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An Account of the Accessioned Specimens in the Jose Vera Santos Memorial Herbarium, University of the Philippines Diliman

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ABSTRACT

The University of the Philippines Herbarium was established in 1908 and originally located in Ermita, Manila. The majority of its pre-war collections were destroyed during World War II, and no formal records of its specimens were preserved. Since then, multiple efforts to restore and improve the Herbarium have been proposed and implemented, most notably its move to the UP Diliman campus. In 1999, the Herbarium was officially renamed as the Jose Vera Santos Memorial Herbarium after the noted grass expert, who initiated rehabilitation work in the Herbarium after the war. The Herbarium is registered with the international code PUH in the Index Herbariorum, a global directory of public herbaria managed by the New York Botanical Garden. To assess the accessioned (uniquely numbered and recorded) collection of the Herbarium, an electronic database of its accessions was created.The Herbarium currently contains 14,648 accessions, 12,681 (86.6%) of which were collected in the Philippines. This is comprised of 309 families, 1903 genera, and 4485 distinct species. Thirty-nine type specimens form part of the collection, only one of which is a holotype. On the basis of major

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plant groups, angiosperms make up 71% of the collection. Unsurprisingly, Family Poaceae has the largest number of specimens at 2,759 accessions. The earliest dated Philippine specimen was collected by E.D. Merrill in 1902, and roughly half of the total accessioned specimens were collected in the 1950s and 1970s. The two most prolific collectors were Santos and Leonardo L. Co, with 2,320 and 2,147 specimens, respectively. Luzon is the most well-represented island group with 2,752 specimens collected in Metro Manila alone. At present, PUH Curator James V. LaFrankie is working on the expansion of the collection and upgrading of the herbarium to encourage future educational and research activities.

Keywords: Herbarium, botany, museum, collection, Philippine flora

INTRODUCTION

The University of the Philippines Herbarium was established in 1908, during a period dubbed as the "Golden Age of Philippine Botany" (Pelser and others 2011). American botanist Elmer D. Merrill (1876-1956) led much of the floristic research conducted at the time, unsurpassed in Asia until he left the country in the early 1920s (Robbins 1958).

The Herbarium was originally located in Ermita, Manila then the main campus of the University of the Philippines (UP) system. Given its proximity to the Bureau of Science herbarium (now the Philippine National Herbarium, or the PNH), the UP herbarium was largely overlooked. Merrill, who was head of the UP Botany Department from 1912 to 1918, lamented the usage of the Herbarium merely as an instructional tool; to him, herbarium work necessitated museum activities (Asis 1975). The lack of funds given to the Herbarium also greatly impeded its development. Tragically, the Herbarium and its collections were destroyed during the liberation of Manila in 1945, during the Second World War. Most, if not all, specimen accessions prior to the war were not preserved.

In 1946, after the war, the rehabilitation of the Herbarium was undertaken by Dr. Jose Vera Santos† (1908-1987). Most of the initial specimen accessions came from Santos' personal collection. By 1949, the Herbarium was housed in UP Diliman, at Pavilion 4, in what was then known as the College of Arts and Sciences. Much of the Herbarium's collections at the time were either stored in cabinets along the corridors of Pavilion 4 or in faculty rooms and laboratories. It was only in 1978 that the Herbarium's collections were consolidated and a room dedicated to its purpose was secured. The bulk of the work in organizing and expanding the Herbarium's collections were done by Leonardo L. Co† (1953 -2010) and Dr.

Prescillano M. Zamora† (1933-2010), then director of the Institute of Biology (LL Co, unpublished notes).

Efforts to improvise and expand the Herbarium were formalized in 1989 by Zamora, with the main purpose of restoring damaged specimens and acquiring new specimens. The Herbarium gained international recognition in 1990, when it was listed in the Index Herbariorum with the acronym PUH. In 1999, it was officially renamed as the Jose Vera Santos Memorial Herbarium. (As a sidenote, there appears to be a discrepancy in the Herbarium's name that was registered in the Index Herbariorum (Jose Vera Santos Memorial Herbarium) and the name used in official documents filed at the Institute of Biology regarding the Herbarium's renaming (Jose Vera Santos Herbarium)).

