

## **An update on the post-release survival of silky sharks incidentally captured by tuna purse seine vessels in the Indian Ocean.**

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### **Abstract**

Silky sharks captured onboard the tropical tuna purse seine vessel Torre Giulia were tagged with miniPATs (Wildlife computers) to study their post release survival. A total of 86 sharks were captured. Twelve of these were in good enough condition to be tagged to estimate survival. Five of the 12 died due to the capture operation. An overall mortality rate of between 82% and 91% was obtained during this cruise.

### **Introduction**

The main shark species incidentally caught by purse seiners around floating objects in the Indian Ocean is the silky shark (*Carcharhinus falciformis*) (Amandè et al. 2008), a trend that is found in every tropical ocean (Dagorn et al. 2012). Initial estimates of mortality of silky sharks captured by tuna purse seine vessels in the Indian Ocean were provided in Poisson et al. (2011). Here we report on a further round of tagging that was conducted during a chartered research cruise on the French tuna purse seine vessel Torre Giulia. The cruise formed part of the bycatch reduction project being run by the International Seafood Sustainability Foundation (ISSF). The cruise took place between 31 March and 8 May 2012 from the Seychelles. During most of the cruise the vessel operated in areas SW, S and SE of the inner islands of the Seychelles. A short trip was undertaken into the Mozambique Channel however no sets were made and no sharks were tagged during this time. The Wildlife Computers miniPATs used to study the survival rate of sharks released alive were funded by the the project Contrat Avenir from the French fleet organization ORTHONGEL and the EU funded MADE project, [www.made-project.eu](http://www.made-project.eu).

### **Materials and Methods**

Silky sharks were captured around drifting FADs following standard purse seine fishing practices. When sharks were observed in the hopper they were removed by members of the crew or scientific staff and placed on a foam mattress. There they were visually assessed by the scientific team to determine whether they were either alive, and could be tagged, highly unlikely to survive, or dead. In cases where the shark showed some signs of life but the scientist felt they were unlikely to survive the sharks were tagged with conventional plastic dart tags (PDTs) and released. Where sharks showed signs of life, the animal was tagged with a miniPAT tag (Wildlife Computers). The total length (TL) of all sharks was

measured to the nearest centimetre and the animal's sex was determined through visual inspection. Tags were anchored with a variety of nylon anchors including both models of the Wilton dart provided by Wildlife Computers as well as the Domeier plastic umbrella dart (see Domeier et al 2005).

As with Poisson et al. (2011) the fate of a tagged shark was determined through examination of the vertical data transmitted from the tag. If the shark was seen to have sank to a depth in excess of 1600 – 1800m (causing the tag to automatically release) shortly after being released from the vessel it was declared as an immediate mortality. Furthermore, a delayed mortality was defined as the same pattern occurring at any point later than one week from the time of tagging.

In total 12 silky sharks (104 – 225 cm TL) were tagged with miniPATs to study their survival. Further details are provided in Table 1.

### Results

A total of 86 sharks were captured in the 16 sets on floating objects during the 39 day cruise. Of these 86, 64 (74%) were declared dead on deck. Twenty-two sharks were released with signs of life, 10 of these were tagged with PDTs. Three of the 12 sharks that were tagged with MiniPATs died immediately after release and a fourth one appeared to have been in very poor condition for four days after release and was then eaten by a predator after sinking to 250m. As such a total of 4 of the 12 sharks died due to the capture event.

Of the 10 sharks tagged with PDTs three were observed sinking with their ventral side facing up, and were declared dead. The fate of the remaining seven is unknown.

As the status of seven sharks released alive with PDTs is uncertain, the final mortality rate is comprised between 82% (71 dead sharks) and 91% (78 dead sharks).

**Table 1** Summary information on silky sharks *Carcharhinus falciformis* tagged with miniPATs to study their post release survival from a tuna purse seine vessel.

Tagging Date	TL cm	Sex	Immediate Mortality	Delayed Mortality	Survival	Unknown
02/04/2012	104	M			Yes	
02/04/2012	113.6	F		Yes		
03/04/2012	132	M			Yes	
03/04/2012	155	M			Yes	
03/04/2012	130	F				Yes
03/04/2012	135	M	Yes			
28/04/2012	147	M				Yes
30/04/2012	135.7	F	Yes			
30/04/2012	116.7	M	Yes			
02/05/2012	113.8	F	Yes			
03/05/2012	224.5	M			Yes	
06/05/2012	104	-			Yes	

## Discussion

Poisson et al. (2011) reported immediate mortality rates of 62% from two cruises during 2011, with a survival rate for sharks released alive estimated to 50%. In total, the mortality rate was estimated to 81%. The mortality rate observed in this extended study appears to be of the same order. These two studies show that the good practice of discarding sharks when they are observed alive on the deck should be promoted, as this could save approximately 10-20% of sharks. However, this would not be enough and complementary practices should be utilized in order to have a significant reduction of the fishery-induced mortality of this species. Clearly solutions to the problem of shark bycatch in tropical tuna purse seine fisheries will have to focus on the areas of the fishing operation before the sharks are brought onboard the vessel.

## References

- Amandè, M. J., Ariz J., Chavance P., de Molina A. D., Chassot E., Gaertner D., Murua H., Pianet R., and Ruiz J. 2008. By-catch and discards of the European purse seine tuna fishery in the Indian ocean: Characteristics and estimation for the 2003-2007 period. IOTC-2008-WPEB-12.
- Dagorn L; Holland K, Restrepo V, Moreno G, 2012. Is it good or bad to fish with FADs ? What are the real impacts of the use of drifting FADs on pelagic marine ecosystems? Fish and Fisheries, DOI: 10.1111/j.1467-2979.2012.00478.x.
- Domeier ML, Kiefer D, Nasby-Lucas N, Wagschal A, O'Brien F (2005) Tracking Pacific bluefin tuna (*Thunnus thynnus orientalis*) in the northeastern Pacific with an automated algorithm that estimates latitude by matching sea-surface temperature data from satellites with temperature data from tags on fish. Fish Bull 103:292–306
- Poisson, F., Vernet, A.L., Filmalter, J.D., Goujon, M., Dagorn, L. (2011). Survival rate of silky sharks (*Carcharhinus falciformis*) caught incidentally onboard French tropical purse seiners. IOTC–2011–WPEB07–28.