Project Proposal for Financial Assistance

on

Modernization of National Forest Insect Collection (NFIC) of Forest Research Institute, Dehradun, Uttarakhand

Submitted

to

CAMPA Scheme

Ministry of Environment, Forest and Climate Change
Government of India, New Delhi

by

Forest Research Institute
Indian Council of Forestry Research and Education
(An autonomous organization of Ministry of Environment, Forests and Climate Change, Govt. of India)
Dehradun, Uttarakhand

1. Project Summary

Title of the Project	**Modernization of National Forest Insect Collection (NFIC) of Forest Research Institute, Dehradun, Uttarakhand**
Participating Institution	Forest Research Institute (FRI), Dehradun
Project Leader	Dr. Renu Singh, Director, FRI, Dehradun
Project Tenure	1.5 years (from date of funding)
Project Highlights	1. Web hosting and regular updation of NFIC database in sync with ongoing scientific advancements. 2. Modernization of NFIC with movable insect specimen storage system supported with dedicated research, consultation and upkeep facilities. 3. Extension and publicity material of NFIC.
Project Budget	**Rs. 98.50 Lakh**

2. Preamble

National Forest Insect Collection (NFIC) at Forest Research Institute is the oldest unique collection that has pride of holding more than 3,00,000 pinned insect specimens with about 22000 authentically identified species (including 1800 types specimens) from mainly the Indian Sub-Continent. Collection created from the year 1858 and preserved and stored in 3140 drawers (18 x 18 x 2.5 in.) in 157 old wooden cabinets holding reference and type material, and about 1500 boxes (13 x 17 x 3 in.) with duplicate collection. There are about 5,000 slides also in the collection. In the NFIC order Coleoptera is fairly well represented with about 9,000 species, followed by Lepidoptera with 3649 species, Hymenoptera and Hemiptera each with about 1100 species from the Indian Sub-Continent. Other orders have fewer than 500 species. NFIC is housed in a hall of size about 8 m (W) and 25 m (L) on first floor of main building of FRI. This collection room also got damaged, its floor cracked at several places and sunken in the middle. With the passage of time the housing facility of NFIC has become old and is also facing lack of space for adding cabinets for new specimens. The collection was made with the efforts of thousands of scientific and technical staff of the Institute of more than 160 years with the oldest specimen of 1858of termite *Hospitalitermes monoceros* species from Shri Lanka and another specimen of butterfly *Delias descombesi* was collected in the year 1968. Many of the species preserved in the collection may not be available or extinct and many of the species are about impossible to collect in this minimum availability of taxonomic expertise in the country. The collection may current worth of more than thousands crore rupees. Hence, this worthy collection needs to be modernized with sophisticated, space efficient and safe facility well equipped with updated equipments for long lasting future referencing.

Therefore, this proposal is put forward for renovation of NFIC facility with modern storage, study, easy physical and web accessibility facility.

3. Executive summary

NFIC is the oldest unique collection that has pride of holding more than 3,00,000 pinned specimens with about 18,000 authentically identified species (including 1800 types specimens). There are about 5,000 slides also in the collection. In the NFIC order Coleoptera is fairly well represented with about 9,000 species, followed by Lepidoptera with 3649 species, Hymenoptera and Hemiptera each with about 1100 species from the Indian Sub-Continent. Other orders have fewer than 500 species. NFIC is housed in a hall of size about 8 m (W) and 25 m (L) on first floor of main building of FRI. In the earthquakes of 1991 and 1999, building received damage and has become weak at several places. With the passage of time the housing facility of NFIC has become old and is facing lack of space. Besides, NFIC has been recently digitized in the form of a database created in 2021 on PHP7 software. The Database is now operational only offline and now needs regularly updated and hosted on the internet in public domain. Hence, now NFIC need to be renewed with modern storage and accessibility facility for increasing its longevity, reducing its maintenance, easy accessibility and hosting of its database on internet will provide worldwide accessibility for the users referencing.

Therefore, this proposal is put forward for renovation of NFIC facility with modern storage, accessibility, study and research facility at FRI.

