RESEARCH ARTICLE

DIVERSITY OF ANGIOSPERM CLIMBER SPECIES IN POINT CALIMERE WILDLIFE AND BIRD SANCTUARY, TAMIL NADU

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Manuscript Info

Abstract

Climbers are currently understood to have a range of important ecological functions in forest dynamics. Climbers are already recognized as an important group for tropical biodiversity, playing a key role in ecosystem level processes and providing resources for pollinators and dispersers. The present study is an attempt to document different climber species and their uses in Point Calimere Wildlife and Birds Sanctuary, Tamil Nadu, India. The present study recorded 53 herbaceous climbers and 21 lianas from all the forests types of Point Calimere Sanctuary, covering 25 families. Considering all climbers and lianas, 40 species are stem twiners, 2 species are branch twiners, 4 are spiny Climbers, 19 species are tendril climbers and 8 species are hook climbers. Most of the lianas are distributed in scrub forests and many climbers are recorded in wet lands. 53 medicinal climbers are recorded in the study area. Roots and leaves are widely used to treat diseases. To obtain a better comprehension of the floristic, ecological and biogeographical patterns of climbing species at a global scale, it is of the utmost importance that future studies include an increased number of subtropical and temperate sites.

Introduction:

The angiosperms, or flowering plants, are the largest, highly diversified, and most successful major group forming the dominant vegetation on the planet earth. Christenhusz and Byng (2016) recorded the currently known, described and accepted number of flowering plant species to 295,383 with 74,273 monocots and 210,008 are eudicots. In India, about 20,000 flowering plants are recorded so far including cultivated/naturalised ones with approximately 15% endemic species. Climbers are rooted in the ground but need support for their weak stems (Richards, 1952). Climbers are classified into various categories such as scrambles, root climbers, twines and tendril climbers. Climbers are part of biological spectra of forest ecosystems. They not only form an important structural component but also play an important ecological role in the forest dynamics and nutrient recycling within these ecosystems (Sarvalingam and Rajendran, 2015). However, in many forest inventories during the last decades, lianas are ignored (Dallmier and Comiskey, 1998) in contrast to herb, shrubs and trees. The present study focuses on diversity of climbers and their economical importance in the Point Calimere Wildlife and Bird Sanctuary, Tamil Nadu, India.

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Study area
The Point Calimere, the renowned wildlife and bird sanctuary located in Nagapattinam district of Tamil Nadu, spreads across an area of 30 sq.km and comprises sandy coastal, saline swamps, sand dunes (the highest of them 23 ft tall), tidal mud-flats, shallow seasonal ponds and thorn scrub forests around the backwater. It is a protected area along the Palk Strait where it meets the Bay of Bengal at Point Calimere and a Ramsar site. Point Calimere sanctuary is the home to black bucks, its flagship species, along with feral pony, spotted deer, bonnet macaque, jackal, wild boar, mongoose, black-naped hare, and Indian star tortoise. The Vedanayam salt swamp, the largest in Tamil Nadu, that runs 7 to 8 km wide to a length of 48 km along the coast from Point Calimere, is one of the richest regions of biodiversity in the country. Several historical sites like Ramarpadam, Modimandapam and Old Chola lighthouse are located in the Sanctuary. Sanctuary receives rain under the influence of both southwest and northeast monsoons. The region receives an annual rainfall of 1500 mm (Map 1).

Methodology:
Field trips were carried out in whole areas of the Point Calimere Wildlife and Bird Sanctuary in various seasons. The climbers are collected and identified with the help of floras (Gamble and Fischer (1915 -1936), Mathew (1981 – 1988) and Daniel and Umamaheswari (2001). The details like name (family, plant name, and local name), locality, date of collection, habit and habitat, uses, distribution and salient features like association were recorded in an elaborate field book. The voucher specimens are housed in Medicinal Plants Garden, CCRS, Mettur, Salem, Tamil Nadu. Information on nomenclature and family was taken from an online botanical database Tropicos (2017). For the uses and common names, Useful plants of India (1986) and Yognarasiman (2000) were referred.

