5

Status of other indigenous taxa threatened in Gujarat

5.1 Introduction

At present, the most critical task is to inventorize all landplants, sowe can get a complete global list of species, and make this information easilyaccessible on-line (Meyer*et al.*, 2015), which is also covered in GSPC target 1, to produce anonline flora of all known plants. But practically, by looking at the time restrainwe can conclude that the first global flora willlargely be a compilation of existing information. Recent botanical studiessuggest that spatial bias in collection activity is unique with large under-collected areasin thetropics and some pockets of intense activity (Vale and Jenkins,2012; Yang *et al.*, 2014).

The next critical task is to globally assess the status ofthe 94% of land plant species not yet evaluated under theIUCN Red List, so that both *in situ*and *ex situ* conservation can betargeted efficiently. A preliminaryassessment of the global status of 15,200 Amazonian treespecies, using spatially explicit models of tree species abundanceand deforestation, and interpreting the results using the IUCN RedList criteria, demonstrates the potential for scaling up the assessmentprocess;however, the authors point out that species byspeciesassessments are still needed (ter Steege *et al.*, 2015). Regional (including national) assessments using IUCN Red List criteriainclude many species that have no global assessment yet, and canprovide a basis for targeting conservation work in these areas(Havens *et al.*, 2014; Sharrock *et al.*, 2014).

When we know what is threatened we can prioritize the protectedarea systems and conserve*in situ*. However, measuring the appropriateness of existing coverage of threatened plants is challenging due to lack of inventories (Sharrock *et al.*, 2014). In response, theRoyal Botanic Gardens, Kew is planning to map and

prioritizethe Tropical Important Plant Areas (TIPAs) that are concentrated with threatened species (www.kew.org/scienceconservation/kews-science-strategy/2020-strategic-outputs/tropical-important-plant-areas).

5.2 Observations and Discussion

Although many regions of the Gujarat state have been thoroughlyexplored at length and breadth, much lacuna existed regarding thedistributional status of many threatened plant species. Most ofthe species entered into the Red Data Books as well as WCMC lists areprovided with meager information. Looking in to this situation, thepresent investigation has been undertaken to fill the existing lacuna onthe status of distribution of threatened plants.

5.2.1 Bauhinia vahlii

Family:Fabaceae

Habit: Liana

DSTR: Narmada Dist.:Sagai, Kokam (Patel, 2013), Ninai, Kelda

It is reported to be very rare in Gujarat (Shah 1978, Patel 2013)

Habitat: on steep slopes in moist deciduous forests

Specimen examined: *SLP* 1361 (SPU), *MCJ* 432, *KRN* 214 (BARO)

EOO = NA

AOO = 8 km^2

No. of locations: 01

AOO density: 1

Threats: This woody climber has the potential to damage trees, so it is cutted by local villagers as they disturb the timber growth.

Owing to its confinement to a single locality, its regional status is assessed to be **Critically Endangered C2a(i)**.

Figure 236: *Bauhinia vahlii*

Figure 237: *Bauhinia vahlii* in flowering

5.2.2 Begonia picta

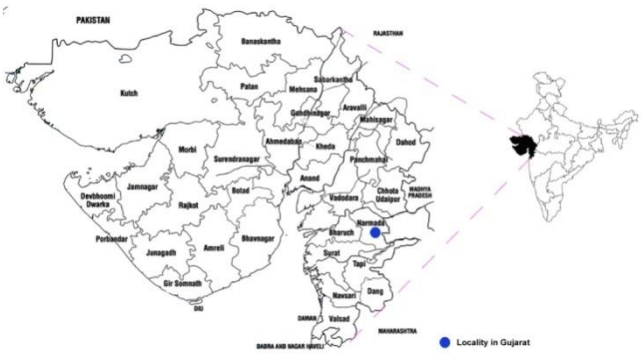


Figure 238: Distribution of *Begonia picta*

Family: Begoniaceae

Habit: Herb

During the field survey we collected a few plants of the genus *Begonia* when it was flowering during the month of September, 2015 from Narmada District of southern Gujarat. On critical observation and perusal of the relevant literature (Saldhana and Ramesh, 1984; Almeida, 1998) the specimens were identified as *B. picta* Smith. The species is native to Bhutan, China, India, Myanmar, Nepal and Pakistan. In India, it is distributed in Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Odisha (Anand Kumar, 1978; Nair et al., 2014). After a scrutiny of the significant literature (Shah, 1978; Raghavan *et al*., 1981; Pradeepkumar, 1993), it was found to be a taxon hitherto not recorded from Gujarat State, hence we reported as a new distribution record for the state (Vanzara *et al*., 2016).

With the current report, the genus Begonia is now represented by two species, viz., *B. crenata* Dryand and *B. picta* Smith in Gujarat. During field studies the species was collected from two locations: Ninai waterfall in Mohbi village and forest area of Kelda village, Dediapada taluka, Narmada District

EOO = NA

AOO = 8 km^2

No. of locations: 1

AOO density: 1

Owing to its confinement to a single locality, its regional status is assessed to be **Critically Endangered C2a(ii)**

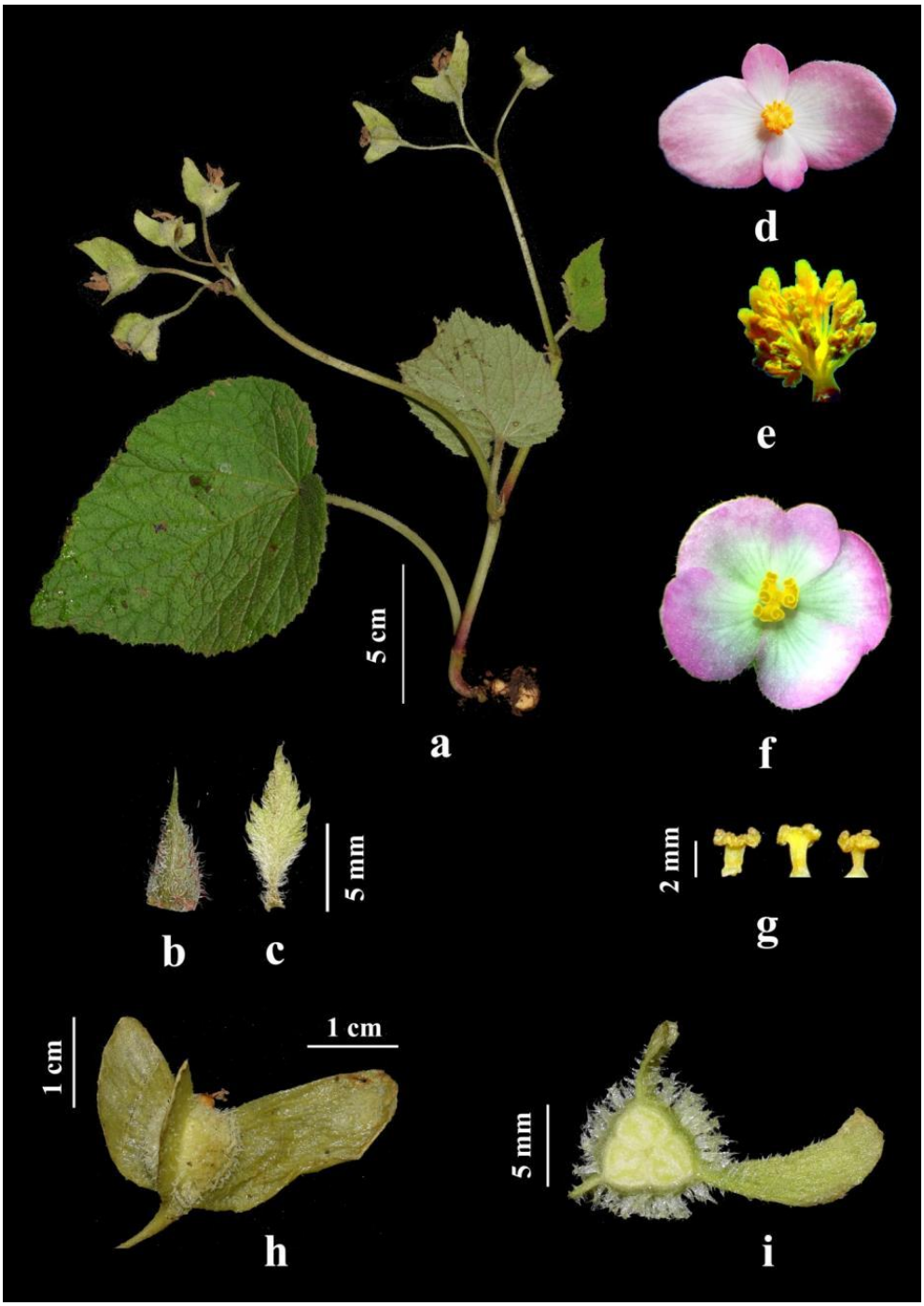


Figure 239: *Begonia picta*: a. habit, b. stipule, c. bract, d. male flower, e. stamens, f. female flower, g. stigma, h. capsule, i. unequal wings

5.2.3 **Bombax ceiba L.** [= *Salmalia malabarica* (DC.) Schott & Endl]

Family: Bombacaceae

Local name: Safed Shimlo

Habit: Tree

Fl. – Fr.: March – April

DSTR Gujarat: Valsad Dist.

