



काष्ठ विज्ञान एवं प्रौद्योगिकी संस्थान

भारतीय वानिकी अनुसंधान एवं शिक्षा परिषद्
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार की एक स्वायत्त निकाय
पी.ओ. मल्लेश्वरम बेंगलुरु - 560 003.



INSTITUTE OF WOOD SCIENCE AND TECHNOLOGY

Indian Council of Forestry Research and Education
An Autonomous Body of Ministry of Environment, Forest and Climate Change, Govt. of India
P.O. Malleswaram, Bengaluru - 560 003.

No. 9-65/16-17/WPEW/IWST/mangrove-project/1931

05.10.2018

To,

The Executive Director,
Mangrove and Marine Biodiversity Conservation Foundation,
O/o The Chief Conservator of Forests,
Mangrove Cell,
2nd floor, 'A' Wing, S.R.A. Building.,
Ananth Kanekar Marg, Bandra (East)
Mumbai -400051.

Sub: Progress report, request to release 3rd instalment and request for extension of the project "Wood anatomical studies of important mangrove species from Maharashtra sea coast for the identification".

Ref: Sanction Letter No. ADMIN/2016-2017/3555 dt. 20.03.2017
This office letter No. 9-65/16-17/WPEW/IWST/mangrove-project/ 215/2882

Sir,

Please find enclosed here with the Progress Report along with Fund Utilisation Certificate and Annexure for breakup of expenses of the above mentioned project for the period April-September 2018.


We would like to submit the following for your information and kind consideration:

1. The project was sanctioned for a period of two years from April 2017- March 2019 with approved project budget of Rs.24.35 Lakh.
2. The equipment "Polarising microscope with image analysis software" was proposed in this project for studying the anatomical characters. This equipment was procured and installed in the month of September 2018. Since our old image analysis system's software was giving problem, the process of data collection has slowed, which has adversely affected progress of the project to some extent. Now newly purchased equipment is being used for further studies.

3. A new study area Sindhudurg has been included in the study in addition to Thane and Mumbai as proposed initially. This will require some more time to complete the study.

In view of the above points, it is requested that the project duration may kindly be extended for nine more months (i.e., up to December 2019) without additional financial requirement. The budget requirement for the extended period can be met from existing allotted budget (Rs.24.35 lakh). We have so far received Rs. 18.93 lakhs. It is also requested that the remaining balance amount of **Rs.5.42 lakhs** may be released at the earliest, so that the project can progress smoothly.

Yours faithfully,


Director
4/10/2018

- Encl:** 1. U.C
2. Annexure of break-up of expenses
3. Progress report

Fund Utilization Certificate

(From 01.04.2017 to 03.10.2018)

To,

The Executive Director,
Mangrove and Marine Biodiversity Conservation Foundation,
Office of the Chief Conservator of forests,
Mangrove cell,
2nd floor, A Wing, S.R.A. Building.,
AnanthKanekar Marg, Bandra(East)
Mumbai -400051.


Sub: Submission of Fund utilization certificate for I instalment for the project: Wood anatomical studies of important mangrove species from Maharashtra sea coast for the identification.


Ref: Sanction Letter No.ADMIN/2016-2017/3555 dt. 20.03.2017.

Sir,

As per the terms of the sanction of the above project and release of I instalment, Please find herewith the "Fund Utilization Certificate" up to 03.10.2018 as under:

1. Funds received : Rs.18,93,000/-
2. Total expenditure incurred : Rs.18,10,569/-
3. Balance : Rs. 82,431/- (Includes balance amount of consultancy and Equipment)
4. Certified that the conditions on which the grant in aid was sanctioned and received in favour of Director, Institute of Wood Science and Technology, Bengaluru, a sum of Rs. 18,10,569/- (Rs. Eighteen Lakh ten thousand five hundred sixty nine only) has been utilized for the purpose for which it was sanctioned and that the balance of Rs. 82,431/- (Rs. Eighty two thousand four hundred thirty one only) remaining unutilized at the end of 03.10.2018 will be adjusted towards the grants –in –aid payable during the next instalment.
1. Certified that I have satisfied myself that the conditions on which grants-n-aid was sanctioned have been duly fulfilled and I have exercised the checks to see money was actually utilised for the purpose for which it was sanctioned.


Drawing and Disbursing officer
Institute of Wood Science and Technology
Bengaluru.


Director 1/c
4/10/2018
Institute of Wood Science and Technology
Bengaluru.