Observation And Discussion:
The present study recorded 53 herbaceous climbers and 21 lianas from all the forests types of Point Calimere Sanctuary, covering 25 families. In dicotyledons, there are 23 families containing 60 genera and 71 species. In monocotyledons, there are 2 families containing 3 genera and 3 species; considering all climbers (C) and lianas (L), 40 species are stem twiner, 2 species are branch twiner, 4 are spiny climbers, 19 species are tendril climbers and 8 species are hook climbers (Table 1). In Cardospermum petiole modified into tendrils, whereas in Cissus and Cyphostemma axillary tips are modified into tendrils. In Passiflora, branch and peduncle are modified into tendrils. In Strychnos minor modified branchlet ends into tendrils. Thorns act as hook to climb over the support in Ziziphus oenoplia and Scutia myrtina. Inflorescence axis modified into hook in Aristolochia indica. Hugonia mystax is straggling climber with spiral hooks. Some geophytic plants such as, Dolichos trilobus consists of root with a fascicle of 3-6 tuberous rootlets. Fleshy tubers present in Trichosanthes tricuspidata, Cyphostemma setosum, Asparagus racemosus and Gloriosa superba.

Distribution of climbers at Point Calimere
Vegetation of the area of study can be classified into sea-shore vegetation, aquatic vegetation, dry evergreen vegetation and mangrove vegetation. Grewia oppositifolia, G. umbellifera, Capparis sepiaria, Cissus quadrangularis, Coccinia grandis, Mukia maderaspatana, Azima tetracantha, Cansjeera rhedii, Pergularia daemia, Basella alba, Asparagus racemosus and Gloriosa superba are frequent in the scrub forests of Ramarpadam. Dioscorea pentaphylla is scarce in the evergreen forest. Cassytha filiformis, Aristolochia indica, Ipomoea marginata, Sarcochscma secamone, S. acidum Ctenolepis garcini, Corallocarpus epigaeus, Passiflora foetida, Cardiospermum halicacabum, Teramus labialis and Dolichos trilobus are found common along water channels and near water bodies such as Nadupallam, Nallathaneerkulam etc., Aganosma cymosa, Ipomoea marginata and Canavalia virosa are frequent along railway tracts. Hugonia mystax is less common along the abandoned railway tract. Cissampelos pareira, Cocculus hirsutus, Pachygone ovata, Tinospora cordifolia, Cissus vitiginea, Abrus precatorius, Clitoria ternatea are common over bushes in varied forest types.

Two villages are located inside the area of study, Kodikkadu in the north and Kodikkarai near angular extreme of Point Calimere are connected by road. Jasminum sambac, Jasminum officinale are planted in the household gardens. Trichosanthes tricuspidata is common in well drained soil. Citrullus colocynthis, Mucuna pruriens and Caesalpinia bonduc are common in the coastal vegetation. Ctenolepis garcini, Rhynchosia minima, Lablab purpureus, Cardiospermum canescens and Ipomoea obscura forms mats over other vegetation during the monsoon period.
Endemics
Asparagus racemosus is reported as a threatened species in Southern Western Ghats (Sarvalingam et al. 2012; Uma and Parthipan, 2015). Celastrus paniculatus recorded as nearly threatened (Gritto et al., 2012) and Gloriosa superba identified as an endangered in Western Ghats (Amalraj et al., 1991; Sukumaran and Raj, 2007; Gritto et al., 2012). The medicinal climber Hemidesmus indicus reported as a depleted species in Western Ghats (Amalraj et al., 1991; Matthew, 1981-1988; Sukumaran and Raj, 2007). Aristolochia indica recorded as a rare species in Southern Western Ghats (Murugeswaran et al., 2014; Sharma and Thokchom, 2014).

Exotics
Biodiversity loss caused by invasive species may soon surpass the damage done by habitat destruction and fragmentation. Biological invasions are an important component of human-caused global environmental change. Invasive alien species are now a major focus of global conservation concern. The decisions need to be made on whether benefits derived from the invasive spread of an alien species outweigh the reduced value of ecosystem services (Sudhakar Reddy et al., 2008). The present study reported invasive species such as Ipomoea obscura, Ipomoea pes-tigridis, Clitoria ternatea and Passiflora foetida.

