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LESS-KNOWN FLOWERING PLANTS IN THE NEIGHBOURHOOD OF PUDUCHERRY SOUTH-EASTERN INDIA

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ABSTRACT

A qualitative-floristic survey was conducted in the outskirts of Puducherry, south-eastern India, in the year 2011. A total of 431 species from 78 families were determined during the survey. Thirteen of these species, belonging to 12 genera and 11 families were of less known occurrence in this region. The regional floras indicate that nine of these species are distributed from the coast to the plains and four in hilly areas. Among the species three are not common in the Tamilnadu Carnatic region. Two of the listed species, *Cynanchum tunicatum* (Retz.) Alston and *Crotalaria evolvuloides* are reported for the first time from the Puducherry region. These plants have become endangered severely due to anthropogenic pressures. The documented species require rapid conservation efforts to mitigate their loss.

Key words: Anthropogenic pressure, Habitat fragmentation, Natural regeneration, Floristic exploration.

Introduction

Coastal landscape of the Indian sub-continent includes a range of ecosystems (Rao and Meher-Homji, 1985). The peninsular-Indian landscape, in particular, consists of evergreen and deciduous forests at different altitudes and mangroves along the coast. The present study reports a survey undertaken in the neighbourhood of Puducherry, a coastal town in south-eastern India that comprises rich and diversified vegetation along the Coromandel Coast, falling into the category Tropical Dry Evergreen Forest (TDEF) (*sensu* Champion and Seth, 1968).

Extensive ecological studies, plant inventories and ethno-botanical studies carried out in this region in the last five decades have pointed out that the forests are being fragmented severely by anthropogenic pressures, resource extraction, grazing and invasion of weeds (Gupta *et al*., 1959; Gupta and Marlange, 1961; Meher-Homji, 1966, 1974, 1977; Blasco and Legris, 1973; Kadavul *et al*., 2004a, 2004b; Kadavul and Jisha, 2006; Ramanujam *et al*., 2007; Parthasarathy *et al*., 2010; Udayakumar and Parthasarathy, 2010; Padmavathy and Anbarashan, 2011)

Much of the focus in these studies has been on woody plants. The present study focuses on other life forms and has been undertaken to determine whether any less-known species exist here, which we define as those species either not documented at all or rarely documented. We aim to highlight their ecological significance *vis à vis* the present scenario of rapid urbanization and other anthropogenic pressures.

Material and Methods

Study area

The survey covered Puducherry town (11^{0}46'? 12^{0}3' N, 79^{0}36'? 79^{0}53' E) and its outskirts (Fig. 1) in south-eastern India with a forest cover of 43.87 km^2 (Forest Survey of India 2009). The forests mainly comprise TDEF patches, sacred groves, and mangroves. Geologically, the region has been characterized as Cuddalore sand-stone formation with red ferralitic soil of the Miocene period (Meher-Homji, 1974). Plant macro-fossil remains indicate the existence of wet or semi-evergreen forest during the Eocene? Miocene periods (Meher-Homji, 1995).

The rainfall is seasonal, 63% of total precipitation occurring between October and December, i.e., retreating north-east monsoon as recorded in a 30 year average (Fig. 2); much of this rainfall occurs through thundershowers and depressions and/ or cyclones, a phenomenon frequent along the Bay of Bengal coast. In 2011, the total annual rainfall was 1751 mm with 67 rainy days, which was actually above the mean rainfall and rainy days of the last 30 years; the monthly mean temperature ranged from 20.8^{0}C to 37.9^{0}C during January and June, respectively (Fig. 2).

Methods

Qualitative-explorative surveys were carried out

Thirteen species belonging to 12 genera and 11 families are of lesser known occurrence among total 431 species reported from the neighbourhood of Puducherry.

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weekly in 2011. Plant species collected were identified using regional floras, *viz.,* Gamble and Fischer (1915-1935); Matthew (1981-1983); Nair *et al.* (1983); Henry *et al.* (1987) and Henry *et al.* (1989). Voucher specimens have been deposited in the Herbarium of the French Institute of Pondicherry (HIFP), Puducherry. The surveys included recording of vegetative and reproductive phenologies of plants to understand their ecology. The short-listing of the less-known is based on a perusal of lists of species available in published papers over the last 50 years and our assessments.

