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Photo Recognition for In-water Identification of Hawksbills in a Marine Protected Area of Honduras

Linda Baeza

Christian Hayes

Cedarville University, christianhayes@cedarville.edu

Marsha K. Wright

Lidia A. Salinas

Stephen G. Dunbar

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*Presenting Author: Stephen G. Dunbar, sdunbar@llu.edu

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PHOTO RECOGNITION FOR IN-WATER IDENTIFICATION OF HAWKSBILLS IN A MARINE PROTECTED AREA OF HONDURAS

Baeza, Linda^{1,2}

Hayes, Christian, T.^{1,3}

Wright, Marsha^{1,4}

Salinas, Lidia, A.^{1,5}

Dunbar, Stephen G.^{1,3,5,*}

¹Protective Turtle Ecology Center for Training, Outreach, and Research, Inc. (ProTECTOR). Colton, CA 92324

²Department of Biological Sciences, Moorpark College, Moorpark, CA 93021

³Marine Research Group, Department of Earth and Biological Sciences, Loma Linda University, Loma Linda, CA 92350

⁴Department of Biological Sciences, Oakwood University, Huntsville, AL 35896

⁵Protective Turtle Ecology Center for Training, Outreach, and Research, Inc., Honduras (ProTECTOR-H), Tegucigalpa, Honduras

ABSTRACT

The hawksbill sea turtle (*Eretmochelys imbricata*) can be found in the Atlantic, Pacific and Indian Oceans. As with other sea turtles species, hawksbills have a cluster of scales on the dorsal and lateral surfaces of the head that form unique scale patterns. Following a previous study using Interactive Individual Identification System (I³S) *Spot*, we used the *Pattern* version of I³S to compare and identify in-water photographs of turtles within the Roatán Marine Park (RMP) on the western end of Roatán, Honduras from May to September, 2014. The *Pattern* program is designed to annotate individual ‘fingerprints’ for species with complex markings by identifying key points and assigning a descriptor area around each point using the Open Source Computer Vision (CV) implementation of Speeded-Up Robust Features (SURF). Points and areas are delineated within a user specified polygon using an automatic key point extraction algorithm. The ‘fingerprint’ on one photograph is then compared to ‘fingerprints’ on other photographs in the database and potential individual matches are selected, thus reducing the number of photographs that require review by manual comparison. Through daily underwater dives, we photographed turtles on 78 occasions and created a database of 182 photographs. New photographs were then cross referenced with photographs in the I³S photo database to determine whether turtles had been previously encountered. We visibly assessed potential matches for

similarities and successfully identified 68 different hawksbill individuals. Nine individuals were re-identified from pictures on later dives and one individual was re-identified twice. I³S *Pattern* failed to recognize actual matches (false negatives) four times (40%), and identified two (20%) false positives. However, these false matches may have been dependent on the quality of the photographs used. We were unable to use I³S *Pattern* to match any dorsally oriented photographs and recommend that future studies use I³S *Spot*, rather than the current version of I³S *Pattern*, to match photographs taken of the dorsal view of the head. The I³S *Pattern* program successfully aided our research by facilitating accurate counts of hawksbill sea turtles re-sighted in the RMP over the period of the study. Automated photo identification can help provide long-term data on turtle migrations, movements, and life-history stages, and can thus be a valuable tool for conservation of marine turtles.