This study aimed to assess the accessioned collection of the Jose Vera Santos Memorial Herbarium (alternatively referred to in this article by its acronym PUH) by analyzing the scope of its collections in terms of taxonomic composition, geographic distribution, and chronological breadth.

METHODS

An electronic database of the Herbarium accessions was created (Note: This database will be made available to interested parties upon request.). Logbooks containing specimen accessions were encoded into an MS Excel file. Entries for each accession include the following: family, genus, species epithet, subspecies or variety, collector, date of collection, and locality in which the specimens were collected. A review of the database was done to determine the taxonomic composition of the collections, the representation of collectors, the number of collections per decade, and the representation of each province in the Herbarium.

For the purpose of analysis, outdated nomenclature was corrected based on the APG III system for Angiosperms (APG III 2009), and according to the online database on the Plant List (www.theplantlist.org).

RESULTS AND DISCUSSION

The Jose Vera Santos Memorial Herbarium contains 14,648 accessions, 12,681 (86.6%) of which were collected in the Philippines. The entire Herbarium collection is comprised of 309 families, 1903 genera, and 4,485 distinct species. Angiosperms make up the majority of the collections, comprising 71% of the total specimens (Figure 1). Bryophytes and pteridophytes make up 12% and 11% of the collections, respectively, while only one percent of the collections are gymnosperms. Five

percent of the collections have either unclear taxonomic affiliations (unresolved identification) or are lacking in data (specimens that have not been identified or those with genera or species that could not be found on any database). Out of the 309 families, Family Poaceae has the largest number of specimens at 2,759, followed by Fabaceae (690), and Asteraceae (539) (Table 1). The Herbarium's namesake, Santos, specialized in grasses, and a great number of the specimens under Poaceae were collected by him.

The PUH's earliest dated specimen collected in the Philippines is the grass *Echinochloa crus-galli* (Poaceae), collected by Elmer D. Merrill on April 26, 1902. As the Herbarium and its contents were destroyed during the war, the origins of 392 pre-war specimens in the PUH cannot be determined. The Herbarium also

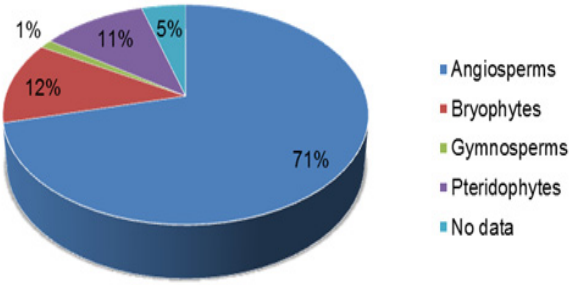

Figure 1. Representation of the four major plant groups in the Jose Vera Santos Memorial Herbarium based on the number of collections. While fungi and algae collections continue to be housed in the Herbarium, no accession numbers have been given for said specimens at this time.

Table 1. The top ten families based on the number of herbarium collections

Rank	Family	Number of collections
1	Poaceae	2,759
2	Fabaceae	690
3	Asteraceae	539
4	Cyperaceae	517
5	Malvaceae	334
6	Rubiaceae	326
7	Euphorbiaceae	322
8	Dicranaceae*	295
9	Lamiaceae	277
10	Moraceae	247

*Dicranaceae is a family under the major plant group Bryophytes, comprised of mosses, liverworts and hornworts.

houses specimens dating from as early as the 1860s collected from overseas or acquired from exchanges with other herbaria. The rise in the number of collections in the 1940s and 1950s (Figure 2) was mostly due to the contributions of Santos and his undergraduate students, during the post-war rehabilitation of the Herbarium. From the 1970s onwards, most of the specimens added to the Herbarium were collected by Leonard Co. A sizeable backlog of specimens has yet to be processed, mounted, and given accession numbers, and this may explain why very few collections have been added from the 2000s up to the present. Jose Vera Santos has the most number of collections in the Herbarium with 2,320 specimens collected (Table 2), followed closely by Leonard Co (2,147). Together, their

