Checklist of Macroalgae at Krakal and Drini Beach, Gunungkidul

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Abstract. Suryandari R. 2017. Checklist of Macroalgae at Krakal and Drini Beach, Gunungkidul. Proc Internat Conf Sci Engin 1: 31-38. Macroalgae are multicellular plants that do not produce seeds or flowers. All macroalgae are multicellular and do not have a specialized body structure and do not have reproductive mechanism like terrestrial plants. Macroalgae is divided into 3 groups namely Chlorophyta (green algae), Rhodophyta (red algae), and Phaeophyceae (brown algae). Green algae and red algae belong to the Plantae kingdom with green algae (Chlorophyta) and included in the Subkingdom Viridiplantae and red algae (Rhodophyta) into the Biliphyta subkingdom. Brown algae (Phaeophyta) belong to the Chromista kingdom. Based on the research, macroalgae found in Drini and Krakal Gunungkidul are green algae, red algae and brown algae. Green algae found and identified are Anadyomene plicata C. Agardh, Chaetomorpha antennina (Bory) Kützing, Chaetomorpha linum (O.F. Müller) Kützing, Boergesenia forbesii (Hardvey) Feldmann, Cladophoropsis herpestica (Montagne) M. Howe, Boodlea composita (Harvey) F. Brand, Caulerpa peltata J.V. Lamoroux, Enteromorpha intestinalis (Linnaeus) Nees, Ulva lactuca Linnaeus. Red algae species found and successfully identified are Acrocystis nana Zanardini, Acanthophora spicifera (M. Vahl) Børgesen, Laurencia papilosa (C. Agardh) Greville, Actinotrichia fragilis (Forsskål) Børgesen, Galaxaura rugosa (J. Ellis & Solander) J.V. Lamoroux, Amphiora anceps (Lamark) Decaisne, Gelidiela acerosa (Forsskål) Feldmann & Hamel, Gracilaria canaliculata Sonder, Gelidiopsis intricata (C.Agardh) Vickers. Brown algae species found and identified are Lobophora variegata (J.V.Lamouroux) Womersley ex E.C.Oliveira, Padina minor Yamada, Sargassum crassifolium J. Agardh, Turbinaria ornata (Turner) J. Agardh. The species that classified as a new record in Indonesia are Cladophoropsis herpestica (Montagne) M. Howe and Gracilaria spinulosa (Okamura) Chang & B.M.Xia.

Keywords: Brown algae, Drini Coast, green algae, Krakal Coast, macroalgae, red algae

INTRODUCTION

Seaweeds or macroalgae are multicellular plants that do not produce seeds or flowers (Morrissey & Sumich, 2012). All macroalgae are multicellular, do not have a specialized body structure and do not have reproductive mechanism like terrestrial plants. Macroalgae have no leaves, stems and actual roots. The entire body is called thallus, a thin filament or giant kelp (Castro & Huber, 2010). The body consists of blades (like leaves), stipe (resembling stems) and holdfast (resembling roots) accompanied by small branches called haptera. In addition to having these parts, macroalgae also have parts similar to fruit in the form of a normally bubbling portion of gas functioning to float the macroalga to the surface in order to be exposed to sunlight (Morrissey & Sumich, 2012).

The algae classification consists of 7 phyla namely Chlorophyta, Euglenophyta, Chrysophyta, Pyrrhophyta, Phaeophyta, Cyanophyta, and Rhodophyta. While the phyla that have members of macroalgae are only Chlorophyta (green algae), Rhodophyta (red algae), and Phaeophyta (brown algae) (Blinks, et al., 1951). Green algae and red algae belong to the Plantae kingdom with green algae (Chlorophyta) are included in the Subkingdom Viridiplantae and red algae (Rhodophyta) into the Subkingdom Biliphyta (Ragan, 1995). Brown algae (Phaeophyceae) belong to Chromista kingdom classification along with diatoms (Bacillariophyta), golden brown algae (Chrysophyta), mold (Oomycetes) and even heterotrophic flagelleta (Silicoflagellata) (Maneveldt & Keats, 1997).

