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Preliminary Results: Behavior and habitat preferences of silky sharks (*Carcharhinus falciformis*) and a big eye thresher shark (*Alopias superciliosus*) tagged in the Eastern Tropical Pacific

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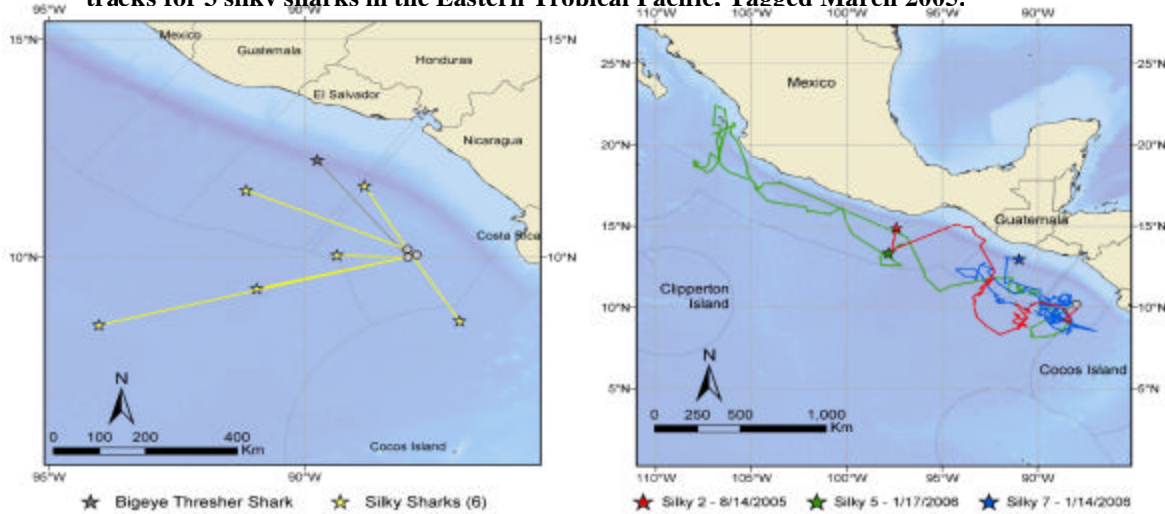
**Introduction.** Commercial exploitation has contributed to a decline in large predatory fish communities worldwide to varying degrees depending on the level of fishing, oceanic conditions, and the life history of individual species of concern (Burgess et al, 2005). Sharks in particular, are highly vulnerable to overfishing due to their life history characteristics (long lived, slow to mature, low fecundity). Pelagic sharks are commonly caught in the Eastern Tropical Pacific purse seine fisheries for tuna and in the longline fisheries for tuna (deep), swordfish (shallow) and mahi mahi (shallow). Estimates of shark relative abundance from mahi mahi longline observer programs in the EEZ of Costa Rica indicate a 60% decline in the probability of a hook catching a shark from 1991 to 2001 (Arauz et al, 2004). Little is known about the habitat preferences of the pelagic sharks taken incidentally in the major fisheries of the ETP. Knowledge of their behaviors will facilitate developing effective management strategies.

**Methods:** Nine sharks were tagged using Pop-off archival tags (PAT; model PAT4, Wildlife Computers): 7 silky sharks (*Carcharhinus falciformis*), one bigeye thresher (*Alopias superciliosus*), and one scalloped hammerhead (*Sphyrna lewini*). Of those, three silky sharks and one bigeye thresher were double tagged with a PAT and Smart Position Tag (SPOT; model SPOT4, Wildlife Computers) mounted on the dorsal fin, and one bigeye thresher was tagged with a SPOT tag only. All sharks were sexed, their fork length measured, and a DNA sample taken.

**Results:** There was one post-hooking mortality (scalloped hammerhead), and one non-reporting PAT tag (silky). PAT tags popped off of 6 silky sharks and 1 bigeye thresher after periods ranging from 42-88 days. SPOT tags on 2 bigeye threshers transmitted for

