



---

**FIRST REPORT OF PTERIDOPHYTES IN MINALUNGAO NATIONAL PARK,  
NUEVA ECIJA, PHILIPPINES**

**ELEONOR D. ALFONSO<sup>\*1,2</sup>, EDEN S. DAVID<sup>1</sup> AND KHRISTINA G. JUDAN CRUZ<sup>1</sup>**

<sup>1</sup>Department of Biological Sciences, Central Luzon State University, Science City of Munoz,  
Nueva Ecija, Philippines

<sup>2</sup>College of Agriculture, Nueva Ecija University of Science and Technology, Gabaldon, Nueva  
Ecija, Philippines

**\*Corresponding author: Eleonor D. Alfonso: E-mail: [eleonoralfonsod@gmail.com](mailto:eleonoralfonsod@gmail.com)**

Received 26<sup>th</sup> Feb. 2018; Revised 29<sup>th</sup> March. 2018; Accepted 24<sup>th</sup> April 2018; Available online 1<sup>st</sup> July 2018

DOI: <https://doi.org/10.31032/IJBPAS/2018/7.7.4498>

**ABSTRACT**

This research identified the pteridophytes present in Minalungao National Park, Nueva Ecija, Philippines through morphological characters and offers the first report of pteridophytes in the area. The national park is characterized by dense forests and offers high potential for the discovery of unrecorded species.

A total of 8 species were identified representing one class (Polypodiopsida), one order (Polypodiales), 3 families (Thelypteraceae, Pteridaceae and Polypodiaceae) and 8 genera. These were *Macrothelypteris torresiana* (Gaudich.) Ching, *Adiantum caudatum* L., *Pteris biaurita* L., *Pteris ensiformes* Burm. f., *Pityrogramma calomelanos* (L.) Link., *Pteris vitata* L., *Adiantum philippense* L., and *Drynaria* sp.

**Keywords: Pteridophytes, Morphological characters, Minalungao National Park**

**INTRODUCTION**

The Philippines is a mega diverse country [1] and due to the patchwork of tropical areas and numerous isolated islands,

the Philippines has a high species diversity and level of endemism. Its unique flora constitute around 60 percent level of species

endemism, among these are the pteridophytes. Despite this biodiversity, the Philippines is also a biodiversity hotspot due to continuous depletion of natural resources [2]. Its high, unique plant life [1] is endangered by many factors such as erosion, cutting of trees and global warming. Due to these threats, a high number of endemic species in the Philippines is facing the threat of extinction, which includes those species that are not yet recorded.

One group of plants that contribute to this biodiversity is the pteridophytes, constituting around 10,000 to 12,000 species globally. Pteridophytes are the most primitive vascular plants, spore-bearing and include ferns and fern-allies. The spores of pteridophytes are aerially dispersed for great distances which results in complete occupation of their suitable habitat.

Pteridophytes is a paraphyletic group of seed plants which consist of four groups: Lycopods, *Equisetum*, Psilotaceae and Ferns [3]. The largest order of living ferns, the *Filicales*, has about 300 genera and about 9000 species, grouped into 33 families depending on the perspective of the particular taxonomist involved [4]. In the Philippines, there are approximately 1,100 species which is under 144 genera and 39 families of Pteridophytes [5].

National parks and conservation areas are widely distributed throughout the Philippines, which help preserve and conserve the natural resources and protect the animals, plants and other living organisms from extinction. One of the protected areas in the Philippines is the Minalungao National Park at General Tinio, Nueva Ecija. It is considered as one of the last natural environments located in North of Manila that covers more than 2,000 hectares of protected areas and holds high diversity of organisms because of its dense forests and rich rivers (eoeath.org). The dense forests of Minalungao National Park holds a high number of species of fishes, bats, birds, trees, ferns, macrofungi and invertebrates and has an immense potential for the discovery of unrecorded species. As a national park, it helps to maintain the present natural resources and prevent extinction of not only the endangered organisms but all of the wide range of organisms inhabiting the area (eoeath.org). This research identified the pteridophytes present in the area through morphological characters and offers the first report of pteridophytes in the area.

## **MATERIALS AND METHODS**

### **Sample Collection and Preservation**

The specimens were collected at Minalugao National Park, General Tinio, Nueva Ecija by hand picking. Whole fern samples pressed using a plant presser served as voucher specimens. The plant specimens were treated with 70% denatured alcohol which causes fixation of tissues by arresting the activity of abscissic acid and thus preventing the leaves and other parts of the plant from falling off [6]. The plants were dried and preserved into herbarium specimens. The plants were laid out and flattened in newspapers with the use of plant presser which consisted of a pair of wood/bamboo frame provided with abaca twine or nylon cord to fasten the pair of frames together. The presser was sun-dried.

