Checklist of Seedplant holdings of the UBD Herbarium (UBDH), with 234 new plant records for Brunei Darussalam

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Abstract

Here we provide a checklist of all seed plant collections (Angiosperms and Gymnosperms) present in the UBD Herbarium (UBDH). The plants are arranged in alphabetical order by family, genus and species, using the latest taxonomic classifications. UBDH contained a total of 5271 databased seed plant collections (1060 fertile, and 4211 sterile), consisting of 1386 species from 130 families. The collections covered only a limited part of Brunei Darussalam, being concentrated near the easily accessible coastal zones of Muara, Tutong and Belait, as well as near the Kuala Belalong Field Study Centre in Temburong. Because the majority of collections in UBDH came from permanent forest plots, the collections are dominated by tree families, with Dipterocarpaceae both the most collected and species rich family. We found 234 species in UBDH that were not listed in the Brunei checklist and are potentially new records for Brunei Darussalam. This would increase the known number of seed plants in Brunei by ca. 5%. The high number of new species records suggests that the Brunei seed plant flora is still incompletely known.

Index Terms: Brunei Darussalam; Brunei checklist; UBDH holdings; new species records; UBD Herbarium; seed plants.

1. Introduction

The UBD Herbarium (UBDH) was established in 1994 with the purpose of having a permanent collection of dried plants that allows students and staff to further their research. A detailed description of the UBDH history, aims and future development is provided by Polgar *et al.*[1] The current herbarium has 9862 databased plant specimens, mostly from Brunei Darussalam. Of these, 5271 specimens are seed plants.

The aim of this study was to produce a complete checklist of all seed plant (Gymnosperm and Angiosperm) species present in the UBD herbarium, provide a map with collecting localities, determine the most commonly collected and species rich families, and check for new species records for Brunei Darussalam.

2. Materials and Methods

The checklist was based on an existing specimen data base that was available in Microsoft Excel (see ***Figure 1*** and ***Table 1***). This database contained all 9862 specimens stored inside the herbarium cabinets. About 16,000 specimens of trees from Indonesia, 1000 specimens of ferns from China and Sarawak, and several hundred specimens that had not yet been entered into the main collection and data base were not included in the present checklist. Since we focused on seed plants only, algae, bryophytes, lycopods and ferns present in the original database were excluded, leaving 5271 seed plant specimens for the current checklist.

The checklist was organized alphabetically by family and within families alphabetically by genus and species. The classification of the plants followed the latest Angiosperm Phylogeny Group

classification.[2] Synonymy issues were resolved using the The Plant List[3] and the Global Biodiversity Information Facility (GBIF**)**.[4] For each species we extracted the following data from the original specimen data base:

[Family Name]
[Genus] [Species] [Author] [Reference] [Native or Not]
[Local Name] [Growth Form] [Location] [Habitat] [Elevation] [Collection numbers]

Example:

ACANTHACEAE
***Acanthus ilicifolius* L.** (Sp. Pl. 639 [1753]) [Native]
Local Name: Jerudu; **Growth Form**: Small Shrub; **Location**: Brunei-Muara; **Habitat**: Disturbed Mangrove Forest, On Muddy Soils, River Bank and Fringe; **Elevation**: 8 m above seas level (asl); **Collections**: DIBS-5, JOR1.

Not all information for each category (*i.e.* local name, growth form, *etc.*) was present for each species in the data base. In such cases the information was obtained from GBIF[4] and the Brunei checklist.[5] Species that were not identified with certainty (indicated by a question mark in the original data base) were omitted from the checklist. New species observations for Brunei were determined by comparing our checklist with the existing checklist of Brunei.[5] Species not found in the Brunei checklist[5] were considered new species observations. Since many collections in the UBD herbarium are sterile, identifications are all subject to some uncertainty. However, it is important to have this preliminary information available to researchers and government agencies as a working list.