4. Title of the project:

Modernization of National Forest Insect Collection (NFIC) of Forest Research Institute, Dehradun, Uttarakhand

5. Introduction

National Forest Insect Collection (NFIC) is a unique and one of the biggest collections of forestry related insects of the Indian subcontinent. It is one of the three main depositories of national importance of India along with Zoological Survey of India & National Pusa Collection, IARI, New Delhi. Besides Bombay Natural History Society also has a large number of species of butterflies from India. The collection is a result of vast efforts and resources put together by entomologists of this country over more than one and half century. Many insects have also been obtained in exchange with other institutions in India and abroad. The collection is mainly of forest insects of injurious nature and is confined largely to the Indian subcontinent (India, Pakistan, Bangladesh, Sri Lanka, Nepal, Myanmar and to lesser extent Malaya). The collection has been identified, wherever possible, by members of the Entomology Division; otherwise by specialists in various parts of the world.

This unique collection has pride of holding more than 3,00,000 pinned specimens with about 22,000 authentically identified species including 1850 type specimens. The Collection is stored in 3140 drawers (18 x 18 x 2.5 in.) in 157 cabinets holding reference and type material, and about 1500 boxes (13 x 17 x 3 in.) with duplicate collection. Wet collection, termites and immature stages of insects, occupies space of 75 shelves (3.5 x 1.5

ft.) and has about 2000 jars. There are about 5,000 slides also in the collection. NFIC is one of the best-maintained collections of our country. Many insect taxonomists of India and abroad come to study these insect specimens every years. While, the existing storage facility is older, damaged from many ways, need more afforests and resources for their maintenance. The facility is also not much user friendly and up to date for easy access worldwide.

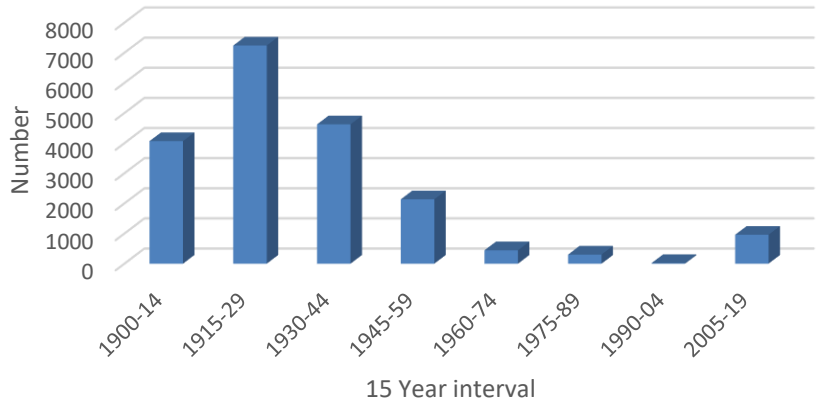

Fig. 1: Periodic buildup of NFIC insect collection at FRI, Dehradun

TABLE 1: SOME 100 TO 150 YEARS OLD SPECIMENS PRESERVED IN NATIONAL FOREST INSECT COLLECTION (NFIC) AT FOREST RESEARCH INSTITUTE, DEHRADUN, INDIA.

Year of coll.	Species	Order: Family	Country: State, locality	Collector's name
1858	*Hospitalitermes monoceros*	Isoptera: Termitidae	SRI LANKA: Candy,1700 ft.	Nictner
1859	*Trinervitermes rubidus*	Isoptera: Termitidae	SRI LANKA: Colombo	
1868	*Delias descombesi*	Lepidoptera: Pieridae	INDIA: SK	TC Jordon
1868	*Philosamia cynthia*	Lepidoptera: Saturniidae	INDIA: SK	TC Jordon
1868	*Psilogramma menephron*	Lepidoptera: Sphingidae	INDIA: SK	TC Jordon
1884	*Cicindela fastidiosa*	Coleoptera: Cicindelidae	INDIA: UK,Doon, Lachiwala	
1886	*Precis orithya surinhoei*	Lepidoptera: Nymphalidae	INDIA: UK, Mussoorie	Mackinnon
1888	*Danais tytia sita*	Lepidoptera: Nymphalidae	INDIA: UK, Mussoori	Mackinnon
1889	*Euploea mulciber mulciber*	Lepidoptera: Nymphalidae	INDIA: AS, Khasi Hills	Mackinnon
1890	*Pagiophloeus clathratus*	Coleoptera: Curculiionidae	INDIA: JH, Singhbhum	Stebbing