The specimens were mounted in an upright position in a standard sized mounting sheet/ Bristol board 28.75 x 41.25 cm at the same time allowing space for the herbarium label which were affixed on the upper left-hand corner of mounting sheets/ Bristol board.

#### Identification of Plants

Specimens in their reproductive stage were collected to determine the presence of spores. The classification of pteridophytes was done on the structure and arrangement of the reproductive parts of the sporophyte which were the sori and

sporangia [7]. Bases of identification include the habitat, rhizome, branching of fronds, stipe, leaf arrangement, pinna, sori, shape of sori, margin, color and surface [8].

#### RESULTS AND DISCUSSION

A total of 8 species were identified using morphological characters representing one class (Polypodiopsida), one order (Polypodiales), 3 families (Thelypteraceae, Pteridaceae and Polypodiaceae) and 8 genera. Table 1 shows the collected pteridophytes at Minalunago, National Park in Nueva Ecija.

#### Family Thelypteridaceae

##### *Macrothelypteris torresiana* (Gaudich.)

#### Ching

Rhizome is short-creeping. Leaves are green in color. Stipes is tramineous up to 70 cm long. Lamina is up to 72 cm long, tripinnatifid, pinnules is adnate, basal pinnae is not reduced, not or only very slightly narrowed at base. Pinnae are up to 26 cm long, pinnules to 5.3 cm and segments are up to 1 cm. Rachis is costae and primary costules above with dense beneath with long slender hairs and has no scales. Indusium is very small, pale and often hidden by mature sporangia [9].

Habit: Terrestrial, in damp woods and along stream banks. Also occurs in sheltered,

moist sandstone gorges where associated with springs and cliff line seepages.

### Family Pteridaceae

#### *Adiantum caudatum* L.

Rhizome is short-erect bearing narrow brown paleae with darker center to 4 mm and simply pinnate linear-lanceolate fronds commonly 20-30 cm long. Leaves are green in color. Stipe is much shorter than lamina, sparsely paleate at base, copiously hairy throughout, the reddish-black sheen somewhat obscured by the pale hairs. Pinnae is sessile not joined at the narrowly cuneate base, commonly 1.5 cm long x 0.5 broad, hairy on both sides, deeply incised into narrow segments. An indusial flap is rounded, not quite 1mm across, very densely setose [9]. Habit: Terrestrial fern.

#### *Pteris biaurita* L.

It has a long rhizome, erect or reeping branched; scales are pale brown to black, concolored, elongate, has an entire margins. Leaves are monomorphic, clustered or closely spaced. Petiole is straw-colored, green, brownish red to purple black, scaly at base, glabrous or scaly distally. Blades are oblong to lanceolate to deltate, 1-4 pinnate. Base truncate or narrowed to stalk. A vein in leaves is conspicuous. Spores brown, trilete, tetrahedral, rugate and/or tuberculate usually with prominent equatorial flange.

Habit: On dry sloping fields, mountain slopes in light shade or in lower montane forests at altitudes below 1400 m, usually a lowland species. It can grow on either terrestrial or on rock.

#### *Pteris ensiformes* Burm. f.

Stems are erect or creeping, branched; scales are pale brown to black, concolored, elongate, margins are entire. Leaves are monomorphic, clustered or closely spaced, 1-20 dm. the petiole are straw-colored, green, brownish red to purple black, longitudinally ridged, 2-3 grooved adaxially, scaly at the base, glabrous or scaly distally with 1 sometimes are less often 2 or more vascular bundle. Blade is oblong to lanceolate to deltate, 1-4 pinnate, herbaceous to leathery, abaxially and adaxially glabrous or sometimes pubescent or scaly, adaxially dull, not striate; rachis are straight. Ultimate segments of blade is sessile to short-stalked, linear to oblong-lanceolate, 1.5-8 mm wide; base are truncate to stalk, the stalk when present is green, not lustrous; margins are plane or reflexed to form false indusial. Veins in the leaves are conspicuous, free and forking well above the base of the segment or highly anastomosing. False indusia pale, scarious, covering sori. Sporangia intramarginal, sori usually continuous except at pinna or segment apex and sinuses,

paraphyses is present. Spores are brown, trilete, tetrahedral, rugate and/or tuberculated, usually with prominent equatorial flange.

