



Diversity of Psammophytes in Sand Dunes of Periyakadu Coast, Southwest Coast of India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.56557/UPJOZ/2024/v45i73984

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://prh.mbimph.com/review-history/3322>

Original Research Article

Received: 16/01/2024
Accepted: 20/03/2024
Published: 29/03/2024

ABSTRACT

The qualitative plant survey in the coastal sand dunes of Periyakadu coast, investigated the current vegetative status of plant life form and its species and families present. The field observations carried out from March 2020 to April 2021. Overall, 126 species belonging to 106 genera and 47 families were recorded in the study area. The most common and dominant families recorded in the study site were: Leguminosae (21species) followed by Poaceae (15 species), Malvaceae (8 Species), Cyperaceae (7 Species), Apocynaceae and Rubiaceae (5 species each). Of these plant species recorded in the study area, 73 Species were herbs, Shrubs (21 Species), Trees (21 species) and Climbers (11 Species). The latter appears to be the case for the plant diversity of the sand dunes under study.

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Keywords: Coastal sand dunes; qualitative plant survey; plant life form; diversity; Periyakadu and India.

1. INTRODUCTION

Coastal dunes are sandy habitats between the sea and the land and a place of complex and unique ecosystem [1]. A key component that guarantees stability of coastal sand dunes (CSDs) is vegetation [2]. Sand dune vegetation or psammophytes in India have been studied for their physical [3] geological [4,5]. and restoration aspects [6,7]. Although CSD ecosystems are categorized as ecologically sensitive [8,9] their floral composition is poorly understood [10]. As such, a gap exists in the understanding of diversity, ecology and functioning of dune vegetation from the Indian coasts [11]. Hence the present study was undertaken to investigate the species diversity of coastal sand dunes at Periyakadu coast of Kanniyakumari district, Tamil Nadu, India.

2. MATERIALS AND METHODS

2.1 Study Area

Kanniyakumari district (8.1111°N, 77.3880°E) is the southernmost tip of the mainland of Tamil

Nadu, India. It has a coastline of 71.5 km. The selected area is specifically located on the Kanniyakumari coast between 8.114288°, 77.389681° and the southwest of the Rajakkamangalam sector. The chosen study area, Periyakadu, is bounded by the Arabian Sea and the coast is ridged and sandy. This village is located 10 km away from Nagercoil, the district capital. The coastal border of Periyakadu coast has a length of 2.38km². The study sites were chosen for the dune diversity assessment and disturbance impacts on vegetation.

2.2 Data Collection

A study of coastal sand dune flora of Periyakadu coast was done from March 2020 to April 2021. A total of 10 pedestrian survey was conducted randomly (wherever the vegetation cover was predominantly found) in the study area at different distance gradients from shoreline till the lagoon boundary begins. Every plant species found in the study area are recorded by observation while walking. Species are identified by using by The Flora of the Gulf of Mannar Southern India [12].