EOO = NA

AOO = 8 km²

No. of locations: 02

AOO density: 0

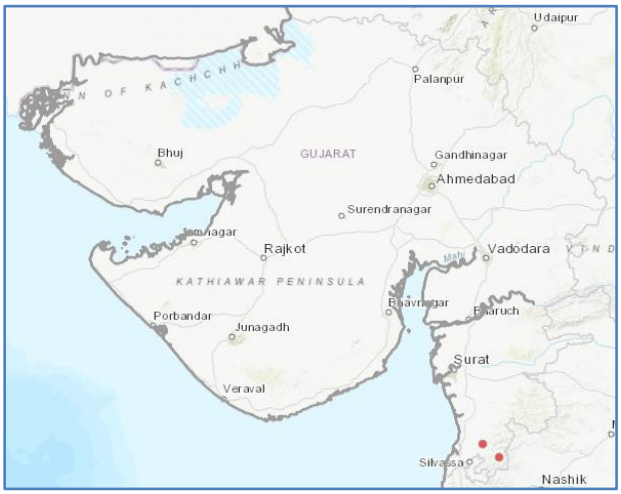


Figure 240: Distribution of yellow *Bombax ceiba*

This yellow variety was first reported by Patel (1971) from Valsad. During the present field explorations, only two individuals were found, so it is evaluated to be**Critically Endangered D**.

Threats: Bark is exploited by tribals for religious activities.

Figure 241: *Bombax ceiba* with yellow flowers

5.2.4 Bombax insigne Wall.

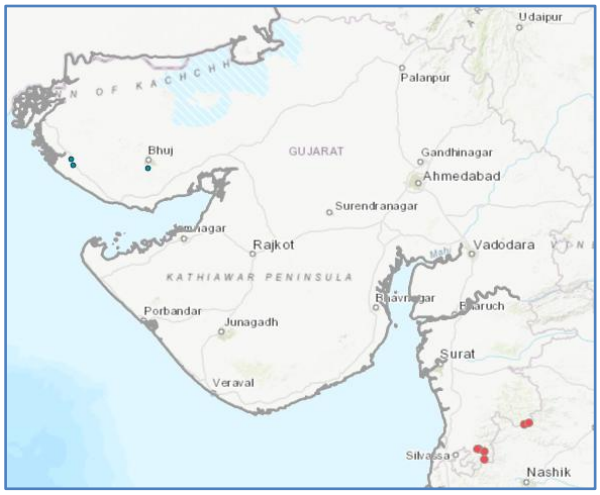


Figure 242: Distribution of *Bombax insigne*

Family: Bombacaceae

Local name: Safed Sawar

Habit: Tree

Fl. – Fr.: December

DSTR: Maharashtra, Goa, Karnataka, Tamil Nadu, Kerala

It was first reported in the Trees of Gujarat (Anon. 2008) where four individuals were mentioned.While in the present studies thirty mature individuals were recorded from the following localities:

Dang Dist.: Ahwa, Malegaon, Saputara

ValsadDist.:Chavshala, Dabkhal, Dinbari, Jaura-Jauri, Kaprada, Matuniya, Narwad

Specimen examined: *KRN*33483 (BSJO)

EOO = 911 km²

AOO = 28 km²

No. of locations: 04

AOO density: 0.43

Due to its restricted distribution it is assessed as an **Endangered** species.

Threats: Bark is exploited locally for medicinal purposes and timber for making huts. Timber was initially collected by the Village Forest Mandalis under which most of the population was wiped off, behind Sayadri Srishti Sankul.

It is categorized as **Endangered B1ab(iii,iv)+2ab(iii)** based on its restricted occurrence and observed habitat degradation throughout its range.

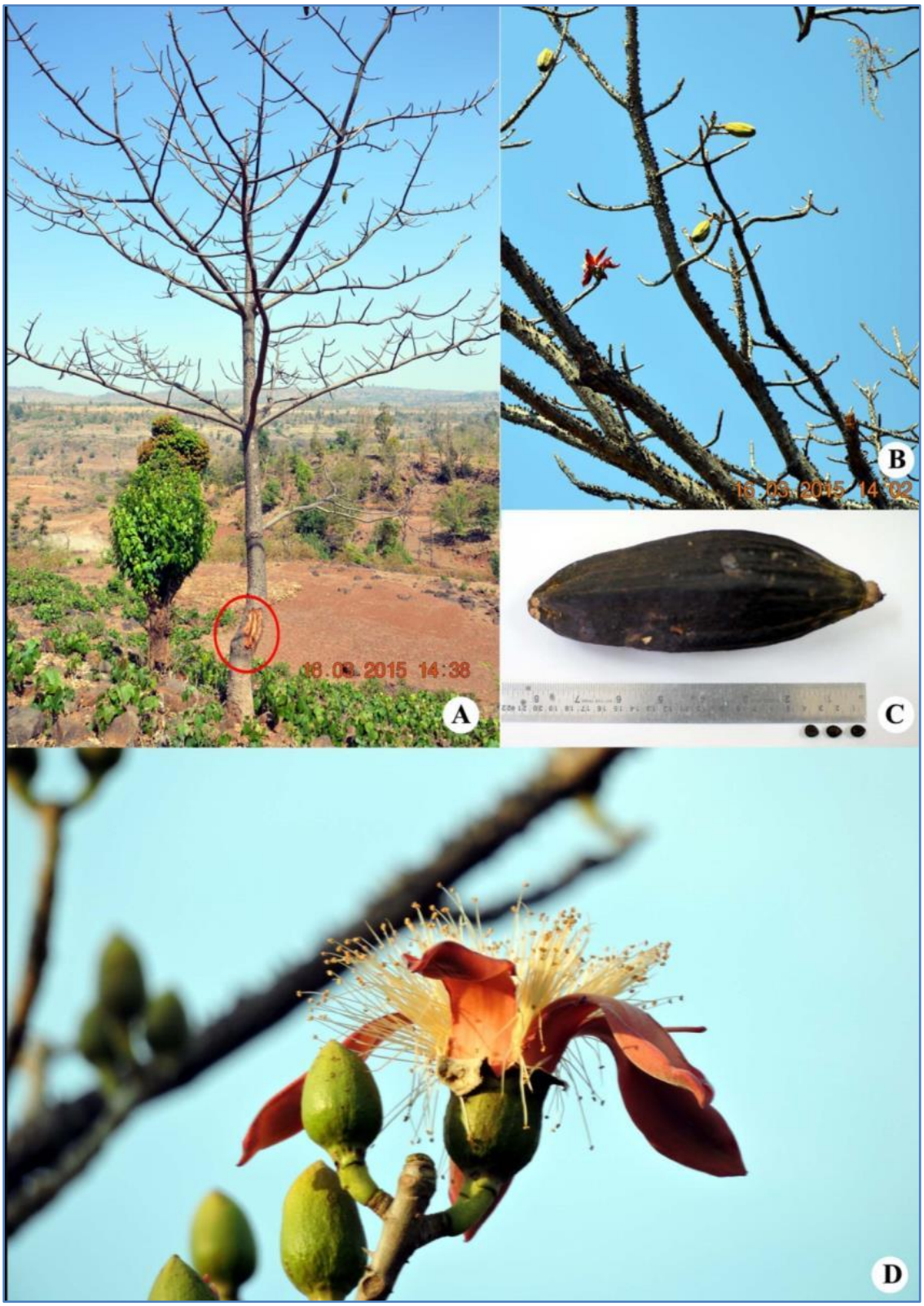


Figure 243: *Bombax insigne*: A. Habit (showing threat of bark exploitation), B. Flowering and Fruiting, C. Fruit and seeds, D. Single flower

5.2.5 Bruguiera cylindrica (L.) Blume

Family:Rhizophoraceae

Habit: Tree

DSTR Gujarat:

NavsariDist.:Borsi (Bhatt, 2014)

Valsad Dist.: Umargaon (Kothari and Singh, 1998)

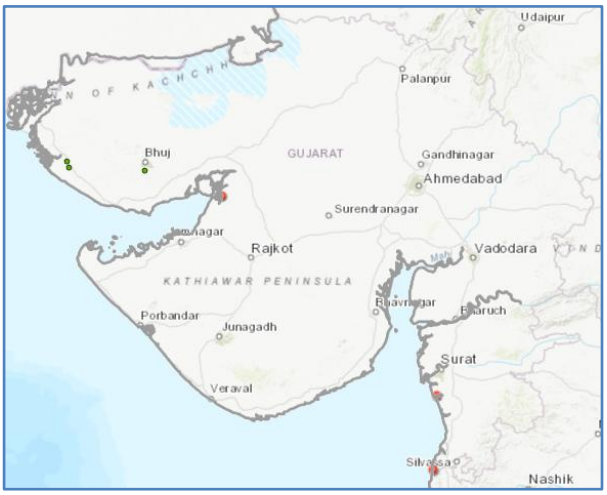
Rajkot Dist.: Navlakhi(Santapau, 1962)

EOO = 10,247.5 km^2

AOO = 12 km^2

No. of locations: 03

AOO density: 0



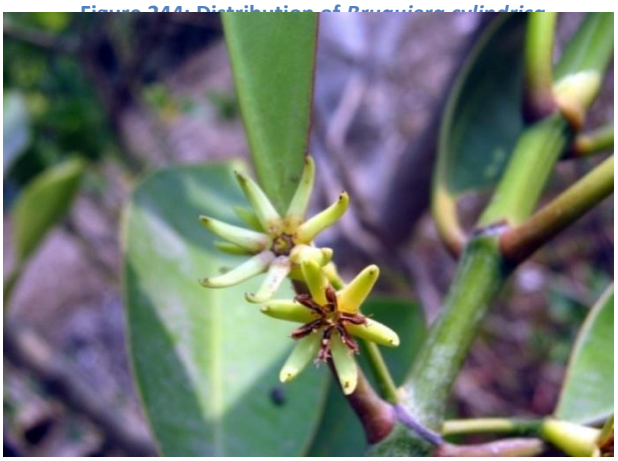


Figure 245: *Bruguiera cylindrica* in flowering

On considering its extent of occurrence it becomes vulnerable, but due to very limited area of occupancy it is evaluated as **EndangeredB2ab(ii,iii,iv)**.

