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Coastal Flora of Porbandar District, Gujarat, India

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Abstract: The coastal flora of Porbandar district, Gujarat, was studied across 23 coastal villages to assess plant diversity. Systematic field surveys recorded 213 species from 174 genera and 58 families, with dicotyledons predominating (172 species from 140 genera and 48 families) and monocotyledons comprising 41 species from 34 genera and 10 families. Comparative analysis with previous studies in Gujarat's coastal regions revealed moderate yet significant biodiversity in Porbandar. The findings reveal diverse habitats, including beaches, mangroves, and sand dunes, each hosting unique assemblages of flora adapted to extreme coastal conditions. Among the identified species, six are classified as threatened according to the IUCN Red Data List, underscoring the urgent need for conservation efforts in this vulnerable ecosystem. The study also discusses the ongoing challenges posed by salinity and anthropogenic influences, recommending diverse native species planting strategies to enhance coastal resilience. These insights serve as a crucial baseline for future ecological studies and conservation initiatives, emphasizing the importance of preserving the coastal flora of Porbandar amidst changing environmental conditions.

Key words: Coastal flora, systematic surveys, threatened species, habitat diversity, Porbandar district.

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Coastal landscapes are highly dynamic and fragile, characterized by steep environmental gradients and shaped by geomorphological, physical, and biological processes (Martínez and Psuty, 2007). These landscapes are subject to constant change due to the interplay of natural forces such as waves, tides, wind, and sediment deposition, which continuously mold and reshape the coastline. The geomorphological processes, including erosion, sediment transport, and deposition, contribute to the formation of distinct coastal features like sand dunes, beaches, cliffs, and estuaries. The dynamic nature of these landscapes, combined with their exposure to the elements, makes them particularly vulnerable to both natural and anthropogenic disturbances.

Despite these challenges, coastal areas exhibit high biodiversity, particularly in terms of floral diversity. The flora in coastal regions is heavily influenced by geological settings and the local climate, with specific vegetation types linked to features such as sand dunes, rocky coasts, mudflats, marshlands, and intertidal zones (Doody, 2012).

These vegetation types are adapted to the harsh conditions of coastal environments, including high salinity, strong winds, shifting sands, and salt spray. For instance, coastal dunes are often colonized by pioneer species that can tolerate the extreme conditions, which play a crucial role in stabilizing the dunes and preventing erosion.

The interaction of fresh and saline water creates unique ecosystems that support a diverse range of flora and fauna, which are essential for the ecological health of coastal areas (Coll *et al*., 2010). Estuaries, where rivers meet the sea, are particularly productive ecosystems that serve as nurseries for many marine species. The mixing of fresh and saltwater creates a gradient of salinity that supports a variety of plant species, from freshwater reeds and sedges to salt-tolerant mangroves and salt marsh grasses. These plants provide habitat and food for a wide range of organisms, including fish, crustaceans, birds, and mammals.

While previous studies by Thaker (1910) and Nagar (2005) focused on the Barda hills and its surroundings, there was no special emphasis on the coastal areas. Additionally, other research efforts were limited to sand dunes in selected locations such as Madhavpur (Gohel *et al*., 2015). This study aims to fulfil these knowledge gaps by documenting and analysing the diversity of coastal flora in Porbandar district through systematic surveys of 23 coastal villages.

Materials and Methods

Study area

Porbandar district, located on the Saurashtra coast of Gujarat at 21.6778°N latitude and 69.8121°E longitude, gets an average rainfall of 539.11 mm and has an average temperature of 28.31°C. The district has a coastline of about 90 km. Out of its three talukas - Porbandar, Ranavav, and Kutiyana only Porbandar Taluka is along the coast. Porbandar Taluka has 74 villages, with 23 of them being coastal, making up 30% of the taluka's villages. These 23 coastal villages are the main focus of this study (Fig. 1).

The study targets the coastal area of Porbandar district in Gujarat, focusing on 23 villages chosen for detailed surveys (Table 1). These villages were selected due to their proximity to the coast and their representativeness of the region. Systematic surveys were conducted in various coastal habitats, including beaches, sand dunes, mangroves, and coastal scrublands. Plant species found during these surveys were carefully identified using the flora of Gujarat (Shah, 1978) and recorded. All specimens were collected and submitted to the herbaria of the Department of Botany, M.D. Science College,

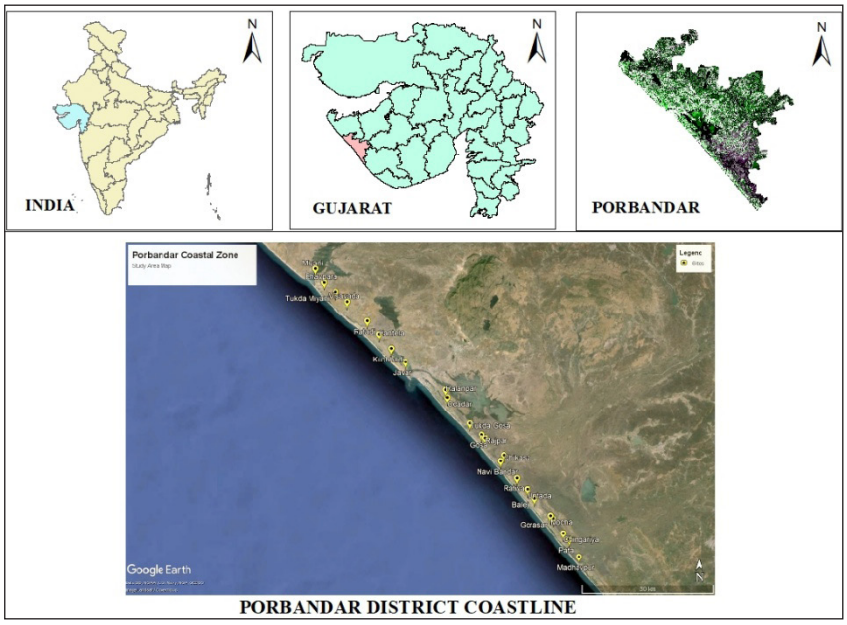

Fig. 1. Study site map.

