

The Gregorio T. Velasquez Phycological Herbarium (MSI): A Legacy and National Heritage

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We present here the history and contents of one of the most important herbaria in the Philippines – the Gregorio T. Velasquez Phycological Herbarium of the Marine Science Institute (MSI) at the University of the Philippines (UP) Diliman. The MSI herbarium was established in the early 1970s by Dr. Gavino C. Trono Jr. and was named in honor of his mentor Dr. Gregorio T. Velasquez, the “Father of Philippine Phycology.” Collections in the MSI herbarium are primarily made by Filipino phycologists within the coasts and offshore islands and reefs of the Philippines. The MSI herbarium currently holds ~55,000 algal and seagrass specimens collected from various areas in the country and abroad. As the largest repository of marine plants in the Philippines and the ASEAN (Association of Southeast Asian Nations) region, we consider the MSI herbarium as both a legacy and national heritage that we owe to the pillars of Philippine phycology – Dr. Gavino C. Trono Jr. and the late Dr. Gregorio T. Velasquez.

Keywords: algae, biodiversity, herbarium, Philippines seagrass, seaweeds, tropical seaweeds

INTRODUCTION

The Philippines, with a total of 1,065 taxa of benthic marine macroalgae (more commonly known as seaweeds), has among the most diverse flora within the tropical western Pacific (Lastimoso and Santiañez 2021). This account – and the incessant increase in our knowledge and understanding of the diversity, distribution, and molecular phylogenetic relationships of Philippine seaweeds – have been primarily based on centuries of dedicated collection and documentation efforts of both foreign and Filipino phycologists, which began as early as 1837 [refer to Ganzon-Fortes (2012) for historical details]. Before the establishment of the current herbaria, the collection of the described local algal species may have been nonextant, deposited in herbaria elsewhere, or destroyed. During World War II, among those burned down were buildings

that housed the massive algal collection of the Bureau of Science in Manila. These collections were done for research and herbarium purposes influenced by foremost American botanists – the late Elmer D. Merrill (1912–1923) and later by H.H. Bartlett (1935–1936, 1940–1941), both professors and lecturers in the Department of Botany of UP at that time. After the war, it was through the pioneering efforts of their student – the late Dr. Gregorio T. Velasquez, Professor Emeritus of Botany at UP – that extensive collection and archiving of Philippine algae, both marine and freshwater, were revived. His monograph, the “Blue-green Algae of the Philippines” (Velasquez 1962), is the most comprehensive and the best reference on this group. His zealous interest, enthusiasm, and dedication to his craft have a profound influence on his students, colleagues, friends, and even acquaintances. He was the “leader and catalyst” in all aspects of the study on Philippine phycology, earning him the title “Father of

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Philippine Phycology,” not formally or officially given but as a fitting tribute for his significant contribution to this field of science in the country (Silva *et al.* 1987). His former student – Dr. Gavino C. Trono Jr., now Professor Emeritus of the UP Marine Science Institute – continues the legacy of Dr. Velasquez by establishing a marine plant herbarium named in his honor: the Gregorio T. Velasquez Phycological Herbarium. Dr. Trono believes that these resources are our natural heritage that should be safeguarded as a race against time before they disappear due to man’s destruction of the habitat, overexploitation of the resource, and pollution. The herbarium houses materials of benthic marine macroalgae, including the freshwater algal collection of Dr. Velasquez – as well as the seagrass collection of Dr. Miguel D. Fortes, his former student and colleague.

To date, the G.T. Velasquez Phycological Herbarium holds the largest collection of these marine plants and has become a major reference on these groups not only in the country but the rest of the ASEAN region. It houses over 55,000 dried mounted specimens of over 2,000 algal species and 18 seagrass species collected from 70 countries. Less than 5% of the collection are foreign materials acquired through specimen exchange (Trono 2000). The G.T. Velasquez Phycological Herbarium is registered in the *Index Herbariorum* of the New York Botanical Garden with herbarium code MSI in 2011.

