Influence of turbidity and water depth on carbon storage in seagrasses, *Enhalus acoroides* and *Halophila ovalis*

[1]Muhammad Halim, [2]Dietriech G. Bengen, [2]Tri Prartono

[1] Marine Science Postgraduate, Faculty of Fisheries and Marine Science, IPB University, Darmaga Bogor, West Java, Indonesia; [2] Departement of Marine Science and Technology, Faculty of Fisheries and Marine Science, IPB University, Rasamala, IPB Darmaga Bogor, West Java, Indonesia. Corresponding author: M. Halim, muhammad_halim@apps.ipb.ac.id

Abstract. Seagrass beds provide services such as a significant carbon sequestration in the sea. Environmental factors can determine organic carbon storage in seagrasses. We studied the influence of turbidity and water depth on organic carbon content in seagrasses, *Enhalus acoroides* and *Halophila ovalis* at Bintan Island, Indonesia. Sampling was carried out at three stations based on the variation of turbidity and water depth. Organic carbon content was analyzed using the loss on ignition (LOI) method with three calculation components (ash content, total organic matter (TOM), and carbon content). The highest organic carbon storage of *E.acoroides* found at Station 1 (68.19±1 g C m^{-2}) and the highest carbon storage of *H.ovalis* found at station 2 (8.75±1 g C m^{-2}). Based on statistical analysis with linear regression of organic carbon content in *E. acoroides* is influenced by turbidity (R^2=0.7732) and water depth (R^2=0.6737). Statistical analysis also showed that organic carbon in *H.ovalis* is influenced by turbidity (R^2=0.9640) and water depth (R^2=0.9892).These results show that variables of turbidity and water depth influenced the organic carbon content on seagrass. Organic carbon storage by *E. acoroides* and *Halophila ovalis* is the highest in conditions of low turbidity and water depth.

Key Words: Bintan Island, carbon sequestration, carbon sink, organic carbon, seagrass ecosystem.

Introduction. Climate change is an important issue caused by increasing by 1.6-1.9% per year the carbon dioxide content in the atmosphere (Solomon 2007). Efforts to reduce carbon dioxide in the atmosphere have been doing to keep off the global warming process below 2^{o}C (Macreadie et al 2017). Coastal ecosystem, such as salwater marsh, mangrove and seagrass provide services as carbon sink. The ecosystems have the capacity to absorb limitless carbon and store it for centuries in sediment (Mcleod et al 2011).

The seagrass ecosystem can reduce the impact of the increasing carbon dioxide concentration in the atmosphere on the climate change (Alongi 2007). Seagrass can absorb large quantities of carbon from the atmosphere and subsequently store them within the biomass and sediments (Fourqurean et al 2012; Rohr et al 2016). Seagrass ecosystem has an estimated sequestration rate of 50-60% organic carbon per year, with the burial average of ~83-133 g C m^{-2} year (Duarte et al 2013). Seagrass ecosystems on a global scale can store 27-44 Tg C/year (1Tg=10^{12}) of carbon or amount to 18% of total carbon storage in the ocean (Duarte et al 2005; Kennedy et al 2010; Rohr et al 2016).

Bintan Island, Indonesia, has 2,094 hectares of the seagrass ecosystem (Kuriandewa & Supriyadi 2006; Trismades 2008). Wahyudi et al (2016) estimated to 31,540.48 g C m^{-2} the carbon stock in the seagrass ecosystem at Eastern Bintan Island.

Turbidity and water depth can influence the carbon sequestration and carbon storage in seagrasses. Turbidity and water depth correlate with the light acceptance of seagrasses. Reduced light makes a negative effect on seagrass growth, which causes morphological adaptations and reduces biomass production (Xu et al 2011). Turbidity and water depth correlate with the light acceptance of seagrasses. Reduced light makes a negative effect on seagrass growth, which causes morphological adaptations and reduces biomass production (Xu et al 2011). *Enhalus acoroides* (large seagrass) and *Halophila ovalis* (small seagrass) have different levels of tolerance to different conditions of the aquatic environment. Therefore, this research aims to examine the influence of turbidity and water depth on the organic carbon storage in seagrasses, *E. acoroides* and *H. ovalis*. This study can provide information related to the impact of turbidity and water depth in determining the amount of organic carbon content in *E. acoroides* and *H. ovalis*.

Material and Method

Description of the study site. The research was conducted in three stations located at the East Coast, North Coast and West Coast of Bintan Island, Indonesia, with a distance between stations of ±40 km. The research stations were determined by considering the differences in their turbidity and water depth. Station 1, located at Trikora Beach, is a conservation area for seagrasses with low turbidity and low water depth. Station 2, located at Sakera Beach, is characterized by medium turbidity and the highest water depth amongst the three study stations. Station 3, located at Penyengat Island, is a small island near Tanjungpinang City, influenced by coastal activities specific to the port, fishery, and tourism. The conditions at Station 3 are characterized by high turbidity and medium water depth.