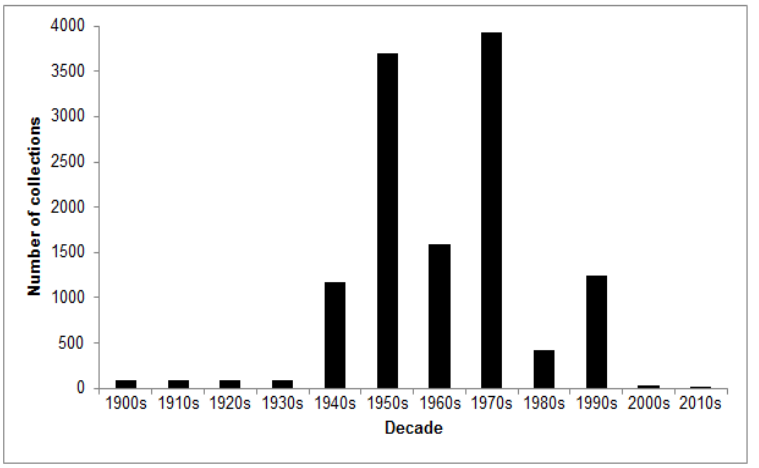

Figure 2. The number of specimens in the Jose Vera Santos Memorial Herbarium collected in the Philippines from the 1900s to present. Note that collections prior to 1940 were mostly destroyed during World War II.

Table2. The top ten collectors based on the number of collections

Rank	Collectors	Number of collections
1	Jose Vera Santos	2,320
2	Leonardo L. Co	2,147
3	R.S. Francia	488
4	A.R. Alvarez Jr.	346
5	D.T. Busemeyer, A. Ipolito & J.F. Barcelona	272
6	Liborio E. Ebalo	209
7	Mary Strong Clemens	206
8	M.Q. Lagrimas	200
9	Juan V. Pancho	195
10	Prescillano M. Zamora	189

collections make up roughly 30.5% of the total number of collections in the Herbarium. Once his unprocessed specimens are added to the Herbarium, Co will likely overtake Santos in the size of collections in the Herbarium.

Based on the number of collections per province, Luzon is the most well-represented island group. Of the 10 provinces listed in Table 3, seven are found in Luzon. Metro Manila tops the list with 2,572 accessions recorded to have been collected from the area. Laguna comes in second with 2,335 specimens, a majority of which are from Mount Makiling and the UP Los Baños campus. In contrast, three provinces in Mindanao are represented by only one specimen (Agusan del Sur, Agusan del Norte, and Surigao del Sur; see Figure 3).

Table 3. The top ten provinces based on the number of collections

Rank	Province	Number of collections
1	Metro Manila	2,572
2	Laguna	2,335
3	Benguet	951
4	Quezon	811
5	Mountain Province	653
6	Palawan	528
7	Rizal	430
8	Oriental Mindoro	305
9	Basilan	279
10	Zambales	264

There are currently 39 type specimens deposited in the PUH; the majority (28) of these are isotypes (Table 4). There is one published holotype and two additional holotypes collected by Zamora that were not published before his death. The earliest type specimen in the Herbarium is an isosyntype of *Aristida culionensis* Pilger ex Perkins (Mez and Pilger 1904) collected by Merrill in 1902, while the most recent is an isotype of *Vacciniumoscarlopezianium* Co (Co and others 2002) collected by Co in 1991 from the Northern Sierra Madre Natural Park in San Mariano, Isabela.

All herbaria will always be biased toward certain geographic regions or taxonomic groups, or both. These biases may be considered as both strengths and limitations of a herbarium. The flora of Luzon is relatively well-represented in the UP Herbarium's collections. Most specimens in the Herbarium are incidental collections, with the exception of groups that were of special interest to contributors, such as grasses (Santos) and ferns (Zamora and some of Co's early collections). The

