C29

by Abdul Syukur

Submission date: 26-Aug-2020 10:03AM (UTC+0700)
Submission ID: 1374181802
File name: 10..pdf (351.6K)
Word count: 2698
Character count: 15045

The International Seminar on Tropical Natural Resources Mataram University, 10 June – 12 June 2015

Environmentally friendly fish farming and seagrass conservation as an instrument of economics development of small-scale fishermen in coastal waters of Tanjung Luar East Lombok

By

Abdul Syukur[1*], Mahrus[1], Syachruddin AR[1]

[1] Department of Sciences Education, Faculty of Teacher Training and Education, Mataram University, Indonesia;
Jalan Majapahit No 56 Mataram Nusa Tenggra Barat; Phone: +62 370 623873
*Corresponding author: Abdul Syukur - Email: syukur_unram@ymail.com; Phone: +62 87870422392

Abstract

Seagrass conservation aims to protect the seagrass existence value from ecological, economic and social aspects. The focus of this research is diversity of economically valuable fish as a seed source of environmentally friendly fish farming in sustainable manner. Fish data collecting is done by using mini purse seine and stationary lift net. Moreover, it was conducted indepth interview with fishermen to determine the economically valuable fish to be cultivated. Data analysis was done by using descriptive statistical analysis method. The results showed that the number of juvenile fish obtained by using a mini purse seine from high to low is Lutjanidae, Haemulidae, Siganidae, Mugilidae, and Mullidae, whereas the fish that is obtained using by a stationary lift net is Siganidae, Lutjanidae, Haemulidae, Mullidae, and Mugilidae respectively. The results of interviews with fishermen showed fish kind that is most easily found and acquired from around seagrass area is Siganidae as a herbivorous fish only. Based on these results it can be concluded that fish seed for environmentally friendly fish farming is a reasonably available and it can be developed to increase the income of small-scale fishermen. In this case, the seagrass conservation value of the ecological aspect is the essential part of the survival of economically valueable fishes to support the sustainability of environmentally friendly fish farming in the study area.

Keywords: economically valuable fish, environmentally friendly, conservation, seagrass

I. Introduction

The function of ecological systems of seagrass beds in the coastal areas is a place of juvenile fish maintenance (Orth *et al*., 2003). Species of juvenile fish in seagrass beds is : *Haemulon flavolineatum, H. Sciurus, Ocyurus chrysurus, Acanthurus chirurgus* and *Sparisoma viride* (den Hartog *et al*., 2000). In addition, seagrass beds is used by fish for foraging (Livingston, 1982), such as coral reef

fish (Sano *et al*., 2003; Baochon and Louis, 2009). Seagrass beds also as a fish habitat more than one species, namely: *Lutjanus monostigmaand* and *Parupeneus barberinus*, and more than 20% of the economically valuable fish species use more than one habitat in its life cycle (Fortes *et al*., 2013). Other indicators of the ecological function of seagrass is to nourish the coral reefs and serves to support the fish resources sustainability (Ruseler *et al*., 2008).

Value of seagrass existence that is critical to the sustainability of fish resources have been much degraded and even disappear from the scale-square meter up to hundreds of square kilometers (Willams *et al*., 2006). For example, from 21.023 ha of seagrass has been lost based on 45 case studies in all the world (Lewis and Erftemeijer, 2006) and accelerate the rate of seagrass damage globally reached 3.7%/year up to 5.5% - 8.0% since 1980 (Duarte and Dannision, 2009). Seagrass degradation threat comes from anthropogenic factors and global climate change, but the factors of a grazing and poor environmental conditions are other source of seagrass degradation (Weil *et al*., 2014). The existence of seagrass in the coastal waters of Indonesia suffered many damage as a result of the increased anthropogenic activities in coastal areas (Asmus *et al*., 2012). One indicator of destruction of seagrass in the study area and threaten the fisheries resources sustainability potentially is the sum of the biomass values of seagrass that are still in the mass of broken growth of 107,672 g wet weight/day due to the exploiting of marine resources using an environmentally unfriendly manner (Syukur *et al*., 2011).

