Threatened status assessment and ecorestoration of endemic tree species and ecosystems in the Western Ghats

MoU - Report of activities

Principal Investigator - Dr. K.H. Amitha Bachan

Rationale:
This a project supported by BMC, SN Puram, IUCN, MGNREGA & WGHF for the red list assessment of plant species and ecosystem based ecological restoration

CEtC, Western Ghats Hornbill Foundation & Research
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Contents

Introduction

Ecosystem level approach and habitat specific micro level understanding of composition is essential for effective ecorestoration practice. Bioclimatic prediction of potential habitat through niche modelling and niche profiling of the threatened species of different ecosystems proposed here to avoid invasion into other species niches while restoration.

This has been experimented successfully for few trees and shrub species. Here we propose for IUCN status assessment, niche modelling and niche profiling of plant species endemic to Western Ghats Sri Lanka Biodiversity hotspots. This can contribute to the research and planning aspect for the species and ecosystem recovery and restoration in plains.

Objectives

Þ Assessment of threatened status of the endemic tree species and ecosystems within the Western Ghats based on IUCN criteria.

Þ Ecorestoration planning, niche modelling of threatened species habitat and degraded ecosystems in the Western Ghats and adjoining landscape with public, private and local community participation.

Þ Develop strategic plans, pool funds, develop nurseries, bring out significant publications including that in the IUCN red list.

Methodology

We have been working in the field level data collection, conservation planning, conservation and ecorestoration involving local community and various local communities and various government agencies. The IUCN has assigned us with global assessment of 30 species of which ten have been submitted. The methodology involved collection of taxonomic records based on herbarium collection, taxonomic literature and other human observations. The information form IPNI and type herbarium shall be used for taxonomic identity. Data from GBIF, India Biodiversity portal and our own data base and other publications shall be used for geocoding of the distribution records.

Important local herbarium will be visited, GPS data shall be scrutinised and corrected during field visit and using QGIS software. The population data collected for each species through laying out 0.1 ha standard plots (MoEFCC, 2014; Bachan et al., 2019; Bachan and Devika, 2021). The distribution records shall be organised into csv format based on IUCN criteria version 3.1, the mapping will be done through geocat facility and assessment will be completed and submitted through SIS tool kit provided by IUCN.

Methodology

The scrutinised geolocations of the species shall be further organised and niche modelling will be done using Worldclim bioclimatic data base, QGIS and Maxent software in Mac environment. The modified methodology suitable to the Western Ghats region to further incorporate factors of Eltonian niche for better prediction accuracy for the Western Ghats region by Bachan et al., 2021; Bachan and Devika 2022). The phytosociological parameters collected from 0.1 ha plot data will be used for analysing composition, IVI as an indicator and segregating the index in to various growth forms in the forest composition (Mueller-Dombois & Ellenberge, 1974).

The species composition of actual habitat of the selected 12 species shall be profiled both two dimensional and three dimensional using the niche profiling methodology (Bachan and Devika, 2021). The ecorestoration plan will be prepared for 12 species based on the niche profile (Bachan, 2020) and shall be submitted to incorporate into the management plan of respective forest department as we did for Cryptocaraya anamalayana (Bachan and Devika 2021; Bachan et al., 2019).

IUCN Red List Assessments

A detailed taxonomic scrutiny and multiple criteria based red list assessment were carried out for the following are the submitted redlist assessments

SL. No.	Targeted species	IUCN assessment status	Previous status	Present status
1	*Orophea uniflora*	Assessment completed, submitted to IUCN, Published in red list https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T179207182A179207187.en.	NE	NT
2	*Goniothalamus cardiopetalus*	Assessment completed, submitted to IUCN, Published in red list https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T180787950A180787952.en.	NE	VU
3	*Orophea erythrocarpa*	Assessment completed, submitted to IUCN, Published in red list https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T179067254A179067264.en.	NE	VU
4	*Meiogyne pannosa*	Assessment completed, submitted to IUCN, Published in red list https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T179067254A179067264.en.	NE	NT
5	*Goniothalamus wynaadensis*	Assessment completed, submitted to IUCN, Published in red list https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T31158A179201448.en.	NE	NT
6	*Goniothalamus rhynchantherus*	Assessment completed, submitted to IUCN, Published in red list	NE	VU

IUCN Red List Assessments

		https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T32856A179204854.en.		
7	*Goniothalamus wightii*	Assessment completed, submitted to IUCN, Published in red list https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T179206765A179206767.en.	NE	EN
8	*Polyalthia malabarica*	Assessment completed, submitted to IUCN, Published in red list https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T31161A180812090.en.	NE	NT
9	*Diospyros crumenata*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/30864/2798277	EN	CR
10	*Cryptocarya anamalayana*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/38783/138508350	NE	EN
11	*Cryptocarya sheikelmudiyana*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/187622842/187623277	NE	CR
12	*Ficus beddomei*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/210013452/210023277	NE	EN

IUCN Red List Assessments

		https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T32856A179204854.en.		
7	*Goniothalamus wightii*	Assessment completed, submitted to IUCN, Published in red list https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T179206765A179206767.en.	NE	EN
8	*Polyalthia malabarica*	Assessment completed, submitted to IUCN, Published in red list https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T31161A180812090.en.	NE	NT
9	*Diospyros crumenata*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/30864/2798277	EN	CR
10	*Cryptocarya anamalayana*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/38783/138508350	NE	EN
11	*Cryptocarya sheikelmudiyana*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/187622842/187623277	NE	CR
12	*Ficus beddomei*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/210013452/210023277	NE	EN

IUCN Red List Assessments

13	***Syzygium occidentale***	Assessment completed, submitted to IUCN, Published in red list	VU	EN
14	***Ochna gamblei***	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/208974595/209009666	NE	EN
15	***Syzygium caryophyllatum***	Assessment completed, submitted to IUCN, Under publication	EN	NT
16	***Syzygium ramavarmae***	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/175221/1419729	NE	EN
17	***Ficus costata***	Assessment completed, submitted to IUCN, Published in red list. https://www.iucnredlist.org/species/210013545/210023282	NE	VU
18	***Ficus dalhousiae***	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/210013949/210023287	NE	VU
19	***Syzygium bourdillonii***	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/32866/149813923	EN	EN

IUCN Red List Assessments

20	*Syzygium calophyllifolium*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/210010463/210023247	NE	EN
21	*Prioria pinnata*	Assessment completed, submitted to IUCN, Published in Red List https://www.iucnredlist.org/species/33647/201031235	EN	VU
22	*Syzygium ponmudiyanum*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/222292291/222292498	NE	CR
23	*Madhuca balakrishnanii*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/225970375/225970391	NE	CR
24	*Syzygium periyarense*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/201031081/201031398	NE	CR
25	*Medinilla anamalaiana*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/239579056/239579839	NE	EN

IUCN Red List Assessments

20	*Syzygium calophyllifolium*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/210010463/210023247	NE	EN
21	*Prioria pinnata*	Assessment completed, submitted to IUCN, Published in Red List https://www.iucnredlist.org/species/33647/201031235	EN	VU
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24	*Syzygium periyarense*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/201031081/201031398	NE	CR
25	*Medinilla anamalaiana*	Assessment completed, submitted to IUCN, Published in red list https://www.iucnredlist.org/species/239579056/239579839	NE	EN

NICHE MODELLING AND ECORESTORATION PLAN PREPARATION

Ecoregion level niche specific habitat prediction of threatened *Syzygium caryophyllatum* (Myrtaceae)

Syzygium caryophyllatum (L.) Alston is a medium-sized threatened tree that mainly occupies the low-elevation evergreen patches of the Western Ghats (India) - Sri Lanka biodiversity hotspot. The present study predicts the potential habitats of Syzygium caryophyllatum at the ecoregion level for prioritising its conservation and restoration area.

