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Introduction (989 of 1,000)

The publicized 80 percent decline of *Eumetopias jubatus* (Steller Sea Lion) over 30 years along the northeast Pacific coast (Gulf of Alaska, central and northern California and the Aleutian Islands) may be caused by overfishing practices (Fritz & Hinkley, 2005). Efforts to understand declines of *E. jubatus* through the lens of human-induced climate change have been minimal. My objective is to compare the body size of *E. jubatus* over three time periods that reflect the impact of human civilization through the industrial revolution in the United States: present to end of industrial revolution (0-181 years ago (ya)), duration of the industrial revolution (182-226 ya) and before the industrial revolution to the beginning of the Holocene (227-11,700 ya). I hypothesize that body size for *E. jubatus* will decline as human interactions with the environment increase. This will shed light on human-induced climate change affecting the population of *E. jubatus* in both the past and present.

Justification (2,124 of 2,500)

The large decline in *E. jubatus* has been a point of fixation for the international community beyond wildlife conservationists because of its dramatic drop in population over a short period of time. After bans on intentional culling in Southeast Alaska and Canada in the 1970s, the population of *Eumoetopias jubatus* has gradually increased by 1-2% ever since, leaving it at the status of "Near Threatened" when looking to the IUCN Red List (Calkins &

Enid, 1988). However, the reasons for the large declines in *E. jubatus* are still unclear. The threat of environmental variability is classified as "potentially high" (Gelatt & Lowry, 2012). This marks a case for exploring human-induced activity with respect to time in the area.

The presence of human civilization is a possible marker for driving the declines in *E. jubatus,* as human activity is linked to increasing global temperatures, affecting Earth's overall climate (Zachos et al., 2001). In fact, human-induced global warming has been linked to driving mammalian evolution as a side-effect, possibly marked by altered body size (Alroy, Koch & Zachos, 2000). Moreover, overfishing practices have been reported to cause nutritional stress on the species, as it affects the diet of *E. jubatus* (Fritz & Hinkley, 2005). With an approach directly measuring body size with respect to distinct time intervals of human engagement with the environment, a clearer picture for the decline of *E. jubatus* can emerge.

Although there is an array of evidence supporting global climate change with mammalian evolution, there is limited published research linking its impacts to *E. jubatus* (Pascual & Adkison, 1994). Data reflecting various levels of human involvement with the environment from the lens of a major historical movement allows for greater insight on its impacts, shedding light on the environmentally-induced changes in body size of *E. jubatus*. Furthermore, any conclusions drawn from this investigation will be potentially useful in better understanding the impact that global climate patterns have on other marine mammals in the region, beyond the case of *E. jubatus*

Research Plan (1,883 of 2,500)

My research efforts will consist of field research, as I plan on travelling to the Alaska SeaLife Center (http://www.alaskasealife.org) for obtain information on body sizes of *E. jubatus*

over the designated time intervals. I plan on collaborating with researchers that focus their work on the body conditions from the birth to death of *E. jubatus* as a means to obtain data on body size (Keough et al., 2013). Body size is utilized to serve as a measure that reflects nutritional wellness. Body size will be measured by standard length and bone mass of both fossilized and recently deceased specimens specific to thee designated time intervals. Preserved fossils at the Alaska SeaLife Center will undergo carbon dating techniques to approximate age. The Paleobiology Database ((https://paleobiodb.org) will also be utilized to gather information about fossilized specimens as complementary information to what is obtained at the Alaska SeaLife Center. All data will be restricted to the specified time intervals, spanning from 0-11,700 ya.

I will use R statistical software to order the body size data into chronological order, and subset the data for the specific time intervals of present to end of industrial revolution (0-181 years ago ya), duration of the industrial revolution (182-226 ya) and before the industrial revolution to the beginning of the Holocene (227-11,700 ya). The mean, standard deviation and standard error for each parameter of body size (body length and bone mass) will be calculated for each of the three time intervals. The mean values for each parameter within a time interval when accompanied by standard error bars will provide insight as to how body size has been affected by human civilization. This will better constrain the relationship between *E. jubatus* and human-environment interactions along Alaskan, Hawaiian, and Californian coastal lines.

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