Habit: Can be on either terrestrial or rock .On mountain slopes or on ground of tropical rain forests at low altitudes in Peninsular, or in dry evergreen forests at low to medium altitudes in other parts.

#### ***Pityrogramma calomelanos* (L.) Link**

It is rhizome bearing linear-lanceolate brow paleae to 5 mm long and finely-dissected fronds to over 1m long. Stipes about equal in length to lamina, conspicuously reddish-black and sinning, glabrous except for a few narrow brown paleae near the base and deciduous white fluffy powder. Lamina is bipinnate to tripinnate, pinnae and pinnules numerous, glabrous but for fluffy whitish resinous powder on the lower surface. Pinnae narrowly lanceolate, the lowest not or hardly reduced. Pinnules ovate-elliptic, acute, the larger ones are toothed. Sori elongate over all veins except costule and at the margins in full development confluent and appearing acrostichoid [9].

Habit: This is common on exposed or in disturbed areas, common to open countryside clearings.

#### ***Pteris vitata* L.**

The rhizome is short creeping, densely scaly, scales are pale brown. Leaves are clustered. The petiole is green to pale brown, densely scaly. Blade is oblanceolate, 1-pinnate; rachis is not winged. Pinnae is numerous, proximally separated, not articulate to rachis, linear-lanceolate to linear-attenuate, simple; base is asymmetrically cordate to widened or truncate; margins is serrulate, apes is acuminate, attenuate or acute; rachis grading into uniseriate hairs on abaxial costae, proximal pinnae is not divided or lobed. Veins are free, forked. Sori are narrow.

Habit: On rather wet sandy ground or on muddy rocks usually along rivers in shade below 800 m altitude. Also on limestone rocks in fissures and in mortar on walls.

#### ***Adiantum philippense* L.**

Rhizome is short and creeping with tufted fronds and with dark-brown subulate rhizome. Leaves are green in color. Stipe is castaneous, glabrous. Frond is arching, herbaceous, often proliferous at the apex. Lamina lanceolate in outline, pinnate; pinnae are mostly very broadly oblong to rhombic, more reduced and obtuse towards the apex of the frond, borne on slender castaneous petioles. Sori are borne on the apices of the pinna lobes.

Habit: It can shift its habitat from ground to higher, shady places depending on climatic change. On rather dry slopes or on muddy crevices of rocks in light shade or sometimes on humus-rich floor of dense montane forests; common at low to medium altitudes, rarely to 1400 m alt., very common except in Peninsular region.

### Family Polypodiaceae

#### *Drynaria* sp.

Rhizome creeping; stipes are widely spaced. Sori are superficial, in pockets or depressions, round, or if in grooves, diagonally and uniformly elongate.

Habit: It is epiphytic, can be on rocks and trunk of trees.

In the Philippines a checklist of the Philippine fern taxa in which 31 families, 151 genera and 958 species are reported [10]. The composition of the families follows closely but not exactly the flora Malesiana [11]. Ferns are common in Southeast Asia especially in the Philippines. In this collection, three families are represented and are typically found in the Philippines. One collected species, *Macrothelypteris torresiana* is also known in other countries such as in Australia and Queensland northern Western Australia, eastern Queensland and north-eastern New South Wales and outside Australia and

occurs naturally from the Mascarene Island to the Pacific where it grows in open places usually near water [12].

*Adiantum caudatum* L. is widely distributed from Africa to Pacific and is common throughout the Philippines [13]. *Pteris biaurita* L. also inhabits Guangdong, Guangxi (Baise), Guizhou, Hainan, C and S Taiwan, Xizang, Yunnan Bangladesh, Bhutan, India, Indonesia, Laos, Malaysia, Nepal, Sri Lanka, Thailand [14].

Twenty-one (21) species of pteridophytes are reportedly inhabiting Central Luzon State University (CLSU), an area also situated in the province of Nueva Ecija, and were identified and classified under one class, one order, eight families and 11 genera. The most dominant species is *Nephtoliepis cordifolia* (L.) Presl. [15].

Limitations in the study included the season of collection where the specimens were collected during the months of December and January wherein moisture is not that abundant, with temperature that is relatively warm with a range of 23 - 27°C and the relative humidity that is quite high ranging from 84-92%. A similar study should be conducted during the rainy season, which is the preferred condition for the growth of most pteridophytes.

## CONCLUSION

Eight species of pteridophytes are reported from Minalungao National Park, Nueva Ecija, Philippines: *Macrothelypteris torresiana* (Gaudich.) Ching., *Adiantum caudatum* L., *Pteris biaurita* L., *Pteris ensiformis* Burm.f., *Pityrogramma*

*calomelanos* (L.) Link., *Pteris vitata* L., *Adiantum philippense* L. and *Drynaria* sp.