History and Documentation of the Herbarium

It was through the efforts of Dr. Gavino C. Trono Jr. that this marine plant herbarium was established in the early 1970s. It was with the understanding that the herbarium, being part of the institute, will have continued support. An in-house personnel (Mrs. Corazon R. Dayrit) was provided, as well as seed money for supplies and materials for herbarium maintenance. The late Dr. Gregorio T. Velasquez, Professor Emeritus of the UP Department of Botany, donated all his algal collections (mostly blue-green algae) to the herbarium. It was for his inspiration and generous contribution that the herbarium was named in his honor. The seagrass collection of Dr. Miguel D. Fortes was later added to the herbarium. The collection grew as more specimens were collected by Dr. Trono, his students, and other local contributions, and through herbaria exchanges with foreign institutions. In early-1982, Edna T. Ganzon-Fortes succeeded Ms. Dayrit as Research Associate of the herbarium. In 1987, after receiving funds from the IDRC (International Development Research Centre of Canada), she established the SICEN (Seaweed Information Center) of the institute and underwent intensive on-the-job training on the use of computer for floristic documentation using Inmagic and D-base III plus under the staff of BIOTROP (Bogor, Indonesia) and *Herbarium Bogoriense* (Faculty of

Fishery, Bogor Agricultural University) (Fortes 1990). Dr. Ganzon-Fortes took charge and managed the herbarium until her retirement in December 2017. Curatorship of the herbarium was handed over to Dr. Wilfred John E. Santiañez in 2018.

At present, important collections housed at the MSI herbarium includes the personal collections of the late Dr. Velasquez and Dr. Trono and their students, the collections of the Institute made during the Pacific Seaboard Research and Development Program (2001–2003), and the several research expeditions in the Kalayaan (Spratlys) Island Group (KIG; 1997–present).

Herbarium databases. The herbarium has separate databases for macroalgae and seagrasses. Updating and editing of these are not currently done due to a lack of trained technical personnel. Editing work involves the tedious work of determining the correctness of information inputted in each record in the database – including updating information (*e.g.* changes in the scientific name), determining missing or duplicate records, followed by a careful perusal of duplicate records accompanied by verifying the actual herbarium material. Corrections are then made in the computer database as well as in the herbarium logbook. The herbarium database has a structure that facilitates easy access and retrieval of information pertaining to seaweed and/or seagrass species that are present in the collection, where (locality) and when (date of collection) these were collected, their scientific names, common names, economic importance/potential, name of collector/s, taxonomic classification, and main taxonomic references, among others.

The macroalgae database currently contains about 28,000 computer-encoded entries, of which 88% are Philippine records. The floristic composition of the herbarium is dominated by the red macroalgae (Rhodophyta) with 46%, followed by the green (Chlorophyta) and brown (Ochrophyta) macroalgae with 20 and 18%, respectively (Figure 1). The blue-green algae (Cyanobacteria) comprise 9%, while the other minor groups form 7%.

The seagrasses are represented by 18 species archived in a total of about 500 dried voucher specimens mounted in white vellum paper.

Herbarium facilities. At present, the herbarium collections are housed in two 5 m × 8 m rooms. Both rooms are airconditioned with fixed working counters and a small sink. Only one room has an exhaust fan and two units of built-in hanging cabinets. There are two types of herbarium cabinets: 1) the typical one has a dimension of 1.2 m × 1.2 m with 18 shelves, which store dried exsiccatae specimens mounted in white vellum papers (there are 28 units of these); 2) the other herbarium cabinet (eight units) has the same dimension as the first, but the

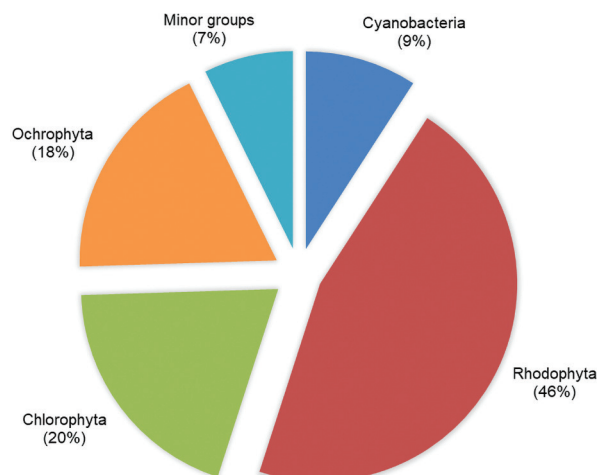


Figure 1. Summary of collections in the G.T. Velasquez Phycological Herbarium (MSI).

shelves are replaced by drawers which accommodate the small boxes for storing crustose coralline algae and other bulky seaweed samples. These collections will soon be transferred to and stored in mobile compactors in the new 8 × 14 m herbarium room, which will be part of the Marine Biodiversity Resources Information Center of the UP Marine Science Institute.