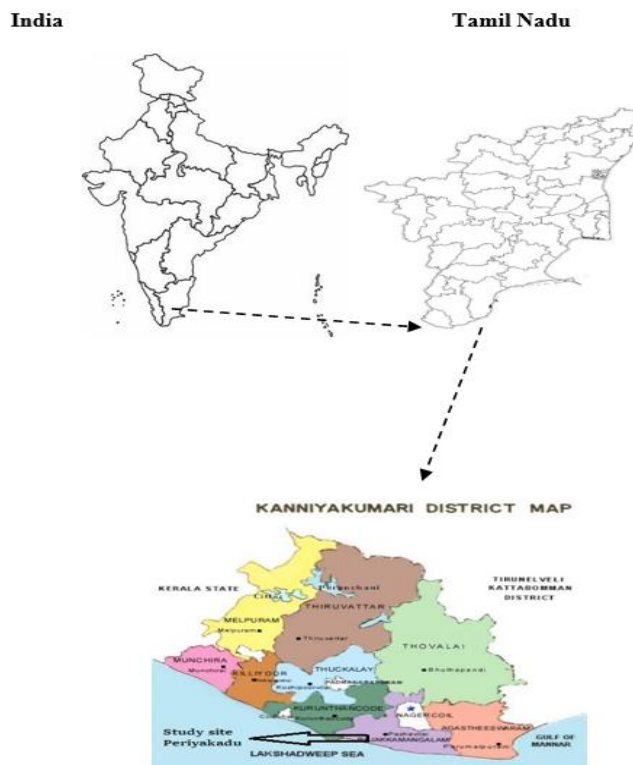


Fig. 1. Map of the study area



Fig. 2. Glimpses of Periyakadu coast is too thick

3. RESULTS AND DISCUSSION

3.1 Diversity of Coastal Sand Dune Vegetation

A total of 126 species from 106 genera and 47 families were reported from the Periyakadu coastal sand dunes. Muthukumar & Samuel (2011) report that 42 species from 38 genera, or 26 families, are found on Manapadu coast. Out of all the coastal sand dune plants found in India, over one-third of the species were listed. Overall, 154 species from 108 genera and 41 families make up the coastal sand dunes of India [8,13]. According to Ramarajan and Murugesan [14] there are 26 families and 55 species on the Tamil Nadu coast. Herbaceous species predominate in both tropical and temperate coastal sand dunes' vegetation, with climbers, creepers, trees, and shrubs following in order of importance [15,16,10,17]. In this present work also indicates that the study area preserves a rich flora with high number of native dune plants. Of the 126

species reported from the present study, 73 species were climbers (11 Species), trees (21 Species), shrubs (21 Species), and herbs (Fig. 3). The majority of the flora found in coastal dune regions is Poaceae, whereas the tropics are home to Asteraceae, Cyperaceae, and Fabaceae [8,13,15] Based on the current study, the most prevalent and prominent family found in this tropical study site was Leguminose, with 21 species. Poaceae (15 species), Malvaceae (8 species), Cyperaceae (7 species), Apocynaceae, and Rubiaceae (5 species each) were the next most common and dominant families (Fig. 4). *Cocos nucifera*, *Croton bonplandianus*, *Dactyloctenium aegypticum*, and *Prosopis juliflora* are examples of invasive alien species that have been discovered. 32% of the species had an annual life span, whereas 68% had a perennial life span (Fig. 5). The number of species in terms of diversity and abundance increased with increasing distance from the shoreline.