Threats: This species is often targeted for timber, as it grows straight and is considered good for construction and charcoal production.

Introduction of the species in other mangrove zones will probably show its establishment behaviour and survival rate. Also, continual monitoring and research is recommended, as well as the inclusion of mangrove areas in marine and coastal protected areas.

5.2.6 Butea monosperma (Lam.) Taub. [= *Butea frondosa* var. *lutea* (Witt.) Maheshw.]

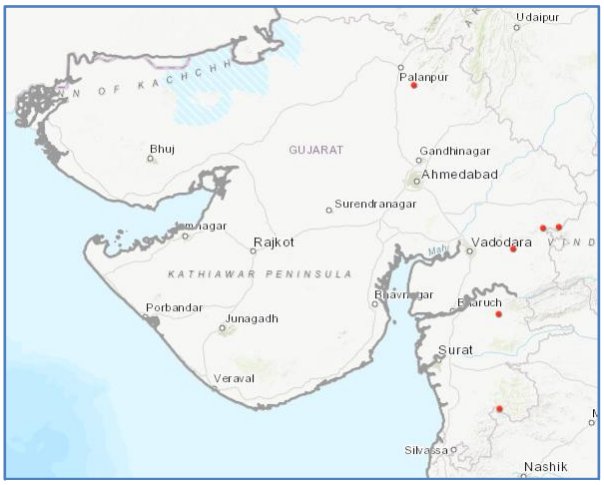


Figure 246: Distribution of *Butea frondosa* var. *lutea*

Family: Fabaceae

Local name: Safed Khakhro

Habit: Tree

Fl. – Fr.: February-April

DSTR: Rajasthan, Madhya Pradesh, Maharashtra, Goa, Karnataka, Tamil Nadu, Kerala

DSTR Gujarat:

ChhotaUdepur Dist.: Alindra-Baria (Tyagi, 2012)

Panchmahal Dist.: Targol

Mehsana Dist.: Panchha

NarmadaDist.:Pangam

Dang Dist.: Barkhandhia, Sevaniya

This tree species is usually seen nearby running water, and the sites convert into a sacred place for the local people worship.

EOO = 22,224.8 km^2

AOO = 24 km^2

No. of locations: 05

AOO density: 0.17

Owing to its less area of occupancy it is categorized as an **Endangered B2ab(ii,iv,v)** species for the state.

Threats: Bark is exploited by local people for treatment of leucoderma and for various other religious activities.As the root bark of the tree is used by local Vaidya, trees were uprooted in Shoolpaneshwar as seen in the following figure (a, b)that leads to death of plant.

Specimen examined: *KRN*33484 (BSJO)

Figure 247: *Butea frondosa* var. *lutea*: A. Tree uprooted, B. Bark exploitation, C. Worshipping of tree, D. Habit, E. Flowers and Fruits

5.2.7 Campylanthus pungens Schwartz

Family:Scrophulariaceae

Habit: Herb

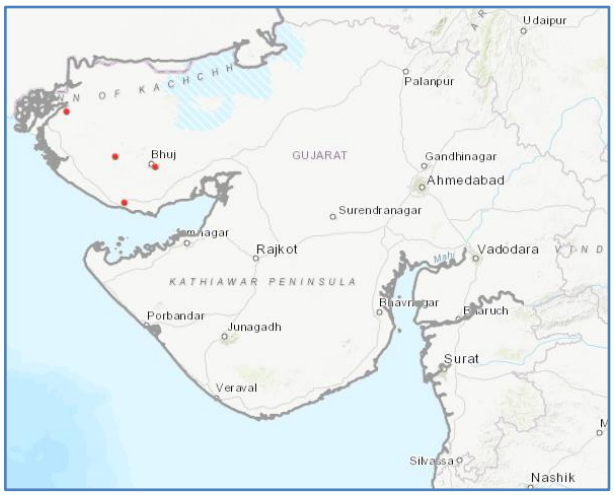


Figure 248: Distribution of *Campylanthus pungens*

DSTR: Based on the collections made by Stocks andWoodrow from Baluchistan and Sind, Wight incorporated this species inhis Icons in 1850. While including this taxon in his Flora of BombayPresidency, Cooke (1958) listed Hyderabad, Junagadh, Sindh for its distribution. Rao and Sabnis (1977) reported it to be found occasionallyfrom Kachchh (Bhuj and Chaduva-Rakhal).

It was not reported in theFlora of Gujarat State (Shah 1978). Eventually its occurrence fromKachchh was reported in few works (Kothari and Hajra 1983; Rao 1981). No specimens of the taxon are available in theHerbaria of Botanical Survey of India, Western Circle, Pune, BotanicalSurvey of India, Arid Zone Cricle, Jodhpur or any of the Herbaria of theuniversities in Gujarat. However, during the present study work it was deposited in the BSI, Jodhpur with the accession number: 33479.

EOO = 2998.7 km^2

AOO = 16 km^2

No. of locations: 04

AOO density: 0

Campylanthus pungens is been assessed here on National level, as in India, it is confined only to Kachchh region. Owing to its restricted distribution, it is evaluated to be **EndangeredB1ab(i,ii,iii,iv)+2ab(iii)**.

Habitat:Dry grassland

Threats: Habitat destruction in the form of land clearings for agricultural practices, quarrying operations (sandstone mining), and expansion of urban areas are found to be the possible threats. However, lack of scientific interest and awareness among

local people are also contributing to the depletion of the species. Looking into the present population size and various biotic threats on this species, it is recommended that at least some of its natural habitats in the surrounding areas of Bhuj, Nakhatrana and Ravapar areas should be protected as conservation plots. And, reintroduction of this species into forests with suitable habitats would be a better way to conserve this taxon.

Specimen examined: *KRN*33479 (BSJO), *VRR* 3028, 4581 (SPU)

Figure 249: ***Campylanthus pungens*** in flowering

5.2.8 **Cansjera rheedei J.F.Gmel.**[= *Cansjera scandens*Roxb.]

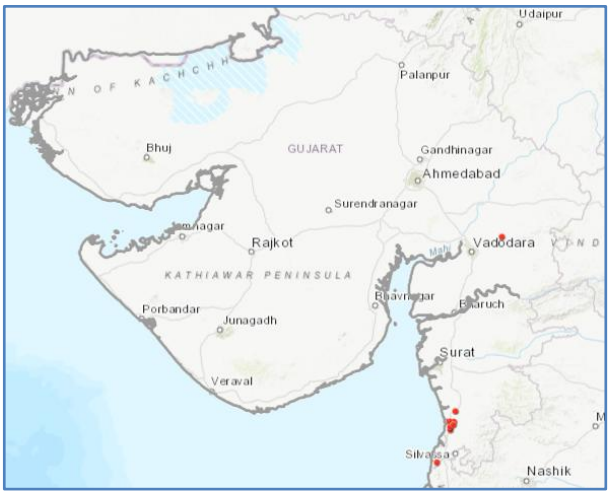


Figure 250: Distribution of *Cansjera rheedei*

Family: Opiliaceae

Local name: Tarar

Habit: Shrub

Fl. – Fr.: December – March

DSTR: Maharashtra, Goa, Karnataka, Tamil Nadu, Kerala

DSTR Gujarat:

Panchmahal Dist.: Pavagadh (Oza, 1961)

Valsad Dist.: Ghadoi, Halar (Patel, 1971), Sanjan, Pardi (Patel, 2013), BKM science college, Vagaldhara, Panera, Pathri Valvada, Balitha, Sarigam, Umargam (Contracter, 1986)

EOO = 1143.3 km^2

AOO = 36 km^2

No. of locations: 06

AOO density: 0.33

Threats: Habitat Loss

Specimen examined: 33492 (BSJO)

In Vagaldhara, plants are growing on hedges of RMD Cancer Hospital that could be removed anytime.

The plant needs utmost attention as the species is a root parasite for further propagation. There is a need to establish protocol for seed germination and propagation in suitable habitat.

However, it has been conserved *In-situ* at the RMD Cancer Hospital, Vagaldhara and the BMC science college, Valsad.

Figure 251: *Cansjera rheedi*: (A) Destructed tree (B) Fruit (C) Flower

5.2.9 **Cometes surrattensis Burm.f.** [=*Cometessurattensis*var.*ambajiensis* Bedi & Madala]

Family: Caryophyllaceae

Habit: Herb

DSTR: Banaskantha Dist.:Ambaji

EOO = NA

AOO = 8 km²

No. of locations: 01

AOO density: 1

Habitat: Dry grassland

Figure 252: Distribution of *Cometes surrattensis*

Due to its very limited habitation and extent of occurrence it is assessed as **Critically Endangered**.

Plant is an indicator of Copper. Owing to the excavation of the copper from the minning site the habitat of the species is gradually lost.The minning site should be revived without modifying the habitat.As the only site for the plant is the mining site of Ambaji forest. The area should be protected as conservation plot.

Figure 253: *Cometes surrattensis* in flowering

5.2.10 IUCN Assessment of *Commiphora stocksiana* (Engl.) Engl.

Draft

Logo

***Commiphora stocksiana* - (Engl.) Engl.**

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SAPINDALES - BURSERACEAE - Commiphora - stocksiana

Common Names: Mitha Guggul (Gujarati), Bayisa gugal (Baluchi)
Synonyms: Balsamea stocksiana Engl.; Balsamodendrum pubescens Stocks

Taxonomic Note:
The species was first reported from Sind province of Baluchistan, Pakistan by J. Ellerton Stocks in 1847 and described as *Balsamodendron pubscens* stocks. In later years the species was also reported by Hooker (1849). Boissier (1872) reported its distribution in presidency of Bombay. The genus *Balsamodendron* was revised and renamed as *Commiphora* and the species *pubscens* revised and renamed as *stocksiana* Engler (Hooker, 1875). Woodrow (1897) reported this species in its earlier locality as reported by Stocks. In India, the genus *Commiphora* has four species which are *C. mukul* Hook. Ex Stock, *C. agollocha* Engl. *C. berryi* (Aen.) Engl. and *C. stocksiana* (Atal et al., 1975).