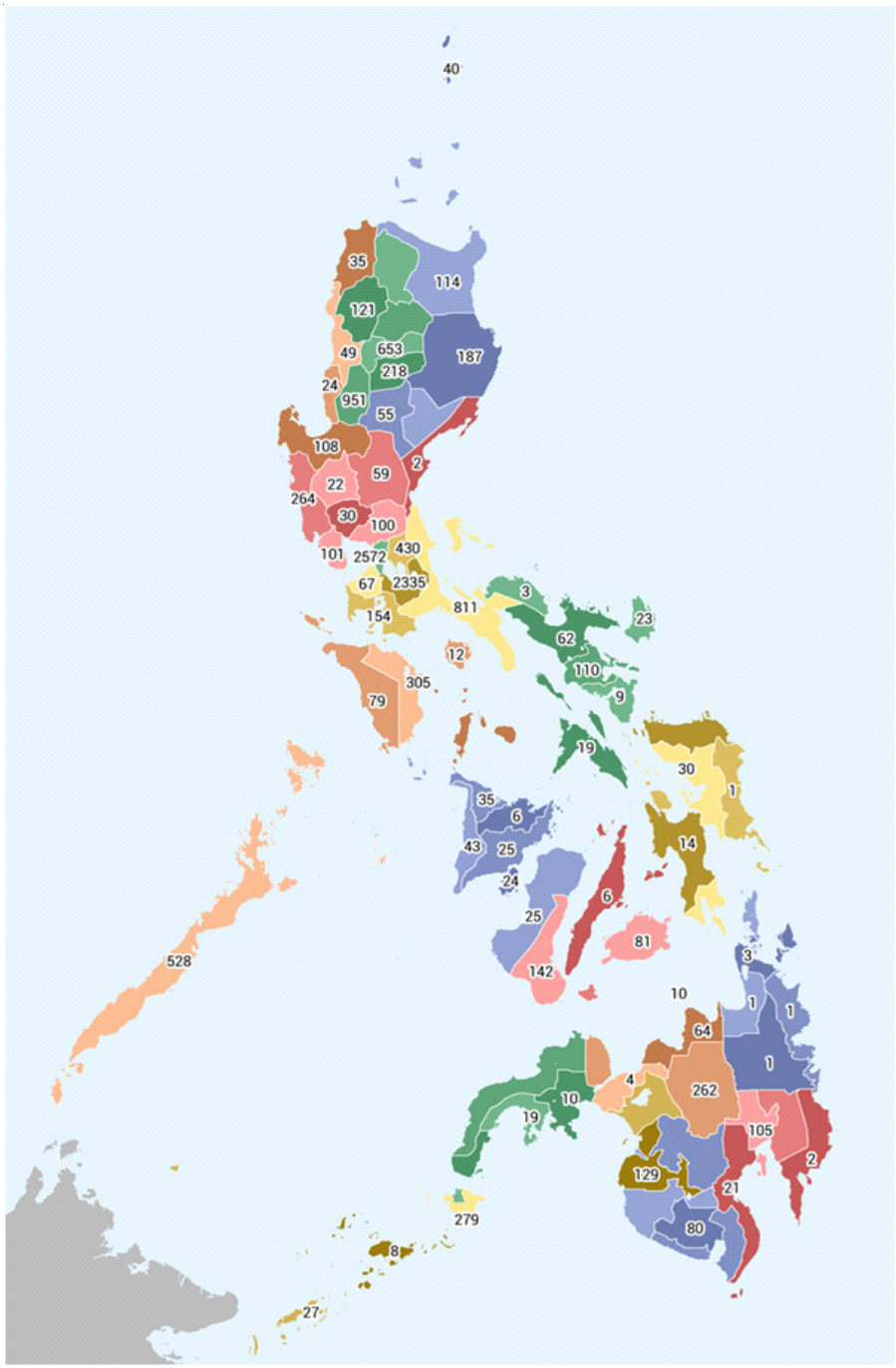

Figure 3. The number of collections per province in the Jose Vera Santos Memorial Herbarium.