Most specimens were geo-referenced in the original data base, either because the original collectors provided GPS coordinates with their collections, or by using location information provided on the specimen labels in combination with Google Earth Pro[6] to extract the location coordinates. We used this information to create a collection distribution map by superimposing a scatter plot of the collection coordinates on top of a map of Brunei Darussalam.

	A	B	C	D	E	F
1	RecordNo	Family	Genus	Species	Species complete	Author
716	U/02482	Asparagaceae	Dracaena	angustifolia	Asparagaceae/Dracaena/Dracaena_angustifolia	Roxb.
717	U/02483	Asparagaceae	Dracaena	angustifolia	Asparagaceae/Dracaena/Dracaena_angustifolia	Roxb.
718	S/00518	Asparagaceae	Dracaena	angustifolia?	Asparagaceae/Dracaena/Dracaena_angustifolia?	(Medik.) Roxb.
719	U/00546	Asparagaceae	Dracaena	elliptica	Asparagaceae/Dracaena/Dracaena_elliptica	Thunb. & Dalm.
720	U/00547	Asparagaceae	Dracaena	elliptica	Asparagaceae/Dracaena/Dracaena_elliptica	Thunb. & Dalm.
721	U/02484	Asparagaceae	Dracaena	elliptica	Asparagaceae/Dracaena/Dracaena_elliptica	Thunb.
722	U/02485	Asparagaceae	Dracaena	elliptica	Asparagaceae/Dracaena/Dracaena_elliptica	Thunb.
723	S/01010	Asparagaceae	Dracaena	sp	Asparagaceae/Dracaena/Dracaena_sp	
724	U/02486	Asparagaceae	Dracaena	sp	Asparagaceae/Dracaena/Dracaena_sp	
725	U/02487	Asparagaceae	Dracaena	sp	Asparagaceae/Dracaena/Dracaena_sp	
726	U/02488	Asparagaceae	Dracaena	sp	Asparagaceae/Dracaena/Dracaena_sp	
727	U/02489	Asparagaceae	Dracaena	sp	Asparagaceae/Dracaena/Dracaena_sp	
728	F/00595	Aspleniaceae	Asplenium	affine	Aspleniaceae/Asplenium/Asplenium_affine	Sw.
729	F/00607	Aspleniaceae	Asplenium	affine	Aspleniaceae/Asplenium/Asplenium_affine	Sw.
730	F/00608	Aspleniaceae	Asplenium	affine	Aspleniaceae/Asplenium/Asplenium_affine	Sw.
731	F/00609	Aspleniaceae	Asplenium	affine	Aspleniaceae/Asplenium/Asplenium_affine	Sw.
732	F/00623	Aspleniaceae	Asplenium	macrophyllum	Aspleniaceae/Asplenium/Asplenium_macrophyllum	Sw.
733	F/00624	Aspleniaceae	Asplenium	nidus	Aspleniaceae/Asplenium/Asplenium_nidus	L.
734	F/00625	Aspleniaceae	Asplenium	nidus	Aspleniaceae/Asplenium/Asplenium_nidus	L.

Figure 1. The raw Excel database of the plants in UBD Herbarium where ferns (in red text) are excluded and an example of an unconfirmed species indicated in yellow.

3. Results and Discussion

A total of 5271 of the 9862 databased collections belonged to seed plants. Of these 1060 were fertile collections mostly collected during botanical surveys, while 4211 were sterile and mostly collected from permanent forest plots.

The collections cover only a limited part of Brunei Darussalam, being concentrated near the easily accessible coastal zones of Muara, Tutong and Belait, as well as near the Kuala Belalong Field Study Centre in Temburong (see ***Figure 2***).

Very few collections have been made in the interior of Brunei.

The 5271 seed plant collections in UBDH consisted of 1386 species belonging to 130 families (see ***Appendix 1***). Most of the species were collected from Temburong and Belait districts (see ***Figure 3***), which is linked to the presence of several permanent forest plots there. Because the majority of collections in UBDH come from permanent forest plots, the collections are dominated by tree families, with Dipterocarpaceae both the most collected and species rich family (see ***Figure 4***).

