

An appraisal on the invasive alien plant species of Andaman & Nicobar Islands, India

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ABSTRACT

The invasive alien species of Andaman and Nicobar Islands, India have been presented in the paper. A total of 74 species under 58 genera of 29 families have been described in brief.

INTRODUCTION

The invasive plant population is currently spreading across the world and creating problems to wildlife habitats and their food availability (Aryal et al., 2017, Aryal et al., 2018; Chaudhary et al., 2022; Clements & Ditommaso, 2011; Murphy et al., 2013; Dar & Reshi, 2015; Regan et al., 2016; Lamsal et al., 2017, 2018). Invasion of alien species on the indigenous flora is one of the major issues which the phytodiversity of India faces these days. It has many adverse effects such as biodiversity loss and species extinction. In response to this, various surveys have been carried out in different states to study the invasion of foreign plants in the country (Khuroo et al., 2007; Reddy et al., 2008; Srivastava & Singh, 2009; Chandra Sekar, 2012; Sankaran, Suresh & Sajeev, 2012; Pathak et al., 2019). It is a major concern that the forests in the biodiversity hotspots of India such as Western Ghats, Himalayan Region and Andaman & Nicobar

Islands are being invaded by exotic plant species. The Indian Himalayan Region has been invaded with a total of 190 plant species belonging to 112 genera under 47 families (Reddy et al., 2008). In this context the present study was carried out to survey the invasive alien plant species of Andaman and Nicobar Islands (ANI's), one of the hotspots of biodiversity. The ANI's (N 6°45' to 13°41' and E 92°12' to 93°57') is a group of 572 Islands and islets and comprise a unique region of rich plant diversity in India with high endemism (Singh, Murugan & Singh, 2014; Singh et al., 2020a,b, 2021a,b; Singh & Ranjan, 2021). It is situated in the tropical belt and frequently battered by tropical rains during both South-West monsoons (May to September) and North-East monsoon (October to December). The majority of rainfall (76%) is received during South-West Monsoon, 22% during the North-East monsoon and the rest during summer season. These islands are exposed to marine impacts have warm and humid climate with annual rainfall ranging from 3000 to 3500 mm and the temperature ranging between 18° to 35°C. In ANI's the soils have low to medium available water holding capacity with acidic nature and moderate to low in base saturation. The soils are medium to deep, red loamy soils including marine alluvium derived soils along the coast. It is dominantly influenced by the climate and vegetation.

The flora of ANI's (N 6°45' to 13°41' and E 92°12' to 93°57') comprises a total of 3410 species under 1281 genera and 303 families including 112 threatened species (Singh, Murugan & Singh, 2014; Singh et al., 2021a,b). Out of these, 2433

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are angiosperms, 9 Gymnosperms, 145 Pteridophytes, 76 Bryophytes, 565 Lichens and 182 Algae (Singh et al., 2021a,b). It includes indigenous as well as introduced species. Out of the introduced species, many are reported to have invasive nature which multiply and colonize the habitat and displace the native plant communities in a short period of time. Convention for Biological Diversity visualizes the biological invasion of alien species as second worst threat after habitat destruction (Surendra et al., 2013).

This study is an outcome of field surveys conducted during 2015-2019 along with the comprehensive investigation on the specimens deposited in PBL, additional live collections and scrutiny of relevant literatures (Wallich, 1850; Kurz, 1870, 1876; Parkinson, 1923; Balakrishnan, 1989; Hajra, Rao & Mudgal, 1999; Sinha, 1999; Dixit & Sinha, 2001; Pandey & Diwakar, 2008; Singh, Murugan & Singh, 2014, Singh et al., 2020a,b, 2021a,b; Murugan et al., 2016; Vivek, Singh & Ekka, 2016; Naik, Singh & Ganeshiah, 2020; Singh & Ranjan, 2021).

RESULT

This work has listed a total of 74 invasive plant species belonging to 58 genera under 29 families occurring in the ANI's. It was observed during the field surveys that native flora is being affected due to increase in population of invasive plants which has imposed high risk on phytodiversity of the islands.

