The Interaction between Predatory Reef Fish and Human use of the Molokini Marine Life Conservation District (MLCD).

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Introduction

From November 2013 to August 2015 a combination of acoustic telemetry, commercial vessel log books and Ecological Acoustic Recorders (EARs) were used to examine the relationship between human activity at the Molokini Marine Life Conservation District (MLCD) and the habitat use of five species of predators including, White Tip reef Sharks (*Triaenodon obesus*), Grey Reef Sharks (*Carcharhinus amblyrhynchos*), Ulua (*Caranx ignobilis*), Omilu (*Caranx melampygus*) and Uku (*Aprion virscens*).

Acoustic array design

A passive acoustic monitoring array was used to track the movements of tagged predators. Seven acoustic receivers were deployed in strategic locations that enable the observation of fish movements in Subzone A and B of the MLCD (Figure 1).

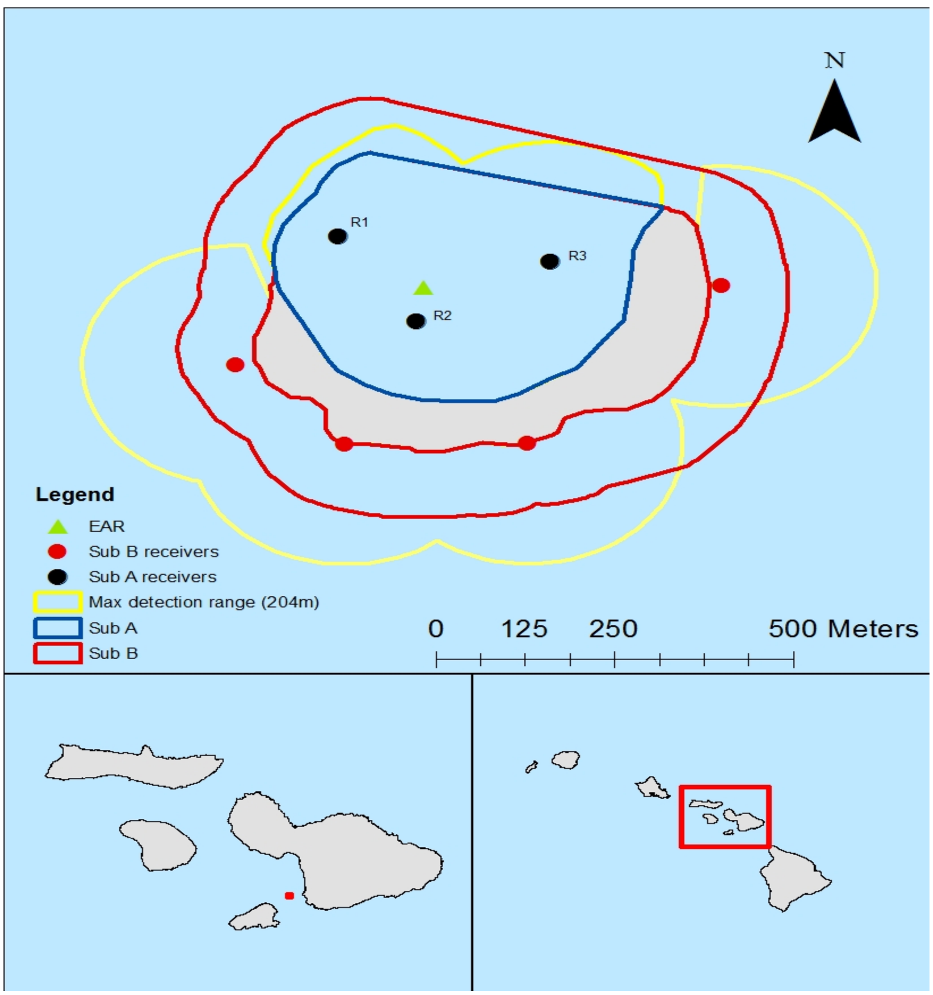


Figure 1: The location of the Molokini MLCD and acoustic array. Red and blue lines indicate subzone demarcation. Black dots indicate subzone A receivers, red dots represent subzone B receivers, yellow triangle indicates the ecological acoustic recorder (EAR) and yellow bands represent the 204 m detection range of the receivers.