Red List Status	
CR - Critically Endangered, C2a(i); D (IUCN version 3.1)	
Possibly Extinct:	No
Possibly Extinct in the Wild:	No
Date Last Recorded (in the wild):	

Red List Assessment

Assessment Information

Date of Assessment: 2017-10-14

Assessor(s): Patel, R. & Rana, K.

Regions: Global

Assessment Rationale

This species is restricted to a single location in India and few locations in Pakistan, and has an extremely small population size. And is heavily exploited due to the medicinal properties of oleo-gum resin which is even more superior in quality than its allied species, *Commiphora wightii*.

Distribution

Geographic Range

This species was first time collected from Sind province of Baluchistan, Pakistan by J. Ellerton Stocks in 1847 and described as *Balsamodendron pubscens* stocks. In later year the species was also reported by Hooker (1849). Boissier (1872) commented on its distribution in presidency of Bombay. The species was validly published in Monographiæ phanerogamarum by Candolle, Alphonse de, (1883) under the name *Commiphora stocksiana* (Engl.) Engl. Later, Woodrow (1897) rediscovered from its earlier locality reported by Stocks. Rao *et al.* (1984) reported the species as an addition to the Indian flora, confined to a single locality in Kachchh district of Gujarat state.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification
16	-

Continuing decline in area of occupancy (AOO)	Qualifier	Justification
Yes	-	-

Extreme fluctuations in area of occupancy (AOO)	Justification
No	-

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
53562	true	-

Continuing decline in extent of occurrence (EOO)	Qualifier	Justification
Unknown	-	-

Extreme fluctuations in extent of occurrence (EOO)	Justification
No	-

Locations Information

Number of Locations	Justification
4	The species is narrowly confined to four different locations, without a single threatening event.

Continuing decline in number of locations	Qualifier	Justification

No	-	-

Extreme fluctuations in the number of locations	Justification
No	-

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
Yes	AOO is 16 sq.km, and number of locations is just 4.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 73

Elevation Upper Limit (in metres above sea level): 140

Map Status

Map Status	How the map was created, including data sources/methods used:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Indomalayan

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
India	Extant	Native	-	-
India -> Gujarat	Extant	Native	-	Resident
Pakistan	Extant	Native	-	Resident

Population

Rao *et al.* (1984) observed around 15-20 individuals. After almost three decades, Patel *et al.* (2013) surveyed and rediscovered the plant from the same locality in Kachchh, with only 3 individuals. However, the present scenario is that the wild population is less than 13 individuals while around 8 individuals are conserved in-situ at the agriculture hedges (individuals may vary there are direct count). Though the population in Pakistan is not known but looking at the threats faced, we assume that the number of individuals to be less than 50.

Population Information

Current Population Trend: Decreasing

Number of mature individuals (=population size): 20

Severely fragmented?	Justification
Yes	-

Continuing decline in mature individuals?	Qualifier	Justification
Yes	Projected	-

Extreme fluctuations in the number of subpopulations	Justification
No	-

Continuing decline in number of subpopulations	Qualifier	Justification
Yes	Projected	-

All individuals in one subpopulation: No

Number of mature individuals in largest subpopulation: 13

Number of Subpopulations	Justification	Subpopulation Details	Subpopulation description	Number of mature individuals	Subpopulation trend	Qualifier	Location type	Number of Subpopulations	Location bounding box	Location coordinates	Notes
2	-	-	-	-	-	-	-	-	-	-	-

Population Reduction - Past

Percent Change in past	Reduction or Increase	Qualifier	Justification
0-1,.5%	Reduction	Suspected	-

Basis?
a) direct observation, c) a decline in area of occupancy, extent of occurrence and/or quality of habitat, d) actual or potential levels of exploitation, e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites)

Reversible?	Understood?	Ceased?
Yes	Yes	Yes

Population Reduction - Future

Basis?
c) a decline in area of occupancy, extent of occurrence and/or quality of habitat, d) actual or potential levels of exploitation, e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites)

Population Reduction - Ongoing

Both: Percent Change over any 10 year or 3 generation period, whichever is longer, and must include both past and future, future can't go beyond 100 years	Reduction or Increase	Number of years for this period	Qualifier	Justification
0-1%	Increase	10	Observed	We have successfully standardized nursery technique. we avoided cutting method for sapling preparation. we only focus on seed based sapling preparation. till date more than 2000 saplings were prepared in ex-situ.

Basis?
a) direct observation, c) a decline in area of occupancy, extent of occurrence and/or quality of habitat, d) actual or potential levels of exploitation, e) the effects of introduced taxa,hybridization, pathogens, pollutants,competitors or parasites

Reversible?	Understood?	Ceased?
Yes	Yes	No

Quantitative Analysis

Probability of extinction in the wild within 3 generations or 10 years, whichever is longer, maximum 100 years	Justification
0-1,.5	-

Probability of extinction in the wild within 5 generations or 20 years, whichever is longer, maximum 100 years	Justification
0-1,.5	-

Probability of extinction in the wild within 100 years	Justification
0	-

Habitats and Ecology

Commiphora stocksiana is a balsamiferous small tree or shrub in hilly and moderately undulating terrain. It tree is prefer to grows in substratum of rocks or boulders and in sandy soil (Enright *et. al,* 2005 & Patel *et. al.* 2013). The species is generally found in the tropical thorn forest especially in the area of mixed thorn forests. The species is generally distributed in calcareous rocks and dry river beds of coastal regions. The tree species like *Acacia senegal*, *Euphorbia caducifolia*, *Grewia spp*. and *Salvadora spp*. are the associated species for *C. stocksiana*.

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
8.1. Desert -> Desert - Hot	resident	Suitable	Yes

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Observed	-

Life History

Generation Length	Justification	Data Quality
10	-	good

Maximum Size (in cms)
400

Movement Patterns

Movement Patterns: Not a Migrant

Systems

System: Terrestrial

Plant Specific

Wild relative of a crop? No

Plant Growth Forms
Tree - small

Use and Trade

General Use and Trade Information

The Mitha Guggul gum was sold at the rate of 150 INR per kg. (Mandvi market; April, 1981). Traders claim that Mitha Guggul gum, *C. stocksiana*, is superior in quality to the gum resin obtained from the species *C. wightii*. Further, experiments on chemical and pharmacological aspects of Mitha Guggul gum should be carried out to verify this claim. The results obtained from these studies will also be useul in determining identity and characteristics of good quality Guggul of the Indian market. This will be useful to workers in Ayurvedic formulations (Rao, *et. al.* 1984). The oleo-gum-resin of *C. stocksiana* is used by the villagers for curing inflammations, rheumatism, indolent ulcers, gum problems, tonsillitis, laryngitis, bronchitis, pneumonia, whooping cough, chronic dyspepsia, diarrhea, chronic endometritis, leucorrhea and piles (Sharma & Kumar, 2012).

Subsistence:	Rationale:	Local Commercial:	Further detail including information on economic value if available:
Yes	-	Yes	-

National Commercial Value: Yes

International Commercial Value: Yes

Is there harvest from captive/cultivated sources of this species? No

Trend in level of total offtake from wild sources: Increasing

Trend in level of total offtake from domesticated sources: Increasing

Harvest Trend Comments: due to illegal and unscientific harvesting method, population reduced drastically.

Non- Consumptive Use

Non-consumptive use of the species? true

Explanation of non-consumptive use: use in Cosmetic and medicine industries.

Threats

The main threat facing this species is over exploitation for the medicinal use of its oleo-gum resin. Additional threats include destruction of its habitat, and mis-identification of this species with *Commiphora stocksiana*.

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
5.2.1. Biological resource use -> Gathering terrestrial plants -> Intentional use (species is the target)	Ongoing	Whole (>90%)	Very Rapid Declines	High Impact: 9

Conservation

Few mature individuals have been conserved at agricultural hedges of Haji Ismail in Lakhapar taluka of Lakhpat village and also Anjar taluka, Kachchh district. Anand Agricultural University has raised propagated plant saplings through cuttings as well as seeds. Further, Gujarat Biodiversity Board funded a project on *ex-situ* conservation of this species to Dr. Rohit Patel, where he developed and standardized the seed based nursery techniques and more than 2000 saplings were prepared and reintroduced at suitable habitats in Kachchh.

Conservation Actions In- Place

Action Recovery Plan	Note
Yes	Ex-situ conservation project was successfully completed by Dr. Rohitkumar Patel.

Systematic monitoring scheme	Note
Yes	-

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
No	-

Percentage of population protected by PAs (0-100)	Note
0	-

Invasive species control or prevention	Note
Unknown	-

Harvest management plan	Note
No	-

Successfully reintroduced or introduced benignly	Note

No	-

Subject to ex-situ conservation	Note
Yes	Gujarat Biodiversity Board-Gandhinagar funded a project on ex-situ conservation of Commiphora stocksiana to Dr. Rohitkumar Patel, Scientist, Gujarat Institute of Desert Ecology, Bhuj-Kachchh. Dr. Patel successfully develop and standardized the seed based nursery technique and till date more than 2000 saplings were prepared and successfully transplanted at various suitable habitats in Kachchh. Few individuals are also raised from stem cutting as well as from seed by at Anand Agricultural University (AAU), Anand-Gujarat

Subject to recent education and awareness programmes	Note
No	Local awareness regarding the rarity of the species has been done by Sahjeevan, Kachchh.