Table 1. Coastal villages of Porbandar district

No.	Villages	Coordinates	No.	Villages	Coordinates
1.	Balej	21°22′29″N 69°51′42″E	13.	Oddar	21°34′44″N 69°40′15″E
2.	Bhavpara	21°48′46″N 69°24′05″E	14.	Pata	21°17′27″N 69°56′14″E
3.	Chikasa	21°27′45″N 69°47′40″E	15.	Rajpar (Navagam)	21°29′47″N 69°45′14″E
4.	Chingariya	21°18′12″N 69°55′28″E	16.	Ratanpar	21°35′40″N 69°40′02″E
5.	Gorasar	21°20′00″N 69°54′08″E	17.	Ratdi	21°44′05″N 69°29′46″E
6.	Gosa	21°30′16″N 69°44′46″E	18.	Ratiya	21°24′59″N 69°49′24″E
7.	Kantela	21°42′28″N 69°31′17″E	19.	Tukda Gosa	21°31′39″N 69°43′13″E
8.	Kuchhdi	21°40′42″N 69°32′56″E	20.	Tukda Miyani	21°47′33″N 69°25′36″E
9.	Madhavpur	21°15′20″N 69°57′30″E	21.	Untda	21°23′33″N 69°50′45″E
10.	Miyani	21°50′25″N 69°22′57″E	22.	Visavada	21°46′23″N 69°27′06″E
11.	Mocha	21°20′19″N 69°53′45″E	23.	Zavar(/Javar)	21°39′05″N 69°34′45″E
12.	Navi Bandar	21°27′02″N 69°47′13″E	-	-	-

Porbandar. Both common and scientific names were documented for accuracy.

Result and Discussion

Diversity overview: The flora identified in the coastal regions of Porbandar reveals a diverse assemblage of species adapted to the harsh environmental conditions of coastal ecosystems. In the survey, 213 species from 174 genera and 58 families were documented (Table 2). Polypetalae had the most variety with 27 families, 64 genera, and 77 species, while Monochlamydae had the least with 8 families, 23 genera, and 33 species (Table 3). The recorded species included 130 herbaceous plants, 33 shrubs, 25 trees, and 25 climbers (Fig. 1). Dicotyledons were more diverse, featuring 48 families, 140 genera, and 172 species, whereas monocotyledons had 10 families, 34 genera, and 41 species. The family, genus, and species ratios of monocots to dicots are 1:4.8, 1:4.12, and 1:4.19, respectively.

Threatened species: Among the diverse plant species in this region, several have been identified as threatened according to the IUCN Red Data List (Table 4). *Commiphora wightii* (Fig. 4), commonly known as Guggul, is classified as Critically Endangered. This species is highly valued for its gum-resin, which is used in traditional medicine and perfumery. Ecologically, this drought-resistant species plays a crucial role in reforestation efforts and provides habitat for various small wildlifes.

Helichrysum cutchicum (Fig. 3) and *Senegalia ferruginea* are categorized as Vulnerable. *Helichrysum cutchicum* is known for its medicinal properties, often used in traditional medicine for treating various ailments. *Senegalia ferruginea*, offers durable timber for construction and serves as a forage crop for livestock like sheep and goats. Its nitrogen-fixing abilities enhance soil fertility and its root system helps reduce erosion in vulnerable areas.

Additionally, *Aegle marmelos*, *Hyphaene dichotoma*, and *Lepidagathis bandraensis* are listed as Near Threatened. *Aegle marmelos*, commonly known as the bael tree, holds significant economic importance through its medicinal uses, with the fruit and leaves utilized in traditional medicine for their antidiarrheal and digestive properties. The tree is culturally revered, often associated with Hindu rituals, and its fruit is processed into jams and juices, enhancing its market value. Ecologically, Aegle marmelos contributes to biodiversity in dry regions, aids in soil conservation, and improves soil fertility through its leaf litter. *Hyphaene dichotoma*, is valued for its edible fruits and the crafting materials derived from its leaves and stems. It enhances biodiversity by providing habitat for various species and improves water retention in sandy soils. *Lepidagathis bandraensis* is appreciated for its ornamental qualities, suitable for landscaping in urban areas, and it is great sand dune stabilizer.

Comparative analysis

In the current study, 213 species from 174 genera belonging to 58 families were recorded in the coastal flora of Porbandar district. Fig. 5 displays comparative abundance information of species of Angiosperms at state and regional levels. Vyas and Joshi (2015) observed 8 species

