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ASSESSMENT OF ANGIOSPERM PLANT DIVERSITY OF NIJHUM DWEEP, BANGLADESH

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Abstract

The present article focuses the status of angiosperm plant diversity of Nijhum Dweep, a small Island in the Bay of Bengal close to Hatiya channel. From the analysis of the data a total of 152 plant species belonging to 56 families has been recorded. Among the recorded species, tree is represented by 66, shrub by 15, herbs by 58 and 13 by climbers. Of the species recorded from the area 51% species represented by 11 families and 49% represented by 45 families. Fabaceae appears to be largest in the Dicotyledones having 10 species whereas Poaceae is the largest in Monocotyledones having 12 species. Analysis confirmed that 68% of the recorded species found to be medicinal and 32% are used for other than medicinal purposes. Data analysis also showed that homesteads supported maximum plants followed by road side, cultivated land, mangrove and mangrove meadows. Collected data revealed that the occurrence of seven species namely *Bruguiera gymnorrhiza, Diospyros blancoi, Derris trifoliata, Heliotropium curassavicum, Tamarix gallica, Typha elephentanea* and *Sarcolobus carinatus* in the study area might be rare. *Dolichandrone spathacea*, a threatened of plant species of Bangladesh, was also found in this mangrove forest area. Through observations and discussion with local people, a number of threats to plant diversity have been identified. Finally, a number of possible conservation measures have been suggested for the management of angiosperm plant diversity of Nijhum Dweep.

Key words: Assessment, Angiosperm, Plant diversity, Nijhum Dweep

Introduction

Nijhum Dweep (Nijhum Island), is a tiny offshore island in the Bay of Bengal located between 21°35′0″N and 92°01′0″E in the southern part of Hatiya Upazila separated by Hatiya channel under Noakhali district. It is a cluster of several small accreditations mainly Char Osman, Char Kamla, Char Muri and Ballar Char. A virgin island with intertidal mudflats and sandflats has a scenic treasure trove having 20 kms long sandy and grassy beach. Total area of the island is about 40390 ha.. In the year 1974, forest department started forestation program using the species of *Sonneratia apetala* (Keora) and *Avicennia alba* (Baine) in the northern part of the island. The forest area is about 9000 acres and is very dense with many other associated species. The forest bed is muddy and inundated by tidal actions twice in a day. The island is also dissected by small creeks

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or canals and its centre part is under cultivation and human habitation. Generally, walk in the forest sometimes is not very easy because of channels and the presence of pneumatophore produced by *Sonneratia apetala* (Keora) and *Avicennia alba* (Baine) trees. The soil is highly alkaline. In the year of 2001, People's Republic of Bangladesh government has declared 16352.23 ha of forest land of Nijhum Dweep as a National Park for the protection of biodiversity. After that many media and enthusiastic people have highlighted the island for ecotourists to visit. According to local people and foresters reports, a good number of people has been visiting the island in winter taking much trouble in the journey. The area enjoys a moist tropical maritime climate and rainfall is frequent and heavy during the monsoon season (May to October) ranging between 140 mm to1040 mm. Temperature ranges from 16ºC to 33ºC, whereas humidity ranges from 29% to 99% (BBS 2011).

In Bangladesh an assessment of plant diversity of different national parks and wildlife sanctuary are already being started (Uddin *et al*. 1998, Uddin and Rahman 1999, Uddin *et al*. 2011, Uddin and Hassan 2004, 2010, Uddin *et al*. 2013). So far floristic literature review, no assessment records of angiosperm plant diversity was found for Nijhum Dweep except few plant names in the forest management plan. In the present study an attempt has been made to attain the following objectives: to assess the angiosperm plant diversity, to identify any threats and to suggest some possible conservation measures for the Nijhum Dweep conservation.

Materials and Methods

Plant sample collections (Hyland 1972, Balick *et al.* 1982 and Alexiades 1996) from the study area have been done in suitable time of the year of 2013 and 2014 paying three visits. Speciemens were collected from mangrove, meadow, cultivated land, roadside and homestead area. Special efforts were given to find species of conservation concern including threatened, endemic and rare. Voucher specimens processed using standard herbarium techniques (Hyland 1972). The specimens were identified consulting different Floras viz., Hooker 1872-1897, Prain 1903, Uddin and Hassan 2004, Siddiqui *et al.* 2007c and Ahmed *et al.* 2008a, 2008b, 2009b, 2009c, 2009d, 2009e. Specimens available at Dhaka University Salar Khan Herbarium (DUSH) were consulted in identifying the collected plant specimens. The updated nomenclature of the species followed Siddiqui *et al.* 2007c and Ahmed *et al.* 2008a, 2008b, 2009b, 2009c, 2009d, and 2009e). Voucher specimens are deposited at DUSH.