Statement showing the expenditure as on 03.10.2018

Heads	Amount approved (Rs.)	Amount released (Rs.)	Amount spent (Rs)	Balance amount (Rs)
M&S	1,00,000	50,000	39,658	10,342
Travel	2,00,000	1,00,000	1,13,696	-13,696
Contingency	2,45,000	1,10,000	81,065	28,935
Project Asst.	2,52,000	1,26,000	1,71,133	-45,133
Equipment	12,00,000	12,00,000	11,48,017	51,983
Consultancy	1,20,000	60,000	10,000	50,000
Sub total	21,17,000	16,46,000	15,63,586	82,414
Institutional charges (15%)	3,18,000	2,47,000	2,47,000	00
Total	24,35,000	18,93,000	18,10,569	82,431



एस. शाशिकला / S. SHASHIKALA
 वरिष्ठ तकनीकी अधिकारी / Senior Technical Officer

Project

Wood anatomical studies of important mangrove species from Maharashtra sea coast for the identification.

Project Investigator

S.Shashikala

Duration of the project

April 2017- March 2019

Report Period

April 2018-September 2018.

Project Title: Wood anatomical studies of important Mangrove species from Maharashtra Sea coast for the identification.

Project Investigator: S.Shashikala

Duration of the project: April 2017- March 2019

Report Period: April 2018-September 2018.

Summary of the project

Data on Physical properties and microstructure of 12 mangrove species from Maharashtra will be collected. The macro (gross) and microstructure of wood material of a timber species is being used as fingerprint for its accurate and reliable identification. The collected data will be useful in identifying the mangrove species where illegal felling has taken place in Mangrove encroached areas of Maharashtra and will help in recovering the encroached areas.

Objectives

1. To study microstructure and important physical properties of important mangrove species selected from two locations
2. To create database of anatomical properties of mangrove species from Maharashtra seacoast for their identification.

Materials and methods:

The following Mangrove species were collected for the study of anatomical and physical properties. Two feet billet from three tree of each species from stem wood were collected for the study.

Sl.No.	Species collected	Location	Replicates
1	<i>Bruguiera gymnorhiza</i> (Rhizophoraceae)	Achra, Sindhudurg	1
2.	<i>Heritiera littoralis</i> (Sterculiaceae)	Khavne, Sindhudurg	2
3	<i>Sonneratia caseoralis</i> (Sonneratiaceae)	Khavne, Sindhudurg	1
4	<i>Lumnitzera racemosa</i>	Thakurwadi,	3

	(Combretaceae)		
5	<i>Rhizophora apiculata</i> (Rhizophoraceae)	Achra	2

Study area : Two tours were conducted to collect wood samples of different species of mangroves from Achra and Khavne of Sindhudurg (N 16 ° 13'768" E 073° 27'418") District of Maharashtra state. The collected samples are brought to the laboratory and prophylactic treatment of FAA is given to the samples to prevent them getting affected by fungus.

The wood samples have been converted to study/ determine the **moisture content, basic density and shrinkage.**

Anatomical properties

Data on anatomical properties were collected by two methods.

- (1). Macerated material and
- (2). Using the microslides.

Macerations: Slivers from radial plane of the specimen is taken in a test tube and cooked in water till all slivers are settled down/saturated. A pinch of potassium chlorate and 30% Nitric acid is added and cooked further till the slivers get bleached. The excess acid is removed by washing with water and the colourless macerated material is shaken till all the wood elements gets separated. This macerated material is put on slides and observed under the polarised microscope and quantification of fibre length, fibre diameter, vessel length, vessel diameter carried out the help of image analysis connected to microscope. Septa of fibre is observed under microscope. 40-50 individual fibres and vessels were measured for their length and width. Macerations of 5 species have been done. Data on fibre and vessel dimensions have been collected from 4 species from macerated material.

Permanent microslides have been prepared as per standard laboratory procedure for 3 species and for one more species is under progress. Data on vessel, fibre and ray, inter vessel pitting have also been collected from permanent microslides for anatomical characterisation. Ten to twenty five fields were randomly chosen from these microslides for collecting data on vessel frequency. Vessels viewed under a grid of 1mmX 1mm are considered for counting for their frequency. Tension wood studies was done using Azur stained sections.

The studies on physical and anatomical properties were initiated and continued with the samples which were collected earlier and the samples which were collected in the present six months duration.

Progress for III half year (April 2018-September 2018).

Objective 1: To study microstructure and important physical properties of important mangrove species selected from two locations.

Progress: Moisture content, basic density and volumetric shrinkage have been studied for the following species. Almost all physical properties of timber vary with moisture content and it is therefore necessary that the moisture content of timber and its basic density/specific gravity be determined at the time of tests.