6. Novelty of the project

NFIC is a unique and one of the biggest collections of forestry related insects of the Indian sub-continent. It is one of the internationally recognized insect depository and one of the three main depositories of national importance of India. The collection is a result of vast

efforts and resources put together by entomologists of this country over more than a century from 1858 (Table 1). Many insects have also been obtained in exchange with other institutions in India and abroad. The collection is mainly of forest insects of injurious nature and is confined largely to the Indian subcontinent (India, Pakistan, Bangladesh, Sri Lanka, Nepal, Myanmar and to lesser extent Malaya). The project aims in enrichment, enhancing the shelf life of old, unique, rare, threatened, economically and academically important preserved insect specimens of forests of the Indian Sub-Continent by modernization of the preservation/storage facility. The proposed system will be more user friendly, space efficient, durable, fire proof, modern safety features rich, easy accessible for the researchers with advanced tools and equipments (Fig 2.). The facility will be more effective in study of insect taxonomy, diversity in wake of climate change and human resource development. Additionally, the insect collection database facility will also be available worldwide on internet and easy outreach in public domain.

7. Objectives of the project

1. Web hosting and regular updation of NFIC database in sync with ongoing scientific advancements.
2. Modernization of NFIC with movable insect specimen storage system supported with dedicated research, consultation and upkeep facilities.
3. Publication of NFIC extension and publicity material

4. Current status –national and international

The NFIC was created in 1930's and was housed in wooden cabinets on the first floor at the time when the concept of insect preservation relied more on chemical preservation. However, with changing times modern storage facilities have evolved like are more environment friendly, less toxic using less lethal chemicals, proper lighting, easy to access and work with e.g. the modern British Natural History Museum insect collection which houses over 10 million Lepidoptera specimens.

5. Premise and justification for undertaking the project

India is a signatory of the Convention on Biological Diversity, and under the Convention is required to inventory and monitor its own biodiversity. This is an onerous task, given that only a small fraction of organisms within the boundaries of most countries have so far been discovered, identified, scientifically named and classified. Though, our country is bestowed with rich biodiversity, which is on a great decline due to population explosion. Insect diversity is the most varied and abundant of all the organisms on this planet and, therefore, plays an important role in forest ecology. Properly preserved and stored insect specimens can provide historic data of biological diversity and can be used to document changes in distribution and abundance of species over time. Insect collections are critical for educating the public about biodiversity and the ecological importance of insects and their relatives. Effective conservation and management of biodiversity depends in large part on our understanding of taxonomy. Well preserved and documented insect collections will help in prioritizing biodiversity conservation and management efforts. Specimens in NFIC, along with the data provided on the specimen labels constitute an

historic record of biological diversity with respect to climate change. The study of insects in collections also provides knowledge that can lead to a better understanding and higher tolerance in our changing environment. Collection of specimens can be preserved and studied for hundreds of years. NFIC at FRI is one of the international repositories of insect specimens in the world. Modernization of NFIC facility of FRI with modern storage and accessibility facility will increase its longevity, reducing its maintenance, easy accessibility to the researches. Hosting a digitized version of NFIC on the internet will help the researchers and foresters in getting up-to-date and speedy information on insect forest species of the Indian region. Enrichment of NFIC will further help in this direction. Therefore, this proposal is put forward for renovation of NFIC facility with modern storage, accessibility, study and research facility at FRI.

6. The proposed work plan (Project components)

Project Components: The project has following three components:

- Component- 1:
  Web hosting and regular updation of NFIC database in sync with ongoing scientific advancements.
- Component-2:
  Modernization of NFIC with movable insect specimen storage system supported with dedicated research, consultation and upkeep facilities.
- Component-3:
  Publication of NFIC extension and publicity material (Booklet, Pamphlet, brochure, posters and webpage, etc)

7. Expected Outcome:

1) Universal accessibility of NFIC database on the internet with high resolution images and updated information for users.
2) Upgradation of a century old existing National Forest Insect Collection (NFIC) into a state of art, modern and sophisticated facility for effective storage, preservation and referencing.
3) A doorway to international collaboration with researchers and exchange of specimen/ information for advancement and enrichment of forest entomology collections.

