Journal of Nature Studies 17(2): 1-9
Online ISSN: 2244-5226

NEW DISTRIBUTION RECORDS OF ORCHIDS (ORCHIDACEAE) IN SAMAR ISLAND, PHILIPPINES

Zhereeleen D. Meneses[1]*, Pastor L. Malabrigo, Jr.[2], Inocencio E. Buot, Jr. [1], and Crusty E. Tinio[2]

[1]Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Baños, Laguna, Philippines
[2]Forest Biological Sciences, College of Forestry and Natural Resources, University of the Philippines Los Baños, Laguna, Philippines

*Corresponding author: zdmeneses@up.edu.ph

ABSTRACT – Samar Island's climatic and edaphic conditions, geographic location, various habitat types and biogeographic history caters many native and endemic orchid species. However, botanical documentation on orchidaceous species on the island is still deficient. A series of orchid inventories from 2013 to 2016 in different forest types of Samar Island, Philippines revealed 23 new distribution records of orchidaceous species representing 16 genera in the island. The genus *Bulbophyllum* has four newly-recorded species, followed by *Dendrobium* and *Dendrochilum* with three species each, while the rest has one species each. Review of their geographic distribution and conservation status revealed that 17 of these species are endemic to the country and five are highly threatened.

Keywords: distribution, orchids, Philippines, Samar Island

INTRODUCTION

Orchids are among the largest and most diverse group among the flowering plants (Dressler 1993). The orchid flora of the Philippines is estimated to be around 1, 100 species of which 80% are endemic in the country (Cootes 2001). Until now, more species are being discovered and more are still awaiting discovery (Cootes and Boos 2013). But with the continuing destruction of tropical forest areas – a major cause of species loss, as well as the uncontrolled poaching of orchids, many species may never be known to the scientific community and to orchid enthusiasts (Sala et al. 2000, Hietz 1998, 2005).

Samar Island is Philippines' third largest island. Due to the island's extremely rugged terrain, geographic location, climatic and edaphic conditions, and biogeographic history, various habitats and forest formations exist and thus harboring many native and endemic species. Merrill's Enumeration of Philippine Flowering Plants (1923-1926) showed that around 406 endemic species of flowering plants under 200 genera and 65 families were found on Samar Island, making it one of the "centers of botanical diversity" in the country as well as the Malesian region (Madulid 2000). This leads to its declaration as Forest Reserve in 2003 under Presidential Proclamation 2003-442. Its contiguous forest is among the remaining frontiers of tropical lowland forest in the Philippines. It serves as a habitat refuge for both flora and fauna and is so labeled as one of the Key Biodiversity Areas and holds a diverse population of native orchid species which have high horticultural and ecological significance (Southeast Asian Ministers of Education Organization Regional Center for Graduate Study and Research in Agriculture 2004).

To cite this paper: Meneses, Z.D., Malabrigo, P.L.Jr., Buot, I.E.Jr. & Tinio, C.E. 2018. New Distribution Records of Orchids (Orchidaceae) in Samar Island, Philippines. *Journal of Nature Studies*. 17(2), 1-9.

Based on Cootes (2011) and Pelser et al. (2011-onwards), only 67 orchid species were documented for Samar Island. This paper provides a list of newly recorded orchidaceous species for Samar Island, thus updating the number of known orchid species for the island. It also presents their current conservation status with corresponding notes regarding endemicity of these horticulturally important yet highly threatened species to serve as guide in various conservation efforts.

MATERIALS AND METHODS

The Study Area

Field surveys were conducted in Samar Island Natural Park (SINP), Samar Island, Philippines from 2013 to 2016. The island lies between 12˚42'52.85'' and 10˚52'54.58'' latitude and 125˚49'50.19'' and 124˚08'27.84'' longitude within the jurisdiction of Samar Island's three provinces: Northern Samar, Samar and Eastern Samar (see Figure 1). Reconnaissance was done in 17 municipalities, six of which were identified to represent three forest types (*viz* Paranas and Marabut's forest over limestone; Hinabangan, Taft, and San Jose de Buan's lowland evergreen forest; and Balangiga's forest over ultramafic substrate).