Compound and stereomicroscopes are available for detailed examination of specimens.

Herbarium organization. The dried mounted specimens on white vellum paper are arranged by genus and are placed inside large thick brown folders (genus cover). Within each genus folder, the materials are arranged by species, then by their collection province if in large numbers, and placed in a thin brown folder or Kraft paper (species cover). Folders containing genera or species of large numbers of mounted specimens may contain only single species. Each container folder is labeled accordingly (with the name of the genus, or the name of

species). Black ink is used to label local materials and red ink for foreign materials.

The herbarium cabinets are arranged alphabetically by genus and are labeled as such. Collections that are not yet identified or verified are placed in separate cabinets. Once the identification is verified, these are placed in their respective cabinets with the alphabetized arrangement of the genera and species. As noted by Kitayama *et al.* (2000), the decision of the MSI herbarium management to arrange the collections alphabetically was primarily for practicality. Unlike other algal herbaria that arranged their collections based on major seaweed groups first (*i.e.* by phylum: Chlorophyta, Ochrophyta, and Rhodophyta) and then alphabetically, the current arrangement scheme of the MSI herbarium facilitates easier specimen access to users as they can readily locate and correctly put them in place even without prior knowledge on algal classification. This arrangement scheme also proved to be more effective in terms of maximizing the limited space to house massive collections of the herbarium.

Significance and Services of the Herbarium

The herbarium not only showcases the collection of Philippine seaweeds and seagrasses to visiting foreign and local visitors but also serves as a repository for type specimens (Table 1) and voucher specimens published in the literature. It also services the needs of individuals doing in-depth taxonomic and biodiversity studies. To visit or gain access to the MSI herbarium and its collections, interested individuals are encouraged to contact and secure a permit from the Director of the Institute through the MSI Herbarium Collections Manager (for convenience, requests can be made in writing *via* email and sent to msiadmin@msi.upd.edu.ph and/or herbarium@msi.upd.edu.ph). It should be noted though that access and use of visitors and researchers of the herbarium, its collections, and facilities are subjected to the MSI Collections Access Regulations.

Table 1. List of type specimens deposited in the G.T. Velasquez Phycological Herbarium (MSI).

Phylum	Taxon	Specimen	Type locality and publication
Chlorophyta	<i>Caulerpa lentillifera</i> var. <i>compacta</i> Trono & Ang 1982	MSI8634	Type locality: Bugsuk, Palawan, Philippines (Trono and Ang 1982: 7)
Rhodophyta	<i>Chondrophycus tranoi</i> (Ganzon-Fortes) K.W. Nam 1999 (= <i>Laurencia tranoi</i> Ganzon-Fortes 1983)	MSI13372	Type locality: North of Pulong Bakaw, Calatagan, Batangas, Philippines (Ganzon-Fortes 1983: 404)
	<i>Eucheuma denticulatum</i> var. <i>endong</i> Trono & Ganzon-Fortes 2012	MSI22475	Type locality: Dancalan, Sorsogon, Philippines (Ganzon-Fortes <i>et al.</i> 2012: 1110)
	<i>Gracilaria manilaensis</i> Yamamoto & Trono 1994	MSI2243.1	Type locality: Hali Beach, Paranaque, Manila Bay, Philippines (Yamamoto and Trono 1994: 96).
	<i>Gracilaria sullivanii</i> Yamamoto & Trono 1994	MSI18986	Type locality: Matabungkay, Batangas, Luzon Island, Philippines (Yamamoto and Trono 1994: 99)