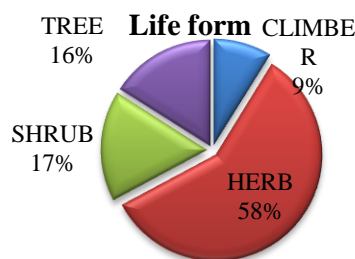


Fig. 3. Habit-wise distribution of plant species in the study area

Table 1. List of sand dune flora of Periyakadu coast

Botanical Name	Family	Life Form
<i>Abutilon indicum</i> (L.) Sweet	Malvaceae	Shrub
<i>Acacia planifrons</i> Wight & Arn.	Leguminosae	Tree
<i>Acalypha fruticosa</i> Forssk.	Euphorbiaceae	Shrub
<i>Acalypha indica</i> L.	Euphorbiaceae	Herb
<i>Achyranthes aspera</i> L.	Amaranthaceae	Herb
<i>Agave vivipara</i> L.	Asparagaceae	Herb
<i>Ageratum conyzoides</i> (L.) L.	Compositae	Herb
<i>Allmania nodiflora</i> (L.) R.Br.ex Wight	Amaranthaceae	Herb
<i>Alysicarpus hamosus</i> Edgew.	Leguminosae	Herb
<i>Amaranthus viridis</i> L.	Amaranthaceae	Herb
<i>Anisomeles malabarica</i> (L.)R.Br.ex Sims	Lamiaceae	Shrub
<i>Annona squamosa</i> L.	Annonaceae	Tree
<i>Aristida setacea</i> Retz.	Poaceae	Herb
<i>Aristolochia indica</i> L.	Aristolochiaceae	Twiner
<i>Atalantia racemosa</i> Wight ex Hook.	Rutaceae	Shrub
<i>Atriplex repens</i> Roth	Amaranthaceae	Subshrub
<i>Axonopus compressus</i> (SW.)P.Beauv	Poaceae	Herb
<i>Azadirachta indica</i> A.juss.	Meliaceae	Tree
<i>Boerhavia diffusa</i> L.	Nyctaginaceae	Herb
<i>Brachiaria distachya</i> (L.) Stapf	Poaceae	Herb
<i>Bulbostylis barbata</i> (Rottb.) C.B. Clarke	Cyperaceae	Herb
<i>Caesalpinia bonduc</i> (L.)Roxb	Leguminosae	Shrub
<i>Calophyllum inophyllum</i> L.	Calophyllaceae	Tree
<i>Calotropis gigantea</i> (L.) W.T.Aiton	Apocynaceae	Shrub
<i>Canavalia cathartica</i> Thouars	Leguminosae	Climbing shrub
<i>Canavalia rosea</i> (Sw.) DC.	Leguminosae	Climber
<i>Canthium coromandelicum</i> (Burm.f)Alston	Rubiaceae	Shrub
<i>Cardiospermum halicacabum</i> L.	Sapindaceae	Climber herb
<i>Cassine glauca</i> (Rottb.) Kuntze	Celastraceae	Tree
<i>Casuarina equisetifolia</i> L.	Casuarinaceae	Tree
<i>Catharanthus roseus</i> (L.)G.Don	Apocynaceae	Shrub
<i>Cenchrus ciliaris</i> L.	Poaceae	Herb
<i>Centrosema molle</i> Benth.	Leguminosae	Climber
<i>Chloris radiata</i> (L.)SW.	Poaceae	Herb
<i>Cissampelos pareira</i> L.	Menispermaceae	Climber
<i>Cissus quadrangularis</i> L.	Vitaceae	Shrub
<i>Cissus repanda</i> (Wight & Arn.) Vahl	Vitaceae	Shrub
<i>Citrullus colocynthis</i> (L.) Schrad.	Cucurbitaceae	Herb
<i>Cleome viscosa</i> L.	Cleomaceae	Herb
<i>Clerodendrum inerme</i> (L.) Gaertn	Lamiaceae	Straggling Shrub
<i>Clitoria ternatea</i> L.	Fabaceae	Climber
<i>Clitoria ternatea</i> L.	Fabaceae	Climber
<i>Cocculus hirsutus</i> (L.) W. Theob.	Menispermaceae	Climber
<i>Cocos nucifera</i> L.	Arecaceae	Tree
<i>Commelina diffusa</i> Burm.f.	Commelinaceae	Herb
<i>Commelina hasskarlii</i> C.B.Clarke	Commelinaceae	Herb
<i>Crinum asiaticum</i> L.	Amaryllidaceae	Herb
<i>Crotalaria linifolia</i> L.f	Leguminosae	Herb
<i>Crotalaria pallida</i> Aiton	Leguminosae	Herb
<i>Croton bonplandianus</i> Baill.	Euphorbiaceae	Herb
<i>Cuscuta reflexa</i> Roxb.	Convolvulaceae	Twiner
<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Herb
<i>Cyperus arenarius</i> Retz.	Cyperaceae	Herb