Table 2 . List of flora of Porbandar district

SN	Scientific name	Family	Vernacular name	Habit	Habitat
1	*Abutilon indicum* (L.) Sweet	Malvaceae	Khapat	SH	Coastal scrublands, disturbed areas
2	*Acalypha indica* L.	Euphorbiaceae	Kuppi	H	Coastal scrublands
3	*Acanthospermum hispidum* DC.	Asteraceae		H	Sandy beaches, disturbed areas
4	*Achyranthes aspera* L.	Amaranthaceae	Aghedo	H	Coastal scrublands, roadsides
5	*Aegle marmelos* (L.) Corrêa	Rutaceae	Billi	T	Inland areas, Plantations
6	*Aeluropus lagopoides* (L.) Thwaites	Poaceae	Khari dhrokad	H	Sand dunes, coastal grasslands
7	*Aerva lanata* (L.) Juss.	Amaranthaceae	Gorakhganjo	H	Beaches, coastal scrublands
8	*Alhagi pseudalhagi* (M.Bieb.) Desv. Ex Wangerin	Fabaceae	Javso	SH	Coastal scrublands, inland areas
9	*Alternanthera sessilis* (L.) DC.	Amaranthaceae	Pani ni Bhaji	H	Wetlands, coastal marshes
10	*Alysicarpus hamosus* Edgew.	Fabaceae	Samervi	H	Coastal scrublands, sandy soils
11	*Amaranthus spinosus* L.	Amaranthaceae	Kantalo dhimdo	H	Coastal scrublands
12	*Ammannia baccifera* L.	Lythraceae	Jal Aagiyo	H	Coastal wetlands, marshes
13	*Andrographis echioides* (L.) Nees	Acanthaceae	Kariyatu	H	Coastal scrublands, disturbed areas
14	*Apluda mutica* L.	Poaceae	Bhangoru	H	Coastal grasslands, sand dunes
15	*Argemone mexicana* L.	Papaveraceae	Darudi	H	Disturbed areas
16	*Aristida funiculata* Trin. & Rupr.	Poaceae	Fusiyu	H	Sandy soils, coastal grasslands
17	*Aristolochia bracteolata* Lam.	Aristolochiaceae	Kidamari	H	Coastal scrublands, rocky areas
18	*Asparagus dumosus* Baker	Asparagaceae	Dariai gajvel	SH	Coastal scrublands, sandy soils
19	*Asparagus racemosus* Willd	Asparagaceae	Satavari	C	Coastal scrublands, open areas
20	*Avicennia marina* (Forssk.) Vierh.	Acanthaceae	Tavariya	T	Mangroves, intertidal zones
21	*Azadirachta indica* A.Juss.	Meliaceae	Limbdo	T	Disturbed areas
22	*Bacopa monnieri* (L.) Wettst.	Plantaginaceae	Brahmi	H	Marshy areas, coastal wetlands
23	*Balanites aegyptiaca* (L.) Delile	Zygophyllaceae	Ingoriyo	SH	Coastal scrublands, sandy soils
24	*Barleria prionitis* L.	Acanthaceae	Pilo kantaseriyo	H	Coastal scrublands, rocky areas
25	*Bergia suffruticosa* (Delile) Fenzl	Elatinaceae	Lavadiyu	H	Sandy beaches, disturbed areas
26	*Blepharis integrifolia var. integrifolia*	Acanthaceae	Untigan	H	Coastal scrublands, sandy soils
27	*Blepharis maderaspatensis* (L.) B.Heyne ex Roth	Acanthaceae	Untigan	H	Coastal scrublands, rocky areas
28	*Boerhavia diffusa* L.	Nyctaginaceae	Nano vasedo	H	Disturbed areas, coastal plains
29	*Boerhavia erecta* L.	Nyctaginaceae	Orlogorlo	H	Coastal scrublands, disturbed areas
30	*Boerhavia plumbaginea* Cav.	Nyctaginaceae	Moto vasedo	H	Coastal scrublands, sandy soils
31	*Bolboschoenus maritimus* (L.) Palla	Cyperaceae	Chiyo	H	Coastal marshes, wetlands
32	*Cadaba fruticosa* (L.) Druce	Capparaceae	Karo katakiyo	SH	Coastal scrublands, rocky areas
33	*Calotropis gigantea* (L.) Dryand.	Asclepiadaceae	Moto Aankdo	SH	Sandy beaches, coastal scrublands
34	*Calotropis procera* (Aiton) Dryand.	Asclepiadaceae	Nano Aankdo	SH	Coastal scrublands, sandy areas
35	*Canavalia cathartica* Thouars	Fabaceae	Tarvardi	C	Coastal scrublands
36	*Capparis decidua* (Forssk.) Edgew.	Capparaceae	Kerdo	SH	Coastal scrublands, rocky areas

Table 2 . Cont..

