

Archival Pop-up Tag Studies of Pelagic Fishes and Sea Turtles in the Pacific Ocean: Treasure Trove of Data

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Integrating the latest technology into their research strategy, scientists from the National Marine Fishery Service Honolulu Lab, and the University of Hawaii, Pelagic Fisheries Research Program, are tackling many questions about the ecology and management of pelagic fish and turtle species in the Pacific Ocean using archival pop-up tags. These tags contain a veritable treasure trove of immediately useful ecological information that can be used to help solve a number of important management questions such as delimiting stock boundaries, identifying possible spawning areas, and investigating the post-hooking survivability.

Archival pop-up tags are *fishery independent* and thus do not require fishermen to physically return tags because data are downloaded via the Argos System of polar orbiting satellites. After a pre-programmed pop-off date or if the animal dies and sinks, the tag automatically jettisons and floats to the surface, whereby it transmits archived data to these satellites. The tag is equipped with several “fail-safe” measures to ensure successful downloading of collected data (e.g. pressure, temperature, and a daily geolocation estimate). Changes in light intensity can be used to calculate times of dusk and dawn from which longitude can be estimated from local noon, while latitude can be estimated by day length.

The type of tag selected for our studies depends on the research questions at hand. For example, we are trying to determine if blue sharks and turtles survive after release from longline fishing gear. If a shark was implanted with a conventional archival tag and it died and sank, we would get no data back. Instead, we chose Archival Pop-up tags to answer our questions about morbidity and mortality in post-released blue shark (and other pelagic species) in the Pacific Ocean because these tags can still provide data in the event of a mortality. Moreover, the data prior to transmissions of data will enable detection of a mortality and allow for differentiation between a shed tag and a dead animal. One of our tagged sharks died and sank, and its tag automatically jettisoned and uploaded its data. According to the temperature and depth chart (**Figure 1**), the shark showed some apparently normal vertical behaviors for the first five days, then expired. We are confident that this tag's data clearly represented a mortality event—the system worked just like we thought it would for showing the mortality of tagged individuals (i.e., the tag's pressure-sensitive depth-release mechanisms worked properly at about 1200m).

Obviously we don't view the mortality as a failure because we expected results like this for some of the deployments. We faced a Hobbesian choice in this study. On one hand we didn't want to tag moribund sharks that were obviously going to die, because that wouldn't provide useful information. But we also didn't want to tag only extremely vigorous animals, because that would skew our conclusions as to rates of post-release mortality. Dr. Chris Moyes, a colleague at Queen's University, will conduct analysis of blood samples to look for biochemical correlates of post-release survivability; with some luck, his data should confirm that the tagged shark was in bad shape when released. In view of the results to date, we envisioned archival



Photos courtesy of Phil White and Mike Musyl

An oceanic white-tip shark is fitted with a harness drilled through the dorsal fin to which an Archival Pop-up tag is attached.

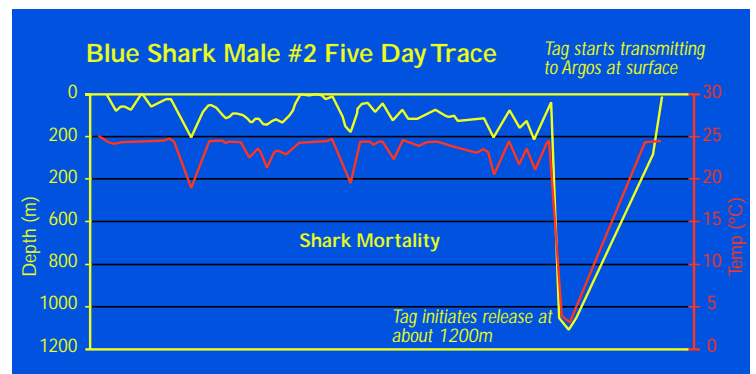


Figure 1. When one of the tagged sharks died and sank, the Archival Pop-up tag jettisoned and uploaded its data.



A blue shark is fitted with an Archival Pop-up tag. Telemetry from the tag helps to determine the mortality and morbidity of released sharks from fishing gear.

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