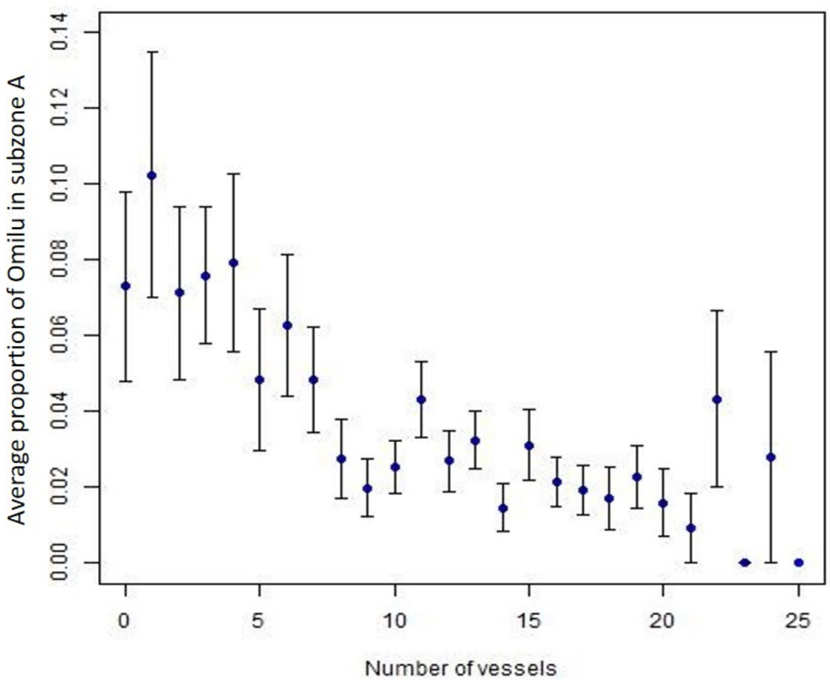
Fish capture and transmiter deployment

Predators in the MLCD were captured with hook and line and tagged with Vemco V-13 coded transmitters surgically implanted into the body cavity of each animal through a 2 cm incision in the abdominal wall. Fish were also tagged with a conventional visible dart tag.

Human use of the MLCD

During the study 599,440 people visited the MLCD, with an average of 23 vessels and 924 people per day. The peak hours in human use were 8, 9, and 10 am with the average number of commercial vessels in subzone A being 12, 15, and 10 respectively.

Movement patterns of each species in the Molokini MLCD



Omilu were the most common species present in subzone A and during peak hours, the presence of this species declined with the number of vessels in subzone A (Figure 2). None of the other four species showed significant relationships between vessel activity and habitat use of subzone A.

An analysis of the presence of Omilu in the two subzones A and B indicates that as the presence of Omilu in subzone A decreased with human use, there was an increase in their abundance in subzone B (Figure 3).

Figure 2: *The proportion of Omilu present in in subzone A, at a given number of vessels during the peak hours in human use (8-10 am). Values are averages with error bars equal to the standard error.*

Summary

The results of this study suggest that the use of the shallow inner reefs within the Molokini MLCD by Omilu is reduced with increasing human use. None of the other four species studied, showed strong evidence for this type of displacement, which may be attributed to natural differences in the spatial and temporal habitat use for these species that limited overlap with humans. This information can be useful to inform the management of recreational activities in Hawaii.

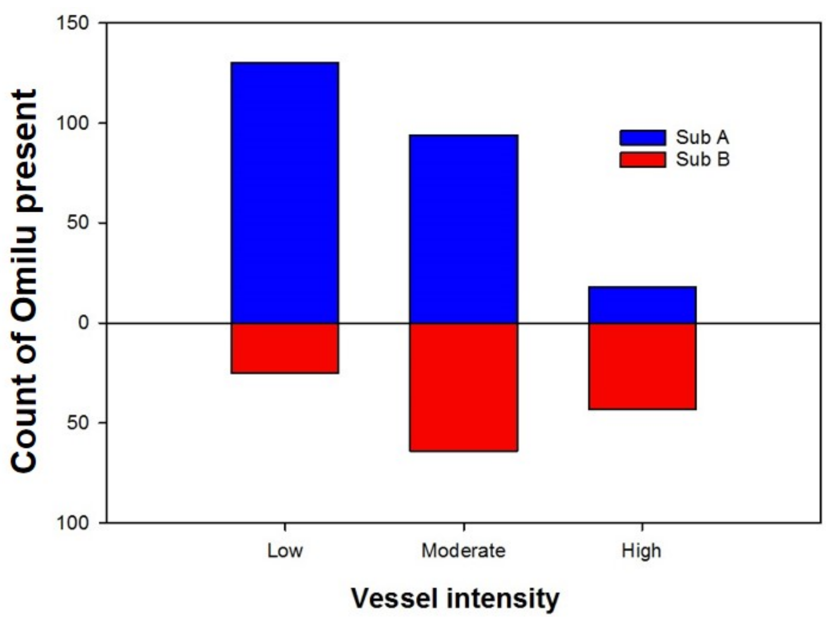


Figure 3: *A comparison of the count of Omilu presences in subzone A (blue) and subzone B (red) across a gradient of vessel intensity, during peak hours (8-10 AM) in human use at subzone A.*

For further information regarding this study please Contact: Russell Sparks (russell.t.sparks@hawaii.gov) and/or Alan Friedlander (friedlan@hawaii.edu)