Results and Discussion

This survey recorded a total of 431 species representing 78 families belonging to seven life forms. Among these, in comparison with previous studies and also based on our survey, we identified 13 taxa as less known.

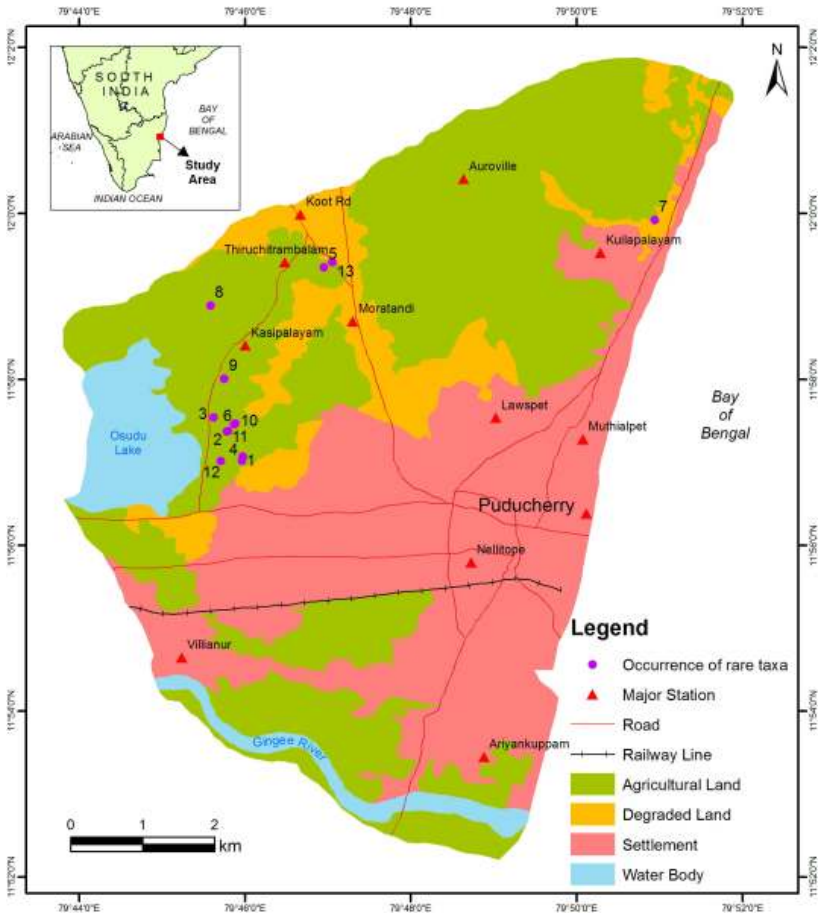

Fig. 1 : Map of Pondicherry and its surroundings showing the locations and their profiles (numbers correspond to species listed in table 1)

