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DIVERSITY OF DICOTYLEDONOUS PLANTS OF THE WATER BODIES OF BANGALORE AND ADJACENT AREAS

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ABSTRACT

Information regarding the diversity, distribution and availability of aquatic dicotyledonous plants of water bodies of Bangalore city and adjacent areas is almost lacking. The present study was meant to fill the existing lacunae by preparing a list of aquatic dicotyledonous plants cited in the literature and comparison with the data gathered during the course of our survey. Seasonal studies have been conducted from May-June 2005 to December – January 2010 as part of our research work. The study deals with the distribution of Dicotyledons in and around 76 lakes of Bangalore and adjacent areas. The present survey revealed a drastic drop in the number of aquatic dicotyledons when compared with the data available from literature. Effective remedial measures are required to restore the dicotyledonous plants of the water-bodies of Bangalore and adjacent areas which at present are facing a bleak future!
Keywords: Bangalore lakes, Aquatic, Dicotyledonous plants, literature survey, diversity

INTRODUCTION

The present paper is an account dealing with the diversity of aquatic Dicotyledonous plants surveyed and identified from 76 lakes of Bangalore and adjacent area of Karnataka state. The study was undertaken to make a regular seasonal survey and opportunistic visits of the water bodies of Bangalore and adjacent area for recording the diversity of aquatic dicotyledonous plants and their availability.

MATERIALS AND METHODS

Area:

The area of study, Bangalore, capital of Karnataka State is located at an altitude of 920 metres above mean sea level, delineating four watersheds: Hebbal, Koramangala, Challaghatta and Vrishabhavathi watersheds. At present, Greater Bangalore (77°37'19.54'' E and 12°59'09.76'' N) which is the major administrative, cultural, commercial, industrial, and knowledge hub of the state of Karnataka occupies an area of 741 square kilometres between the latitudes 12°39'00'' to 13°13'00''N and longitude 77°22'00'' to 77°52'00''E. Bangalore which was

earlier termed as 'City of thousand lakes' has presently ended up at present as a city of few lakes. Very little information was available about the distribution of aquatic Dicotyledonous plants of the water bodies of Bangalore and adjacent areas and hence this work which was also awarded the doctorate degree.

Collection:

The water bodies of Bangalore and adjacent areas were surveyed twice every year starting from May-June 2005 and December – January 2010 coupled with random periodic visits. The plants were also collected from these waterbodies for the preparation of herbarium specimens.

RESULTS

Literature survey of Flora of Bangalore District (Ramaswamy and Razi-1973), Flora of Karnataka – Vol I (Saldanha, 1984) and Flora of Karnataka (Sharma et al.,1984) indicates the distribution of the following Dicotyledonous plants in the water bodies of Bangalore and adjacent area as indicated in Table-I.

The seasonal survey of 76 water bodies of Bangalore and adjacent area indicate 30 families with 54 genera and 67 species, as listed in Table-II. There is a progressive decline in the number of species due to the increased anthropogenic activities like rapid urbanisation, illegal sand mining and encroachment of lakes.

The changing profile in the water bodies of Bangalore and adjacent area is depicted by the absence of many Dicotyledonous plants. According to literature survey (before 2005), the Dicotyledonous plants of Bangalore and adjacent area had 40 families with 66 genera and 89 species as listed in Table-I & III which at present (2010) has dwindled to 30 families with 54 genera and 67 species as cited in Table-II & III. Nearly 18 families, 49 genera and 63 species (Table V & III) were not sighted during out seasonal survey and 6 new families, 34 genera and 41 species (listed in Table 1V & III) which were not cited in literature has been newly reported during out survey. *Neolamarckia cadamba (Roxb.) Bosser* that has been reported during the research work on the shores of the lake might probably have been transferred by birds from nearby park or garden.