Included in international legislation	Note
No	-

Subject to any international management/trade controls	Note
No	-

Important Conservation Actions Needed

Conservation Actions	Note
1.1. Land/water protection -> Site/area protection	-
1.2. Land/water protection -> Resource & habitat protection	-
3.2. Species management -> Species recovery	-
3.3.1. Species management -> Species re-introduction -> Reintroduction	-
4.3. Education & awareness -> Awareness & communications	-
5.4.1. Law & policy -> Compliance and enforcement -> International level	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-
6.5. Livelihood, economic & other incentives -> Non-monetary values	-

Research Needed

Research	Note
1.2. Research -> Population size, distribution & trends	-
1.4. Research -> Harvest, use & livelihoods	-
1.5. Research -> Threats	-
2.1. Conservation Planning -> Species Action/Recovery Plan	-
2.2. Conservation Planning -> Area-based Management Plan	-
2.3. Conservation Planning -> Harvest & Trade Management Plan	-
3.1. Monitoring -> Population trends	-
3.3. Monitoring -> Trade trends	-

Ecosystem Services

Ecosystem Services Provided by the Species

	Importance:	Geographic range of benefit:
9. Provision of Critical Habitat	3 - Some Importance	Global
14. Other 1 (specify in notes)	1 - Very Important	Global

Bibliography

Abedin, S. and Ali, S.I. 1972. *Flora of West Pakistan*. Pakistan Agricultural Research Council.

Anjum Perveen, Ghulam Rasool Sarwar and Ishtiaq Hussain. 2008. Plant biodiversity and phytosociological attributes of Dureji (Khirthar range). *Pakistan Journal of Botany* 40(1): 17-24.

Atal, C.K., Gupta, O.P., and Afaq S.H. 1975. Commiphora mukul: Source of Guggal in Indian systems of medicine. *Economic Botany* 29: 208-218.

Boissier, E. 1872. *Flora Orientalis*.

Cooke, T. 1967. *The flora of the presidency of Bombay*.

Hooker, J.D. 1875. *Flora of British India*.

Hooker, W.J. 1879. On two Balsam Trees (Balsamodendron) from Scinde. *Journal of Botany*: 257--265.

Marshall Woodrow, G. 1897. *The Flora of Western India*.

Patel, R., Mahato, ArunKumar, Roy., Dabgar, Yogesh,B., and Kumar,V,Vijay. 2014. Note on the Distribution of Commiphora stocksiana Engl. In Kachchh: A Rare Medicinal Plant of India Need Conservation. *Annals of Plant Sciences* 3(2): 614-616.

Rao, K.S.S., Patel, D.H. and Dalal, K.C. 1984. Occurrence of Commiphora Stocksiana (Mitha Guggul) in Kutch. *INDIAN DRUGS*: 541-543.

Shah, G.L. 1978. *Flora of Gujarat State*. Sardar Patel University, Vallabh Vidyanagar.

Specimen examined: *KRN*33490 (BSJO)

Figure 254: *Commiphora stocksiana*: A. Habit, B. Single flower (magnified under stereozoom microscope), C. Bark sold by men of Jara village

5.2.11 Dactyliandra welwitschii Hook.f.

Family:Cucurbitaceae

Habit: Climber

DSTR: Kachchh Dist.:Naliya, Tapkeshwari

It has been stated as 'rare' in the Flora of Gujarat state; Shah (1978) mentioned on the authority of Bhandari and Singh. It is restricted to Kachchh (Patel 2013).

EOO = 277.2 km^2

AOO = 12 km^2

No. of locations: 02

AOO density: 0.33

Habitat:Dry grassland

Specimen examined: 33489 (BSJO)

This species closely resembles *Ctenolepis cerasiformis* which is very commonly found on agricultural hedges and occurs throughout Gujarat. It differs by its seeds which are truncate at ends and more or less compressed in *Dactyliandra*, whereas they are plano–convex and smooth in *Ctenolepis*.

Figure 255: *Dactyliandra welwitschii*

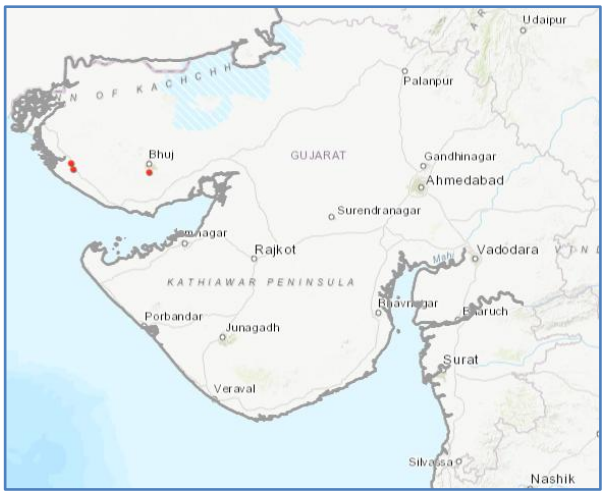


Figure 256: Distribution of *Dactyliandra welwitschii*

5.2.12 Drosera indica L.

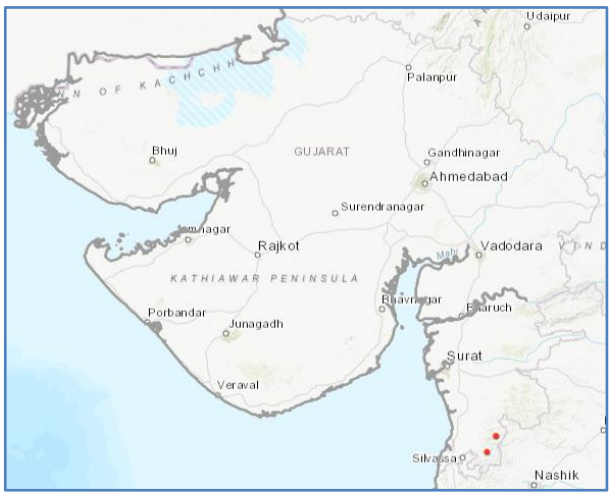


Figure 257: Distribution of *Drosera indica*

Family: Droseraceae

Habit: Herb

Fl. – Fr.:

DSTR: Maharashtra, Goa, Karnataka, Tamil Nadu, Kerala

DSTR Gujarat:

During our field explorations, we collected one interesting Droseraceae member with leaves cauline, linear. On detailed examination of the specimen, it turned out to be *D. indica* (Cooke 1908). It was first reported from Gujarat from agricultural hedges on Dharampur-Dabkhal road (Kshirsagar and Parabia, 2005). Then after a decade, it wascollectedduring the present study, from Shanker Dhodh at Dharampur, Valsad in a very small patch of 15 sq. m. Hence, due to its very limited habitation and extent, it is a **Critically Endangered** species.

EOO = NA

AOO = 8 km^2

No. of locations: 02

AOO density: 0

Habitat:It is commonly found growing in wet shallow and poor nutrient soils, overlaying rocks and in wet muds, in swamps, marshes, pools and streams, and in open humid soils.

Threats: Habitat loss, owing to agriculture encroachment.

Specimen examined: *KRN*33485 (BSJO)

Figure 258: *Drosera indica*: A. Habit, B. Flowering stage (Flower zoomed, upper right corner)

5.2.13 **Entada rheedii Spreng.**[= *Entada pursaetha*DC.]

Family: Mimosaceae

Habit: Liana

Fl. – Fr.: March – May

DSTR: Maharashtra, Goa, Karnataka, Tamil Nadu, Kerala

DSTR Gujarat:

Valsad Dist.: Mulgam Faliya, Barpuda, Vavar, Bhadarpada, Kaprada (Patel, 2013), Chand vegan (Mandva), Shahuda

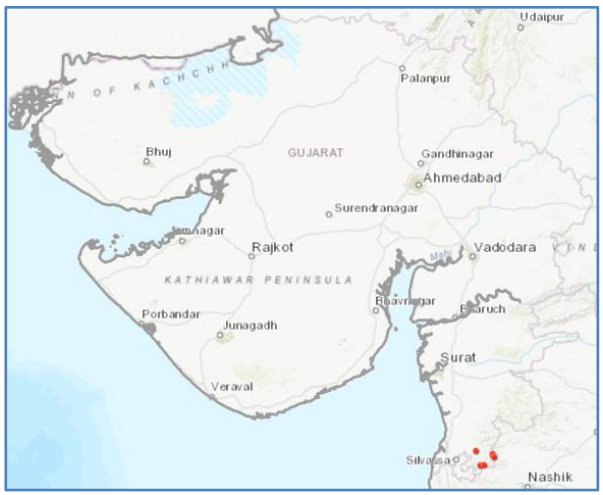


Figure 259: Distribution of *Entada rheedii*

EOO = 196.6 km^2

AOO = 24 km^2

No. of locations: 03

AOO density: 0.5

Reddy (1987) reported it from Barpuda, Dharampur forest in Valsad district, as a new record to the Flora of Gujarat State. It is stated to be 'very rare' and restricted only to Kaprada forests in Valsad (Patel, 2013). This species occurs in humid rainforest, a habitat suffering from rapid deforestation. In the present analysis it is assessed to be **Endangered** climber.

Habitat:Climbing on *Mangifera* trees growing on hill slopes.

Threats: Habitat loss, owing to deforestation.

Specimen examined: *KRN*33486 (BSJO), *SLP* 13 (SPU).

The liana is protected by local people as it is a source of income. Its big-sized seeds are also used as an antidote against snake bites. Its wood is also used in carpentry and as a fuel.

It has been conserved at Kaprada forest office compound and forest nursery near Mandva village. Also, a few saplings have been propagated and planted at our arboretum.

