and species of conservation significance can be assessed by asking learners to identify photographs of different species displayed and preparing a checklist of species found in their areas. An additional way of assessment that can be used is the observation of participation by individual learners in group discussions.

At advanced learner level: The assessment methodology suggested for this level is the use of tests based on multiple choice questions for the theoretical inputs. The part of the curriculum where inputs are in the form of practical demonstrations for fixing of knowledge can be evaluated through informal viva-voce and participation in group discussions. The knowledge of species identification can be evaluated through spotting tests of specimens or their photographs or models, the participants can also be asked to prepare a checklist of macro-fauna of Ganga Basin. Knowledge transfer processes that are through supervised study can be evaluated based on assignments.

At trainer level: The participants in this level can be evaluated through development of plans of action for identified species/ situations that necessitate rescue, rehabilitation and release of aquatic macro-fauna. Additional ways of assessment include reports of short projects that are assigned to participants based on the stakeholder group they belong to, site assessment reports for identification of potential release sites and participation in group discussions and other exercises aimed at assessing their preparedness in addressing tasks that they need to undertake based on their assigned roles and responsibilities. The assessment of field veterinarians can be based on case studies that are based on interventions they may need to undertake for managing distressed/ displaced aquatic macro-fauna.

The assessments undertaken would form the basis for evaluating the preparedness of the participants of these capacity building programs in addressing emergent situations of aquatic macro-fauna. They would also form the basis for any corrections that need to be undertaken in the curriculum or the strategies used for the delivery of inputs.

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Annexure I

Instructional strategy and duration of capacity building programs for the various stakeholders

Stakeholder group	Level	Module	Instructional Strategy	Duration (1 session: 3 hours' duration)
Local communities and voluntary organization representatives	**Beginner**	I: Overview of Ganga Basin and its biodiversity	Lecture	1 session
		II: Field identification, ecology and natural history of aquatic macro-fauna inhabiting Ganga Basin	Lecture and demonstration	1 session
		III: Rescue and rehabilitation as a conservation strategy	Lecture and discussion	0.5 session
		IV: Legal aspects of rescue and rehabilitation	Lecture and discussion	0.5 session
		V: Assessment and communication of rescue situations	Lecture and demonstration	0.5 session
		VI: Ensuring Safety of animal(s) and local people during capture and transport	Lecture and demonstration	0.5 session
	Total duration of the capacity building program			**2 days**
	Advanced learner	I: Create an awareness on the zoonotic potential of aquatic macro-fauna	Lecture and demonstration	0.5 session
		II: Create awareness in support of rescue and rehabilitation	Lecture and demonstration	0.5 session
		III: Release site identification	Lecture, demonstration and field visit	0.5 session
		IV: Post-release monitoring	Lecture, demonstration and field visit	0.5 session
				1 day field visit for modules III and IV
	Total duration of capacity building program			**2 days**
	Trainer	I: Monitoring biodiversity and threats in Ganga Basin	Lecture, demonstration and field visit	1 session
		II: Rescue of aquatic macro-fauna	Lecture, demonstration and field visit	0.5 session
		III: Nest protection, relocation and egg rescue	Lecture, demonstration and field visit	0.5 session
				1 day field visit for modules I, II and III
	Total duration of the capacity building program			**2 days**
Forest and zoo officials and rescue teams	**Beginner**	I: Overview of Ganga Basin and its biodiversity	Lecture	1 session
		II: Field identification, ecology and natural history of aquatic macro-fauna inhabiting Ganga Basin	Lecture and demonstration	1 session
		III: Rescue and rehabilitation as a conservation strategy	Lecture and demonstration	1 session
		IV: Mobilize rescue teams	Lecture and demonstration	1 session
		V: Assessment of rescue situations and conduct of rescue operations	Lecture, demonstration and field visit	0.5 session
		VI: Liaison with other agencies and stakeholders	Lecture, demonstration and field visit	0.5 session
		1/2 day field visit for modules V and VI		
	Total duration of the capacity building program			**3 days**