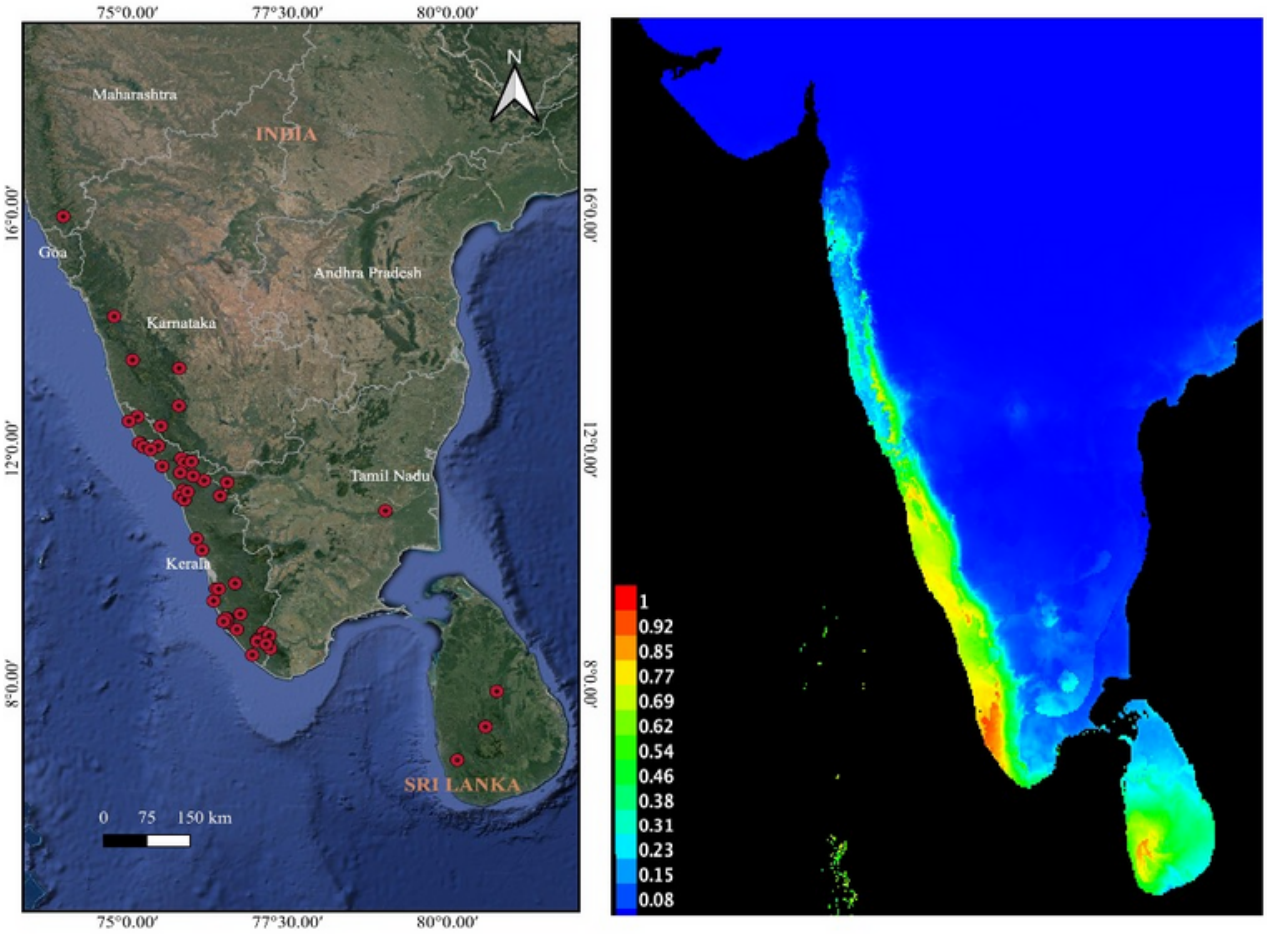
The standardised vegetation and landuse layer used in this model for the prediction of potential niche of the species incorporating biotic factors. The incorporation of standardised vegetation layer for the inclusion of Eltonian factors along with MaxEnt based Ecological Niche Modelling helped to refine its predicted area from 10,824 km2 to 8595 km2 within the Western Ghats. The ecoregion level prediction for the potential habitat of the threatened tree species provides adequate information for the niche specific conservation and ecorestoration planning ensuring ecosystem-based approach (EbA).

Among the 19 bioclimatic parameters 14 found to contribute to the niches of Syzygium caryophyllatum. The primary contributing bioclimatic parameters of Syzygium caryophyllatum include Temperature seasonality SD (50%), Annual Precipitation (25.6%), Precipitation of Coldest Quarter (6%), and Temperature Annual Range (4.9%). Among which Temperature seasonality SD and Temperature Annual Rangeare negatively correlating and Annual Precipitation and Precipitation of Coldest Quarterare positively correlating factors. The niche of Syzygium caryophyllatum is defined by a total of 14 bioclimatic parameters, with Temperature Seasonality (50%) making positive and negative the most contribution and Precipitation of the Wettest Quarter (0.2%) making the least

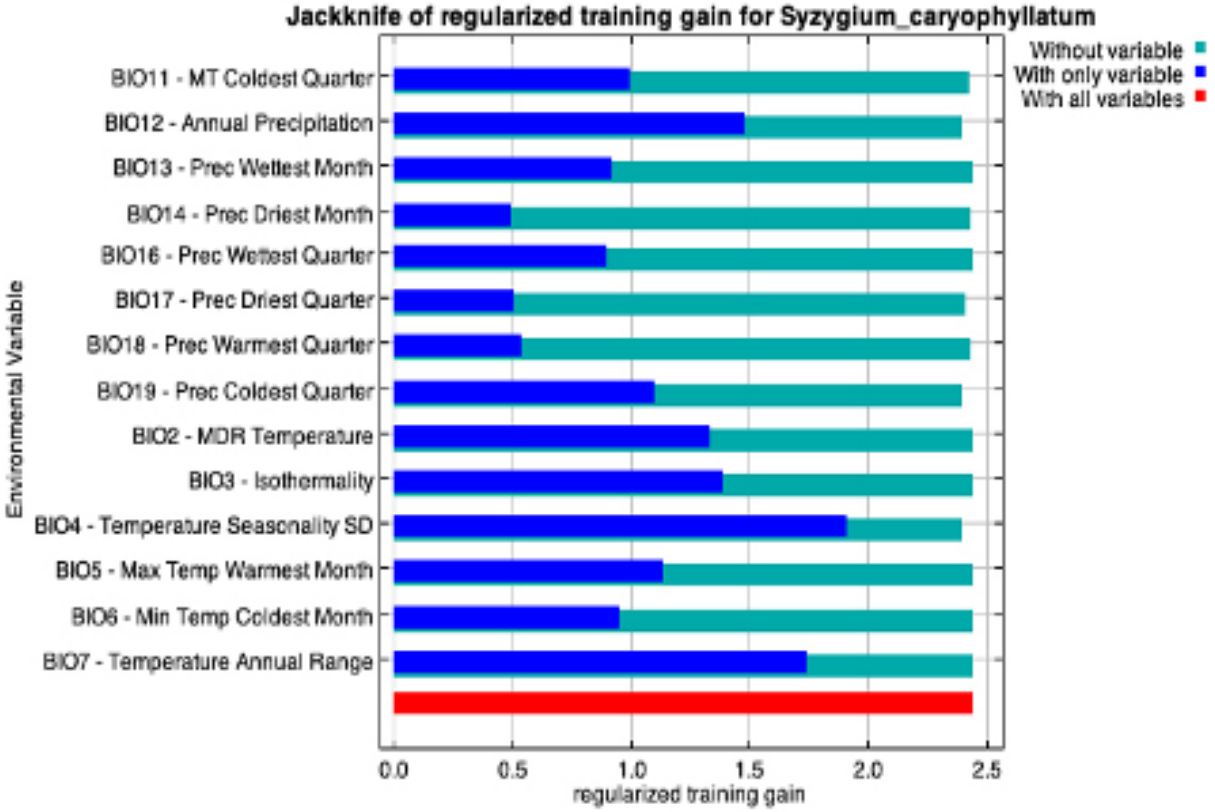
The Receiver Operating Characteristic (ROC) curve for the resulting data, again averaged over the replicate runs. The average test AUC for the replicate runs for Syzygium caryophyllatum is 0.92, and the standard deviation is 0.193. The regularised training gain for this species shows the contribution of each bioclimatic variable