Table 4. A list of the type specimens in the Jose Vera Santos Memorial Herbarium

PUH Accession #	Scientific name	Type Category	Publication
11016	*Acrosorusnudicarpus* P.M. Zamora & Co	Isotype	Zamora and Co 1980
9990	*Ancistrachneancylotricha* (Quis et Merr.) St. Blake	Isotype	Quisumbing and Merrill 1928
12297	*Andreaeanivalis var. baileyi* Holz.	Type (undefined type specimen)	Holzinger 1924
10059	*Aristidaculionensis* Pilger ex Perkins	Isosyntype	Mez and Pilger 1904
11017	*Aspleniummantalingahanum* P.M. Zamora & Co	Isotype	Zamora and Co 1980
10111	*Centothecaphilippinensis* (Merr.) Monod de Froideville	Isotype	Monod de Froideville 1971
8780	*Cheilanthesdilimanensis* P.M. Zamora	Holotype	Zamora 1974
10163	*Cheilanthesdilimanensis* P.M. Zamora	Paratype	Zamora 1974
10164	*Cheilanthesdilimanensis* P.M. Zamora	Paratype	Zamora 1974
10112	*Digitariaphilippinensis* Henr.	Isotype	Henrard 1950
10072	*Dimeriaciliata* Merr.	Isotype	Merrill 1928
9988	*Echinochloastagnina* (Retz.) Beaun	Isotype	Quisumbing and Merrill 1928
12315	*Fissidensmanateensis* Grout	Type (undefined type specimen)	Holzinger 1926
12178	*Fissidenspringlei* Cardot	Isotype	Cardot 1909
10099	*Garnotiaacutigluma var. longiaristata* (Santos) Jansen	Isotype	Santos 1950
83	Garnotiamindanaensis Santos	Isotype	Santos 1950
6302	*Garnottialongiaristata var. basilanensis* Santos	Isotype	Santos 1950
9690	*Grammitisalepidota* M.G.Price	Paratype	Price 1973
12317	*Grimmiamoxleyi* R.S. Williams	Type (undefined type specimen)	Williams 1926
5284	*Isachnelutaria* Santos	Isotype	Santos 1943
10136	*Miscanthusfloridulus* (Labill.) Warb. ex K. Schum. & Lauterb.	Isotype	Merrill 1910
9963	*Monostachyacentrolepidioides* Merr.	Isotype	Merrill and Merritt 1910
1842	*Opuntiacharlestonensis* Clokey	Isotype	Clokey 1943
1843	*Opuntiamultigeniculata* Clokey	Isotype	Clokey 1943
14580	*Pandanusleonardocoi* P.M. Zamora	Holotype	Unpublished
14581	*Pandanuspricei* P.M. Zamora	Holotype	Unpublished
3274	*Potentillacryptocaulis* Clokey	Isotype	Clokey 1938
7060	*Premnaodorata* Blanco	Isoneotype	Munir 1984
10366	*Pronephriumbalabacensis* P.M. Zamora & Co	Isotype	Zamora and Co 1980
12680	*Rottboelliaparadoxa* de Koning & Sosef	Isotype	Veldkamp and others 1986
374	*Schefferaheteroclada* Frodin	Isotype	Frodin 1986
309	*Schefferaminutipetiolata* Frodin	Isotype	Frodin 1986
10071	*Schizostachyum lima* (Blanco) Merr.	Isotype	Merrill 1916
10081	*Schizostachyumlumampao* (Blanco) Merr.	Isotype	Merrill 1916
11015	*Sphaerostephanoscartilagidens* P.M. Zamora & Co	Isotype	Zamora and Co 1980
11918	*Taiwanobryumrobustum* Veloira	Isotype	Veloira del Rosario 1959
11931	*Thamnobryumquisumbingii* (Veloira) Z. Iwats. & B.C. Tan	Isotype	Iwatsuki and Tan 1977
11932	*Thamnobryumquisumbingii* (Veloira) Z. Iwats. & B.C. Tan	Paratype	Iwatsuki and Tan 1977
12120	*Trichosteleumaequorum* FL. Ex Dixon	Type (undefined type specimen)	Dixon 1916
10687	*Vacciniumoscarlopezianum* Co	Isotype	Co and others 2002
10863	*Xanthostemonfruticosus* Peter G. Wilson & Co	Isotype	Wilson and Co 1998

Herbarium also has an unofficial policy of not collecting replicates, especially for common, ornamental, or agricultural species.

Another important feature of the Herbarium is that it reflects, in part, the state of floristic research in the country, which appears to have stagnated in the past two decades based on accessioned specimens. A major overhaul of the Herbarium is currently under way. Under new management, led by Curator James V. LaFrankie, an estimated 26,000 specimens (Baja-Lapis and others 2004) are now being processed and accessioned, including some 6,000 specimens collected by Co. The addition of these specimens will allow for further analyses of the Herbarium's collection, and consequently, of how much or how little of the Philippine flora is represented in PUH.

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REFERENCES

APG III. 2009. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. Bot. J. Linn.Soc. 161: 105-121.

Asis CV. 1975. Quisumbing and friend. Nat. Appl. Sci. Bull. 27(1-2): 1-73.