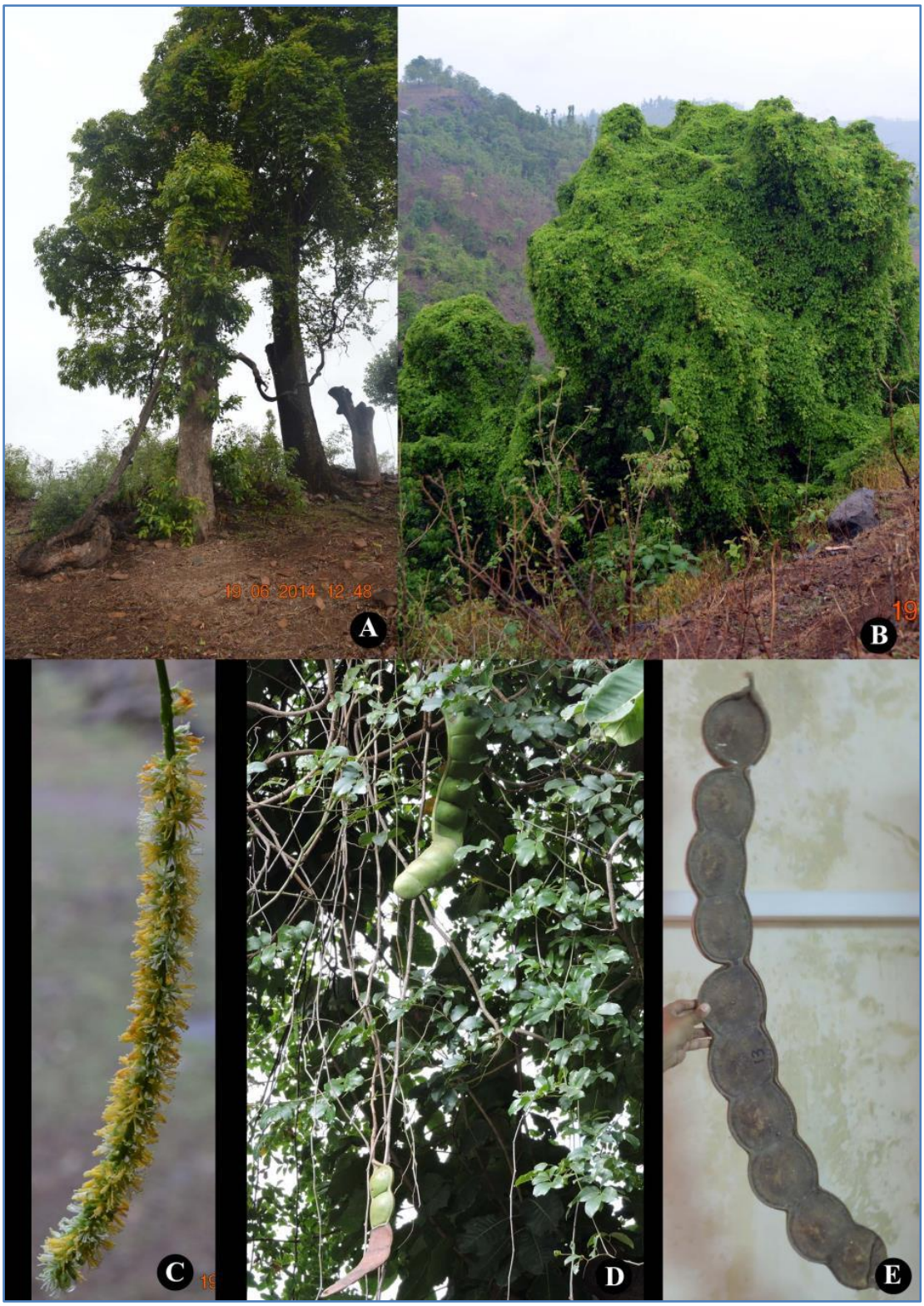


Figure 260: *Entada rheedi*: (A & B) Habit (C) Flower (D & E) Fruit

5.2.14 Eriolaena candollei Wall.

Family: Sterculiaceae

Local name: Bothi

Habit: Tree

DSTR: Maharashtra, Karnataka

DSTR Gujarat:

ChhotaUdepur Dist.: Rampura, Baria (Tyagi, 2012)

Dang Dist. (Shah, 1978): Saputara, Ambapada, Kotamdar

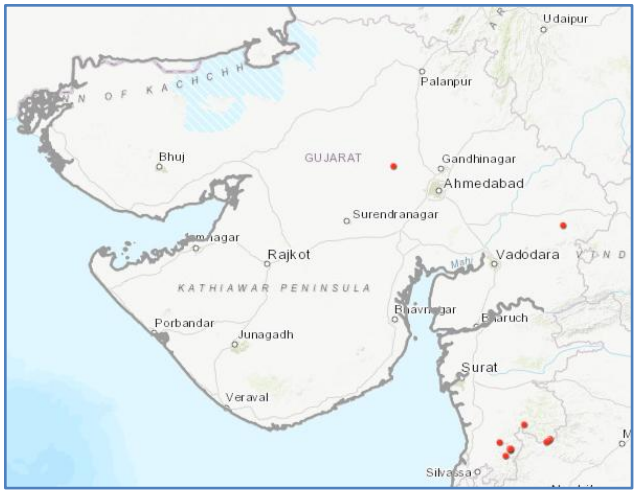


Figure 261: Distribution of *Eriolaena candollei*

Valsad Dist.: Cheepada, Pangarbari, Pendha (Reddy, 1987), Ambatalat, Wilson hill

EOO = 30,568.8 km^2

AOO = 44 km^2

No. of locations: 07

AOO density: 0.36

It has been stated as 'rare' in the Flora of Dharampur by Reddy (1987). Based on its sporadic distribution in Gujarat state, it is categorized as Least Concern, but due to restricted distribution it is an **Endangered** species.

E. candollei Wall, *E. stocksii* HK. f. & Th. and *E. hookeriana*W. & A. are conspecific adopting the first name, but this should betreated provisional. Following Saldanha and Ramesh (1984) in Flora of Karnataka 1:230, our plant matches with *E. candollei*Wall, on the basis of the fruit character.

Specimen examined: *ASR* 2460 (SPU)

No conservation practices carried out for this species, yet due to protection of Amba forests in Dharampur,it has improved the population of this species.

Figure 262: *Eriolaena candollei*: A. Flowering, B. Fruiting, C. Seed

5.2.15 **Excoecaria agallocha L.**[= *Stillingaagallocha*(L.) Baill.]

Family: Euphorbiaceae

Habit: Tree

DSTR: Maharashtra

DSTR Gujarat: Valsad Dist.: Varoli, Sanjan (Bhatt *et al.*, 2008)

EOO = NA

AOO = 8 km²

No. of locations: 02

AOO density: 0

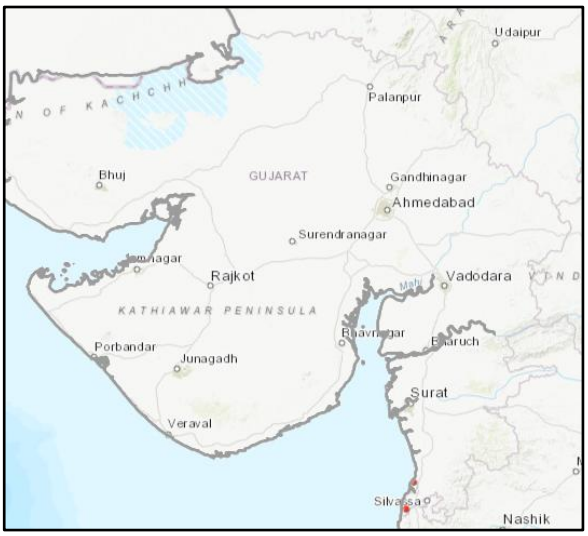


Figure 263: Distribution of *Excoecaria agallocha*

This is a back mangrove species and often exploits open areas and is tolerant of disturbed areas. Yet it is restricted in Gujarat and thus stated to be **Critically Endangered.**

Threats: Sea level rise is a major threat, especially to back mangroves that have no area in which to expand. Mangrove species with a habitat on the landward margin may be particularly vulnerable to sea-level rise if owing to coastal development their movement inland is blocked.

Figure 264: *Excoecaria agallocha* (Photo credit: S. Bhatt and D.G. Shah)

5.2.16 **Falconeria insignis Royle**[= *Sapiuminsigne*(Royle) Benth.& Hook.f.]

Family: Euphorbiaceae

Local name: Sherod

Habit: Tree

DSTR: Assam, Maharashtra, Goa, Karnataka, Tamil Nadu, Kerala

DSTR Gujarat:

Dang Dist. (Tadvi, 2013): Kotamdar (Suryanarayan, 1968), Kanchan Ghat, Saputara, Rambhas, Waghai

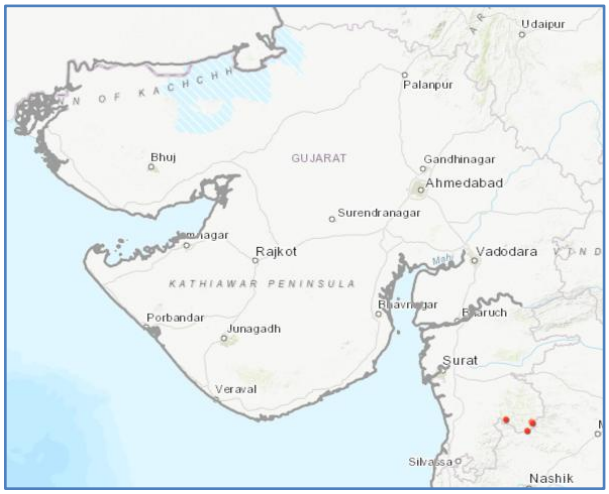


Figure 265: Distribution of *Falconeria insignis*

EOO = 160.7 km²

AOO = 16 km²

No. of locations: 03

AOO density: 0.25

It has been stated to be 'rare' in the Dangs by Suryanarayan (1968). And, based on his authority also documented in the Trees of Gujarat (2008) and mentioned that "there is only one tree in Kotumbdar Reserveforest at Malegaon". However, in the present work, we collected two individuals from Kotamdar and sixteen individuals from Kanchan Ghat near Galkund, and it is assessed as an **Endangered** tree species of Gujarat.