Results and Discussion

A total of 152 plant species under 56 families has been recorded from Nijhum Dweep. For each species local name, scientific name, family, habit and habitat are provided (Table 1). Among the species, 66 are represented by to trees, 15 by shrubs, 58 by herbs and 13 by climbers (Fig. 1). From the recorded species, 51% species represented by 11 families and 49% species represented by 45 families (Fig. 2). Fabaceae is the largest family in the Dicotyledon having 10 species whereas Poaceae is the largest family in Monocotyledon having 12 species. We compared plants species recorded in the Nijhum Dweep with medicinal plants data base of Bangladesh. Within recorded plants, 68% found to be medicinal and 32% used for other purposes (Fig. 3). Data analysis also showed that homestead supported maximum plants followed by road side, cultivated land, mangrove and mangrove meadow (Fig. 4). *Dolichandrone spathacea*, a threatened plant species of Bangladesh was recorded from the mangrove forest (Ara *et al.* 2013). Observations also revealed that occurrence of seven species including *Bruguiera gymnorrhiza, Diospyros blancoi, Derris trifoliata, Heliotropium curassavicum, Tamarix gallica, Typha elephentina* and *Sarcolobus carinatus* in the study area might be rare. To confirm such status further detailed survey is needed.

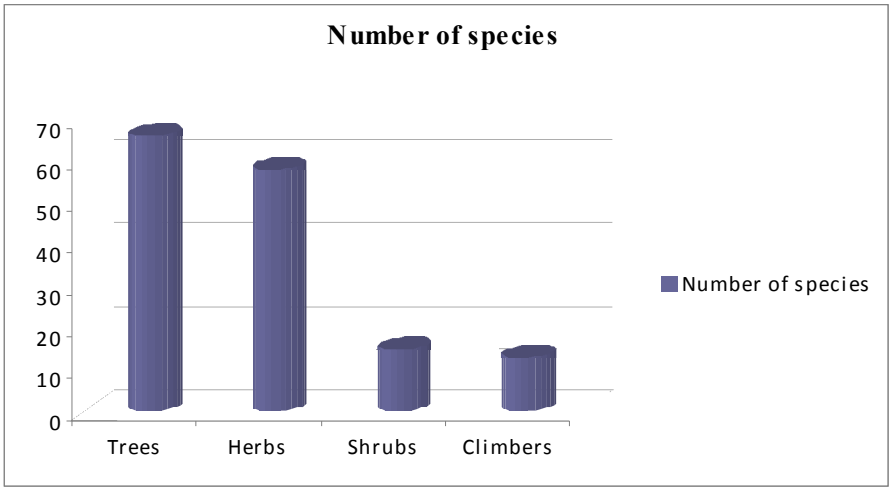

Fig. 1. Different life forms of plant species.

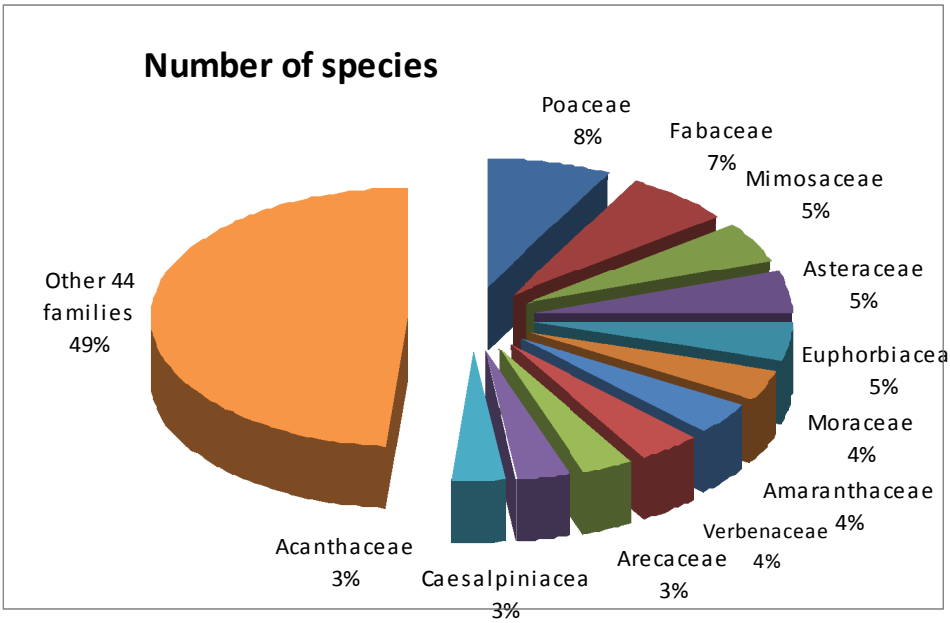

Fig. 2. Distribution of species in the families.