Details of invasive alien plant species in the Andaman and Nicobar Islands

1. *Acacia farnesiana* (L.) Willd. (Mimosaceae). Armed shrub to small tree, grows aggressively in the habitat and disturbs the native flora; spreading fast in the Islands; native to North America.
2. *Aeschynomene americana* L. (Fabaceae). Herb or shrublet, found in wetlands, agricultural land, and along roadsides; introduced for forage and green manure; spreading in Islands; native of Tropical America.
3. *Ageratum conyzoides* (L.) L. (Asteraceae). Annual herb, stem and leaves viscid hairy, very variable in size and shape; flower heads varying in colour from white to bluish or pinkish; native to Central America and Caribbean Islands (Fig. 1 A).
4. *Alternanthera brasiliana* (L.) Kuntze (Amaranthaceae). Subshrub with leaves and stem pinkish to purplish and flowers white, in heads; introduced in Andaman Nicobar Islands as ornamental plant, escaped and naturalized; native of Brazil and Mexico (Fig. 1 B).
5. *Alternanthera paronychioides* A.St.-Hil. (Amaranthaceae). Creeping herb with hairy stem and leaves; flowers white, in heads; spreading along roadsides in the Islands; native of Tropical America.
6. *Alternanthera philoxeroides* (Mart.) Griseb. (Amaranthaceae): Perennial, aquatic or semi-aquatic herb; mat forming; flowers white in heads; disturbs existing flora of the habitat; native of South America (Fig. 1 C).
7. *Alternanthera tenella* Colla var. *tenella* (Amaranthaceae). Creeping herb with hairy stem and leaves; flowers white, in heads; spreading along roadsides in the Islands; native of Tropical America.
8. *Antigonon leptopus* Hook. & Arn. (Polygonaceae). Woody climber with showy flowers; covers the local vegetation; usually found along roadsides and on forest margins; native of South America.
9. *Argemone mexicana* L. (Papaveraceae). Erect herb with prickly stem, leaves and milky latex; invades the disturbed lands near forest and agricultural fields; native of Tropical Central and South America.
10. *Asclepias curassavica* L. (Asclepiadaceae). Ornamental shrub with showy flowers in shades of yellow, orange and red, medicinal as well; found along road sides and disturbed areas in the Islands; native of Tropical America.
11. *Blainvillea acmella* (L.) Philipson (Asteraceae). Erect herb with hairy stem and leaves; flowers white, in heads; spreads in open, disturbed areas and disturbs the native flora; spreading fast in the Islands; native of Tropical America.
12. *Blumea eriantha* DC. (Asteraceae). Erect herb with white to purplish flowers; spreading in wastelands and road sides in the Islands; native of Tropical America.
13. *Blumea lacera* (Burm.f.) DC. (Asteraceae). Erect herb with yellowish flowers; spreading in wastelands, agricultural land and roadsides in the Islands; native of Tropical America.
14. *Caladium bicolor* (Aiton) Vent. (Araceae). Tuberous, perennial herb; leaves in varying colours of white, dotted and pinkish lined; poisonous; introduced in almost all the Islands; native of South America.
15. *Cascabela thevetia* (L.) Lippold (Apocynaceae). Shrub with linear leaves and showy, yellow flowers; grows vigorously and displaces the native flora; whole plant is poisonous; grown as ornamental in the Islands; native of Tropical America.
16. *Celosia argentea* L. (Amaranthaceae). Erect herb with flowers of varying colours and shapes; a garden escape, spreading in open disturbed places in the Islands; native of Tropical America (Fig. 1 D).
17. *Centratherum intermedium* Less. (Asteraceae). Scandent herb with showy, purple flower heads; introduced as ornamental plant in the Islands; covers the habitat and suppresses the growth of local flora; native of South America.

