

STUDY ON EPIPHYTIC FERNS IN TANINTHARYI NATURE RESERVE PROJECT (TNRP) AREA, YEPHYU TOWNSHIP, TANINTHARYI REGION

Thuzar Myint¹

Abstract

A survey of epiphytic ferns was carried out in Tanintharyi Nature Reserve Project (TNRP) Area. The TNRP encompasses an area of 1,700 sq km and is located in the Dawei District Tanintharyi Region, southern Myanmar. A total of 15 species of epiphyte were collected from this area. Epiphytic ferns grow on tree trunks, on mossy tree-trunks or on branches of trees. Most species were found growing in light humus as compared to bark and heavy humus as substrate. The field survey was conducted during September, 2020 to February, 2021. Floristic study of collected specimens were classified the families, genus and species. In this survey was collected 15 species belonged to 7 genera, 4 families. Among these, polypodiaceae was the most species-rich families at the study area. Nephrolepidaceae (*Nephrolepis brownii*) was found in only one species.

Keywords: Outstanding characters, Classification, Comparison of 15 species of ferns

Introduction

Epiphytes grow on other plants and get nutrients from the air, rain, or debris. They also known as ‘air plants’, typically found in rainforests. They live symbiotically on other plants from which they obtain nutrients and moisture.

Epiphytic ferns can be divided into different groups: low-level epiphyte and high-level epiphyte. Low level epiphytes are found in moist or shady conditions. High-level epiphytes grow on the branches of the crowns of the tallest trees in the forest.

The morphological characteristic of epiphyte ferns was the erected rhizome and living in the colony. The roots of epiphytes are aerial; they do not grow into the soil but instead attach themselves to larger trees. Some epiphytes have leaves that can store large amounts of water, providing shelter and breeding grounds for various animals.

The TNRP area is characterized by undulating terrain and high elevation ranging from 15 m above sea level in the lowlands to 1,400 m at the ridge of the Thai border; the mountain range here runs from north to south while the slope rises from west to east, climbing to the top of the ridge. It consists of three reserves: the eastern parts of Kaleinaung Reserve and Heinze Reserve (about 85,725 ha) as well as Luwaing Reserve (about 84,273 ha) (TNRMP, 2013). Tropical evergreen forests, especially evergreen dipterocarp forests, occur in southern part of Myanmar. Tanintharyi Nature Reserve (TNR) was established in 2005 as a protected area (TNRMP 2009) where tropical moist evergreen forests are dominant (Pollard et al. 2014).

Totally 74 species of ferns and fern allies were collected in Tanintharyi Nature Reserve (TNRP) area. Among these, 15 species of epiphytic ferns were collected in this area.

Ferns, as a part of biodiversity, are the community which owns essential roles in the forest ecosystem. Such as the soil coverage, the manure mixer for soil nutrient, the producer for the chain food in the ecosystem, germplasm resource, and potential food and medicine resources. Thus, the main objectives of this study were to conduct a floristic study of epiphytic ferns in

¹ Department of Botany, University of Yangon

Tanintharyi Nature Reserve Project (TNRP) area, Tanintharyi Region and to provide conservation of epiphytic ferns diversity in protected areas.

Materials and Methods

Study site

The study area lies in the townships of Yephyu and Dawei, Dawei District in the northern part of the Tanintharyi Region in Myanmar. It is situated between the Dawei River and Myanmar-Thailand border in Southern Myanmar. It is located between the latitudes 14° 20' 50" and 14° 57' 55" North and between the longitudes 98° 5' 10" and 98° 31' 32" East, a total area of 1700 square kilometers (170,000 ha).

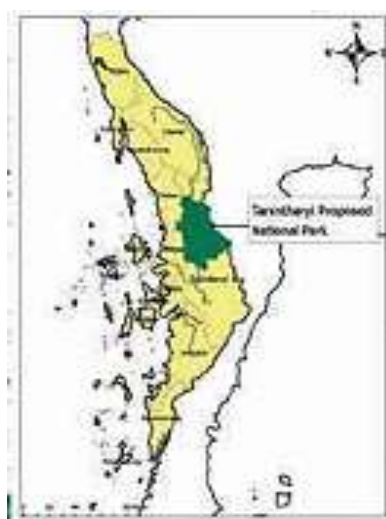


Figure 1.1 Map of Tanintharyi Region, Tanintharyi

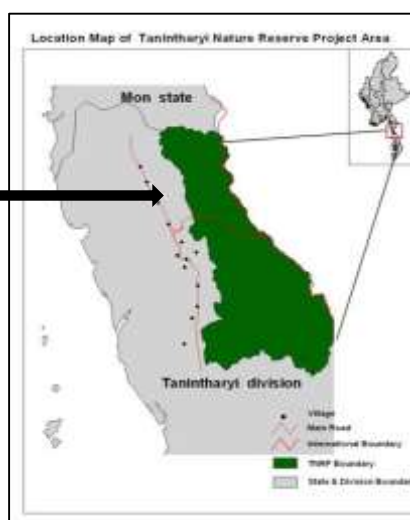


Figure 1.2 TNRP Area, Yephyu Township, Region

Materials and collecting of the specimens

Specimens are properly collected from April 2020 to February 2021. The plant specimens were collected by using along the existing trails method. The collected specimens were placed into the newspaper for drying and then placed into the press frame. Locations of specimens were determined by using GPS (GP 315, Global Positioning System device). Their habitat and some diagnostic characters of each species were recorded.