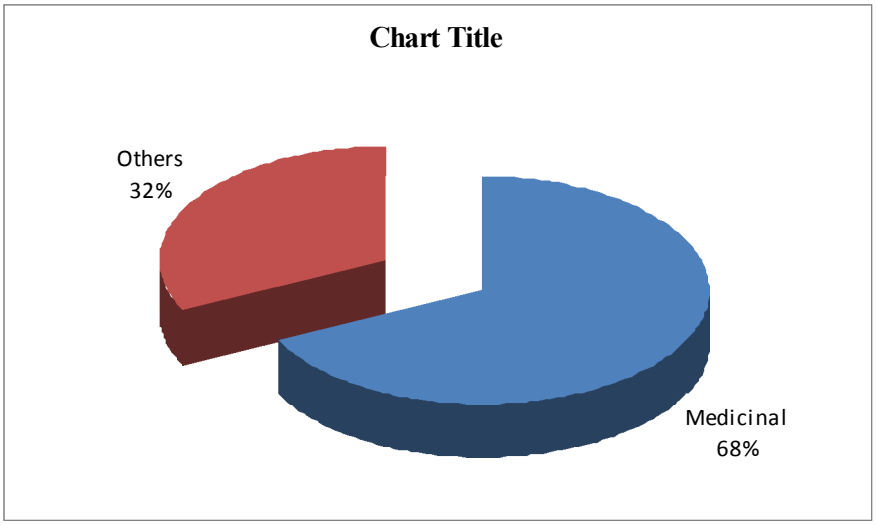

Fig. 3. Relative percentage of medicinal plants.

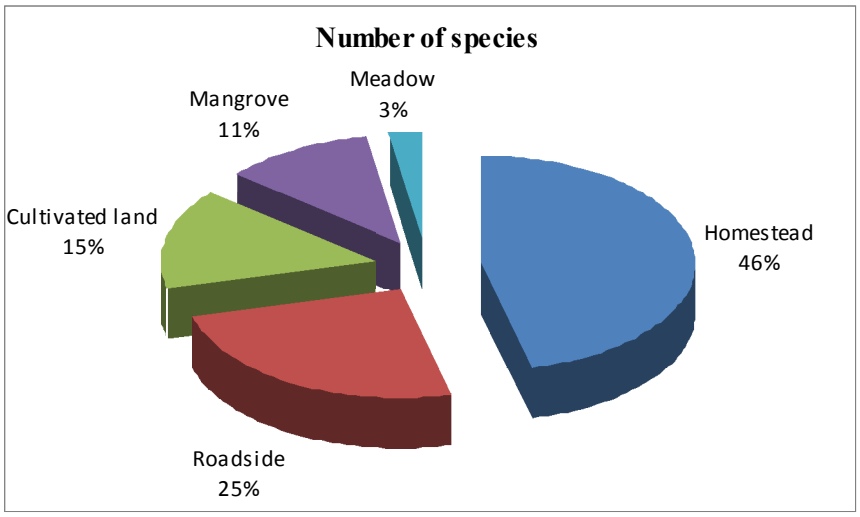

Fig. 4. Percentage of plant species in different habitats.

Observations further revealed that the Island showed different types of land used patterns. Each pattern has been occupied by different types of angiosperm plants. In the inundated area of tidal action, the forest has been formed by mangrove vegetation. Among the vegetation, the most common tree species in the top canopy is *Sonneratia apetala* (Keora). Associate species in this canopy is *Avicennia officinalis* (Baine). The middle canopy mainly dominated by only *Excoecaria agallocha* (Geoa). Two rare tree species also recorded in this layer of vegetation. These are *Bruguiera gymnorrhiza* (Kakra) and *Dolichandrone spathacea*. The ground primarily covered by *Zoysia matrella*, *Porteresia coarchtata, Fimbristylis acuminata* and *Fimbristylis ferruginea*.

Table 1. Plant diversity of Nijhum Dweep (T= tree, S =shrub, H= herb, C= climber).