Seagrass degradation globally has a negative impact on the preservation of biodiversity, being inspiration for many biologists and conservation, and should become a priority especially in the Indo-Pacific (Unsworth *et al*., 2010). Other important argument is the seagrass beds conservation is a key of economics sustainability for coastal fisheries (Espino *et al*., 2014). Conservation of seagrass with restoration methods can increase fish biomass of 0.98 kg/m2/year equivalent to US$ 230,000/ha/year with a return potency of US$ 629,000/ha in less than five-year (zu Ermgassen and Blandon, 2014). Therefore, seagrass conservation through eco-friendly fish farming can be a conservation strategy in order to improve the economy of small-scale fishermen in coastal areas of Tanjung Luar East Lombok.

II. Materials and Methods

This paper is part of research on seagrass conservation through environmentally friendly fish farming to increase the income of small fishermen in the coastal areas of Tanjung Luar East Lombok. The geographical position of research area is 116°37'-116°45' east longitude and 8°17'- 8°18' latitude south (Figure 1). Descriptions of this paper focus on the diversity of economically valueable juvenile fish associated with seagrass. Collecting fish data is done by two ways, namely using a mini trawling and stationary lift net. Netting standard of mini trawl had ever been used according to location condition of study area has characteristics of length size 70 m, mesh wings size 1.25 inches, 1 inch, 0.75 inch, and 0.625 inch and 0.5 inch bag nets (Syukur, *et al*., 2012). Data were collected from February to March 2015. Besides collecting data through interviews with fishermen about the opportunities of economically important fish seed availability in study areas to support the sustainability of environmentally friendly fish farming. Data analysis used descriptive statistical analysis method and economically important fish species identified using guide from Tsukamoto *et al*. (1997).

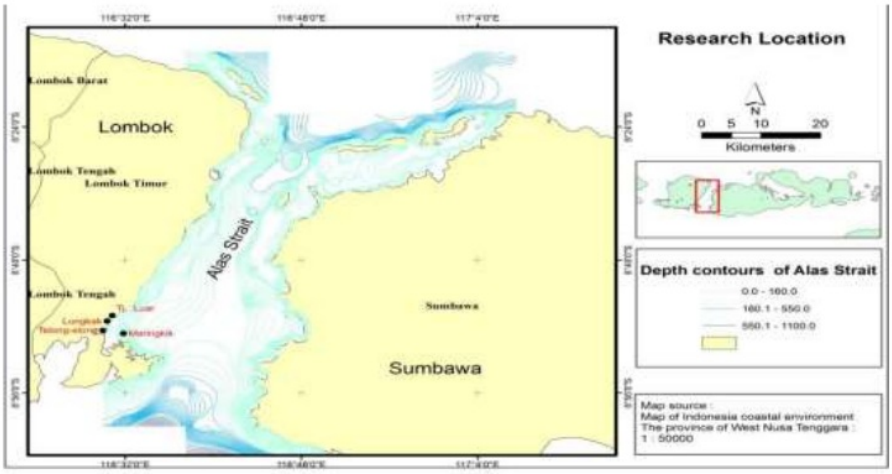

Figure 1. Research Location

III. Results and Discussion

3.1. Family of economically valueable fish and seagrass conservation

Economically important fish families that have been identified during the research are: Siganidae (Rabbitfishes), Mugilidae (Mullets), Lutjanidae (Snappers), Haemulidae (Grants, sweetlips) and Mullidae (Goatfihes). Composition of the number of individuals of economically valueable juvenile fish obtained by using mini trawl (Figure 2) and the composition of the economically important fish individuals obtained using stationary lift net (Figure 3).

