Population Abundance Estimates of Olive Shells (*Olivella biplicata*) on Northern Hobuck Beach

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Michael Murner
P.O. Box 736
Neah Bay WA. 98357

Abstract

To determine whether the harvesting of olive shells is a sustainable resource this paper was made. A previous beach was nearly wiped out either because of overharvesting or an oil spill. A point of reference for this beach is needed in the event that another decimation of the olive shell population. I found that there was 119,709 (95% confidence interval 112,082 to 127,337) within a 25.6 acre area on the north end of Hobuck beach. Unequal sample sized of each tidal zone may have biased my result because the three tidal zones surveyed showed statistically significant different survey plot densities. Since a 1 gallon per person per month restriction of the olive shells is in effect we extrapolated that 1 gallon can contain 2,086 olive shells which could potentially become a problem if too many people harvest olive shells.

Introduction

The olive shell has been an important cultural resource for the Makah tribe for generations. The shells are used as a decoration for native regalia and are unique to the Makah tribe alone (Halliday and Chehak 2002).

The purpose of this paper is to determine whether the taking of olive shells from Hobuck beach can be maintained without significant impact the overall population of the olive shell. This survey is being done for a couple reasons, one being a need for a population estimate in events that would require other studies to look back and have this information as a point of reference. The other reason as stated above is to determine whether the taking of olive shells can be maintained. This is because in previous years another beach was used as the main source of olive shells, but due to either

overharvesting or an oil spill from the tenya maru the majority of olive shells were wiped out. (Pers. Com. Debbie Preston)

Methods

Site Description

Hobuck Beach was the area surveyed for Olive Shells. Hobuck Beach is located on the Makah Indian Reservation in the most Northwest point of the State of Washington in the United States. The beach is made up of fine grain sand with relatively no seaweed or other plant life in the lower tidal zones. The area of Hobuck Beach that was surveyed was approximately 3000 feet in length extending from a small groundwater creek to the Wya'atch River.

The above picture gives a general idea of the start and end points within the survey area; it is not representative of the area within which the survey taken, only the starting and ending points therein. Only the North end of the beach was surveyed because it was determined that the Southern end didn't hold a viable quantity of olive shells. This was determined since the olive shell collectors only use the Northern end of the beach.

Data Collection

All olive shells within a 50 ft. by 6 ft. plot were counted. Plot size was by running 50 ft. of tape, the width was determined as 3 feet (a yard stick) on each side of the transect tape. Plot distribution was randomized by tossing an object in front of the current location and using where the object land as a starting point, then throwing another object and using that location as the direction for the ending point. Olive shells were spotted by a small lump in the sand, one lump would count for one olive shell, if one section was littered with lumps then a hand count of every olive shell within the survey area was done. During the first day we surveyed the upper tidal range of olive shell distribution. During day two the tide was much lower and a survey was taken during this lower tide. The beach was surveyed from South to North for a low tidal zone estimate, and then surveyed again from North to South on the way back for a mid tidal zone estimate approximately halfway between the high and low survey tidal zones.

Since there is a one gallon limit on the number of olive shells a person can gather in a month I decided that I would find out how many olive shells were in a gallon. To do this I counted how many olive shells could be held in one standard measuring cup. From that number I extrapolated one cup into one gallon.

Data Analysis

A GPS point was taken at the beginning and ending point of each transect recorded. The points were then entered into ArcMap. From ArcMap the points were transferred over to google earth where a polygon was created that encompassed all the points which allowed me to estimate the approximate area of the survey zone by breaking

the polygon into triangles which I could then determine each individual area by using the equation, A=1/2(LxH).

The density of the olive shell population is calculated by counting the number of olive shells observed within each transect and dividing by the plot area. Total population was calculated by extrapolating average plot density to the whole survey area.

Analysis of variance was used to compare plot counts of the three tidal zones (Ramsey and Shafer, 2002).

Results

Figure 1: the white polygon was the area surveyed; this polygon has an area of approximately 1,116,000 square feet and defined the boundaries for the scope of inference for olive shell abundance.

Within the surveyed area of figure 1, seventy-eight transects were taken to gather sufficient data to make an estimate of the population abundance of olive shells (*Olivella biplicata*). I extrapolated the abundance to the 25.6 acres surveyed. The abundance

estimate of the Olive Shell population was 119,709 (95% confidence interval 112,082 to 127,337).

There is currently a one gallon limit on the number of olive shells a Makah tribal member can take in one month. That one gallon averages out to approximately 2,086 olive shells.

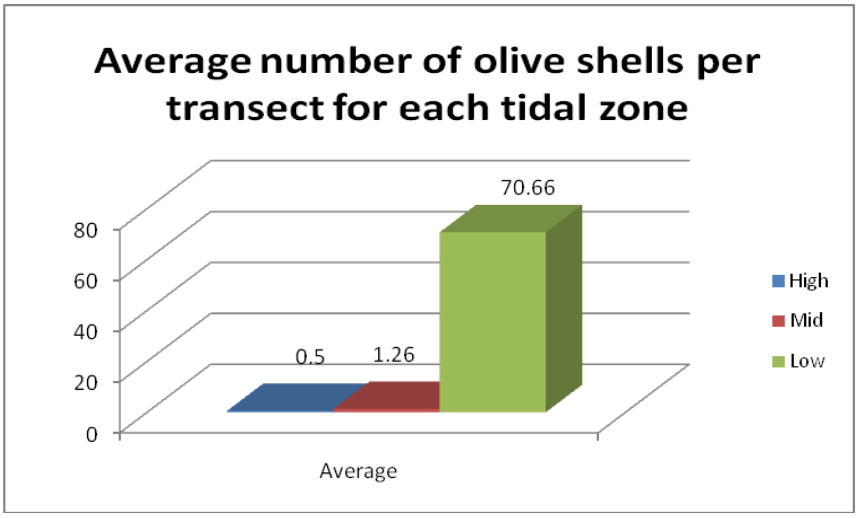

Figure 2: Shows the difference in average plot density according to tidal zone

I found strong evidence of differences in olive shell abundance by tidal height of beach surveyed (ANOVA, df=77, p = 0.049). As the height of the tide increased, the abundance of olive shells decreased, such that the low track had the highest abundance, the medium track had medium abundance, and the high track had the lowest abundance (figure 2).

Discussion

The data showed that there is a sufficient quantity of olive shells within the area surveyed to continue a harvest of the shells. However without further study there is no way to gauge the impact over time of a continued harvest. With the one gallon limit of

2,086 olive shells in effect it would only take sixty people over a one month period to decimate the 119,709 olive shells within the area surveyed. People usually only collect olive shells once per year at most which potentially helps the olive shell population. I believe that further regulation and abundance estimates are necessary to maintain the olive shell population.

From ANOVA we found that we may not have properly sampled the whole area. There is likely a greater abundance of olive shells at the lower tidal zones as shown in figure two. If we had only sampled from the lower tidal zone we would likely have come up with a higher number for olive shell abundance that we did. Further surveys of olive shell abundance in the future are recommended.

Work cited

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