The effect of using the initial weight of seedlings by the floating method on the percentage of daily growth of seaweed *Eucheuma cottonii*.

W Isroni 1,2, A S Bahri 3, A A Amin 4

1 Faculty of Fisheries and Marine Science, Universitas Airlangga. Kampus C, Jl. Dharmahusada Permai No.330, Mulyorejo, Surabaya 60115, East Java,
2 Malang Fisheries Science College / STIP, Jl. Cengger Ayam I No.5, Tulusrejo, Kec. Lowokwaru, Malang 65141, East Java, Indonesia.
3 Coastal and Marine Research Center, Brawijaya University
4 Corresponding author: wahyu.isroni@fpk.unair.ac.id

Abstract. *Eucheuma cottonii* is widespread in coastal areas. The content of seaweed in the form of agar, carrageenan, and alginate causes seaweed to have an important meaning in industry. The problem currently faced is the lack of production of seaweed for industrial materials, caused by the lack of growth rate. The community's understanding is that the more weight the seedlings plant, the more yields will be obtained and the faster to harvest. But in reality, the less weight the seeds planted, the faster the rate of growth, so that the seeds needed are not so many and produce a lot of harvest. The purpose of this study was to determine the effect of different initial seed weights on the growth rate of *E. cottonii* seaweed. This research is an experimental study, using a Completely Randomized Trial Design consisting of one factor and six replications. While the treatment used is the initial weight of different seedlings, (25 gr, 50 gr, 75 gr, and 100 gr). This research was conducted in the waters of Lamawalang District, Larantuka City, East Flores Regency. Data analysis technique used one-way ANOVA (one factor) with the Least Significant Difference Test level of 5%.

1. Introduction

Marine resources play an important role in supporting regional and national economic development. These marine resources have a comparative advantage because they are available in large quantities and are diverse and can be utilized at relatively low exploitation costs so as to create competitive bidding capacity [1].

Seaweed is also one of the coastal resources which has a high economic value and is one of the mainstay export commodities whose demand is high on the world market, so its production capability must be increased to meet the needs of consumers who experience shortages each year. One of the types of seaweed that has been intensively cultivated is *Eucheuma cottonii* in coastal waters. *Eucheuma cottonii* carrageenan is very important as a stabilizer, thickening agent, gelling agent, emulsifier and so on [2]. Of these, 80% are used in food products, for medicines, cosmetics, textiles, paints, toothpaste and other industries [3]. As the demand for seaweed is high as an export commodity, it is also necessary to increase seaweed cultivation, especially in Larantuka, East Flores Regency. However, the success of a seaweed cultivation business depends very much on factors affecting both
external factors, namely related to the selection of suitable locations the types of seaweed are also factors closely related to environmental characteristics of the local waters as well as internal factors related to the origin of the thallus, the weight of the seedlings and the distance of planting used. Seaweed growth is influenced by various internal and external factors. Internal factors that influence the growth rate are species, thallus (seedlings) and age and external factors related to the environment, plant distance, initial seed weight, seed selection, plant care. Methods that are often used in seaweed cultivation include the floating monoline method [4].

The condition of coastal waters in Larantuka is a very potential area as a place for seaweed cultivation, especially when viewed from the condition of water quality and topography. However, the cultivation system used is still very simple and cannot reach the expected production. The main constraints are the location of the cultivation area, planting distance and, origin of the thallus and the weight used as the initial seedlings used. The coastal waters of Lamawalang Subdistrict, Larantuka City have important meaning for the local community with their role as a source of livelihood in the field of fisheries, one of which is seaweed cultivation which is an additional livelihood from fishing activities which results are insufficient for daily needs. Only by using simple equipment and relatively less power, seaweed cultivation can obtain decent results as well as the main job of catching fish. Based on the above, it is suspected that there are obstacles related to seaweed growth by considering the initial weight of seedlings; so that on this occasion a research related to the rate of growth of Eucheuma cottonii seaweed in the waters of Lamawalang District, Larantuka City, East Flores Regency.