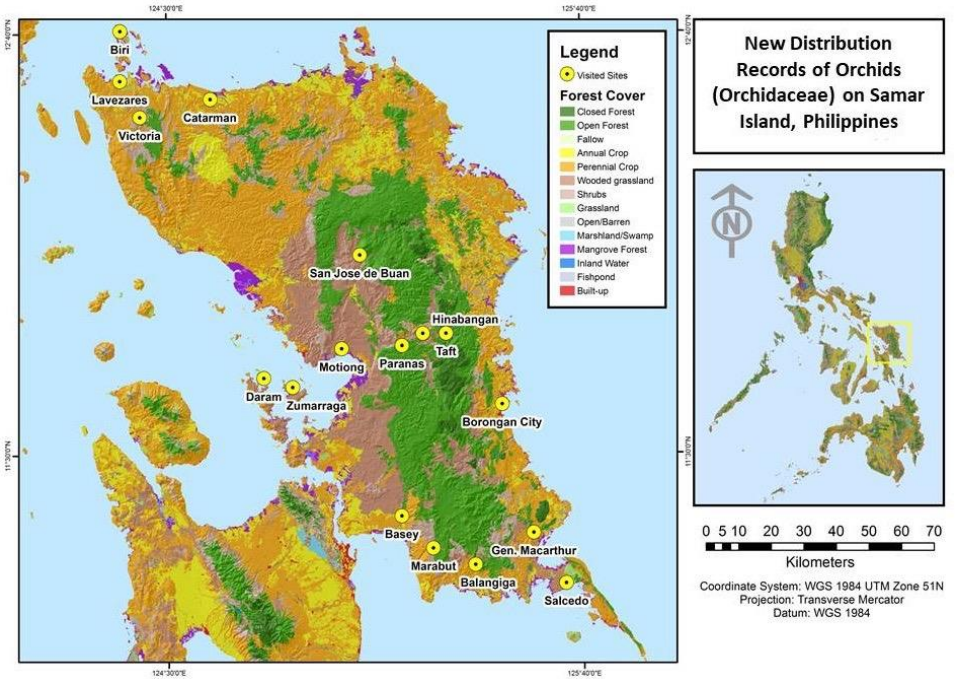

Figure 1. The map of the visited sites in Samar Island, Philippines created from GIS 04/13/2016.

Primary and secondary data collection

Preliminary distribution data of Philippine orchids was based from Cootes (2011) and Pelser et al. (2011-onwards). These works served as the baseline information in the assessment of new distribution

records of orchidaceous species for Samar Island. The compiled data were supplemented with additional field collections in three forest types across the six municipalities of Samar Island. Figure 2 shows some of the surveyed sites within the natural park.

Figure 2. Some of the surveyed sites in Samar Island: (a) Mt. Huraw; (b) San Jose de Buan (c) Hinabanggan and (d) Paranas.

Specimen identification and processing

Processing of herbarium specimens was conducted at the Metallophytes Laboratory of the Department of Forest Biological Sciences, College of Forestry and Natural Resources, University of the Philippine Los Baños. Specimens were identified using various taxonomic literatures, pictorial guides (Cootes 2011, Pelser et al. 2011-onwards), and expert consultations. The nomenclature and classification follows Chase et al. (2015) and were further referenced using The International Plant Name Index (2012). Voucher specimens were deposited at Ecosystem Research and Development Bureau Botanical Laboratory *cum* Herbarium (EBL) following Theirs (2015).

Assessment of conservation status

Conservation status of the newly recorded orchids was referenced using the International Union for Conservation of Nature-compliant Department of Environment and Natural Resources Administrative Order 2017-11 entitled, 'Updated National List of Threatened Philippine Plants and their Categories' and were further check using the International Union for Conservation of Nature red list of threatened species (IUCN 2017).