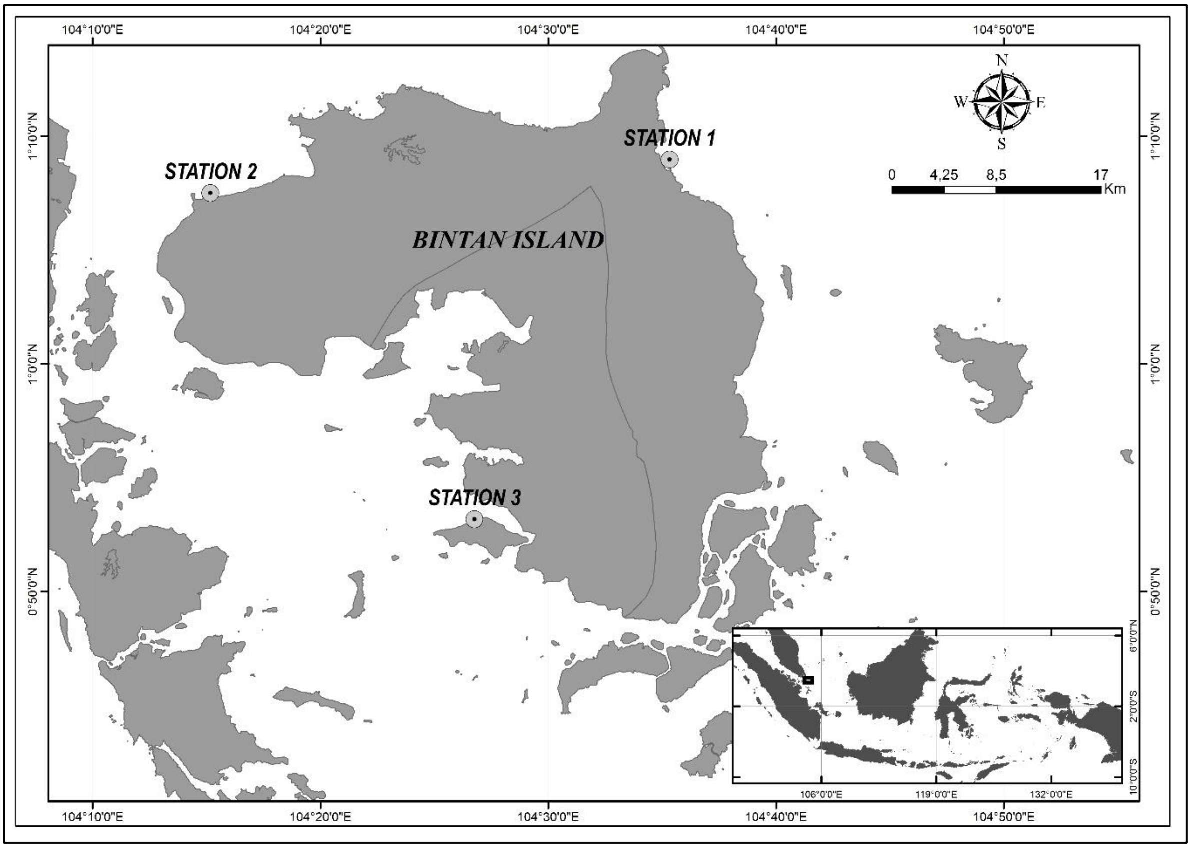

Figure 1. The location map of seagrass sampling of *Enhalus acoroides* and *Halophila ovalis* at Bintan Island, Indonesia.

Collection of seagrass samples. *E. acoroides* and *H. ovalis* collected at the same time as seagrass density observation. The seagrass samples were collected by using quadrat transect (50 cmx50 cm). Five seagrass samples with the best condition were collected and brought to the laboratory for more analysis (Rohr et al 2016). Seagrass samples were cleaned from epiphytes attached to the leaves by using freshwater and by scraping them with a knife. At the end, they were wind-dried, then inserted into plastic containers.

Water quality. Turbidity and water depth parameters were measured on site with a turbidity meter and a water depth gauge board, respectively. At each research station, measurements were done at three spots, at ±100 meters distance from each spot. Then, the turbidity and water depth were statistically analyzed.

Seagrass density. Seagrass density data was collected using the line transect method. Each research station is set by three lines transect with length 100 m, and the distance between line transect was 50 m, so that the total area is 100x100 m^2. The calculation of the seagrass stand was carried out in transect quadrats of 50 cmx50 cm.