18. *Chromolaena odorata* (L.) King & Robinson (Asteraceae). Scandent, perennial shrub with white flowers in heads; fast growing and invading the Islands; native of Tropical America.
19. *Chrozophora rottleri* (Geis.) Spreng. (Euphorbiaceae). Erect herb with silvery hairs on stem and leaves; flowers yellowish; established in dry fields and waste places in the Islands; native of Tropical America.
20. *Corchorus aestuans* L. (Tiliaceae). Erect, spreading herb, with hairy stem and yellow flowers; occurs in disturbed areas, mostly in partial shade and colonizes in short period of time; spreading fast in the Islands; native of Tropical America.
21. *Crassocephalum crepidioides* (Benth.) Moore (Asteraceae). Erect herb with succulent stem and white to orange-coloured flowers in heads; grows fast in disturbed areas usually during monsoon; native of Tropical America.
22. *Croton bonplandianus* Baill. (Euphorbiaceae). Woody herb or shrub with stellate and viscous glandular hairs; inflorescence terminal raceme; male and female flowers separate; flowers greenish-white; spreading in the Islands; native of Temperate South America.
23. *Cuscuta chinensis* Lam. (Cuscutaceae). Climbing, parasitic herb with yellowish stem and minute flowers; spreads on other plants, forms mat and ultimately kills the host; spreading in open areas of the Islands; native of Mediterranean region.
24. *Cyperus iria* L. (Cyperaceae). Herb; overgrows in habitat and disturbs the native flora; spread in open wet places, road sides and other disturbed areas in the Islands; native of Tropical America.
25. *Dinebra retroflexa* (Vahl) Panz (Poaceae). Fast growing herb, usually found in paddy cultivations and reduces the crop yield; spreads also in other wetland situations in the Islands; native of Tropical America.
26. *Echinochloa colona* (L.) Link (Poaceae). Fast growing herb, usually found in paddy cultivations, along roadsides and disturbed areas in wet soil; moderately disturbs the crops; established in the Islands; native of Tropical South America.
27. *Echinochloa crus-galli* (L.) P.Beauv. (Poaceae). Usually found in the wet situations of the Islands, overgrows in paddy fields and reduces crop yield; native of Tropical South America.
28. *Eichhornia crassipes* (C.Martius) Solms. (Pontederiaceae). Aquatic herb with inflated petioles and showy bluish flowers; multiplies rapidly and covers the water surface and disturbs other water plants; established in wetlands and reservoirs in the Islands; native of Tropical America (Fig. 1 E).
29. *Eleutheranthera ruderalis* (Sw.) Sch. Bip. (Asteraceae). Erect, annual herb with small yellow flowers; grows fast along roadsides, plains and agricultural fields; common in the Islands; native of Tropical America (Fig. 1 F).
30. *Euphorbia heterophylla* L. (Euphorbiaceae). Erect, annual herb having milky latex; invades road sides and disturbed areas in the Islands; native of Central America.
31. *Gomphrena celosioides* Mart. (Amaranthaceae). Prostrate herb with silky hairy stem and leaves; flowers white, in heads; found along roadsides and disturbed open fields in the Islands; native of South America.
32. *Hyptis capitata* Jacq. (Lamiaceae). Erect shrub; flowers white, in heads; widespread in the Islands; native of Central America.
33. *Hyptis suaveolens* (L.) Poit. (Lamiaceae). Shrub with hairy stem and leaves; flowers bluish to purplish; spreads fast disturbing the local flora; native of Tropical America (Fig. 1 G).
34. *Imperata cylindrica* (L.) Raeusch. (Poaceae). Tuft forming, rhizomatous, perennial herb with silky-white panicle; established in the Islands; native of Tropical America.
35. *Indigofera glandulosa* Roxb. ex Willd. (Fabaceae). Much branched herb; flowers born in sessile heads, red in colour; pods linear to oblong, hairy, angled, winged and toothed on angles; spreading in the Islands; native of Tropical America.
36. *Ipomoea aquatica* Forssk. (Convolvulaceae). Creeping wetland herb with white or purplish flowers, forms dense mat over the water and hampers the growth of other aquatic plants; widespread in the aquatic situations in the Islands; native of Central to South China (Fig. 1 H).
37. *Ipomoea cairica* (L.) Sweet (Convolvulaceae). Creeping vine; flowers showy, purplish; grows fast and suppresses the growth of local floras; spreading fast along road sides, disturbed sites etc. in the Islands; native of Tropical Africa and Asia.
38. *Ipomoea carnea* Jacq. subsp. *fistulosa* (Mart. ex Choisy) Austin (Convolvulaceae). Ornamental subshrub; flowers showy, white to pinkish white; occupies the road sides in the Islands; native of Tropical America.
39. *Ipomoea hederifolia* L. (Convolvulaceae). Ornamental, twining herb, introduced in gardens; flowers showy, white to pinkish-white; spreading fast along roadside; native of Tropical America.
40. *Ipomoea obscura* (L.) Ker.-Gawl. (Convolvulaceae). Twining herb with woolly stem and cordate-circular or ovate leaves; flowers funnel like, white or pale yellow; spreading in the Islands; native of Tropical Africa.
41. *Ipomoea quamoclit* L. (Convolvulaceae). Ornamental, twining herb with attractive dissected leaves and flowers; covers and suppresses the growth of host plant; plant has poisonous properties as well; native of Tropical America.