The variable with highest gain when used in isolation is Temperature seasonality (BIO – 4). Whereas the variable that decreases the gain the most when it is omitted is Annua Mean Temperature (BIO -1). Turning to the lighter blue bars, it seems that no variable has a significant quantity of important information that isn't already present in the other variables, as eliminating each variable separately did not significantly reduce the training gain.

Sl. No.	Bioclimatic Variables	Percent Contribution	Permutation Importance
1	BIO4 - Temperature Seasonality SD	50.9	72.6
2	BIO12 - Annual Precipitation	25.6	16.7
3	BIO19 - Precipitation of Coldest Quarter	6	3.3
4	BIO7 - Temperature Annual Range	4.9	0.5
5	BIO3 - Isothermality	3.8	0
6	BIO11 - Mean Temperature of Coldest Quarter	2.7	1.9
7	BIO14 - Precipitation of Driest Month	1.9	0.5
8	BIO17 - Precipitation of Driest Quarter	1.5	2.3
9	BIO13 - Precipitation of Wettest Month	1	0.3
10	BIO2 - Mean Diurnal Range	1	0.3
11	BIO6 - Minimum Temperature of Coldest Month	0.5	0
12	BIO18 - Precipitation of Warmest Quarter	0.4	0
13	BIO8 - Mean Temperature of Wettest Quarter	0.3	0.4
14	BIO16 - Precipitation of Wettest Quarter	0.2	1.4



Add a little bit of turning to the lighter blue bars, it seems that no variable has a significant quantity of important information that isn't already present in the other variables, as eliminating each variable separately did not significantly reduce the training gain. In each iteration of the training process, the rise in regularized gain is added to the contribution of the related variable to produce the first estimate; if the change in the absolute value of lambda is negative, it is deducted from it. For the second estimate, the values of each environmental variable on the training presence and background data are randomly permuted. It is revaluating the model using the permuted data results in a decrease in training AUC, which is displayed in the table normalized to percentages.