Descriptions of species and identification were done with the help of the literatures: Kholia, (2010), Tagawa & Iwatsuki, (1979-1989) and www.eFlora.org. Latest updated nomenclature with synonyms is provided based on Kew Science (www.plantsoftheworldonline.org). The classification system of epiphytic ferns of TNRP area follows that of PPG1 (2016).

Results

A total of 15 species of epiphyte were collected from different location as shown in Table 1.1 and have been classified into 1 classes, 1 orders, 4 families, 7 genera and 15 species based on the system of PPGI (Pteridophyte Phylogeny Group)(2016).

Table 1. List of epiphytic ferns from Tanintharyi Nature Reserve Project (TNRP) Area

Order	Family	Genus	Species	GPS Location
Polypodiales	Pteridaceae	1. <i>Antrophyum</i>	<i>parvulum</i>	14°09'55.5"N,98°23'40.3"E,326 m
		2. <i>Haplopteris</i>	<i>elongata</i>	14°24'07.8" N, 98°03'59.2"E,58 m
	Nephrolepidaceae	3. <i>Nephrolepis</i>	<i>brownii</i>	14°2'48" N, 98°27'55" E, 464 m
		4. <i>Davallia</i>	<i>denticulata</i>	14°03'46.8" N, 98°13'57.7" E 52 m
	Davalliaceae	5. <i>D.</i>	<i>divaricata</i>	14°03'40.8" N, 98°13'51.3" E 56 m
		6. <i>D.</i>	<i>trichomanoides</i>	14°07'49.2" N, 98°26'08.1"E 313 m
		7. <i>Drynaria</i>	<i>propinqua</i>	14°24'23.6" N, 98°10'50.3" E 33 m
	Polypodiaceae	8. <i>D.</i>	<i>quercifolia</i>	14°23'02.6" N, 98°04'44.4" E 24 m
		9. <i>D.</i>	<i>sparsisora</i>	14°07'49.2" N, 98°26'08.1"E 313 m
		10. <i>Microsorium</i>	<i>punctatum</i>	14°24'23.6" N, 98°10'50.3" E 33 m
		11. <i>Pyrrosia</i>	<i>costata</i>	14°14'55.3" N, 98°21'45.6" E102 m
		12. <i>P.</i>	<i>lanceolata</i>	14°09'57.0" N, 98°23'42.5" E325 m
		13. <i>P.</i>	<i>lingua</i>	14°17'08.0" N, 98°17'15.1" E 53 m
		14. <i>P.</i>	<i>nummulariifolia</i>	14°14'55.3" N, 98°21'45.6" E102 m
		15. <i>P.</i>	<i>piloselloides</i>	14°09'59.9" N, 98°23'54.8" E409 m

Scientific Name: *Antrophyum parvulum* Blume

Family : Pteridaceae

Common Name : Lineleaf ferns

Outstanding character

Rhizome sub-erect; scale clathrate. Fronds clustered, monomorphic; stipe appressed, forming very narrow wings; lamina spatulate, leathery, veins reticulate. Sori linear, 2 or more parallel lines along the veins, paraphyses club shaped. Spores tetrahedral-globose, trilete.

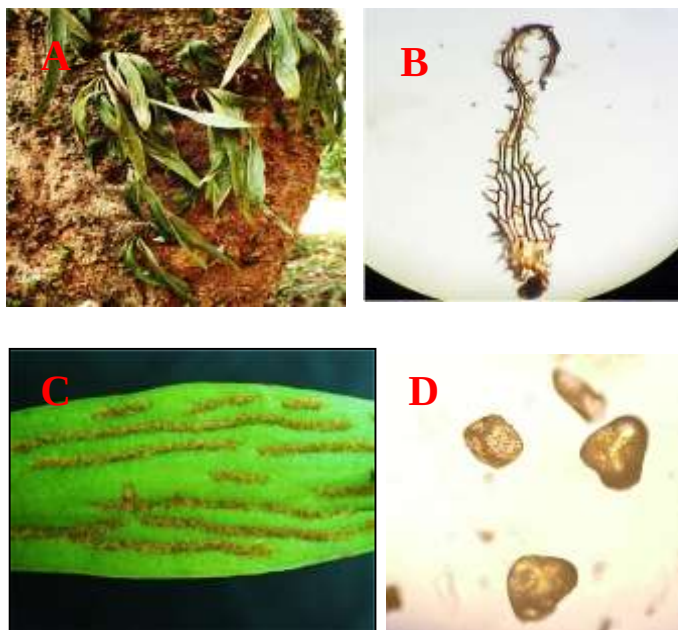


Figure. 2 A-Habit, B-Scale, C-Sori on adaxial D- spore

Scientific Name: *Haplopteris elongata* (Sw.) E. H. Crane

Family : Pteridaceae

Common Name: Tape fern

Outstanding character

Rhizome long creeping; scales subulate-lanceolate, clathrate. Fronds monomorphic, clustered at base; stipe very short; lamina simple, linear or ribbonlike, veins evident. Sori line the margin, immersed in deep groove, paraphyses many; spore monolete, bean shaped, smooth.

