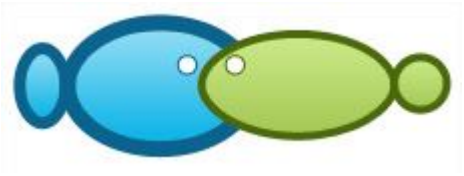

The marine macroalgal flora of the Romblon Island Group (RIG), Central Philippines

[1,3]Ken Joseph E. Clemente, [1,2]Susana F. Baldia, [1]Paciente A. Cordero Jr.

[1] The Graduate School, University of Santo Tomas, España Blvd, Manila 1015, Philippines; [2] Research Center for Natural and Applied Sciences, University of Santo Tomas, España Blvd, Manila 1015, Philippines; [3] Senior High School, University of Santo Tomas, España Blvd, Manila 1015, Philippines. Corresponding author: K. J. E. Clemente, keclemente@ust.edu.ph

Abstract. Marine macroalgae or seaweeds are considered as ecologically and biologically important component of marine ecosystems. Diversity studies on these organisms became mainstream in Philippine phycology for the past decades. However, a comprehensively accounted seaweed floristic data for most of the Philippine islands, including the Romblon Island Group (RIG) in the central Philippines, has remained to be largely unexplored. This study, delving with the identification and classification of the marine macroalgal species of RIG, including their local distribution and seasonal occurrence, is designed to address the anemic biodiversity issue. Sample collections were conducted from a total of twenty (20) intertidal sites in the major islands of RIG, namely Romblon Island, Sibuyan Island, and Tablas Island. Specimens were sorted out in the laboratory and herbarium preparation was done. Samples were identified to the lowest taxonomic level possible (usually species) based primarily on morphological and anatomical features. A dendrogram was made using cluster analysis based on Jaccard index to infer similarities between sites. A total of 129 macroalgal taxa were herein reported, encompassing 48 Chlorophyceae, 56 Rhodophyceae, and 25 Phaeophyceae. The clustering together of floristic components may be due to the similarities of substratum types and other dominant environmental conditions while distinct separation between macroalgal floristic composition of areas within RIG may be attributed primarily to the differing and dynamic ocean current patterns in the area. This floristic study provides a comprehensive checklist totaling 129 macroalgal taxa in RIG and is deemed to be a significant addition to the seaweed flora of Central Philippines. Since this study is the first detailed seaweed account in the area, it likewise filled the gap in the phycological diversity and distribution map of the Philippines.
Key Words: biodiversity, floristics, macroalgae, seaweeds, Romblon Island Group.

Introduction. Marine macroalgae make a substantial contribution to marine primary production and provide habitat for nearshore benthic communities (Satheesh & Wesley 2012). Similar to any other taxa in the web of life, demand for seaweed biodiversity studies is increasing and work is ongoing to increase resolution in taxonomy and to understand distribution and diversity. Approximately there are 10,000 species of seaweed in the world, of these, 966 species are found in the Philippines (Ang et al 2013). In Algae Base, an estimated 7,000 and 5,000 species are still undescribed for Rhodophyceae and Chlorophyceae respectively (including microscopic algae) (Guiry 2012).

In the Philippines, studies on the diversity and distribution of seaweeds were already carried out by several authors. During the 1970s to 1980s, a surge in the taxonomic type of publications on marine macroalgae emerged. Significant number were the works of Trono (1972, 1986) and Cordero (1977, 1980) on the Philippine archipelago among others. Yet, more of these and other studies, e.g. Domantay (1962) and Meñez (1961) in Hundred Islands, Hurtado-Ponce et al (1992) in Panay, Liao & Sotto (1980) in Cebu, and Marcos-Agngarayngay (1983, 1984) in Ilocos Norte were focused only on the major islands and coastlines within the country or to areas that are readily accessible for macroalgal studies. Moreover, during the 1990s, the seaweed research trend shifted to the more applied aspects leaving behind places not fully or initially documented for seaweed biodiversity studies. Likewise, the researchers share with the belief that there is

still no sufficient picture of the true richness and abundance of the country's seaweed flora as some localities remained unexplored. One of these localities include the Romblon Island Group (RIG), an island group composed of major islands Tablas, Romblon, and Sibuyan strategically located at the center of the Philippine Archipelago.

Hence, due to the dearth and scanty information, this study intensively documented the marine macroalgal flora of the RIG in its major islands mentioned above. There were no published records of macroalgal accounts in this region except for one obscure record of *Gracilaria disticha* J. Agardh collected from Sibuyan Island (Abbott 1985) and a record of *Laurencia flexilis* Setchell from Romblon Island (Trono 2004). These two recorded red seaweed species join other interesting records of terrestrial flora and fauna in RIG. Compared with the number of terrestrial biodiversity studies done in this place (Goodman et al 1995; Proctor et al 1998; Lit & Eusebio 2008; Esselstyn & Goodman 2010; Brown et al 2011; Siler et al 2012; Siler et al 2016), marine biodiversity research in RIG has not been receiving much attention. Interestingly, Romblon is classified as an area surrounding a marine corridor (Carpenter & Springer 2005), which means that it is an area of migration of commercial marine organisms (Leyzack et al 2014). Marine macroalgae, as basal component of the marine food chain, justify the necessity to be identified taxonomically especially those of the corridor area. These photosynthetic organisms must have a significant role in heterotrophic species migration. Hence, basic floristic investigations must be strengthened.