42. *Jatropha gossypifolia* L. (Euphorbiaceae). Ornamental shrub with pinkish-green to purplish-green leaves and red, yellow centered flowers; spreading along roadsides and wastelands in the Islands; native of South America.
43. *Lantana camara* L. (Verbenaceae). Scandent shrub with prickly stem and showy flowers in different shades of red, yellow, rose, white, etc.; vigorously spreading and disturbing the local flora; native of Central and South America (Fig. 2 A).
44. *Limncharis flava* (L.) Buchenau (Alismataceae). Aquatic herb with showy leaves and yellow flowers; spreading fast in the shallow pools, swamps, ditches, and rice fields in the Islands; native of Central America, South America, and the Caribbean Islands (Fig. 2 B).
45. *Ludwigia octovalvis* (Jacq.) Raven (Onagraceae). Shrub with showy, yellow flowers; spreading in undisturbed wetlands of the Islands; native of Tropical Africa.
46. *Ludwigia perennis* L. (Onagraceae). Shrub with minute, yellow flowers; spreading in the paddy fields and semi-aquatic places in the wastelands; native of Tropical Africa.
47. *Ludwigia peruviana* (L.) Hara (Onagraceae). Shrub with showy, yellow flowers; grows vigorously and disturbs other plants in the habitat; spreading in the undisturbed wetlands of the Islands; native of Tropical Africa.
48. *Malvastrum coromandelianum* (L.) Garcke (Malvaceae). Stellate pubescent subshrub having yellowish flowers and pubescent fruits; moderately spreading in the Islands; native of Tropical America.
49. *Mecardonia procumbens* (Mill.) Small (Scrophulariaceae). Creeping herb with wedge-shaped leaves having toothed margins; flowers small, bright yellow; spreading in the Islands; native of Tropical North America.
50. *Melochia cochorifolia* L. (Sterculiaceae). Erect or decumbent herb or subshrub with yellow-brown branches; flowers white, drying reddish; native of Tropical America.
51. *Merremia vitifolia* (Burm.f.) Hallier f. (Convolvulaceae). Twining herb with showy, yellow flowers; vigorously grows over other plants and suppresses their growth; spreading on forest margins and wastelands in the Islands; native of Indo-Malesia and China.
52. *Mikania cordata* (Burm.f.) B.L.Rob. (Asteraceae). Twining herb; grows fast and suppresses the growth of host plants; one of the worst invaders in the world as per Global Invasive Species Database; fast spreading in the Islands; native of North, Central and South America (Fig. 2 C).
53. *Mimosa pudica* L. (Mimosaceae). Straggling herb with prickly stems and showy rose to pink-coloured flowers; infests cultivated and undisturbed fields, roadsides, wastelands, etc.; native of South America (Fig. 2 D).
54. *Monochoria vaginalis* (Burm.f.) C.Presl (Pontederiaceae). Aquatic herb with showy flowers in bluish to purplish shades; invades the ditches, canals, and other wetland situations; moderately invading the paddy fields and roadside canals in the Islands; native of Tropical America (Fig. 2 E).
55. *Muntingia calabura* L. (Elaeocarpaceae). Tree, cultivated for fruits and shade; flowers white; fast growing, colonizing the wastelands and wetlands in the Islands; native of Tropical America.
56. *Ocimum americanum* L. (Lamiaceae). Medicinal shrub with aromatic leaves; fast spreading locally wherever the plant is introduced; moderately spreading along roadsides and human settlements in the Islands; native of Tropical America.
57. *Parthenium hysterophorus* L. (Asteraceae). Herb with dissected leaves and white flowers in heads; fast colonizing the wastelands and disturbing the local flora; pollen grains are allergic to human; native of North and South America (Fig. 2 F).
58. *Passiflora foetida* L. (Passifloraceae). Twining herb with showy, fragrant flowers; suppresses the growth of other plants; occupies roadsides and wastelands in the Islands; native of Tropical America.
59. *Pennisetum pedicellatum* Trin. (Poaceae). Annual pasture grass with showy inflorescence; grows fast and replaces the local vegetation; found along roadsides, wastelands and unattended areas in the Islands; native of Africa and Asia.
60. *Pennisetum polystachion* (L.) Schult. (Poaceae). Annual pasture grass having showy inflorescence; grows fast and replaces the local vegetation; found along roadsides, wastelands and unattended areas in the Islands; native of Tropical Africa.
61. *Pennisetum purpureum* Schum. (Poaceae). Annual pasture grass of showy inflorescence; grows fast replacing the local vegetation; found along roadsides, wastelands and unattended areas in the Islands; native of Tropical Africa, Asia and Australia.
62. *Physalis angulata* L. (Solanaceae). Annual herb with off-white, to cream-coloured flowers; fruits enclosed in persistent calyx, edible; moderately disturbing the local flora in agricultural land and wastelands in the Islands; native of Tropical Africa, Asia and Australia.
63. *Prosopis juliflora* (Sw.) DC. (Mimosaceae). Shrub to small tree with thorny stem and branches; overgrows in the habitat and suppresses the growth of local plants; reported from South Andaman only; native of Peru, Central America, and the Caribbean Islands.
64. *Ruellia tuberosa* L. (Acanthaceae). Ornamental herb or shrub with showy purple to bluish flowers; spreading moderately in the habitat; infesting human settlements in the Islands; native of Tropical America.
65. *Senna alata* (L.) Roxb. (Caesalpiniaceae). Shrub with