Gunungkidul is a district located in the Special Region of Yogyakarta precisely 110 ° 21 '- 110 ° 50' east longitude and 7 ° 46 '- 8 ° 09' LS with areas dominated by karst mountains and beaches. The research was conducted in Drini Beach and Krakal Beach on February 24, 2017. Drini Beach is located in Ngestiharjo Village, Tanjungsari Sub-district east of Sepanjang Beach. Drini Beach is a beach that has a river flow into the shore, but now the stream is small. Drini Beach has a beach that tends to be small and protrudes restricted karst ridges so that the waves cannot reach the shoreline directly. This coastal intertidal region consists of sand that is overgrown by *Padina* sp.

Krakal Beach is about 70 km from the city of Yogyakarta. Krakal Beach is a beach with beautiful white sand and has the longest coastline among other beaches in Baron-Kemadang tourist complex. Krakal Beach is relatively sloping and its intertidal region consists of dead corals that are overgrown by macroalga *Enteromorpha* sp., *Cladophoropsis* sp., And *Ulva* sp. Basically, the species found on Krakal Beach and Drini Beach tend to have much in common and are only distinguished in terms of the dominating species.

MATERIALS AND METHODS

The research was conducted on February 24th 2017 in Drini and Krakal Coast, Gunungkidul, Yogyakarta.This

research was done on March-May, 2016. This research was conducted in laboratory of Zoology Faculty of Science and Technology UIN Sunan Kalijaga Yogyakarta.



Figure 1. Map of Drini Coast and Krakal Coast.

The equipment used in this research include waterproof paper, clipboard, pencils 2B, a digital

Table 1. Checklist of Green Macroalgae that found at Waisai Coast.

camera, underwater camera, identification book. Materials used in this research are specimens and 10% formalin.

Carried out by tracing the intertidal areas of Krakal Beach and Drini Beach at random and inventorying each discovered macroalgae. Steps of this research are: 1) Researchers trace the coastline randomly. 2) Specimens were found photographed in the habitat and collected using a plastic specimen. 3) Specimens are cleaned using filtered seawater. 4) Cleared specimens are photographed over millimeters of block. 5) The specimen is inserted into the specimen bottle and then 10% formalin poured into the bottle. 6) Bottle specimen labeled 7) Specimen identified using identification book.

RESULTS AND DISCUSSION

The macroalgae found in Drini Beach and Krakal Beach are 32 species consisting of 9 species of green algae (Chlorophyta), 11 species of red algae (Rhodophyta), and 4 species of brown algae (Phaeophyta) and 8 species that can't be identified until species level.

Green Macroalgae (Clorophyta)

Class, Order and Family of green macroalgae that found at Drini and Krakal Coast shown in the table 1 below.

Class	Order	Family	Species
Ulvophyceae	Cladophorales	Anadyomenaceae	Anadyomene plicata C. Agardh
		Cladophoraceae	Chaetomorpha antennina (Bory) Kützing
			Chaetomorpha linum (O.F. Müller) Kützing
			Boergesenia forbesii (Hardvey) Feldmann
		Boodleaceae	Cladophoropsis herpestica (Montagne) M. Howe
			Boodlea composita (Harvey) F. Brand
	Bryopsidales	Caulerpaceae	Caulerpa peltata J.V. Lamoroux
	Ulvales	Ulvaceae	Enteromorpha intestinalis (Linnaeus) Nees
			Ulva lactuca Linnaeus

Anadyomene plicata C. Agardh

Description: Thallus is yellowish green, there is no stipe, a membrane like a leaf. Holdfast is a collection of rhizoid masses. The main filaments branched polychotomous but generally only 2-4 branches (Huisman & Parker, 2016).

Distribution in Southeast Asia: Indonesia, Malaysia, Philippines, Vietnam (Guiry & Guiry, 2017).