Botanical Name	Family	Life Form
<i>Cyperus bulbosus</i> Vahl	Cyperaceae	Herb
<i>Cyperus compressus</i> L.	Poaceae	Herb
<i>Cyperus rotundus</i> L.	Cyperaceae	Herb
<i>Cyrtococcum deccanense</i> Bor	Poaceae	Herb
<i>Dactyloctenium aegyptium</i> (L.) Willd.	Poaceae	Herb
<i>Dendrophthoe falcata</i> (L.f.)Ettingsh	Loranthaceae	Parasitic subshrub
<i>Desmodium triflorum</i> (L.) DC.	Leguminosae	Herb
<i>Digitaria bicornis</i> (Lam.) Roem. & Schult.	Poaceae	Herb
<i>Digitaria ciliaris</i> (Retz.) Koeler	Poaceae	Herb
<i>Dodonaea viscosa</i> (L.) Jacq.	Sapindaceae	Shrub
<i>Eleusine indica</i> (L.) Gaertn.	Poaceae	Herb
<i>Emilia sonchifolia</i> (L.) DC. Ex DC.	Compositae	Herb
<i>Eragrostis viscosa</i> (Retz.) Trin.	Poaceae	Herb
<i>Erythroxylum monogynum</i> Roxb.	Erythroxylaceae	Tree
<i>Euphorbia hirta</i> L.	Euphorbiaceae	Herb
<i>Euphorbia hispida</i> Bioss.	Euphorbiaceae	Herb
<i>Euphorbia rosea</i> Retz.	Euphorbiaceae	Herb
<i>Fimbristylis argentea</i> (Rottb.) Vahl	Cyperaceae	Herb
<i>Fimbristylis cymosa</i> R.Br.	Cyperaceae	Herb
<i>Flueggea leucopyrus</i> Willd.	Phyllanthaceae	Shrub
<i>Garnotia tenella</i> (Arn.ex Miq.) Janowski	Poaceae	Herb
<i>Gisekia pharnaceoides</i> L.	Gisekiaceae	Herb
<i>Gomphrena serrata</i> L.	Amaranthaceae	Herb
<i>Halopyrum mucronatum</i> (L) Stapf	Poaceae	Herb
<i>Hibiscus micranthus</i> L.f	Malvaceae	Shrub
<i>Hybanthus enneaspermus</i> (L.)F.Muell.	Violaceae	Herb
<i>Hydrophylax maritima</i> L.f.	Rubiaceae	Herb
<i>Hyptis suaveolens</i> (L.)Poit.	Lamiaceae	Shrub
<i>Indigofera linnaei</i> Ali	Leguminosae	Herb
<i>Ipomoea pes – caprae</i> (L.)R.Br.	Convolvulaceae	Stout creepers
<i>Ipomoea purpurea</i> (L.)Roth	Convolvulaceae	Climber
<i>Justicia diffusa</i> Willd.	Acanthaceae	Herb
<i>Justicia japonica</i> Thunb.	Acanthaceae	Herb
<i>Kohautia aspera</i> (B. Heyne ex Roth) Bremek.	Rubiaceae	Herb
<i>Lannea coromandelica</i> (Houtt.) Merr.	Anacardiaceae	Tree
<i>Lantana camara</i> L.	Verbenaceae	Shrub
<i>Launaea sarmentosa</i> (Willd.) Sch.Bip. ex kuntze	Compositae	Herb
<i>Leptadenia reticulata</i> (Retz.) Wight & Arn.	Apocynaceae	Climber
<i>Leucas zeylanica</i> L.	Lamiaceae	Herb
<i>Madhuca longifolia</i> (J.Koenig ex L.) J.F.Macbr	Sapotaceae	Tree
<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae	Herb
<i>Millingtonia hortensis</i> L.fil.	Bignoniaceae	Tree
<i>Morinda citrifolia</i> L.	Rubiaceae	Tree
<i>Mukia maderaspatana</i> (L.) M.Roem.	Cucurbitaceae	Climber
<i>Mollugo nudicaulis</i> Lam.	Mulluginaceae	Herb
<i>Murraya koenigii</i> (L.) Spreng	Rutaceae	Tree
<i>Ocimum americanum</i> L.	Lamiaceae	Herb
<i>Oldenlandia stricta</i> L.	Rubiaceae	Herb
<i>Oldenlandia umbellata</i> L.	Rubiaceae	Herb
<i>Opuntia dillenii</i> (Ker Gawl.) Haw.	Cactaceae	Herb
<i>Paederia foetida</i> L.	Rubiaceae	Climber
<i>Passiflora foetida</i> L.	Passifloraceae	Climber
<i>Pedaliium murex</i> L.	Pedaliaceae	Herb
<i>Pentatropis capensis</i> (L.fill.) Bullock	Apocynaceae	Climber
<i>Perularia daemia</i> (Forssk.) Chiov.	Apocynaceae	Climber