Scientifc name	Local name	Family	Habit	Habitat
Acacia nilotica L.	Babla	Mimosaceae	T	Homestead
Acanthus ilicifolius L.	Hargoza	Acanthaceae	S	Mangrove
Adenanthera pavonina L.	Lalchandon	Mimosaceae	T	Homestead
Aegle marmelose (L.) Corr.	Bel	Rutaceae	T	Homestead
*Ageratum conyzoides (*L.) L.	Fulkuri	Asteraceae	H	Roadside
Albizia lebbeck (L.) Benth. & Hook.	Shilkoroi	Mimosaceae	T	Homestead
Albizia procera (Roxb.) Benth.	Sadakoroi	Mimosaceae	T	Homestead
Albizia richardiana (Voigt.) King & Prain.	Shiris	Mimosaceae	T	Homestead
Albizia saman (Jacq.) Merr.	Botkoroi	Mimosaceae	T	Homestead
Alocasia macrorrhizos (L.) G. Don	Mankachu	Araceae	H	Homestead

Contd.

Scientifc name	Local name	Family	Habit	Habitat
Alternanthera philoxeroides (Mart.) Griseb.	Helencha	Amarnthaceae	H	Cultivated land
Alternanthera sessilis (L.) R. Br. *Ex* DC..	Hainchashak	Amaranthaceae	H	Cultivated land
Amaranthus spinosus L.	Kantanote	Amaranthaceae	H	Roadside
Amaranthus viridis L.	data shak	Amaranthaceae	H	Homestead
Annona squamosa L.	Ata	Annonaceae	T	Homestead
Aphanamixis polystachya (Wall.) R. N. Parker	Pitraj	Meliaceae	T	Homestead
Areca catechu L.	Supari	Arecaceae	T	Homestead
Artocarpus heterophyllus Lamk.	Kathal	Moraceae	T	Roadside
Artocarpus lacucha Buch.-Ham.	Dewa	Moraceae	T	Homestead
Averrhoa carambola L.	Kamranga	Averrhoaceae	T	Homestead
Avicennia officinalis L.	Bain	Verbenaceae	T	Mangrove
Axonopus compressus (Sw.) P. Beauv.	Dhakagass	Poaceae	H	Roadside
Azadirachta indica A. Juss.	Neem	Meliaceae	T	Homestead
Bacopa monnieri (L.) Pennell	Brammi Shak	Scrophulariaceae	H	Mangrove
Bambusa balcooa Roxb.	Baijja Bans	Poaceae	T	Homestead
Bauhinia purpurea L.	Kanchan	Caesalpiniacea	T	Homestead
Blumea lacera (Burm. f.) DC.	Kukurmuta	Asteraceae	H	Roadside
Bombax ceiba L.	Shimultula	Bombaeacace	T	Homestead
Borassus flabellifer L.	Tal	Arecaceae	T	Roadside
Bruguiera gymnorrhiza (L.) Lamk.	Kakra	Rhizophoraceae	T	Mangrove
Callistemon citrinus (Curtis) Skeels	Bottle Brush	Myrtaceae	T	Homestead
Calotropis procera (Aiton) Dryand	Akand	Asclepiadaceae	S	Roadside
Capsicum frutescens L.	Morich	Solanaceae	H	Cultivated land
Carica papaya L.	Pepe	Caricaceae	S	Homestead
Cassia fistula L.	Sonalu	Caesalpiniaceae	T	Roadside
Casuarina equisetifolia L.	Jau	Casuarinaceae	T	Roadside
Cayratia japonica (Thunb.) Gagnepain.	-	Vitaceae	C	Roadside
Centella asiatica (L.) Urban	Adamoni	Apiaceae	H	Roadside
Chrysalidocarpus lutescens (Bory) H. Wendl.	Arecapalm	Arecaceae	T	Homestead
Chrysopogon aciculatus (Retz.) Trin.	Premkanta	Poaceae	H	Roadside
Citrus maxima (Burm. F.) Merr.	Jambura	Rutaceae	T	Homestead
Clerodendrum indicum (L.) Kuntze	Bhat	Verbenaceae	S	Mangrove
Cocos nucifera L.	Narikel	Arecaceae	T	Homestead
Colocasia esculenta (L.) Schott	Kachu	Araceae	H	Homestead
Crotalaria juncea L.	Junjuni	Fabaceae	H	Roadside
Croton bonplandianus Baill.	Bankhira	Euphorbiaceae	H	Roadside
Cryptocoryne retrospiralis (Roxb.) Fisch.	Kelakachu	Araceae	H	Mangrove

Contd.