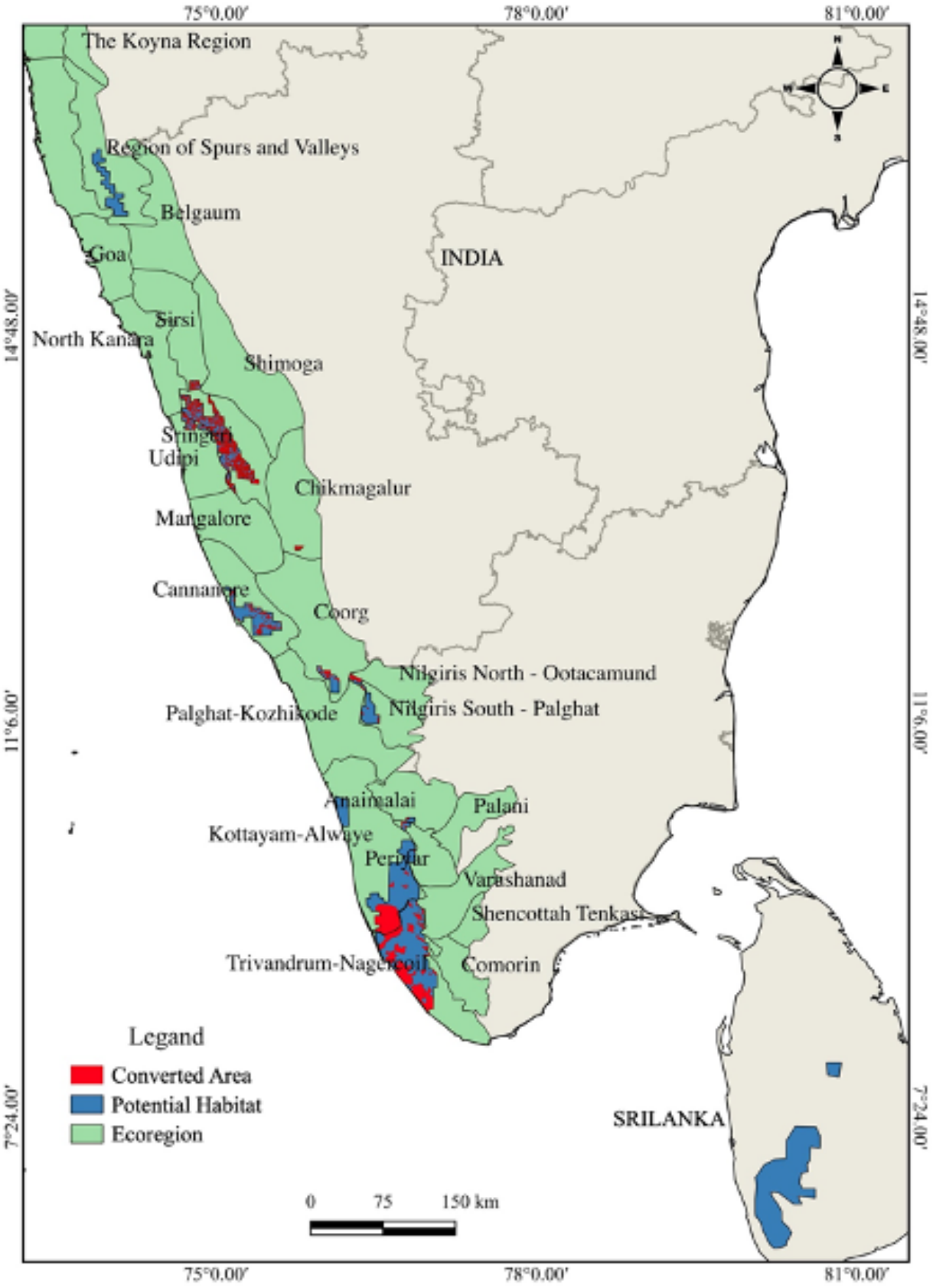


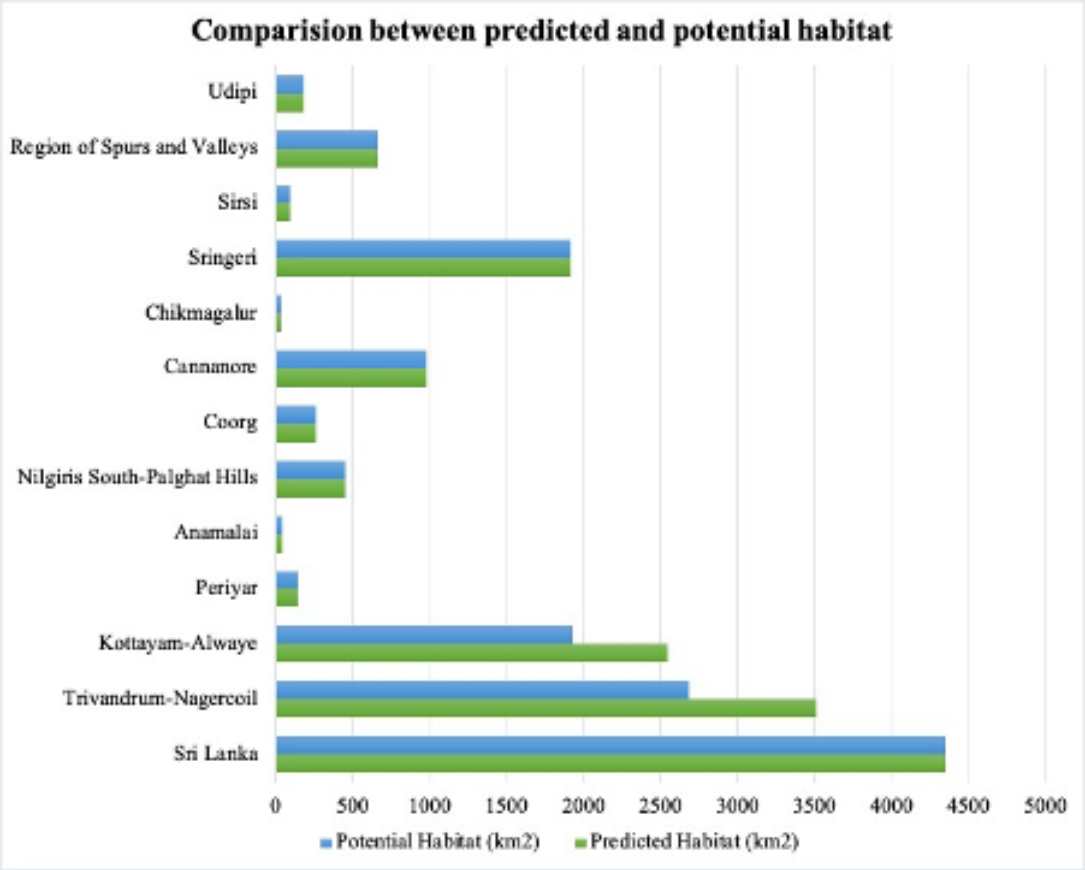
The actual distribution of the species is given (Fig. 3a) which shows its distribution range across the Western Ghats Sri Lanka biodiversity hotspot from the coastal sacred groves to low land evergreen forest upto an elevation of 1160 m. The total predicted area of Syzygium caryophyllatum is estimated about 15177.8 km2 (shown in red and orange). More prediction observed in the ecoregions of Trivandrum – Nagercoil, Kottayam – Alwaye, Sringeri, Cannanore. The species bioclimatic forecast demonstrates consistent habitat suitability throughout the Western Ghats, primarily in the lower plains, which is the area subjected to total conversion of the habitats.

The prediction obtained for the threatened tree Syzygium caryophyllatum is a total of 15177.8 km2 using bioclimatic envelop modelling using the MaxEnt of which 10,824.5 km2 area was predicted from the 12 ecoregions within the Western Ghats (Fig. 4). The predictions were refined to 8,595 km2 using this present model (Amitha Bachan & Devika, 2023) which incorporate classified vegetation layers as biotic input. Rotenberry et al. (2006) suggested biotic layer inputs for Eltonian components in SDMs to improve predictions. Eltonian niche elements must be taken into account in order to define a species' habitat,

Sl. No.	Ecoregion	Predicted Habitat (km^2)	Potential Habitat (km^2)	Converted Habitat (km^2)
1	Trivandrum-Nagercoil	3516.30	2681.58	834.714
2	Kottayam-Alwaye	2547.80	1922.57	625.23
3	Periyar	143.86	134.389	9.471
4	Anamalai	40.50	37.616	2.884
5	Nilgiris South-Palghat Hills	454.70	411.625	43.075
6	Coorg	260.92	220.434	40.486
7	Cannanore	982.56	889.62	92.940
8	Chikmagalur	28.57	15.706	12.864
9	Sringeri	1918.26	1406.823	511.437
10	Sirsi	87.68	64.926	22.754
11	Region of Spurs and Valleys	662.52	662.52	0
12	Udipi	180.83	147.744	33.086
13	Sri Lanka	4353.30	4353.30	0
	Total	**15177.8**	**12948.853**	**2228.941**

Major ecoregions with possible habitats for Syzygium caryophyllatum include Sringeri (1,406 km2), Trivandrum- Nagercoil (2,681 km2), Cannanore (889 km2), Kottayam- Alwaye (1922 km2), and Nilgiris South-Palghat Hills (441 km2). This demonstrates that the 2,228.9 km2 of the predicted region was altered as a result of anthropogenic activities such as reservoirs and dams, plantations, and agricultural uses, making the area unsuitable for the restoration of niche-specific species (Fig. 5). Area with more habitat conversation, only the sacred groves are the actual habitat in the potential habitat of the coastal region.


75°0.00′
78°0.00′
81°0.00′
14°48.00′
11°6.00′
7°24.00′
The Koyna Region
Region of Spurs and Valleys
Belgaum
Goa
INDIA
Sirsi
North Kanara
Shimoga
Sringeri
Udipi
Chikmagalur
Mangalore
Cannanore
Coorg
Nilgiris North - Ootacamund
Palghat-Kozhikode
Nilgiris South - Palghat
Anaimalai
Palani
Kottayam-Alwaye
Periyar
Varushanad
Shencottah Tenkasi
Trivandrum-Nagercoil
Comorin
SRILANKA
Legand
Converted Area
Potential Habitat
Ecoregion
0
75
150 km