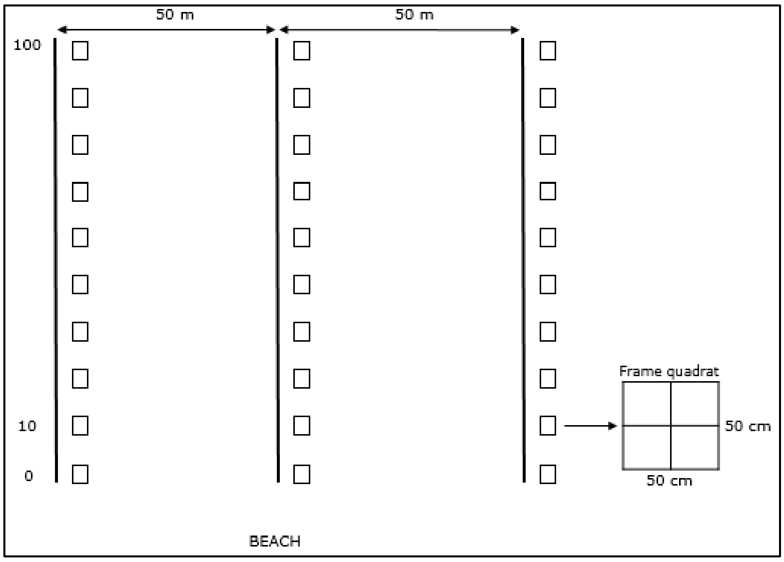

Figure 2. The sketch layout of quadratic transect for seagrass data collection at each research station (Rahmawati et al 2014).

Seagrass biomass. Seagrass biomass is the total quantity of dry weight of all parts of the seagrass. Estimation of seagrass biomass is divided into two parts, namely above-ground biomass (AGB), including leaves and midribs leaves, and below-ground biomass (BGB), including roots and rhizomes. Seagrass samples, AGB and BGB, were oven-dried at 60°C for 48 hours to obtain constant dry weight (Rohr et al 2016).

Estimation of carbon content. The organic carbon content in seagrass was analyzed by loss on ignition (LOI) method. The samples were burned using a muffle furnace at 550°C for 6 hours, then the results of ignition calculated to obtain the value of organic carbon content (Diyat et al 2015). The organic carbon content calculated with three components: ash content, total organic matter (TOM), and organic carbon content (Indriani et al 2017).

Data analysis. The seagrass species density was counted using the following formula (Supriadi et al 2014):

$$D = \frac{\sum n_i}{A} \qquad (1)$$

Where: D=seagrass species density (individual/m^2), n_i=amount of seagrass stands of species i, A=sampling area (m).

The seagrass biomass was counted using the formula (Graha et al 2016):

$$B = W \times D \qquad (2)$$

Where: B=seagrass biomass (g DW m^{-2}), W=dry weight (g), D=seagrass density (individuals/m^2).

The organic carbon content was counted using the formula (Helrich 1990):

$$\text{Ash content} = \frac{Z-X}{Y-X} x\ 100 \qquad (3)$$

$$TOM = \frac{[(Y-X)-(Z-X)]}{Y-X} x\ 100 \quad (4)$$

$$\text{Organic carbon content} = \frac{TOM}{1.724} \quad (5)$$

Where: X=container weight, Y=weight (container+sample), Z=weight (container+ash content), and 1.724 = standard formula (constant value of total organic carbon).

Statistical analysis. The influence of environmental variables such as turbidity and water depth on the organic carbon content in *E. acoroides* and *H. ovalis* seagrasses were analyzed with a linear regression model. Turbidity and water depth of are hypothesized as being the independent variables and the organic carbon content in seagrasses as the dependent variable. The statistical analysis was performed with the XLSTAT application.

Results. Station 3, at Penyengat Island, has the highest turbidity value compared to other stations. The average value of turbidity at Station 1, Station 2 and Station 3 is 18.62 NTU, 10.07 NTU, and 1.94 NTU, respectively. The deepest water depth was found at Station 2. The average value of water depth at Station 1, Station 2 and Station 3 is 1.67 meters, 2.67 meters, and 2.32 meters, respectively (Table 1).

Table 1

The turbidity (NTU) and water depth (m) values in the research sites (Station 1 in Trikora Beach, Station 2 in Sakera Beach and Station 3 in Penyengat)

	Station 1			*Station 2*			*Station 3*		
	Sub 1	Sub 2	Sub 3	Sub 1	Sub 2	Sub 3	Sub 1	Sub 2	Sub 3
Turbidity (NTU)	2.01	2.46	1.35	8.97	11.5	10.16	24.56	19.08	12.23
Water depth (m)	1.70	1.60	1.72	2.70	2.60	2.73	2.30	2.32	2.35

Seagrass density. Seagrass density of *E. acoroides* and *H. ovalis* at Station 1 is 12 individuals/m^2 and 37 individuals/m^2, respectively; at Station 2 it is 49 individuals/m^2 and 13 individuals/m^2, respectively; at Station 3 it is 19 individuals/m^2 for *E. acoroides,* but *H. ovalis* was not found. The observation results of seagrass species density at research sites are categorized as rare (25-75 individuals/m^2) and very rare (<25 individuals/m^2), based on the seagrass meadows status scale, according to Gosari & Haris (2012).