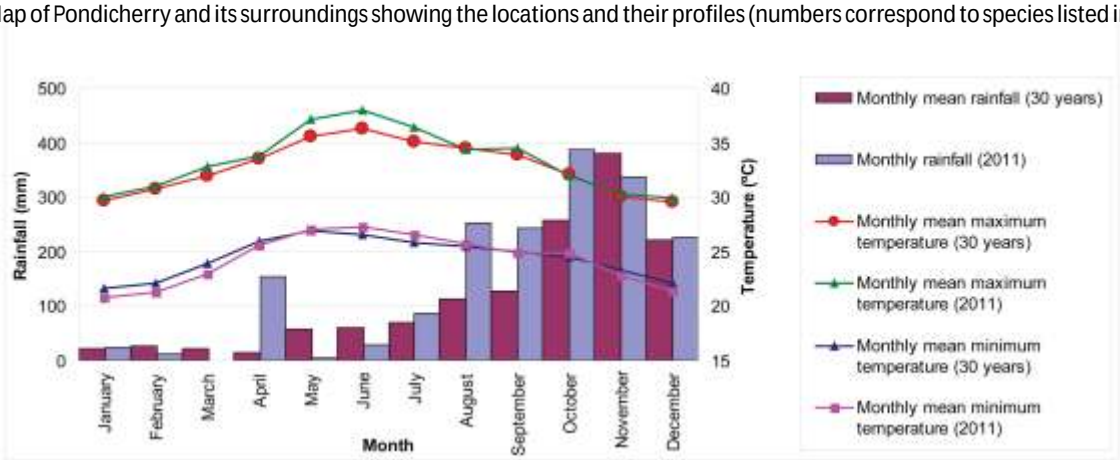

Fig. 2 : Pattern of distribution of rainfall and temperature during last thirty years (1981-2010) and 2011

Table 1 : Less known species and their ecology

No	Family	Binomial	Accession number (HIFP)	Flowering phenology	Fruiting phenology	Collection details		Plant description	Regional distribution details (Gamble and Fischer, 1915- 1935; Matthew, 1981-1983)
						Place of collection	Habitat		
1	Acanthaceae	*Blepharis repens* (Vahl) Roth	26561	Jan.-Dec.	Jan.-Dec.	Chinna Mudhaliyar Chavadi and Ousteri Lake	Dry exposed hard red soil, barren condition	Prostrate to ascending herb, blue flower,	Plains from the coast, to 400 m
2	Aizoaceae	*Trianthema triquetra* Rottl. ex Willd.	25778	Jan.-Dec.	Jan.-Dec.	Ousteri	Alkaline clayey soil in a place that gets periodically inundated and then dries	Prostrate herb, semi-succulent, Flower fascicled	Plains from the coast, to 600 m
3	Asclepiadaceae	*Cynanchum tunicatum* (Retz.) Alston	26640	Dec.-Apr.	Jan.-Jun.	Near Kurumbapet	Dry open place with hard red soil	Milky twiner, flowers greenish tinged with pink	Hills above 800 m, occasional
4	Caesalpiniaceae	*Cassia absus* L.	26641	Jan.-Dec. (Nov.-Jan.)	Jan.-Dec.	Ousteri	Bare exposed gravel soil with more pebble	Sub-shrub, branch let viscid, reddish-yellow flower	Plains to 1000(1400) m
5	Euphorbiaceae	*Euphorbia corrigioloides* Boiss.	26642	Jan.-Dec.	Jan.-Dec.	Near Tiruchitrampala m junction	Bare soil, cleared of pebbles and quartz gravel	Spreading herb, semi-succulent.	Plain from the coast, to 500 m
6	Euphorbiace ae	*Euphorbia indica* Lam.	26558	Jan.-Dec.	Jan.-Dec.	Ousteri	Degraded clayey soil	Erect herb, leaves thin.	Plains, especially on the coast, to 750 (1000) m
7	Fabaceae	*Crotalaria evolvuloides* Wight ex Wight & Arn.	26569	Jan.-Dec.	Jan.-Dec.	Near Chinna Mudhaliyar chavadi	Dry exposed hard red soil, associate with grass cover	Prostrate to ascending herb, flower yellow	Hills, 800-1300 m, occurs exposed area
8	Malvaceae	*Sida schimperiana* Hochst.	26645	Jan.-Dec.	Jan.-Dec.	Fallow land between Poothurai and Thiruchitra-mpalam	Less disturbed places with wet clayey soil	Rigid herb with bright yellow flower	Plains, towards the coast, in scrub jungles, not common
9	Orchidaceae	*Eulophia epidendraea* (Koen.) Schltr.	Not available	Apr. -Jun.	Not recorded	Near Poothurai	Bare gravel soil associate with grass cover	Terrestrial orchid with bulbous underground stem	Plains, in scrub jungles
10	Poaceae	*Hackelochloa granularis* (L.) Kuntze	25083	Jan.-Dec. (Nov.-Dec.)	Jan.-Dec.	Ousteri	Highly weathered top soil in scrub jungles	Culm, sessile spikelet	Foothills to 1100 m, usually in drier tracts
11	Poaceae	*Melanocenchris monoica* (Rottl.) Fischer	26643	Jan.-Dec. (successive wave)	Jan.-Dec.	Scrub jungle near Poothurai	Highly weathered top soil in scrub jungles	Culm, turbinate head	Plain: floor of scrub jungle
12	Polygalaceae	*Polygala javana* DC.	26644	Jan.-Dec. (successive wave)	Jan.-Dec.	Ousteri	Dry exposed hardened red soil, associate with grass patches	Erect herb, pretty flower (purple to violet)	Hills (above 250m), on the exposed slopes, particularly favour on forest clearing
13	Vitaceae	*Cayratia pedata* (Lam.) Juss. ex Gagnep	26646	Jan.-Dec. (Apr. Jun.)	Jan.-Dec.	Near Auroville	Denuded land	Liana, leaves pedately 7-9 foliate	Plains from the coast, rare