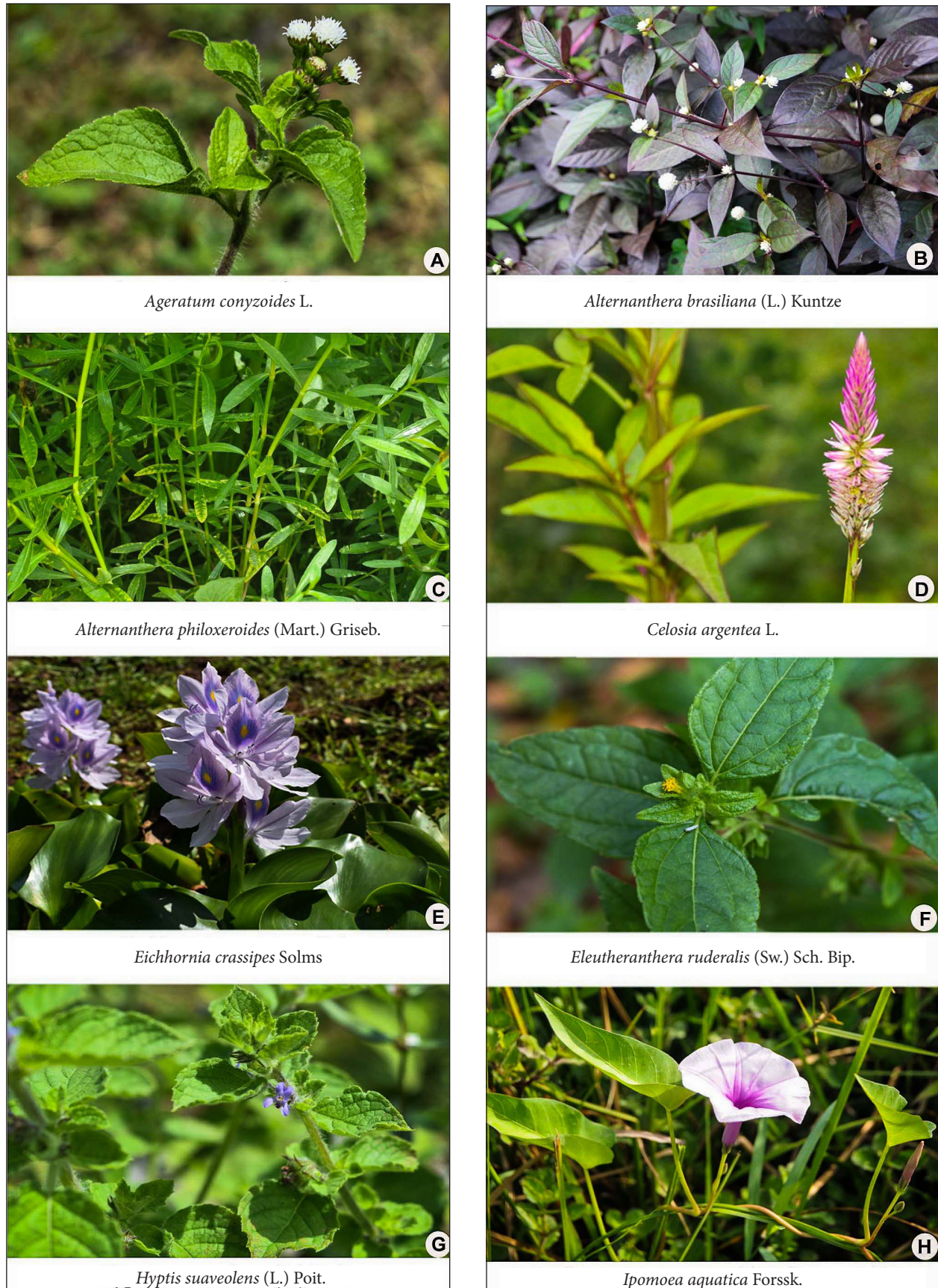


Figure 1. Invasive alien plant species in the Andaman and Nicobar Islands.