SN	Scientific name	Family	Vernacular name	Habit	Habitat
37	*Cardiospermum halicacabum* L.	Sapindaceae	Kagdoriyu	C	Disturbed areas
38	*Casuarina equisetifolia* L.	Casuarinaceae	Jhuri	T	Sand dunes
39	*Causonis trifolia* (L.) Mabb. & J.Wen	Vitaceae	Khatkhatumbo	C	Coastal scrublands, disturbed areas
40	*Celosia argentea* L.	Amaranthaceae	Lanpdi	H	Disturbed areas, coastal plains
41	*Cenchrus ciliaris* L.	Poaceae	Dhramnu	H	Coastal grasslands, sandy soils
42	*Chamaecrista pumila* (Lam.) V.Singh	Fabaceae	Chamediyu	H	Coastal scrublands, sandy soils
43	*Chenopodium album* L.	Amaranthaceae	Sil	H	Disturbed areas, coastal plains
44	*Chloris barbata* Sw.	Poaceae	Chokadi	H	Coastal grasslands, sandy soils
45	*Chrozophora plicata* (Vahl) A.Juss. ex Spreng.	Euphorbiaceae	Kalo okhrad	H	Coastal wetlands
46	*Chrozophora rottleri* (Geiseler) Spreng.	Euphorbiaceae	Betho okhrad	H	Coastal wetlands
47	*Citrullus colocynthis* (L.) Schrad.	Cucurbitaceae	Kothimbdu	C	Sandy beaches, coastal scrublands
48	*Cleome viscosa* L.	Cleomaceae	Pili talavani	H	Coastal scrublands, disturbed areas
49	*Clerodendrum phlomidis* L.f.	Lamiaceae	Arni	SH	Coastal scrublands, rocky areas
50	*Clitora ternatea* L.	Fabaceae	Garni	C	Disturbed areas
51	*Coccinia grandis* (L.) Voigt	Cucurbitaceae	Gholu	C	Coastal scrublands, disturbed areas
52	*Cocculus hirsutus* (L.) W.Theob.	Menispermaceae	Vevdi	C	Coastal scrublands, rocky areas
53	*Cocos nucifera* L.	Arecaceae	Nariyeri	T	Beaches, plantation
54	*Coldenia procumbens* L.	Boraginaceae	Okharad	H	Coastal wetlands, disturbed areas
55	*Commelina benghalensis* L.	Commelinaceae	Motu Sesmuriyu	H	Coastal wetlands, disturbed areas
56	*Commelina forskalaei* Vahl.	Commelinaceae	Nanu Sesmuriyu	H	Coastal wetlands, coastal marshes
57	*Commiphora wightii* (Arn.) Bhandari	Burseraceae	Gugad	SH	Coastal scrublands, rocky areas
58	*Convolvulus prostratus* Forssk.	Convolvulaceae	Sankhavali	H	Sandy soils
59	*Corchorus depressus* (L.) Stocks	Malvaceae	Bahuphali	H	Coastal scrublands, disturbed areas
60	*Cordia sinensis* Lam.	Boraginaceae	Gundi	T	Coastal scrublands, disturbed areas
61	*Cressa cretica* L.	Convolvulaceae	Pariyo	H	Beaches, sandy soils, Coastal marshes
62	*Crotalaria hebecarpa* (DC.) Rudd	Fabaceae	Adadiyo	H	Coastal scrublands, disturbed areas
63	*Cucumis maderaspatanus* L.	Cucurbitaceae	Chanakchibhadi	C	Coastal scrublands, disturbed areas
64	*Cucumis prophetarum* L.	Cucurbitaceae	Indranu	C	Coastal scrublands, sandy soils
65	*Cyanthillium cinereum* (L.) H.Rob.	Asteraceae	Sedardi	H	Disturbed areas, coastal scrublands
66	*Cymbopogon schoenanthus* (L.) Spreng.	Poaceae	Roush-ghas	H	Sandy soils

Table 2 . Cont..

SN	Scientific name	Family	Vernacular name	Habit	Habitat
67	*Cynodon dactylon* (L.) Pers.	Poaceae	Dhrokhad	H	Beaches, coastal grasslands
68	*Cyperus conglomeratus* Rottb.	Cyperaceae	Kharo chiyo	H	Sandy soils
69	*Cyperus flavidus* Retz.	Cyperaceae	Chiyo	H	Coastal wetlands, marshes
70	*Cyperus rotundus* L.	Cyperaceae	Chiyo	H	Disturbed areas, coastal plains
71	*Dactyloctenium aegyptium* (L.) Willd.	Poaceae	Chokadi	H	Coastal grasslands, sandy soils
72	*Dactyloctenium scindicum* Boiss	Poaceae	Chokdi	H	Coastal grasslands, disturbed areas
73	*Dalechampia scandens* L.	Euphorbiaceae	Khajoti	C	Coastal scrublands, disturbed areas
74	*Datura innoxia* Mill.	Solanaceae	Kalo dhaturo	H	Disturbed areas, coastal plains
75	*Datura metel* L.	Solanaceae	Dhodo dhaturo	H	Disturbed areas, coastal scrublands
76	*Desmostachya bipinnata* (L.) Stapf	Poaceae	Dabh	H	Coastal wetlands, marshes
77	*Dichanthium annulatum* (Forssk.) Stapf	Poaceae	Jinjvo	H	Coastal grasslands, sandy soils
78	*Dicliptera paniculata* (Forssk.) I.Darbysh.	Acanthaceae	Kali aghedi	H	Coastal scrublands, disturbed areas
79	*Digera muricata* Mart.	Amaranthaceae	Kananjro	H	Disturbed areas, coastal plains
80	*Digitaria ciliaris* (Retz.) Koeler	Poaceae		H	Coastal grasslands, sandy soils
81	*Dyerophytum indicum* Kuntze	Plumbaginaceae	Lal chitro	SH	Coastal scrublands, rocky areas
82	*Echinops echinatus* Roxb.	Asteraceae	Utkanto	H	Coastal scrublands, disturbed areas
83	*Echiochilon pauciflorum* (Stocks) Långström & M.W.Chase	Boraginaceae	Karvas	H	Coastal scrublands, rocky areas
84	*Eclipta prostrata* (L.) L.	Asteraceae	Bhangro	H	Coastal wetlands, disturbed areas
85	*Enicostema axillare* (Poir. ex Lam.) A.Raynal	Gentianaceae	Mamejvo	H	Coastal scrublands, sandy soils
86	*Euphorbia heyneana* Spreng.	Euphorbiaceae	Dudhli	H	Coastal scrublands, disturbed areas
87	*Euphorbia neriifolia* L.	Euphorbiaceae	Hathala thor	SH	Coastal scrublands, rocky areas
88	*Euphorbia tirucalli* L.	Euphorbiaceae	Dandaliyo Thor	SH	Coastal scrublands, disturbed areas
89	*Evolvulus alsinoides* L.	Convolvulaceae	Kali Sankhavali	H	Coastal scrublands, sandy soils
90	*Ficus amplissima* Sm.	Moraceae	Pipad	T	Coastal scrublands, rocky areas
91	*Ficus benghalensis* L.	Moraceae	Vad	T	Coastal scrublands, disturbed areas
92	*Ficus religiosa* L.	Moraceae	Piplo	T	Coastal scrublands, disturbed areas
93	*Fimbristylis bisumbellata* (Forssk.) Bubani	Cyperaceae	Saj	H	Coastal wetlands, marshes
94	*Flueggea leucopyrus* Willd.	Phyllanthaceae	Chinvi	SH	Coastal scrublands, disturbed areas
95	*Glinus lotoides* L.	Molluginaceae	Mitho Okhrad	H	Coastal wetlands, disturbed areas

Table 2 . Cont..