8. Project Team:

Investigators	**Name**	**Assigned component/objective**
Coordinator	Dr. Arun Pratap Singh Scientist-G,	Coordination and Research
Principal Investigator	Dr. Arvind Kumar Scientist-F	Project management & Research
Co-Principal Investigator	Sh. R.S. Topwal Scientist-F	Civil renovation & Research
Co-Principal Investigator	Dr. G.S.Uma Scientist-B	Project management & Research

Co- Principal Investigator	Dr. V.P. Pandey, CTO	Project management & Research

9. Deliverables (Year wise)

First Year

1. Web hosting and updation of NFIC database in sync with ongoing scientific advancements.
2. Renovation and modernization of NFIC insect storage system, specimen examination and research infrastructure with modern equipment and facilities.
3. Purchase of scientific, office equipments for insect study and photography facility.

Second Year

1. Purchase of scientific, office equipments for insect study and photography facility.
2. Fumigation and maintenance of insect specimens of NFIC.
3. Publication of publicity and scientific material of NFIC (Booklet, Pamphlet, brochure, posters and web page, etc)

15. Major Deliverables

i. Universal accessibility of NFIC database on the internet with high resolution images and updated information.
ii. State of art, modern and sophisticated forest insect collection storage and referencing facility.
iii. A doorway to international collaboration with researchers and exchange of information for advancement of forest entomology will be ushered.

16. Milestones to be monitored (give six monthly)

SL.	**Details of activities**			
		1st six month	2nd six month	3rd six month
1	Web hosting of NIFC Database			
2	Updation of NFIC database			
3	Civil repair of NFIC infrastructure and installation of temp and humidity system			
4	Purchase and installation of movable metallic insect cabinets and furnishing the NFIC with new infrastructure			
5	Purchase of scientific and office equipment / instruments			
6	Shifting of insect specimens to the new storage facility			
7	Publication of publicity and scientific material of NFIC (Booklet, Pamphlet, brochure, posters and web page, etc)			

15. Role of industry partners or stakeholder: Not included

16. IPR (briefly describe the possibility of developing new IPR from this project): NA

17. Leadership perspective- briefly describe the global position in the technology and resultant leadership position and economic benefits to the country:

World's biggest insect collection housed at Natural History Museum, London UK with about 35 million specimens representing world's 4.5 lakh insect species diversity. Similarly, NFIC is also one of the biggest collection of forest related insect with about 3.0 lakh specimens and also an internationally recognized depository and reference collection of the insect. The renovation of this facility will emerge as a one of the global facility for research and academics in the field of Forest Entomology.

18.Total Budget Requirement : Rs. 98.50 Lakh

Detailed list of work items with budget required

Sl. No.	Item	Quantity/ Area (m^2)	details	Estimated cost (Lakh)
A	**Civil repair work**			
1	White wash, Painting and other finishing work	~1000m^2	H10m X L 25m X W8m (02 No.)	4.0
2	Flooring with tiles	416m^2	L 26m X W 8m (02 No.)	7.5
3	Fall ceiling	416 m^2	L 26m X W 8m (02 NO.)	4.5
4	Electrical rewiring and other appliance	~1000m^2	For rooms (02 no.)	4.0
5	Air condition facility	~1000m^2	to maintain temperature and RH of collection room	5.0
6	Wooden work	100m^2	Repair and preparation of working tables/ specimen display table/ wall cupboards etc.	2.6
	A- Total			**27.6**
B	**Modern movable insect storage facility and other supporting accessories**			
1	Movable insect storage cabinet system	40 No.	Metallic insect storage cabinets (double walled), and showcase cabinets.	40.0
2	Computer table and chairs	04 No.	@ Rs 0.2 lakh each	0.8
3	Laboratory revolving chairs	06 no.	@ Rs 0.10 lakh each	0.6
	Total			**41.4**
C	**Scientific equipment and instruments**			
1	Computer work station	1 no.	for NFIC database updation	2. 7