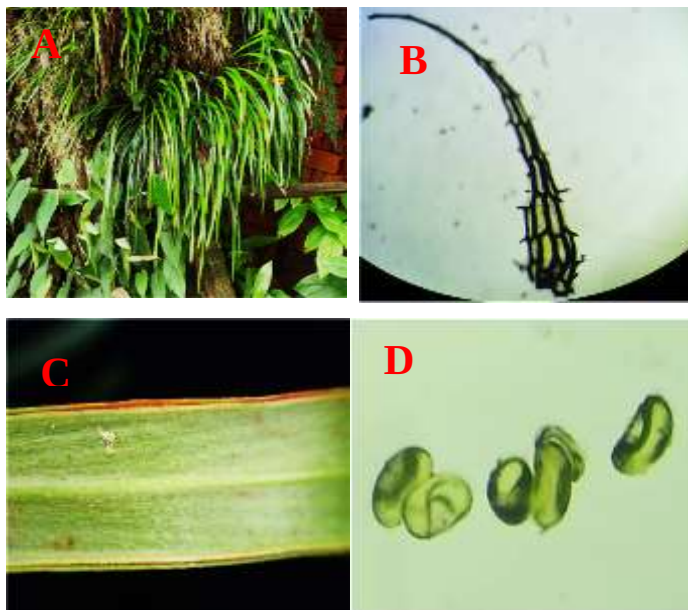


Figure. 3 A-Habit, B-Scale, C-Sori on marginal D-spores

Scientific Name: *Nephrolepis brownii* (Desv.) Hovenkamp & Miyam

Family : Nephrolepidaceae

Common Name : Not known

Outstanding character

Rhizome erect, wiry roots numerous; scales peltate, fimbriate margin. Fronds monomorphic; stipe grooved adaxially, with appressed; lamina unipinnate, pinnae 12-20 pairs, elliptic-lanceolate, articulate, veins forked. Sori bearing along the submarginal, orbicular; indusia reniform; spores oblong, monolet.

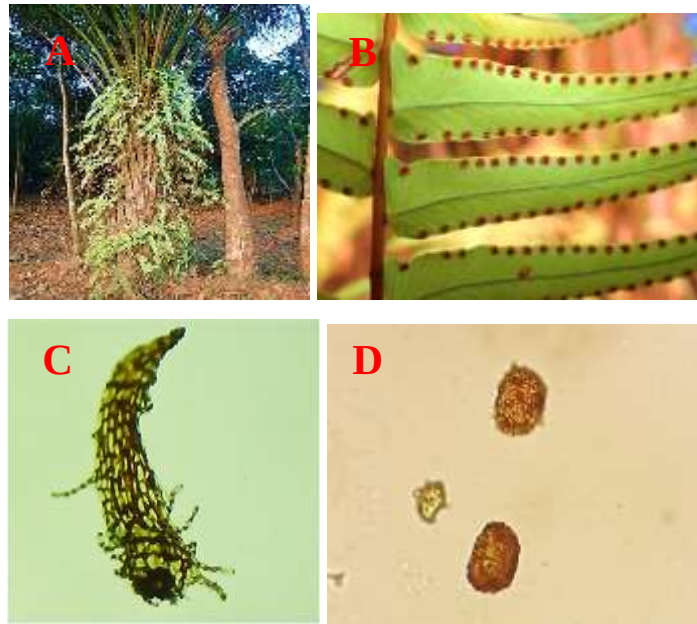


Figure. 4 A-Habit, B-Scale, C-Sori on marginal I spores

Scientific Name : *Davallia denticulata* (Burm.f) Mett.

Family : Davalliaceae

Common Name : foot ferns

Outstanding character

Rhizome long creeping, scales peltate. Fronds monomorphic; stipe adaxially grooved; lamina quadripinnate compound, deltoid and broadest toward base, pinnae deltoid, veins forked, false veins present. Sori at margin of lobes, indusia pouch-shaped; spores oblong, monolet.