We found 234 species in UBDH that were not listed in the Brunei checklist[5] (see ***Table 2***). These are potentially new records for Brunei Darussalam. We have to be cautious because a majority of these new records were represented by sterile material, introducing uncertainty in their identification accuracy. If all 234 new species records are confirmed, it would increase the known Brunei seed plant flora by ca. 5%. Despite the uncertainty in species identifications, the high number of new species records does suggest that the Brunei seed plant flora is still incompletely known. As a first step to overcome this, a combined checklist of the holdings of the Brunei National Herbarium (BRUN) and UBDH would form an useful update of the existing Brunei checklist.[5] Furthermore, a coordinated collecting effort, with emphasis on as yet unvisited locations in Brunei, is essential to increase our knowledge of the Brunei seed plant flora.

Table 1. List of information provided in the Excel specimen database.

Specimen details	**Collection details**	**Location**	**Extra details**
Record number	Collector's name	Country	Loan to
Family – Genus – Species	Collector number	Province – District – Sub district	Loan date and return date
Vernacular name	Collector suffix	Location details	Type status
Sublevel category and sublevel name	Collection date	Geology	Duplicate institutes
Vegetation type and Habitat	Received date	Altitude	Cabinet store number
Species author and reference	Identified by and Identification date	Elevation	Duplication number
Uses and plant notes	Previously identified by and identification date	Longitude	Index number
Previous family – genus – species name		Latitude	Picture

Figure 2. Collection localities of 1183 plant collections present in UBDH.

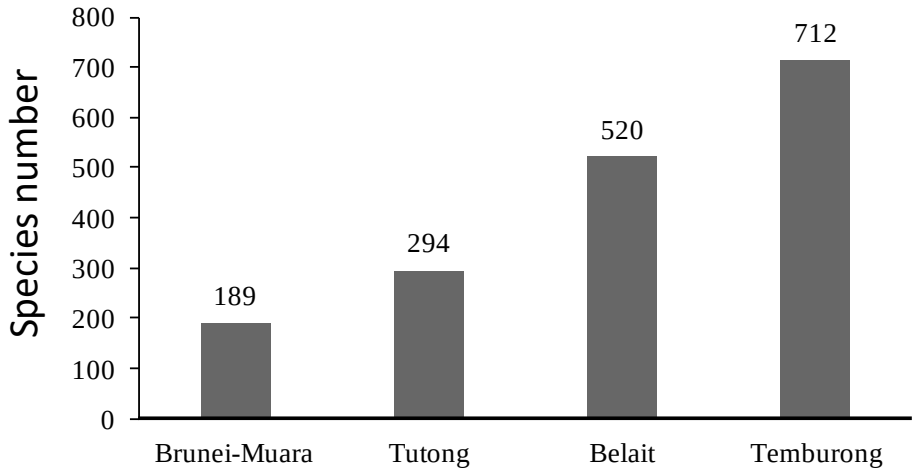

Figure 3. The number of species per district present in the UBDH.