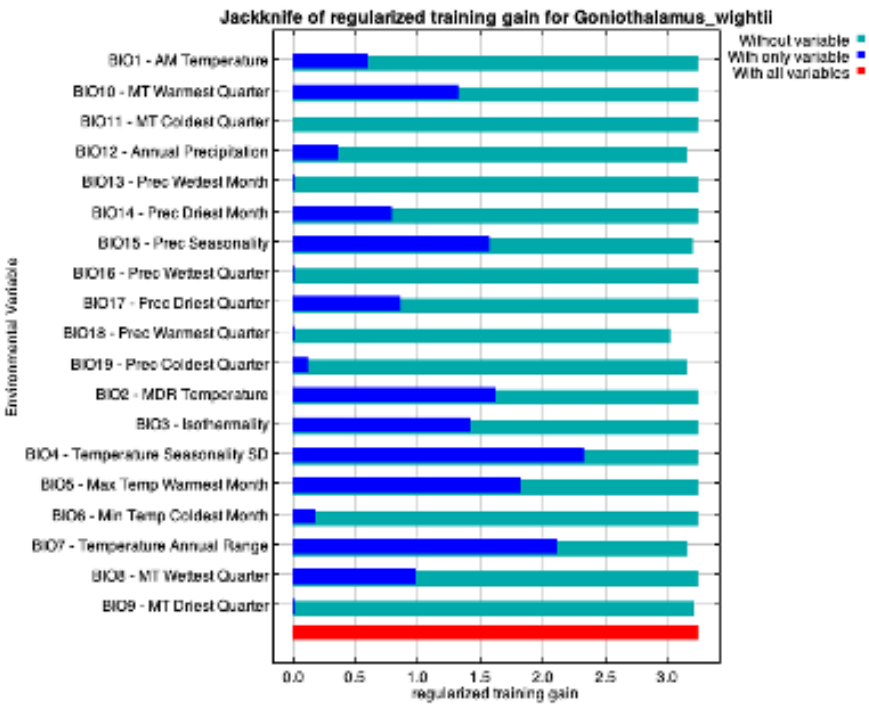
The lowland evergreen forests especially sacred groves are the most preferred habitat of the species and which is confirmed through the modelling. There are 22 subpopulation for the species among which the largest sub population has 30 adult individuals. The species is observed to have close associations with Vateria indica, Hopea ponga, Hopea parviflora, and Memecylon umbellatum (Devika & Amitha Bachan, 2023). The incorporation of more location information provided an Area of Occupancy (AOO) of 196 km2 and an Extent of Occurrence (EOO) of 255,677 km2 in its recent assessment (Devika & Amitha Bachan, 2023).

Even though ex situ seed germination and conservation at a few locations are in place for the species, the low germination rate and small number of mature individuals, each in small sub-populations within the rapidly vanishing low land forests and sacred groves, make this species vulnerable.

ECOREGION LEVEL NICHE SPECIFIC HABITAT PREDICTION OF THREATENED GONIOTHALAMUS SPECIES

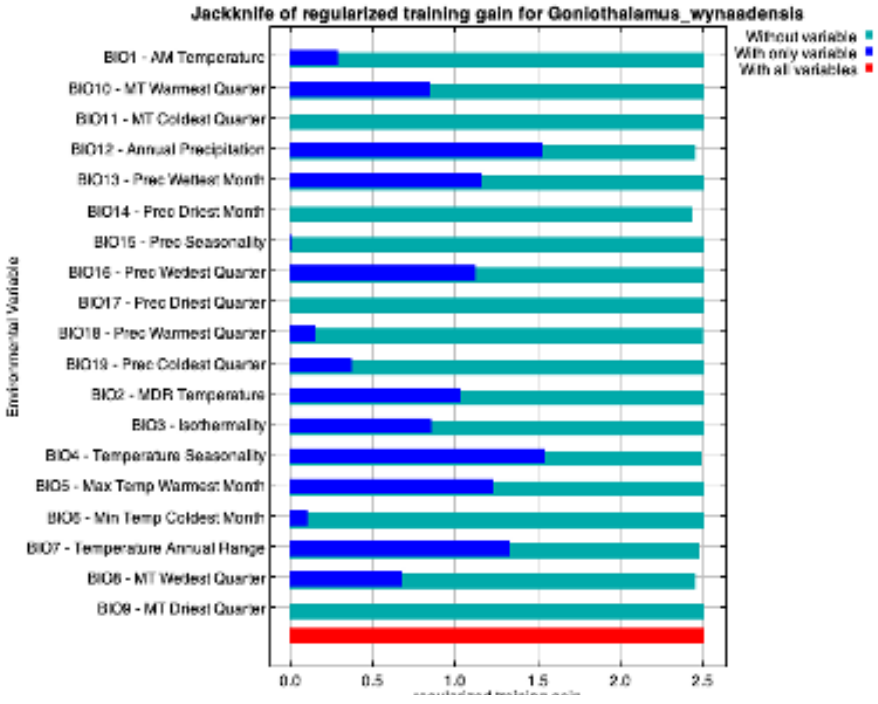
The major four factors contributing to G. cardiopetalus are Temperature seasonality (BIO4), Temperature Annual Range (BIO7), Isothermality (BIO3), Maximum Temperature of Warmest Month (BIO5), MT Wettest Quarter (BIO9), MT Warmest Quarter (BIO10). For G. rhynchantherus is Precipitation of Driest Month (BIO14), Precipitation Seasonality (BIO15), Precipitation of Driest Quarter (BIO17), Temperature Seasonality (BIO4). For the G. wightii Precipitation of Driest Month (BIO14), Precipitation of Driest Quarter (BIO17), Temperature Seasonality (BIO4), Maximum Temperature of Warmest Month (BIO5). The maximum contribution for defining the niche of G. wynaadensis is Precipitation of the Coldest Quarter (BIO19)

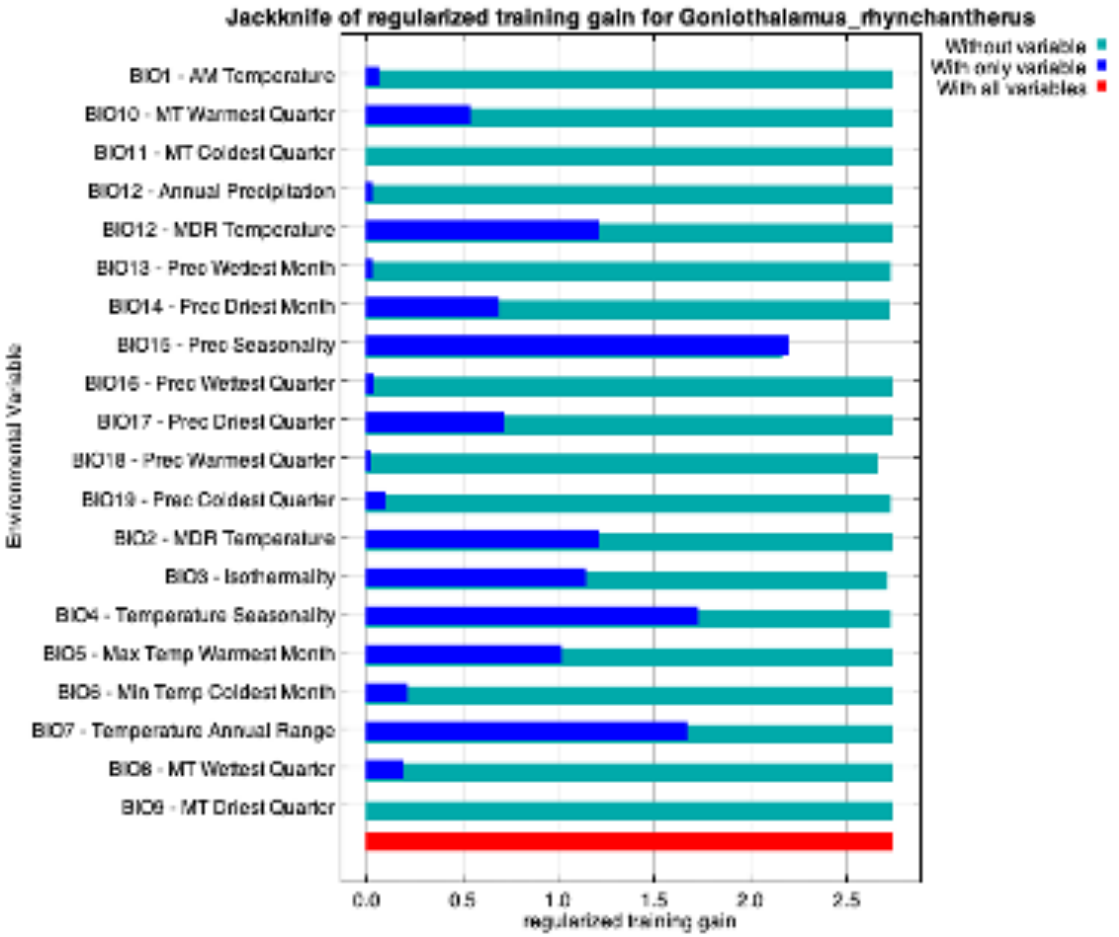
Annual Precipitation (BIO12), Precipitation of Wettest Month (BIO13), Precipitation of Wettest Quarter (BIO16), Temperature Seasonality (BIO4). The factors of precipitation including annual precipitation and precipitation in the driest months of the quarter, show a positive correlation, and the factors of temperature, including its seasonality and maximum temperature in the dry and cold periods, show a negative correlation for defining niches for these species.

