INTISARI

Produksi dan Serapan Karbon pada *Eucheuma cottonii* **:** Studi Kasus di Perairan PLTU Punagaya Kabupaten Jeneponto Provinsi Sulawesi Selatan

Pemanasan global sebagai krisis lingkungan telah melanda berbagai negara sehingga diperlukan penerapan solusi berbasis ekosistem. Budidaya rumput laut selain bernilai secara ekonomis juga diharapkan dapat berkontribusi terhadap penyerapan karbon. Namun, penyerapan karbon oleh rumput laut dipengaruhi oleh kondisi lingkungan. Penelitian ini bertujuan untuk menganalisis serapan karbon pada budidaya *Eucheuma cottonii* studi kasus sekitar Pembangkit Listrik Tenaga Uap (PLTU) Punagaya, Kabupaten Jeneponto, Provinsi Sulawesi Selatan. Penelitian ini juga membandingkan dengan serapan karbon pada budidaya *E. cottonii* di perairan Desa Kassi yang berlokasi jauh dari PLTU. Penelitian dilakukan selama satu siklus budidaya (45 hari) menggunakan metode budidaya *long-line*. Parameter yang diamati meliputi biomassa, laju pertumbuhan harian, produksi, kandungan karbohidrat, produksi karbohidrat, kandungan karbon, serapan karbon, pigmen klorofi-a dan karotenoid, serta parameter kualitas perairan. Hasil penelitian menunjukkan bahwa kondisi lingkungan perairan PLTU tetap mampu mendukung produksi *E. cottoni* dan kemampuan serapan karbonnya dengan hasil analisis statistik tidak berbeda nyata dengan pertumbuhan dan serapan karbon di lokasi bukan PLTU ($p>0,05$). Di area PLTU, Produksi biomassa basah meningkat dari 143,23 ± 11,93 g m^{-2} pada hari ke-0 menjadi 1.109,37 ± 410,74 g m^{-2} pada hari ke-30. Sementara itu, di area kontrol (bukan PLTU), biomassa meningkat dari 289,06 ± 143,63 g m^{-2} menjadi 945,31 ± 11,05 g m^{-2} pada hari ke-45.Kemampuan serapan karbon mencapai 3,521.280±3.404.364 ton C/ha/tahun pada hari ke-30, melebihi serapan di lokasi bukan area PLTU 2,818.560±3.167.445 ton C/ha/tahun. Analisis korelasi Pearson menunjukkan variasi hubungan antar parameter fisik-kimia dan biologis. Di area PLTU, korelasi negatif antara CO_2 dan DO ($r = –0,64$) serta korelasi positif antara pigmentasi dan produktivitas mengindikasikan dampak termal dan kimia terhadap fotosintesis. Di lokasi non-PLTU, korelasi positif antara NO_3^- dan pigmen fotosintetik ($r > 0,69$). Hal ini menunjukkan bahwa *E. cottonii* yang dibudidayakan di perairan kawasan PLTU Punagaya tetap mampu mendukung produksi dan kemampuan penyerapan karbon bahkan relatif mempunyai nilai lebih tinggi dibandingkan dengan budidaya *E. cottoni* di kawasan bukan area PLTU.

Kata Kunci : Ekosistem, karbon biru, kualitas air,pemanasan global,rumput laut.

ABSTRACT

Carbon Production and Sequestration in *Eucheuma cottonii*: A Case Study in the Waters near Punagaya Coal-Fired Power Plant, Jeneponto Regency, South Sulawesi Province

Global warming as an environmental crisis has impacted many countries, thus requiring the implementation of ecosystem-based solutions. Seaweed farming, aside from its economic value, is also expected to contribute to carbon sequestration. However, carbon uptake by seaweed is influenced by environmental conditions. This study aims to analyze the carbon sequestration potential of *Eucheuma cottonii* cultivated around the Punagaya coal-fired power plant (PLTU) in Jeneponto Regency, South Sulawesi Province. It also compares the carbon uptake of *E. cottonii* cultivated in the waters of Kassi Village, which is located far from the power plant. The study was conducted over one cultivation cycle (45 days) using the long-line farming method. Observed parameters included biomass, daily growth rate, productivity, carbohydrate content, carbohydrate production, carbon content, carbon uptake, photosynthetic pigments (chlorophyll-a and carotenoids), and water quality parameters. The results showed that the environmental conditions near the PLTU were still able to support the growth and carbon sequestration capacity of *E. cottonii*, with no statistically significant difference compared to the non-PLTU site ($p > 0.05$). In the PLTU area, wet biomass increased from 143.23 ± 11.93 g/m² on day 0 to 1,109.37 ± 410.74 g/m² on day 30. Meanwhile, in the control area (non-PLTU), biomass increased from 289.06 ± 143.63 g/m² to 945.31 ± 11.05 g/m² by day 45. Carbon sequestration reached 3.52 ± 3.40 tons C/ha/year on day 30 in the PLTU area, higher than in the non-PLTU area, which was 2.82 ± 3.17 tons C/ha/year. Pearson correlation analysis revealed variations in relationships among physico-chemical and biological parameters. In the PLTU area, a negative correlation between CO_2 and DO ($r = –0.64$) and a positive correlation between pigmentation and productivity indicate thermal and chemical impacts on photosynthesis. In the non-PLTU site, a positive correlation was observed between NO_3^- and photosynthetic pigments ($r > 0.69$). These findings suggest that *E. cottonii* cultivated in the waters near the Punagaya PLTU remains capable of high productivity and carbon sequestration, even showing relatively higher values than cultivation in non-PLTU areas.

Keywords: Blue carbon, ecosystem, global warming, seaweed, water quality,.