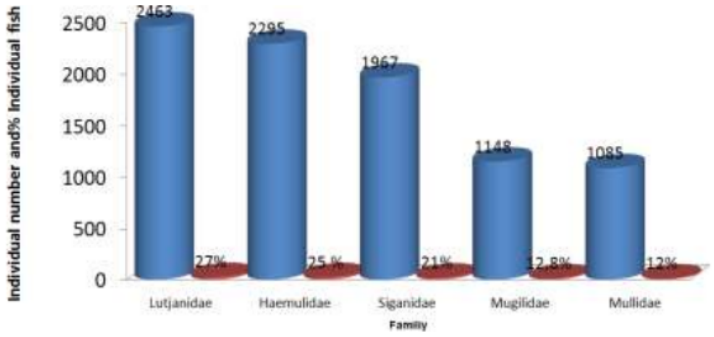

Figure 2. Number of individual fish obtained using mini trawl

Composition number of economically valuable juveniles fish obtained by using mini trawling and stationary lift net can be an indicator of the ecological function of seagrass to the sustainability of economically important fish. In this case the area of seagrass beds in study area has a very important value from the aspect of conservation including a comprehensive value, sufficiency and representative. Value comprehensively describes the ability of a conservation area fully for the conservation of biodiversity, (2) the adequacy illustrates a potency of conservation area from the whole geographical area for the sustainability of the species and ecological communities, and (3) representative acreage demonstrates the ability to ensure adequate conservation of a number of individuals and species which can survive in the long term (Jelbart *et al*., 2008). The next, area standard of conservation for sustainable fish resources is quite diverse describing that representative area to maintain fish stocks ranged between 20-30% (Possingham *et al*., 2005), larval fish at least 40% (Gladstone, 2007).

Five families of economically important fish in the study area has a dependency form with seagrass. Dependency value of fish with seagrass is as fish meal directly and a place looking for foods. Syukur *et al*. (2014) reported that some of economically important fish families found in the location of seagrass beds in coastal waters territorial of Tanjung Luar such as: a fish family of Siganidae feeding seagrass and algae, Lutjanidae meals is small fish, fish larvae and shrimp, foods for Haemulidae is small fish and crabs, shrimp for Mullidae, small fish and shrimp for Mugilidae family. This is a evidence that seagrass beds provide the fish food diversities. Therefore, the type of fish that have dependencies with seagrass in seagrass location directly can be used as an indicator for conserving seagrass in the study area.

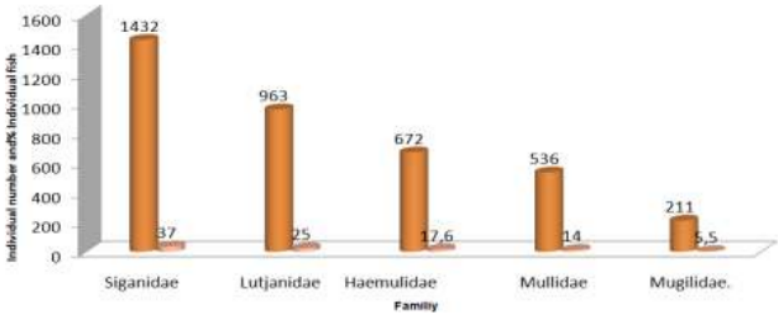

Figure 3. Number of individual fish obtained using stationary lift net

3.2. Sustainable aquaculture

Seagrass conservation as an instrument of increasing income of small- scale fishermen can be effective when a group of small-scale fishermen gets benefit from conservation efforts. One form of fishing activities which mutual support with seagrass conservation efforts in the study area is an environmental friendly cultivating. In this respect, environmental friendly aquaculture that has economics value significantly as complement of fishery business and can develop into a major source of sustainable livelihood (Perez *et al*., 2012). From interviews with fishermen groups of farming 5 species of economically important fishes obtained through mini trawl (Figure 2) and stationary lift net (Figure 3) can be cultivated by using floating fish cage in the study area.

Types of fish chosen by fishermen groups of farming is family-Siganidae. It is quite rational because Siganidae fish species is a herbivorous fish. Direct value obtained by a fishermen groups for farming environmentally friendly is increasingly highly activities that have economics value. Furthermore, to achieve the goal of environmental friendly farming can be an instrument of economic development with a group of small-scale fishermen by using a cooperative approach. This approach was chosen because of small-scale fishermen has a cooperation habit in groups as a single working unit for fishermen in catching fishes (Basurto *et al*., 2013). An other thing that is very important is the result of a cooperative approach can accommodate differences among members as a force in achieving a common goal. Cooperative approach has advantages as a community empowerment approach because it has properties as follows: (1) participative, (2) coordinative, (3) collaborative and (4) consultative (Wright *et al*., 2006). The results of cooperative approach obtained indicators of sustainable cultivation environmentally friendly sourced from small-scale fishermen in the study area are: (1) fish seeds of environmentally friendly aquaculture can be found from the surrounding environment, (2) fish seeds always available for propagation, (3) fish foods can be obtained from the environment, especially for Siganidae family (4) marketable and has a high economic value and (5) a new income source for small- scale families's fishermen

