

ABSTRAK

MUHAMMAD AZZA AL KAUSAR. Studi Komparatif Kinerja EfficientDet-D0 dan YOLOv8 untuk Identifikasi Spesies Lamun pada Citra Bawah Air. Dibimbing oleh NOLA RITHA dan NURUL HAYATY.

Identifikasi spesies lamun secara manual pada citra bawah air masih menghadapi kendala akibat kemiripan morfologi antarspesies, kualitas citra yang dipengaruhi kekeruhan air, serta kebutuhan waktu dan tenaga ahli. Penelitian ini bertujuan membandingkan kinerja EfficientDet-D0 dan YOLOv8 dalam mengidentifikasi enam spesies lamun pada citra bawah air serta mengevaluasi pengaruh pendekatan *Remove Background* dan *Pseudo-Labeling*. Dataset yang digunakan terdiri atas 6.000 citra bawah air dari Perairan Desa Pengudang, Pulau Bintan, dengan pembagian data 80% pelatihan, 10% validasi, dan 10% pengujian. Model dievaluasi menggunakan *mean Average Precision (mAP)*, *Precision*, *Recall*, *F1-Score*, dan waktu inferensi. Hasil penelitian menunjukkan bahwa *Remove Background* menurunkan kemampuan generalisasi model pada citra asli, sedangkan *Pseudo-Labeling* meningkatkan performa kedua model. YOLOv8 memperoleh hasil terbaik dengan $mAP@50$ sebesar 66,25%, lebih tinggi 2,92 poin persentase dibandingkan EfficientDet-D0 (63,33%). Dari sisi efisiensi komputasi, YOLOv8 memiliki waktu inferensi sekitar 2,4 ms/citra, sedangkan EfficientDet-D0 sekitar 28,2 ms/citra. Sebaliknya, EfficientDet-D0 menggunakan memori GPU yang lebih rendah dibandingkan YOLOv8. Secara keseluruhan, YOLOv8 dengan *Pseudo-Labeling* memberikan performa terbaik dari sisi akurasi, kemampuan generalisasi, dan kecepatan inferensi, sedangkan EfficientDet-D0 lebih unggul dalam efisiensi penggunaan memori GPU.

Kata kunci: Identifikasi Spesies Lamun, EfficientDet-D0, YOLOv8, *Computer Vision*, *Deep Learning*, *Pseudo-Labeling*,.

ABSTRACT

MUHAMMAD AZZA AL KAUSAR. Comparative Performance Study of EfficientDet-D0 and YOLOv8 for Seagrass Species Identification in Underwater Images. Supervised by NOLA RITHA and NURUL HAYATY.

Manual identification of seagrass species in underwater images remains challenging due to the morphological similarity among species, image degradation caused by water turbidity, and the considerable time and expertise required. This study aims to compare the performance of EfficientDet-D0 and YOLOv8 in identifying six seagrass species from underwater images and to evaluate the effects of the *Remove Background* and *Pseudo-Labeling* approaches. The dataset consists of 6,000 underwater images collected from the waters of Pengudang Village, Bintan Island, using an 80:10:10 split for training, validation, and testing. The models were evaluated using *mean Average Precision* (mAP), Precision, Recall, F1-Score, and inference time. The results indicate that the *Remove Background* approach reduced the models' generalization capability on the original underwater images, whereas *Pseudo-Labeling* improved the performance of both models. YOLOv8 achieved the best result with an mAP@50 of 66.25%, outperforming EfficientDet-D0 (63.33%) by 2.92 percentage points. In terms of computational efficiency, YOLOv8 achieved an inference time of approximately 2.4 ms/image, whereas EfficientDet-D0 required approximately 28.2 ms/image. Conversely, EfficientDet-D0 demonstrated lower GPU memory usage than YOLOv8. Overall, YOLOv8 combined with *Pseudo-Labeling* achieved the best overall performance in terms of detection accuracy, generalization capability, and inference speed, whereas EfficientDet-D0 demonstrated superior GPU memory efficiency.

Keywords: *Seagrass Species Identification*, EfficientDet-D0, YOLOv8, *Computer Vision*, *Deep Learning*, *Pseudo-Labeling*.