Note – (The first three letters, Jan.-Dec. in phenology indicate months- January-December; months in parentheses denote peak flowering months.

These 13 species (10 dicotyledons; 3 monocotyledons) belonging to 12 genera and 11 families, are distributed among three life forms, *i.e.,* herbs, grasses, and climbers (lianas and twiners). Except climbers all are either annuals or biennials. Binomials, family names, and brief descriptions of the determined

Table 2 : Details of the herbarium specimens of the studied plants housed in the French Institute of Pondicherry (HIFP) collection

No	Binomial	Accession Number (HIFP)	Collector	Location	Year
1	*Blepharis repens* (Vahl) Roth	161	Meher-Homji, V. M.	Tiruchirapally	1961
		162	Balasubramanian, K.	Marakkanam	1974
2	*Trianthema triquetra* Rottl. ex Willd.	682	Meher-Homji, V. M. and Marlange, M.	Kunimedu	1963
3	*Cynanchum tunicatum* (Retz.) Alston	Not available	Not available	Not available	Not available
4	*Cassia absus* L.	8431	Legris, P	Pondicherry	1956
		8432	Meher-Homji, V. M.	Vellaivarai	1961
5	*Euphorbia corrigioloides* Boiss.	7643	Virat, M.	Pondicherry-Madras	1962
		7644	Blasco, F.	Ousteri	1955
6	*Euphorbia indica* Lam.	7660	Marlange, M. and Meher-Homji, V. M.	Pondicherry-Cuddalore	1963
7	*Crotalaria evolvuloides* Wight ex Wight & Arn.	Not available	Not available	Not available	Not available
8	*Sida schimperiana* Hochst.	12703	Legris, P.	Tirukoilur	1957
		12704	Kadamban, D.	Olagapuram	1997
9	*Eulophia epidendraea* (Koen.) Schltr.	22417	Legris, P.	Tirucoyrur	1957
		22419	Kadamban, D.	Savur	1997
10	*Hackelochloa granularis* (L.) Kuntze	23000	Legris, P.	Karumangudi Reserve forest	1957
		23001	Guinnet, Ph.	Vilvur	1961
		23002	Blasco, F.	Pondicherry	1971
11	*Melanocenchris monoica* (Rottl.) Fischer	23085	Marlange, M. and Meher-Homji, V. M.	Andiapalayam (South Arcot)	1963
12	*Polygala javana* DC.	15808	Legris, P.	Kodai hills	1957
		15810	Shankaranarayan, K. S.	Courtallam	1958
13	*Cayratia pedata* (Lam.) Juss. ex Gagnep	21100	Ridsdale, C. E.	Silent Valley	1976

species are enumerated in Table 1 along with their photographs (Fig. 3). The collection locations of the 13 species chosen in this study are mapped indicating them in their respective landscape profiles (Fig. 1).

Out of the 13 species shortlisted by us, several herbarium sheets are stored in the collections of the HIFP (Table 2), mostly between the late 1950s and early 1970s; Shankaranarayan and Dabholkar (1959) encompassing the larger area of Madras state, have listed many of them among which only three species have been reported in the publications of the last decade.