This study aims at determining the marine macroalgae of RIG in terms of its floristic composition. This paper broadens the amount of available information on the phytogeographic distribution, species composition, and diversity of marine macroalgae in the Philippines. Findings of this study will impact future biodiversity literature reviews of the macroalgae of the Asia-Pacific region, especially for comparing global-scale distributions.

Material and Method

Study site and sample collection. A total of twenty (20) sampling sites (Figure 1) were chosen in this study on the basis of distinct ecological features such as substrate types, degree of disturbance (whether or not frequently in contact with anthropological activities), wave exposure and biological associations (e.g. mangrove forests, seagrass beds, urchin beds) (Table 1). The macroalgal field collections and assessment were done twice. The first and second collection were conducted on September 2014 and on May 2015 respectively. Sampling was done primarily along the intertidal zone and fifteen (15) to twenty (20) days were approximately spent in RIG for each collection period. After washing thoroughly with seawater, all macroalgae were properly kept in pre-labeled Ziploc® bags. The samples were fixed for constant preservation in 3-5% formalin-seawater mix buffered with borax (Al-Yamani et al 2014).

Species identification. Collected specimens were sorted out in the laboratory and herbarium preparation was done following that of Coppejans et al (2010). After mounting, all specimens were identified to the lowest taxonomic level possible (usually species). Identification were based primarily on morphological and anatomical features of the specimen. Details of morphological structures were examined using stereomicroscope and compound light microscope.

Macroalgal floristic composition. To account for the similarities between macroalgal flora collected from the 20 sampling sites, a dendrogram was generated through cluster analysis using the PAST software version 3.11 (Hammer et al 2001). Cluster analysis was based on Paired-Group Algorithm and Jaccard Index of Similarity following that of Santiañez et al (2015). The Jaccard Index is a powerful tool that is appropriately used for presence-absence data (Kindt & Coe 2005; Krebs 2014).

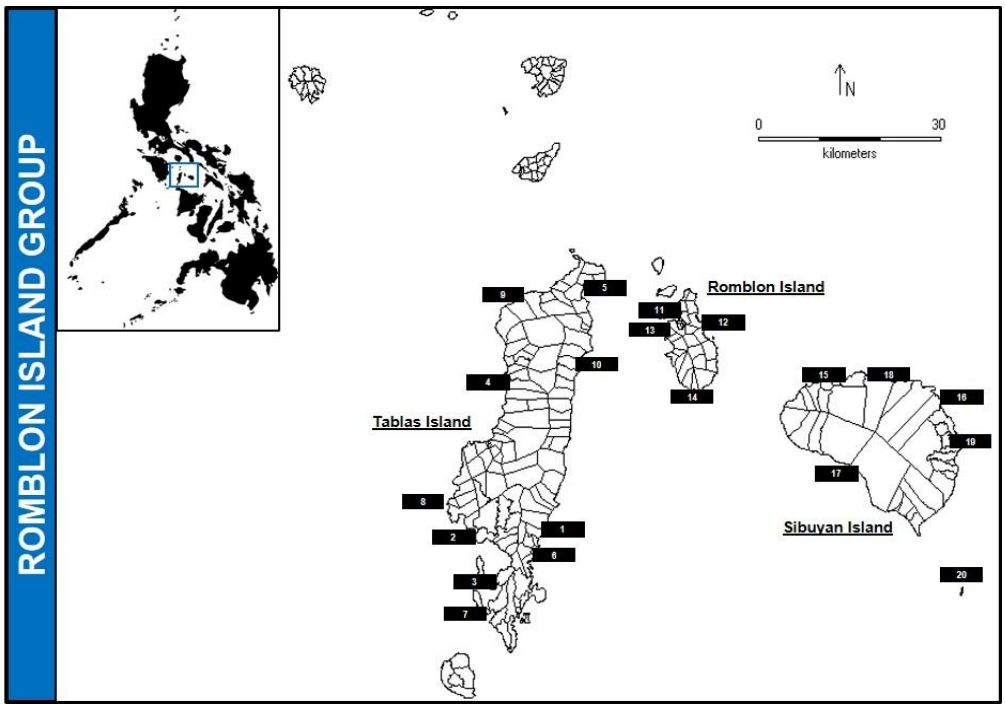

Figure 1. Map of the 20 sampling sites in Romblon Island Group (RIG): 1-ALC (Alcantara), 2-BUE (Buenavista), 3-MAT (Mat-i), 4-TAN (Tan-agan), 5-CAR (Carmen), 6-MPN (Malapantao Point), 7-STF (Sta Fe), 8-FER (Ferrol), 9-CTV (Calatrava), 10-DAK (Dakit Point), 11-CAJ (Cajimos), 12-LIO (Li-O), 13-IPL (Ipil), 14-AGP (Agpanabat), 15-AMB (Ambulong), 16-CMB (Cambalo), 17-OLA (Olango), 18-TAM (Tampayan), 19-TAG (Taguilos), 20-CDG (Cresta De Gallo).