Bryopsis corymbosa J. Agardh

Description: plants epilithic or epiphytic, 2-4 cm high, densely tufted, light green, without distinct main axis, arising from entangled rhizoidal system, axes bearing irregular radial laterals, laterals with clusters of several short ramuli at apex, often with descending rhizoidal outgrowth in lower portion of main axes, ramuli radial to alternate, septa inconspicuous between ramuli and parent axes towards apex, conspicuous towards base (Lee *et al*, 1991)

Distribution in Southeast Asia: Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam (Guiry & Guiry, 2017).

Chaetomorpha linum (O.F. Müller) Kützing

Description: Thallus is light green, commonly known as spaghetti seaweed because its shape is elongated and interlocked irregularly like noodles. Usually freefloating or attached to rocks and shells. The filaments are not branched, cylindrical, and curly (Barnes, 2008).

Distribution in Southeast Asia: Indonesia, Myanmar, Philippines, Singapore, Thailand, Vietnam (Guiry & Guiry, 2017).

Boergesenia forbesii (Hardvey) Feldmann

Description: yellowish green in colour, 3-5 cm tall forming patches on the substratum, vesicles slightly curved, clavate, filled with fluid, club-shaped in younger stage enlarged in the upper part giving grape-like appearance in older stage. Basal branched filamentous parts of the thallus septate. Common in intertidal rock pools (Jha *et al*, 2009).

Distribution in Southeast Asia: Indonesia, Myanmar, Philippines, Singapore, Thailand, Vietnam (Guiry & Guiry, 2017).

Cladophoropsis herpestica (Montagne) M. Howe

Description: Thallus dark green, the shape of thallus is cylinder and small with a length of 1 cm. Usually his life is colony and the holdfast form of rhizoid. These macroalgae cell walls are quite thick (Cribb, 1960).

Distribution in Southeast Asia: Malaysia, Thailand, Vietnam (Guiry & Guiry, 2017).

Boodlea composita (Harvey) F. Brand

Description: This species forms a mass of sponges on rocks and coral reefs and has a slightly crunchy texture. These macroalgae can be found in the intertidal and subtidal zones, from a depth of 0.5 to 1 m2. The main branch appears as unilateral or opposite and then becomes irregularly branched. Some branches blend together and make the macroalga appear matted (Luan Keng, 2017).

Distribution in Southeast Asia: Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam (Guiry & Guiry, 2017).

Caulerpa peltata J.V. Lamoroux

Description: The thallus is yellowish green, characteristic of this macroalga which is to have the peltate disk at the distal end of the short stalk, there is a stolon which then appears ramuli among them, ramuli stacked together (Menez & Calumpong, 1982)

Distribution in Southeast Asia: Indonesia, Malaysia, Myanmar, Philippines, Singapore, Spratley Islands, Thailand, Vietnam (Guiry & Guiry, 2017).

Enteromorpha intestinalis (Linnaeus) Nees

Description: The color of the bright green talus is striking, the blade is tubular and unbranched. Blades usually grow from small discoid bases, rounded blade edges (Anonymous, 2013).

Distribution in Southeast Asia: Indonesia, Malaysia, Philippines, Singapore, Vietnam (Guiry & Guiry, 2017).

Ulva lactuca Linnaeus

Description: The thallus is green, has a single sheet of blade with a length of up to 150mm and a width of 10-100mm. The edge of the thallus is smooth, the basal part of the rhizoid mass (Baldock, 2009).

Distribution in Southeast Asia: Indonesia, Malaysia, Myanmar, Philippines, Singapore, Vietnam (Guiry & Guiry, 2017).



Figure 2. Macroalgae of Chlorophyta at Drini and Krakal Coast (A. Anadyomene plicata C. Agardh, B. Chaetomorpha antennina (Bory) Kützing, C. Chaetomorpha linum (O.F. Müller) Kützing, D. Boergesenia forbesii (Hardvey) Feldmann, E. Cladophoropsis herpestica (Montagne) M. Howe, F. Boodlea composita (Harvey) F. Brand, G. Caulerpa peltata J.V. Lamoroux, H. Enteromorpha intestinalis (Linnaeus) Nees, I. Ulva lactuca Linnaeus.