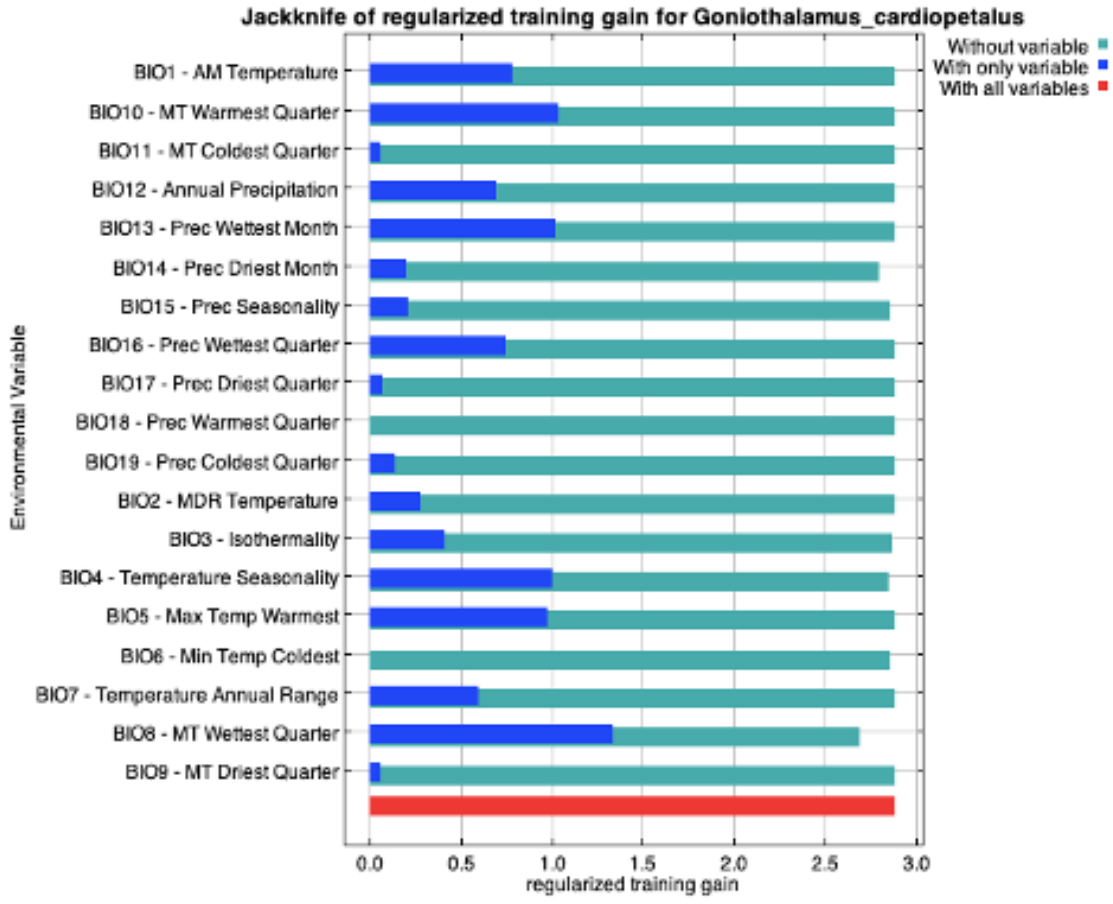


The niche modelling standardised with classified vegetation layer as biotic input provides highly specific information for the potential niche-specific habitat of the four species of Goniothalamus endemic to the Western Ghats (Table 1). The widest and maximum potential habitat is for G. cardiopetalus, with 3.624 km2 of potential habitat within seven ecoregions.

This is followed by G. wightii, distributed across seven ecoregions with a potential habitat of 2.609 km2. G. wynaadensis has the maximum number of converted habitats, with a present potential area of 2.211 km2 within six ecoregions (Fig. 4). G. rhynchantherus is the most restricted species, with a potential habitat of only 0.56 km2 within three ecoregions in the extreme south of the Western Ghats.



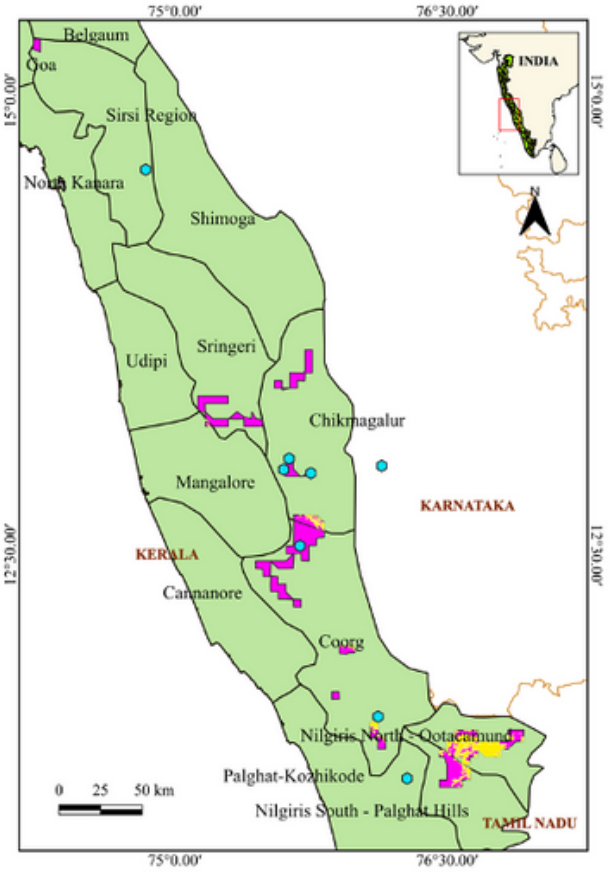

Jackknife of regularized training gain for Goniothalamus_rhynchantherus
Without variable
With only variable
With all variables
BIO1 - AM Temperature
BIO10 - MT Warmest Quarter
BIO11 - MT Coldest Quarter
BIO12 - Annual Precipitation
BIO12 - MDR Temperature
BIO13 - Prec Wettest Month
BIO14 - Prec Driest Month
BIO15 - Prec Seasonality
BIO16 - Prec Wettest Quarter
BIO17 - Prec Driest Quarter
BIO18 - Prec Warmest Quarter
BIO19 - Prec Coldest Quarter
BIO2 - MDR Temperature
BIO3 - Isothermality
BIO4 - Temperature Seasonality
BIO5 - Max Temp Warmest Month
BIO6 - Min Temp Coldest Month
BIO7 - Temperature Annual Range
BIO8 - MT Wettest Quarter
BIO9 - MT Driest Quarter
Environmental Variable
0.0
0.5
1.0
1.5
2.0
2.5
regularized training gain