Scientifc name	Local name	Family	Habit	Habitat
Cucurbita maxima Duchesne	Misti kumra	Cucurbitaceae	C	Homestead
Cuscuta reflexa Roxb.	Shwarnalata	Cuscutaceae	C	Roadside
Cyclea barbata Miers.	Patalpur	Menispermaceae	C	Roadside
Cynodon dactylon (L.) Pers.	Durbagass	Poaceae	H	Homestead
Cyperus rotundus L.	Muthagass	Cyperaceae	H	Cultivated land
Dalbergia sissoo DC.	Shissu	Fabaceae	T	Roadside
Delonix regia Rafin.	Krishnachura	Caesalpiniaceae	T	Roadside
Dentella repens (L.) J. R. & G. Forst.	Bhuipat	Rubiaceae	H	Cultivated land
Derris scandens (Roxb.) Benth.	Kalilata	Fabaceae	C	Mangrove
Derris trifoliata Lour.	Kalilota	Fabaceae	C	Mangrove
Dioscorea bulbifera L.	Matialu	Dioscoriaceae	C	Homestead
Diospyros blancoi A. DC.	Bilatigab	Ebenaceae	T	Homestead
Diospyros malabarica (Desr.) Kostel.	Deshigab	Ebenaceae	T	Homestead
Dolichandrone spathacea (L.f.) K. Schum.	Chamhechandan	Bignoniaceae	T	Mangrove
Eclipta prostrata (L.) Mant.	Keshoraj	Asteraceae	H	Cultivated land
Eichhornia crassipes (Mart.) Solms	Kachripana	Pontederiaceae	H	Homestead
Elaeocarpus tectorius (Lour.) Poir.	Jolpai	Elaeocarpaceae	T	Cultivated land
Eleocharis geniculata (L.) Roem. & Schult.	Joraghasi	Cyperaceae	H	Cultivated land
Eleusine indica (L.) Gaertn.	Malankuri	Poaceae	H	Cultivated land
Erythrina indica Lamk.	Painnamandar	Fabaceae	T	Homestead
Erythrina ovalifolia Roxb.	Mandar	Fabaceae	T	Homestead
Excoecaria agallocha L.	Gewa	Euphorbiaceae	T	Mangrove
Ficus benghalensis L.	Bot	Moraceae	T	Roadside
Ficus hispida L. f.	Dumur	Moraceae	T	Homestead
Ficus infectoria Roxb.	Pakur	Moraceae	T	Roadside
Ficus racemosa L.	Jogdumur	Moraceae	T	Roadside
Fimbristylis acuminata Vahl	-	Cyperaceae	H	Cultivated land
Fimbristylis ferruginea (L.) Vahl	-	Cyperaceae	H	Cultivated land
Garcinia cowa Roxb. *ex* DC.	Kao	Clusiaceae	T	Homestead
Gardenia jasminoides J.Ellis	Gandhraj	Rubiaceae	S	Homestead
Gomphrena globosa L.	Botamphul	Amaranthaceae	H	Roadside
Grangea maderaspatana (L.) Poir.	Nemuti	Asteraceae	H	Cultivated land
Heliotropium curassavicum L.	Nuinna	Boragnaceae	H	Cultivated land
Heliotropium indicum L.	Hatisur	Boragnaceae	H	Cultivated land
Hibiscus rosa-sinensis L.	Joba	Malvaceae	S	Homestead

Contd.