Table- I : Dicotyledon plant diversity of Bangalore and adjacent area accessed through literature survey

Arrangement according to alphabetical order	
List of Families	**List of Genera and species**
Acanthaceae	*Hygrophila auriculata (Schum.) Hiene*
Aizoaceae	*Glinus lotoides L.* *Glinus oppositifolius (L.) Aug. DC.* *Mollugo nudicaulis Lam.* *Trianthema decandra L.*
Amaranthaceae	*Nothosaerva brachiata (L.) Wight.* *Alternanthera sessilis (L.) R. Br. ex DC.*
Annonaceae	*Goniothalamus cardiopetalus (Dalz.) J. Hk. & Thoms.*
Apiaceae	*Centella asiatica (L.) Urban*
Araliaceae	*Pentapanax leschenaultii (Wight & Arn.) Seem.*

Aristolochiaceae	*Thottea siliquosa (Lamk.) Ding Houmore.*
Asclepiadaceae	*Asclepias curassavica L.*
Asteraceae	*Sphaeranthus indicus L.* *Grangea maderaspatanus (L.) Poir.* *Blumea mollis (D.Don) Merr.* *Gnaphalium indicum L.* *Xanthium strumarium L.* *Eclipta prostrata L.* *Synedrella nodiflora (L.) Gaertn.*
Boraginaceae	*Coldenia procumbens L.*
Campanulaceae	*Lobelia alsinoides Lam.*
Caryophyllaceae	*Drymaria cordata (L.) Willd. ex Schult.*
Ceratophyllaceae	*Ceratophyllum demersum L.*
Cleomaceae	*Cleome monophylla L.*
Convolvulaceae	*Ipomoea aquatica Forssk.* *Ipomoea maxima (L.f.) Don.*
Droseraceae	*Drosera burmanni Vahl*
Euphorbiaceae	*Kirganelia reticulata (Poir.) Baill.*
Fabaceae	*Indigofera viscosa Lam.* *Aeschynomene indica L.* *Phaseolus lathyroides L.*
Gentianaceae	*Hoppea dichotoma B. Heyne ex Willd* *Nymphoides cristatum (Roxb.) O.kuntze* *Nymphoides indicum (L) Kuntze*
Halaragaceae	*Myriophyllum intermedium DC.*
Lamiaceae	*Coleus canisius*
Lentibulariaceae	*Utricularia caerulea L.* *Utricularia caerulea L. L.var.filicaulis* *Utricularia gibba L. subsp.exoleta* *Utricularia inflexa Forssk.var. Stellaris* *Utricularia scandens Benj.subsp.scandens* *Utricularia uliginosa Vahl.*
Lythraceae	*Rotala fimbriata Wight* *Rotala indica (Willd.) Koehne* *Ammania baccifera L.* *Nesaea brevipes Koehne*
Mimosaceae	*Neptunia triquetra (Willd.) Benth.*
Molluginaceae	*Glinus lotoides L.*

	Glinus oppositifolius (L.) Aug. DC.
Moraceae	*Ficus heterophylla L.f.* *Ficus hispida L.f.* *Ficus laevis Blume* *Streblus asper Lour.*
Nyctaginaceae	*Boerhavia diffusa L.*
Nymphaeaceae	*Nelumbo nucifera Gaertn.* *Nymphaea nouchali Burman f.* *Nymphaea pubescens Willd.*
Onagraceae	*Ludwigia adscendens (L.) H. Hara* *Ludwigia perennis L.* *Oenothera rosea L'Hér. ex Aiton.*
Opiliaceae	*Cansjera rheedeii J. Gmelin*
Piperaceae	*Peperomia pellucida (L.) HBK*
Polygonaceae	*Polygonum glabrum Willd.* *Polygonum lanigerum R. Br.*
Rubiaceae	*Dentella repens (L.) J.R.Forster*
Salicaceae	*Salix tetrasperma Roxb.*
Scrophulariaceae	*Limnophila sessilis (Benth.) C.E.C.Fisch.* *Limnophila heterophylla (Roxb.) Benth.* *Limnophila indica (L.)Druce* *Dopatrium junceum (Roxb.) Buch.-Ham. ex Benth* *Bacopa monnieri (L.) Pennell* *Lindernia anagallis (Burm. f.) Pennell* *Lindernia ciliata (Colsmann) Pennell* *Lindernia hyssopoides (L.) Haines* *Lindernia parviflora (Roxb.) Haines* *Sopubia delphinifolia G. Don*
Tiliaceae	*Corchorus aestuans L.* *Corchorus trilocularis L.*
Trapaceae	*Trapa natans L.*
Ulmaceae	*Aphananthe cuspidata (Blume) Planch.* *Holoptelea integrifolia (Roxb.) Planch.*
Urticaceae	*Elatostema acuminatum (Poir.) Brong.* *Elatostema lineolatum Wight* *Pellionia heyneana Wedd.* *Pilea melastomoides (Poir.) Wedd.* *Pouzolzia bennettiana Wight var. mysorensis* *Pouzolzia pentandra (Roxb.) Benn.* *Laportea interrupta (L.) Chew.*