	Advanced learner	I: Monitoring and reporting threats to bio-diversity	Lecture, demonstration and field visit	1 session
		II: Planning and implementing effective rescue and rehabilitation	Lecture, demonstration and case studies	1 session
		III: Release site identification and post-release monitoring	Lecture, demonstration and field visit	1 session
		1 ½ days field visit for modules I and III		
	Total duration of the capacity building program			**3 days**
	Trainer	I: Assessment of threats to neonates and nests and mitigation *in-situ*	Lecture, demonstration and field visit	1 session
		II: *Ex-situ* management of rescued neonates and eggs	Lecture, demonstration and field visit to a rescue centre with hatchery for rescued eggs	1 session
		III: *Ex-situ* management of rescued aquatic macro-fauna	Lecture, demonstration and field visit to a rescue centre with hatchery for rescued eggs	1 session
		1 ½ days field visit for modules I – III		
	Total duration of the capacity building program			**3 days**
Veterinary professionals of the state animal husbandry department and zoos	**Beginner**	I: Overview of Ganga Basin and its biodiversity	Lecture	1 session
		II: Field identification, ecology and natural history of aquatic macro-fauna inhabiting Ganga Basin	Lecture and demonstration	1 session
		III: Assessment of the needs of the rescued animal	Lecture demonstration and field visit	1 session
		IV: Ensuring welfare of the rescued animal	Lecture demonstration and field visit	1 session
		V: Deciding the fate of the animal	Lecture demonstration and field visit	1 session
		1 ½ days field visit for modules III – V		
	Total duration of the capacity building program			**4 days**
	Advanced learner	I: Health assessment of rescued animal(s)	Lecture and demonstration	3 sessions
		II: Hazards and their management in rescue and rehabilitation	Lecture and demonstration	2 sessions
		III: Health-management in captivity	Lecture and demonstration	5 sessions
		1 day field visit for modules I – III		
	Total duration of the capacity building program			**5 days**
	Trainer	I: Nutrition of rescued animals in captivity	Lecture, demonstration and field visit	3 sessions
		II: Assessing fitness and welfare of animals	Lecture, demonstration and field visit	3 sessions
		III: Management of rescued neonates and eggs	Lecture, demonstration and field visit	4 sessions
		2 days field visit for modules I - III		
	Total duration of the capacity building program			**7 days**
Enforcement agencies (state and central police departments), line	--	I: Overview of ecosystem services provided by Ganga Basin and the role of biodiversity for promoting its conservation	Lecture and demonstration	1 session
		II: Legal issues in confiscations and essential records to be maintained	Lecture and demonstration	1 session

agencies (state irrigation, public works and revenue departments)		III: Identification of species being rescued/ confiscated and address immediate needs	Lecture and demonstration	1 session
		IV: Assessment of rescue situations and communication of information	Lecture and demonstration	1 session
	Total duration of the capacity building program			**2 days**
Policy makers	--	I: Overview of the Ganga Basin	Lecture	0.5 session
		II: Overview of ecosystem services provided by Ganga Basin and the role of biodiversity	Lecture and demonstration	0.5 session
		III: Facilitate development of appropriate infrastructure and skills	Lecture, demonstration and field visit	0.5 session
		IV: Guiding action of field personnel	Lecture and demonstration	0.5 session
	Total duration of the capacity building program			**1 day**
Academicians, scientists and students	--	I: Overview of Ganga Basin and its biodiversity	Lecture and demonstration	3 sessions
		II: Field identification, ecology and natural history of aquatic macro-fauna inhabiting Ganga Basin	Lecture and demonstration	2 sessions
		III: Conservation assessments and actions for conservation	Lecture and case studies	2 sessions
		IV: Ecology and geomorphology of Ganga Basin	Lecture, case studies and field visit	3 sessions
		V: Rescue and rehabilitation of aquatic macro-fauna	Lecture, demonstration, case studies and field visit	1 session
		VI: Conservation education	Lecture and case studies	1 session
		1 day field visit for modules IV and V		
	Total duration of the capacity building program			**7 days**
Media persons	--	I: Overview of ecosystem services provided by Ganga Basin and the role of biodiversity	Lecture and demonstration	1 session
		II: Best practices in rescue and rehabilitation of aquatic macro-fauna	Lecture and demonstration	0.5 session
		III: Creating an environment supportive of aquatic biodiversity conservation	Lecture and demonstration	0.5 session
		1 day field visit for modules I – III		
	Total duration of the capacity building program			**2 days**