ABSTRAK

MUHAMMAD RIDHO. Klasifikasi Habitat Bentik Perairan Dangkal Berbasis *Deep Learning* Menggunakan Arsitektur *MobileNetV2*. Dibimbing oleh FORTIA MAGFIRA dan INDAH KARTIKA.

Desa Berakit, Kecamatan Teluk Sebong, Kabupaten Bintan, Kepulauan Riau memiliki ekosistem habitat bentik di perairan dangkal yang merupakan pusat biodiversitas pesisir, namun tekanan degradasi akibat peningkatan aktivitas manusia di wilayah pesisir dapat menggangu habitat bentik sehingga membutuhkan sistem pemantauan yang efisien dan objektif. Identifikasi habitat bentik secara manual melalui survei visual penyelam memiliki keterbatasan karena memerlukan waktu dan biaya besar serta rentan terhadap subjektivitas pengamat. Penelitian ini bertujuan menganalisis kemampuan arsitektur *MobileNetV2* dalam mengklasifikasikan habitat bentik pada citra bawah air yang mencakup lima kelas, yaitu Karang, Lamun, Alga, Substrat Pasir, dan Objek di Luar Bentik, ditinjau dari nilai *accuracy, precision, recall,* dan *F1-Score.* Dataset berjumlah 1.250 citra yang dikumpulkan secara *in-situ* di perairan Desa Berakit menggunakan kamera *smartphone* bawah air. Dataset dibagi menjadi data latih, validasi, dan uji dengan perbandingan 70:20:10. Model dilatih menggunakan pendekatan *transfer learning* dua fase dengan bobot *pre-trained ImageNet*, disertai pencarian *hyperparameter* optimal melalui *grid search* terhadap 27 kombinasi *learning rate* dan *dropout*. Model terbaik mencapai nilai *accuracy* sebesar 96%, *precision* sebesar 0,96, *recall* sebesar 0,96, dan *F1-Score* sebesar 0,96 pada data uji dengan konfigurasi *learning rate* Fase = 5e-4, *learning rate* Fase 2 = 1e-4, dan *dropout* = 0,4.

Kata kunci: Citra bawah air, *Deep learning,* Habitat bentik*, MobileNetV2, Transfer learning.*

ABSTRACT

MUHAMMAD RIDHO. *Shallow Water Benthic Habitat Classification Based on Deep Learning Using MobileNetV2 Architecture. Supervised by* FORTIA MAGFIRA *and* INDAH KARTIKA.

Berakit Village, Teluk Sebong District, Bintan Regency, Riau Islands has shallow water benthic habitat ecosystems that serve as centers of coastal biodiversity however, increasing degradation pressure from human activities in coastal areas can disrupt benthic habitats, necessitating an efficient and objective monitoring system. Manual identification of benthic habitats through diver visual surveys has limitations due to high time and cost requirements and susceptibility to observer subjectivity. This study aims to analyze the capability of the MobileNetV2 architecture in classifying benthic habitats in underwater images covering five classes, namely Coral, Seagrass, Algae, Sand Substrate, and Non-Benthic Objects, evaluated in terms of accuracy, precision, recall, and F1-Score. The dataset consists of 1,250 images collected in-situ from the coastal waters of Berakit Village using an underwater smartphone camera. The dataset was divided into training, validation, and test sets with a ratio of 70:20:10. The model was trained using a two-phase transfer learning approach with ImageNet pre-trained weights, accompanied by optimal hyperparameter search through grid search over 27 combinations of learning rate and dropout. The best model achieved an accuracy of 96%, precision of 0.96, recall of 0.96, and F1-Score of 0.96 on the test data with a configuration of learning rate Phase 1 = 5e-4, learning rate Phase 2 = 1e-4, and dropout = 0.4.

Keywords: Underwater imagery, Deep learning, Benthic habitat, MobileNetV2, Transfer learning.