Phylum	Taxon	Specimen	Type locality and publication
Ochrophyta	<i>Hydroclathrus minutus</i> Santiañez & Kogame 2018	MSI29248 (=SAP115290)	Type locality: Senaga, Naha, Okinawa, Japan (Santiañez <i>et al.</i> 2018: 67)
	<i>Sargassum abbotiae</i> Trono 1994	MSI14853	Type locality: Pulong Bakaw, Calatagan, Batangas, Philippines (Trono 1994: 5)
	<i>Sargassum angii</i> L.M. Liao in Modelo <i>et al.</i> 1998 (= <i>Sargassum yamadae</i> Trono 1994, nom. illeg.)	MSI237	Type locality: Barrio Pangil, Currimao, Ilocos Norte, Philippines (Trono 1994: 4)
	<i>Sargassum balingasayense</i> Trono 1994	MSI18502	Type locality: Barrio Balingasay, Bolinao, Pangasinan, Philippines (Trono 1994: 5)
	<i>Sargassum bataanense</i> Trono 1994	MSI12195	Type locality: Pulong Bato, Orion, Bataan, Philippines (Trono 1994: 6)
	<i>Sargassum currimaoense</i> Trono 1994	MSI18504	Type locality: Pangil, Currimao, Ilocos Norte, Philippines (Trono 1994: 6)
	<i>Sargassum dotyi</i> Trono 1994	MSI6613	Type locality: Honduras, Puerto Galera, Oriental Mindoro, Philippines (Trono 1994: 3)
	<i>Sargassum ohnoi</i> Trono 1994	MSI12156	Type locality: Big Balatero, Puerto Galera, Oriental Mindoro, Philippines (Trono 1994: 7)
	<i>Sargassum samarense</i> Trono 1994	MSI18501	Type locality: Borongan, Eastern Samar, Philippines (Trono 1994: 4)
	<i>Sargassum sullivanii</i> Trono 1994	MSI18503	Type locality: Palawig, Zambales, Philippines (Trono 1994: 6)
	<i>Sargassum umezakii</i> Trono 1994	MSI12209	Type locality: Medio Island, Puerto Galera, Oriental Mindoro, Philippines (Trono 1994: 7)
	<i>Sargassum velasquezii</i> Trono 1994	MSI12087	Type locality: San Isidro, Puerto Galera, Oriental Mindoro, Philippines (Trono 1994: 4)
	<i>Sargassum yoshidae</i> Trono 1994	MSI12198	Type locality: Cabugao Bay, Virac, Catanduanes, Philippines (Trono 1994: 5)
	<i>Tronoella ryukyuana</i> Santiañez & Kogame 2018	MSI29249 (=SAP115297)	Type locality: Odo, Itoman, Okinawa, Japan (Santiañez <i>et al.</i> 2018: 67)

Below is a list of published literature citing the G.T. Velasquez Phycological Herbarium (MSI) as a repository of specimens or as a source of information for in-depth taxonomic and biodiversity studies (incomplete) (Table 2).

Plans and Prospects for the Herbarium

Collections in the MSI herbarium continue to be predominantly from mainland Luzon and the Visayas, with some collections in Mindanao – particularly in Zamboanga, Sulu, and Tawi-Tawi (Trono 2000). Presently, collections from the coastal areas in southern Mindanao and the Pacific seaboard of the country remained limited, although the latest collections on the latter have been monographed recently by Trono (2017, 2018). Future collection efforts will be directed to other areas in the country, including the isolated islands and reef features in the open sea such as those in the KIG and the Philippine Rise, as well as in the deep and mesophotic reef areas. However, we do recognize that the major constraints in collection efforts such as lack of funds for (marine) biodiversity and taxonomic works previously highlighted by Trono (2000) are still prevailing. Similarly, most of

the collection efforts in the past decades were made in fieldwork associated with funded applied phycological research (Trono 2000). Although, we do note that in the last several years, marine biodiversity research – especially in the KIG and Philippine Rise – has received considerable funding and we anticipate that commitment and financial support for such efforts from the government and even private institutions will continue within the next decade.

Moreover, continued updating – including reviewing the identifications made on many herbarium materials by conducting thorough taxonomic studies [as encouraged earlier by Trono (2000)] – and digitizing of collections records, are in the pipeline. Along with the digitizing efforts, we also intend to make scans of the specimens in our collections, with hopes of making this invaluable information available to the public through an open-access database. Additionally, we anticipate collaborating with other local herbaria in the country – especially those with algal collections (Table 3) – to encourage them to digitize and make their collections readily accessible online.

Table 2. List of some important publications acknowledging the role of the G.T. Velasquez Phycological Herbarium (MSI) since its inception.