Red Macroalgae (Rhodophyta)

Class, Order and Family of redmacroalgae that found at Drini and Krakal Coast shown in the table 2 below.

Table 2. Checklist of Red Macroalgae that found at Drini and Krakal Coast.

Class	Order	Family	Species
Florideophyceae	Ceramiales	Rhodomelaceae	Acrocystis nana Zanardini
			Acanthophora spicifera (M. Vahl) Børgesen
			Laurencia papilosa (C. Agardh) Greville
	Nemaliales	Galaxauraceae	Actinotrichia fragilis (Forsskål) Børgesen
			Galaxaura rugosa (J. Ellis & Solander) J.V. Lamoroux
	Corallinales	Corallinaceae	Amphiora anceps (Lamark) Decaisne
	Gelidiales	Gelidiaceae	Gelidiela acerosa (Forsskål) Feldmann & Hamel
	Gracilariales	Gracilariaceae	Gracilaria canaliculata Sonder
			Gracilaria spinulosa (Okamura) Chang & B.M.Xia
			Gracilaria vieullardii P.C.Silva
	Rhodymeniales	Lomentariaceae	Gelidiopsis intricata (C.Agardh) Vickers

Acrocystis nana Zanardini

Description: Small thallus with a height of about 4.4 mm, forming a loose aggregation. Branching upright, dark brown thallus color, but can branching usually colored more pale (Lee, Liao, & Tan, 2009).

Distribution in Southeast Asia: Indonesia, Philippines, Singapore, Vietnam (Guiry & Guiry, 2017).

Acanthophora spicifera (M. Vahl) Børgesen

Description: Yellowish brown colour, erect plants, to 40 cm tall, with solid cylindrical branches, 2 - 3 mm wide, branched either sparingly to repeatedly. Main branches have short, determinate branches, irregularly shaped and spinose, with spines numerous and radially arranged. There are no spines on main axes. The plant grows from a large, irregularly shaped holdfast. (Anonymous, 2001).

Distribution in Southeast Asia: Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam (Guiry & Guiry, 2017).

Laurencia papilosa (C. Agardh) Greville

*Description:*Plants about 5-16 tall, growing in dense clusters. The lower parts of the plants are smooth, but toward the ends, the branches are sparsely crowded with short, truncate to tuberculate branchlets. Plants olive green to greenish purple in colour, consistency somewhat cartilaginous (Kluijvver, Gijswijt, Leon, and Cunda, 2012)

Distribution in Southeast Asia: Indonesia, Philippines, Vietnam (Guiry & Guiry, 2017).

Actinotrichia fragilis (Forsskål) Børgesen

Description: The color of the reddish orange thallus is calcified, its shape is erect and diffuse, the two branches located at 3-6 mm intervals and 40-60 sudut angles and there are circular filaments on the talus (Wiridayamrikul, Lewmanomont, & Boo, 2013).

Distribution in Southeast Asia: Indonesia, Philippines, Singapore, Thailand, Vietnam (Guiry & Guiry, 2017).

Galaxaura rugosa (J.Ellis & Solander) J.V.Lamoroux

Description: Thallus thick, rigid, solid, hemisphericshaped mound, brownish-brown, bifurcated irregular, calcified. Branches are cylindrical in diameter about 0.5-1.5 mm, solid but sometimes covered by stiff hairs like filament, holdfast is not very visible (Kim, 2015).

Distribution in Southeast Asia: Indonesia, Philippines, Singapore, Vietnam (Guiry & Guiry, 2017).

Amphiora anceps (Lamark) Decaisne

Description: Thallus is purplish red but in shallow waters rather faded, there are many dichotomous branches. The edges are thinner and somewhat sharper, the margins are parallel and slightly widened at the ends, and calcification occurs near the end (Womesrley & Johansen, 2001).

Distribution in Southeast Asia: Indonesia, Philippines, Singapore, Vietnam (Guiry & Guiry, 2017).