IV. Conclusion

Seagrass protection from the threat of sustainable damage in study area can be done through conservation and environmentally friendly cultivation for economically *valueable* fishes. Seagrass conservation can guarantee the economics sustainability of small-scale fishermen in the long term and economically important fish farming can be a new source of income for small- scale fishermen. Therefore conservation of seagrass and economically important fish farming can be an instrument of environmental friendly policy in improving the economic status of small-scale fishermen in the study area.

References

Asmus H, Nadiarti, Etty Riani, Ita Djuwita, Sugeng Budiharsono dan Ari Purbayanto. 2012. Challenging for seagrass management in indonesia. *Journal of Coastal Develpopment*, 15 (3): 234-242

Baochon C and Louis M. 2009. Mangrove and seagrass beds as feeding areas for fishes of commercial interest in a Caribbean Island. *Proceeding of The 62hd Gulf and Caribbean Fisheries Institut*, Nopember 2 – 6: 24-29.

Basurto, X, Bennett, Weaver A. H, Rodriguez-Van-Dyck, S. and Aceves-Bueno, J-S. 2013. Cooperative and noncooperative strategies for small-scale fisheries' self-governance in the globalization era: implications for conservation. *Ecology and Society* 18 (4): 38.

den Hartog C, Nagelkerken I, van der Velde G , Gorissen M. W , Meijer G. J and van't Hof T. 2000. Importance of Mangroves, Seagrass Beds and the Shallow Coral Reef as a Nursery for Important Coral Reef Fishes, Using a Visual Census Technique. *Estuarine, Coastal and Shelf Science*. 51, 31- 44.

Duarte C.M and Dannision W.C. 2009. Global loss of coastal habitats rates, causes and consequences and Global trajectories of seagrasses, the biological sentinels of coastal ecosystems. Fundation BBVA, 91-108.

Espino F, Tuya and Haroun R. 2014. Economic assessment of ecosystem services: Monetary value of seagrass meadows for coastalfisheries. Ocean & Coastal Management, 96: 181-187

Fortes M. D, Honda K, Nakamura Y, Nakaoka M and Wilfredo H. U. 2013. Habitat Use by Fishes in Coral Reefs, Seagrass Beds and Mangrove Habitats in the Philippines. *PLoS ONE*, 8(8), 1-10.

Gladstone W. 2007. Requirements for marine protected areas to conserve the biodiversity of rocky reef fishes. *Aquatic Conservation Marine and Freshwater Ecosystems* 17: 71 – 87.

Jelbart J, Mohammad RS dan William G. 2008. The effectiveness of seahorses and Pipefish (Pisces : Syngnathidae) as a flagship group to evaluate the conservation value of estuarine seagrass beds. *Aquatic Conservation Marine and Freshwater Ecosystems*. (www Interscience Wiley). DOI : 10.1002/aqc. 1009.

Lewis R.R.R and Erftemeijer P.L.A. 2006. Environmental impacts of dredging on seagrasses: A review. *Marine Pollution Bulletin* . 52: 1553–1572.

Livingston R.J. 1982. Trophic organisation of fishses in a coastal seagrass system. Marine Ecology-Progress Series. 7, 1-12.

Orth R.J, Heck Jr K.L and Hays G. 2003. Critical evaluation of the nursery role hypothesis for seagrass meadows. Marine Ecology Progress series, 253: 123–136.

Perez, M.L, Pido M.D, Garces L.R. dan Salayo N.D. 2012. Towards Sustainable Development of Small-Scale Fisheries in the Philippines: Experiences and Lessons Learned from Eight Regional Sites. *WorldFish*. Penang, Malaysia.