Threats: Exploited for its latex, that is obtained from its branches, and used as fish poison.

Even though the milk is said to bepoisonous, locally it has a medicinal value in externalapplication.

Specimen examined: 33458 (BSJO), BS 2791 (SPU)

Figure 266: *Falconeria insignis*: A. Habit, B. Fruit, C. Bark

5.2.17 **Indigofera coerulea Roxb.**[=*Indigofera coerulea*var. *coerulea*]

Family: Fabaceae

Local name: Surmai, Jungli Gali

Habit: Shrub

DSTR: Maharashtra, Tamil Nadu, Kerala

DSTR Gujarat:

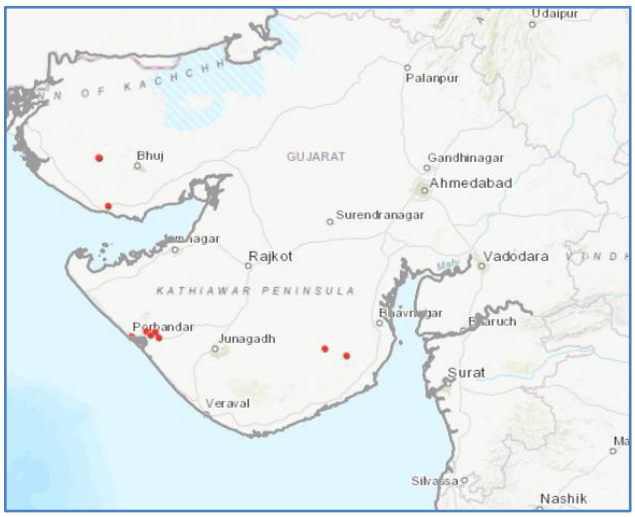


Figure 267: Distribution of *Indigofera coerulea*

Porbandar Dist.: Chhaya, Adodara, Bokhira, Ranavav, Bhod, Ranakandorna, Aniali (Thaker, 1910)

Bhavnagar Dist.: Naliyadhar, Shetrunjya (Nagar, 2008), Meena (2014) stated it as rare, and noticed in wastelands, neglected in corners of fields and garden, collected from Ukhral and Khigdia

Kachchh Dist.: Nakhtrana (Bhatt, 1993), Mandvi (Raole, 1993)

EOO = 21,418 km^2

AOO = 44 km^2

No. of locations: 07

AOO density: 0.36

Santapau (1962) reported var. *occidentalis* from Saurashtra region, but the description that he gives is of var. *coerulea*. Shah (1980) following Santapau lists var. *occidentalis* from Saurashtra and Bharuch.

Gillet (1958) in his monograph on *Indigofera* in tropical Africa gives distribution of var. *coerulea* as occurring in India but no Indian locality for the var. *occidentalis*. From the above evidence, it appears that Santapau's specimens from Saurashtra belong to var. *coerulea*. The variety occurs in Sind (Pakistan), Indian desert (Bhandari, 1978), North-East Rajasthan (Sharma and Tiagi, 1979), Saurashtra and Kachchh (Bhatt, 1993).

Due to its wide distribution in Saurashtra and Kachchh, it is a Near Threatened species as per its extent of occurrence. But as the area occupied by the species is very less, it is classified as an **Endangered** plant.

Specimen examined: *Meena* 24182, 24382, *KRN*33499 (BSJO)

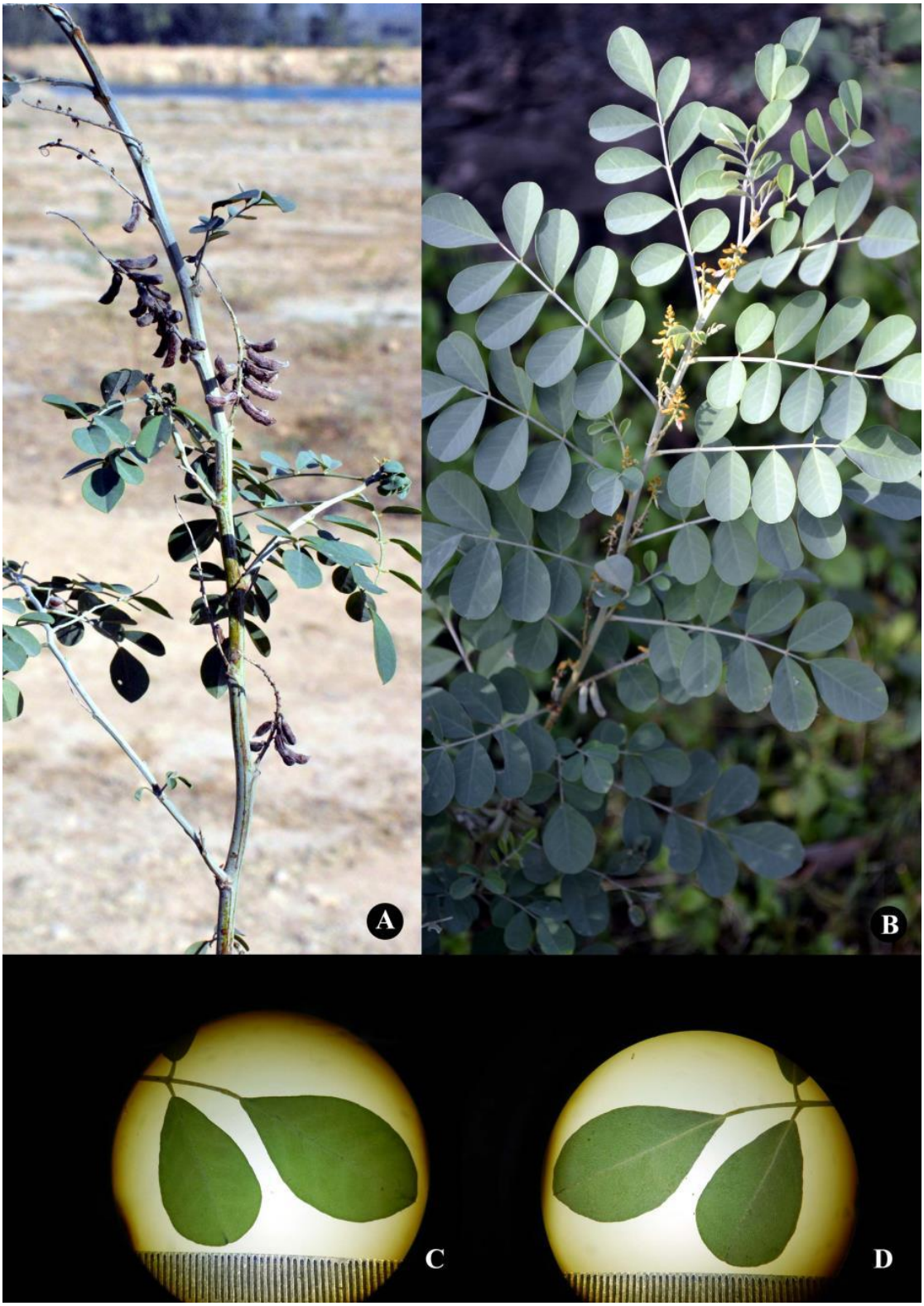


Figure 268: *Indigofera coerulea* var. *coerulea*: A. & B. Habit with Flowering and Fruiting, C. Leaflets glabrous above, D. Leaflets densely pubescent below

5.2.18 Ipomoea kotschyana Hochst.ex Choisy

Family:Convolvulaceae

Habit: Herb

Rao (1981) reported this herbaceous climberfrom Kachchh for the first time in India. While discussing rare andendangered and endemics of Kachchh, Sabnis and Rao (1983) stated thatthis taxon is common in southeastern parts of Kachchh, besides itsdistributional range in Mauritania, Mali, Dahomey, Niger, TechadmEthiopia and Sudan.

Figure 269: *Ipomoea kotschyana*

During the present field explorations, it was collected from Bhuj, Nakhatrana, Naliya, Mandvi and Anjar.

Specimen examined: *KRN*33469 (BSJO), *BAB* 322 (BARO)

EOO = 3264 km^2

AOO = 20 km^2

No. of locations: 05

AOO density: 0

Sandy habitats in surrounding areas of Bhuj, Nakhatrana, Desalpar, Khavada, Motiveraniare frequently disturbed by human activities and grazing. Since this plant is restricted only to Kachchh region in India, it isrecommended to

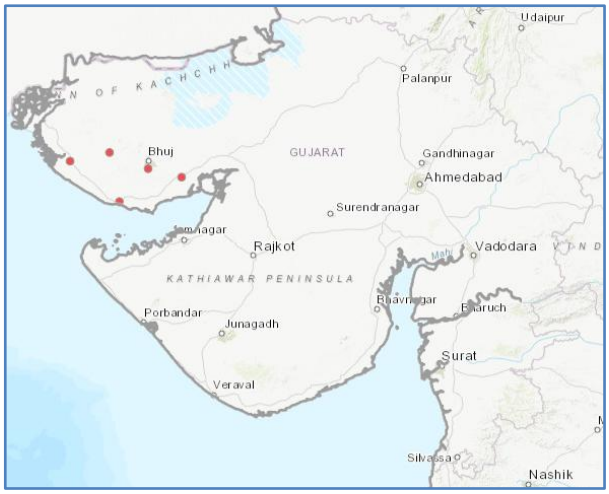


Figure 270: Distribution of *Ipomoea kotschyana*

protect its natural habitats. Its reintroduction into suitable habitats would be a better step towards its conservation.