## ACKNOWLEDGEMENT

The authors appreciate the permission, assistance and support of the people of Minalungao National Park, General Tinio, Nueva Ecija, Philippines. This piece of work is humbly dedicated to them.

Table 1: Pteridophytes at Minalungao, National Park Gen. Tinio, Nueva Ecija

Pteridophytes	Family
<i>Macrothelypteris torresiana</i> (Gaudich.) Ching	Thelypteridaceae
<i>Adiantum caudatum</i> L.	Pteridaceae
<i>Pteris biaurita</i> L.	Pteridaceae
<i>Pteris ensiformes</i> Burm. f.	Pteridaceae
<i>Pityrogramma calomelanos</i> (L.) Link.	Pteridaceae
<i>Pteris vitata</i> L.	Pteridaceae
<i>Adiantum philippense</i> L.	Pteridaceae
<i>Drynaria</i> sp.	Polypodiaceae



Figure 1: *Macrothelypteris torresiana* (Gaudich.) Ching Figure 2. *Adiantum caudatum* L. Figure 3. *Pteris biaurita* L. Figure 4. *Pteris ensiformes* Burm. f. Figure 5. *Pityrogramma calomelanos* (L.) Link. Figure 6. *Pteris vitata* L. Figure 8. *Drynaria* sp.

## REFERENCES

- [1] CARPENTER, K. E. and SPRINGER, V. G. (2005). Environmental Biology of Fishes 72:467-480.
- [2] DELOS ANGELES, M. and BUOT, I. (2012). Orders and Families of Philippine Pteridophytes. Journal of Nature Studies . 11 (1&2): 19-33
- [3] QIU, Y. L. and PALMER, J. D.(1999) Phylogeny of early land plants: insights from genes and genomes. Trends Plant Sci 4: 6–30
- [4] JENSEN, W. A. and SALISBURY, F. B. (1972). Botany and Ecological Approach. Belmont California. 784p.
- [5] BARCELONA, J. F. (2002). Philippine pteridophyte collections as a resource for conservation planning. Fern Gazette 16(6,7, &8): 307-312.
- [6] GUEVARA, B. Q. (2005). A Guidebook to plant screening: Phytochemical and Biological, Revised edition. Published by RESEARCH Center for the Natural Sciences, University of Santo Tomas Publishing House Espana, Manila.
- [7] CROFT, J. (1999). A guide to collecting herbarium specimens of ferns and their allies. Australian National Herbarium. Retrieved from [jrc@anbg.gov.au](mailto:jrc@anbg.gov.au) December 20, 2013.
- [8] VAN STEENIS C. G. J. and HOLTUM, R. E. (1982). Flora Malesiana Series II-Pteridophyta ferns and fern allies, Republic of Indonesia Lembaga Ilmu Pengetahuan Indonesia (L.I.P.I.) Indonesian Institute of Sciences, Published by Martinus Nijhoff, Dr. W. Junk Publishe, the Hague/Boston/London. ISBN 90 247 2653 0.
- [9] BARCELONA, J. F. (1994). Pteridophyte flora of Mount Iraya and Vicinity, Batan Island Northern Philippines. Unpublished Graduate Thesis. Graduate School, University of Santo Tomas, Espana, Manila
- [10] SALGADO, E. A. 1990. A checklist of Philippine ferns, Philipp. J. Sci. 119: 107-148
- [11] HOLTUM, R. E. and ALSTON, A. H. G. 1959. Gleicheniaceae, Schizaeaceae, Isoetaceae. In: Flora Malesiana. Series II. Pteridophyta 1(1): 37-64, + xxiv.
- [12] BOSTOCK, P.D. (1998). Thelypteridaceae. *Flora of Australia* 48, 327–358.
- [13] ZAMORA, P.M. and CO, L.L. 1986. Economic Ferns, Endemic Ferns, and

- Gymnosperms In Guide to Philippine Flora and Fauna. Vol. 2. pp. 1-271. Natural Resources Management Centre and University of the Philippines, Quezon City.
- [14] FRASER, J. (2008). Taxon. Revis. Indian Subcontinental Pteridophytes, 115-116.
- [15] DELA CRUZ, M. F. O. (1997). Diversity of Pteridophytes in CLSU Muñoz, Nueva Ecija. Unpublished Undergraduate Thesis. Department of Biological Sciences. Central Luzon State University, Muñoz, Nueva Ecija.