Economical importance
The people who dwell in Point Calimere jungles are presently called “Seenthil Valayars”. It is said the name Seenthil Valayars came because these people are known to consume the climber Seenthil (Tinospora cordifolia) stems. Mucuna pruriens seeds are edible after processing by the native forest dwellers. Lablab purpureus, Momordica charantia, Momordica dioica and Canavalia viroso fruits are used as vegetable. Dioscorea pentaphylla tubers are edible. Basella alba, Ipomoea obscura and Ipomoea marginata young leaves used as spinach. Ziziphus oenoplia fruits are edible. India has about 265 climber species, of which 125 are woody and the rest are herbaceous. About 100 species are medicinal in nature (Chaudhuri, 2007). Climbers are widely used in traditional systems of medicine (Eilu and Bukenya-Ziraba, 2004). 53 medicinal climbers are recorded in the study area (Table 2). Roots and leaves are widely used to treat diseases.

Source: District Forest Office, Nagapattinam.
| S. No. | Botanical name | Family          | Tamil name            | Mode of climbing | Nature of climbing organ (modification) | Habit |
|-------|----------------|-----------------|-----------------------|------------------|----------------------------------------|-------|
| 1.    | Abrus precatorius L. | Fabaceae | Kuntri               | Twiner           | Stem                                   | C     |
| 2.    | Aganosma cymosa (Roxb.) G. Don. | Apocynaceae | Saraikkodi          | Twiner           | Stem                                   | L     |
| 3.    | Aristolochia indica L. | Aristolochiaceae | Ishvari, Karudakkodi | Hook climber    | Inflorescence axis                      | C     |
| 4.    | Asparagus racemosus Wild. | Asparagaceae | Thanhirvittan Kizhangu | Spiny twiner    | Leader axis and branches                | C     |