Baja-Lapis AC, Servaz-Audije BN, Linatoc AC. 2004. A compendium of extant botanical collections in the Philippines. Laguna, Philippines: ASEAN Regional Centre for Biodiversity Conservation (ARCBC).

Cardot J. 1909. Revue Bryologique 36: 69.

Clokey IW. 1938. Notes on the flora of the Charleston Mountains, Clark County, Nevada. Bull. S. Calif. Acad. Sci. 37: 4.

Clokey IW. 1943. Notes on the flora of the Charleston Mountains, Clark County, Nevada. Madroño. 7: 67-76.

Co LL, Madulid D, Argent G. 2002. A new species of *Vaccinium* (Ericaceae) from the Philippines Edinb. J. Bot. 59(03): 373-376.

Dixon, H.N. 1916. On a Collection of Bornean Mosses made by the Rev. C.H. Binstead. Bot. J. Linn. Soc. 43: 291-323.

Frodin DG. 1986.Studies in *Schefflera* (Araliaceae) II.Northern Luzon (Philippines) species of the Heptapleurum group. Proc. Acad. Nat. Sci. Philadelphia 138: 403-425.

Holzinger. 1926. Musci Acrocarpi Boreali-Americani et Europai. Fasc. 24:590. Bryol. 29(5): 63-64.

Henrard M. 1950. Monograph of the Genus *Digitaria* 563–565, f. fig. 874

Holzinger JM. 1924. *Andreaea nivalis bailey*i n. var. Bryol. 27(6): 90-92+xi.

Iwatsuki Z, Tan BC. 1977. New names for Philippine mosses. Misc. Bryol. Lichenol. 7: 152.

Merrill ED. 1910. New or noteworthy Philippine plants, VIII. Philipp. J. Sci. C. Bot. 5(3): 170.

Merrill ED. 1914. New or noteworthy Philippine plants, X. Philipp.J.Sci. C. Bot. 9: 262.

Merrill ED. 1916. On the identity of Blanco's species of *Bambusa*.Am.J.Bot. 3(2): 58-64.

Merrill ED, Merritt LM. 1910. The flora of Mount Pulog. Philipp. J. Sci. 5: 287-401.

Mez C, Pilger R. 1904. Gramineae. In: Perkins J, editor. Fragmenta Florae Philippinae: Contributions to the Flora of the Philippine Islands, Vol. 1. Leipzig: Gebrüder Borntraeger. p 137-150.

Monod de Froideville C. 1971. Notes on Malesian Grasses IV. Blumea 19(1): 60.

Munir J. 1984. A taxonomic revision of the genus *Premna* L. (Verbenaceae) in Australia. J. Adel.Bot.Gard. 7(1): 1-91.

Pelser PB, Barcelona JF, Nickrent DL, editors. 2011 onwards. Co's digital flora of the Philippines. www.philippineplants.org

Price, MG. 1973. A new species of *Grammitis* from Mount Banahaw, Luzon. Philipp. Agric. 57(1-2): 34-36.

Quisumbing E, Merrill ED. 1928. New Philippine plants. Philipp. J. Sci. 37: 133-213.

Robbins WJ. 1958. Elmer Drew Merrill 1876-1956: A biographical memoir. Washington, DC: National Academy of Sciences.

Santos JV. 1943. New grasses from the Philippines and South India. J. Wash. Acad. Sci. 33: 135-140.

Santos JV. 1950. A revision of the grass genus *Garnotia*. Nat. App. Sci. Bull. 10: 3-175.

Veldkamp JF, de Koning R, Sosef MSM. 1986. Generic delimitation of *Rottboellia* and related genera (Gramineae). Blumea 31(2): 281-307.

Veloira del Rosario NE. 1959. Two new mosses from the Philippines.The Bryologist 62(2): 104-108.

Wilson PG, Co LL. 1998. *Xanthostemon fruticosus* (Myrtaceae), a new species from the Philippines. Sida 18: 283-286.

Zamora PM. 1974. A new species of *Cheilanthes*. Kalikasan 3: 193-195.

Zamora PM, Co LL. 1980. New species of ferns (Filicopsida) from Palawan, Philippines. Nat. App. Sci. Bull. 32: 43-52.

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