2. Material and methods

2.1. Place and time of research

This research was conducted in March-May 2019. A sampling of seaweed in the waters of Lamawalang District, Larantuka City, East Flores Regency.

2.2. Tools and materials

The tools used are Boats, Bamboo with a length of 5 meters by 2 points, Bamboo with a length of 2.5 meters by 2 points, Monofilament plastic rope with a size of 2.5 × 5 m², Iron with a length of 0.5 meters by 3 meters, One iron spike which is 4 meter long as a sign in the sea for the floating net method. Ingredients Seaweed type Eucheuma Cottonii with seed weight of 25 grams, 50 grams, 75 grams, 100 grams.

2.3. Procedure of research preparation

This study used an experimental method with a Completely Randomized Design (CRD) consisting of one 4 treatment and 6 replications. With the following treatment: Treatment A with initial seed weight of 25 grams, Treatment B with initial seed weight of 50 grams, Treatment C with initial seed weight of 75 grams, Treatment D with initial seed weight of 100 grams.

The location must be free from the effects of hurricanes and pollution from industry or households, does not experience large salinity fluctuations, contains nutrients for growing seaweed, makes it possible to apply cultivation methods, easy to reach. Seedlings in the form of cuttings must come from plants that are clean, fresh, not affected by disease, still new and young, superior seeds with the characteristic of having many branches.

Pieces of bamboo that have been prepared are made into rectangular rafts by tying the four corners. In order to make the raft stronger and the bonds do not easily shift, each angle is given a peg. Then the raft is installed at a predetermined location. Seedlings are tied with raffia ropes, then hung on ropes with a distance of 20 cm that is stretched assembled.

Plant maintenance is done by monitoring every day seaweed plants to repair the construction of damaged rafts or broken ropes, and replacing dead seaweed with new seeds. During the maintenance period we need to pay attention to cleaning plants from other objects (mud and dirt) attached to the
plants, overcoming attacks by sea urchins by taking and disposing of them and avoiding fish and turtles by installing nets around the planting site [4].

2.4. Data analysis

Data obtained were analyzed using one-way ANOVA. If F arithmetic ≥ F table 5%, then there is a significant influence and continued with the LSD test (Least Significant Difference) to determine the difference between treatments.

3. Result and discussion

The results showed that the initial weight difference of Eucheuma cottonii seedlings had a significant effect on the growth of Eucheuma cottonii seaweed during the study. Where the yield that gives absolute growth and the highest daily growth rate is treatment A (initial seed weight of 25 gr) with daily growth rates of the 15th, 30th, 45th and 60th days of 16.14%, 9.81%, 7%, 30% and 5.62% and the lowest is D treatment (initial weight of 100 gr seedlings), which is 8.60%, 6.27%, 4.45%, 3.37%.

Figure 1. The average daily growth percentage of Eucheuma cottonii seaweed is 15.30.45 and 60 days after planting

The difference in growth that occurs is very closely related to the initial weight of the seedlings where the difference in the initial weight of the seedlings will cause a different spacing. This means that the initial weight range of 25 gr seedlings has a finer distance between bonds than the initial seed weight of 50 gr, 75 gr and 100 gr. With spaced spacing, Eucheuma cottonii in treatment A (initial weight of 25 gr seedlings) has more than enough room to grow and develop. This is then different from the treatment B, C and D (initial weight of seedlings 50 gr, 75 gr and 100 gr) where with the initial weight of more seeds, it automatically has more tightly spaced spacing, and because of spaced spacing, then Eucheuma cottonii seaweed will compete with one another to utilize the available space to grow and develop so that eventually growth becomes not optimal.
Addition of seaweed biomass causes a process of competition between seaweed in obtaining food, space and sunlight [5] [6]. Related to sunlight, the geographical location of Larantuka waters is very supportive for the growth of Eucheuma cottonii seaweed, where in the Lamawalang District Waters, Larantuka City, East Flores Regency, sunlight can reach the bottom of the waters. With sunlight that is able to penetrate to the inside and even reach the bottom, it provides a photoperiodic light response that allows Eucheuma cottonii to regulate the time for thallus growth. Seaweed growth is strongly influenced by environmental factors such as water quality, climate, current speed, waves and other biological factors [7].

