

Visualizing habitat use and behavior of whale sharks using the open-tag, applications for ecotourism regulation.

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Background. The rapidly decreasing cost of electronic components and growing hacker industry has enabled access to better tools for monitoring the behavior of whale sharks on a fine scale never before achieved. We use the new Open Tag as a novel approach to visualizing feeding behavior of whale sharks.

Methods. The Open Tag is a Arduino compatible open-source inertial measurement unit for recording high speed motion sensor data to a microSD memory card. A three dimensional gyroscope, accelerometer, and magnetometer allow for calculating pitch, yaw, and heading, while depth and temperature sample continuously. The rechargeable lithium battery allows for deployments up to 7 days sampling at 100Hz. The Open Tag is placed in a hydrodynamic syntactic foam float, with a band that stretches around the dorsal fin. A galvanic release incorporated into the tag allows for a release time to be programmed and a VHF tag (ATS) aids in recovery.

Results. An Open Tag was successfully deployed on a whale shark for 101 hours in August of 2013 in Yucatan Mexico. Behaviors noted included frequent surface intervals, even during the night when previously believed whale sharks were normally in deeper waters. A maximum depth of 49 meters was observed, with dives to 25 meters recorded regularly. We were able to identify possible harassment at the surface and defecation events.

Conclusion. The Open Tag fills a unique niche in whale shark studies as a useful tool to better understanding of fine scale habitat use and behavior. By incorporating these data into Trackplot with data on the position of ecotour vessels, we can visualize behavior and investigate potential erratic changes in depth, heading and lateral movement amplitude indicative of harassment.

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