Our survey reveals that *Crotalaria evolvuloides* and *Cynanchum tunicatum,* out of the 13 less-known species are reported first time for Puducherry and its neighbourhood. A few individuals of *C. evolvuloides*, a prostrate herb, were found in a dense grass cover; a single occurrence of *C. tunicatum*, a twiner, occurred in an open land near Kurumbapet. These two species are reported in high elevations above 800 masl (Gamble and Fischer, 1915-1935; Matthew, 1981-1983) in similar habitats. The more speciose genera like *Crotalaria* occur chiefly as undergrowth in deciduous-evergreen forests though some members of this genus are confined to grasslands or evergreen forests on higher elevations (Arora and Chandel, 1972).

However, we considered that it would be important to report these species because some of them, such as *Crotalaria evolvuloides*, *Eulophia epidendraea*, and *Polygala javana* indicate the presence of vanishing microhabitats such as grassy patches in denuded landscapes; *Sida schimperiana*, *Melanocenchris monoica* and *Cayratia pedata* occur in patches of scrub thickets and seven of these species occurred as isolated clusters in nearly barren, red ferralitic soils. Gamble and Fischer (1915–1935) and Matthew (1981–1983) indicated that nine of these species are distributed from the coast to the plains and four in hilly areas. Among the species three are not as common in the Tamil Nadu Carnatic region.

Blepharis repens (= *B. molluginifolia*) has been documented by Balasubramanyan (1977); Kadavul *et al*. (2004b) and Parthasarathy *et al*. (2010). We found a few individuals of this species on a barren land. Dubey *et al*. (2011) in their study of herbaceous species in nutrient-depleted soil conditions, found that this species had high specific leaf area, which indirectly indicates a preference for dry habitats. Marlange and Meher-Homji (1965)

Blepharis repens (Vahl) Roth

Trianthema triquetra Rottl. ex Willd.

Cynanchum tunicatum (Retz.) Alston

Cassia absus L.

Euphorbia corrigioloides Boiss.

Euphorbia indica Lam.

Crotalaria evolvuloides Wight ex wight & Arn.

Sida schimperiana Hochst.

Eulophia epidendraea (Koen.) Schltr.

Hackelochloa granularis (L.) Kuntze

Melanocenchris monoica (Rottl.) Fischer

Polygala javana DC.

Cayratia pedata (Lam.) Juss. ex Gagnep

Fig. 3 : Less known species in Puducherry neighbourhood

identified *Euphorbia indica* (= *E. hypercifolia*) specific to alluvial soil and *Trianthema triquetra* to black clayey soil. Our survey validates the same (Table 1). *Trianthema triquetra* designated as a saline plant by Kasera and Mohammad (2010) is considered a coastal species by us in alkaline soil.

Ravikumar and Ved (2000) refer to *Cayratia pedata* as a globally critically endangered species. Reddy and Parthasarathy (2003) surveyed the liana diversity and distribution in four TDEF forests that yielded 39 liana species among which *C. pedata* was recorded only in one of the four TDEF forests in lesser density, indicating its rarity. A few individuals of this species have been recorded in denuded land in our surveys.

Polygala javana, an erect herb with purple-violet flowers was observed in the present study in small numbers along grassy patches in the ferralitic soil. This herb is particularly well distributed mainly at higher elevations, such as Kodai hills and Courtallam (*vide* HIFP source) (Table 2), but reported from Pondicherry region by Kadavul *et al*. (2004b). This indicates the large ecological amplitude of this taxon; in any case, we suppose that due to increased eroding conditions, microhabitats favouring such species seem to be vanishing, highlighting the need for periodic surveys to identify such under reported (or the less reported) species.

Cassia absus was recorded in our study in isolated, barren gravelly soil with a large proportion of pebbles and has not been reported in the literature but found in the HIFP collections from the region in the early 1960s (Table 2). *Eulophia epidendraea*, a ground-dwelling orchid of which a single individual was noted by us in the grass cover dominated by scrub thicket was reported by Shankaranarayan and Dabholkar (1959) as not common in the scrub jungles of the erstwhile Madras state. *Euphorbia corrigioloides* occurs in coarse sand partially cleared of pebbles and quartz gravel in the TDEF of Marakanam (Blasco and Legris, 1973); our study confirms limited numbers of the species in similar degraded habitats. Ramanujam *et al.* (2007) and Udayakumar and Parthasarathy (2010) have listed *Sida schimperiana* in three TDEF sacred groves of Puducherry region. We observed this rare species, in less disturbed places with wet clayey soil.