SN	Scientific name	Family	Vernacular name	Habit	Habitat
96	*Grangea maderaspatana* (L.) Poir.	Asteraceae	Kali fudadi	H	Coastal scrublands, sandy soils
97	*Grewia tenax* (Forssk.) Fiori	Malvaceae	Gangeti	SH	Coastal scrublands, disturbed areas
98	*Grewia villosa* Willd.	Malvaceae	Padekhado	SH	Coastal scrublands, rocky areas
99	*Gymnosporia montana* (Roth) Benth.	Celastraceae	Vikro	SH	Coastal scrublands, disturbed areas
100	*Halopyrum mucronatum* (L.) Stapf	Poaceae	Kansado	H	Sandy soils
101	*Halosarcia indica* (Willd.) Paul G.Wilson	Amaranthaceae	Bholdo	H	Coastal wetlands, saline habitats
102	*Helichrysum cutchicum* (C.B.Clarke) R.S.Rao & Deshp.	Asteraceae	Kado Fulvo	H	Coastal scrublands, disturbed areas
103	*Heliotropium bacciferum* Forssk.	Boraginaceae	Hathisundhi	H	Beaches, coastal scrublands
104	*Heliotropium curassavicum* L.	Boraginaceae	Hathisundhi	H	Coastal wetlands, disturbed areas
105	*Heliotropium supinum* L.	Boraginaceae	Hathisundhi	H	Coastal scrublands, sandy soils
106	*Heliotropium zeylanicum* Lam.	Boraginaceae	Hathisundhi	H	Coastal wetlands, disturbed areas
107	*Hygrophila auriculata* (Schumach.) Heine	Acanthaceae	Kantado Kubo	H	Coastal wetlands, marshes
108	*Hyphaene dichotoma* (D.White bis ex Nimmo) Furtado	Arecaceae	Ravan tad	T	Coastal scrublands, disturbed areas
109	*Indigofera cordifolia* B.Heyne ex Roth	Fabaceae	Bethi gali	H	Coastal scrublands, disturbed areas
110	*Indigofera oblongifolia* Forssk.	Fabaceae	Gali	SH	Coastal scrublands, rocky areas
111	*Ipomoea aquatica* Forssk.	Convolvulaceae	Nada Vel	C	Coastal wetlands, marshes
112	*Ipomoea fistulosa* Mart. ex Choisy	Convolvulaceae	Gandi vel	SH	Coastal scrublands, disturbed areas
113	*Ipomoea pes-caprae* (L.) R.Br.	Convolvulaceae	Dipad Vel	C	Beaches, sandy soils
114	*Jatropha gossypiifolia* L.	Euphorbiaceae	Neparo	SH	Coastal scrublands, disturbed areas
115	*Juncus meritimus* Lam.	Juncaceae		H	Coastal wetlands, marshes
116	*Lantana indica* Roxb.	Verbenaceae	Dhanidariya	SH	Coastal scrublands, disturbed areas
117	*Launaea procumbens* (Roxb.) Ramayya & Rajagopal	Asteraceae	Bhopatri	H	Coastal scrublands, disturbed areas
118	*Launaea sarmentosa* (Willd.) Kuntze	Asteraceae	Bhopatri	H	Coastal scrublands, sandy soils
119	*Lepidagathis bandraensis* Blatt.	Acanthaceae	Harancharo	H	Sandy soils, rocky area
120	*Leptadenia reticulata* (Retz.) Wight & Arn.	Apocynaceae	Kharkhodi	C	Coastal scrublands, disturbed areas
121	*Leucas urticifolia* (Vahl) Sm.	Lamiaceae	Kubo	H	Coastal scrublands, disturbed areas
122	*Limnophyton obtusifolium* Miq.	Alismataceae	Nalkut	H	Coastal wetlands, marshes

Table 2 . Cont..