Verbenaceae	*Phyla nodiflora (L.) Greene*
40 families with 66 genera and 89 species	

Table- II : Dicotyledon plant diversity of Bangalore and adjacent area recorded during seasonal survey from 2005-10	
Arrangement according to alphabetical order	
List of Families	**List of Genera and species**
Acanthaceae	*Asystasia gangetica (L.) T.Anderson* *Hygrophila schulli (Buch.-Ham.) M.R.Almeida & S.M. Almeida*
Amaranthaceae	*Achyranthes aspera L.* *Alternanthera paronychioides A. St.-Hil* *Alternanthera philoxeroides (Mart.) Griseb.* *Alternanthera sessilis (L.) R. Br. ex DC.* *Amaranthus spinosus L.* *Gomphrena celosioides Mart.* *Gomphrena globosa L.*
Apiaceae	*Centella asiatica (L.) Urban*
Asclepiadaceae	*Asclepias currasavica L.* *Calotropis gigantea (L.) Dryand.* *Calotropis procera (Aiton) Dryand.*
Asteraceae	*Acmella paniculata (Wall. ex DC.) R.K.Jansen* *Bidens pilosa L.* *Chromolaena odorata (L.) R.M.King & H.Rob.* *Eclipta prostrata L.* *Grangea maderaspatana (L.) Desf.* *Parthenium hysterophorus L.* *Sphaeranthus indicus L.* *Tridax procumbens L.* *Xanthium indicum Konig ex Roxb.*
Boraginaceae	*Heliotropium indicum L.*
Ceratophyllaceae	*Ceratophyllum demersum L.*
Convolvulaceae	*Cuscuta reflexa Roxb.* *Ipomoea aquatica Forssk.* *Ipomoea cairica (L.) Sweet* *Ipomoea fistulosa Mart. ex Choisy* *Ipomoea turbinata Lag.*
Euphorbiaceae	*Croton bonplandianus Baill.* *Croton parvifolius Müll.Arg.* *Jatropha gossypiifolia L.* *Ricinus communis L.*

Fabaceae	*Aeschynomene indica L.* *Crotalaria pallida Aiton*
Haloragaceae	*Myriophyllum sp.*
Lamiaceae	*Hyptis suaveolens (L.) Poit.* *Leucas aspera (Willd.) Link*
Lentibulariaceae	*Utricularia gibba L.* *Utricularia stellaris L. f.*
Malvaceae	*Abutilon indicum (L.) Sweet*
Meliaceae	*Cipadessa baccifera (Roth) Miq.*
Menyanthaceae	*Nymphoides cristata (Roxb.) Kuntze* *Nymphoides indica (L.) O. Kuntze*
Mimosaceae	*Mimosa pudica L.*
Molluginaceae	*Glinus lotoides L.*
Nelumbonaceae	*Nelumbo nucifera Gaertn.*
Nyctaginaceae	*Boerhavia diffusa L.* *Mirabilis jalapa L.*
Nymphaeaceae .	*Nymphaea nouchali Burman f.* *Nymphaea pubescens Willd.* *Nymphaea rubra Roxb. ex Andrews* *Victoria regia Lindl*
Onagraceae	*Ludwigia adscendens (L.) H. Hara* *Ludwigia perennis L.*
Papavaraceae	*Argemone mexicana L.*
Passifloraceae	*Passiflora foetida L.*
Polygonaceae	*Persicaria glabra (Willd.) M. Gómez*
Rubiaceae	*Neolamarckia cadamba (Roxb.) Bosser*
Sapindaceae	*Sapindus trifoliatus L.*
Solanaceae	*Solanum torvum Sw.* *Datura stramonium L.*
Trapaceae	*Trapa natans L.*
Verbenaceae	*Lantana camara L.* *Phyla nodiflora (L.) Greene* *Stachytarpheta indica (L.) Vahl* *Vitex negundo L.*
30 families with 54 genera and 67 species	