Basic density is determined using the formulae: Mass of the oven-dry sample / volume of the saturated sample. 6-7 samples have been used from a tree specimen.

Shrinkage : Samples have been converted in to 6 x 2 x 2 cm dimension and saturated in water. The specimen is weighed initially correctly to 0.001 g and the volume is determined by immersion method correctly to 0.01cc. A suitable vessel, half filled with water kept on the pan of a weighing balance and weighed accurately to 0.001g. The specimen is then completely dipped in water using a needle and weighed again. The difference of the two readings is the volume of the specimen. The specimen is taken out of water, wiped with dry cloth and end coated with hot paraffin and allowed to air season under room conditions and weighed periodically until moisture content of about 12 percent is attained. The volume is determined once again for the air dried specimen. The specimen is kept in hot air oven at $103 \pm 2^{\circ}$ Until constant weight is attained. After oven drying, the specimen is again weighed and while still warm is immersed in hot paraffin wax bath, care being taken to remove it quickly to ensure only a thin coating. The volume of the specimen is determined by immersion as before.

Volumetric shrinkage (%) from initial condition to required dry condition is determined using the formulae

$$\frac{(V_1 - V_r)}{V_1} \times 100$$

Where V_1 = volume in cc at initial condition (usually green)

V_r = volume in cc at the required dry condition at r percent moisture content (usually 12 percent moisture content or oven dry condition).

Moisture content, density and Volumetric shrinkage have been determined for ten species.

The range of tentative results are given in Table 1:

Table 1: Physical properties of ten mangrove species

Sl.No.	Species	Moisture content (%)	Basic density kg/m ³	Volumetric shrinkage (%)
1	<i>Avicennia officinalis</i>	126 (122-129)	625 (619-638)	7.93 (6.71-11.17)
2	<i>Sonneratia alba</i>	175 (161-187)	479 (461-521)	5.82 (5.05-9.90)
3	<i>Ceriops tagal</i>	64 (62-69)	904 (880-925)	8.33 (7.6-8.6)
4	<i>Rhizophora apiculata</i>	47 (46-49)	966 (952-984)	8.73 (7.57-9.22)
5	<i>Bruguiera gymnorrhiza</i>	57 (55-58)	910 (896-935)	7.84 (7.06-8.63)
6	<i>Avicennia marina</i>	99 (92-106)	757 (726-792)	8.76 (7.6-9.58)
7	<i>Sonneratia apetala</i>	136 (123-146)	552 (524-597)	5.78 (5.47-6.43)
8	<i>Exoecaria agallocha</i>	174 (150-191)	432 (425-436)	4.79 (4.69-4.95)
9	<i>Rhizophora mucronata</i>	51 (48-56)	972 (931-1003)	8.81 (8.4-9.44)
10.	<i>Bruguiera cylindrica</i>	75 (69-80)	780 (757-799)	7.21 (6.89-7.62)

Objective 2: To create database of anatomical properties of mangrove species from Maharashtra seacoast for their identification

Progress: Data on fibre morphology (fibre length, fibre diameter and fibre wall thickness), vessel morphology (vessel element length, vessel diameter and vessel frequency) have been collected from macerated material in order to know their variations in individual trees of *Avicennia officinalis*, *Sonneratia alba*, *Ceriops tagal*. The tentative results obtained are shown in table 2.

Table 2: Fibre and Vessel morphology in three different mangrove species.

Sl. No	Species	Sample	Vessel element length (µm)	Vessel diameter (µm)	Vessel frequency (/mm ²)	Fibre length (µm)	Fibre diameter (µm)	Fibre wall thickness (µm)
1	<i>Avicennia officinalis</i>	1	227	74	29	969	19.39	10.92
		2	237	95	23	1114	20.73	9.54
		3	240	78	15	1006	19.01	9.91
2	<i>Sonneratia alba</i>	1	589	109	49	945	23.14	7.83
		2	639	121	39	1175	23.33	8.07
		3	511	100	49	1001	21.50	6.81

3	<i>Ceriops tagal</i>	1	464	52	57	1011	22.51	15.56
		2	508	58	62	1069	22.21	15.46
		3	546	66	40	1136	24.92	17.18

Qualitative data like presence/ absence of growth rings, vessel arrangement, ray seriation, ray composition and presence of crystals and their location and parenchyma distribution for *Excoecria agallocha* and *Ceriops tagal* was recorded using the polarised microscope. Phloem and xylem percent was recorded for *Avicennia marina* and *Avicennia officinalis*

The above anatomical properties studied will be used in describing the anatomy of the species and further will be utilised in codification of the data base as per IAWA (1989).