SN	Scientific name	Family	Vernacular name	Habit	Habitat
123	*Limonium stocksii* (Boiss.) Kuntze	Plumbaginaceae	Chitrak	H	Coastal wetlands, sandy beaches
124	*Lotus garcinii* Ser.	Fabaceae	Mohto Bhankho	H	Sandy beaches
125	*Luffa echinata* Roxb.	Cucurbitaceae	Kukdavelu	C	Coastal scrublands, disturbed areas
126	*Lycium europaeum* L.	Solanaceae	Kaag Mehndi	SH	Coastal scrublands, disturbed areas
127	*Maerua oblongifolia* (Forssk.) A.Rich.	Capparaceae	Safed hemkand	SH	Coastal scrublands, rocky areas
128	*Melilotus albus* Medik.	Fabaceae	Jungli methi	H	Disturbed areas, coastal plains
129	*Melilotus indicus* (L.) All.	Fabaceae	Jungli methi	H	Disturbed areas, coastal plains
130	*Merremia gangetica* (L.) Cufod.	Convolvulaceae	Undarkani	C	Coastal scrublands, disturbed areas
131	*Mesosphaerum suaveolens* (L.) Kuntze	Lamiaceae	Vilayati tulsi	H	Coastal scrublands, disturbed areas
132	*Mimosa hamata* Willd.	Fabaceae	Kasedi	SH	Coastal scrublands
133	*Momordica balsamina* L.	Cucurbitaceae	Vad kareli	C	Coastal scrublands, disturbed areas
134	*Momordica dioica* Roxb. ex Willd.	Cucurbitaceae	Kantola	C	Coastal scrublands, disturbed areas
135	*Najas marina* L.	Hydrocharitaceae	Lekhri	H	Coastal wetlands, submerged habitats
136	*Nanorrhinum ramosissimum* (Wall.) Betsche	Plantaginaceae		H	Coastal scrublands, disturbed areas
137	*Neltuma juliflora* (Sw.) Raf.	Fabaceae	Gando baval	T	Coastal scrublands, disturbed areas
138	*Nymphaea nouchali var. nouchali*	Nymphaeaceae	Poyna	H	Coastal wetlands, marshes
139	*Nymphaea pubescens* Willd.	Nymphaeaceae	Poyna	H	Coastal wetlands, marshes
140	*Ocimum basilicum* L.	Lamiaceae	Takmariya	H	Coastal scrublands, disturbed areas
141	*Opuntia elatior* Mill.	Cactaceae	Fafda thor	SH	Coastal scrublands, disturbed areas
142	*Oxystelma esculentum* (L.f.) Sm.	Apocynaceae	Jaldudhi	C	Coastal scrublands, rocky areas
143	*Panicum antidotale* Retz.	Poaceae	Dhuns	H	Coastal grasslands, sandy soils
144	*Parkinsonia aculeata* L.	Fabaceae	Pardeshi baval	T	Coastal scrublands, disturbed areas
145	*Parthenium hysterophorus* L.	Asteraceae	Gajar ghas	H	Disturbed areas, coastal plains
146	*Paspalum distichum* L.	Poaceae	Velari dhrokad	H	Coastal wetlands, marshes
147	*Passiflora foetida* L.	Passifloraceae	Krishnakamal	C	Coastal scrublands, disturbed areas
148	*Pavonia arabica* Steud.	Malvaceae	Adariyu	H	Coastal scrublands, disturbed areas
149	*Pedalium murex* L.	Pedaliaceae	Ubhu Gokharu	H	Coastal scrublands, disturbed areas
150	*Peltophorum pterocarpum* (DC.) Backer ex K.Heyne	Fabaceae	Tamrafali	T	Coastal scrublands, disturbed areas

Table 2 . Cont..

SN	Scientific name	Family	Vernacular name	Habit	Habitat
151	*Pergularia daemia* (Forssk.) Chiov.	Apocynaceae	Chamar dudheli	C	Coastal scrublands, disturbed areas
152	*Persicaria glabra* (Willd.) M.Gómez	Polygonaceae		H	Coastal wetlands, marshes
153	*Phoenix dactylifera* L.	Arecaceae	Khajuri	T	Coastal scrublands, plantations
154	*Phoenix sylvestris* (L.) Roxb.	Arecaceae	Tadi	T	Coastal scrublands, disturbed areas
155	*Phragmites karka* (Retz.) Trin. ex Steud.	Poaceae	Nali	H	Coastal wetlands, marshes
156	*Phyla nodiflora* (L.) Greene	Verbenaceae	Ratveliyo	H	Coastal wetlands, sandy soils
157	*Phyllanthus maderaspatensis* L.	Phyllanthaceae	Bakrato	H	Coastal scrublands, disturbed areas
158	*Phyllanthus niruri* L.	Phyllanthaceae	Bhoy Aamli	H	Coastal scrublands, disturbed areas
159	*Phyllanthus reticulatus* Poir.	Phyllanthaceae	Keda Kamboi	SH	Coastal scrublands, rocky areas
160	*Physalis minima* L.	Solanaceae	Sarpopoto	H	Coastal scrublands, disturbed areas
161	*Pithecellobium dulce* (Roxb.) Benth.	Fabaceae	Bakhay amli	T	Coastal scrublands, disturbed areas
162	*Polycarpaea spicata* Wight ex Arn.	Caryophyllaceae	Vajradanti	H	Sandy soils
163	*Polygonum plebeium* R.Br.	Polygonaceae	Rato lano	H	Coastal wetlands, marshes
164	*Pontederia crassipes* Mart.	Pontederiaceae	Jal kumbhi	H	Coastal wetlands, marshes
165	*Portulaca oleracea* L.	Portulacaceae	Moti luni	H	Coastal scrublands, sandy soils
166	*Prosopis cineraria* (L.) Druce	Fabaceae	Khijdo	T	Coastal scrublands, disturbed areas
167	*Pupalia lappacea* (L.) Juss.	Amaranthaceae	Dhodo jipto	H	Coastal scrublands, disturbed areas
168	*Rhynchosia minima* (L.) DC. var minima	Fabaceae	Kamarvel	C	Coastal scrublands, disturbed areas
169	*Rivea hypocrateriformis* Choisy	Convolvulaceae	Fang	C	Coastal scrublands, disturbed areas
170	*Rostellularia diffusa* (Willd.) Nees	Acanthaceae	Kalo Arduso	H	Coastal scrublands, disturbed areas
171	*Ruellia patula* Salzm. Ex Ness	Acanthaceae	Jungli Fatakdi	H	Coastal scrublands, disturbed areas
172	*Salvadora persica* L.	Salvadoraceae	Mithi Pilu	T	Coastal scrublands, sandy soils
173	*Senegalia ferruginea* (DC.) Pedley	Fabaceae	Kanti	T	Coastal scrublands, disturbed areas
174	*Senegalia senegal* (L.) Britton	Fabaceae	Gorad	T	Coastal scrublands, disturbed areas
175	*Senna auriculata* (L.) Roxb.	Fabaceae	Aavar	SH	Coastal scrublands, disturbed areas
176	*Senna italica* Mill.	Fabaceae	Mindhi aavar	H	Coastal scrublands, disturbed areas
177	*Senna occidentalis* (L.) Link	Fabaceae	Kasurndro	H	Coastal scrublands, disturbed areas
178	*Senna tora* (L.) Roxb.	Fabaceae	Kuvadiyo	H	Coastal scrublands, disturbed areas

Table 2 . Cont..