Gelidiela acerosa (Forsskål) Feldmann & Hamel

Description: High thallus 5-7 cm, some tufted, tangled, erect axis arising from the creeping axis lying and pointing, attached to the substrate with the stolon having rizhoid, the cylindrical upright axis, usually branched across and branched pinnate at the second branch, the length of the branch is usually 15 mm, generally the apical part is shorter (Ang Jr., 2004).

Distribution in Southeast Asia: Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam (Guiry & Guiry, 2017).

Gracilaria canaliculata Sonder

Description: Thallus stiff, brittle, texture like cartilage, length up to 55mm. Solitary, discoid holdfast generate 1 axis or two axes. Short type, most subdichotomous branches, next dichotomy 45-90 $^{\circ}$ for each branch. The apical parts are round cylindrical and the red rosewood's color is firm to bright (Iyer et al, 2004)

Distribution in Southeast Asia: Indonesia, Malaysia, Myanmar, Philippines, Singapore, Vietnam (Guiry & Guiry, 2017).

Gracilaria spinulosa (Okamura) Chang & B.M.Xia

Description: Thalli are bushy and erect, consisting of loose to dense, irregularly dichotomously branched, flattened blades, arising from a discoid holdfast, Blades are rose to dark red, occasionally greenish in colour (Anderson *et al*, 2004).

Distribution in Southeast Asia: Philippines, Vietnam (Guiry & Guiry, 2017).

Gracilaria vieillardii P.C.Silva

Description: Thalli are slightly prosterate or erect, consist of irregularly dichotomously branched, flattened blades, arising from a conspicuous discoid holdfast, The margins of young blades are mostly entire, when old, upper parts of blades possess fine marginal spines, Blades are 255-395 μ m in thickness, composed of two

layers of of pigmented cortical cells. Blades are bright to dark red when shaded or greenish in color when exposed to sunlight (Anderson *et al*, 2004).

Distribution in Southeast Asia: Indonesia, Philippines, Singapore, Vietnam (Guiry & Guiry, 2017).

Gelidiopsis intricata (C.Agardh) Vickers

Description: Thallus stiff, small, matted, red, green, brown, or purple, branched sparsely, irregularly until somewhat dichotomous. Basal axis (stolon) creeps, cylindrical upright axis, irregular rhizoid (Huisman & Parker, 2016).

Distribution in Southeast Asia: Indonesia, Myanmar, Philippines, Singapore, Thailand, Vietnam (Guiry & Guiry, 2017).



Figure 3. Macroalgae of Rhodophyta at Drini and Krakal Coast (A. Acrocystis nana Zanardini, B. Acanthophora spicifera (M. Vahl) Børgesen, C. Laurencia papilosa (C. Agardh) Greville, D. Actinotrichia fragilis (Forsskål) Børgesen, E. Galaxaura rugosa (J. Ellis & Solander) J.V. Lamoroux, F. Amphiora anceps (Lamark) Decaisne, G. Gelidiela acerosa (Forsskål) Feldmann & Hamel, H. Gracilaria canaliculata Sonder, I. Gracilaria spinulosa (Okamura) Chang & B.M.Xia, J. Gracilaria vieullardii P.C.Silva F. Weber & D. Mohr, K. Gelidiopsis intricata (C.Agardh) Vickers.

Brown Macroalgae (Phaeophyceae)

Class, Order and Family of brown macroalgae that found at Drini and Krakal Coast shown in the table 3 below.

ClassOrderFamilySpeciesPhaeophyceaeDictyotalesDictyotaceaeLobophora variegata (J.V.Lamouroux) Womersley ex E.C.Oliveira
Padina minor YamadaFucalesSagassaceaeSargassum crassifolium J. Agardh
Turbinaria ornata (Turner) J. Agardh

 Table 3. Checklist of Brown Macroalgae that found at Drini and Krakal Coast.

Lobophora variegata (J.V.Lamouroux) Womersley ex E.C.Oliveira

Description: The dark brown thallus is shaped like a fan, blade overlap, and is often found growing on rocky rocks. Blade there is a faint yellow concentric line (Baldock, 2009).