RESULTS AND DISCUSSION

Twenty-three (23) new distribution records of orchids were accounted for Samar Island, thus updating the currently known number of orchid species in the island 67 to a total of 90 species. Table 1 shows the list of these 23 orchidaceous species while Figure 3 shows some of the orchid species found in the island. These species were found at elevations ranging from 105 to 750 meters above sea level across three notable forest types: lowland evergreen forest, forest over ultramafic substrate, and forest over limestone.

Table 1. List of new distribution records of orchids on Samar Island, Philippines.

No.	Species	Status	Previous records	Locality	Collection No.
1	*Abdominea minimiflora* (Hook.f.) J.J.Sm.	U*	Lu, Bo, Le, Mi	T, P, H	*ZDM* 067
2	***Agrostophyllum loheri*** Ormerod	U*	Lu	Sj	*ZDM* 034
3	***Appendicula leytensis*** Ames	U*	Le	P	*ZDM* 075
4	***Bulbophyllum leytense*** Ames	U*	Le, Mi	M	*ZDM* 022
5	***Bulbophyllum loherianum*** (Kraenzl.) Ames	E^	Lu, Le, Mi	P, M	*ZDM* 049
6	***Bulbophyllum maquilingense*** Ames and Quisumbing	U*	Lu, Si, Mi	P	*ZDM* 121
7	*Bulbophyllum mucronatum ssp. alagense* (Ames) J.J.Verm. & P.O'Byrne	U*	Lu, Mr, Le, Mi	P	*ZDM* 031
8	***Crepidium binabayense*** (Ames) Szlach.	U*	Mr, Pn	Sj, P, H	*ZDM* 021
9	*Cymbidium aliciae* Quisumb.	E^	Lu, Mr, Ne	SJ	*ZDM* 013
10	*Dendrobium microphyton* L.O. Williams	U*	Bo, Mi	P	*ZDM* 124
11	***Dendrobium orbilobulatum*** Fessel & Lückel	U*	Le	P, H, Sj	*ZDM* 036
12	*Dendrobium philippinense* Ames	U*	Lu, Po, Mr, Pn, Le, Mi	P, H, T	*ZDM* 047
13	***Dendrochilum convallariiforme*** Schauer	U*	Lu, Mr, Ms, Mi	P	*ZDM* 079
14	***Dendrochilum tenellum*** (Nees & Meyen) Ames	U*	Lu, Cb, Mr, Le, Bi, Mi	P	*ZDM* 037
15	***Dendrochilum filiforme*** Lindl.	U*	Lu, Ne	P	*ZDM* 009
16	***Grammatophyllum wallisii*** Rchb.f.	Ce^	Lu, Le, Ne, Mi	P, H	*ZDM* 098
17	***Phalaenopsis lueddemanniana*** Rchb.f.	E^	Lu, Po, Pl, Le, Bi, Mi	Sj	*ZDM* 016

Table 1 (Continued). List of new distribution records of orchids on Samar Island, Philippines.

No.	Species	Status	Previous records	Locality	Collection No.
18	***Pinalia polyura*** (Lindl.) Kuntze	U*	Lu, Mr, Pl, Si, Le, Pn, Mi	P	*ZDM* 063
19	***Podochilus intricatus*** Ames	U*	Lu, Mi, Ba, Su	P	*ZDM* 119
20	***Pteroceras philippinense*** (Ames) Garay	U*	Lu, Mr, Le, Mi	P, Sj	*ZDM* 076
21	*Renanthera matutina* (Poir.) Lindl.	U*	Le, Mi	P	*ZDM* 130
22	***Trichoglottis loheriana*** (Kraenzl.) L.O.Williams	E^	Lu	T	*ZDM* 096
23	***Vanilla ovalis*** Blanco	U*	Lu, Mr, Si, Bi, Mi	Sj, P	*ZDM* 038