Table 1: Climbers of Point Calimere Wildlife and Birds Sanctuary.
|   | Species Name                                                                 | Family       | Common Name                  | Life Form | Climbing Mechanism                        | C   |
|---|------------------------------------------------------------------------------|--------------|------------------------------|-----------|------------------------------------------|-----|
| 5 | Azima tetracantha Lam.                                                        | Salvadoraceae| Mul Chankan                  | Spiny straggler | Leader axis and branches                  | C   |
| 6 | Basella alba L.                                                               | Basellaceae  | Pasalaikerei                 | Twiner    | Stem                                     | C   |
| 7 | Caesalpinia bonduc (L.) Roxb.                                                 | Fabaceae     | Kazharchi kottai             | Hook climber | Prickles on stem & leaf rachis            | L   |
| 8 | Canavalia virosa (Roxb.) Wight & Arn.                                        | Fabaceae     | Koliavarai, Kattu thummattai | Twiner    | Stem                                     | C   |
| 9 | Cansjera rheedii Gmel.                                                        | Opiliaceae   | Spiny Climber                | Leader axis and branches | L   |
| 10 | Capparis brevispina DC.                                                       | Capparaceae  | Twiner & straggler           | Leader axis of main stem and branches | L   |
| 11 | Capparis sepiaria L.                                                          | Capparaceae  | Thorati                      | Leader axis of main stem and branches | L   |
| 12 | Capparis zeylanica L.                                                         | Capparaceae  | Aathandai                    | Leader axis of main stem and branches | L   |
| 13 | Cardiospermum canescens Wall.                                                 | Sapindaceae  | Mudakkartan                  | Tendril climber | Petiole modified                        | C   |
| 14 | Cardiospermum halicacabum L.                                                  | Sapindaceae  | Mudakkartan                  | Tendril climber | Petiole modified                        | C   |
| 15 | Cassytha filiformis L.                                                        | Lauraceae    | Erumaikkottan                | Twiner    | Stem                                     | C   |
| 16 | Ceropegia candelabrum L.                                                      | Apocynaceae  | -                            | Twiner    | Stem                                     | C   |
| 17 | Ceropegia juncea Roxb.                                                        | Apocynaceae  | Somakodi                     | Twiner    | Stem                                     | C   |
| 18 | Cissampelos pareira L., var. hirsuta (DC.)                                   | Menispermaceae| Ponnusuttai                  | Twiner    | Stem                                     | C   |
| 19 | Cissus quadrangularis L.                                                      | Vitaceae     | Pirandai                     | Tendril climber | Axillary tips                        | C   |
| 20 | Cissus vitiginea L.                                                           | Vitaceae     | Naralai                      | Tendril climber | Axillary tips                        | C   |
| 21 | Citrullus colocynthis (L.) Schrad.                                            | Cucurbitaceae| Aartu thummatti; Varikummati | Tendril climber | Stem                                     | C   |
| 22 | Clitoria ternatea L.                                                          | Fabaceae     | Kakkartan                    | Twiner    | Stem                                     | C   |
| 23 | Coccinia grandis (L.) Voigt.                                                  | Cucurbitaceae| Kovai                        | Tendril climber | Stem                                     | C   |
| 24 | Cocculus hirsutus (L.) Diels                                                  | Menispermaceae| Kattukkodi                   | Twiner    | Stem                                     | C   |
| 25 | Corallocarpus epigaeus (Rottl.) C.B. Clarke                                  | Cucurbitaceae| Kollankovai                  | Tendril climber | Stem                                     | C   |
| 26 | Ctenolepis garcinii (Burm. f.) C.B. Clarke                                   | Cucurbitaceae| Nypa                         | Tendril climber | Stem                                     | C   |
| 27 | Cyphostemma setosum (Roxb.) Alston                                           | Vitaceae     | Pulinaralai                  | Tendril climber | Axillary tips                        | C   |
| 28 | Dalbergia coromandeliana Prain                                                | Fabaceae     | -                            | Hook climber | Hooks and twisted branches              | L   |
| 29 | Derris scandens (Roxb.) Benth.                                                | Fabaceae     | Takil                        | Hook climber | Hooks and twisted branches              | L   |
| 30 | Dioscorea pentaphylla L.                                                      | Dioscoreaceae| Vallaikodi                   | Twiner    | Stem                                     | C   |
| No. | Species Name | Family | Common Name(s) | Voucher Designation | Habit | Axis of Climb |
|-----|--------------|--------|----------------|---------------------|-------|---------------|
| 31  | Diplocyclos palmastrum (L.) C. | Cucurbitaceae | Iviralikkovai | Tendril climber | Stem | C |
| 32  | Dolichos trilobus L., | Fabaceae | Minnikizhangu | Twiner | Stem | C |
| 33  | Gloriosa superba L. | Colchicaceae | Kalappaikizhangu, Kanvalipoo | Tendril climber | Leaf tip | C |
| 34  | Grewia oppositifolia Buch. | Malvaceae | Unnu | Twiner & straggler | Leader axis of main stem and branches | L |
| 35  | Grewia umbellifera Beddome | Malvaceae | - | Twiner & straggler | Leader axis of main stem and branches | L |
| 36  | Hemidesmus indicus (L.) R.Br. var. indicus | APOCYNACEAE | Nannari | Twiner | Stem | C |
| 37  | Hugonia mystax L., | Linaceae | Mothirakanni | Hook climber | Hooks and twisted branches | C |
| 38  | Ichnocarpus frutescens (L.) R. Br., | Apocynaceae | Utharkodi, Paravalli | Twiner | Stem | L |
| 39  | Ipomoea marginata (Desr.) Verde. | Convolulaceae | Siruthazhi | Twiner | Stem | C |
| 40  | Ipomoea pes-tigridis L. | Convolulaceae | Punaikkirai, Pulisuvasi | Twiner | Stem | C |
| 41  | Ipomoea obscura (L.) Ker Gawler | Convolulaceae | Thazhi | Twiner | Stem | C |
| 42  | Jasminum angustifolium (L.) Wild. | Oleaceae | Kattumalligai | Twiner | Stem | L |
| 43  | Jasminum officinale L. | Oleaceae | Pitchi | Twiner | Stem | C |
| 44  | Jasminum sambac (L.) Ait. | Oleaceae | Malligai | Twiner | Stem | C |
| 45  | Kedrostis foetidissima (Jacq.) Cogn | Cucurbitaceae | Appakkovai | Tendril climber | Stem | C |
| 46  | Lablab purpureus (L.) Sweet. | Fabaceae | Mochai, Kattu avarai | Twiner | Stem | C |
| 47  | Leptadenia reticulata (Retz.) Wight & Arn. | Apocynaceae | Paala kodi, Keerappalai | Twiner | Stem | C |
| 48  | Momordica charantia L. | Cucurbitaceae | Pagal | Tendril climber | Stem | C |
| 49  | Momordica dioica Roxb. ex Willd. | Cucurbitaceae | Pazhupagad | Tendril climber | Stem | C |
| 50  | Mucuna pruriens (L.) DC., | Cucurbitaceae | Poonakatchi, Poonakali | Twiner | Stem | C |
| 51  | Mukia maderaspatana (L.) M. Roem. | Cucurbitaceae | Musumusukai | Tendril climber | Stem | C |
| 52  | Olax scandens Roxb. | Oolacaceae | Kadalaranji | Twiner | Branch | L |
| 53  | Pachygone ovata (Poir.) Miers ex Hook. f. & Thoms. | Minispermaceae | Kattukkodi | Twiner | Stem | C |
| 54  | Passiflora foetida L. | Passifloraceae | Jimikkipoo, Poonaipidukku | Tendril climber | Branch and peduncle | C |
| 55  | Pentatropis capensis (L.f.) Bullock | Apocynaceae | Uppilankodi, Uppilikodi | Twiner | Stem | C |
| 56  | Pergularia daemia | Apocynaceae | Uttamani, | Twiner | Stem | C |
| S. No. | Botanical name | Medicinal uses |
|--------|----------------|----------------|
| 1.     | Abrus precatorius | The leaves and roots sweet |
| 2.     | Aganosma cymosa | Useful in diseases of paraplegia, sciatica and neuralgia |
| 3.     | Aristolochia indica | Root, stem used as antidote and anti-inflammatory |
| 4.     | Asparagaceae racemosus | Root tubers tonic, diuretic and galactagogue |
| 5.     | Azima tetracantha | Juice of the leaves used to relieve cough and phthisis |
| 6.     | Caesalpinia bonduc | Leaves and bark used as febrifuge, emmenagogue, anthelmintic |
| 7.     | Capparis brevipinna | Root barks stomachic |
| 8.     | Capparis zeylanica | Root bark sedative, stomachic, used in cholera. |
| 9.     | Cardiospermum canescens | Plant useful in rheumatism |
| 10.    | Cardiospermum | Leaves used to relieve gastritis |