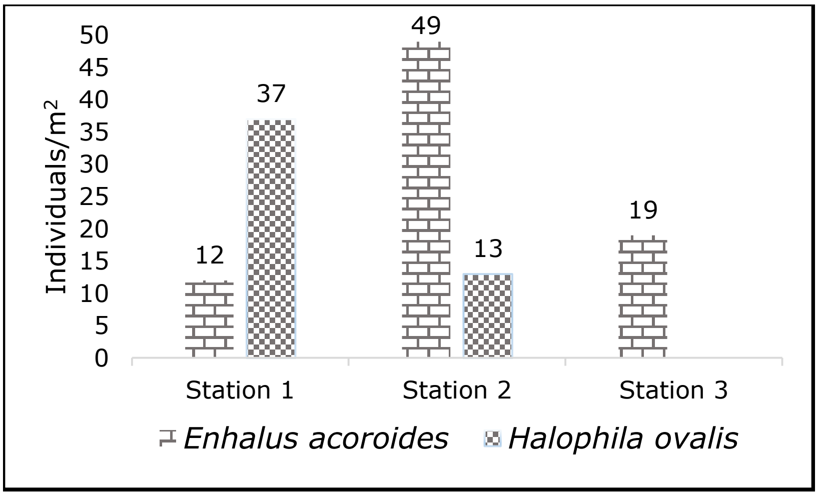

Figure 3. Density value of *Enhalus acoroides* and *Halophila ovalis* through filed observation.

Seagrass biomass. Seagrasses store biomass in the body organs and food reserve from photosynthesis. The total biomass of *E. acoroides* in three research sites about 49.47-436.64 g DW m^{-2} (Table 2). The biomass value is insignificantly different from the results by Duarte & Chiscano (1999) which is 72-392.4 g DW m^{-2}. Total biomass of *H. ovalis* about 12.43-13.09 g DW m^{-2} (Table 2). The results are lower compared with the research of Duarte & Chiscano (1999), reporting values between 21.1-54.8 g DW m^{-2} and Xu et al (2011) at Guangxi, China about 17.38-37.62 g DW m^{-2}.

Table 2

Biomass value (g DW m^{-2}) *Enhalus acoroides* and *Halophila ovalis* seagrasses in above-ground biomass (AGB), below-ground biomass (BGB), and total biomass (AGB+BGB).

Location	*Species*	*Above ground biomass (AGB) (g DW m^{-2})*	*Below ground biomass (BGB) (g DW m^{-2})*	*Total biomass (AGB+BGB) (g DW m^{-2})*
Station 1	*Enhalus acoroides*	169.40	267.23	436.64
Station 1	*Halophila ovalis*	5.29	7.14	12.43
Station 2	*Enhalus acoroides*	27.91	119,16	147.07
Station 2	*Halophila ovalis*	5.87	7.23	13.09
Station 3	*Enhalus acoroides*	18.54	30.93	49.47
Station 3	*Halophila ovalis*	-	-	-

Organic carbon content in seagrass. Estimation of the organic carbon content in seagrasses is divided into the organic carbon content in above-ground biomass (AGB), the organic carbon content in below-ground biomass (BGB) and total organic carbon (AGB+BGB). The results showed that the organic carbon content storage in *E. acoroides* and *H. ovalis* seagrasses in BGB is higher than the organic carbon content in AGB (Figure 4).