Eucheuma cottonii seaweed cultivation, the less weight is planted, the faster the growth rate [8], where plant spacing is closely related to the unity of land area, the less initial biomass the wider the spacing so that the wider the movement of water that carries nutrients so that the growth of seaweed can increase [9]. The wider movement of water movement can also avoid the accumulation of impurities in the thallus which will help airing so that the photosynthesis process needed for seaweed growth can take place properly [10].

Water quality parameters recorded during the study indicate that they are still at a reasonable level to support the growth of seaweed, except the current velocity whose values are still below the ideal range. one of the important factors in seaweed culture, especially the Eucheuma genus, is the parameters of water and harvest age [11].

4. Conclusion
The initial weight difference treatment of seedlings gives a real influence on the growth of Euchema cottonii seaweed. The best growth was obtained by treatment A (initial weight of 25 gr seedlings) with a daily growth rate of the 15th, 30th, 45th and 60th day of 16.14%, 9.81%, 7.30% and 5.62%; treatment B (initial seed weight of 50 gr) that is equal to 13.92%. 8.83%, 6.73% and 5.09%; treatment C (initial seedling weight 75 gr) that is 10.89%, 7.46%, 5.42% and 4.10%; and the lowest is treatment D (initial weight of 100 gr seedlings) which is 8.60%, 6.27%, 4.45%, 3.37.

5. References
[1] Syahputra Y 2005 Pertumbuhan dan kandungan karaginan Budidaya Rumput Laut Eucheuma cottonii pada Kondisi Lingkungan yang Berbeda dan Perlauan Jarak Tanam di Teluk Lhok Seudu (Institut Pertanian Bogor. Bogor)
[2] Winarno F G 1990 Teknologi Pengolahan Rumput Laut (Jakarta : Pustaka Sinar Harapan)
[3] Bambang Wirjatma B 2002 Pemanfaatan Rumput Laut I
[4] Mubarak H 1990 Petunjuk Teknis Budi Daya Rumput Laut (Jakarta: Pusat Penelitian dan Pengembangan Pribadi Penelitian dan Pengembangan Pertanian)
[5] Darmayasa I G P 1988 Studi Perbandingan Luaj Pertumbuhan 15
[6] Supit D S 1989 Karakteristik Pertumbuhan dan Kandungan Rumput Laut Euchema cottonii (Doty) Yang Berwarna Abu – abu, Coklat dan Hijau Yang Ditanam di Coba Lapangan Pasir Pulau Pari (Institut Pertanian Bogor. Bogor)
[7] Soegiharto, Sulistijo A, Atmadja, Mubarak H 1989 Rumput Laut (Algae), Manfaat, Potensi dan Usaha Budidaya (Jakarta: LON, LIPI) p 83
[8] Hamid A 2009 Pengaruh Berat Bibit Awal Dengan Metode (Floating method) Terhadap Persentase Pertumbuhan Harian Rumput Laut (Eucheuma Cottonii) (Malang : Universitas Islam Negeri Maulana Malik Ibrahim)
[9] Sudjiharto 2001 Teknologi Budidaya Rumput Laut (Lampung : Balai Budidaya Laut) p 91
[10] Prihanigrum A Meiyana M Evalawati 2001 Biologi Rumput Laut; Teknologi Budidaya Rumput Laut (Kappaphycus alvarezii) (Lampung : Balai Budidaya Laut) p 66
[11] Sulistijo, Atmadja W S 2002 Usaha Pemanfaatan bibit alga laut Eucheuma pinosium (L) J. Aagardh di Pulau-Pulau Seribu untuk Budi dayakan (Jakarta : LON – LIPI) p 133