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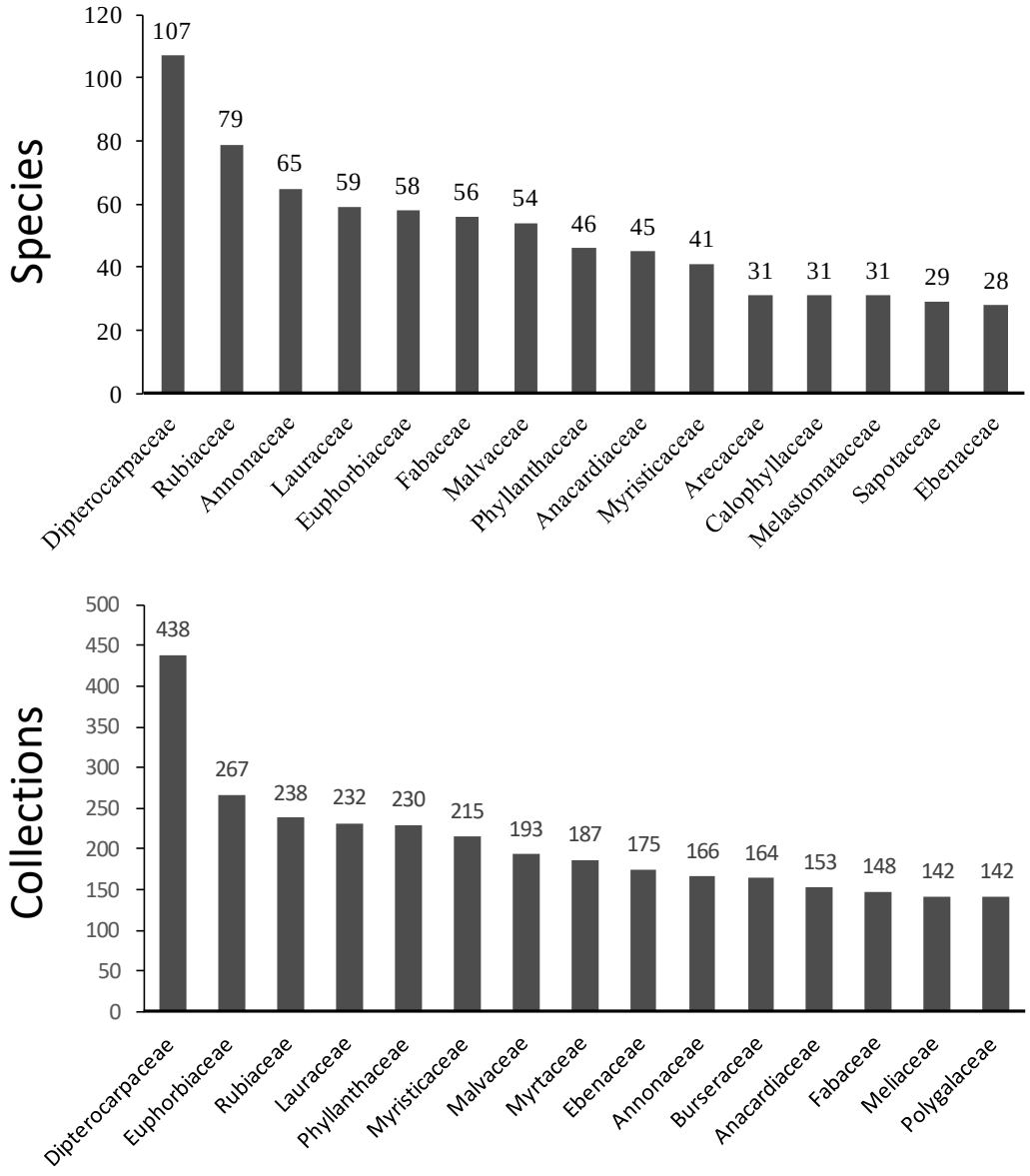

Figure 4. The top 15 most collected and species rich families in the UBDH.

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Appendix 1 (122 pages) has been published as a separate document.

Table 2. Species available in UBDH but absent in BRUN checklist.

FAMILY	**GENUS**
ACANTHACEAE	*Clinacanthus nutans*
ACHARIACEAE	*Hydnocarpus sumatrana*
	Ryparosa baccaureoides
	Trichadenia phillipinensis
ACTINIDIACEAE	*Saurauia glabra*
	Saurauia longipetiolata
	Saurauia subcordata
ANACARDIACEAE	*Buchanania insignis*
	Drimycarpus luridus
	Gluta macrocarpa
	Gluta oba
	Mangifera blommesteinii
	Mangifera torquenda
	Melanochyla angustifolia
	Melanochyla caesia
	Melanochyla densiflora
	Melanochyla minutiflora
	Melanochyla tomentosa
	Parishia insignis
	Semecarpus euodiifolius
	Semecarpus minutipetalus
ANISOPHYLLEACEAE	*Anisophyllea beccariana*
ANNONACEAE	*Drepananthus deltoideus*
	Goniothalamus megalocalyx
	Goniothalamus parallelovenius
	Goniothalamus roseus
	Goniothalamus tapisoides
	Monocarpia euneura
	Polyalthia bullata
	Polyalthia obliqua
	Polyalthia sclerophylla
	Polyalthia xanthopetala
	Popowia fusca
	Popowia hirta