Table 1

Sampling localities in RIG grouped according to island. The brief site description presents environmental characteristics in terms of substrata and other distinct ecological features

No.	*Code*	*Locality*	*Coordinates*	*Site description*
			Tablas Island	
1	ALC	Alcantara	12°15'37.5"N 122°03'28.0"E	Intertidal zone about 200 m seaward, wave-exposed, characterized by sandy seagrass meadows near the shore and becoming corally to rocky seaward with occurrence of several coral heads; entire flat is seaweed rich, however dominated by *Sargassum* in the coral heads region; disturbed habitat due to fisher boats docking the area; entire coast is residential.
2	BUE	Buenavista	12°17'08.9"N 121°56'41.5"E	Intertidal extending up to about 300 meters, entirely seagrass beds with sandy to rocky substratum, dense secondary mangrove forest at shore; marine refuge and sanctuary nearby.
3	MAT	Mat-i	12°11'51.9"N 121°58'35.2"E	Wave protected area, located at the innermost part of Looc Bay, devoid of strong water currents, about 2 m deep during high tide, muddy to sandy substrate with small patches of coral growths at the edge of intertidal zone; dominated by the large and thick-bladed seagrass *Thalassia*; dense mangrove foliage along shore.
4	TAN	Tan-agan	12°29'58.1"N 122°00'40.8"E	Rocky tidal flat extending up to 200 m seaward, with coral heads at seaward portion. Shores with moderate foliage of mangroves, slightly disturbed with few fisher boats docking the area, few residents thriving along coast. Freshwater effluents come from 2 medium sized rivers located southwards at about 500 m distance from the sampling locality.

5	CAR	Carmen	12°37'33.0"N 122°07'31.9"E	Site at the northeastern portion of the island, coarse sandy to rocky tidal flat and a narrow fringing reef extending up to 150 m from shore. Patches of small to medium sized seagrass meadows occur near shore. Located in Carmen Bay and the nearby Mt. Payapao so the place is slightly protected from waves and winds. Sparse mangrove trees along share.
6	MPN	Malapantao Point	12°14'26.5"N 122°03'18.5"E	Fringing reef flat extending about 150 m from shore, characterized by sandy substratum becoming rocky with dense coral heads at seaward portion. Dense beds of small to medium sized seagrass near shore while dominated by *Sargassum* beds at the seaward edge of the reef. Area undisturbed by human activities and is cove-like with slight wave exposure.
7	STF	Sta. Fe	12°09'11.9"N 121°58'53.9"E	Narrow fringing reef at the southernmost tip of the island, with substratum of coarse white sand and rocky bottom dominated by small to medium-sized seagrass species and exposed to strong water current and wind; collection site is barricaded from a freshwater effluent coming from a small river outlet by a small rocky strip within which stand very few mangroves.
8	FER	Ferrol	12°18'51.5"N 121°55'16.6"E	Narrow fringing reef flat 100 m about 2 m deep when high tide, with substratum of coarse white sand mixed with coral rubbles and hard rocky bottom, seagrass of small to medium size occur entirely at the high to middle intertidal zone. Slightly protected from waves and wind by a short sandbar leading to a small islet.
9	CTV	Calatrava	12°36'43.4"N 122°01'51.8"E	A marine sanctuary at the northwestern portion of the island and a broad reef flat characterized by fine to coarse sandy bottom with coral heads on the seaward portions; with very rich foliage of mangrove stands. One medium-sized river nearby about 400 meters from sampling point.
10	DAK	Dakit Point	12°34'49.1"N 122°08'20.9"E	Intertidal zone extending up to 200 m seawards, substratum of fine to silty sand at shore area becoming coarse white sand seaward dominated by small to medium-sized seagrass species and exposed to strong water current and wind; with moderate foliage of mangrove stands.
			Romblon Island	
11	CAJ	Cajimos	12°35'33.5"N 122°16'12.1"E	Narrow fringing reef flat that is parabolic in shape slightly sloping seawards, substratum fine sand becoming coarse sandy to corally with coral heads at the seaward portions, with moderate foliage of mangroves. Protected from waves and strong winds by the cove-like Romblon Harbor and the adjacent Alad and Lugbung Islands. Area entirely used for fishing.
12	LIO	Li-o	12°34'59.5"N 122°17'46.4"E	Site on the eastern side of the island characterized by coarse sand becoming corally seawards, seaweed rich in the lower intertidal zone, dense mangrove at shore; coast residential. A huge marble quarry at the nearby shore is in direct contact with sea.
13	IPL	Ipil	12°34'45.8"N 122°15'31.9"E	About 1.5 m deep when high tide, coarse sandy and corally substrates that are exposed during low tide, narrow fringing reef extending up to 150 m coral heads at the seaward portion. Fisher boats dock at the area, indicating site being used for commerce.

14	AGP	Agpanabat	12°28'46.5"N 122°17'39.1"E	Site located on the southern portion of the island facing substratum fine sand to coarse corally; very narrow fringing reef about 50 m wide, exposed to strong waves.
			Sibuyan Island	
15	AMB	Ambulong	12°29'49.0"N 122°30'07.9"E	Tidal flat with rocky to corally substratum extending 100 m seawards; coral heads present at seaward portion of the reef; extensive bed of *Sargassum* in the middle to lower portion of the reef exposed to waves and wind; sparse mangrove stands at shore; area proximal to passenger and cargo ship port.
16	CMB	Cambalo	12°27'44.7"N 122°40'09.4"E	Hard coarse sandy substratum dominated by fine to medium-sized seagrass species; few mangrove trees found in the rocky area of the shore. Seaweeds evenly distributed in the middle and low intertidal zone, mostly brown and green species in high intertidal
17	OLA	Olango	12°22'17.9"N 122°31'18.1"E	Narrow fringing reef slightly and irregularly sloping extending up to 150 m from shore with substratum entirely rocky to corally, exposed to strong water current and winds; freshwater effluents coming from wide rivers on both sides at a distance of about 1 km
18	TAM	Tampayan	12°30'08.0"N 122°32'12.3"E	Tidal flat extending up to 100 m characterized by coarse sandy to corally substratum, slightly dominated by small to medium sized seagrass; dense mangrove foliage occurs along shore
19	TAG	Taguilos	12°24'59.6"N 122°41'20.3"E	Coarse sandy substratum becoming rocky seawards, dominated by fine to medium-sized seagrass species; few mangrove stands found along shore.
20	CDG	Cresta De Gallo	12°11'17.9"N 122°41'52.7"E	A remote islet about 1.2 km in length off mainland Sibuyan characterized by a long stretch of sandbar. Substratum fine to coarse white sand beneath patches of small coral heads seen from near shore extending about 300 m seaward. 1.5-2.5 m deep when high tide