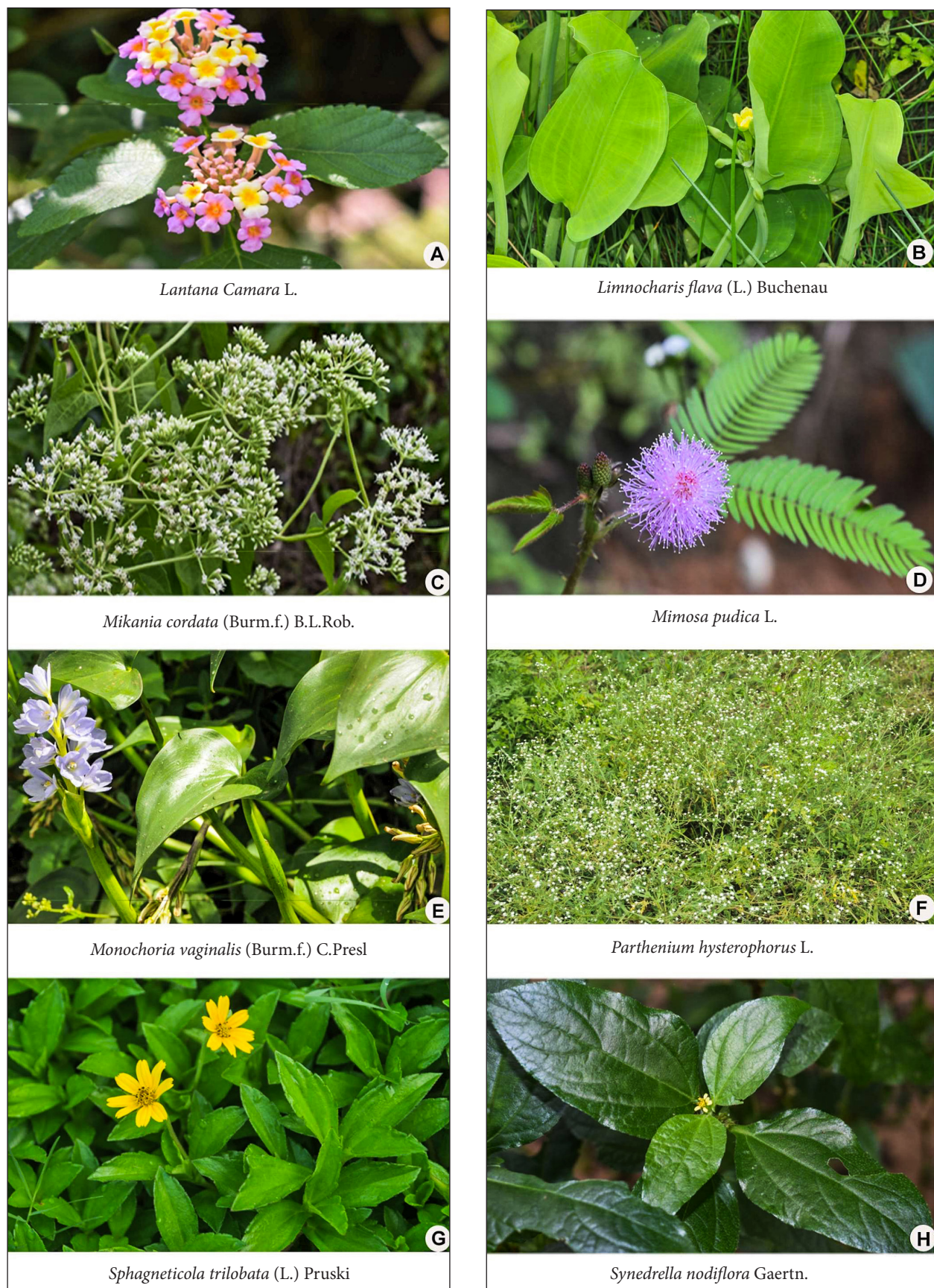


Figure 2. Invasive alien plant species in the Andaman and Nicobar Islands.

showy yellow flowers; grows in marshy lands, roadsides, wastelands; native of Tropical America.

66. *Senna tora* (L.) Roxb. (Caesalpiniaceae). Shrub growing along roadsides, in wastelands, marshy lands, cultivated lands moderately disturbing the native flora; native of South America.
67. *Sesbania bispinosa* (Jacq.) Wight (Fabaceae). Shrub growing in marshy lands, and wastelands; rapidly colonizes the areas and suppresses the growth of local flora; spreading in the Islands; native of Asia and Africa.
68. *Spermacoce hispida* L. (Rubiaceae). Prostrate to ascending herb or subshrub with quadrangular stem; flowers pink, purple or white, funnel like; native of Tropical America.
69. *Sphagneticola trilobata* (L.) Pruski (Asteraceae). Creeping herb with trilobed leaves and showy, yellow flowers; widely used for ornamental purpose; forms thick mat and displaces the native vegetation; native of Tropical America (Fig. 2 G).
70. *Stachytarpheta jamaicensis* (L.) Vahl (Verbenaceae). Sprawling and pubescent subshrub or herb; flowers dark blue; spreading in open and wet places in the Islands; native of Tropical America.
71. *Synedrella nodiflora* (L.) Gaertn. (Asteraceae). Erect herb with small, yellow flowers; overgrows in partially shaded, agriculture land, forest margins and other disturbed sites in the Islands; native of West Indies (Fig. 2 H).
72. *Tridax procumbens* L. (Asteraceae). Scandent to creeping herb with yellowish flowers in heads; spreading along open roadsides in the Islands; native of Tropical America.
73. *Triumfetta rhomboidea* Jacq. (Tiliaceae). Subshrub or herb with hairy branches, yellow flowers and spiny fruits; spreading in the Islands; native to Tropical America.
74. *Turnera ulmifolia* L. (Turneraceae). Herb or sub-shrub with yellow flowers; introduced in the Islands as ornamental; native of Tropical America.

CONCLUSIONS

A total of 74 invasive species belonging to 58 genera under 29 families are recorded in the flora of the ANI's. Many of them have already well established in the flora and rest are in process. Of these, *Parthenium hysterophorus*, *Eichhornia crassipes*, *Limnocharis flava*, and *Mikania cordata* are spreading at an alarming speed in the Islands from South to North Andaman Islands and Nicobar group of Islands. They are at the stage of setting threat to the biodiversity of the Islands. Despite being isolated from the mainland and other countries, entry of large number of invasive plant species into the Islands is matter of high concern and is to be properly monitored to save the native flora.

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