Scientifc name	Local name	Family	Habit	Habitat
Hygrophila phlomoides Nees	-	Acanthaceae	H	Cultivated land
Hygrophila salicifolia (Vahl) Nees	Kakmasha	Acanthaceae	H	Cultivated land
Ipomoea aquatica Forssk.	Kolmi	Convolvulaceae	H	Homestead
Ipomoea fistulosa Mart. *ex* Choisy	Dolkolmi	Convolvulaceae	H	Roadside
*Ipomoea pes-caprae (*L.) R. Br.	Chagalkhuri	Convolvulaceae	H	Cultivated land
Lablab purpurea (L.) Sweet	Seem	Fabaceae	C	Homestead
Lagenaria siceraria (Molina) Standl.	Lao	Cucurbitaceae	C	Homestead
Lagerstroemia indica L.	Cheri	Lythraceae	T	Homestead
Lagerstroemia speciosa (L.) Pers.	Jarul	Lythraceae	T	Homestead
Lannea coromandelica (Houtt.) Merr.	Bhadi	Anacardiaceae	T	Homestead
Lawsonia inermis L.	Mehendi	Lythraceae	T	Homestead
Leucaena leucocephala (Lamk.) de Wit.	Epilepil	Mimosaceae	T	Roadside
Lippia alba (Mill.) N. E. Br. Ex Britt. &Wilson	Bhuiokra	Verbenaceae	H	Roadside
Litchi chinensis Sonn.	Lichu	Sapindaceae	T	Homestead
Mangifera indica L.	Aam	Anacardiaceae	T	Homestead
Melia azederach L.	Goraneem	Meliaceae	T	Homestead
Mikania micratha Kunth	Assamilata	Asteraceae	C	Roadside
Morinda citrifolia L.	Banach	Rubiaceae	S	Homestead
Moringa oleifera Lamk.	Shajna	Moringaceae	T	Homestead
Mosla dainthera (Buch.-Ham. *ex* Roxb.) Maxim.	-	Lamiaceae	H	Homestead
Mucuna gigantean (Willd.) DC.	Bara-alkuchi	Fabaceae	C	Roadside
Musa paradisiaca L.	Kola	Musaceae	H	Homestead
Nelsonia canescens (Lamk.) Spreng.	-	Acanthaceae	H	Roadside
Ocimum sanctum L.	Tulsi	Lamiaceae	H	Homestead
Paspalum distichum L.	Gitlaghas	Poaceae	H	Cultivated land
Paspalum vaginatum Sw.	-	Poaceae	H	Meadow
Phaulopsis imbricata (Forssk.) Sweet	Kantasi	Acanthaceae	H	Roadside
Phoenix sylvestris (L.) Roxb.	Khejur	Arecaceae	T	Roadside
Phyla nodiflora (L.) Greene	Kanghas	Verbenaceae	H	Cultivated land
Phyllanthus acidus (L.) Skeels	Orbori	Euphorbiaceae	T	Homestead
Phyllanthus reticulatus Poir.	Sitki	Euphorbiaceae	S	Roadside
Pithecellobium dulce (Roxb.) Benth.	Khoibabla	Mimosaceae	T	Homestead
Polygonum blebeium R. Br.	-	Polygonaceae	H	Cultivated land
Pongamia pinnata (L.) Pierre	Koroj	Caesalpiniaceae	T	Homestead

Contd.

Scientifc name	Local name	Family	Habit	Habitat
Porteresia coarctata (Roxb.) Takeoka	Uri	Poaceae	H	Meadow
Portulaca oleracea L.	Nuainashak	Potulacaceae	H	Cultivated land
Psilotrichum ferrugineum (Roxb.) Moq.-Tand.	Putishak	Amarnthaceae	H	Cultivated land
Punica granatum L.	Dalim	Punicaceae	S	Homestead
Ricinus communis L.	Keron	Euphorbiaceae	S	Homestead
Saccharum spontaneum L.	Chan	Poaceae	H	Mangrove
Sapium indicum Willd.	Harua	Euphorbiaceae	T	Roadside
Sarcolobus carinatus Wall.	-	Asclepiadaceae	C	Mangrove
Schumannianthus dichotomus (Roxb.) Ganep.	Patipata	Meratnaceae	H	Homestead
Sesbania grandiflora (L.) Pers.	Bakul ful	Fabaceae	S	Homestead
Solanum nigrum L.	Titbegun	Solanaceae	H	Roadside
Sonneratia apetala Buch.-Ham.	Keora	Sonneratiaceae	T	Mangrove
Spondias pinnata (L. f.) Kurz.	Deshi amra	Anacardiaceae	T	Homestead
Stephania japonica (Thunb.) Miers	Muchchanilata	Menispermaceae	C	Roadside
Swietenia mahagoni (L.) Jacq.	Mehagoni	Meliaceae	T	Homestead
Syzygium cumini (L.) Skeels	Kalojam	Myrtaceae	T	Homestead
Syzygium fruticosum (Roxb.) DC.	Bhutijam	Myrtaceae	T	Homestead
Syzygium malaccense (L.) Merr. & L. M. Perry	Jamrul	Myrtaceae	T	Homestead
Tamarindus indica L.	Tentul	Caesalpiniaceae	T	Homestead
Tamarix gallica L.	Nonajau	Tamaricaceae	S	Mangrove
Terminalia arjuna (Roxb. *ex* DC.) Wight & Arn.	Arjun	Combretaceae	T	Roadside
Terminalia catappa L.	Katgolap	Combretaceae	T	Homestead
Terminalia chebula (Gaertn.)Retz.	Bohera	Combretaceae	T	Homestead
Thespesia populnea (L.) Sol. Ex Corr.	Paresh	Malvaceae	S	Mangrove
Trewia nudiflora L.	Pidali	Euphorbiaceae	T	Homestead
Typha elephantina Roxb.	Hogla	Typhaceae	H	Cultivated land
Urena lobata L.	Jogagota	Malvaceae	H	Homestead
Vernonia cinerea (L.) Less.	Kuksim	Asteraceae	H	Roadside
Vitex negundo L..	Nishinda	Verbnaceae	S	Roadside
Vitex trifolia L.. f.	Neelnishinda	Verbenaceae	S	Roadside
Wedelia calendulacea (L.) Less.	Mohabingaraj	Asteraceae	H	Mangrove
Xanthium indicum Koen. *ex* Roxb.	Ghagrashak	Asteraceae	H	Cultivated land
Xanthosoma violaceum Schott	Dudkachu	Araceae	H	Homestead
Ziziphus mauritiana Lamk.	Boroi	Rhamnaceae	T	Homestead
Zoysia matrella (L.) Merr.	Gass	Poaceae	H	Meadow
Zoysia tenuifolia Willd. ex Thiele	-	Poaceae	H	Meadow