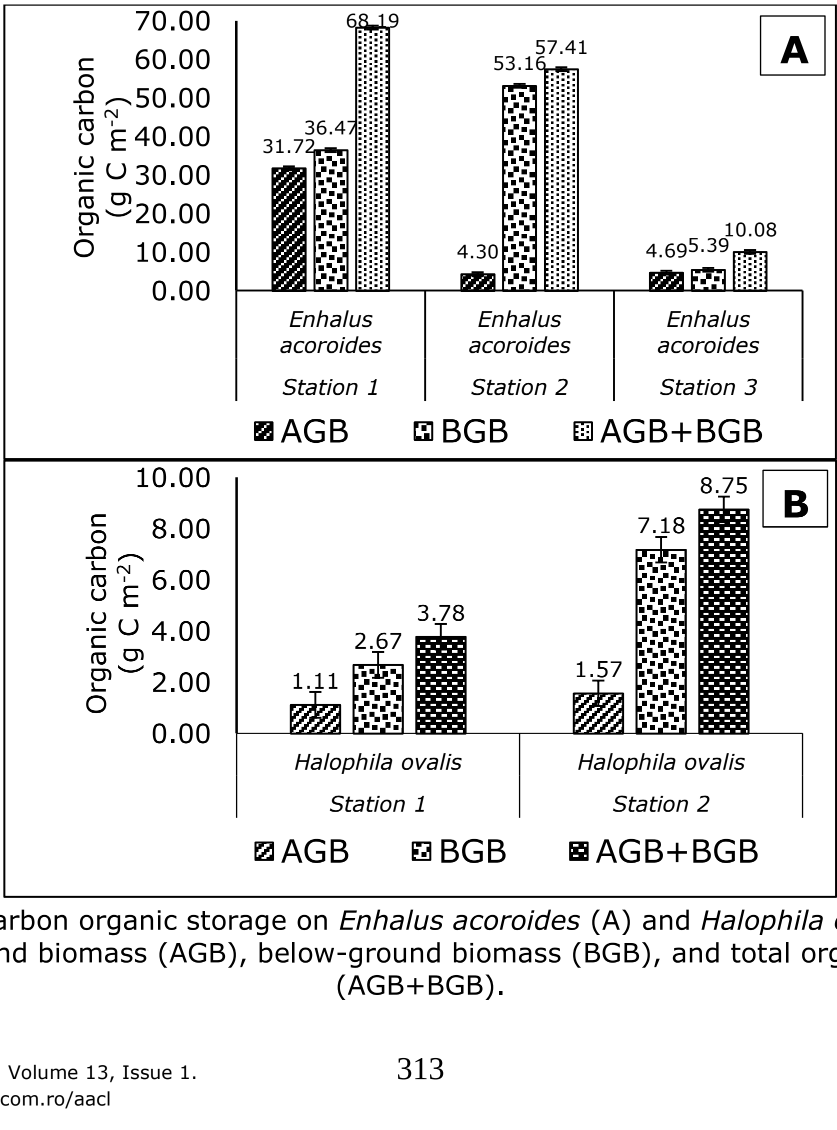

Figure 4. Carbon organic storage on *Enhalus acoroides* (A) and *Halophila ovalis* (B) in above-ground biomass (AGB), below-ground biomass (BGB), and total organic carbon (AGB+BGB).

The total organic carbon of *E. acoroides* from the highest to the lowest is: Station 1 about 68.19±1 g C m^{-2}, Station 2 about 57.41±1 g C m^{-2} and Station 3 about 10.08±1 g C m^{-2}. The highest total organic carbon of *H. ovalis* at Station 2 about 8.75±1 g C m^{-2}, Station 1 about 3.78±1 g C m^{-2}, and *H. ovalis* not found in Station 3 (Figure 4).

Influence of turbidity and water depth on seagrass organic carbon content. Based on statistical analysis with linear regression of organic carbon content in *E. acoroides* influenced by turbidity (R^2=0.7732 and p-value=0.0018) and water depth (R^2=0.6737 and p-value=0.0067). Statistical analysis also showed that organic carbon in *H. ovalis* influenced by turbidity (R^2=0.9640 and p-value=0.0005) and water depth (R^2=0.9892 and p-value=<0.0001).

