



Florida Program for Shark Research

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19 May 2014

Sonke Mastrup, Executive Director
California Fish and Game Commission
P.O. Box 944209
Sacramento, CA 94244-2090

Dear Mr. Mastrup,

It is my understanding that the California Fish & Game Commission will be addressing a request to list the white shark (*Carcharodon carcharias*) as endangered in California waters. As you know, the National Marine Fisheries Service has rejected a similar request for listing at the national level and Fish & Game scientific staff have reviewed available scientific data and not endorsed the proposed listing. The requested listing actions were largely prompted by a recent tag-recapture study that used photographic identifications of white sharks at two aggregation sites to estimate abundance in “central California” at 219 mature and sub-adult individuals.

The authors of that study (Chapple *et al.* 2011) concluded this represented approximately one-half of the total abundance of mature and sub-adult sharks in the entire eastern North Pacific Ocean (ENP). That unusually low population size not only was alarming to the conservation community but raised eyebrows in the scientific research community as well. We assembled an international team of leading shark researchers with individuals chosen for their experience with white sharks and areas of expertise: demography, population dynamics, life history, tagging/movements, fishery biology and conservation. We critically examined the aforementioned study and found violations of model assumptions that, when considered in total, lead to population underestimates. We also use a Bayesian mixture model to demonstrate that the inclusion of transient sharks, characteristic of white shark aggregation sites, would substantially increase abundance estimates for the adults and sub-adults in the surveyed sub-population.

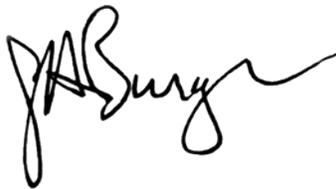
Using a dataset obtained from the same sampling locations and widely accepted demographic methodology, our analysis indicates that a minimum all-life stages population size of >2000 individuals in the California subpopulation is required to account for the number and size range of individual sharks observed at the two sampled sites. Even accounting for methodological and conceptual biases, an extrapolation of these data to estimate the white shark population size throughout the ENP is inappropriate. The true ENP white shark population size is likely several-fold greater as both our study and the original published estimate exclude non-aggregating sharks and those that independently aggregate at other important ENP sites. Accurately estimating the central California and ENP white shark population size requires methodologies that account for

biases introduced by sampling a limited number of sites and that account for all life history stages across the species' range of habitats.

Our demographic results suggest that the white shark population abundance required to account for the number of mature and sub-adult sharks sighted by Chapple *et al.* at the localities they surveyed must be at least an order of magnitude larger than their estimate when all age classes are included and is probably not "far lower" than other apex predators in coastal California or the ENP. Furthermore, there are signs that the California sub-population is at least stable with recent data suggesting increasing numbers of juveniles. Our estimate and these recent observations place doubt on the need for inclusion of white sharks on the national or state endangered species lists and indicate that existing protective measures are likely to be improving the population status and should be maintained.

Our study [Burgess, George H., Barry D. Bruce, Gregor M. Cailliet, Kenneth J. Goldman, R. Dean Grubbs, Christopher G. Lowe, M. Aaron MacNeil, Henry F. Mollet, Kevin C. Weng, and John B. O'Sullivan. *In Press. A re-evaluation of the size of the white shark (Carcharodon carcharias) population off California, U.S.A.*] is in press at the journal PLOS ONE and is expected to be published any day. Because formal publication may not occur prior to the cut-off date for tendered input, we are submitting this communication in hope that its content may be useful in the decision-making process.

Sincerely,

A handwritten signature in black ink, appearing to read 'G. Burgess', with a stylized, flowing script.

George H. Burgess
Director, Florida Program for Shark Research