			and backup and printer (01)	
2	Stereozoom microscope with photography and image analysis software	01 No	For Specimen photography and image measurements analysis	11.0
	C-Total			**13.7**
D	**Web hosting of database, Printing and publications**		• Web hosting and updation of database • Printing of naming/ display items • Printing and publication of brochure/booklet on NFIC, web page etc.	3.0
E	**Contingency and consumables**		• Chemicals for fumigation cleaning and other consumables • Skilled and semiskilled contractual workers for insect cabinets specimen maintenance and web /data updation. • Manpower for fumigation of insect collection boxes (4200 boxes) • Other miscellaneous items	12.8
	Grand Total			
	A- Civil repair and renovation work			**27.6**
	B- Modern movable insect storage facility and furnishing			**41.4**
	C- Scientific equipment and instruments			**13.7**
	D- Web hosting, Printing and publications			**3.0**
	E- Contingency and consumables			**12.8**
	Grand Total=A+B+C+D+E			**98.5**

18. a: Year wise budget requirement

Sl. No	Item	Ist Year (1^{st} & 2^{nd} six month)	IInd Year (3^{rd} six month)	Total
A	**Civil repair work**	**27.6**	**0.0**	**27.6**
B	**Modern movable insect storage facility and furnishing**	**41.4**	**0.0**	**41.4**
C	**Scientific equipment and instruments**	**13.7**	**0.0**	**13.7**
D	**Web hosting, Printing and publications**	**2.0**	**1.0**	**3.0**
E	**Contingency and consumables**	**6.4**	**6.4**	**12.8**
	Total	**91.1**	**7.4**	**98.5**

Fig. 2: Proposed movable insect storage infrastructure layout of NFIC, FRI

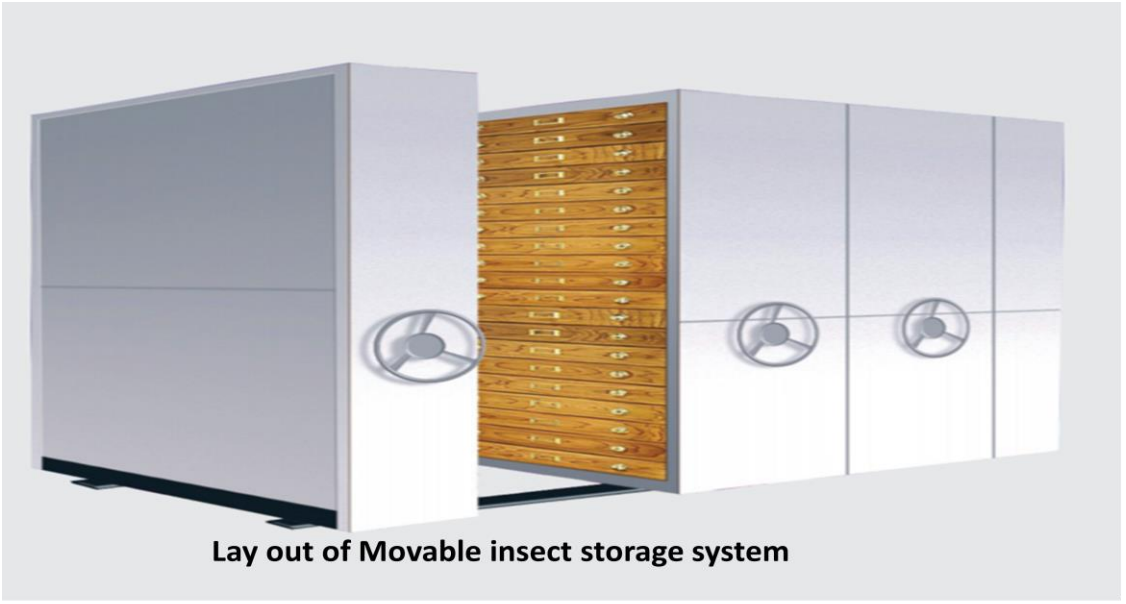

Fig. 2a: Proposed research and analysis infrastructure of NFIC, FRI

Fig. 3: Existing NFIC insect storage system