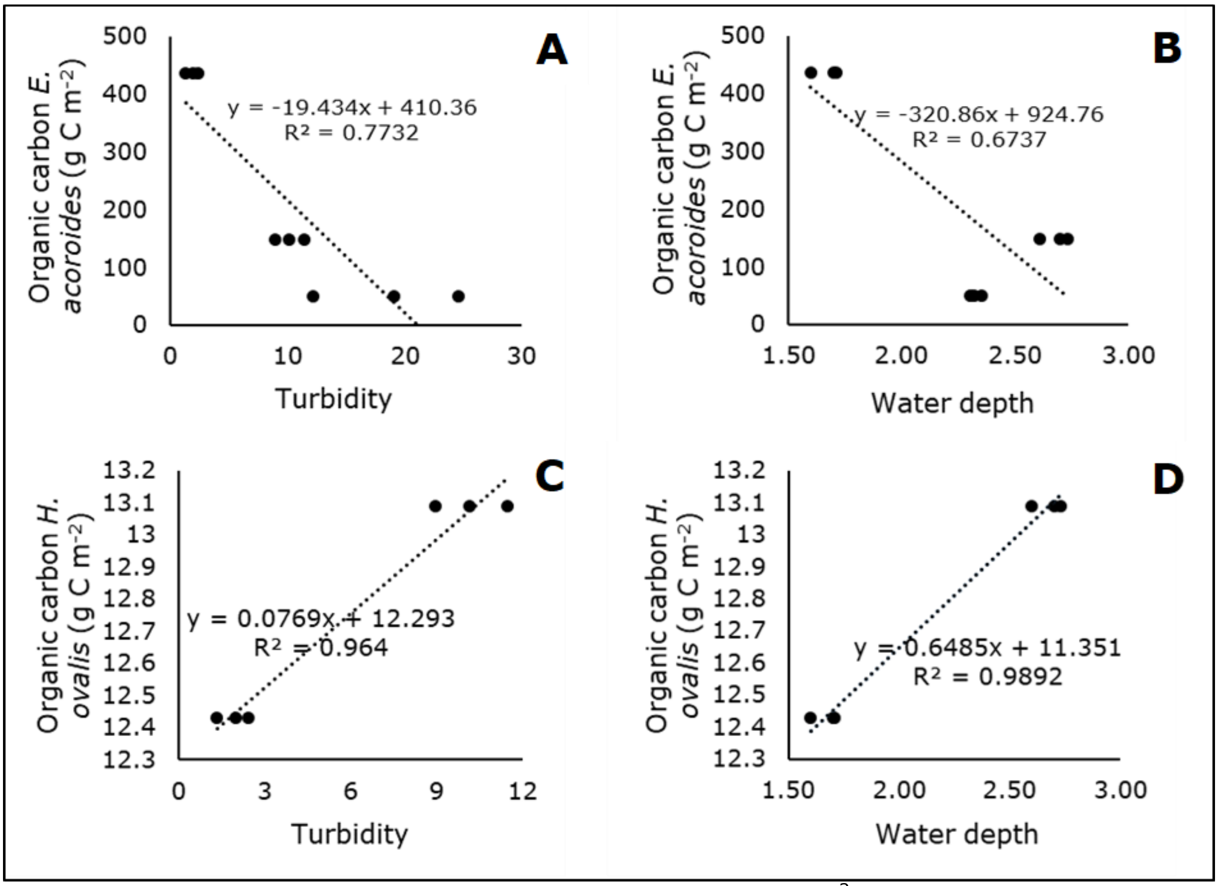

Figure 5. Correlation between organic carbon content (g C m^{-2}) in *Enhalus acoroides* and *Halophila ovalis* seagrasses with turbidity (A and C) and water depth (B and D).

Discussion. Turbidity and water depth are the limiting factors that determine the capacity of carbon dioxide absorbtion by seagrass with the photosynthesis process, due to the correlation of these factors to the penetration of sunlight, proved by the results of the statistical regression analysis between organic carbon content in *E. acoroides* and *H. ovalis* seagrasses with turbidity and water depth in Figure 5. Seagrasses that grow in waters with minimal sunlight will lower the shoot size and leaves total surface. Their photosynthesis rate will be reduced, which influences the carbon dioxide absorbtion capacity of seagrass leaves (Ruiz & Romero 2003; Xu et al 2011).

Seagrass density field observation of *E. acoroides* and *H. ovalis* allowed their categorization in "rare" and "very rare" (Figure 3), in comparison with other dominating seagrass species at Station 1 and Station 2. At Station 3, only *E. acoroides* were found, probably because the water conditions do not allow the growth of other seagrass species. The high turbidity value lowers the sunlight penetration, needed for the seagrass photosynthesis at the bottom of waters, consequently decreasing the diversity of seagrass species. According to Sidik et al (2010), the abundance of seagrasses in an area is controlled by the environmental conditions, including the penetration of sunlight, which is the most critical limiting factor.

The highest *E. acoroides* biomass value occured at Station 1, which has a low density of *E. acoroides*. These results showed that seagrass biomass is not only determined by seagrass species density. Morphological factors, such as the size of leaf, rhizome, and root, determine the value of seagrass biomass. In addition, the age differences between the *E. acoroides* plants also determine the quantity of biomass, inducing a variability in the seagrass organs growth (Jhonstone 1979). Despite its low density, the highest *H. ovalis* biomass amount was reported at Station 2, due to broader leaves and rhizomes, storing more carbohydrates as an adaptation to the decrease of the sunlight penetration with the water depth.

The *E. acoroides* biomass in BGB productivity is higher than in AGB (Table 2),due to the extensive size of root and rhizome and to their root hairs. In addition, *E. acoroides* biomass can grow for a long time without disturbance from external factors, due to the ability of *E. acoroides* root and rhizome to penetrate and attach to deeper sediment layers and (Duarte & Chiscano 1999). *H. ovalis* biomass storage in BGB is higher than in AGB (Table 2). The result of this study is similar to the result of Razalli et al (2011) research, where the *H. ovalis* biomass in BGB amounts about 53-56% of the total biomass of *H. ovalis*. The storage in BGB is higher because the *H. ovalis* rhizome can grow larger and longer than other body parts.

The values of organic carbon content in *E. acoroides* and *H. ovalis* were different at the three research stations (Figure 4). *E. acoroides* growing at stations with low turbidity and low water depth has higher carbon organic content, correlated with a higher intensity of sunlight acceptance by the seagrass leaves, which optimizes the photosynthesis process. Consequently, *E. acoroides* will produce larger shoots and will store more carbohydrates in the root and rhizome. Both of these are indicators of a high level of carbon storage (Ruiz & Romero 2003).