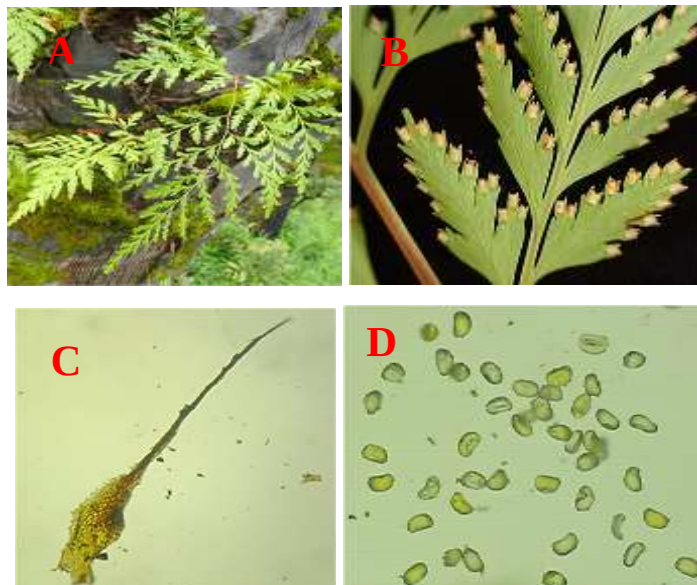


Figure. 5 A-Habit, B-Scale, C-Sori on adaxial D- spores

Scientific Name: *Davallia divaricata* Blume

Family : Davalliaceae

Common Name : Not known

Outstanding character

Rhizome long creeping, scales subulate with long, narrowed toward apex. Fronds monomorphic; stipe adaxially grooved; lamina tripinnate compound, deltoid and broadest toward base, veins forked, without false veinlets. Sori terminal on veinlets, indusial pouch-shaped; spores oblong, monolete.

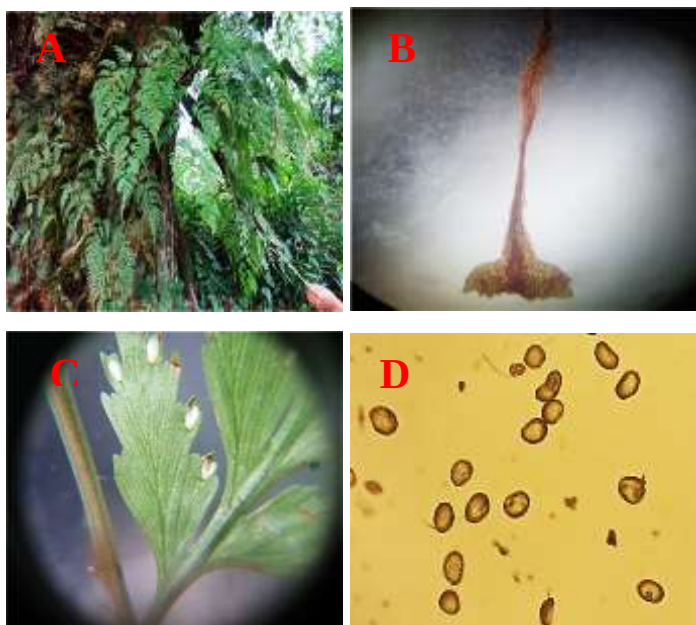


Figure. 6 A-Habit, B-Scale, C-Sori on adaxial D- spores

Scientific Name: *Davallia trichomanoides* Blume

Family : Davalliaceae

Common Name : Not known

Outstanding character

Rhizome long creeping, scales peltate base to long tail apex. Fronds monomorphic; stipe terete, lamina tri to quadripinnate, deltoid, veins forked, false veins present. Sori borne on the tip of veinlets, indusium pouch shaped; spores oblong, monolete.

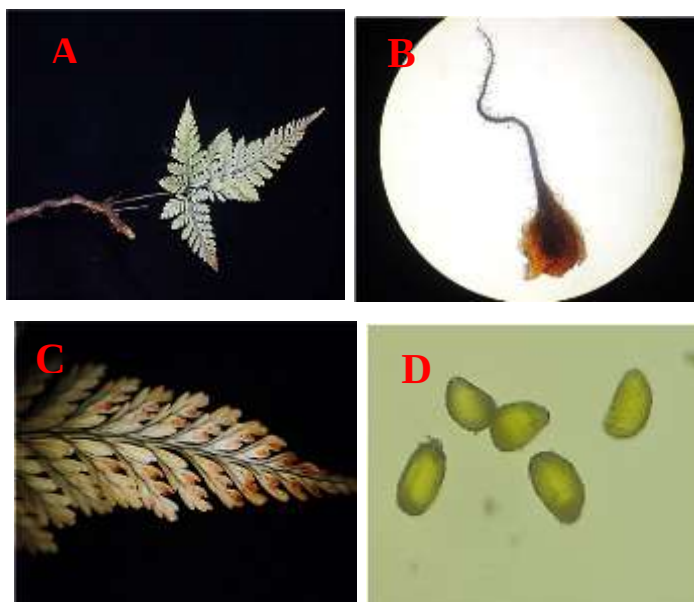


Figure. 7 A-Habit, B-Scale, C-Sori on adaxial D- spores

Scientific Name: *Drynaria*

propinqua (Wall.ex Mett)

J. Sm.ex Bedd.

Family : Polypodiaceae

Common Name : Basket ferns

Outstanding character

Rhizome long creeping; scales lanceolate. Fronds dimorphic; nest leaves sessile, ovate; foliage leaves unipinnate, pinnatifid; stipe narrowly winged, deeply lobed, pinna 10-15 pairs, lanceolate, decurrent, veins anastomosing. Sori round, two rows between costa and lateral veins; spores ellipsoid, monolet.

