Estimation of Shark's Biomass through Active Acoustics

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We study sharks biomass in open sea using non-invasive active acoustics. The importance of continuous long-term monitoring of top predator biomass is vital in understanding the healthiness and balance of the ecosystem. Instead of the traditional catch-and-release methods and visual inspections, which are too sporadic to supply reliable statistics, we rely on acoustic tools for the quantitative estimation of the number of sharks in a given area, their size, and the evaluation of their motion patterns.

We take a blind classification approach and identify sharks' related reflections from sea boundary reflections based on a track-before-detect approach. Specifically, by emitting a series of wideband acoustic signals, we create a time-delay image whose rows correspond to the received reflection response. We rely on the observation that sea boundary reflections are characterized by a random clutter-like pattern, while shark's related reflections are continuous and steady. Thus, we detect a shark in a clutter by identifying in the time-delay image continuous but curved lines whose structure meet certain limitations, namely, the shark's maximal speed and its expected carangiform motion pattern.

In the full paper, we will describe our method and show simulation results.