Near the bank of channel and water the dominant vegetations are A*canthus ilicifolious, Porteresia coarchtata, Cryptocoryne retrospiralis, Saccharum* sp.*, Wedelia calendula, Baccopa monnieri, Phylla nodiflora, Hibiscus poplena, Dalbergis spinosa, Zoysia matrella and Clerodendrun indicum.* The main climbers of the area are *Derris scandens, Derris trifoliata* and *the rare occurrence Sarcolobus carinatus.* A rare occurrence of *Tamarix gallica* (Nuinna Jao) also recorded in the Mangrove area.

The meadow near the river is dominated by *Porteresia coarchtata, Zoysia matrella* and *Paspalum vaginatum*. Sporadic distribution of seedling of *Excoecaria agallocha* tree was also recorded in the meadow area. Once wildlife particularly spotted deer used to browse and roam in such meadow area. Unfortunately this area now converted into domestic buffalos grazing field. The cultivated land mainly is used for rice production during rainy season. In the summer the land covered by a number herbaceous plants. Among them the common species are *Bacopa monnieri*, *Dentella repens, Psilotrichum ferrugineum, Polygonum plebejum, Phyla nodiflora, Grangea madarspatana, Xanthium indicum, Portulaca oleracea, Heliotropium curassavicum, H. indicum, Eclipta prostrata* and *Alternanthera sessilis.*. A rare occurrence of *Typha elephentanea* (Hogla) also recorded in the wetland. Some summer crops including chili, watermelon, sweet *pumpkin, sweet* potato, Tomato, legumes etc. were observed to cultivate in this area. The vegetation of the homestead is very rich with so many planted species like main land homestead vegetation. The most common species are Rain tree (*Albizia saman*), Mango (*Mangifera indica*), Jackfruit (*Artocarpus heterophyllus*), Coconut (*Cocos nucifera*), Areca palm (*Areaca catechu*), Date palm (*Phoenix sylvestris*), Talipalm (*Borassus flabellifer*), Koroi (*Albizia procera*) and Shilkoroi (*Albizia labbeck*). Both sides of the road always support dense vegetation of different life forms of plant species. The most common tree species in the road sides are Date palm (*Phoenix sylvestris*), Talipalm (*Borassus flabellifer*), Akanda (*Calotropis procera*), Pidali (*Trewia nudiflora*), Rain tree (*Samanea saman*), Jao (*Casuarina litoralis*), Sonalu (*Cassia fistula*), Arjun (*Terminalia arjuna*), and Epilepil (*Leucaena leucocephala*). A good number of shrubs, herbs and climbers also colonized in both sides of the road.

For the management of the Island, threats determination is very important challenge. Without such work management plan could not be worked properly to achieve desired goal. In our study, discussion with foresters, interviews with local people, group discussion and observation in the field, a number of threats to plant diversity in Nijhum Dweep have been identified.