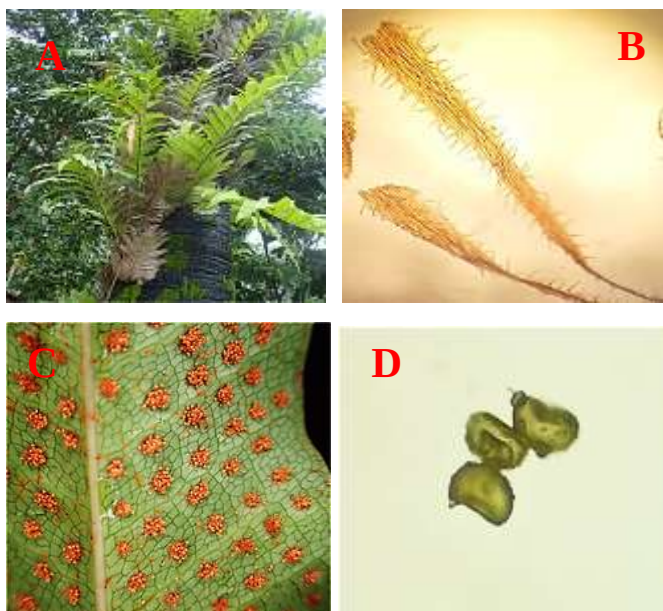


Figure. 8 A-Habit, B-Scale, C-Sori on adaxial D- spores

Scientific Name: *Drynaria*

quercifolia (L.) J. Sm.

Family : Polypodiaceae

Common Name : Basket ferns

Outstanding character

Rhizome short creeping; scales peltate, narrowing from base to tailed apex, Fronds dimorphic; nest leaves sessile, obovate, shallowly lobed; foliage leaves unipinnate, stipe winged, pinna 10-12 pairs, deeply lobed, veins anastomosing. Sori round, two rows between veinlets; spores monolet, ellipsoid.

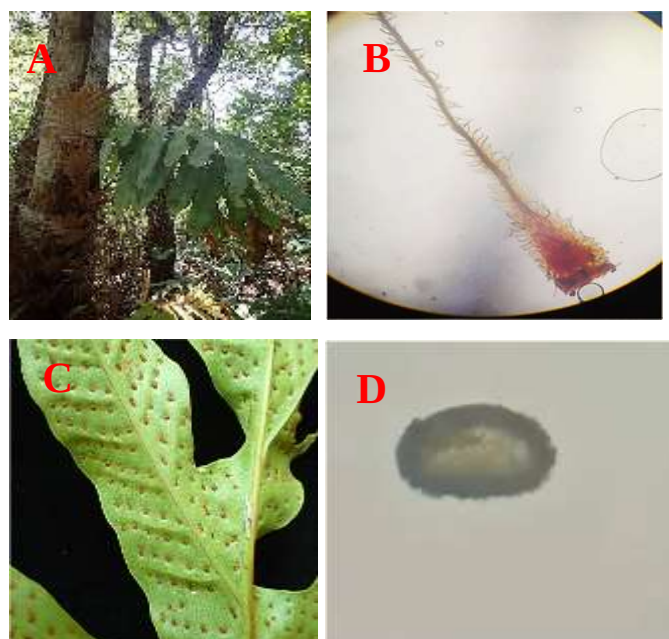


Figure. 9 A-Habit, B-Scale, C-Sori on adaxial, D- spore

Scientific Name: *Drynaria*

sparsisora (Desv.) T. Moore

Family : Polypodiaceae

Common Name : Oak-leaf fern

Outstanding character

Rhizome creeping; scales lanceolate. Fronds dimorphic; nest leaves sessile, ovate-oblong, middlely lobed; foliage leaves unipinnate; stipes narrowly winged, deeply lobed, pinna 12-15 pairs, oblong-lanceolate, veins anastomosing. Sori round, two rows between adjacent main veins; spores monolet, ellipsoid.