Results. In this study, a total of 129 macroalgal taxa were identified for the 20 collecting sites in RIG. All collections represent the three classes of seaweeds, Rhodophyceae (red algae), Chlorophyceae (green algae), and Phaeophyceae (brown algae). The 44% of the total collection is composed of the Rhodophyceans, 37% of the Chlorophyceans, and 19% by the Phaeophyceans. Of the 129, 116 taxa were listed on the species rank, 12 taxa on the genus rank, and 1 taxon on the family rank. The total seaweed taxa of RIG represent 13.35% of the 966 reported taxa from the Philippines (Ang et al 2013). The number of taxa per major island also varies with Tablas Island having the highest number for all seaweed classes. Full checklist of RIG seaweed species is provided here including their local distribution (Table 2). This checklist however excluded some epiphytic macroalgae except for some members under Rhodophyceae such as *Leveillea jungermannioides* (Hering & G. Martens) Harvey 1855 and unidentified species under the genera *Bostrychia*, *Catenella*, *Hydrolithon*, *Polysiphonia*, *Spyridia*, and *Tolypiocladia*. A more detailed and comprehensive study on these macroalgal epiphytes have the potential to significantly increase the number in this checklist. Moreover, some interesting species from Southern Philippines are included in the checklist such as *Dasycladus vermicularis* (Scopoli) Krasser 1898 which was firstly reported in Siquijor Island (Silva et al 1987) and *Padina jonesii* Tsuda 1972 which was first recorded in the Philippines in 2005 (Geraldino et al 2005). This study, thus extends the distribution of this species to the Central Philippines region particularly the Romblon Island Group (RIG). One of the previously reported alga in RIG by Trono (2004), *Laurencia flexilis* Setchell 1926, was also encountered in this study. *L. flexilis* specimens were collected from Tablas Island and Romblon Island. However, the other previously reported red alga from Sibuyan Island by Abbott (1985), *Gracilaria disticha* J. Agardh, were not encountered in this study.

Table 2

Checklist of the 129 macroalgal taxa and their local distribution in the major islands of RIG

Species	Tablas Island									Romblon Island						Sibuyan Island				
	ALC	BUE	MAT	TAN	CAR	MPN	STF	FER	CTV	DAK	CAJ	LIO	IPL	AGP	AMB	CMB	OLA	TAM	TAG	CDG
Chlorophyceae (48)																				
Acetabularia major G. Martens 1866	x				x	x				x			x	x			x		x	
Anadyomene wrightii Harvey ex J. E. Gray 1866			x									x				x				
Avrainvillea erecta (Berkeley) A. Gepp & E. S. Gepp 1911	x		x																	
Avrainvillea lacerata Harvey ex J. Agardh 1887	x		x	x	x	x														
Avrainvillea obscura (C. Agardh) J. Agardh 1887								x												
Boergesenia forbesii (Harvey) Feldmann 1938		x										x								
Boodlea composita (Harvey) F. Brand 1904									x											x
Bornetella nitida Munier-Chalmas ex Sonder 1880	x			x	x	x		x		x	x	x	x			x	x	x	x	
Bornetella oligospora Solms-Laubach 1892	x				x				x			x			x		x	x	x	
Bornetella sphaerica (Zanardini) Solms-Laubach 1892	x	x			x		x	x	x		x	x	x	x		x	x	x	x	
Caulerpa cupressoides (M. Vahl) C. Agardh 1817	x				x					x		x								
Caulerpa microphysa (Weber-van Bosse) Feldmann 1955							x													
Caulerpa racemosa (Forsskål) J. Agardh 1873	x	x				x		x				x	x	x		x		x	x	x
Caulerpa serrulata (Forsskål) J. Agardh 1837									x										x	x
Caulerpa sertularioides (S. G. Gmelin) M. A. Howe 1905	x					x														

Table 2 (continued)

Checklist of the 129 macroalgal taxa and their local distribution in the major islands of RIG

Species	Tablas Island								Romblon Island						Sibuyan Island					
	ALC	BUE	MAT	TAN	CAR	MPN	STF	FER	CTV	DAK	CAJ	LIO	IPL	AGP	AMB	CMB	OLA	TAM	TAG	CDG
Chlorophyceae (48)																				
Caulerpa taxifolia (M. Vahl) C. Agardh 1817				x					x	x			x							
Chaetomorpha crassa (C. Agardh) Kützing 1845		x		x						x										
Chaetomorpha sp.									x											
Chlorodesmis fastigiata (C. Agardh) S. C. Ducker 1969	x					x														
Cladophoropsis vaucheriaeformis (Areschoug) Papenfuss 1958			x																	
Codium arabicum Kützing 1856			x	x		x	x		x							x		x		
Codium bartlettii C. K. Tseng & W. J. Gilbert 1942																x				
Codium tenue (Kützing) Kützing 1856						x														
Dasycladus vermicularis (Scopoli) Krasser 1898		x								x			x							
Dictyosphaeria cavernosa (Forsskål) Børgesen 1932	x	x		x	x		x		x	x	x		x	x	x	x	x	x	x	x
Dictyosphaeria versluysii Weber-van Bosse 1905							x													
Halicoryne wrightii Harvey 1860	x			x				x		x			x						x	
Halimeda cuneata Hering 1846	x			x	x	x			x		x	x		x	x		x			x
Halimeda gracilis Harvey ex J. Agardh 1887						x														
Halimeda incrassata (J. Ellis) J. V. Lamouroux 1816		x	x	x		x														
Halimeda macroloba Decaisne 1841	x		x		x	x	x						x							x

