

THE DREW LAB AT COLUMBIA UNIVERSITY

ECOLOGY, EVOLUTION AND CONSERVATION OF CORAL REEFS

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A shark from the past

One of the topics I find incredibly exciting is the idea of historical ecology. Briefly, historical ecology is essentially the study of what ecosystems looked like and how they functioned at any time in the past. This can take place at any temporal scale, from paleoecology to (in theory) last week. However the area that I look at is the time prior to full-scale commercial exploitation of coral reefs. These data are hard to come by because in the Pacific exploitation often predated full-scale scientific exploration. This often means we have to be creative in how we generate inferences into past ecosystems. One of the sources of data that I love to use are museum collections, and I my colleagues and I have been using these collections to reconstruct apex predatory communities in the Gilbert Islands in the country of Kiribati.

We currently have a paper in review looking at [weaponized shark teeth](#) and their use in ecological studies. As part of the peer review process one reviewer asked for us to investigate collecting area in the region, in effect asking how hard were people looking. We are addressing this by reconstructing the efforts by museums in the Gilbert Islands. As part of this exploration I was digging around in Harvard's Museum of Comparative Zoology's on-line ichthyological database* and came across this mysterious looking entry for [S-113](#).



A SCAN OF THE HARVARD'S MUSEUM OF COMPARATIVE ZOOLOGY'S COLLECTION DATABASE.

The genus *Carcharias* is the sole representative in the family *Odontaspidae* otherwise known as sand-tigers**. There are one (possibly two) species of Sand Tiger Sharks. One *C. taurus* which was described in 1810 and is present circumtropically except in the Indian and Indo-West Pacific where it is replaced by *C. tricuspidatus*. Although some argue that the two are just morphs of a single, globally distributed species, given the genetic [subdivision](#) within populations in *C. taurus*, I tend to think that there are probably 2 (or more) species.

Now for the important part. **This species has never been recorded as coming from Kiribati. Ever. Anywhere.** This single museum collection represents the sum of the world's knowledge about this species being found in these waters. If we did not have this specimen we would have never known that at some point in our past, this species was part of the biological diversity of Kiribati. This fish was collected in 1860, seventy-eight years *before* the first formal scientific expedition focusing on the Gilbert Islands' fishes. This particular individual had been added to the catalogue during the [Louis Agassiz](#) days, and represents an important look back to a particular time and place that no longer exist. Had this collection never been made, had it never been digitized and had the staff there not been willing to answer my emails we would have never known that this species once existed in the waters of the Gilbert Islands.



THE BUSINESS END OF S-113

This is why I love doing collections based research. It is an opportunity to travel back in time; to reefs that no-living person has ever seen. As a conservation biologist I think this kind of research also gives us hope. By seeing how vibrant reefs used to be, **by envisioning an ecosystem that had abundant large predatory fish we gain a new standard by which to gauge our current conservation efforts.** Understanding how past ecosystems looked forces us not to be complacent and to settle for today's duller version of coral reefs.

Finally I am grateful to [Brooke Flammang](#), and Andy Williston of the MCZ for their help in this museum based detective story.

* Digitizing collections is clearly the way of the future and allows researchers from around the world to access data that had been previously restricted by finances or geography.

** Not to be confused with [Tiger sharks](#). Different family. Common names are suboptimal.

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