Conservation status: U = Not yet assessed; Ce = Critically endangered; E = Endangered

^ refers to Philippines' list of threatened species while * refers to IUCN red list

Locality: H = Hinabanggan, M = Marabut, P = Paranas, Sj = San Jose de Buan, T = Taft

Previous island records: Ba = Basilan, Bi = Biliran, Bo = Bohol, Cb = Camiguin de Babuyanes, Le = Leyte, Lu = Luzon, Mi = Mindanao, Mindoro = Mr, Ms = Masbate, Ne = Negros, Pl = Palawan, Pn = Panay, Po = Polillo, Si = Sibuyan, Su = Sulu

Seventeen (17) of these newly recorded species are endemic to the Philippines. All of the newly recorded orchids have not yet been assessed under the International Union for Conservation of red list of threatened species (2017). However, based on DENR DAO 2017-11, five species are listed under the Philippines' list of threatened species. *Grammatophyllum wallisii* Rchb.f. is classified as critically endangered while *Bulbophyllum loherianum* (Kraenzl.) Ames, *Cymbidium aliciae* Quisumb., *Phalaenopsis lueddemanniana* Rchb. *f.* and *Trichoglottis loheriana* (Kraenzl.) L.O.Williams were classified as endangered.

Among the 23 newly recorded orchids in Samar Island, *Pinalia polyura* (Lindl.) Kuntze is the most widely occurring species in the Philippines archipelago which is found in a total of eight islands, followed by *Dendrochillum tenellum* (Nees & Meyen) Ames and *Phalaenopsis lueddemanniana* which is now known in seven islands. Likewise, several wide-ranging orchids which were then known from the islands that comprise PAICs of Greater Luzon, Greater Mindanao, and Greater Negros-Panay are unsurprisingly also found in Samar Island such as *Dencrochillum convallariiforme* Schauer and *G. wallisii* due to their perceived eurytopic tendencies.

When the concept of Pleistocence Aggregated Island Complexes (Heaney 1986, Brown and Diesmos 2009) is taken into account, these new records of orchids in the island could be biogeographically ellucidated. Four species is now known in just two islands; *Agrostophyllum loheri* Ormerod and *Trichoglottis loheriana* were shared with Luzon Island; while *Appendicula leytensis* Ames and *Dendrobium orbilobulatum* Fessel & Lückel were then considered Leyte Island-endemics. Meanwhile, the eastern Philippines' biogeographic disjunction of 12 orchid species is herewith resolved since they were then recorded in the Greater Luzon and Greater Mindanao PAICs. These species which crossed the two PAICs via Samar Island include *Bulbophyllum mucronatum* ssp. *alagense* (Ames) J.J. Verm. & P.O'Byrne, *Podochillus intricatus* Ames, *Pteroceras philippinense* (Ames) Garay, *Abdominea minimiflora* (Hook.f.) J.J.Sm., and *Vanilla ovalis* Blanco, among others.

Figure 3. Some of the orchids found in Samar Island: (a) *D. microphyton* L.O. Williams, (b) *D. filiforme* Lindl. (c) *G. wallisii* Rchb.f.and (d) *T. loheriana* (Kraenzl.) L.O.Williams.

It is noteworthy that three orchids which were then recorded across the Greater Mindanao PAIC attained their northernmost distribution in Samar Island. This biogeographic pattern is exemplified by *Bulbophyllum leytense* Ames, *Renanthera matutina* (Poir.) Lindl., and *Dendrobium microphyton* L.O. Williams which were all then known in Mindanao Island, Leyte (former two species) and Bohol (latter species).

In contrast, several orchids reached their easternmost habitat range in Samar Island. This includes orchids which are formerly recorded from the Pleistocence Aggregated Island Complexes of Greater Luzon and Greater Panay such as *Cymbidium aliciae* and *Dendrochilum filiforme* Lindl. This pattern likewise applies to those orchids then found in Mindoro Island, namely *Crepidium binabayense* (Ames) Szlach. (also found in Greater Panay) and *Dendrobium philippinense* Ames (also recorded in Greater Luzon).