Table 2 (continued)

Checklist of the 129 macroalgal taxa and their local distribution in the major islands of RIG

Species	Tablas Island									Romblon Island					Sibuyan Island					
	ALC	BUE	MAT	TAN	CAR	MPN	STF	FER	CTV	DAK	CAJ	LIO	IPL	AGP	AMB	CMB	OLA	TAM	TAG	CDG
Chlorophyceae (48)																				
Halimeda opuntia (Linnaeus) J. V. Lamouroux 1816	x	x	x	x	x		x	x	x	x	x		x	x	x	x		x	x	x
Halimeda simulans M. A. Howe 1907							x													
Halimeda taenicola W. R. Taylor 1950	x						x								x					
Halimeda tuna (J. Ellis & Solander) J. V. Lamouroux 1816	x	x	x		x					x										x
Halimeda velasquezii W. R. Taylor 1962						x														
Monostroma nitidum Wittrock 1866		x																		
Neomeris annulata Dickie 1874				x	x						x	x		x						
Neomeris vanbossae M. A. Howe 1909	x	x				x	x													x
Udotea indica A. Gepp & E. S. Gepp 1911	x			x		x														
Udotea occidentalis A. Gepp & E. S. Gepp 1912	x																			
Udotea orientalis A. Gepp & E. S. Gepp 1911					x					x								x	x	
*Ulva clathrata (*Roth) C. Agardh 1811 *(=Enteremorpha clathrata* (Roth) Greville*)*								x												
Ulva intestinalis Linnaeus 1753 (=*Enteromoprha intestinalis* (Linnaeus) Nees)								x												
Ulva prolifera O.F. Müller 1778 (=*Enteromoprha prolifera* (O. F. Müller) J. Agardh)																				x
Ulva reticulata Forsskål 1775									x											

Table 2 (continued)

Checklist of the 129 macroalgal taxa and their local distribution in the major islands of RIG

Species	Tablas Island									Romblon Island					Sibuyan Island					
	ALC	BUE	MAT	TAN	CAR	MPN	STF	FER	CTV	DAK	CAJ	LIO	IPL	AGP	AMB	CMB	OLA	TAM	TAG	CDG
Chlorophyceae (48)																				
Valonia aegagrophila C. Agardh 1823		x																		
Valonia utricularis(Roth) C. Agardh 1823		x					x													
Phaeophyceae (25)																				
*Dictyotaceae (*close to *Dictyotopsis propagulifera)*				x			x			x	x									
Canistrocarpus cervicornis (Kützing) De Paula & De Clerck 2006 (=*Dictyota cervicornis* Kützing*)*										x			x							
Dictyota dichotoma (Hudson) J. V. Lamouroux 1809	x	x			x	x			x	x		x	x				x			x
Dictyota implexa (Desfontaines) J. V. Lamouroux 1809 (=*Dictyota divaricata*)	x		x		x	x		x		x		x				x		x	x	x
Dictyota sp.	x																			
Hormophysa cuneiformis (J. F. Gmelin) P. C. Silva 1987 (=*Hormophysa triquetra* (C. Agardh) Kützing)	x				x	x				x		x								
Hydroclathrus clathratus (C. Agardh) M. A. Howe 1920			x		x	x	x		x	x	x	x	x			x		x	*x*	
Lobophora variegata (J. V. Lamouroux) Womersley ex E. C. Oliveira 1977	x		x																	
Padina arboresens Holmes 1896	x					x														
Padina australis Hauck 1887		x		x	x		x	x	x	x		x	x		x	x		x		x

Table 2 (continued)

Checklist of the 129 macroalgal taxa and their local distribution in the major islands of RIG

Species	Tablas Island									Romblon Island					Sibuyan Island					
	ALC	BUE	MAT	TAN	CAR	MPN	STF	FER	CTV	DAK	CAJ	LIO	IPL	AGP	AMB	CMB	OLA	TAM	TAG	CDG
Phaeophyceae (25)																				
Padina boryana Thivy ex W. R. Taylor 1966																				x
Padina gymnospora (Kützing) Sonder 1871										x										
Padina japonica Yamada 1931			x							x		x		x	x		x	x	*x*	
Padina jonesii Tsuda 1972					x															
Padina minor Yamada 1925	x			x	x	x					x		x	x	x	x	x	x	*x*	
Padina tetrastromatica Hauck 1887	x	x		x		x	x	x	x											
Sargassum aquifolium (Turner) C. Agardh 1820 (=*Sargassum binderi* Sonder ex J. Agardh)				x		x		x												
Sargassum fulvellum (Turner) C. Agardh 1820						x														
Sargassum ilicifolium (Turner) C. Agardh 1820 (=*Sargassum duplicatum* Bory de SaintVincent)										x							x			
Sargassum oligocystum Montagne 1845					x				x						x				x	
Sargassum piluliferum (Turner) C. Agardh 1820	x		x		x		x			x	x			x		x				x
Sargassum polycystum C. Agardh 1824	x				x		x		x		x	x		x		x		x	*x*	
Sargasum sp. (attached to mangrove)																		x		
Turbinaria conoides (J. Agardh) Kützing 1860				x		x					x									
Turbinaria ornata (Turner) J. Agardh 1848	x			x	x	x			x	x	x		x	x	x		x		x	x
Rhodophyceae (56)																				
Acantophora spicifera (M. Vahl) Børgesen 1910	x	x									x			x		x		x		x