Hackelochloa granularis (= *Cenchrus granularis; Manisuris granularis*) and *Melanocenchris monoica* (= *Pomereulla monoica; Gracilea nutans*) noted in this study in fewer numbers in the highly weathered top soil in scrub jungles were previously reported by Shankaranarayan and Dabholkar (1959) and Marlange and Meher-Homji (1965), respectively, in similar habitats; some herbarium specimens also occur at the HIFP (Table 2).

This study confirms that three out of 13 species listed are common in higher elevations. Our study supports the conclusion of Blasco and Legris (1973), that the flora of the evergreen thickets near Puducherry is essentially formed of species having an extensive geographic distribution and consequently are with a large ecological tolerance.

The degradation of TDEF, unique to this region, is so high that Blanchflower (2005) estimates only 5% of the forest to be pristine. Fragmentation is one more issue in such forests where reproduction of plants may be limited because of lower density or abundance of pollinators (Nayak and Davidar, 2010). Our surveys highlight that periodical exploration of the flora even in an area that is rapidly urbanizing and under tremendous anthropogenic pressure, can help identify less known and possibly even rare taxa and record their ecological significance with a view to their future conservation in sanctuaries and national parks (Jain *et al.,* 2010). The species listed here are also of medicinal importance (Chitra and Nithyanandhi, 2007; Paulsamy *et al*., 2007; Maridass *et al*., 2008; Waghmare *et al*., 2010); hence we suggest that in-vitro studies of these species are critical.

Conclusion

The plants listed in this study as less known are indeed found in limited habitats, characteristic of the coastal zone, where cyclones are frequent and where the topography is of a naturally fragmented landscape. The pressure from the urban developmental activities, including the recent escalation in real estate and tourist resort activity that has converted even fallow lands where some scope for natural regeneration of species was available, makes a strong case for continuing at an even greater frequency surveys to document possibly disappearing species and follow up actions to conserve them for posterity.

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पुडुचेरी के आस-पास दक्षिण-पूर्वी भारत में पुष्पित होने वाले पादप, जिनके बारे में अधिक जानकारी नहीं है।

आर. पोन्नुचामी, ए.प्रगासम, एस. अरवजय तथा के. अनुपमा

सारांश

वर्ष 2011 में पुडुचेरी, (दक्षिण पूर्वी भारत) के बाहय क्षेत्र में गुणवत्तात्मक-पुष्पण सर्वेक्षण किया गया। सर्वेक्षण के दौरान 78 कुलों की 431 प्रजातियों का निर्धारण किया गया। जिनमें से तेरह प्रजातियां बारह वंशों और ग्यारह कुलों से थी जिनकी उत्पति की जानकारी क्षेत्र में बहुत कम थी। क्षेत्रीय फ्लोरा से पता चलता है कि इनमें से नौ प्रजातियां समुद्र तट से मैदानों तथा चार प्रजातियां पर्वतीय क्षेत्रों की ओर फैली हुई है। इनमें से तीन प्रजातियां तमिलनाडु कार्नेटिक क्षेत्र में सामान्यत: नहीं पाई जाती है। पुडुचेरी क्षेत्र में दो सूचीबद्ध प्रजातियों का पता पहली बार लगा है। ये प्रजातियां है – *साइनाकम ट्यूनीकेटम,* एल्सटोन तथा *क्रोटालेरिया इवोल्ब्यूलोइड्स* वाइटेक्स वाइट और आर्न। मानवीय दवाब के कारण ये प्रजातियां भयंकर रूप से संकटापन्न हो चुकी है। इनकी क्षति को न्यूनतम करने के लिए प्रलेखीकृत प्रजातियों के संरक्षण प्रयास तेजी से करने होगे।

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