SN	Scientific name	Family	Vernacular name	Habit	Habitat
179	*Setaria geminata* (Forssk.) Veldkamp	Poaceae	Moto Samo	H	Coastal scrublands, disturbed areas
180	*Setaria verticillata* (L.) P.Beauv.	Poaceae	Moti kunchi	H	Coastal scrublands, disturbed areas
181	*Sida cordifolia* L.	Malvaceae	Bala	H	Coastal scrublands, disturbed areas
182	*Solanum virginianum* L.	Solanaceae	Bhoyringni	H	Coastal scrublands, disturbed areas
183	*Sonchus brachyotus* DC.	Asteraceae	Sonki	H	Coastal scrublands, disturbed areas
184	*Sporobolus diandrus* (Retz.) P.Beauv.	Poaceae	Velarimermer	H	Coastal grasslands, rocky areas
185	*Suaeda nudiflora* (L.) Dumort.	Amaranthaceae	Lano	H	Coastal wetlands, marshes
186	*Suaeda vermiculata* Forssk. ex J.F.Gmel.	Amaranthaceae	Lano	H	Coastal wetlands, marshes
187	*Tamarindus indica* L.	Fabaceae	Khati aamli	T	Coastal scrublands, plantations
188	*Tamarix ericoides* Rottler	Tamaricaceae	Prans	SH	Coastal wetlands, marshes
189	*Taverniera cuneifolia* (Roth) Arn.	Fabaceae	Khoti gethimadh	SH	Coastal scrublands, disturbed areas
190	*Tephrosia purpurea* (L.) Pers.	Fabaceae	Sarpankho	H	Coastal scrublands, disturbed areas
191	*Terminalia catappa* L.	Combretaceae	Badam	T	Coastal scrublands, disturbed areas, plantations
192	*Tetrapogon villosus* Desf.	Poaceae	Laso lampdo	H	Coastal scrublands, disturbed areas
193	*Thespesia populnea* (L.) Sol. ex Corrêa	Malvaceae	Paras Piplo	T	Coastal scrublands, sandy soils, plantations
194	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Galo	C	Coastal scrublands, disturbed areas
195	*Tragus mongolorum* Ohwi	Poaceae	Vandariyu	H	Coastal scrublands, sandy soils
196	*Trianthema portulacastrum* L.	Aizoaceae	Satodo	H	Beaches, sandy soils
197	*Trianthema triquetra* Willd. ex Spreng.	Aizoaceae	Satodi	H	Coastal scrublands, sandy soils
198	*Tribulus terrestris* L.	Zygophyllaceae	Bethu gokharu	H	Coastal scrublands, disturbed areas
199	*Trichodesma indicum* (L.) Lehm.	Boraginaceae	Undha fuli	H	Coastal scrublands, disturbed areas
200	*Tridax procumbens* L.	Asteraceae	Ghaburi	H	Coastal scrublands, disturbed areas
201	*Triumfetta rhomboidea* Jacq.	Malvaceae	Zipti	SH	Coastal scrublands, disturbed areas
202	*Triumfetta rotundifolia* Lam.	Malvaceae	Zipto	SH	Coastal scrublands, sandy soils
203	*Turnera ulmifolia* L.	Passifloraceae	Pili fuldi	H	Coastal scrublands, disturbed areas
204	*Typha elephantina* Roxb.	Typhaceae	Panni	H	Coastal wetlands, marshes
205	*Urochloa ramosa* (L.) T.Q.Nguyen	Poaceae	Kariyu	H	Coastal wetlands, disturbed areas

Table 2 . Cont..

SN	Scientific name	Family	Vernacular name	Habit	Habitat
206	*Vachellia leucophloea* (Roxb.) Maslin, Seigler & Ebinger	Fabaceae	Harmo baval	T	Coastal scrublands, disturbed areas
207	*Vachellia planifrons* (Wight & Arn.) Ragup., Seigler, Ebinger & Maslin	Fabaceae	Chatro baval	T	Coastal scrublands, disturbed areas
208	*Vincetoxicum spirale* (Forssk.) D.Z.Li	Apocynaceae	Singroti	C	Coastal scrublands, disturbed areas
209	*Withania somnifera* (L.) Dunal	Solanaceae	Ghodakhund	SH	Coastal scrublands, disturbed areas
210	*Xanthium strumarium* L.	Asteraceae	Gadariyu	H	Coastal wetlands, marshes, disturbed areas
211	*Ziziphus nummularia* (Burm.f.) Wight & Arn.	Rhamnaceae	Bordi	SH	Coastal scrublands, disturbed areas
212	*Zoysia matrella* (L.) Merr.	Poaceae	Khari Dhrokad	H	Coastal marshes, sandy soils
213	*Zygophyllum creticum* (L.) Christenh. & Byng	Zygophyllaceae	Dhamaso	H	Coastal scrublands, disturbed areas

Table 3. Synoptic analysis of Coastal flora of Porbandar

Class	No. of families	No. of genera	No. of species
Polypetalae	27	64	77
Gamopetalae	13	53	62
Monochlamydae	8	23	33
Total Dicotyledons	48	140	172
%	82.75862069	80.45977011	80.75117371
Total Monocotyledons	10	34	41
%	17.24137931	19.54022989	19.24882629
Grand Total	58	174	213
Ratio (Monocots: Dicots)	1:4.8	1:4.12	1:4.19

from 5 different marshy habitats along the Bhal coastal region. Das *et al*. (2019) recorded 243 plant species belonging to 177 genera and 61 families from the coastal area of Devbhumi Dwarka district and its islands in the Gulf of Kachchh. Chudasama and Vyas (2020) documented 25 species from 25 genera and 12 families along the coastline of Mangrol