Table 2 (continued)

Checklist of the 129 macroalgal taxa and their local distribution in the major islands of RIG

Species	Tablas Island								Romblon Island						Sibuyan Island					
	ALC	BUE	MAT	TAN	CAR	MPN	STF	FER	CTV	DAK	CAJ	LIO	IPL	AGP	AMB	CMB	OLA	TAM	TAG	CDG
Rhodophyceae (56)																				
Actinotrichia fragilis (Forsskål) Børgesen 1932	x		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Amphiroa anastomosans Weber-Van Bosse 1904	x																			
Amphiroa foliacea J. V. Lamouroux 1824				x	x															
Amphiroa fragilissima (Linnaeus) J. V. Lamouroux 1816						x								x			x	x		
Bostrychia sp.		x		x																
Catenella sp.		x																x		
Ceratodictyon intricatum (C. Agardh) R. E. Norris 1987 (=*Gelidiopsis intricata* (C. Agardh) Vickers)				x			x													x
Ceratodictyon variabile (J. Agardh) R. E. Norris 1987 (=*Gelidiopsis variabilis* (Greville ex J. Agardh) F. Schmitz)				x					x		x		*X*					x		
Champia parvula (C. Agardh) Harvey 1853							x		x											x
Chondrophycus cartilagineus (Yamada) Garbary & J. T. Harper 1998 (=*Laurencia cartilaginea* Yamada)				x						x										
Corallina pinnatifida			x			x					x		x							
Galaxaura divaricata (Linnaeus) Huisman & R. A. Townsend 1993 (=*Galaxaura fasciculata*Kjellman)	x		x		x	x	x		x	x	x		x	x	x	x	x		x	
Galaxaura sp.	x																			

Table 2 (continued)

Checklist of the 129 macroalgal taxa and their local distribution in the major islands of RIG

Species	Tablas Island									Romblon Island						Sibuyan Island				
	ALC	BUE	MAT	TAN	CAR	MPN	STF	FER	CTV	DAK	CAJ	LIO	IPL	AGP	AMB	CMB	OLA	TAM	TAG	CDG
Rhodophyceae (56)																				
Ganonema farinosum (J. V. Lamouroux) K. C. Fan & Yung C. Wang 1974 (=*Liagora farinosa* J. V. Lamouroux)									x											
Gayliella sp.							x	x	x											
Gelidiella acerosa (Forsskål) Feldmann & G. Hamel 1934		x	x	x	x	x	x		x	x	x	x		x	x	x	x	x	x	
Gelidiopsis sp.	x				x															
Gelidium divaricatum G. Martens 1866					x															
Gracilaria arcuata Zanardini 1858																				x
Gracilaria salicornia (C. Agardh) E. Y. Dawson 1954		x		x				x	x		x			x	x	x		x	x	
Gracilaria textorii (Suringar) De Toni 1895				x	x	x					x									x
Gracilariopsis longissima (S. G. Gmelin) M. Steentoft, L. M. Irvine & W. F. Farnham 1995 (=*Gracilaria verrucosa* (Hudson) Papenfuss)		x		x	x		x	x			x	x						x		
Halymenia durvillei Bory de SaintVincent 1828	x			x		x														
Hydrolithon sp.																				x
Hydropuntia eucheumatoides (Harvey) Gurgel & Fredericq 2004 *(=Gracilaria eucheumoides* Harvey)					x							x								
Hypnea cenomyce J. Agardh 1851													x							
Hypnea charoides J.V. Lamouroux 1813	x							x				x								

Table 2 (continued)

Checklist of the 129 macroalgal taxa and their local distribution in the major islands of RIG

Species	Tablas Island										Romblon Island					Sibuyan Island				
	ALC	BUE	MAT	TAN	CAR	MPN	STF	FER	CTV	DAK	CAJ	LIO	IPL	AGP	AMB	CMB	OLA	TAM	TAG	CDG
Rhodophyceae (56)																				
Hypnea esperi Bory					x	x		x		x				x	x	x			x	x
Hypnea pannosa J. Agardh 1847											x									x
Hypnea valentiae (Turner) Montagne 1841	x						x				x		x					x	x	
Jania adhaerens J. V. Lamouroux 1816	x			x	x				x	x						x			x	
Jania capillacea Harvey 1853	x		x	x			x				x	x	x						x	
Jania decussato-dichotoma (Yendo) Yendo 1905	x									x										
Jania pumila J. V. Lamouroux 1816		x		x	x	x									x					
Jania ungulata (Yendo) Yendo 1905		x							x	x										
Kallymenia sp.	x																			
Laurencia obtusa (Hudson) J. V. Lamouroux 1813					x	x														
Laurencia flexilis Setchell 1926	x					x						x								
Laurencia sp. 1																				x
Laurencia sp. 2																				x
Leveillea jungermannioides (Hering & G. Martens) Harvey 1855			x				x	x	x			x						x		x
Mastophora rosea (C. Agardh) Setchell 1943	x					x			x	x		x								
Melanamansia glomerata (C. Agardh) R. E. Norris 1995 (=*Amansia glomerata* C. Agardh)						x														
Meristotheca coacta Okamura 1930	x																			