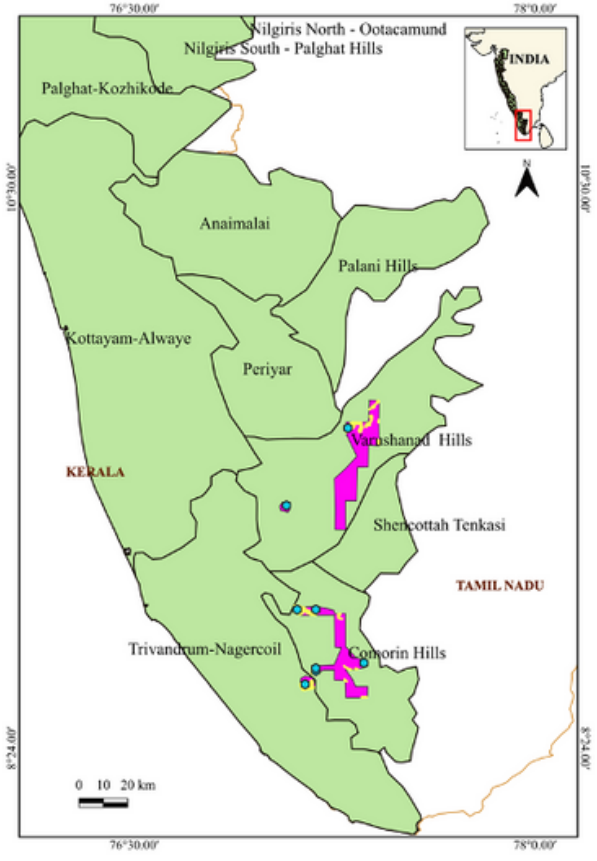

Jackknife of regularized training gain for Goniothalamus_cardiopetalus
Without variable
With only variable
With all variables
BIO1 - AM Temperature
BIO10 - MT Warmest Quarter
BIO11 - MT Coldest Quarter
BIO12 - Annual Precipitation
BIO13 - Prec Wettest Month
BIO14 - Prec Driest Month
BIO15 - Prec Seasonality
BIO16 - Prec Wettest Quarter
BIO17 - Prec Driest Quarter
BIO18 - Prec Warmest Quarter
BIO19 - Prec Coldest Quarter
BIO2 - MDR Temperature
BIO3 - Isothermality
BIO4 - Temperature Seasonality
BIO5 - Max Temp Warmest
BIO6 - Min Temp Coldest
BIO7 - Temperature Annual Range
BIO8 - MT Wettest Quarter
BIO9 - MT Driest Quarter
Environmental Variable
0.0
0.5
1.0
1.5
2.0
2.5
3.0
regularized training gain

The predictions provide clear picture of the niche partitioning even though these phylogenetically related species are within the tropical rainforest biomes of the Western Ghats. The actual distribution location which lack maximum predictions were three locations for G. cardiopetalus is zero for G. rhyncantherus, one for G. wightii and two for G. wynaadensis. Apart from the actual distribution, new predictions were obtained for G. cardiopetalus (4), G. rhyncantherus (1), G. wightii (3), G. wynaadensis (5). These ecoregions could have conservation and ecorestoration potential and possibility for encounter for the species

. Goniothalamus rhyncantherus and Goniothalamus wightii show partial similarity in bioclimatic parameters (Fig. 5) which is chiefly reflected by the precipitation of Driest Month (BIO14) and Quarter (BIO17), indicating more wet rainforest niches. The maximum bioclimatic correlation is shown between G. wightii and G. wynaadensis, where multiple factors of temperature determine the niche suitability of the species. The figure provides more clarity on the differences in bioclimatic factors that define these four species (Fig. 5). The results indicate the WorldClim bioclimatic parameters can well differentiate niches of closely related species or their populations in space and time.

Species	No. Ecoregion (NM)	No. Ecoregion	Predicted Potential Area (NM) km²	Predicted Potential Area km²
G. cardiopetalus	8	7	20.67	3.624
G. rhynchantherus	3	3	7.32	0.56
G. wightii	9	7	17.86	26.09
G. wynaadensis	10	6	20.16	22.11


75°0.00'
76°30.00'
15°0.00'
12°30.00'
Belgaum
Goa
Sirsi Region
North Kanara
Shimoga
Udipi
Sringeri
Chikmagalur
Mangalore
KARNATAKA
KERALA
Cannanore
Coorg
Nilgiris North - Ootacamund
Palghat-Kozhikode
Nilgiris South - Palghat Hills
TAMIL NADU
0 25 50 km
INDIA
N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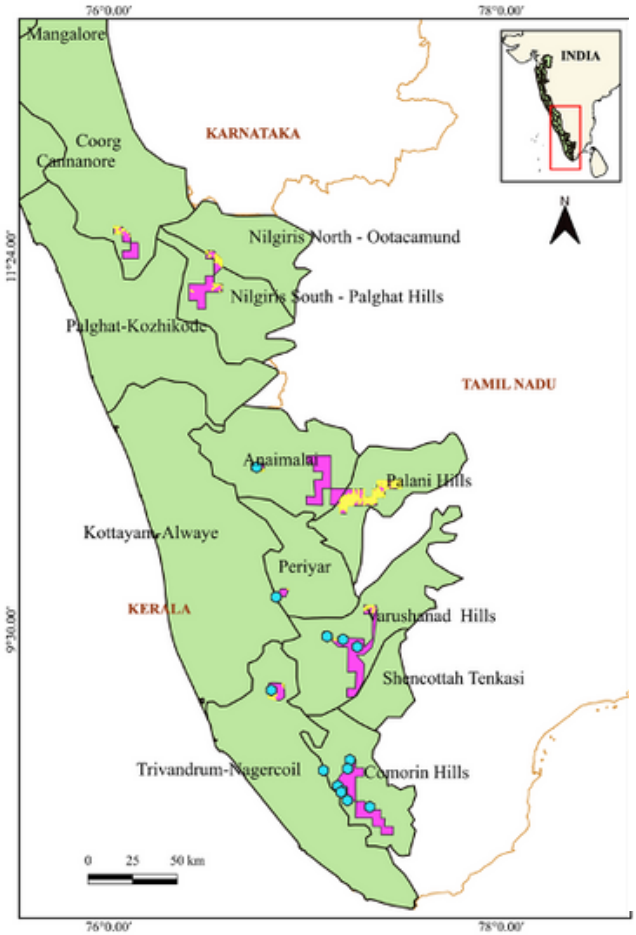
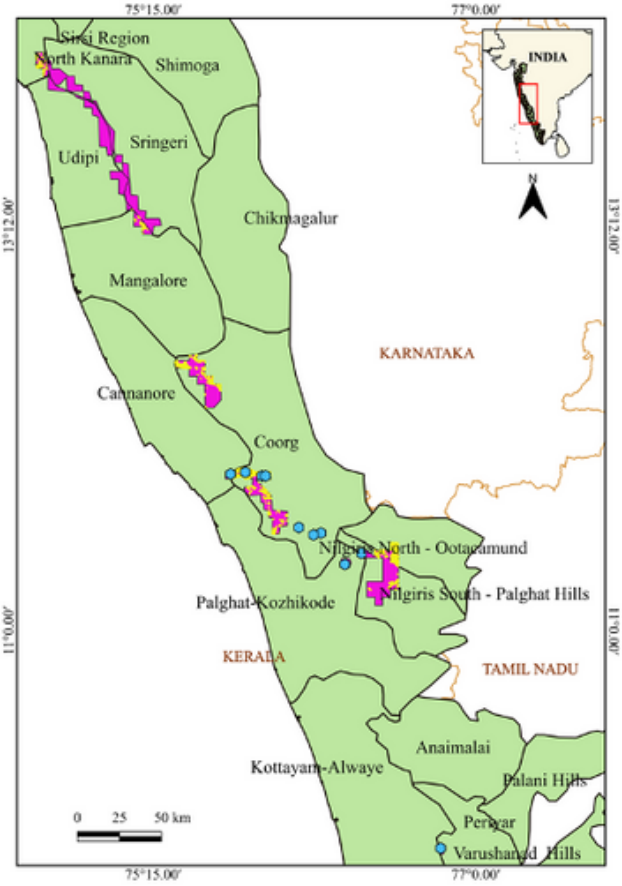
78°0.00'
10°30.00'
8°24.00'
Nilgiris North - Ootacamund
Nilgiris South - Palghat Hills
Palghat-Kozhikode
Anaimalai
Palani Hills
Kottayam-Alwaye
Periyar
Varushanad Hills
KERALA
Shencottah Tenkasi
TAMIL NADU
Trivandrum-Nagercoil
Comorin Hills
0 10 20 km
INDIA
N