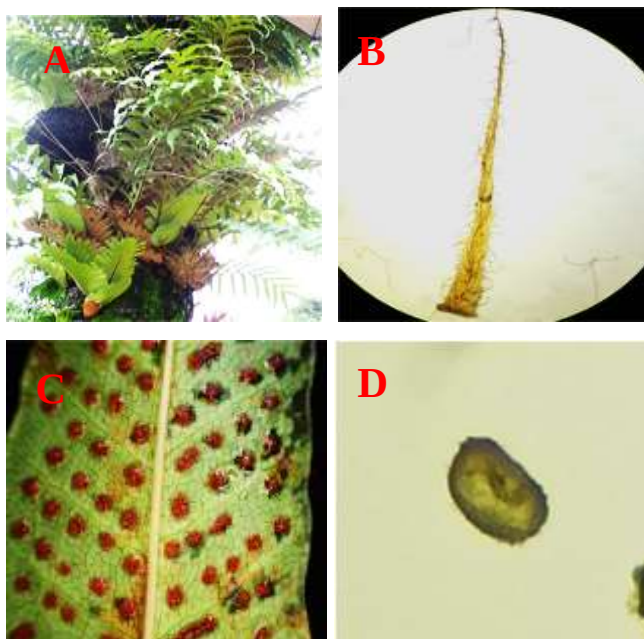


Figure 10 A-Habit, B-Scale, C- Sori on adaxial
D-spores

Scientific Name: *Microsorium*

punctatum (L.) Copel.

Family : Polypodiaceae

Common Name: Not known

Outstanding character

Rhizome short creeping; scales peltate. Fronds monomorphic, sessile; lamina simple, elliptic- lanceolate, pale green, veins anastomosing, midrib distinct. Sori small, orbicular, scattered on the upper half of the fronds; spore oblong, monolet.

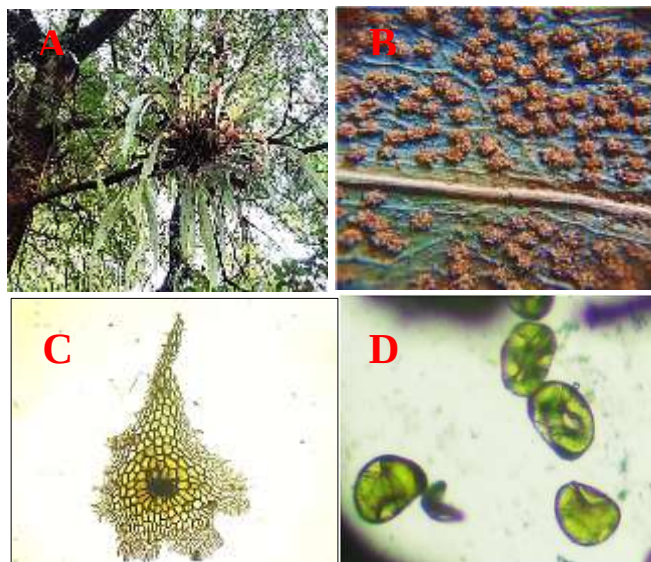


Figure 11 A-Habit, B-Scale, C-Sori on adaxial D-
spores

Scientific Name: *Pyrrosia costata*
(Wall. Ex C. Presl) Tgawa & K.Iwats.

Family : Polypodiaceae

Common Name : Not known

Outstanding character

Rhizome short creeping; scales clathrate. Fronds monomorphic; stipe terete, winged nearly to the base; lamina simple, oblanceolate, main veins distinct and pinnate, hydathodes distinct, veins anastomosing, stellate hairy. Sori superficial abaxially; spore oblong, monolet.

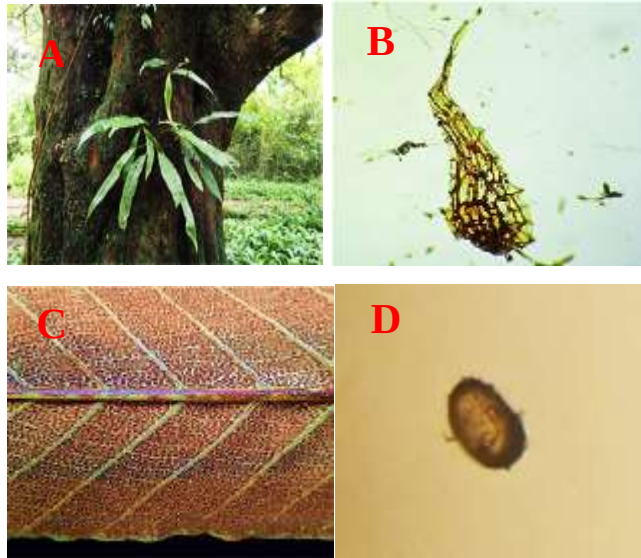


Figure 12 A-Habit, B-Scale, C-Sori on adaxial
D- spores

Scientific Name: *Pyrrosia lanceolata*
(L.) Farw.

Family : Polypodiaceae

Common Name : Japanese felt fern

Outstanding character

Rhizome long creeping, densely scaly throughout; scales peltate, margin ciliate. Fronds monomorphic; stipe terete; lamina simple, elliptic-lanceolate, veins free. Sori borne several rows on each side of main veins, the lower one densely stellate hairs throughout; spore monolet, oblong, cristae.