	Sageraea sarawakensis
	Xylopia caudata
	Xylopia elliptica
APOCYNACEAE	*Alstonia iwahigensis*
	Kibatalia villosa
	Tabernaemontana divaricata
AQUIFOLIACEAE	*Ilex sclerophylloides*
ARACEAE	*Cryptocoryne cordata*
ASTERACEAE	*Blumea balsamifera*
	Centratherum punctatum
	Elephantopus mollis
	Helianthus annuus
BIGNONIACEAE	*Bignonia corymbosa*
BONNETIACEAE	*Ploiarium alternifolium*
BURSERACEAE	*Canarium divergens*
	Dacryodes nervosa
CALOPHYLLACEAE	*Calophyllum stipitatum*
	Calophyllum sundaicum
	Kayea grandis
	Mesua beccariana
	Mesua ferrea
CELASTRACEAE	*Euonymus Indicus*
	Lophopetalum pachyphyllum
CHRYSOBALANACEAE	*Atuna nannodes*
	Parinari rigida
CLUSIACEAE	*Garcinia blumei*
	Garcinia brevipes
	Garcinia caudiculata
	Garcinia forbesii
	Garcinia havilandii
	Garcinia minimiflora
	Garcinia miquelii
CONVULVULACEAE	*Merremia tridentata*
CORNACEAE	*Alangium nobile*
	Mastixia glauca
	Mastixia macrocarpa
	Mastixia rostrata
DILLENIACEAE	*Dillenia ovata*
	Dillenia phillippinensis
DIPTEROCARPACEAE	*Hopea dryobalanoides*
	Shorea palembanica
	Vatica hulletii
EBENACEAE	*Diospyros clementium*
	Diospyros fusiformis
	Diospyros lanceifolia
	Diospryos macrophylla
	Diospyros maritima
	Diospyros muricata
	Diospyros oligantha

	Diospyros ridleyi
	Diospyros subrhomboidea
ERIOCAULACEAE	*Eriocaulon sexangulare*
ESCALLONIACEAE	*Polyosma borneensis*
	Polyosma kingiana
EUPHORBIACEAE	*Agrostistachys Indica*
	Hevea brasiliensis
	Jatropha integerrima
	Macaranga lamellata
	Macaranga puncticulata
	Mallotus leucodermis
	Manihot esculenta
	Neoscortechinia forbesii
	Ptychopyxis arborea
	Ptychopyxis costata
	Ptychopyxis glochidiifolia
	Suregada multiflora
	Trigonostemon capillipes
FABACEAE	*Archidendron jiringa*
	Archidendron triplinervium
	Crudia reticulata
	Dialium cochinchinense
	Dialium patens
	Dioclea hexandra
	Flemingia strobilifera
	Leucaena leucocephala
	Sindora coriacea
FAGACEAE	*Lithocarpus pusillus*
	Quercus gaharuensis
	Quercus lineata
GENTIANACEAE	*Utania Spicata*
LAMIACEAE	*Clerodendrum japonicum*
	Clerondendrum paniculatum
	Gmelina arborea
	Orthosiphon aristatus
	Teijsmanniodendron sinclairii
LAURACEAE	*Actinodaphne sphaerocarpa*
	Alseodaphne elmeri
	Alseodaphne longipes
	Beilschmiedia gemmiflora
	Beilschmiedia glabra
	Beilschmiedia lucidula
	Beilschmiedia wieringae
	Cinnamomum racemosum
	Cryptocarya erectinervia
	Cryptocarya tawaensis
	Endiandra macrophylla
	Litsea artocarpifolia
	Litsea castanea