Year of publication	Literature	Taxa
1970–1980	Vannajan and Trono (1977)	Cyanophyta, Chlorophyta
	Saraya and Trono (1979)	Cyanophyta, Chlorophyta, Ochrophyta (=Phaeophyta)
	Trono and Azanza-Corrales (1980)	Rhodophyta
1981–1990	Trono and Ang (1982)	Chlorophyta, Ochrophyta, Rhodophyta
	Ganzon-Fortes (1983)	Rhodophyta
	Trono <i>et al.</i> (1983)	Rhodophyta
1991–2000	Trono (1992)	Ochrophyta
	Trono (1994)	Ochrophyta
	Yamamoto and Trono (1994)	Rhodophyta
	Trono (1999)	Chlorophyta, Ochrophyta, Rhodophyta
2001–2010	de Senerpont Domis <i>et al.</i> (2003)	Chlorophyta
	Ganzon-Fortes <i>et al.</i> (2006)	Rhodophyta
2011–Present	Ganzon-Fortes (2012)	Chlorophyta, Ochrophyta, Rhodophyta
	Ganzon-Fortes <i>et al.</i> (2012)	Rhodophyta
	Santiañez <i>et al.</i> (2015)	Chlorophyta, Ochrophyta, Rhodophyta
	Santiañez <i>et al.</i> (2018)	Ochrophyta
	Santiañez and West (2019)	Ochrophyta
	Dumilag <i>et al.</i> (2020)	Chlorophyta
	Lastimoso and Santiañez (2021)	Chlorophyta, Ochrophyta, Rhodophyta

Table 3. List of herbaria, their official codes, and location in the Philippines that house benthic marine macroalgae collections.

Herbarium code ¹	Herbarium name and location
BATSTATEU	VIP CORALS Marine Repository Hub, Verde Island Passage Center for Oceanographic Research and Aquatic Life Sciences (VIP CORALS), Batangas-Tabangao-Lobo Road, Barangay Masaguitsit, Lobo, Batangas
CAHUP	Museum of Natural History, UP, CFNR Quadrangle, UP Los Baños, College, Los Baños, Laguna
CEBU	University of San Carlos Herbarium, Biology Department University of San Carlos, Cebu City, Cebu
DLSUH	De La Salle University Herbarium, Biology Department, De La Salle University, 2401 Taft Avenue, P.O. Box 3819, Manila
FEUH	Far Eastern University Herbarium, Biological Sciences, Institute of Arts and Sciences, Far Eastern University, SB 509, Nicanor Reyes Sr. Street, Sampaloc, Manila
MSI	G.T. Velasquez Phycological Herbarium, College of Science, The Marine Science Institute, UP, Diliman, Quezon City
MSU	Mindanao State University Herbarium, Institute of Oceanography and Environmental Science, Mindanao State University, Tawi-Tawi College of Technology and Oceanography, Marine Science Museum, Sanga-Sanga, Bongao, Tawi-Tawi
NLUH	UP Baguio Herbarium, Division of Natural Sciences and Mathematics, UP Baguio, Governor Pack Road, Baguio City
PNH	Philippine National Herbarium, National Museum, P.O. Box 2659, Manila
PPC	Palawan State University Herbarium, Biodiversity Center for Research and Conservation, Palawan State University, Puerto Princesa City, Palawan
PUH	Jose Vera Santos Memorial Herbarium, Institute of Biology, College of Science, UP, Diliman, Quezon City
USTH	University of Santo Tomas Herbarium, 3 rd Floor, Research Center for the Natural and Applied Sciences, Thomas Aquinas Research Center, España, Manila

¹Based on Thiers (2021).

CONCLUSION

The Gregorio T. Velasquez Phycological Herbarium (MSI), being the largest phycological herbarium in the tropical western Pacific, is considered a legacy and national heritage that we owe to our two National Scientists – the two pillars of marine phycology in the Philippines: Dr. Gavino C. Trono Jr. and the late Dr. Gregorio T. Velasquez. Being the main repository of the reference collections of benthic marine macroalgae of the Philippines, the MSI Herbarium is a treasure trove of marine biodiversity resources that we must continue to foster. Towards that end, and similar to those advocated by Lastimoso and Santiañez (2021), we believe that stronger institutional (including provisions of technical manpower), financial, and infrastructural support should be provided for the MSI herbarium – and by extension, other local herbaria and museums – for it to reach its full potential, especially in serving both science and society.

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