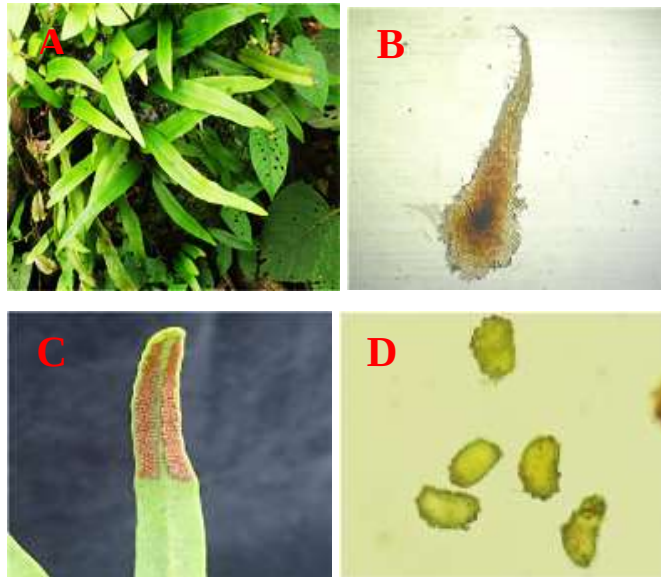


Figure 13 A-Habit, B-Scale, C-Sori on adaxial D-
spores

Scientific Name: *Pyrrosia lingua*

(Thunb.)Farw.

Family : Polypodiaceae

Common Name : Not known

Outstanding character

Rhizome long creeping; scales peltate. Fronds monomorphic; coriaceous; stipe terete; lamina simple, ob-ovate, stellate hairs, hydathodes distinct, veins pinnate. Sori borne between veins parallel, superficial; spores monolete, rugose.

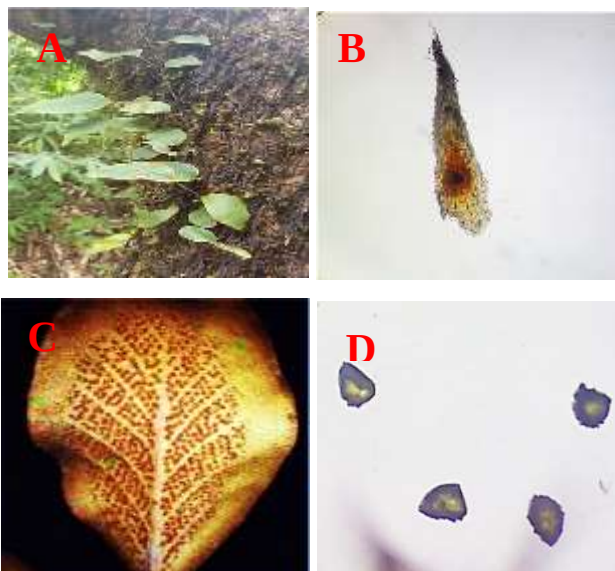


Figure 14 A-Habit, B-Scale, C-Sori on adaxial D-spores

Scientific Name: *Pyrrosia*

nummulariifolia (Sw.) Ching

Family : Polypodiaceae

Common Name : Not Known

Outstanding character

Rhizome long creeping, scales peltate, tailed apex. Fronds dimorphic; sterile leaves stipe short; lamina ovate, densely stellate hairs; fertile leaves stipe terete, lamina elliptic-ovate, veins indistinct. Sori superficial; spores ellipsoid, monolete.



Figure 15 A-Habit, B-Scale, C-Sori on adaxial D-spores

Scientific Name: *Pyrrosia**piloselloides* (L.) M.G. Price**Family** : Polypodiaceae**Common Name** : Dragon Scales fern**Outstanding character**

Rhizome long creeping, scales circular peltate, the outer hyaline and the center brown. Fronds dimorphic; stipe of sterile leaves short; lamina ovate, veins obscure, reticulate venation, both surfaces sparsely stellate hairy; fertile leaves lamina oblong, veins indistinct. Sori in two distinct rows, each row between midrib and margin; spore oblong, monolet, cristae.

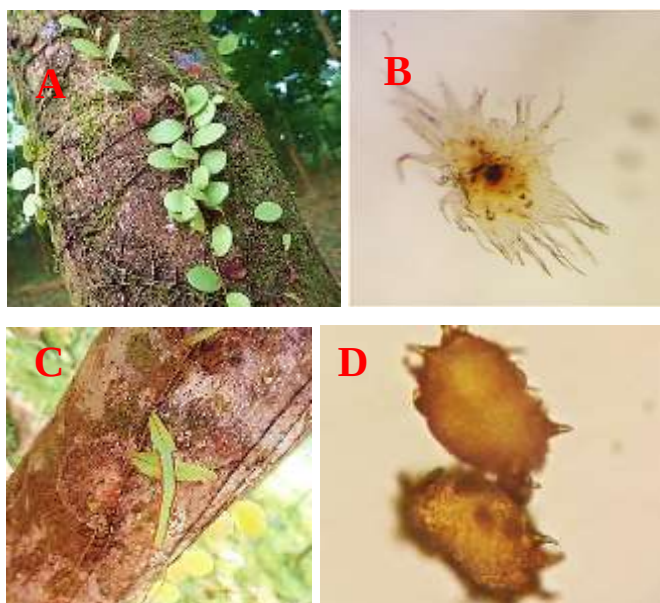


Figure 16 A-Habit, B-Scale, C-Sori on adaxial D-spores

Table 2. Comparable attributed characteristics of 15 species of epiphytic ferns in TNRP area