**Table 2:** Medicinal importance of climbers.
| 11. | Cassytha filiformis | Plant used in bilious affections, urethritis |
| 12. | Ceropogia juncea | Leaves used in skin diseases |
| 13. | Cissampleos pareira var. hirsuta | Root diuretic, antiperiodic, used in urinary troubles |
| 14. | Cissus quadrangularis | Plant used in bone setting, the juice prescribed in scurvy. |
| 15. | Cissus vitiginea | Crushed stem bark is used to heal wounds |
| 16. | Citrullus colocynthis | Fruit pulp considered drastic hydragogue, cathartic |
| 17. | Clitoria ternatea | Roots cathartic and diuretic |
| 18. | Coccinia grandis | Root, stem, leaf. Fruit used in skin diseases, ulcers, stomatitis, diabetes and asthma |
| 19. | Cocculus hirsutus | Whole plants used as cooling agent |
| 20. | Cyphostemma setosum | Tubers useful in piles |
| 21. | Diploycyclos palmas | Whole plant used in constipation and as aphrodisiac |
| 22. | Dolichos trilobus | Roots used for constipation, ophthalmia and skin diseases |
| 23. | Gloriosa superba | Root tubers used as tonic, stomachic and anthelmintic |
| 24. | Hemidesmus indicus var. indicus | Root used in urinary diseases, and in glandular swellings |
| 25. | Ichnocarpus frutescens | Root as a substitute for Hemidesmus root |
| 26. | Ipomoea pes-tigridis | Leaf poultice is used to heal cuts and wounds |
| 27. | Jasminum angustifolium | Leaf juice given as an emetic in poisoning |
| 28. | Jasminum officinale | Useful in making garlands, also useful in eye diseases, headache and skin diseases |
| 29. | Kedrostis foetidissima | Root is useful in piles |
| 30. | Leptadenia reticulata | Plants useful in habitual abortion, stimulant and restorative |
| 31. | Mucuna pruriens | Root, seed useful in diarrhoea, hemiplegia, filariasis and as aphrodisiac |
| 32. | Mukia maderaspatana | Root, leaf used in fever, diseases of kapam, and abdominal disorders |
| 33. | Olax scandens | Bark used in anaemic conditions due to fevers |
| 34. | Pachygone ovata | Whole plants used as cooling agent |
| 35. | Passiflora foetida | Fruits emetic. Fruit decoction used in asthma and biliousness |
| 36. | Pentatropis capensis | Plant used in general debility |
| 37. | Pergularia daemia | Whole plant useful in convulsions, asthma and in worm infestation |
| 38. | Phyllanthus reticulatus | Bark used in rheumatism, dysentry and venereal diseases |
| 39. | Pisonia aculeata | Roots expectorant, diuretic and laxative, used in asthma |
| 40. | Rhyynosia minima | Leaves used as an abortifacient |
| 41. | Salacia chinensis | Roots used in diabetes; decoction given in amenorrhoea and venereal diseases |
| 42. | Sarcostemma acidum | Dried stem emetic |
| 43. | Sarcostemma secamone | Decoction of the plant useful in sore throat |
| 44. | Scutia myrtina | Leaf poultice is applied to hasten parturition |
| 45. | Solanum trilobatum | Leaf used to treat tuberculosis, respiratory problems and bronchial asthma |
| 46. | Teramnus labialis | Seeds useful in fever and in pain |
| 47. | Tiliacora acuminata | Used as a cure for snakebite |
| 48. | Tinospora cordifolia | Stems are medicinal having anti-diabetic properties |
| 49. | Toddalia asiatica | Root bark used as diaphoretic, stomachic, and antipyretic |
| 50. | Trichosanthes cucumerina | Fruit febrifuge, bitter tonic, emetic, emmenagogue and cathartic |
| 51. | Trichosanthes tricuspidata | Fruits used in migraine |
| 52. | Tylophora indica | Leaves and roots used in asthma, bronchitis and whooping cough |
| 53. | Wattakaka volubilis | Plant juice used as a sternutatory |