The presence of these species in Samar Island could be explained by contraction and expansion of the Pleistocene aggregated island complexes (Heaney 1986, Brown and Diesmos 2009). In general, climatic fluctuations that occurred in Southeast Asia during the Tertiary and Quaternary influenced the Philippines' flora and fauna (Morley and Flenley 1987; Hall 2001 and 2002) through alterations in sea levels, in the degree of seasonality in precipitation and in the variations of temperature.

Species from Mindoro may have reached mainland Luzon through Zambales and vice versa when the Mindoro microplate was linked to Zambales for a short period of time. Meanwhile species originating from Samar and Mindanao may have reached mainland Luzon through land bridges in the Bicol peninsula (Vallejo 2011; Heads 2003).

If the distribution of these species is expanding, it could be theorized that a contiguous forest once enabled the spread of species through land bridges. Therefore, the absence of the species in nearby provinces and islands could just be a remnant of under-collection and thus, may still be discovered in similar studies. On the other hand, if the orchid species distribution is contracting, it could be theorized that during warming and sea level rise, land bridges disappear and orchid populations remained in their areas of establishment. However, with land use changes and habitat fragmentation, orchid niches contract thereby restricting their distribution (Sexton et al. 2009).

Despite the rich orchid diversity and high endemicity, anthropogenic pressures such as orchid poaching, illegal timber extraction, and land use conversion continuously threaten orchid diversity (Sala et al. 2000). This plant group is likely experiencing genetic erosion in its wild populations due to unfavorable landscape changes, orchid collection and other related anthropogenic activities. Therefore, the updated list of orchids in Samar Island can be used as baseline information for future proper conservation programs and for the sustainable use of native, endemic and rare orchidaceous species.

CONCLUSION

There are 23 species of orchids that are recorded for the first time on Samar Island, of which 17 species are endemic to the Philippines. Based on the country's list of threatened species, five species are considered endangered while on the international level, all of these species are not yet assessed with regards to their conservation statuses. Their recorded intra-Philippine distribution could be partially explained by the concept of PAICs or could be just remnants of scientific under-collection. The continuing anthropogenic pressures to the island's forests threaten the habitats of these orchid species and thus this updated list could be used as baseline information for the future conservation initiatives.

ACKNOWLEDGEMENT

The authors wish to thank The Rufford Foundation and the Department of Science and Technology for providing financial support for the conduct of the study and the Protected Area Management Board Region 8 for providing access and permit for fieldworks. Also, to JT Adorador, D Montellana, T Rambacod and D Miralles for the assistance and companionship throughout the conduct of the research.

STATEMENT OF AUTHORSHIP

The first author consolidated the list of orchids of Samar Island, conducted the series of field surveys in the island, proposed and acquired funding from DOST and The Rufford Foundation to conduct the research and initiated the writing of the manuscript. The second, third and fourth authors reviewed the project proposal prior to submission to the funding agencies, involved in writing and elaboration of the results and discussions of the study, identified some issues and reviewed the paper.

REFERENCES

Brown R. and Diesmos A.C. 2009. Philippines, biology. In Gillespie, R.G. and D.A. Clague (eds.). Encyclopedia of Islands: 723--732 University of Califonia Press.

Chase M.W., Cameron K.M., Freudenstein J.V., Pridgeon A.M., Salazar G., Van Den Berg C., and Schuiteman A. 2015. An Updated Classification of Orchidaceae. Botanical Journal of the Linnean Society 177: 151—174.

Cootes J.E. 2001. A Selection of Orchid Species from the Philippines. Timber Press, Incorporated.