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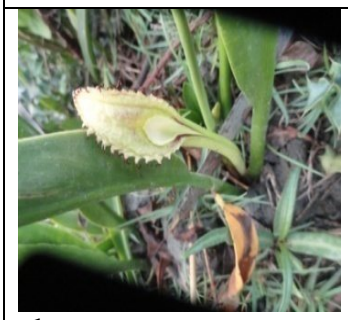 d.	 e.	 f.
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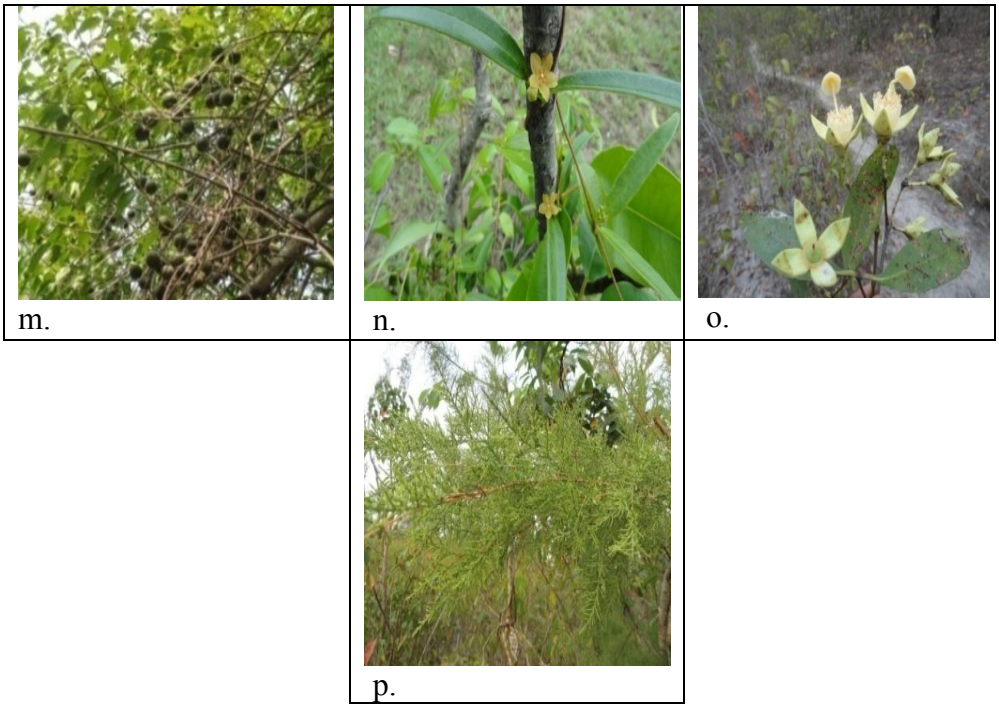

m. n. o. p.

Plate 1: Some salt tolerant plants of the Island a. *Acanthus ilicifolius* b. *Avicennia officinalis* c. *Bruguiera gymnorrhiza* d. *Cryptocoryne retrospiralis* e. *Derris scandens* f. *Derris trifoliata* g. *Diospyros blancoi* h. *Dolichandrone spathacea* i. *Excoecaria agallocha* j. *Heliotropium curassavicum* k. *Hibiscus populnea* l. *Pongamia pinnata* m. *Sapium indicum* n. *Sarcolobus carinatus* o. *Sonneratia apetala* p. *Tamarix gallica.*

These are uncontrolled population pressure, human settlement, encroachment into the forested areas, increasing rate of land value, land lease by District commissioner, illegal logging, overgrazing by domestic buffalos, regeneration problem in canopy trees, edge effect, lack of inundation, keora plant in extinction process in some area, lack of awareness about the value of biodiversity, lack of manpower in the forest department, and political influence in encroachment into the forest area.

Based on our present survey results and observations, a number of possible measures have been suggested for the future management plan of Nijhum Dweep. These are provided below: Sharp boundary can be created around the national park using plantation of native tree species. Ownership conflict between District Commissioner (DC) and forest department should be solved and also ensuring ownership of newly accreted land. Grazing in both forest area and meadow land by domestic animals should be controlled. The study area could be used as climate change monitoring area/biodiversity conservation monitoring area. Plantation program within the Island could be taken to promote

biodiversity particularly deer and birds population. Capacity of local forest department should be doubled. Awareness program should be conducted to provide the opportunity to the local people about the impact of overpopulation, illegal logging and climate change. Local stakeholder should be involved in the management process of the study area. Guideline could be written for ecotourists to watch biodiversity.

The present list of angiosperm plant diversity (152 species) is still considered as preliminary for the Nijhum Dweep. There might be some more species yet to be listed and few specimens remain unidentified. Based on the field observations and present preliminary results it may be concluded that the Island is not so rich in the angiosperm plant diversity and the area is the home for one threatened plant species (*Dolichandrone spathacea)*. *Bruguiera gymnorrhiza, Diospyros blancoi, Derris trifoliata, Heliotropium curassavicum, Tamarix gallica, Typha elephentanea* and *Sarcolobus carinatus* are also found to be rare in the study area. Field observation also confirmed that regeneration of Keora (*Sonneratia apetala*) and Bain (*Avicennia officinalis*) species in the habitat are severely hampered because of anthropogenic pressure and over-grazing by domestic animals. Invasive species such as *Croton bonplandianus, Urena lobata, Mikania micrantha* are another challenge to native species diversity in the study areas. The study suggests for further long term research to focus all aspects of angiosperm plant diversity to help in making proper management plan for this Island. If managed properly, the Nijhum Dweep could be fascinating to tourist and also good sources of revenue for the country. Local community will also be benefited from the Island.

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