	Litsea caulocarpa
	Litsea costata
	Litsea erectinervia
	Litsea magnifica
	Phoebe macrophylla
	Tetranthera angulata
LECYTHIDACEAE	*Barringtonia curranii*
LYTHRACEAE	*Lagerstroemia speciosa*
MALVACEAE	*Brownlowia ovalis*
	Durio bruneiensis
	Durio crassipes
	Durio oxleyanus
	Heritiera elata
	Hibiscus rosa-sinensis
	Microcos latifolia
	Pentace corneri
	Pentace rigida
	Pterospermum diversifolium
	Pterospermum subpeltatum
	Scaphium affine
	Schoutenia accrensens
MELASTOMATACEAE	*Memecylon argenteum*
	Memecylon cantleyi
	Memecylon longifolium
	Memecylon megacarpum
	Pternandra coriacea
	Pternandra echinata
MELIACEAE	*Aglaia glabrata*
	Aglaia hiernii
	Aglaia oligophylla
	Reinwardtiodendron humile
	Walsura pinnata
MORACEAE	*Artocarpus chama*
	Artocarpus obtusus
	Prainea frutescens
	Streblus elongatus
MYRISTICACEAE	*Horsifeldia laticostata*
	Horsfieldia pallidicaula
	Horsefiedia reticulata
	Horsfieldia tomentosa
	Knema conferta
	Myristica malaccensis
MYRTACEAE	*Syzygium ovalifolium*
	Tristaniopsis beccarii
OCHNACEAE	*Brackenridgea elegantissima*
OLACEAE	*Strombosia javanica*
OLEACEAE	*Chionanthus cuspidatus*
	Chionanthus havilandii
	Chionanthus montanus

OPILIACEAE	*Meliantha suavis*
PEDALIACEAE	*Sesamum indicum*
PHYLLANTHACEAE	*Aporosa caloneura*
	Aporosa nervosa
	Baccaurea sarawakensis
	Cleistanthus hirsutipetalus
	Sauropus rhamnoides
POACEAE	*Oryza sativa*
POLYGALACEAE	*Xanthophyllum eurhynchum*
	Xanthophyllum neglectum
	Xanthophyllum pauciflorum
	Xanthophyllum reflexum
	Xanthophyllum schizocarpon
PRIMULACEAE	*Ardisia hosei*
PROTEACEAE	*Helicia symplocoides*
	Heliciopsis velutina
PUTRANJIVACEAE	*Drypetes laevis*
	Drypetes macrostigma
	Drypetes microphylla
	Drypetes polyneura
ROSACEAE	*Prunus grisea*
RUBIACEAE	*Aidia borneensis*
	Discospermum becarianum
	Ixora miquelii
	Morinda lucida
	Porterandia catappifolia
	Porterandia grandifolia
	Tarenna fragrans
RUTACEAE	*Maclurodendron porteri*
	Melicope glabra
	Micromelum minutum
SALICACEAE	*Casearia tuberculata*
	Homalium longifolium
	Osmelia maingayi
	Osmelia philippina
SAPOTACEAE	*Madhuca elmeri*
	Madhuca glabrescens
	Madhuca kuchingensis
	Palaquium elegans
	Palaquium rufolanigerum
	Payena endertii
	Payena ferruginea
	Planchonella maingayi
SIMAROUBACEAE	*Quassia borneensis*
STEMONURACEAE	*Gomphandra quadrifida*
	Stemonurus grandifolius
THYMELACEAE	*Aquilaria malaccensis*
	Aquilaria microcarpa
	Gonystylus calophyllus

	Gonystylus forbesii
VERBENACEAE	*Stachytarpheta indica*
VIOLACEAE	*Rinorea congesta*
ZINGIBERACEAE	*Etlingera coccinea*