Table 2 (continued)

Checklist of the 129 macroalgal taxa and their local distribution in the major islands of RIG

Species	Tablas Island								Romblon Island						Sibuyan Island					
	ALC	BUE	MAT	TAN	CAR	MPN	STF	FER	CTV	DAK	CAJ	LIO	IPL	AGP	AMB	CMB	OLA	TAM	TAG	CDG
Rhodophyceae (56)																				
Meristotheca papulosa (Montagne) J. Agardh 1872				x																
Palisada perforata (Bory de Saint Vincent) K. W. Nam 2007 (=*Laurencia papillosa* (C. Agardh) Greville, Setchell & N. L. Gardner)		x			x	x		x		x	x	x	x			x		x	x	x
Peyssonnelia rubra (Greville) J. Agardh 1851													x							
Polysiphonia sp.									x											x
Portieria hornemannii (Lyngbye) P. C. Silva 1987	x								x		x						x			
Pterocladiella capillacea (S. G. Gmelin) Santelices & Hommersand 1997												x								x
Spyridia sp.								x												x
Tolypiocladia sp.		x	x	x	x	x	x		x									x		
Tricleocarpa fragilis (Linnaeus) Huisman & R. A. Townsend 1993 (=*Galaxaura oblongata* (J. Ellis & Solander) J. V. Lamouroux)	x			x	x	x		x	x			x		x	x		x	x	x	
Yamadaella cenomyce (Decaisne) I. A. Abbott 1970															x					
Zellera tawallina G. Martens 1866									x											
Total no. of taxa = 129	49	26	21	35	40	41	28	22	35	33	27	28	25	20	18	22	17	28	27	32

Legends: X present; sites are abbreviated as: ALC = Alcantara, BUE = Buenavista, MAT = Mat-i, TAN = Tan-agan, CAR = Carmen, MPN = Malapantao Point, STF = Sta. Fe, FER = Ferrol, CTV = Calatrava, DAK = Dakit Point, CAJ = Cajimos, LIO = Li-o, IPL = Ipil, AGP = Agpanabat, AMB = Ambulong, CMB = Cambalo, OLA = Olango Point, TAM = Tampayan, TAG = Taguilos, and CDG = Cresta De Gallo.

Discussion. Floristics is the science of identifying the diversity of plants across a given geographic region (Harvard University 2016). In this study, macroalgal floristic composition refers to the different macroalgae identified in relation to selected sampling sites in RIG. The dendrogram from cluster analysis revealed that sampling sites that were geographically neighboring and/or subjected to the same influence of environmental conditions such as substrate, wave and current exposure, and other hydrological parameters partake more or less similar flora (Figure 2). We can take into consideration the ocean currents in discussing similarity analysis of macroalgal flora in RIG. In Han et al (2009), on their account of the seasonal surface ocean circulation in Philippine archipelago, the Sibuyan Sea has annual mean currents that are directed westward from west Pacific via San Bernardino Strait and flow into the Sulu Sea via the Tablas Strait. They also claim that around the islands north of Panay, the circulation is cyclonic and surface water from the South China Sea also intrudes into the Archipelago. RIG is geographically located north of Panay, thus influenced by cyclonic circulation following that of Han et al (2009) and is also influenced by surface water intrusion from South China Sea owing to RIG's proximity to Verde Island Passage.

Considering that RIG lies within this area where ocean currents from the South China Sea and West Philippine Sea exchange, the flora is expected to be uniformly distributed, but the cluster analysis claims otherwise. Along these current patterns within these seas, Tablas Island, being a large island compared to other RIG islands, may have acted as a geophysical barrier against the efficient dispersal of propagules in the region, leading to the observed clustering of TAN, BUE, FER and MAT from the rest of the group. This group, that we designated as 'outgroups' (except for CDG, which may have a different story independent of ocean current), are located on the west side of Tablas Island and may probably receive minute influence from the westward currents coming from the Pacific.