Progress for III half year ending September 2018

Sl. No	List of project activities	Deliverables (Performance indicators)	Progress up to September 2018
1	Purchase of chemicals and glass wares, M&S.	M&S required for the work will be procured.	Purchased chemicals and glass wares
2	Purchase of Equipment	Process for procurement of image analysis system will be completed in the next quarter.	Purchase of Nikon microscope model Ci-POL with accessories has been made and installed in September 2018.
3	Collection of samples	Collection of four more species of mangrove wood samples from Sindhudurg District depending on the access and availability of the species.	<i>Heritiera littoralis</i> (2 individuals), <i>Rhizophora apiculata</i> (2 individuals), <i>Sonneratia caseoralis</i> (1 individual) have been collected from various places/creeks in Sindhudurg district.
4	Preparation of samples	Preparation of wood samples for density, shrinkage. Macerations and preparation of micro slides for collecting anatomical properties will be completed for <i>Rhizophora apiculata</i> , <i>Brugueira gymnorhiza</i> and <i>A.officinalis</i> and the same will be initiated for newly collected samples.	Samples of size 2*2*6 mm were prepared for density and shrinkage tests of newly collected species. Density and Shrinkage have been determined for all the species collected so far. Macerations and permanent micro slides were prepared for 4 species.
5	Study of anatomical properties and density.	Vessel, fibre morphology will be studied for the samples from macerated material and Ray morphology, composition; vessel frequency will be studied with permanent microslides.	Data on vessel and fibre morphology have been collected for 3 more species from macerated material.*
6	Submission of third- six monthly report and subsequent work plan for next 6 months	The report for the half year ending September 2018 will be submitted, along with the plan of work and deliverables for the subsequent half year.	Submitted

*** Constraints:**

1. The anatomical data was collected through image analysis system connected to polarising microscope (Leica Laborlux 12 S Pol) which was available in the laboratory. Since the image analysis system's software was giving problem, process of data collection has slowed which has affected the progress of the project to some extent. The new image analysis system (Nikon microscope model Ci-POL with accessories) which was proposed in this project, is purchased and installed in the month of September 2018 and being used for further studies.

2. The collection and study of different mangrove species is taken up from **three** locations as against **two** locations mentioned in the present objectives which require more time period for the studies.

Hence an extension of the project up to December- 2019 (9 months) without any extra financial aid is sought for the successful completion of the project.

Plan of Work for October 2018 to December 2019 for the project titled “Wood anatomical studies of Important mangrove species from Maharashtra Sea Coast for the identification”.

PI: S.Shashikala, Senior Technical Officer, IWST.

Sl.No	List of project activities	Plan of work (October 2018-March 2019)	Plan of work (April 2019-December 2019)
1	Purchase of chemicals and glass wares, M&S.	M&S required for the work will be procured.	M&S required for the work will be procured.
2	Collection of samples	Collection of <i>Kandelia candel</i> / <i>xylocarpus granatum</i> and of any excluded tree samples of already collected mangrove species from Thane and Sindhudurg Districts.	Collection <i>Aegiceros corniculatum</i> from Thane District
3	Preparation of samples	Preparation of wood samples for density, shrinkage. Macerations of the samples. Preparation of micro slides for collecting anatomical properties will be completed for <i>Heritiera littoralis</i> , <i>Kandelia candel</i> / <i>xylocarpus granatum</i> , <i>Lumnitzera racemosa</i> .	Preparation of wood samples of <i>Aegiceros corniculatum</i> for density, shrinkage. Macerations of <i>Sonneratia caseoralis</i> and <i>Aegiceros corniculatum</i> samples.
4	Study of physical properties.	Moisture content, basic density and volumetric shrinkage will be studied for 4 more species.	Moisture content, basic density and volumetric shrinkage will be studied for <i>Aegiceros corniculatum</i>
5.	Analysis of soil and water	pH, salinity and other important physical parameters will be studied.	pH, salinity and other important physical parameters of soil and water will be studied from Thane area.
6	Study of anatomical properties	Fibre and vessel morphology will be studied for 4 species. and Ray morphology, composition; vessel frequency will be studied from permanent microslides for 4 species.	Fibre and vessel morphology will be studied for 3 species from macerated material. and Ray morphology, composition; vessel frequency will be studied from permanent microslides for remaining species. Photomicrography of the permanent slides

			Description of the species Codification as per IAWA 1989.
7.	Submission of fourth - six monthly report	The report for the half year ending March 2019 will be submitted	The report for the half year ending September 2019 and quarter ending December 2019 will be submitted. Preparation of Final Project completion report.