76°0.00'
78°0.00'
11°24.00'
9°30.00'
Mangalore
KARNATAKA
Coorg
Cannanore
Nilgiris North - Ootacamund
Nilgiris South - Palghat Hills
Palghat-Kozhikode
TAMIL NADU
Anaimalai
Palani Hills
Kottayam-Alwaye
Periyar
KERALA
Varushanad Hills
Shencottah Tenkasi
Trivandrum-Nagercoil
Comorin Hills
0 25 50 km
INDIA
N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11°0.00'
Sirsi Region
North Kanara
Shimoga
Udipi
Sringeri
Chikmagalur
Mangalore
KARNATAKA
Cannanore
Coorg
Nilgiris North - Ootacamund
Palghat-Kozhikode
Nilgiris South - Palghat Hills
KERALA
TAMIL NADU
Anaimalai
Kottayam-Alwaye
Palani Hills
Periyar
Varushanad Hills
0 25 50 km
INDIA
N

Model Nursery

The Western Ghats Hornbill Foundation and Research Department of Botany at MES Asmabi College officially inaugurated the seed germination centre for threatened tree species. Seedlings of nine threatened (IUCN) tree species were successfully germinated this year to use in the identified restoration sites based on niche profiling and niche modelling. In collaboration with forest department and local community the restoration processes will be taken place. The rain forest tree species such as Diospyros crumenata, Prioria pinnata, Hopea ponga, Hopea parviflora, Baccaurea courtallensis, Humboldtia vahliana, Aporosa bourdillonii, Syzygium occidentale were produced more in number.

Community Nursery

The Community nursey was developed by the local women through MGNREGA scheme to spread the message of local gene pool in local nursery in collaboration with “Make A Difference Week” of Society for Ecological Restoration (SER) as part of Environment Day celebrations.

COASTAL ECORESTORATION PLAN FOR COASTAL ECOSYSTEM

The Sree Narayana Puram Grama panchayat (SN Puram) requisite to develop a perspective strategic plan for the conservation, monitoring and ecorestoration of the coastal ecosystems and its biodiversity involving local community and Biodiversity Management Committee (BMC). The panchayat has diverse coastal representee ecosystems such as sacred groves, Pandanus thickets, river, ponds, associated water bodies and sand dunes. The very umbilical relationship of the people for their livelihood and cultural wisdom are the reason for the richness of the region. The paradigm shift into capital economy based livelihood means requisite new perspectives and strategic planning involving the local community for the conservation and ecorestoration of these biodiversity heritage.

The Sanghukulangara Kavu and Pandanus (Screw pine species diversity) are some good examples of people concerned towards conservation of our biodiversity richness. A strategic plan is envisaged here for the conservation and ecorestoration of biodiversity richness in the Gama Panchayat. The limited fund made available to the panchayat by the Kerala State Biodiversity Board (KSBB) is being utilised for developing a perspective plan, detailed project document along with primary initiatives for ecorestoration and ecological monitoring in the Grama Panchayat. This has been implemented as a decision from the BMC involving the Research Department of Botany MES Asmabi College.

Detailed Project Proposal (DPR) for the community based conservation, monitoring and ecorestoration of coastal ecosystems and its biodiversity

Identified different ecosystems in the Panchayath

The SN puram Grama panchayat is part of sandy deposits and related coastal ecosystems in a coastal evergreen rainfed climate nourished with inflow from the catchments of Periyar and Chalakudy rivers from the Western Ghats. The field study and mapping has identified seven different kinds of ecosystems within the SN puram Grama Panchayat. These are i. Coastal sandy beaches ii. Sacred groves iii. Fresh water stream draining to the sea (Arappathodu) iv. Pandanus thickets v. Freshwater ponds vi. Small Freshwater channels vii. Backwater (Canoly canal). The Panchayat has few better samples of these ecosystems such as the Sanghukulangara Kavu and the Canoly canal backwater. The remaining all are represented with relics of vegetations or are in highly degraded conditions.

Coastal sandy beaches

Local history indicated that the shoreline had sand dunes which was later mined and eroded. The area is facing serious threat of coastal erosion, the recent interventions with granite sea walls also failing. The recent climate change induced cyclones, sea upwelling also made stabilization and restoration of the sandy shores very essential. The field study indicated the vegetation embankment using Casuarina is not effective in checking sand erosion since the trees are not deep rooted (Fig. 2). Ecorestoration of native vegetation through scientific profiling has been recommended as a remedy for stabilization of the sea shore.

The Sanghukulangara Kavu is one of the best representatives of the coastal evergreen forest grove in central Kerala (Fig. 3). The Panchayat has similar small sacred groves under the ownership of different families. All these are maintained traditionally by the families with the support of the local community.

I The Sanghukulangara Kavu is conserved and maintained by Kizhakootu Family traditionally and has been registered as a Trust named 'Kizhakootu Family Trust'.ncreased soil erosion waste deposition at the pond can lead to die-off of roots of the old growth trees and may lead to tree fall. Dieback of old canopy trees is also observed there, incident of fall of a mature tree in the Kavu is observed during this monsoon also. Proper physical management facilities especially zonation to manage intervention of people, waste deposition, vehicle transport, protection of existing best vegetation samples with a buffer plantations, embankments and soil filling to prevent soil erosion and ecorestoration in vacant areas based on scientific profiling are recommended.

Arappathodu – fresh water stream draining to the sea.

Pandanus thickets at the beach

Fresh water ponds

Fresh water channels