On the other hand, the organic carbon content in *H. ovalis* was higher at stations with high turbidity and high water depth which is at Station 2 (Figure 4). The limited sunlight for photosynthesis, due to the high turbidity and high water depth, will trigger a morphological adaptation response from *H. Ovalis,* such as increasing canopy height, and also a physiological adaptation, such as increasing its chlorophyll content (Abal et al 1994) for capturting sufficient sunlight to support photosynthesis process. In addition, carbon sequestration of *H. ovalis* that grows in waters with limited sunlight will be stored rather in the rhizome, in the form of carbohydrates, than in larger grown shoots (Longstaff et al 1999).

The capacity of organic carbon storage by *E. acoroides* and *H. ovalis* is higher in roots and rhizomes (BGB) than in leaf and leaf midrib (AGB). Seagrass root is an important component for the carbon storage, 50% of the carbon resulting from the photosynthesis being stored in the roots, while the rhizome stores only 25-35% (Duarte et al 1998; Kaldy & Dunton 2000).

Conclusions. There were variations of organic carbon storage values in *E. acoroides* and *H. ovalis* seagrasses, at three research stations from Bintan Island, which can be r related to the influence of environmental variables such as turbidity and water depth on the seagrass habitat. The organic carbon storage of *E. acoroides* was higher at the station with low turbidity and low water depth and organic carbon storage of *H. ovalis* was higher at the station with high turbidity and high water depth.

Acknowledgements. We thank the assistant of Chemical Laboratory, Raja Ali Haji Maritime University (UMRAH), Tanjungpinang for permitting and helping us to use the laboratory facilities. Thanks to Marine Sciences students at UMRAH: Alfon, Ica, Rudi, and Widya for their assistance during the data collection in the field.

References

Abal E. G., Loneragan N., Bowen P., Perry C. J., Udy J. W., Dennison W. C., 1994 Physiological and morphological responses of the seagrass *Zostera capricorni* Ashers, to light intensity. Journal of Experimental Marine Biology and Ecology 178:113–129.

Alongi M. D., 2007 Mangrove forests: Resilience, protection from tsunamis, and responses to global climate change. Estuarine, Coastal and Shelf Science 76:1-13.

Diyat J. W., Sri Y. W., Muslim, 2015 [Distribution of total phosphate and carbon organic content in the Estuary Banjir Kanal Timur, Semarang]. Journal Oceanografi 4(1):55-63. [In Indonesian].

Duarte C. M., Chiscano C. L., 1999 Seagrass biomass and production: a reassessment. Aquatic Botany 65:159–174.

Duarte C. M., Kennedy H., Marba N., Hendriks I., 2013 Assessing the capacity of seagrass meadows for carbon burial: Current limitations dan future strategies. Ocean and Coastal Management 83:32-38.

Duarte C. M., Middelburg J. J., Caraco N., 2005 Major role of marine vegetation on the oceanic carbon cycle. Biogeosciences 2:1–8.

Duarte C. M., Merino M., Agawin N. S. R., Uri J., Fortes M. D., Gallegos M. E., Marba N., Hemminga M. A., 1998 Root production dan belowground seagrass biomass. Marine Ecology Progress Series 171:97-108.

Fourqurean J. W., Duarte C. M., Kennedy H., Marba N., Holmer M., Mateo M. A., Apostalki G. A., Kendrick E. T., Krause-Jensen D., McGlathery K. J., Serrano O., 2012 Seagrass ecosystem as a globally significant carbon stock. Nature Geoscience 5:505-509.

Graha Y., Arthana I. W., Astawa-Karang I. W. G., 2016 [Carbon storage in seagrass meadows of Sanur Beach region, Denpasar City]. Journal of Environmental Science 10(1):46–53. [In Indonesian].

Gosari B. A. J., Haris A., 2012 [Study of seagrass density and seagrass cover in Spermonde Islands]. Journal Ilmu Kelautan and Perikanan 22(3):156–162. [In Indonesian].

Helrich K., 1990 Official methods of analysis of the association of official analytical chemists. Arlington VA: The Association, Virginia, 771 p.

Indriani, Wahyudi A. J., Yona D., 2017 [Carbon stock in the seagrass meadows at coastal of Bintan Island, Riau Islands]. Oseanologi and Limnologi in Indonesia 2(3):1-11. [In Indonesian].

Jhonstone I. M., 1979 Papua New Guinea seagrasses and aspects of the biology dan growth of *Enhalus acoroides* (L. f.) Royle. Aquatic Botany 7:197-208.

Kaldy J. E., Dunton K. H., 2000 Above- and below-ground production, biomass dan reproductive ecology of *Thalassia testudinum* (turtle grass) in a subtropical coastal lagoon. Marine Ecology Progress Series 193:271-28.