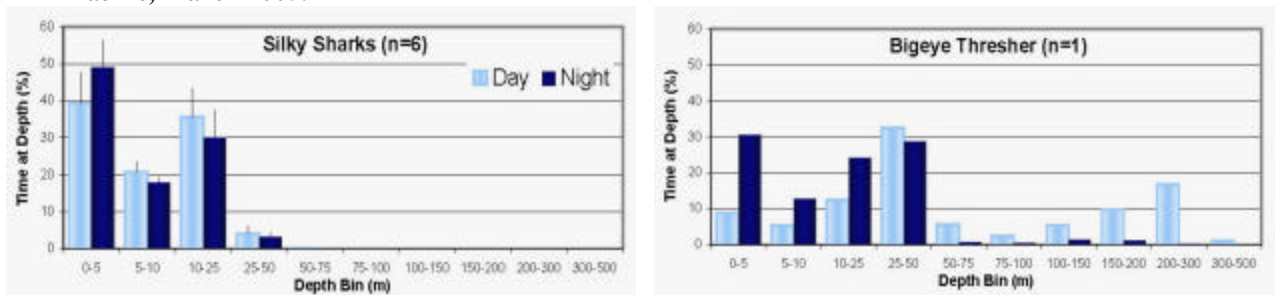
several months, although locations were not obtained. SPOT tags on the 3 silky sharks transmitted locations for 5-10 months. Two still transmit regularly (Fig 1). One animal traveled from Costa Rican water northwest nearly 2500 km to the mouth of the Gulf of California and back in 10 months.

**Figure 1. Pop off site locations for 6 silky sharks and one bigeye thresher, and SPOT tracks for 3 silky sharks in the Eastern Tropical Pacific. Tagged March 2005.**



Silky sharks spend 99% of their time in the top 50 meters of the water column. In contrast, the bigeye thresher spent considerable time in deeper waters diving to 300 meters repeatedly and spending nearly 30% of its time below 30 meters. The bigeye thresher did most of its deep diving during daylight hours. At night, the bigeye and silky sharks occupied similar depths (Fig 2).

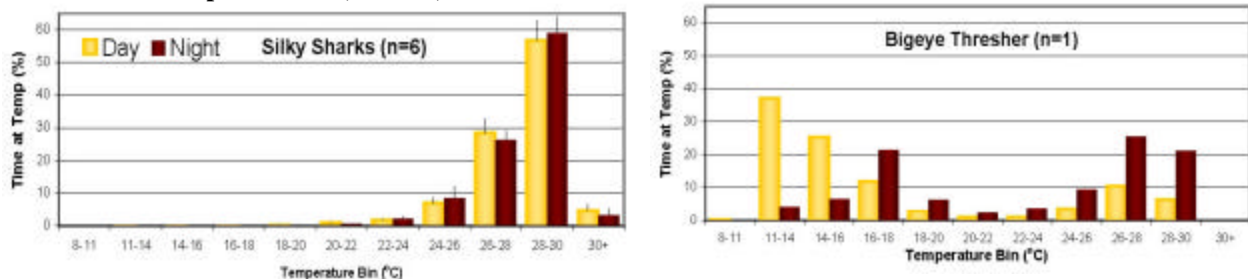
**Figure 2. Vertical movements of 6 Silky sharks and 1 bigeye thresher, tagged in the Eastern Tropical Pacific, March 2005.**



Silky sharks prefer waters between 28 and 30°C where they spent over 55% of their time, followed by waters between 26 and 28°C where they spent 25-30% of their time, with little difference between day and night. The bigeye thresher preferred colder waters

ranging from 11 to 18°C where it spent over 70% of its time during the day. During the night, it spent over 55% of its time in waters ranging from 24 to 30°C (Fig 3).

**Figure 3. Temperature preference of 6 silky sharks and 1 bigeye thresher tagged in the Eastern Tropical Pacific, March, 2005.**



Discussion: The results demonstrate that PAT tags are effective tools for studying the behavior of pelagic sharks. SPOT tags are not effective on bigeye thresher sharks; they are not likely to spend enough time with their dorsal fin above the surface. The bigeye thresher has a broad vertical niche during daylight hours which could bring them in contact with deep set (tuna) longline gear, and a shallow niche at night where they could overlap with shallow set (swordfish, mahi mahi) gear. The silky shark has a much narrower depth and temperature niche, and would be vulnerable to the shallow set longline fisheries and purse seine fisheries targeting smaller tuna and mahi mahi in the upper 50 meters. The SPOT tags demonstrate the migratory nature of the silky sharks and the need to manage them on an international level, as the silky sharks tagged in this study ranged into the EEZs of 6 countries and beyond into international waters.

#### Bibliography

Arauz, R., Y. Cohen, J. Ballester, A. Bolaños & M. Pérez. 2004. Decline of Shark Populations in the Exclusive Economic Zone of Costa Rica. International Symposium on Marine Biological Indicators for Fisheries Management. UNESCO, FAO. Paris, France. March, 2004

Burgess, G. H., L. R. Beerkircher, G. M. Cailliet, J K. Carlson, E. Cortés, K. J. Goldman, R. D. Grubbs, J. A. Musick, M. K. Musyl, C. A. Simpfendorfer. 2005. Is the collapse of shark populations in the Northwest Atlantic Ocean and Gulf of Mexico real? *Fisheries* 30(10):19-26.