Table- III : Final analysis of the data and its interpretation			
Dicotyledonous plants of Bangalore			
Survey	**Families**	**Genera**	**Species**
Literature survey (before 2004)	40	66	89
Lake survey from 2004-2010	30	54	67
Plants newly reported	06	34	41
Missing plants	18	49	63

Table- IV : Dicotyledon plants recorded for the first time during the seasonal survey from 2005-10 and not accessed during literature survey	
List of new Families	**List of new Genera and species**
Arrangement according to alphabetical order	
Malvaceae	*Abutilon indicum (L.) Sweet*
Meliaceae	*Cipadessa baccifera (Roth) Miq.*
Papavaraceae	*Argemone mexicana L.*
Passifloraceae	*Passiflora foetida*
Sapindaceae	*Sapindus trifoliatus L.*
Solanaceae	*Solanum torvum Sw.* *Datura stramonium L.*
List of Families already reported but having new genera and species	
Acanthaceae	*Asystasia gangetica (L.) T.Anderson*
Amaranthaceae	*Achyranthes aspera L.* *Alternanthera paronychioides A. St.-Hil* *Alternanthera philoxeroides (Mart.) Griseb.* *Alternanthera sessilis (L.) R. Br. ex DC.* *Amaranthus spinosus L.* *Gomphrena celosioides Mart.* *Gomphrena globosa L.*
Asclepiadaceae	*Calotropis gigantea (L.) Dryand.* *Calotropis procera (Aiton) Dryand.*
Asteraceae	*Bidens pilosa L.* *Chromolaena odorata (L.) R.M.King & H.Rob.* *Parthenium hysterophorus L.* *Tridax procumbens L.*
Boraginaceae	*Heliotropium indicum L.*
Convolvulaceae	*Cuscuta reflexa Roxb.* *Ipomoea cairica (L.) Sweet* *Ipomoea fistulosa Mart. ex Choisy*

	Ipomoea turbinata Lag.
Euphorbiaceae	*Croton bonplandianus Baill.* *Croton parvifolius Müll.Arg.* *Jatropha gossypiifolia L.* *Ricinus communis L.*
Fabaceae	*Crotalaria pallida Aiton*
Lamiaceae	*Hyptis suaveolens (L.) Poit.* *Leucas aspera (Willd.) Link*
Lentibulariaceae	*Utricularia stellaris L. f.*
Mimosaceae	*Mimosa pudica L.*
Nyctaginaceae	*Mirabilis jalapa L.*
Nymphaeaceae	*Victoria regia Lindl*
Rubiaceae	*Neolamarckia cadamba (Roxb.) Bosser*
Verbenaceae	*Lantana camara L.* *Stachytarpheta indica (L.) Vahl* *Vitex negundo L.*
06 families, 34 genera and 41 species	

Table- V : Dicotyledon plants not recorded during the seasonal survey from 2005-10 but reported in the literature survey