Distribution in Southeast Asia: Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam (Guiry & Guiry, 2017).

Padina minor Yamada

Description: Thallus fan-shaped, yellowish brown to brown or slightly white color caused by calcification. Blade is full or divided into lobes, consisting of 2 layers of cells. The bottom surface of the blade is divided into concentric areas with fine lines that have a consistent distance to each other, the height of the blade reaches 10 cm (Trono, 2001).

Distribution in Southeast Asia: Indonesia, Myanmar, Philippines, Thailand, Vietnam (Guiry & Guiry, 2017).

Sargassum crassifolium C. Agardh

Description: Thallus is somewhat flattened, slick, but the main stem is round, rather rough, holdfast discs. The first branch arises at the base of about 1 cm from holdfast. Regular intermittent branching. The blade is

oval or extends 40x10 mm, the middle veins of the blade are clearly visible from the tip of the base to the tip, the cryptostomata is not very clear. The edges of the toothed blade are sparse, wavy, curved or pointed edges, duplicate (double edge) at the end to the center of the blade, especially on the blades at the top of the branching (Atmadja et al 1996).

Distribution in Southeast Asia: Indonesia, Malaysia, Philippines, Thailand, Vietnam (Guiry & Guiry, 2017).

Turbinaria ornata (Turner) J. Agardh

Description:Dark brown in colour, up to 50 cm tall, bushy, axes arising from dichotomously branched holdfast, main axes erect and cylindrical and irregularly branched, leaves closely arranged, turbinate to obconical, coarse, 0.5-1.5 cm long 10-15 mm broad at the distal ends, distal ends of the leaves triangular, subconcave with double row of spines on the surface with terete stalks, vesicles immerged in the leaves, receptacles racemose, arising on the stalks of the upper leaves (Jha *et al*, 2009).

Distribution in Southeast Asia: Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam (Guiry & Guiry, 2017).



Figure 4. Macroalgae of Phaeophyceae at Drini and Krakal Coast (A. Lobophora variegata (J.V.Lamouroux) Womersley ex E.C.Oliveira, B. Padina minor Yamada, C. Sargassum crassifolium J. Agardh, D. Turbinaria ornata (Turner) J. Agardh.

Unidentified specimens up to the species level were 8 specimens including: **sp. 1**. Thallus reddish brown, irregular Branch, each branch is two branches, tip rounded blunt talus, **sp. 2**. The color of dark brown thallus and apical parts of light brown, there are older brown patches on the surface of the talus, the shape of a blade resembling a leaf, the location of the sideways blade, the edge of a small wavy blade, **sp. 3**. Thallus reddish-brown, cylindrical talus round elongated segments with each base of the segments there is a bulge bulge, **sp. 4**. Reddish brown color, small rounded thallus form bulging, the spheres are stacked like a colony, **sp. 5**. Color of light brown thallus, reddish yellow on new branch, irregular branch, elongated cylindrical talus shape with pointed tip, *Hypnea* **sp**. The thallus is dark brown, the shape of the thin cylindrical talus extends, the branches appear from the base, the two-pronged end, *Laurencia* **sp**. Yellowish brown color slightly reddish, irregularly branched thallus and talus surface there are irregular spheres, talus tend to flat, *Spongomorpha* sp.

Dark green, talus like thin hair that sticks to the stolon.



Figure 5. Macroalgae that cannot be identified to species level at Drini and Krakal Coast (A. Sp. 1, B. Sp. 2, C.Sp. 3, D.Sp. 4, E.Sp. 5, F. Hypnea sp, G. Laurencia sp. H. Spongomorpha sp.

Twenty fourth identified macroalgae species have been found in previous studies in Southeast Asia. Southeast Asia region where the species are found, among others Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam.