5.2.19 Lumnitzera racemosa Willd.

Family: Combretaceae

Habit: Tree

DSTR: Maharashtra

DSTR Gujarat: Valsad Dist.: Varoli, Sanjan (Bhatt *et al.*, 2008)

EOO = NA

AOO = 8 km²

No. of locations: 02

AOO density: 0

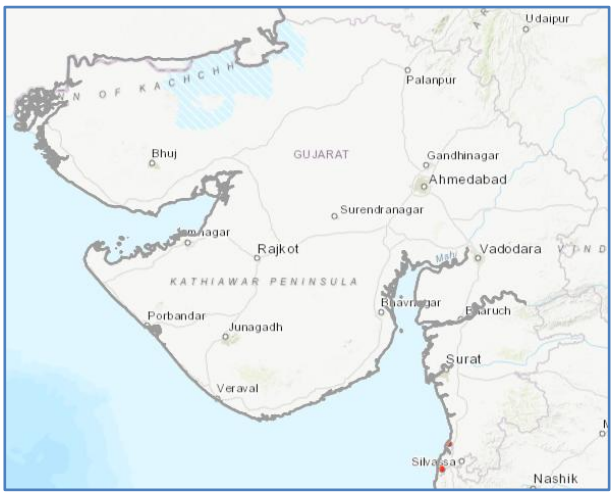


Figure 271: Distribution of *Lumnitzera racemosa*

Because of its very less extent and limited habitation, it is evaluated as a **Critically Endangered** species.

Threats: This species is particularly sensitive to siltation from upstream, land use changes, and erosion.

Figure 272: *Lumnitzera racemosa* in flowering (photo credit: S. Bhatt and D.G. Shah)

5.2.20 **Microchirita hamosa (R.Br.) Yin Z.Wang** [= *Chirita hamosa* R.Br.]

Family: Gesneriaceae

Habit: Herb

Figure 273: Distribution of *Microchirita hamosa*

DSTR Gujarat: In the Flora of Gujarat state, the family Gesneriaceae is represented by a single species *Didymocarpus pygmaeus* distributed in Dangs in southern Gujarat, Pavagadh, Devagadh-Baria, Chhota Udepur, Panchmahals in central Gujarat and Sarneshwar, Kadi in northern Gujarat (Shah, 1978).

EOO = NA

AOO = 8 km^2

No. of locations: 01

AOO density: 1

Figure 274: *Microchirita hamosa* in flowering

In the present work, we collected a member of Gesneriaceae from a single locality in Shoolpaneshwar wildlife sanctuary and on critical identification confirmed to be *Microchirita hamosa* (R.Br.) Yin Z.Wang. It was found growing in association with *Begonia picta*.

5.2.21 Olax nana Wall.ex Benth.

Family: Olacaceae

Habit: Herb

DSTR: North-Western Himalayas, Punjab, Nepal, Bihar, North Bengal, Assam, Burma, West Bengal and Odisha (Cooke 1903, Biswas 1971)

Figure 275: Distribution of *Olax nana*

DSTR Gujarat:

In Gujarat, the family Olacaceae is represented by a single species *O. nana*. First occurrence of this species in Gujarat state was stated by Cooke (1903) on the authority of C. Macnaghten from Rajkot district, Saurashtra region. Later the plant was documented by Thakar (1910) from Dharampur, Ranakandorna, Ranavav, Bhod and Aniyari villages of Porbandar district. It was stated to be rare in Saurashtra by Santapau (1962). Since then the plant was never stated from the reported localities (Shah 1978, Nagar 2003). During the present studies, its presence was reconfirmed for Gujarat state after 104 years, from Kachchh.

EOO = 1666.4 km^2

AOO = 24 km^2

No. of locations: 01

AOO density: 1

Due to its limited habitation and range, it is considered to be an **Endangered** species.

Specimen examined: *KRN*33493 (BSJO)

Figure 276: *Olax nana*: A. Habitat, B. Flowering (Credit: Ritesh Pokar), C. Habit

5.2.22 Sterculia guttata Roxb. ex G.Don.

Family: Sterculiaceae

Local name: Dawalo

Habit: Tree

DSTR: Maharashtra, Goa, Karnataka, Tamil Nadu, Kerala

DSTR Gujarat:The plant was spotted for the first time from Kaprada, and reported as a new record for Gujarat state (Joshi, 1983). Later, fifteen individuals were reported by Suthar (2010) from Mulgam faliya in Kaprada.

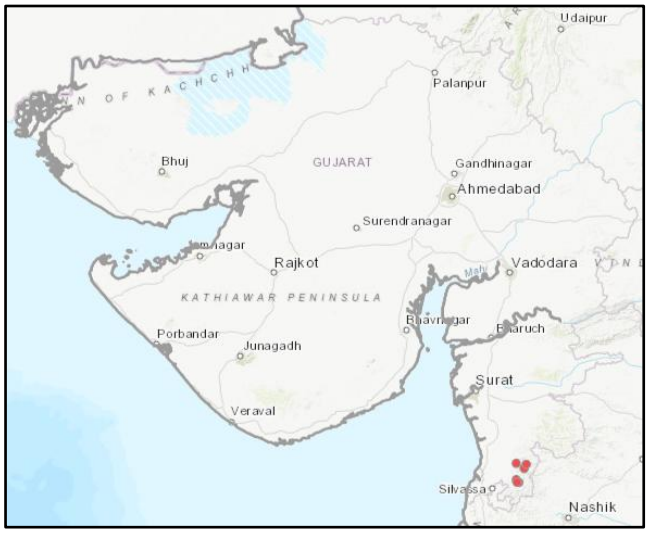


Figure 277: Distribution of *Sterculia guttata*

In the present study, twelve indiduals could be traced from Pangarbari, Sidhumbar, Dabkhal and Dinbari.

Conservation measures were undertaken at Amba forest nursery, Dharampur (*Pers. Comm.* Shri Dipak Pandya) and at silviculture nursery, Rajpipla (*Pers. Comm.* Shri G. I. Naik).Seed's kernel is edible; also the tree can be cultivated as an avenue true for its aesthetic appearance.

EOO = 131.6 km^2

AOO = 24 km^2

No. of locations: 03

AOO density: 0.5

Based on the distribution analysis, it is categorized as an **Endangered** species for the state.

Specimen examined: *KRN*33496 (BSJO)

Figure 278: *Sterculia guttata*: A. Habit, B. Flowering, C. Fruiting

5.2.23 Talinum portulacifolium (Forssk.) Asch. ex Schweinf.[=*Portulacacuneifolia*Vahl; *Talinumcuneifolium*(Vahl) Willd.]

Family: Portulacaceae

Habit: Herb

DSTR Gujarat: Kachchh Dist.: Dhinodhar

The species is reported to be very rare and has been mentioned in the flora of Gujarat on the authority of Dr. B.S. Vaidhya who collected it from Ahmedabad (Shah, 1978). Later, Patel *et al*. (2014) reported it from Kachchh.

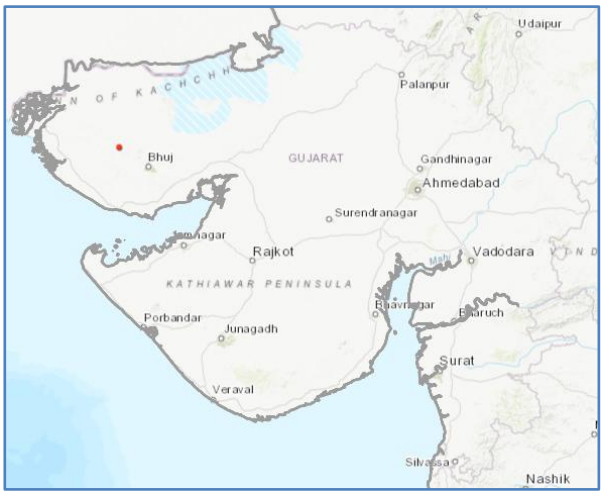


Figure 279: Distribution of *Talinum portulacifolium*

T. portulacifolium is generally confused for *T. triangulare* - a cultivated species. Both the species can be differentiated by leaf apex and seeds.Probably the plant located from Ahmedabad could be mis-identified.

Plant grows in rocky substratum and is restricted to peak of the hillocks. The growth and development should be intensively studied.

EOO = NA

AOO = 4 km^2

Due to its restricted distribution it is evaluated as **Critically Endangered** species for Gujarat.

Specimen examined: *KRN*33461, 33462 (BSJO)

Figure 280: *Talinum portulacifolium*: A. Habit, B. Flower, C. Seeds, D. Fruiting

5.2.24 Tolypanthus lageniferus Tiegh.

Family: Loranthaceae

Habit: Herb

This partial stem parasite was reported for Gujarat flora fromSongadh forests before three decades (Mac, 1982). Later, it was collected by Parabia *et al.*(2001) from Pindwal in Dharampur forests. It was then reported by Rao (2002) from Malegaon, Ahwa, Tutterkhed in Dangs and Sidumbar in Valsad. Thus it appears to show a continuous distribution inthe Western Ghats of Gujarat.

In the present work it was observed to be growing on *Terminalia chebula* in Anjankund and Chinchli of the Dangs forest. Due to restricted distribution, it has been assessed as **Critically Endangered** for Gujarat.

Specimen examined: *VRR* 2230, 2278 (SPU)

Figure 281: *Tolypanthus lageniferus*