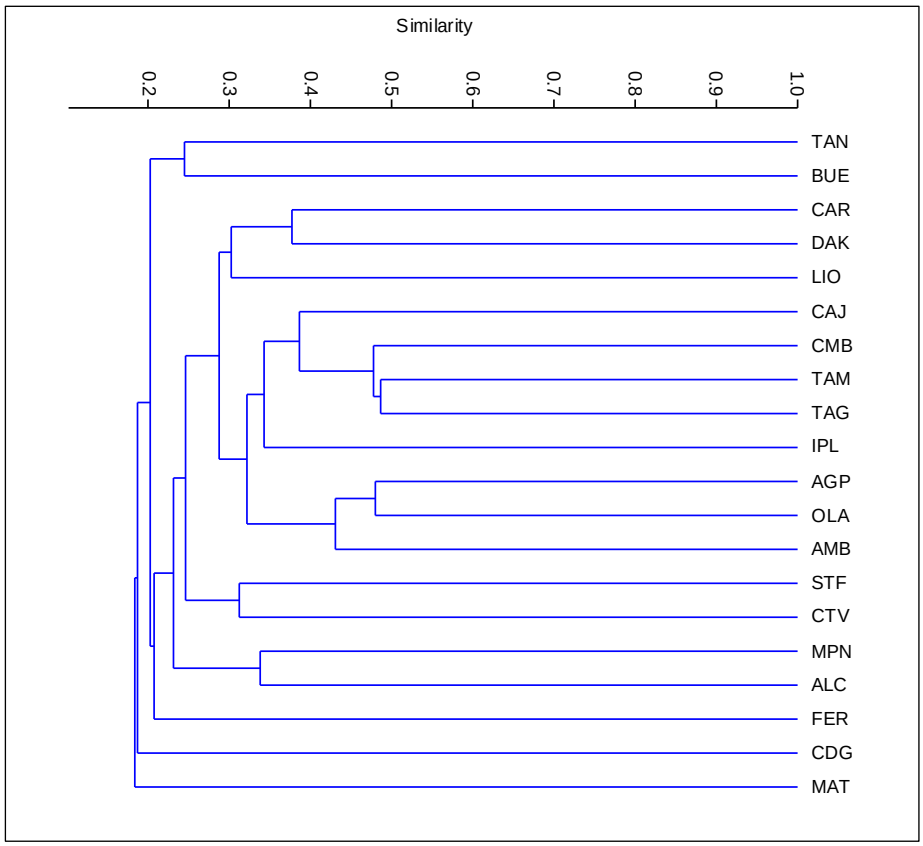

Figure 2. Dendrogram for the 20 sampling sites generated through cluster analysis using Paired-Group Algorithm and Jaccard Index as a measure of similarity: AGP-Agpanabat, ALC-Alcantara, AMB-Ambulong, BUE-Buenavista, CAJ-Cajimos, CAR-Carmen, CDG-Cresta De Gallo, CMB-Cambalo, CTV-Calatrava, DAK-Dakit Point, FER-Ferrol, IPL-Ipil, LIO-Li-O, MAT-Mat-I, MPN-Malapantao Point, OLA-Olango, STF-Sta Fe, TAG-Taguilos, TAM-Tampayan, TAN-Tan-agan.

Moreover, the rest of the formed clusters were more or less found to have flora more similar to each other and differences may be due to variation in substrate and biophysical characteristics of the sampling sites. The separation of MAT as the most distant from the rest of the stations may be primarily attributed to the fine sandy to silty substrate on the high to middle intertidal area and relatively poor water movement considering it is situated in the innermost part of Looc Bay, thus separating itself from the open sea. CDG, being an outgroup next to MAT, is a pristine locality where patches of small coral heads and coral tables occur in the entire intertidal zone and contributing five (5) 'rare' species in the checklist. By 'rare', we mean that these species are only found specifically in this site among the twenty sampling sites. Moreover, there are four (4) species, designated as 'common', meaning, these were found in at least 75% of the total sampling sites, thus they occur in at least fifteen (15) of the twenty (20) sampling sites. These species are *Dictyosphaeria cavernosa*, *Halimeda opuntia*, *Actinotrichia fragilis*, and *Gelidiella acerosa*. This widespread occurrence of this particular species in the region may be due to a premise based on the study of Brennan et al (2014) which demonstrated the influence of local coastal morphology on the distribution of macroalgal spores including their distribution in relation to current flow. On the other hand, restricted distribution or 'rarity' of particular species may be attributed to their poor dispersal capacities, differences in substrates, differing environmental parameters or low sampling effort.

The clustering of localities from CAR down to AMB may be designated as the 'Sibuyan-Romblon-Northeastern Tablas' cluster which isolates itself from the southeastern and western Tablas localities. This is quite interesting though it can be assumed that this clustering may be due to the vast distance of Romblon-Sibuyan to the southeastern and western Tablas localities and the strategically narrow distance of Romblon-Sibuyan to northeastern Tablas localities. Though, distance may or may not be a major barrier for seaweed dispersal as propagules are generally at the mercy of ocean current, there might be restricting elements and factors in the light of the physical oceanography of the inner Sibuyan Sea.

Conclusions. This study provides a comprehensive checklist of the 129 macroalgal taxa for the three major islands namely Tablas, Romblon, and Sibuyan islands of the Romblon Island Group (RIG), Central Philippines, an area with a legitimately undocumented macroalgal flora. Of the 129, 116 taxa were listed on the species rank, 12 taxa on the genus rank, and 1 taxon on the family rank. Representing 13.35% of the 966 reported taxa from the Philippines, the RIG is relatively diverse. Distinct separation between macroalgal floristic composition of areas within RIG may be attributed to geophysical barriers such as differences in ocean current patterns, while similarities among the floristic components may be attributed to the similarities of substrate types and other prevailing environmental conditions. This study provides a considerable contribution in the phycological diversity map of the Philippines which may or should be replicated in other areas of the country. With this, elucidation of the country's status in terms of macroalgal biodiversity and conservation may be achieved. Likewise, this study will impact future macroalgal distribution studies on a global scale.

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Authors:
Ken Joseph E. Clemente, The Graduate School, Senior High School, University of Santo Tomas, España Blvd, Manila 1015, Philippines, e-mail: keclemente@ust.edu.ph
Susana F. Baldia, The Graduate School, Research Center for Natural and Applied Sciences, University of Santo Tomas, España Blvd, Manila 1015, Philippines, e-mail: sfbaldia@yahoo.com
Paciente A. Cordero, Jr., The Graduate School, University of Santo Tomas, España Blvd, Manila 1015, Philippines, e-mail: drpacjr@yahoo.com

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