Possingham HP, Simon AB dan Greg AS. 2005. Intertidal habitat conservation: identifying conservation targets in the absence of detailed biological information. *Aquatic Conservation Marine and Freshwater Ecosystems* 15: 271 – 288.

Ruseler S.M, Marieke C.V, Nagelkerken I and Hans I. 2008. Seagrass nurseries contribute to coral reef fish populations. Limnology *Oceanography*. 53(4), 1540–1547.

Sano M, Nakamura, Y Horinochi, M and Nakai T. 2003. Food habits of fishes in a seagrass on a fringing coral reef at Iriomote Island, southern Japan. *Ichthyological Research*. 50, 15-22.

Syukur A, Yusli W, Mukhsin I dan Kamal M.M. 2011. Keragaman Jenis Lamun dan Kondisinya di Perairan Tanjung Luar Lombok Timur. *Biologi Trofis*. 12 (2): 1-11.

Syukur A, Yusli W, Mukhsin I dan Kamal M.M. 2012. Desain konservasi Lamun untuk keberlanjutan sumberdaya ikan di Tanjung Luar Lombok Timur. *Disertasi*. Institut Pertanian Bogor (IPB). Bogor Jawa Barat.

Syukur A, Yusli W, Mukhsin I dan Kamal M.M. 2014. Status trofik ikan yang berasosiasi dengan lamun di Tanjung Luar Lombok Timur. *Biologi Trofis*. 14 (2): 162-170.

Tsukamoto K, Keiichi M dan Kurnaen SO. 1997. *Fiel Guide to Lombok Island*: *Identification Guide to Marine Organisms In Seagrass Beds Lombok Island*.Ocean Research Institut University of Tokyo pp. 445.

Unsworth, R. K. F., Cullen, L. C., Pretty, J .N., Smith, D. J . & Bell, J . J . 2010 . Economic and subsistence values of the standing stocks of seagrass fisheries:Potential benefits of no-fishing marine protected area management. Ocean and Coastal Management, 53, 218–224.

Weil E, Brigitta I. van Tussenbroek, Jorge Corte ´s, Rachel Collin, Ana C. Fonseca, Peter M. H. Gayle, Hector M. Guzma, Gabriel E. Ja ´come, Rahanna Juman,, Karen H. Koltes, Hazel A. Oxenford, Alberto Rodrı´guez- Ramirez, Jimena Samper-Villarreal, Struan R. Smith, John J. Tschirky. 2014. Caribbean-Wide, Long-Term Study of Seagrass Beds Reveals Local Variations, Shifts in Community Structure and Occasional Collapse. *PLOS ONE*, 9: 1-13.

Willams S.L, Michelle Waycotta, , Carlos M. Duarte , Tim J. B. Carruthers , Robert J. Orth , William C. Dennison , Suzanne Olyarnik , Ainsley Calladinea , James W. Fourqurean, Kenneth L. Heck, Jr. A. Randall Hughes , Gary A. Kendrick ,W. Judson Kenworthyj , Frederick T. Short. 2006. Accelerating loss of seagrasses across the globe threatens coastal ecosystems. *PNAS*, 106 (30): 12377–12381.

Wright, A., Stacey, N. dan Holland, P. 2006. The cooperative framework for ocean and coastal management in the Pacific Islands: Effectiveness, constraints and future direction. *Ocean and Coastal Management*: 49, 739 - 763.

zu Ermgassen P. S. E and Blandon A. 2014. Quantitative estimate of commercialfish enhancement by seagrass habitat in southern Australia. Estuarine, *Coastal and Shelf Science*, 141: 1-8.

C29

ORIGINALITY REPORT

1%	%	1%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	"Interactive Governance for Small-Scale Fisheries", Springer Science and Business Media LLC, 2015 Publication	1%
2	I. Nagelkerken, G. van der Velde, M.W. Gorissen, G.J. Meijer, T. Van't Hof, C. den Hartog. "Importance of Mangroves, Seagrass Beds and the Shallow Coral Reef as a Nursery for Important Coral Reef Fishes, Using a Visual Census Technique", Estuarine, Coastal and Shelf Science, 2000 Publication	1%

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	On		