Cootes J.E. 2011. Philippine Native Orchid Species. Katha Publishing Co., Inc. Philippines: 288

Cootes J.E and Boos R. 2013. A new *Dendrochilum* species (Orchidaceae) from the island of Samar, Philippines. Orchideen Journal Vol. 1(1): 3-5.

Dressler R.L. 1993. Phylogeny and Classification of the Orchid Family. Cambridge University Press, Cambridge.

Fernando E.S., Suh S.H., Lee J., and Lee D.K. 2008. Forest formations of the Philippines. ASEAN-Korea Environmental Cooperation Unit.

Hall R. 2001. Cenozoic reconstruction of SE Asia and the SW Pacific; changing patterns of land and sea. In Metacalfe I., Smith J.M.B., Morwood M., and Davidson I.D. (eds.), Faunal and floral migrations and evolution in SE Asia – Australia: 35-56. AA Balkema (Swets & Zeitlinger Publishers), Lisse.

Hall R. 2002. Cenozoic geological and plate tectonic evolution of SE Asia and the S Pacific: computer-based reconstructions, model and animations. Journal of Asian Earth Sciences 20: 353-431.

Heads M.J. 2003. Ericaceae in Malesia. Telopea 10(1): 311-449.

Heaney L.R. 1986. Biogeography of mammals in SE Asia - Estimates of rates of colonization, extinction, and speciation. Biological Journal of the Linnean Society 28: 127-165.

Hietz P. 1998. Diversity and conservation of epiphytes in a changing environment. Pure Applied Chemistry 70: 2114.

Hietz P. 2005. Conservation of vascular epiphyte diversity in Mexican coffee plantations. Conservation Biology 19: 391-399.

IUCN 2017. The IUCN red list of threatened species. Version 2017-3. <http://www.iucnredlist.org>. Last accessed on 23 December 2017.

Madulid D. 2000. A review and assessment of the floristic knowledge of Samar Island. Department of Environment and Natural Resources, Philippines.

Merrill E.D. 1923-1925. An enumeration of Philippine flowering plants Volume 1-3. Bureau of Printing Manila, Philippines.

Morley R.J. and Flenley J.R. 1987. Late Cainozoic vegetational and environmental changes in the Malay archipelago. In: Whitmore T.C. (ed), Biogeographical evolution of the Malay archipelago: 5-59. Oxford Manographs on Biogeography.

Pelser P.B., Barcelona J.F., and Nickrent D.L. (eds.). 2011-onwards. Co's Digital Flora of the Philippines. http://www.philippineplants.org. Last accessed April 2018.

Sala O.E., Chapin F.S., Armesto J.J., Berlow E., Bloomfield J., Dirzo R., Huber-Sanwald E., Huenneke L.F., Jackson R.B., Kinzig A., Leemans R., Lodge D.M., Mooney H.A., Oesterheld M., Poff N.L., Sykes M.T., Walker B.H., Walker M., and Wall D.H. 2000. Global biodiversity scenarios for the year 2100. Science 287: 1770-1774.

Southeast Asian Ministers of Education Organization Regional Center for Graduate Study and Research in Agriculture. 2004. Biological resources assessment. Samar Island Natural Park. Philippines. Final Report. Unite Nations Development Programme.

Sexton J.P., Mclntyre P.J., Angert A.L., and Rice K.J. 2009. Evolution and ecology of species range limits. Annual Review of Ecology, Evolution, and Systematics Vol. 40: 415-436.

The International Plant Names Index. 2012. Published on the Internet http://www.ipni.org. last accessed December 28, 2017.

Theirs, B. 2015. Index Herbariorum: A global directory of public herbarium and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/science/ih/. Last accessed December 2017.

Vallejo B. 2011. The Philippines in Wallacea. In: Telnov D. (ed). Biodiversity, Biogeography and Nature Conservation in Wallacea and New Guinea, Vol. I: 27-42.

JOURNAL OF NATURE STUDIES
(formerly Nature's Bulletin)
Online ISSN: 2244-5226