List of missing Families	**List of missing Genera and species**
Arrangement according to alphabetical order	
Aizoaceae	*Glinus lotoides L.* *Glinus oppositifolius (L.) Aug. DC.* *Mollugo nudicaulis Lam.* *Trianthema decandra L.*
Annonaceae	*Goniothalamus cardiopetalus (Dalz.) J. Hk. & Thoms.*
Araliaceae	*Pentapanax leschenaultii (Wight & Arn.) Seem.*
Aristolochiaceae	*Thottea siliquosa (Lamk.) Ding Houmore.*
Campanulaceae	*Lobelia alsinoides Lam.*
Caryophyllaceae	*Drymaria cordata (L.) Willd. ex Schult.*
Cleomaceae	*Cleome monophylla L.*
Droseraceae	*Drosera burmanni Vahl*
Gentianaceae	*Hoppea dichotoma B. Heyne ex Willd*
Lythraceae	*Rotala fimbriata Wight* *Rotala indica (Willd.) Koehne* *Ammania baccifera L.*

	Nesaea brevipes Koehne
Moraceae	*Ficus heterophylla L.f.* *Ficus hispida L.f.* *Ficus laevis Blume* *Streblus asper Lour.*
Opiliaceae	*Cansjera rheedeii J. Gmelin*
Piperaceae	*Peperomia pellucida (L.) HBK*
Salicaceae	*Salix tetrasperma Roxb.*
Scrophulariaceae	*Limnophila sessilis (Benth.) C.E.C.Fisch.* *Limnophila heterophylla (Roxb.) Benth.* *Limnophila indica (L.)Druce* *Dopatrium junceum (Roxb.) Buch.-Ham. ex Benth* *Bacopa monnieri (L.) Pennell* *Lindernia anagallis (Burm. f.) Pennell* *Lindernia ciliata (Colsmann) Pennell* *Lindernia hyssopoides (L.) Haines* *Lindernia parviflora (Roxb.) Haines* *Sopubia delphinifolia G. Don*
Tiliaceae	*Corchorus aestuans L.* *Corchorus trilocularis L.*
Ulmaceae	*Aphananthe cuspidata (Blume) Planch.* *Holoptelea integrifolia (Roxb.) Planch.*
Urticaceae	*Elatostema acuminatum (Poir.) Brong.* *Elatostema lineolatum Wight* *Pellionia heyneana Wedd.* *Pilea melastomoides (Poir.) Wedd.* *Pouzolzia bennettiana Wight var. mysorensis* *Pouzolzia pentandra (Roxb.) Benn.* *Laportea interrupta (L.) Chew.*
List of Families reported in Literature with only a few missing genera and species	
Amaranthaceae	*Nothosaerva brachiata (L.) Wight.* *Alternanthera sessilis (L.) R. Br. ex DC.*
Asteraceae	*Blumea mollis (D.Don) Merr.* *Gnaphalium indicum L.* *Synedrella nodiflora (L.) Gaertn.*
Boraginaceae	*Coldenia procumbens L.*
Convolvulaceae	*Ipomoea maxima (L.f.) Don.*
Euphorbiaceae	*Kirganelia reticulata (Poir.) Baill.*
Fabaceae	*Indigofera viscosa Lam.*

	Phaseolus lathyroides L.
Lamiaceae	*Coleus canisius*
Lentibulariaceae	*Utricularia inflexa Forssk.var. Stellaris* *Utricularia scandens Benj.subsp.scandens* *Utricularia uliginosa Vahl.*
Mimosaceae	*Neptunia triquetra (Willd.) Benth.*
Molluginaceae	*Glinus oppositifolius (L.) Aug. DC.*
Onagraceae	*Oenothera rosea L'Hér. ex Aiton.*
Polygonaceae	*Polygonum lanigerum R. Br.*
Rubiaceae	*Dentella repens (L.) J.R.Forster*
18 Families, 49 genera and 63species	

CONCLUSION

The seasonal survey of distribution of dicotyledonous plants in the water bodies of Bangalore and adjacent area when compared to the dicotyledonous plant distribution obtained through literature survey reveals a drastic decrease in the number of species mainly due to increased anthropogenic activities like urbanisation, land encroachment, sand mining, etc. These activities have resulted in many of the dicotyledonous plants disappearing permanently from the shores of these water bodies. Only invasive obnoxious weeds have survived even after this increased human interference. Fencing of the water bodies without disturbing the dicotyledon diversity should be taken up by the concerned authorities.

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