Kennedy H., Beggins J., Duarte C. M., Fourqurean J. W., Holmer M., Marba N., Middelburg J. J., 2010 Seagrass sediment as a global carbon sink: Isotopic constraints. Global Biogeochemical Cycles 24:GB4026.

Kuriandewa T. E., Supriyadi I. H., 2006 Seagrass mapping in East Bintan coastal area, Riau Archipelago, Indonesia. Coastal Marine Science 30(1):154–161.

Longstaff B. J., Loneragan N. R., O'Donohue M. J., Dennison W., 1999 Effects of light deprivation on the survival and recovery of the seagrass *Halophila ovalis* (R.Br.) Hook. Journal of Experimental Marine Biology and Ecology 234:1-27.

Macreadie P. I., Nielsen A. D., Kelleway J. J., Atwoods T. B., Seymour J .R., Petrou K., Connolly R. M., Thomson A. C. G., Trevathan-Tackett S. M., Ralph P. J., 2017 Can we manage coastal ecosystems to sequester more blue carbon? Frontiers in Ecology and the Environment 15(4):206–213.

Mcleod E., Chmura G. L., Bouillon S., Salm R., Björk M., Duarte C. M., Lovelock C. E., Schlesinger W. H., Silliman B. R., 2011 A blueprint for blue carbon: toward an

improved understanding of the role of vegetated coastal habitats in sequestering CO2. Frontiers in Ecology and the Environment 9(10):552–560.
Rahmawati S., Irawan A., Supriyadi I. H., Azkab M. H., 2014 [Seagrass Monitoriong Guidelines]. Hutomo M., Nontji A. (eds), Coremap CTI LIPI, Jakarta. [In Indonesian].
Razalli N. M., Pen T. C., Syukri M., Yusof M., Mohamed J., Hwai T. S., Yasin Z., Abdullah A. L., 2011 Distribution and biomass of *Halophilla ovalis* (R. Brown) Hook. f. at Pulau Gazumbo, Penang, straits of Malacca. Publications of the Seto Marine Biological Laboratory 41:71-76.
Rohr M. E., Bostrom C., Canal-Vergés P., Holmer M., 2016 Blue carbon stocks in Baltic Sea eelgrass (*Zostera marina*) meadows. Biogeosciences 13(22):6139-6153.
Ruiz J. M., Romero J., 2003 Effects of disturbances caused by coastal constructions on spatial structure, growth dynamics dan photosynthesis of the seagrass *Posidonia oceanica*. Marine Pollution Bulletin 46:1523–1533.
Sidik J. B., Harah Z. M., Fakhrulddin I. M., Anuar M. S. K., Arshad A., 2010 Growth performance of Malaysian's spoongrass, *Halophila ovalis* (R.Br.) Hooker f. under different substrate, salinity and light regime. Coastal Marine Science 34(1):103–107.
Solomon S., 2007 Climate change: The physical science basis: working group I contribution to the fourth assessment report of the IPCC. Cambridge University Press, 43 p.
Supriadi, Kaswadji R. F., Bengen D. G., Hutomo M., 2014 Carbon stock of seagrass community in Barranglompo Island, Makassar. Journal Ilmu Kelautan 19(1):1–10.
Wahyudi A. J., Rahmawati S., Prayudha B., Iskandar M. R., Arfianti T., 2016 Vertical carbon flux of marine snow in *Enhalus acoroides* dominated seagrass meadows. Regional Studies in Marine Science 5:27–34.
Xu N. N., Tong X., Tsang P. K. E., Deng H., Chen X. Y., 2011 Effects of water depth on clonal characteristics dan biomass allocation of *Halophila ovalis* (*Hydrocharitaceae*). Journal of Plant Ecology 4(4):283-291.
*** Trismades, 2008 Trikora seagrass management demonstration site. Coremap 2008-2011, Jakarta, Indonesia.

Received: 12 October 2019. Accepted: 03 February 2020. Published online: 17 February 2020.
Authors:
Muhammad Halim, IPB University, Faculty of Fisheries and Marine Science, Marine Science Postgraduate Student, Darmaga, Bogor, Indonesia, e-mail: muhammad_halim@apps.ipb.ac.id
Dietriech G. Bengen, IPB University, Faculty of Fisheries and Marine Science, Departement of Marine Science and Technology, Darmaga, Bogor, Indonesia, e-mail: dieter@indo.net.id
Tri Prartono, IPB University, Faculty of Fisheries and Marine Science, Departement of Marine Science and Technology, Darmaga, Bogor, Indonesia, e-mail: triprartono@gmail.com

How to cite this article:
Halim M., Bengen D. G., Prartono T., 2020 Influence of turbidity and water depth on carbon storage in seagrasses, *Enhalus acoroides* and *Halophila ovalis*. AACL Bioflux 13(1):309-317.