**Discussion:**
Similar to present study, previous reports on climber diversity at Southern Western Ghats of Coimbatore (Sarvalingam and Rajendran, 2015), in Rajshahi region, Bangladesh (Rony Rani et al., 2019), Araucaria forest of
Rio Grande do Sul State, Brazil (Guilherme Dubal dos et al., 2014), temperate forests of the Americas (Annik Schnitzler et al., 2016) and in North Andaman Forest, India (Asutosh Ghosh, 2013) also recorded taxonomic and ecological diversity of climbing plants. DeWalt et al. (2000), Muthuramkumar and Parthasarathy (2001), Perez-Salicerup et al. (2001), Phillips et al. (2002), Parthasarathy et al. (2004), Rice et al. (2004), Phillips et al. (2005). DeWalt et al. (2006), Ghosh, (2013) reported on the lianas diversity in various forests.

The bird’s congregation of the Point Calimere Sanctuary depends on the forest canopy. The canopy of the scrub jungle is significantly mated by the lianas. The lianas provide habitat for the migratory birds. In these nests, the birds had skirted Point Calimere in their route towards Sri Lanka. The loss of green cover certainly drastically damages the bird’s life. Though it is a protected area, chemical companies and small-scale shrimp farms around the wetland have started to pose a threat to the biodiversity and ecosystem of the sanctuary. Strict environmental regulations should be imposed and salt pan and other aquaculture practices, unregulated economical activities around the sanctuary should be prohibited. This effective action will help in maintaining species diversity and composition to provide suitable breeding sites in the sanctuary.

Acknowledgement:
Authors are thankful to the Dr. K. Natarajan, Head and Professor, Department of Botany (Rtd.), St. Xavier’s College, Palayamkottai for providing available research facilities.

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