Botanical Name	Family	Life Form
<i>Platostoma hispidum</i> (L.) A.J.Paton	Lamiaceae	Herb
<i>Plumbago zeylanica</i> L.	Plumbginaceae	Herb
<i>Polycarpaea spicata</i> Wight ex Arn.	Caryophyllaceae	Herb
<i>Polycarpon tetraphyllum</i> (L.)L	Caryophyllaceae	Herb
<i>Polygala erioptera</i> DC.	Polygalaceae	Herb
<i>Pongamia pinnata</i> (L.)Pierre	Fabaceae	Herb
<i>Portulaca oleracea</i> L.	Portulacaceae	Herb
<i>Portulaca quadrifida</i> L.	Portulacaceae	Herb
<i>Rhizophora mucronata</i> Lam.	Rhizophoraceae	Tree
<i>Rhynchospora barbata</i> (Vahl) Kunth	Cyperaceae	Herb
<i>Rivea hypocrateriformis</i> Choisy	Convolvulaceae	Climber
<i>Santalum album</i> L.	Santalaceae	Tree
<i>Scutia buxifolia</i> Reissek	Rhamnaceae	Tree
<i>Senna alexandrina</i> Mill.	Leguminosae	Shrub
<i>Sesbania procumbens</i> (Roxb). Wight & Arn.	Leguminosae	Herb
<i>Sida cordifolia</i> L.	Malvaceae	Herb
<i>Sida rhombifolia</i> L.	Malvaceae	Herb
<i>Solanum virginianum</i> L.	Solanaceae	Herb
<i>Spermacoce articularis</i> L.f	Rubiaceae	Herb
<i>Spermacoce ocymoides</i> Burm.f.	Rubiaceae	Herb
<i>Spinifex littoreus</i> (Burm.f) Merr.	Poaceae	Herb
<i>Sporobolus ioclados</i> (Trin.) Nees	Poaceae	Herb
<i>Stachytarpheta indica</i> (L.)Vahl	Verbenaceae	Shrub
<i>Striga densiflora</i> (Benth.) Benth.	Orobanchaceae	Herb
<i>Stylosanthes fruticosa</i> (Retz.) Alston	Leguminosae	Herb
<i>Tephrosia bracteolata</i> Guill.& Perr.	Leguminosae	Shrub
<i>Tephrosia cinerea</i> (L.)Pers	Leguminosae	Shrub
<i>Tephrosia maxima</i> (L.) Pers.	Leguminosae	Herb
<i>Tephrosia pumila</i> (Lam.) Pers.	Leguminosae	Herb
<i>Themeda tremula</i> (Nees ex Steud.) Hack.	Poaceae	Herb
<i>Toddalia asiatica</i> (L.)Lam.	Rutaceae	Shrub
<i>Tragus mongolorum</i> Ohwi	Poaceae	Herb
<i>Trianthema portulacastrum</i> L.	Aizoaceae	Herb
<i>Tridax procumbens</i> L.	Asteraceae	Herb
<i>Tylophora indica</i> (Burm. f.) Merr.	Apocynaceae	Climber
<i>Vernonia cinerea</i> (L.) Less	Asteraceae	Herb
<i>Vulpia bromoides</i> (L.) Gray	Poaceae	Herb
<i>Wattakaka volubilis</i> (L. fil.) stapf.	Apocynaceae	Climber
<i>Zaleya pentandra</i> (L.) C. Jeffrey	Aizoaceae	Herb

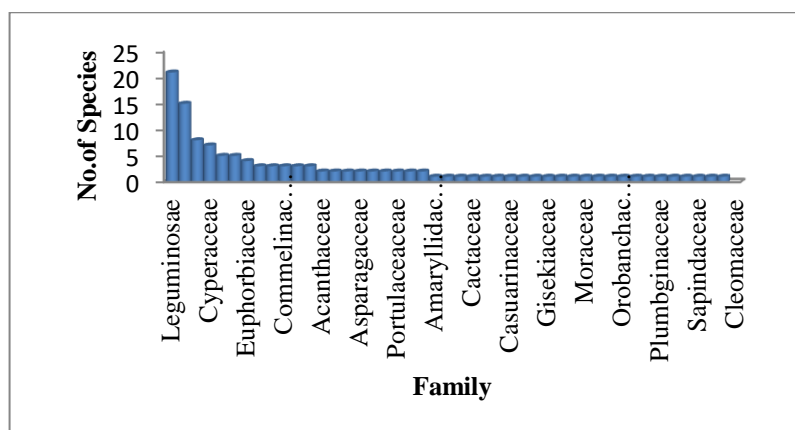


Fig. 4. Family-wise distribution of plant species in the study area.