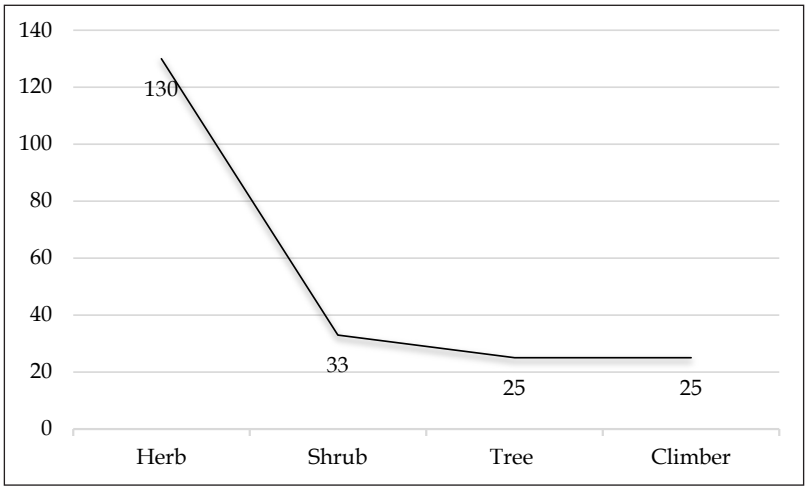

Fig. 2. Habit of Coastal flora.

Table 4. Threatened species

Species	Status
Aegle marmelos (L.) Corrêa	Near threatened
Commiphora wightii (Arn.) Bhandari	Critically Endangered
Helichrysum cutchicum (C.B.Clarke) R.S.Rao & Deshp	Vulnerable
Hyphaene dichotoma (D.White bis ex Nimmo) Furtado	Near threatened
Lepidagathis bandraensis Blatt.	Near threatened
Senegalia ferruginea (DC.) Pedley	Vulnerable

Fig. 3. Helichrysum cutchicum.

Fig. 4. Commiphora wightii.

taluka in Junagadh district. Shah (2018) noted 203 angiospermic taxa under 145 genera and 57 families from the coastal area of Kachchh district. Salvi *et al*. (2017) reported 27 halophytic plant species from 23 genera and 14 families from the Gulf of Kachchh.

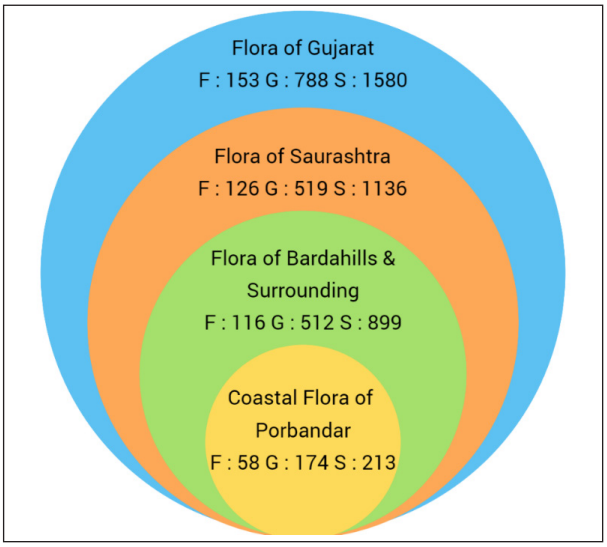

Fig. 5. A comparative abundance information of species of Angiosperms at state and regional level (F:famil, G:genera, S:species).

Conclusion

The coastal flora of Porbandar district exhibits considerable biodiversity, comprising 213 species from 174 genera and 58 families. The prevalence of dicotyledons and the presence of threatened species, such as *Commiphora wightii, Helichrysum cutchicum, Senegalia ferruginea, Aegle marmelos, Hyphaene dichotoma*, and *Lepidagathis bandraensis*, highlight the ecological richness and conservation needs of this region.

The majority of species were found in coastal scrublands, showcasing the adaptability of plants to thrive in disturbed and sandy environments. Coastal wetlands and marshes also support a significant number of species, illustrating the critical role of these habitats in maintaining plant diversity and providing essential ecosystem services. While beaches and sand dunes hosted fewer species, the presence of effective sand dune stabilizers, such as

Halopyrum mucronatum and *Ipomoea pes-caprae*, underscores the ecological significance of these areas in preventing erosion and supporting coastal protection.

The coast is home not only to halophytes (salt-tolerant plants) but also to various non-saline plants, which face increasing threats from rising salinity. To mitigate this issue, an interlinking project for a coastal canal has been ongoing since 2006, linking the coastal canal from Madhavpur to Miyani with the Madhuvanti, Bhadar, Ojat rivers, and other small tributaries of the district. Additionally, the spread of saline areas poses a significant crisis. In response, Forest Management is planting *Neltuma juliflora* in various coastal regions. However, instead of the monotonous planting of a single invasive species, it is advisable to introduce diverse native species like *Salvadora, Casuarina*, and *Tamarix*. Furthermore, sand dune stabilizer species such as *Halopyrum mucronatum*, *Ipomoea pes-caprae*, *Lotus garcinia*, and *Zoysia matrella* can be planted on sand dunes to prevent the spread of sand to non-saline areas.

Systematic documentation and analysis of these plant species provide a crucial baseline for future conservation efforts and underscore the importance of preserving these unique coastal ecosystems. Conservation strategies should include habitat protection and restoration of degraded areas. Additionally, future research should focus on monitoring the effects of climate change on coastal flora, assessing the impact of human activities, and exploring the potential for sustainable use of plant resources to balance conservation with local livelihoods.

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Author contributions

KNO, KS, and BAJ planned and designed the research. KNO and KS conducted fieldwork, performed the systematic surveys, and analysed the data. KNO, KS, and BAJ wrote the manuscript.

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