Species that can be found in the seven countries of Southeast Asia region in previous research are *Chaetomorpha antennina* (Bory) Kützing, *Caulerpa peltata* J.V. Lamoroux, *Acanthophora spicifera* (M. Vahl) Børgesen, *Gelidiela acerosa* (Forsskål) Feldmann & Hamel, *Lobophora variegata* (J.V.Lamouroux) Womersley ex E.C.Oliveira, *Turbinaria ornata* (Turner) J. Agardh. Species that only found in Phillippines in previous research is *Palmaria palmata* (Linnaeus) F. Weber & D. Mohr. Species that have never been found in the Southeast Asia region in previous studies is *Gigartina stellata* (Stackhouse) Batters.

The richness of macroalgae has many types of benefits. One of the benefits that have been widely known is for the sake of health. Species Actinotrichia fragilis (Forsskål) Børgesen is one of the species that has health benefits. Species with calcined talus contain Penicillium citrinum endophytic fungi that produce alkaloid secondary metabolites. Alkaloids are the components used for anti-cancer (Raghukumar, 2008). Another red alga useful in the field of health is Amphiora anceps (Lamark) Decaisne. Amphiora anceps can be used as an alternative source of R-PE (R-Ficoeritrin) which is usually ficoeritrin used for biochemical techniques and clinical diagnosis (Kawsar, Fujii, Matsumoto, Yasumitsu, & Ozeki, 2011). While the species of brown algae that was found and has efficacy in health is Padina minor. The Padina minor has antioxidant and anti-inflammatory potential which at high doses does not result in acute toxicity. For cosmeceuticals, P. minor indicates pharmacological activity, especially antioxidant and antiinflammatory

agents that benefit cosmetics and do not cause skin irritation (Peerapornpisal, et al., 2010).

Some of the found and identified macroalgae also have benefits for humans especially for maintaining environmental health. Chaetomorpha linum (O.F. Müller) Kützing is a macroalga commonly used in aquariums to remove nitrates, assist in pH buffers, break down carbon dioxide into oxygen, and as a hiding space for small creatures. This seaweed also allows for the production of biofuels, liquid fertilizers, and bioremediation in aquaculture. Extracts of this species contain insecticides, antimicrobials, antioxidants, larvacides, and antiviral activity (Kim, 2015). While other macroalgae from brown algae group also has benefits for environmental conservation efforts namely Lobophora variegata (J.V.Lamouroux) Womersley ex E.C.Oliveira. Lobophora variegata is the best and most informative macroalgae as a metal contaminant bioindicator because it can quickly absorb the Co, Cr, Mn, and Ni contents (Hedouin, Bustamante, Fichez, & Warnau, 2008).

CONCLUSIONS

Based on the research, macroalgae found in Drini and Krakal Gunungkidul are green algae, red algae and brown algae. Green algae found and identified are *Anadyomene plicata* C. Agardh, *Chaetomorpha antennina* (Bory) Kützing, *Chaetomorpha linum* (O.F. Müller) Kützing, *Boergesenia forbesii* (Hardvey) Feldmann, *Cladophoropsis herpestica* (Montagne) M. Howe, *Boodlea composita* (Harvey) F. Brand, *Caulerpa peltata* J.V. Lamoroux, *Enteromorpha intestinalis* (Linnaeus) Nees, *Ulva lactuca* Linnaeus. Red algae species found and successfully identified are *Acrocystis nana* Zanardini, *Acanthophora spicifera* (M. Vahl) Børgesen, Laurencia papilosa (C. Agardh) Greville, Actinotrichia fragilis (Forsskål) Børgesen, Galaxaura rugosa (J. Ellis & Solander) J.V. Lamoroux, Amphiora anceps (Lamark) Decaisne, Gelidiela acerosa (Forsskål) Feldmann & Hamel, Gracilaria canaliculata Sonder, Gelidiopsis intricata (C.Agardh) Vickers. Brown algae species found and identified are Lobophora variegata (J.V.Lamouroux) Womersley ex E.C.Oliveira, Padina minor Yamada, Sargassum crassifolium J. Agardh, Turbinaria ornata (Turner) J. Agardh. The species that classified as a new record in Indonesia are Cladophoropsis herpestica (Montagne) M. Howe and Gracilaria spinulosa (Okamura) Chang & B.M.Xia.

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