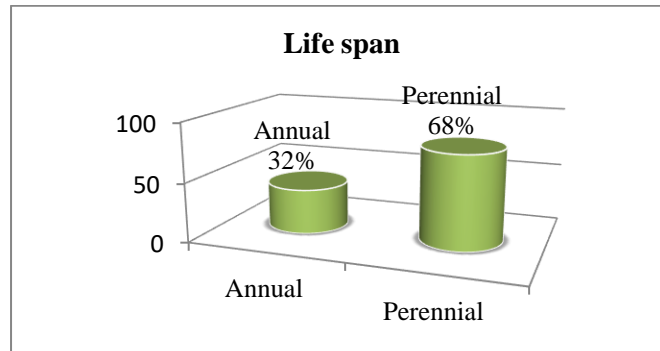


Fig. 5. Life span distribution

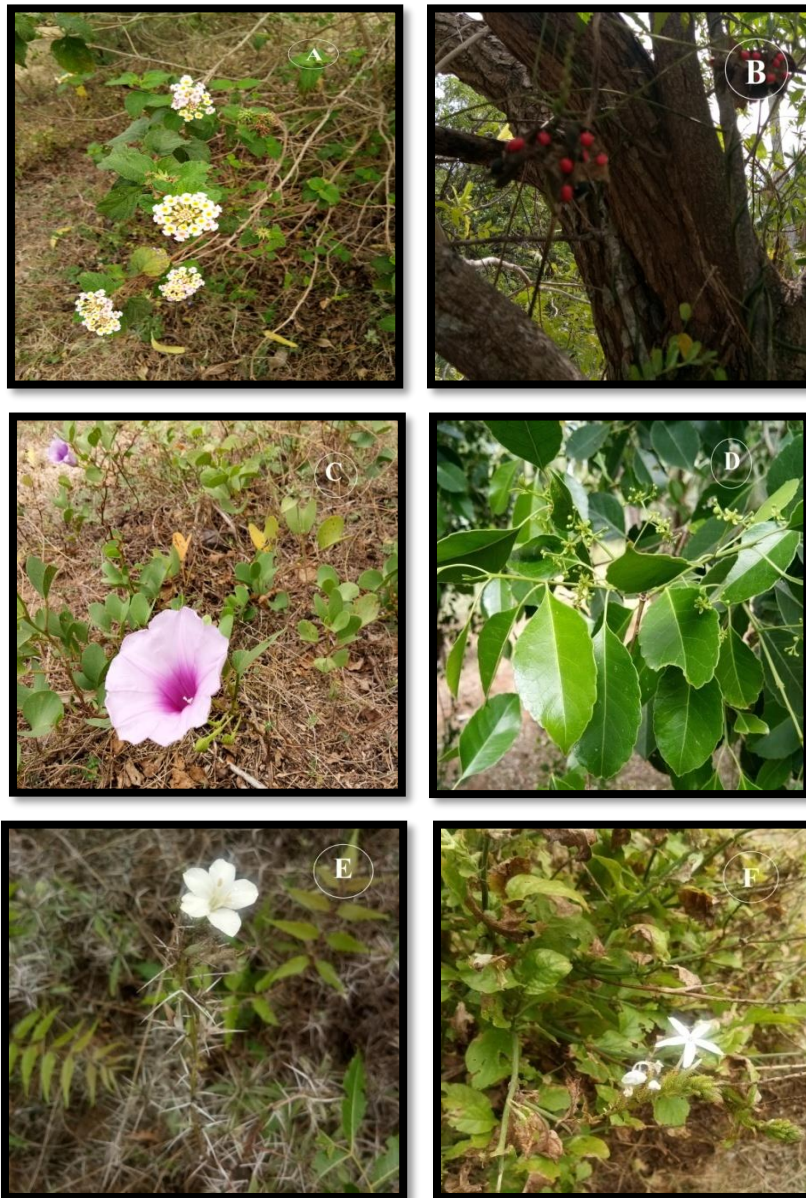


Fig. 6. Species from sand dune vegetation of Periyakadu coast (A) *Lantana camara* L., (B) *Abrus precatorius* L., (C) *Ipomoea pes-caprae* (L.) R.Br., (D) *Cassine glauca* (Rottb.) Kuntze, (E) *Barleria buxifolia* L., (F) *Plumbago zeylanica* L.



Fig. 7. Threats observed in the study field; (A) Livestock grazing, (B) Drying coconut husk on coastal sand dunes, (C) Natural disaster observed, (D) Sand mining,

4. CONCLUSION

The plant species found in the coastal sand dunes are incredibly valuable resources that are essential to both the local economy and biodiversity. Current study also shows that the study region maintains a high diversity of flora as well as a range of environmental factors and habitat types that are essential to the health of the dune ecosystem. Sand mining and other anthropogenic impacts, such as the deposition of solid trash, polythene bags, and human waste on coastal sand dunes, have an immediate or indirect effect on the dune vegetation. These hasten the significant alterations in the flora and environmental conditions of the coastal sand dunes. Plantation crops like coconuts are grown primarily for their economic value; on the other hand, the husks of these coconuts are used to make rope. It is crucial to conserve and protect the coastal sand dune vegetation for our future coastal generation protection and ecosystem management.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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