No	Scientific Name	rhizome	scale	frond	veins	sori	spores
1	<i>Anthrophyllum parvulum</i>	sub-erect	clathrate	monomorph	anastomosing,	margin	monolet
2	<i>Haplopteris elongata</i>	long creeping	clathrate	monomorph	indistinct	margin	monolet
3	<i>Nephrolepis brownii</i>	erect	lanceolate	monomorph	forked	margin	monolet
4	<i>Davallia denticulata</i>	long creeping	peltate	monomorph	false vein present	tip of veinlets	monolet
5	<i>Davallia divaricata</i>	long creeping	subulate	monomorph	without false vein	tip of veinlets	monolet
6	<i>Davallia trichomanoides</i>	long creeping	peltate	monomorph	false vein present	tip of veinlets	monolet
7	<i>Drynaria Propinqua</i>	long creeping	lanceolate	dimorphic	anastomosing,	two rows	monolet
8	<i>D. quercifolia</i>	short creeping	peltate	dimorphic	anastomosing,	two rows	monolet
9	<i>Drynaria sparsisora</i>	short creeping	lanceolate	dimorphic	anastomosing,	two rows	monolet
10	<i>Microsorium punctatum</i>	short creeping	peltate	monomorph	indistinct	scattered	monolet

No	Scientific Name	rhizome	scale	frond	veins	sori	spores
11	<i>Pyrossia costata</i>	short creeping	clathrate	monomo rphic	anastro mosing,	superficial	monolete
12	<i>P.lanceolata</i>	long creeping	peltate	monomo rphic	free	rows on each side of main veins	monolete
13	<i>P. lingua</i>	long creeping	peltate	monomo rphic	pinnate	between veins parallel	monolete
14	<i>P. nummulariifolia</i>	long creeping	peltate	dimorp hic	indistinct	superficial	monolete
15	<i>P. piloselloides</i>	long creeping	circular peltate	dimorp hic	indistinct	two distinct rows	monolete

Discussion and Conclusion

In the present study, 15 species belong to 4 families of epiphytic ferns collected from Tanintharyi Nature Reserve Project (TNRP) area have been described, identified and classified. Among these, Polypodiaceae had the highest number (57.1%) and followed by Davalliaceae, (21.4%), Pteridaceae (14.29%) and Nephrolepidaceae was 7.14% respectively.

Epiphytic plants usually occur on shady branches or tree trunk from low elevation to mid elevation, the most abundant genera were *Pyrrosia* which 5 species. Among these, *Microsorium punctatum*, *Pyrrosia piloselloides* (L.) M. G. Price are abundant on the tree trunk and occur more than one localities.

Two types of fronds were occurred in this area. Dimorphic fronds are observed in *Drynaria propinqua*, *D. quercifolia*, *D. sparsisora*, *Pyrrosia nummulariifolia* and *P. piloselloides* while the other species are monomorphic fronds. Erect rhizome is found in *Antrophyum parvulum* and *Nephrolepis brownii* and the rest 13 species are creeping rhizome. It is agreed with the report of Tagawa & Iwatsuki (1979-1989).

Simple leaves (fronds) were collected in *Anthrophyllum parvulum*, *Haplopteris elongata*, *Microsorium punctatum*, *Pyrossia costata*, *P. lanceolata*, *P. lingua*, *P. nummulariifolia* and *P. piloselloides*. Unipinnately compounds were found in *Nephrolepis brownii*, *Drynaria propinqua*, *D. quercifolia* and *D. sparsisora*. and tripinnately to quadripinnately compound were recorded in *Davallia denticulata*, *D. divaricata* and *D. trichomanoides*.

Among the collected families, two types of spores had been recorded in the study area. Trilete (tetradral) spores are only found in *Anthrophyllum parvulum* Blume. Monolete (bilateral) spores are observed in 14 species of plants. It is agreed by Tagawa & Iwatsuki (1979-1989), Winter & Amoroso (2003) and Kholia (2010).

In conclusion, epiphytic ferns that had been discovered from the TNRP area consist of 4 families, 7 genera and 15 species which have various morphological characteristics. TNRP area is very suitable for the growing of pteridophytes and rich resources of more species are found in this area compared different area of Yephyu Township, especially on the epiphyte.

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- Website Flora of China (**Error! Hyperlink reference not valid.**)Kew science (<http://www.plantsoftheworldonline.org>)